

Chemical Abstracts

Published by the

American Chemical Society

Volume 20

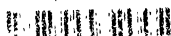
JANUARY—MAY

Editor: E. J. Crane; Associate Editors: Elmer Hockett and Helen Game

Assistant Editors

W. L. Badger
A. K. Balls
G. B. Barton
Edward Bartow
S. R. Benedict
W. D. Bigelow
G. L. Clark
C. E. Curran
C. C. Davis

D. J. Donohue
R. M. Driscoll
W. O. Fernelius
A. C. F. Fernelius
C. G. F. Fernelius
C. N. F. Fernelius
R. A. F. Fernelius
W. T. F. Fernelius
P. B. F. Fernelius



L. A. Olney
Austin M. Patterson
A. N. Richards
Allen Rogers
F. M. Rogers
C. A. Rouiller
A. H. Sabin
E. Scherubel
J. J. Skinner

A. E. Stevenson
P. P. Underhill
H. G. Wells
C. J. West
E. T. Wherry
R. S. Williams
J. C. Witt
E. C. Zeisberg
P. W. Zerbau

Abstractors

W. H. Adolph
A. R. Albouze
A. R. Albright
Jerome Alexander
S. K. Allison
J. A. Almquist
F. O. Anderegg
M. S. Anderson
E. C. R. Ardagh
S. B. Arenson
C. V. Bailey
D. C. Bardwell
R. C. Bardwell
R. M. Barnette
J. M. Bell
H. G. Berger
R. Beutner
F. R. Bichowsky
E. C. Bingham
C. M. Bouton
W. H. Boynton
R. Bradfield
J. F. Brewster
C. P. Brockett
F. E. Brown
J. B. Brown
F. L. Browne
R. Buchanan
A. Butts
J. F. Byrne
F. A. Cajori
J. S. Caldwell
G. Calingaert
A. T. Cameron
L. K. Campbell
B. H. Carroll
T. S. Carswell
M. L. Cast
E. L. Chappell
S. L. Chisholm
C. H. Christman
E. R. Clark
I. D. Clarke
G. F. Comstock
A. W. Coniari
C. W. Cook
C. L. Cooper
H. J. Corper
J. D. Davis
T. L. Davis

I. A. Denison
H. J. Denel, Jr.
A. H. Dick
D. B. Dick
R. L. Dodge
A. W. Dox
A. G. Du Mez
M. L. Dundon
W. C. Eblough
C. H. Eldridge
L. D. Elliott
Paul Escher
O. L. Evenson
L. T. Farhall
W. F. Faragher
Marie Farsworth
C. S. Fazel
M. J. Fessler
F. P. Flag
M. E. Flentje
A. W. Francis
E. S. Freed
D. K. French
P. K. Fröhlich
R. C. Fuson
W. G. Gaessler
Harriet W. Gibson
J. E. Gill
J. L. Gillson
W. F. Goebel
R. T. Goodwin
R. E. Greenfield
I. Greenwald
A. Grollman
S. Gulbrandsen
N. F. Hall
C. E. Halstead
H. C. Hamilton
M. T. Hanke
B. Harro
R. J. Havighurst
M. Heidelberg
L. M. Henderson
S. Hepburn
G. A. Hill
J. J. Hinman, Jr.
W. W. Hodge
B. J. C. van der Hoeven
J. M. Holderby
E. Holm
F. Holmes

A. Hungenmann
R. D. Hunneman
W. F. Hunt
W. J. Husa
C. E. Ives
K. D. Jacob
Mary Jacobsen
J. S. Joffe
C. L. Jones
R. M. Jones
J. C. Jurrjens
A. J. Kammerer
K. Kashima
J. A. Kennedy
A. W. Kenney
E. J. Kern
C. C. Kiess
C. G. King
H. S. van Klooster
N. Kopeloff
P. C. Kracke
Frances Krasnow
H. R. Kraybill
H. F. Kriege
J. N. Kugelmass
M. O. Lamar
A. R. Lamb
N. A. Lange
W. D. Langley
S. Lehrman
L. Leiter
H. B. Lewis
J. H. Lewis
Arthur Locke
L. B. Loeb
R. H. Lombard
E. R. Long
A. E. Lothrop
Max Luthy
J. F. Lyman
D. F. McFarland
H. M. McLaughlin
M. McPherson
A. E. MacRae
C. L. Mantell
T. Markovits
G. E. Matthews
Mary E. Maver
W. F. Meggers
A. L. Mehring
E. G. Meiter

H. B. Merrill
A. R. Merz
R. J. Montgomery
H. R. Moore
J. H. Moore
S. Morgulis
W. A. Mudge
R. S. Mulliken
C. E. Mullin
J. T. Myers
B. H. Nicolet
W. Albert Noyes, Jr.
W. Ogawa
H. L. Olin
W. L. Owen
A. W. Owens
A. Papineau Couture
H. C. Parish
C. R. Park
J. L. Parsons
J. B. Patch
O. Patk
W. A. Perlzweig
J. H. Perry
C. V. J. Pettibone
P. B. Place
W. B. Plummer
O. F. Poindexter
Robt. S. Posmontier
L. A. Pridgeon
Edith Quimby
E. T. Ragan
L. S. Ramsdell
F. G. Rawling
G. F. Reddish
F. E. Rice
C. H. Richardson
L. W. Riggs
C. H. A. Robak
L. D. Roberts
R. C. Roberts
A. R. Rose
W. H. Ross
C. C. Ruchhoff
W. B. Ruder
C. M. Salls
J. F. Schairer
F. M. Schertz
E. R. Schierz
R. F. Schneider
A. L. Schoen

F. N. Schott
H. G. Schurecht
W. Seegerblom
Florence Seibert
M. Seymour
F. L. Seymour-Jones
D. E. Sharp
G. E. Simpson
S. G. Simpson
G. H. Smith
F. D. Snell
M. H. Soule
A. D. Spillman
H. A. Spöcher
W. Steicker
J. T. Stern
W. W. Stiffer
H. Stoertz
C. G. Storm
C. O. Swanson
W. H. Swanson
E. M. Symmes
F. W. Tanner
Shiro Tashiro
E. W. Thiele
R. E. Thompson
A. P. H. Trivelli
H. C. Urey
H. W. Vahlteich
D. S. Villars
H. H. Volwiler
S. Waldbott
L. E. Warren
H. B. Weiser
G. L. Wendt
P. A. Wertz
W. P. White
W. A. ver Wiebe
E. P. Wightman
J. J. Willaman
J. A. Wilson
Raymond Wilson
L. E. Wise
E. J. Witzemann
M. A. Yerger
F. H. Yorston
M. A. Voutz
A. C. Zachlin
H. F. Zoller

CHEMICAL ABSTRACTS

Vol. 20.

JANUARY 10, 1926

No. 1

1—APPARATUS AND PLANT EQUIPMENT.

W. L. BADGER

The technical spring fair at Leipzig, with heat and brown coal exhibits. BERTHOLD BLOCK. *Chem. App.* 12, 134-6, 142-4, 172-4, 185-6, 193-4, 202-4(1925); 33 cuts.—Descriptions of centrifugal and acid pumps, automatic chargers for phosphate furnaces, bisulfite furnaces, rotary filters, gas washers, a small O plant, feed-H₂O app., gages, etc.

Some new apparatus devised by Prof. R. Pohl, Göttingen. v. ÖLSHAUSEN. Z. *Elektrochem.* 31, 502-3(1925).—1. An experimental table. 2. Hydro-dynamic apparatus (a) for the detn. of current speed and pressure in relation to tube cross-section, and (b) a centrifuge for small-scale work, and detn. of particle size. 3. Wave-length apparatus with special shaft and carriage. No details of construction are given.

R. C.

Standardization of viscosity pipets. EMIL GARDOS. *Am. J. Pharm.* 97, 541-4(1925).—Results of expts. show that the present U. S. P. method for detg. the viscosity of liquid petrolatum is not sufficiently accurate, owing to the very conflicting results obtained by using pipets the specifications of which satisfy the demands in the U. S. P. In order to get the same results with different pipets, a standardization of the bulb and stem is needed, special attention being given to the delivery tube and to the bore.

W. G. GAESSLER

Calibration of the Vogel-Ossag viscometer. PASCHEN. Z. *angew. Chem.* 38, 891-2(1925).—Methods and fees of the Phys.-Techn. Reichsanstalt.

J. H. MOORE

A new type of nephelometer. R. KINGSLAKE. *Trans. Optical Soc. (London)* 26, 53-63(1924-5).—This describes a new type of nephelometer which enables measurement of minute amts. of ppt. by means of the turbidity it produces in soln. Light is passed into the end of a tube contg. the soln. and the intensity of the scattered light is measured by a special form of wedge photometer. Means by which stray light can be kept from the eye during observations is described.

D. E. SHARP

Turbidometer and colorimeter. H. DOLD. *Chem.-Ztg.* 49, 842(1925).—A description of a turbidometer sold by F. and M. Lautenschläger, Frankfurt a. M.

W. C. EBAUGH

A new laboratory stirring apparatus. ARNO MÜLLER. *Chem.-Ztg.* 49, 807(1925).—An illustrated description of a patented form of stirring app. marketed by A. Primavesi, Magdeburg.

W. C. EBAUGH

Grease-free mercury valve with porous glass plates. ALFRED STOCK. *Ber.* 58B, 2058-60(1925).—The previously described Hg float valve (cf. C. A. 9, 765; 11, 2637; 12, 547) has the disadvantage that it fails to function rapidly when large pressure differences exist across it. To overcome this disadvantage a Hg valve has been designed with porous glass plates to replace the glass float. The construction of this valve has been made possible by the recent development by the Jenaer Glaswerk Schott and Gen. of porous glass plates that can be fused into glass app. The plates permit passage of gas but are impervious to Hg. The permeability of gas varies between 100 and 500 cc. per min. per atm. drop. The valve consists of a glass U across the two arms of which are fused 2 porous glass plates. A T-connection at the bottom of the U leads to a Hg leveling device. When the Hg level is below the U, connection is made between the 2 arms of the U through the plates. To close the valve the Hg is run up against the 2 plates.

R. L. DODGE

An apparatus for approximate or comparative melting points of fats, waxes and petroleum. HOYT STEVENS. *J. Oil and Fat Ind.* 2, 28-30(1925).—A glass rod about the size of the thermometer is coated with a thin layer of the substance whose m. p. is to be detd. and suspended in the m. p. bath close but not touching the thermometer. The temp. at which the coating becomes transparent is the softening point and that at which it slides down the rod the m. p.

H. S. BAILEY

Welded steel pipe protected inside and out by reinforced concrete. A. BONNA. *Technique sanitaire* 20, 80-8(1925). J. J. HINMAN, JR.

Silica gel, its properties and apparatus for using it (HORST) 2.

Column still. J. SCHNEIBLE. U. S. 1,557,112, Oct. 13.

Filter. H. BECHHOLD. U. S. 1,557,234, Oct. 13. A filter adapted for purifying serums, H_2O , fruit juices or other liquids may be of diatomaceous earth which is impregnated with $AgCl$ or other insol. or difficultly sol. compd. of a metal of lower soln. tension than H and of higher soln. tension than Cu .

Filter. H. BECHHOLD. U. S. 1,557,235, Oct. 13. Filters for H_2O , fruit juices, serums, etc., and which may be formed of clay, C , diatomaceous earth, etc., are impregnated with substances at least one of which is a metal, e. g., Ag or Au , of lower soln. tension than H and of higher soln. tension than Pt , another being a compd. of a metal of lower soln. tension than H , e. g., $AgCl$.

Centrifugal filter. H. S. HELE-SHAW. U. S. 1,557,585, Oct. 20.

Rotary filter. W. D. MOUNT. U. S. 1,558,038, Oct. 20.

Air filter. A. JORDAHL. U. S. 1,560,790, Nov. 10.

Gas filter. R. M. RANYARD. U. S. 1,559,456, Oct. 27.

Filter for beverages, pharmaceutical solutions, etc. H. S. LEVINTHAL. U. S. 1,560,266, Nov. 3.

Filter for water, etc. W. L. HILBISH. U. S. 1,558,608, Oct. 27.

Filter for water, cider, beer, etc. W. L. COOP. U. S. 1,556,426, Oct. 6.

Viscometer. R. G. CASEY. U. S. 1,560,662, Nov. 10.

Viscometer. F. P. ZIMMERLI. U. S. 1,557,517, Oct. 13.

Optical pyrometer. F. H. SCHOFIELD. U. S. 1,560,864, Nov. 10.

Thermostat. G. H. WHITTINGHAM. U. S. 1,557,535, Oct. 13.

Temperature indicator and recorder. F. J. BAST and F. KRAMER. U. S. 1,551,129, Aug. 25.

Thermostatic temperature regulator. S. T. HINDENACH, J. G. BRADFORD, H. W. HUNTLEY and J. G. GOODHUE. U. S. 1,551,153, Aug. 25.

Liquid-oxygen container. C. MOTT and W. H. MARSHALL. U. S. 1,561,101, Nov. 10. U. S. 1,561,102 (C. Mott) also relates to a vacuum container adapted for transporting liquid air, etc.

Apparatus for charging liquids with carbon dioxide. G. F. SUGDEN. U. S. 1,561,036, Nov. 10.

Apparatus for contacting gases with liquids. P. M. KUEHN. U. S. 1,561,000, Nov. 10.

Apparatus for dehydrating air by refrigeration. J. A. MARTOCELLO. U. S. 1,558,741, Oct. 27.

Apparatus for disintegrating, emulsifying and mixing milk powder, china clay, barytes or other substances. H. POVEY and H. O. HALLAS. U. S. reissue 16,191, Oct. 27. (Original pat. No. 1,489,786, issued April 8, 1924; C. A. 18, 1768.)

Apparatus for continuous crystallization of sodium hyposulfite or other substances. H. HOWARD. U. S. 1,560,473, Nov. 3.

"Reflex oven" employing surface combustion. G. WOLLERS. U. S. 1,561,389, Nov. 10. An oven is specified, adapted for "hardening" (metals?) or producing low temp. tar, etc.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

The discipline of chemistry. C. H. DESCH. *Nature* 116, 504-5(1925).—A lecture. F. N. SCHOTT

Some Czech contributions to chemical science. J. G. F. DRUCE. *Science Progress* 20, 308-11(1925).—An essay on the present status of chemistry in Bohemia. JOSEPH S. HEPBURN

Chevreul. L. J. SIMON. *La nature* 53, ii, 235-8(1925).—A biography of Chevreul with portraits, with particular reference to his work on animal fats and org. acids and their classification, and his creation of proximate analysis. C. C. DAVIS

A new method of determination of certain dimensions of molecules and of the number N based on the study of the surface equilibrium of colloidal solutions. P. LE-

COMTE DU NOÛY. *J. phys. radium* 6, 145-53(1925).—By the use of the tension meter (cf. Noüy, *C. A.* 13, 1549, and Klopsteg, *C. A.* 18, 3501) the adsorption isotherms of different colloidal sols. have been detd. as a function of time. These colloids were studied: proteins (albumin, globulin, hemoglobin, etc.), oleates, stearates taurocholates, Na glycocholate, saponin, etc., a large no. of coloring materials and electrosols of Au, Ag, Fe and Al. The fall of the surface tension was from the beginning and during a time which depended on the concn. proportional to the time and then followed a logarithmic law as a function of time. In the case of Na oleate at the concn. of 10^{-8} this proportionality continued to the equilibrium value of 32 dynes at 22° . No explanation is offered for the observation that during the 1st 10 mins. (approx.) with Na oleate at concns. between 1×10^{-8} and 4×10^{-8} one-third the time is required to produce the same lowering of surface tension if the concn. is doubled. When the sols. were shaken or agitated, even slightly, the surface tension rose, but not to the initial value except for some very dil. sols., and then decreased according to the same law as above. This phenomenon could be repeated indefinitely. In order to obviate the effect of agitation and to det. the min. value of surface tension at the end of an arbitrary time, the sols. were placed side by side on a table supported on piers. The tension meter was brought successively to the sols. on a little carriage rolling on rails. For each substance a max. fall occurred at a certain concn. (e. g., $1/140,000$ for egg albumin). This max. corresponded to a critical arrangement of the mols. and was evidently a function of the ratio (adsorption surface) (S)/ (vol. of the liquid) (V). By adding glass spheres of known surface, expts. demonstrated that the displacement of the max. was directly proportional to the different values of S/V , i. e., adsorption occurred on the glass as well as on the surface of the liquid. In the curves plotting surface tension at the end of 2 hrs. with concn., 3 well-defined minima occurred. These min. were attributed to a geometrical arrangement of a mono-mol. layer of mols. oriented in parallel (polarized) on the surface. By assuming that all the mols. were adsorbed and using the vol. and concn. of the soln., the total area of surface and the d. of pure Na oleate, the thickness of the adsorbed layer for the 3 min. at concns. of $1/750,000$, $1/1,220,000$ and $1/1,390,000$ corresponded, resp., to 12.3×10^{-8} , 7.56×10^{-8} and 6.64×10^{-8} cm.. By considering the 3 thicknesses to correspond to the 3 dimensions of a mol. of Na oleate and using the d. and mol. wt. of pure Na oleate, $N = 6.004 \times 10^{23}$. A discussion of the sources of error indicated an accuracy of 0.15%, i. e., $N = 6.004 \pm 0.09 \times 10^{23}$.
H. M. McLAUGHLIN

The derivation of the equation for the effect of temperature on reaction rate. R. C. TOLMAN. *J. Am. Chem. Soc.* 47, 2652-61(1925).—The equation of Arrhenius for the temp. coeff. of mono- and bi-molecular reaction is derived on the assumptions of microscopic reversibility, i. e., that the condition of statistical equil. is that the number and rate of the mols. entering any statistical state shall be equal, and on the assumption that the number of unactivated mols. is given by the Maxwell law. No assumption of the mol. mechanism or indeed of the mol. significance of the process of activation need be made. The energy of activation comes out a function of the difference of the av. energies of the activated and non-activated mols. and not as a function of the difference of the individual energies as assumed by Lewis and Smith in their account of the mechanism of activation. This mechanism must therefore be wrong. No alternate mechanism is offered here.
F. R. B.

Cohesive forces of liquids. A. TH. VAN URK. *Proc. Acad. Sci. Amsterdam* 28, 356-64(1925).—See *C. A.* 19, 3185.
E. J. C.

Equilibrium in the system zinc sulfate-water. ERNEST COHEN AND A. L. TH. MOESVELD. *Proc. Acad. Sci. Amsterdam* 28, 461-6(1925).—See *C. A.* 19, 2158.
E. J. C.

Study of the ternary mixture—water, ethyl alcohol, normal butyl alcohol. F. DROUILON. *J. chim. phys.* 22, 149-68(1925).—The temps. of mutual soly. of the two phases formed by mixing different portions of H_2O , EtOH and BuOH were detd. by sealing a number of known mixts. in small glass tubes and heating slowly until the boundary between the phases disappeared. From these data curves were drawn representing the soly. of BuOH in a series of EtOH- H_2O mixts. (from 0 to 25% EtOH by wt.) covering a temp. range from 10° to 130° . The data are also shown in triangular coordinates. The coeff. of partition of BuOH between the aq. and alcoholic layer at 20° was then detd. over a wide range of concn. The method of analysis of the phases was based on the addn. of a known wt. of either EtOH or H_2O and detn. of the temp. of mutual soly. as in the case of the first expts. The coeffs. thus detd. varied from 12.3 to 1.00.
A. W. KENNEY

Standardization and calculation of results for the Haber-Löwe gas interferometer. G. WERNER. *Z. angew. Chem.* 38, 905-11(1925).—Equations and tables are given

for the standardization and for the use of this app. in the detn. of the compn. of binary gas mixts. The use is discussed in detail and a bibliography given. WM. B. PLUMMER

A general theory of solvent systems. A. F. O. GERMANN. *J. Am. Chem. Soc.* **44**, 2461-8(1925).—Based on a study of the analogy between the reactions in H_2O and in $COCl_2$ solns., a general theory of acids, bases and salts as related to a parent solvent has been outlined. The common definitions of aquo acids, aquo bases and aquo salts or ammono acids, ammono bases and ammono salts have been generalized to include other solvents and the names changed to *solvo acids*, *solvo bases* and *solvo salts*. The application of the theory to other solvents— SO_2Cl_2 , $SeOCl_2$ and $SOCl_2$ —has been suggested. H. M. McLAUGHLIN

Considerations on the properties of physical systems in the vicinity of the critical state. L. ÇAY AND N. PERRAKIS. *J. chim. phys.* **22**, 169-85(1925).—A general consideration is given to the phenomena of the crit. point. By definition, any system containing any number of phases, of which at least two are fluid, is at the crit. point with regard to these two fluid phases when by causing a suitable variation in the conditions imposed on this system the two phases in question mix and become identical at all points. Illustrations as, for example, C_2H_4 -EtOH mixts. and nicotine- H_2O mixts. are given. The major portion of the article is devoted to theoretical generalizations in regard to the analytical geometry of crit. points and the mathematical form which the different curves may take. By a suitable choice of variables the crit. curve may be represented by an approx. straight line. A. W. KENNEY

Colloidal cobaltic hydroxide. C. PAAL AND HANS BOETERS. *Ber.* **58**, 1539-41 (1925).—*Prepn.*: (a) Oxidation with air. A soln. of 1 g. of Na protalbinat or lysalbinat in 25 cc. of H_2O was treated alternately with small portions of $CoCl_2$ (1%) and NaOH (normal) until a permanent turbidity (after about 9-10 cc. of the $CoCl_2$) remained. The hydrosol was dialyzed for 3-4 days until free of Cl^- . After 1 day the cobaltous was changed to cobaltic hydrosol by the O_2 of the air. With transmitted light the content of the dialyzer changed from a deep green to a reddish brown. After filtering the hydrosol was concd. by evapg. at 50-60° and 25 mm. pressure and finally dried in a vacuum desiccator. (b) Oxidation with H_2O_2 . The procedure was the same as in a except that 2 g. of the Na protalbinat or lysalbinat was dissolved in 20 cc. H_2O and 10 cc. of 3% H_2O_2 added before adding the $CoCl_2$ and NaOH. Brittle, black lustrous lamella easily sol. in H_2O were obtained. H. M. McLAUGHLIN

The densities of beryllium halides. CARL MESSERKNECHT AND WILHELM BILTZ. *Z. anorg. allgem. Chem.* **48**, 152-6(1925).—The densities of beryllium chloride (I), bromide (II) and iodide (III) were detd. by means of a pycnometer. Mineral oil b. 180-240° was used. I and II were prepd. by the action of the respective halogens on BeO in the presence of C. All three were obtained also from the beryllium carbide and purified by sublimation. The mol. vols. calcd. from the d agree with those calcd. from the mol. vols. of K halides according to the equation $V_{BeHal_2} = aV_{KHal_2} + b$, where $b = -2.76$, $a = 1.193$. No simple relation to Biltz's extension of Kopp's rule could be found. EMIL KLARMANN

Specific gravity of concentrated solutions of orthophosphoric acid. WM. H. ROSS AND R. M. JONES. *Ind. Eng. Chem.* **17**, 1170-1(1925).—The sp. gr. of solns. of H_3PO_4 of 90 to 100% concn. was detd. at different temps. ranging between 20° and 60°. W. H. ROSS

Silica gel, its properties and apparatus for using it. F. W. HORST. *Chem. App.* **12**, 159-61, 201-2(1925); 7 cuts. J. H. MOORE

The kinetics of sol-gel-transformation of concentrated ferric oxide sols. H. FREUNDLICH AND A. ROSENTHAL. *Kolloid-Z.* **37**, 129-31(1925); cf. Schalek and Szegvary, *C. A.* **17**, 2663.—The observed and calcd. (cf. *C. A.* **14**, 1067) velocity of gelation (reciprocal of the time required for the sol-to-gel transformation) were in close agreement. With increasing electrolyte concn. the velocity of gelation increased to a const. value which was then independent of the concn. of the electrolyte. During the measurements it was necessary to retard the gelation by adding glycooll, alanine and similar compds. (cf. Paine and Evans, *C. A.* **18**, 609). These added substances were not characteristically protective but seemed to form inner complexes with the Fe on the surface of the colloid particle. H. M. McLAUGHLIN

Monomolecular soap films in emulsions. WM. RIEMAN 3RD AND P. A. VAN DER MEULEN. *J. Am. Chem. Soc.* **44**, 2507-13(1925); cf. *C. A.* **18**, 1412.—Emulsions of the oil-in- H_2O type contg. a soln. of C_6H_5OH in toluene as the internal phase and Na oleate as the emulsifying agent have been studied. When the concd. emulsion was dild. 5 to 500 cc. instead of 10 to 500 cc. the av. area of interface covered per mol. varied, i. e., the av. area per mol. depended primarily on the concn. of the soap in the external

phase and not on the concn. of the soap in the concd. emulsion. The C_6H_5OH displaced the soap in the film to a limited extent and affected the av. area per mol. of soap. When the soap concn. in the external phase of the dil. emulsion exceeded 0.01 M, the protective film was composed of closely packed, oriented soap mols., occupying an av. area of 17 sq. Å. each. To account for the difference from the area of 22 sq. Å. per $-COOH$ found by Langmuir (cf. *C. A.* 11, 2849) and others, it is assumed that the neighboring $-COOH$ groups are drawn into the H_2O to different depths and that the 17 sq. Å. represents the av. cross-sectional area of the hydrocarbon chain of the oleic acid.

H. M. McLAUGHLIN

The absorption of oxygen and liberation of carbon monoxide by alkaline pyrogallol solutions. T. J. DRAKELEY AND HUGH NICOL. *J. Soc. Chem. Ind.* 44, 457-62T (1925).—Preliminary investigation showed that all of the alk. pyrogallol solns. described in the literature yielded CO when absorbing O of high strength. Systematic study of the absorption conditions showed that the CO production was minimized under the following conditions: use of a highly concd. absorbent soln., vigorous agitation of the absorbent, use of a nearly fresh pyrogallol soln., and diln. of high concn. O to not over 25% with N. No difference in CO production was noted when KOH, NaOH, or NH_4OH was used as alkali. The Orsat app. is unsuitable because agitation of the absorbent is difficult. The best general soln. is that of Anderson, contg. 15 g. of pyrogallol to 100 cc. KOH, d. 1.55. For accurate O detn., a separate CO detn. should be made after the O detn.

T. S. CARSWELL

Adsorption of acids by purified silica. J. N. MUKHERJEE. *Nature* 115, 497 (1925).—M. showed in *C. A.* 19, 1320, that hydrated silica free from all impurities adsorbs acids. Data are now given to show that thoroughly washed hydrated silica, prepd. from pure $SiCl_4$ and allowed to be partially dehydrated in air at room temp., exhibits a marked increase in its capacity to adsorb acids.

FLORENCE N. SCHOTT

Catalytic transference of hydrogen as the basis of the chemistry of dissimilation processes. A. J. KLUYVER AND H. J. L. DONKER. *Proc. Acad. Sci. Amsterdam* 28, 605-18 (1925).—See *C. A.* 19, 2354.

E. J. C.

Comparative investigations of the activity of contact catalysts. II. Water synthesis by metals of the iron group and by binary alloys that these metals form with the platinum group metals, insofar as they are catalytically active at room temperature. H. REMY AND H. GONNINGEN. *Z. anorg. allgem. Chem.* 148, 279-92 (1925); cf. *C. A.* 18, 3307.—The comparative catalytic activity of Rh, Pd, Os, Ir, Pt toward the reaction $2H_2 + O_2 = 2H_2O$ was redetd. in a new app. by the same method as in the previous investigation. The results of the previous investigation were confirmed in every case. The influence on the catalytic activity of preliminary treatment of the catalyst with H or O was detd. as well as the influence of H, O or N as diluent in the electrolytic gas mixt. The metals and alloys were prepd. by the same method as previously described. The pure metals of the Fe group that were studied were Fe, Co and Ni; the alloys (proportions not given) were Rh/Fe, Rh/Ni, Pd/Fe, Pd/Co, Pd/Ni, Ir/Fe, Ir/Co, Ir/Ni, Pt/Fe, Pt/Co, Pt/Ni. In general the catalytic activity of the alloys was found to be less than for the corresponding Pt group metals under the same conditions. After preliminary treatment with H the Ni alloys were the most active of the alloys, but after O treatment they were decidedly the least active. The Fe alloys showed the reverse behavior, being least active after preliminary H treatment, and particularly active after O treatment. The metals and alloys that do not catalyze the synthesis of H_2O at room temp. under any conditions are Fe, Co/Fe, Ni/Fe, Ru/Fe, Os/Fe, Co, Ni/Co, Ru/Co, Os/Co, Rh/Co, Ni, Ru/Ni, Os/Ni, Ru. The alloys Rh/Fe and Ir/Fe will catalyze the reaction at room temp. only after preliminary treatment with H; Rh/Ni only after preliminary treatment with O. Os, Os/Ru, Rh, Rh/Os, Rh/Ru, Ir, Ir/Rh, Ir/Os, Ir/Ru, Ir/Ni, Ir/Co, Pd, Pd/Ir, Pd/Rh, Pd/Os, Pd/Ru, Pd/Ni, Pd/Co, Pd/Fe, Pt, Pt/Pd, Pt/Ir, Pt/Rh, Pt/Os, Pt/Ru, Pt/Ni, Pt/Co, Pt/Fe all catalyze the reaction at room temp.

R. L. DODGE

Heterogeneous catalysis. J. R. PARTINGTON. *Nature* 115, 534 (1925).—Graham's explanation for the adsorption of H by Pt is quoted.

F. N. SCHOTT

Gaseous catalysis by metals of the platinum group. L. DUPARC, P. WENGER AND CH. URFER. *Helvetica Chim. Acta* 8, 809-31 (1925).—The catalytic action of Rh was measured in two types of gaseous reactions. The first type was oxidation reactions, the second reduction reactions. The Rh was employed in the form of "Rh Black" deposited on asbestos fibers for support. In several expts. the action of the Rh catalyst was compared with the action of Pt black under similar conditions. The oxidation reactions investigated were the oxidation by O of (1) SO_2 and (2) NH_3 . The reduction reactions were the reduction by H of (1) CO, (2) CO_2 , (3) NO and (4) N_2O . The dy-

namic method was used. The catalytic oxidation of SO_2 is claimed to proceed through the formation of intermediate compds. of the O with the catalyst. In the oxidation of NH_3 the Rh catalyst was found to be more active than the Pt catalyst. This reaction is claimed to proceed through the formation of a hydride of Rh and nascent N. By suitable choice of conditions (not specifically indicated) the reduction of CO by H could be made to proceed completely to CH_4 without the formation of C. The reduction of CO_2 to CH_4 proceeded less easily. NO was reduced to NH_3 , while the product of reduction of N_2O was invariably N_2 . This fact is used to support the theory that all reactions of N proceed only through the nascent state. R. L. DODGE

Thermodynamics of the quinhydrone electrode and the chemical constant of hydrogen. ERLING SCHREINER. *Z. physik. Chem.* 117, 57-87(1925).—The sp. heat of quinone, hydroquinone and quinhydrone were measured from 10° to 300° . The heat of combustion of these substances was measured and found to be at const. vol. (wts. reduced to vacuum), resp.: 656.61, 682.29 and 1334.54 kcal. per mol. The heat of solution of quinone in water was -43.4 cal./g.; in 50% AcOH $+42.55$ cal./g. The heat of soln. of hydroquinone was $+40.9$ cal./g.; in 50% AcOH $+31.1$ cal./g. The solubilities of hydroquinone and of quinone were measured in water and in H_2SO_4 solus. The e. m. fs. of the cells Pt|hydroquinone, quinone, H_2SO_4 | H_2 |Pt, and the similar cells with hydroquinone, quinhydrone and with quinone, quinhydrone, as well as their temp. coeffs. were measured. All of these data are consistent with the second and third laws of thermodynamics and lead to the values for the chem. const. of H of 1.11, 1.12, 1.11, 1.09 and 1.01, of which the last value has little wt. F. R. B.

The measurement of very low temperatures. XXXIII. Comparison of the hydrogen and the helium thermometers of constant volume at different zero-point pressures. F. P. G. A. J. VAN AGT AND H. KAMERLINGH ONNES. *Verslag. Akad. Wetenschappen Amsterdam* 34, 644-51(1925).—The results of previous papers are used for comparison of the Celsius-Avogadro temp. scales (based on $\alpha = 0.0036618$) of the He and the H_2 thermometers. It appears from the linear $(t_{\text{He}} - t_{\text{H}_2})/p_0$ curves for different temps, that the differences converge all to zero at $p_0 = 0$. The accuracy of the temp. scale used with the given corrections is about 0.002° down to 14° K. B. J. C. VAN DER H.

A buffer method for calorimetry at high temperatures. W. A. ROTH. *Z. Elektrochem.* 31, 456(1925).—In order to damp the sudden flux of temp. produced by dropping a hot body into a calorimeter it is proposed to catch the body in a bed of some easily fused salt, thus preventing temp. rises to a point higher than the m. p. of the salt. F. R. B.

Thermal expansion of crystals and chemical composition. F. A. HENGLEIN. *Z. Elektrochem.* 31, 424-8(1925).—The density of the alkali halides as measured in a gas-filled pycnometer at 0° , -79° and -184° arc, resp.: LiF 2.642, 2.6606, 2.6780; LiCl 2.0712, 2.0913, 2.1135; LiBr 3.4207, 3.4589, 3.5022; LiI 3.9261, 3.9781, 4.0375; NaF 2.8043, 2.8273, 2.8471; NaCl 2.1677, 2.1866, 2.2080; NaBr 3.2139, 3.2445, 3.2814; NaI 3.6587, 3.6982, 3.7466; KF 2.5202, 2.5428, 2.5638; KCl 1.9925, 2.0086, 2.0277; KBr 2.7557, 2.7799, 2.8096; KI 3.1265, 3.1577, 3.1968; RbCl 2.7302, 2.7516, 2.7783; RbBr 3.2805, 3.3074, 3.3419; RbI 3.5148, 3.5481, 3.5901. The coeff. of expansion is inversely proportional to the heat of formation for all these salts. The connection between coeff. of expansion and the possibility of forming mixed crystals is discussed in a general way. F. R. BICHOWSKY

Sweet ice from sea water. Last reply to J. J. Van Laar. CH. M. VAN DEVENTER. *Chem. Weekblad* 22, 475(1925); cf. C. A. 19, 2438, 2439, 3410. MARY JACOBSEN

The form of representation of color systems. HEINRICH TRILLICH. *Farbe und Lack.* 43, 506-7(1925). F. A. WERTZ

Magnetic researches. XXVII. Magnetic properties of some paramagnetic chlorides at low temperatures. H. R. WOLTJER. *Proc. Acad. Sci. Amsterdam* 28, 536-43(1925). XXVIII. Magnetization of anhydrous chromic chloride, cobalt chloride and nickel chloride at very low temperatures. H. R. WOLTJER AND H. KAMERLINGH ONNES. *Ibid* 544-9.—See C. A. 19, 3058. E. J. C.

Electrometric studies of the precipitation of hydroxides (BRITTON) 7. Mechanical properties and structure of solid solutions in systems with limited solubility in the solid state. Investigations on solid solutions rich in Ag, of the systems Ag-Mg, Ag-Al, Ag-Sb, Ag-Sn, Ag-Zn, Ag-Cd and Ag-Mn (SAEFTEL, SACHS) 9. An X-ray investigation of some finely divided minerals, artificial products and dense rocks (RINNE) 8. Isotopic composition of Cl in meteorites, atomic weight of meteoric and terrestrial Cl (HARKINS, STONE) 3. Equilibrium diagrams of alloys with formation of a single compound (MŁODZIEJOWSKI) 9. Conduction by metallic colloids and their electrotechnical applications (ANDRE) 4.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

- The reflection and refraction of light as a problem of the electron theory. P. P. EWALD. *Fortschritte Chem.* 18, No. 8, 3-28(1925).—A review. D. S. VILLARS
- Persistence of the radiation excited in mercury vapor. LUCY J. HAYNER. *Phys. Rev.* 26, 364-75(1925). D. C. HARDWELL
- Duration of fluorescence of mercury vapor. R. N. GHOSH. *Phys. Rev.* 26, 376-9(1925). D. C. BARDWELL
- Critical potentials in secondary electron emission from iron, nickel and molybdenum. R. L. PETRY. *Phys. Rev.* 26, 346-59(1925). D. C. BARDWELL
- The new world of the atom and Albert Einstein. ARCHIBALD HENDERSON. *J. Elisha Mitchell Sci. Soc.* 41, 70-93(1925).—An historical and explanatory review of theories regarding the structure of the atom. A. L. MEHRING
- The atom model. K. K. DARROW. *Bell Tech. J.* 4, 642-84(1925).—This installment is devoted to Bohr's atom model for H and ionized He. C. G. F.
- A difficulty in the determination of the number of vibrations radiated by the Bohr atom. R. K. CHATURVEDI. *Z. Physik* 33, 680-3(1925). H. C. U.
- The polarized fluorescent light in solutions of dyes. FRITZ WEIGERT AND GERHARD KÄPPLER. *Z. Physik* 33, 801-2(1925).—A criticism of the work of Vavilov and Levshin (*C. A.* 3838; 18, 1787; 19, 1663). H. C. U.
- A new $K\beta_1$ doublet of the elements manganese and chromium. N. SELYAKOV AND A. KRASNIKOV. *Z. Physik* 33, 601-5(1925).—The $K\beta_1$ line of Mn and Cr has been resolved into two lines $K\beta_1$ and $K\beta_1'$ the ratio of the intensities of the two components being 2:1. H. C. U.
- Monochromatic excitation of fluorescence. A. C. S. VAN HEEL. *Verslag Akad. Wetenschappen Amsterdam* 34, 654-6(1925).—It has been found previously that the fluorescence spectrum of autunite (Ca uranyl phosphate) consists of 8 bands, each built up of 5 components, separable at low temps. A const. difference: $\Delta(1/\lambda) = 820$ was found between corresponding components. The absorption spectrum of similar structure had $\Delta(1/\lambda) = 710$. Fluorescence is exclusively caused by light of a wave length of one of the absorption bands with a frequency higher than that of the emitted fluorescence. B. J. C. VAN DER HOEVEN
- The difference in the fluorescence and the absorption spectrum of uranyl salts. G. H. DIEKE AND A. C. S. VAN HEEL. *Verslag Akad. Wetenschappen Amsterdam* 34, 652-3(1925).—Whereas UO_2 salts fluoresce with a group of bands of const. frequency difference, the absorption spectrum has a similar group with smaller difference. The authors explain this by assuming the existence of 2 sets of energy levels in the UO_2 group, one for the normal state, the other for the excited state. B. J. C. VAN DER HOEVEN
- The scattering of light by dielectric spheres. C. V. RAMAN. *Z. Physik* 33, 870(1925); cf. Blumer, *C. A.* 19, 2165. H. C. U.
- A simple attempt to find a selective effect in the scattering of Röntgen rays. H. MARK AND L. SZILARD. *Z. Physik* 33, 688-91(1925). H. C. U.
- The total strength of the absorption lines coming from one steady state. W. KUHN. *Z. Physik* 33, 408-12(1925). H. C. U.
- The question of the polarization of scattered and fluorescent light. LOTHAR NORDHEIM. *Z. Physik* 33, 729-40(1925). H. C. U.
- The mechanism of break-down of damp insulating liquids. A. GYEMANT. *Z. Physik* 33, 789-800(1925).—It is assumed that in emulsions of conducting particles in dielectric liquids the particle becomes elongated under the influence of the high elec. field and finally forms a conducting tube at sufficiently high fields. The hypothesis has been applied mathematically to the results of expts. on oils used in transformers. H. C. U.
- A theory of the phenomena at the cathode of the glow discharge. A. GÜNTHER-SCHULZE. *Z. Physik* 33, 810-30(1925). H. C. U.
- The depolarization of light in diffuse reflection. G. P. WORONKOFF AND G. I. POKROWSKI. *Z. Physik* 33, 860-9(1925). H. C. U.
- Ether and matter and relativity. OLIVER LODGE. *Nature* 115, 419(1925). F. N. SCHOTT
- Maxwell's electromagnetic ether and the Michelson-Morley experiment. A. PRESS. *Phil. Mag.* 50, 809-12(1925). S. C. L.
- On the nature of the disturbance in the second medium in total reflection. C. V. CAMAN. *Phil. Mag.* 50, 812-5(1925). S. L. C.

Distribution of electrons in atoms. J. D. M. SMITH. *Phil. Mag.* **50**, 878-9(1925).
—A priority claim. S. C. L.

Professor Whittaker's atomic model. J. A. ELDRIDGE. *Proc. Roy. Soc. Edinburgh* **45**, 245-8(1924-5); cf. *C. A.* **16**, 3428-9.—W. has failed to take into account the forces on the central pole of his magnetic wheel, which will not in fact be set into rotation on the approach of the electron as he assumes. He has in effect employed a unipolar magnet—"a conception abhorrent to physics."—In a note W. says in reply that the essential feature of his model is the *magnetic current* which is a new conception not derivable from old conceptions. The storage of momentum in the ether involved in the model is a generally accepted conception. In a second note H. STANLEY ALLEN says: "There is a way out of the difficulty if we suppose that the electron, instead of moving along the axis of the 'wheel,' passes through the ring of poles of one name but not through the ring of poles of contrary name." NORRIS F. HALL

The fields of force of polarized dielectrics. AMALIA CALDI. *Nuovo cimento N. S.* **2**, No. 2, 125-42(1925).—C. has deduced a formula based upon theoretical considerations which permits the calcn. of dilatation per unit vol. of spherical condensers. The calcd. values obtained by C. are much nearer the exptl. values obtained by Quincke than Quincke's calcd. values are. L. T. FAIRHALL

Equilibrium between matter and radiation. OTTO STERN. *Z. Elektrochem.* **31**, 448-9(1925).—Recent exptl. studies of the equivalence of mass and energy, as given by the special relativity formula $E = mc^2$, suggest that these 2 quantities are interconvertible. Thermodynamics is therefore applicable to reversible transformations of matter and energy. An expression is developed, by use of Nernst's heat theorem, for the entropy change involved. From this it is possible to calc. the number of atoms in equil. with black-body radiation at any temp. Eddington's deductions for the loss of wt. of stars due to energy radiation are verified qual. For an electron d. as small as 1 electron per cm.³: a temp. of 100,000,000°C. is necessary, and for H nuclei the temp. must be at least 2000 times as high. This fact explains the extraordinary preponderance of electrons over protons in the material world. HARRY R. MOORE

The derivation of Planck's law from Einstein's equation. A. S. EDDINGTON. *Phil. Mag.* **50**, 803-8(1925).—A direct derivation is given of Planck's radiation law from Einstein's equation (*C. A.* **11**, 729), without assuming Boltzmann's formula. S. C. L.

Atomic structure and coördination number. J. D. MAIN SMITH. *Chemistry and Industry* **44**, 944-7(1925); cf. *C. A.* **18**, 1944.—A brief restatement and discussion of the so-called "Stoner" scheme of allotting electrons to quantum sub-groups (first published by Smith, l. c.). The author concludes: (1) In any two-electron link both electrons must belong to the same quantum sub-group (in opposition to Sidgwick's view (*C. A.* **18**, 196)). (2) In many cases the two-electron link is inadmissible. (3) The max. coördination no. is unrelated to the size of any quantum group or sub-group in any atom. (4) "No means other than expt. exist... for detg. the no. of electrons in any chem. bond." (5) "The time is not yet ripe for the application of general electronic theories of chem. combination either in org. or inorg. chemistry." NORRIS F. HALL

The isotope effect in band spectra. IV. The spectrum of silicon nitride. R. S. MULLIKEN. *Phys. Rev.* **26**, 319-38(1925); cf. *C. A.* **19**, 3060.—The spectrum of the bands obtained by passing SiCl₄ vapor into active N₂ was rephotographed, and the quantum relations were applied. The vibrational quantum effect was confirmed for Si²⁹ and Si³⁰. The evidence is against half quantum nos. for SiN. D. C. BARDWELL

The separation of chlorine into isotopes (isotopic elements) and the whole-number rule for atomic weights. W. D. HARKINS. *Proc. Nat. Acad. Sci.* **11**, 624-8(1925).—A review of the work of sepg. Cl into isotopes. Samples with at. wts. 0.055 units higher and 0.04 units lower than ordinary Cl have been obtained. MARIE FARNSWORTH

The isotopic composition of the element chlorine in meteorites: the atomic weight of meteoric and terrestrial chlorine. W. D. HARKINS and S. B. STONE. *Proc. Nat. Acad. Sci.* **11**, 643-5(1925).—Cl from a meteorite and from a rock of non-marine origin (wernerite) has exactly the same at. wt. as ordinary Cl. The bearing of these results on the history of the earth and the meteorites and the stability of the atoms of the two isotopes are discussed. MARIE FARNSWORTH

The radioactivity of potassium, rubidium and other elements. W. D. HARKINS and W. G. GUY. *Proc. Nat. Acad. Sci.* **11**, 628-30(1925).—The method used to measure the radioactivity is to balance the natural leak of a large ionization chamber against another one containing U₃O₈. The radiation from Rb salts is 10-15 times weaker than that from K and is probably more complex. MARIE FARNSWORTH

Electric phenomena in the atmosphere. J. CLAY. *Proc. Acad. Sci. Amsterdam*

28, 531-5(1925).—On the plateau of Bandoeng the potential gradient has a mean value of about 90 v., a max. value of 250 v. and a min. value of 40 v. per m. It is higher at greater elevations. The mean no. of positive ions found per cc. was 260 and the no. of negative ions 220. The value for Rn was 3×10^{-10} curie per cc. M. F.

Ionium. I. Recovery of ionium from carnotite. II. Adsorption of ionium-thorium by barium sulfate. III. Ionium-thorium ratio in carnotite. G. D. KAMMER AND ALEXANDER SILVERMAN. *J. Am. Chem. Soc.* **47**, 2514-22(1925).—There is no good method for sepg. Io directly from carnotite. That carried down with the Ra-Ba sulfate can be sepd. by fusion by Na_2CO_3 or boiling with Na_2CO_3 . BaSO_4 has an extraordinary capacity for the adsorption of Th, 1 g. of BaSO_4 adsorbing as much as 16% of its own wt. of ThSO_4 . The Io-Th ratio in av. Colorado carnotite is 1:15.8.

MARIE FARNSWORTH

Proof of the existence of retrograde hydrogen particles from disintegrated atoms. GERHARD KIRSCH. *Physik. Z.* **26**, 379-80(1925).—Rutherford and Chadwick have contended (*C. A.* **16**, 526, 4128) that H particles ejected at angles of 90° - 180° to the direction of α -rays hitting the nuclei of B, N, F, Na, Al, P atoms are true retrograde rays. A re-investigation of these data has lead K. to the conclusion that the observed backward ranges are those of particles sent off at right angles to the various directions of incidence of the colliding α -rays. Therefore R. and C. have not proved the existence of retrograde H particles, but this has been accomplished in Vienna by means of special methods.

H. R. MOORE

The reflection of α -particles from atomic nuclei. HANS PETTERSSON. *Arkiv for Matematik, Astronomi och Fysik* **19A**, No. 15(1925) (in English).—The numbers of α -particles and of H-particles reflected per min. from collisions between α -particles from Ra C and at. nuclei of Mg, Al, Cu and Ni, and following paths 150° from the initial paths of the α -particles have been counted with the aid of a microscope of new design which secures greater apparent brilliancy for the impacts on a ZnS screen. Mica screens were used to det. the residual air-absorption ranges of the particles. The α -particles could be distinguished from the H-particles by the greater brilliancy of their scintillations. The very few α -particles reflected from C and Mg and their low ranges suggest that the collisions with atomic nuclei are not elastic impacts. Ni and Cu reflect numerous α -particles at 150° but their max. residual ranges are too low for elastic collision (*i. e.*, for Ni 3.4 cm. air instead of 4.6; for Cu 3.0 instead of 4.5). C. M. B.

The aging effect in the mobility of positive ions. H. B. WAHLIN. *Proc. Nat. Acad. Sci.* **11**, 606-8(1925).—W. answers Loeb's criticism (cf. *C. A.* **19**, 3214) of the results on the effect of aging on the mobility of positive ions. The change in mobility observed by Loeb was due to the gauze and was absent in W.'s results.

MARIE FARNSWORTH

Glow discharge in high-frequency fields. FRITZ KIRCHNER. *Ann. Physik* **77**, 287-301(1925).—In specially constructed double tubes, one side being used for the glow discharge, the other side (evacuated) for cathode-ray production, with two electrodes in common, the min. potential necessary for the glow discharge was measured from the max. deviation of a pencil of electrons, which crossed the field of the electrodes. The behavior of air, Ne, H_2 and O_2 was investigated. It was found that on applying potentials, obtained from a wireless transmitter tube, with frequencies of 1.2 to 3.5×10^7 , the min. potential required to run the discharge fell down considerably, for Ne a min. potential of 15 v. was observed. At const. frequency the potential decreases slightly with diminishing pressure, passes a min. at about 0.4 mm. and then increases rapidly. The min. for $n = 3.5 \times 10^7$ in air lay at 28 v., 0.4 mm Hg, *i. e.*, $1/10$ of the d. c. min. potential. Expts. on the influence of varying electrode distance showed that the potential minima become sharper and occur at lower pressures the larger the electrode distance. K. explains these phenomena by assuming that as a result of the high frequency of the current, the electrons swing back and forth in the gas, ionize repeatedly, liberating new electrons, without ever reaching the electrodes; no high cathode fall is in this case necessary to keep up the electron production. The mean free path, *i. e.*, the chance for an electron to collect sufficient energy for ionization, is longer the lower the gas pressure; consequently the discharge potential drops for decreasing pressures; as soon, however, as the free path becomes of the order of the electrode distance further pressure decrease results in an increasing potential. The electrode distance in other words measures the m. f. p. (between two nonelastic collisions) of the electrons at the pressure corresponding to the potential min. On reducing the m. f. p. values to 760 mm. they are found to check satisfactorily and to be 3 to 5 times as large as those derived from the gas kinetic laws.

B. J. C. VAN DER HOEVEN

Magnetic field of a moving electron. F. COUÉRY. *Compt. rend.* **179**, 895-7(1924).

—The application of Maxwell's theory leads to a value for the magnetic field of a moving electron which is not in accordance with the first law of Laplace. There results from this expression an action between elements of current which is half that observed, but it is not an admissible hypothesis to attribute half the action to modifications of the elec. field due to the movement. Conclusion: the magnetic field of an electron is a mathematical expression without physical reality. B. C. A.

Electrical discharge in gases at low pressures. R. MAGINI. *Nuovo cimento* N. S. 2, No. 2, 83-124(1925).—The exptl. results obtained by M. demonstrate the complete efficacy of a photographic means of following the course of cathode rays. This permits a discrimination of the elements of discharge not accessible by other means. Through the superficial limits of the cathode and the intensity of flow electrodes become rapidly coated in the air with a skin and the photograph indicates an anomalous form of discharge. With a cathode centered in a large balloon the positive flow is uniform and the limit of dark space is a function of the anode; the ions move freely and the discharge is symmetrical. In cylindrical tubes the appearance of the discharge is altered owing to the action of the walls. With a given aperture there is established an axis of discharge with opposed cathodic bundles and bands. The flow and current are at a max. in the direction of the cathode axis. Mica placed before the cathode resulted in a modification of flow, but the discharge tended to preserve its original symmetry. It is possible that the true cathode is constituted of the stratum of gas directly in front of the metal cathode. L. T. FAIRHALL

Demonstration of the photoelectric effect with the glow lamp. H. GREINACHER. *Physik. Z.* 26, 376-9(1925).—Expts. are described which are similar in many respects to those of Oschwald and Tarrant (*C. A.* 18, 3008) on the effect of external light sources on the p. ds. necessary to maintain a glow discharge. G. finds that the luminous discharge occurs at the usual voltage when p. ds. somewhat less than the discharge p. d. are first applied, and the tube is then irradiated with light from a Zeiss arc. The effect is tested with 6 types of glow lamps under variable voltages and different electrodes in the tubes. This reduction of the p. d. necessary for discharge is probably due to a simple photoelec. effect, since the negative electrode must be exposed in every case. Moreover, the magnitude of the effect bears a definite relation to the intensity of the light. In general, the light intensity must be higher the greater the difference between the impressed potential and the glow potential. H. R. MOORE

Electronic conduction in crystals. H. LENZ. *Physik. Z.* 26, 481-3(1925).—Acting on the assumption that electron conductance in crystals may be increased by the introduction of free electrons into the crystal, L. has designed an app. for bombarding ZnS crystals with cathode rays. The crystal face exposed to the rays is covered with a thin layer of Ag, which serves to conduct excess electrons to earth. One terminal of a sensitive galvanometer is connected to the posterior side of the crystal and the other in series with a high potential battery. Although only a small fraction of the bombarding electrons penetrates the crystal, the cond. is found to be 10^{-8} amp. or 10,000 times the usual primary photoelec. current. Destruction of the ZnS lattice is thus accompanied by a strong "electrolytic current" in the crystal. No systematic study is made of the dependence of this new effect on crystal thickness, voltage and cathode-tube voltage. Concomitant studies of the variance of the photoelec. conductance of diamond and ZnS crystals with temp. are readily interpreted in light of the new effect. The curves obtained affirm L.'s theory that the primary photoelec. current is due to displacement of electrons within the crystal lattice. Photoelec. conductance is a rapidly increasing function of temp., since thermal excitation undoubtedly increases the effective number of cond. electrons. HOWARD R. MOORE

Ionization and activation potentials. I. Methods of determining critical potentials. K. T. COMPTON. *Fortschritte Chem.* 18, 291-351(1925).—A large no. of methods for detg. crit. potentials are critically discussed, together with methods for distinguishing between crit. potentials of atoms and mols. A no. of problems are suggested for further work; e. g., degree of activation, intensity of spectral lines, mean free path of electrons, etc. Finally a no. of suggestions as to general technic are given. **II. Critical potentials and their significance.** F. L. MOHLER. *Ibid* 352-425.—The work which has been done on simple ionization and resonance potentials of the atoms is discussed, taking them up as they occur in the periodic system, and the results are compared with values calcd. from spectral data. The significance of higher crit. potentials is pointed out and values obtained for double ionization, ionization of ions, combined ionization and excitation, excitation of ions, etc., are discussed. Crit. potentials of mols. and the potentials for the production of X-ray spectra are treated. A bibliography of 180 references is given. A. E. S.

The attachment of electrons to gas molecules. V. A. BAILEY. *Phil. Mag.* 50, 825-43(1925).—For N collisions between electrons and gas mols. let h be the fraction that results in attachment. B. asserts that h is not independent of u , the velocity of agitation of the electrons, and criticizes the results of others involving the assumption of independence of h and u . B. develops a new method to test the relation which depends on causing photoelectrons and the ions resulting from attachment to move under a uniform field through a series of plates with central circular openings, which serve to filter out that part of the electrons and ions that has diverged from the line of flow. Since the electrons diverge more than the ions, each plate increases the ratio of the latter to the former, and this effect is still further enhanced by recombination with positive ions. The theory is presented in detail and the equations are deduced necessary to its test by employing the exptl. data obtained. For thoroughly dry air the following results were calcd.

Z/p	0.5	1.0	2.0
h	3.3×10^{-8}	2×10^{-8}	0.7×10^{-8}
	3.3×10^{-7}	4.5×10^{-7}	6×10^{-7}

showing how rapidly h diminishes with increasing u . (Z/p is the ratio of voltage drop to pressure.) Without a more accurate knowledge of the mean free path of electrons in O_2 , one can only estimate from these results that h for O_2 is of the order 10^{-8} , admitting h for N_2 to be infinity. In other words, about 1 collision in 100,000 results in attachment of a free electron to form a negative O_2 ion. S. C. LIND

Impact experiments in compound gases. Ammonia. ALMA T. WALDIE. *J. Franklin Inst.* 200, 507-18(1925).—Photoelectrons obtained by irradiating Ni on acceleration gave crit. potentials at 11 v. (confirming Mackay, *C. A.* 18, 352), at 22 and perhaps at 33 v. On continuing the expt. crit. voltages for H and N were obtained. Thermions on colliding near the wire give values chiefly for H with some N due to thermal decompn. of NH_3 . Farther away from the wire a few impacts were obtained with NH_3 . F. O. A.

The ionization of HCl by electron impacts. E. F. BARKER AND O. S. DUFFENDACK. *Phys. Rev.* 26, 339-45(1925).—With HCl flowing continuously through a 3-element discharge tube so that it passed through the observation chamber where the electron impacts occurred before it reached the filament, no H lines appeared up to acceleration voltages of 120 v. Current-voltage curves showed a crit. potential at 14 v. which is attributed to the ionization of the mol. without dissociation. No band spectra of between 6000 and 2000 Å. accompany this excitation; hence it is concluded that the mol. has no electron transitions between 2 and 6 v., but that the electron is probably bound in a single operation with consequent radiation of energy equiv. to 14 v. D. C. BARDWELL

Negative-ion emission from oxide-coated filaments. H. A. BARTON. *Phys. Rev.* 26, 360-3(1925).—Negative ions emitted from an oxide-coated Pt filament were shown by a mass spectrograph to be O_2^- , formed by disintegration of the oxide coating. D. C. BARDWELL

Three examples illustrating X-ray methods of supplementing and correcting crystallographic data. KATHLEEN YARDLEY. *Phil. Mag.* 50, 864-78(1925).—The limitation of goniometric and of X-ray spectrometric measurements are discussed and compared. The comparisons are illustrated by potassium hydrogen chloromaleate, ammonium chlorofumarate and ammonium hydrogen fumarate. S. C. L.

A note on the vibration of the CO_2 ion. S. CHAPMAN AND A. E. LUDLAM. *Phil. Mag.* 50, 822-4(1925).—C. and L. attempt to improve the theory proposed by Kornfeld (*C. A.* 18, 3313) for the structure of the CO_2 ion in a crystal lattice to account for its infra-red frequencies of vibrations. While some improvement is effected, difficulties remain which probably can be met only by taking account of the influence of surrounding ions in the crystal. S. C. L.

Directed quanta of scattered X-rays. A. H. COMPTON AND A. W. SIMON. *Phys. Rev.* 26, 290-9(1925); cf. *C. A.* 19, 1534.—Out of 38 cases where recoil tracks and β -ray tracks are found on the photograph of tracks from X-rays, the direction of scattering is in 18 cases within 20° of that to be expected if the X-ray is scattered as a quantum so that energy and momentum are conserved during the inter-action between the radiation and the recoil electron. The chance that this agreement is accidental is 1 in 259, thus giving direct proof that at least part of the scattered X-rays proceed in directed quanta of radiant energy. D. C. BARDWELL

Experiments on the wave length of scattered X-rays. S. K. ALLISON AND WM. DUANE. *Phys. Rev.* 26, 300-9(1925).—The Compton theory of the shift in the max.

intensity of the modified band is confirmed in general for Li, Al, Be, C, Na, NaCl, Mg, W and S.

D. C. BARDWELL

High-energy γ -rays and their photoelectric effect. M. DE BROGLIE. *Nature* 115, 461(1925) (in French).—The work of Black (cf. *C. A.* 19, 1530) is in accord with that of Thibaud (cf. *C. A.* 19, 1225), who observed the conversion of γ -rays of 2 million v. by photoelectric effect in the K and L orbits of heavy atoms, the effect being very intense with lighter atoms such as Ce, Sb, Sn, Ag, Cu and Fe, and who verified precisely the quantum relation for this effect.

GERALD L. WENDT

The Zeeman effect in strong magnetic fields. P. KAPITZA AND H. W. B. SKINNER. *Proc. Roy. Soc. (London)* 109A, 224-39(1925).—A method of utilizing the transient magnetic fields (up to 130,000 gauss), produced by accumulator discharges through a coil, for the study of the Zeeman effect is given. The method involves photographing a spectrum with an exposure of not more than 1/300 sec., and a means for doing this with a high-dispersion quartz spectrograph is described. It consists of a special application of a large condenser battery to give a single localized spark, the spark being timed to occur at the moment when the max. field strength is attained. For spark electrodes the metals Cu, Al, Zn and Mg were used. On account of the high vapor pressures developed in a momentary spark considerable difficulty was experienced in obtaining sharp spectral images, but fairly consistent results were obtained by photometric measurement of some Zeeman patterns for strong doublets, singlets and triplets in these spectra. The magnetic resolutions are approx. what would be expected from the usual expts. on the Zeeman effect if the separations increase proportionally to the field strength. Evidence is positive, however, that for the s-p combinations of Zn and Hg, the splitting is not strictly proportional to the field strength between fields of 70,000 and 130,000 gauss; at the latter value it is 10% greater than would be expected. The splitting of the s-p combinations in doublet and singlet spectra seems to be normal. Three cases of Paschen-Back effect are discussed in connection with observations on the Ca diffuse doublet (3159, 3179, 3181 Å. U.) and the pp' groups for Mg and Be.

W. F. MEGGERS

The structure of the K_{α} lines of molybdenum. F. K. RICHTMYER AND R. C. SPENCER. *Phys. Rev.* 23, 550-1(1924).—With a Mo water-cooled target and an ionization chamber of high resolving power a search was made for the faint lines in the neighborhood of K_{α} discovered for the lighter elements by other investigators and attributed to multiply ionized K shells. No lines were found. By studying the line width as a function of slit width it is shown that the width of $K_{\alpha 1}$ is probably not greater than 0.0003 Å. U.

W. F. MEGGERS

The mechanism of the quantum relationships in black body radiation. SATYENDRA RAY. *Z. Physik* 32, 473-6(1925).—R. claims to have shown in previous articles by two different lines of reasoning that in a light wave the ratio between amplitude and wave length must be const., and he has further shown that this assumption is contained in the Bohr theory. In the present article he arrives at the same conclusions for heat waves on the basis of thermodynamical reasoning. The expression as obtained involves the idea of a discreet sub-electronic elec. structure of the ether, the frequency of vibration of one of the ether particles being assumed const. over time intervals of a second. The reasoning also contains the assumption of what the author terms Doppler's principle; to wit, that amplitude divided by the wave length is a const., for the equation deduced contains beside this factor and a const. only the velocity light. Thus in postulating the constancy of the velocity of light, it is not surprising that the Doppler principle follows from the equation.

L. B. LOEB

The theory of the radiometer. H. E. MARSH, E. CONDON AND L. B. LOEB. *J. Opt. Soc. Am.* 11, 257-62(1925).—Although the theory of repulsion radiometers is fairly well developed by the recent work of Hettner and Czerny, that of the ordinary vane radiometer commonly seen in opticians' windows is very unsatisfactory. Recently A. Einstein has proposed a theory giving the magnitude of the effect in order of magnitude only. Contrary to the accepted beliefs this makes the action dependent on a narrow strip of the vane, of the dimensions of mol. free path at the existing pressure, along the edge of the vane. Such an action would make the torque on a vane having a large edge moment greater than one having a smaller edge moment and the same area. The authors tested this and find the effect as predicted. The torque does not appear to be proportional to the edge moment, however. It was also found that pressure variations of the torque were present which are not included in Einstein's theory. In a forthcoming paper by H. E. Marsh in the *J. Opt. Soc. Am.*, it will be shown that both these deviations from the Einstein theory are due to temp. differences which were not detd. in the article being abstracted. It will further be shown that the torque

observed is in good agreement in order of magnitude with the Einstein theory.

L. B. LOEB

Comet-tail spectrum and Deslandres' first negative group. H. B. LEMON. *Proc. Nat. Acad. Sci.* 11, 41-3 (1925).—A long vacuum tube of the Wood type filled with He pumped by circulation through activated C furnishes an extremely brilliant comet-tail spectrum provided the partial pressure of the C compds. is of the order 10^{-6} mm. The compn. of the residual C compds. is quantitatively unknown, although CO_2 and certain hydrocarbons are present. The He plays only a secondary role in the excitation of these spectra, but nevertheless is necessary for their production with great intensity.

B. C. A.

Law of variation with temperature of the conductivity of solid salts, and possible relationship to the characteristic spectrum of the metal of the salt. P. VAILLANT. *Compt. rend.* 180, 206-8 (1925).—If the liberation of electrons that carry the current which flows when an e. m. f. is applied to a layer of a solid salt (cf. C. A. 19, 2770) is caused by the absorption of radiant energy produced by a monochromatic radiation of wave length λ , then the coeff. K , which connects the densities of the liberated electrons, n_1 , with that of the particles giving rise to them, n_2 ($Kn = n_1^2$), should vary with temp. and follow the same law as this radiation, viz., $K = K_0 e^{-hc/\nu T \lambda}$, where h = Planck's const., c = velocity of light. The wave lengths, λ , calcd. in this way for the salts of Na, K and Li are, within the limits of exptl. error, those of the chief lines in the spectra of the elements.

B. C. A.

A peculiarity of some red neon lines. W. H. J. CHILDS. *Nature* 115, 572 (1925).—The wave length of the reversal of λ 6402 was found to be 6402.251 ± 0.001 A. U.

FLORENCE N. SCHOTT

Spectroscopic determination of electron affinity of halogens. E. V. ANGERER AND A. MÜLLER. *Physik. Z.* 26, 643 (1925).—The long-wave absorption limit of thermally dissociated alkali halide vapors yields a measure of the electron affinity of the halogen atoms. The following values were obtained:

Salt	KF	NaCl	CsCl	KBr	CsBr	KI
Å. units	3030	3280	3170	3590	3490	3980
Cal	94.0	86.6	89.6	79.1	81.3	71.3

Vapor density and temp. yield no marked influence on the precision with which the absorption limit may be evaluated.

F. C. KRACEK

The origin of some band spectra. M. DUFFIEUX. *Ann. phys.* [10] 4, 249-318 (1925).—The widths of spectrum lines emitted by gaseous particles are explained largely as Doppler-Fizeau effects resulting from the thermal agitation of the particles. Other causes which contribute to the widths of the lines are discussed. The formula for the half-width of a spectrum line (the distance between the abscissas of those points of the interference pattern at which the intensity is half the max.) is shown to depend directly on the abs. temp. and inversely on the mass of the emitting particle. It is, therefore, possible to deduce the masses of the particles by measuring the half-widths of the lines at const. temps. The Fabry-Perot interferometer was used in making observations of the limiting orders of interference for lines in various spectra. From the tabulated details of the observations it is concluded that the mol. H_2 emits the H secondary spectrum; the mol. N_2 emits the first positive group of N; the atom N emits the second positive group of N, the negative group of N, and the two cyanogen groups at 3883 A. U. and 4212 A. U.; the atom O emits the bands of the CO spectrum, that at 4123 A. U., however, probably originating in the C atom.

C. C. KRESS

Mass spectra of some light elements. J.-L. COSTA. *Ann. phys.* 4, 425-56 (1925).—A mass spectrograph is described, similar to that of Aston but of greater precision, which was used in measuring the masses of H, He, Li, C and N. The method of measurement consisted in photographing two masses of known ratio under conditions in which the magnetic field was maintained const., but the elec. field was varied so as to be a little less and a little larger than the ratio of the masses. In this way a scale of the spectrograph is secured for dispersion of mass with varying field, permitting the precise detn. of an unknown mass whose image on the photographic plate lies between two successive images of the known mass, the field strength producing it being known. The ratio of the masses $\text{H}:\text{H}_2$ thus measured was found to be exactly 1:2. For He and H_2 the ratio 2.0148 was measured; for He:C the measurements gave 1:3. Li has two isotopes of masses 6 and 7. The mass of Li^6 compared with He was found to be 6.009, that of Li^7 compared with N (14.008) was found to lie between 7.010 and 7.013. Measurements on N indicate that its mass is greater than 14 but less than 14.008 assigned by chemists.

C. C. KRESS

Structure of the nickel spectrum. II. KARL BECHERT. *Ann. Physik* 77, 537-59 (1925).—Previous work on the structure of the Ni arc spectrum (*C. A.* 19, 3427) classified many of the lines in multiplets of the singlet and triplet series systems and combinations between them. The present work classifies additional lines in the triplet and quintet systems, and in combinations between the triplet and quintet systems and between the singlet and quintet systems. About 220 lines are tabulated in addition to those previously classified. Comparison of the term-structure of Ni with those of Fe and Co shows a striking resemblance between them as regards the distribution of the higher terms. The septs. ($\Delta\nu$) of complex terms, however, show a rapid increase in passing from Fe (approx. 300 cm^{-1}) through Co (approx. 600 cm^{-1}) to Ni (approx. 900 cm^{-1}). C. C. KRESS

Infra-red absorption spectra. Experimental and theoretical determination of the infra-red absorption spectra of some organic compounds. LADISLAUS MÁRTON. *Z. physik. Chem.* 117, 97-128 (1925).—The near infra-red absorption spectra of some org. compds. were measured with a thermopile, the light of a Nernst glower after passing through the absorbing media being dispersed in a prism spectrometer. Numerical data and graphs are given for the following compds.: Hexane, cyclohexane and homologs, benzene and homologs, some aliphatic aldehydes, acetone, chloroform, phosgene, and thiophosgene. All these substances have similar absorption spectra between 1.1 μ and 4 μ . The following differences, however, have been noted: from hexane to cyclohexane all the bands are displaced toward longer wave lengths and become more intense; the homologs of the various substances differ only in the variations in intensity of the bands; the bands of compds. with unsaturated bonds are displaced toward shorter wave lengths. The bands may be represented by a formula of the type $\nu_s = \nu_0(1 - px)$, which describes the anharmonic oscillations of the mols. ν_0 is the fundamental frequency of the oscillator and p is a variable assuming successive integral values. A table compares the calcd. values of ν_s for several compds. with those derived from the measurements. C. C. KRESS

Change of wave lengths for certain lines of zinc, cadmium and mercury in a condensed discharge. MITSU HARU FUKUDA. *Sci. Papers Inst. Phys. Chem. Research, Japan* 3, 183-92 (1925) (in English).—Lines in the spectra of Zn, Cd and Hg, excited in capillary tubes by condensed discharges, were observed to undergo changes in wave length. The shifted lines are mostly members of the sharp series and the displacement is toward increasing wave lengths. Of the diffuse series lines some shifted toward the red, others toward the violet. The shifts increased as the spark gap, inserted in series with the tube, was lengthened. The wave-length changes are attributed to Stark effects produced by the elec. field of the closely crowded ions in the capillary of the tube. C. C. KRESS

Complementary researches on the structure and distribution of band spectra. H. DESLANDRES. *Compt. rend.* 181, 265-71 (1925).—The relation previously found for expressing the members of band series in terms of a fundamental frequency d_1 1062.5 (*C. A.* 19, 2782) is shown to hold for the infra-red absorption bands of NH_3 . The bands of HF, HCl and HBr are likewise expressible in terms of d_1 . These bands have well-observed secondary max. the frequencies of which are fractional parts of d_1 . The denominators of the fractions are related to the atomic no. of the heavier atom of the mol. but more work will be required to establish the precise relationship. C. C. KRESS

Complementary investigations on the structure and distribution of band spectra. H. DESLANDRES. *Compt. rend.* 181, 387-92 (1925).—Previous work (*C. A.* 19, 606, 2299, 2782, and preceding abstr.) has shown that the frequencies of the absorption bands of simple gaseous compds. may be represented by the formula $\nu = qd_1/rs = q'd_1/r's'$ in which the fundamental frequency $d_1 = 1062.5$, s is the no. of atoms comprised in the mols., s' is the no. of free positive charges on the nucleus of the heavier atom, and q, r, q', r' are integers. Recent studies of the absorption spectra of CH_4 , C_2H_2 , C_2H_4 , CHCl_3 , CCl_4 , C_2H_6 , CO_2 , H_2S , SO_2 , CS_2 and solid cryst. S, and also the emission bands of CO_2 and CO , prove them all to be satisfactorily represented by the above formula. As in previous investigations those bands are strongest for which $r = 1$. C. C. KRESS

The regularities in the resonance spectrum of iodine vapor and the calculation of the moment of inertia. A. KRATZER AND ELIS. SUDHOLT. *Z. Physik* 33, 144-52 (1925).—The regularities detected by Mecke in the resonance spectrum of I excited by the green Hg line (*C. A.* 17, 2994) are shown to be in agreement with the theoretical formula for band spectra. For the moment of inertia of the unexcited I mol. the value $8.63 \times 10^{-39} \text{ g. cm}^2$ has been calcd. The distance between the atoms of the mol. comes out $r = 2.87 \times 10^{-8} \text{ cm}$. C. C. KRESS

The influence of an alternating magnetic field on the polarization of resonance radiation. E. FERMI and F. RASSETTI. *Z. Physik* 33, 246-50; *Atti accad. Lincei* 2, 117-20(1925).—An expt. is described for measuring the effect on the polarization of the resonance radiation of Hg of a magnetic field of const. amplitude but of variable frequency. The results of the observations do not permit derivation of quant. relations between the amt. of polarization and frequency of the field, but qualitatively there is for certain amplitudes an increase of polarization with frequency, and for others the polarization remains const. as the frequency increases. The results also indicate that the Larmor precession is $3/2$ the normal for the Hg line 2536 A. U. C. C. KIESS

Intensity of multiple spectral lines: experiment and theory. I. S. ORNSTEIN. *Proc. Phys. Soc. (London)* 37, 334-7(1925).—An address. C. C. KIESS

The series spectrum of gold. J. C. McLENNAN and A. B. McLAY. *Proc. Roy. Soc. (London)* 108A, 571-82(1925).—Absorption expts. with Au vapor indicate that the pair of ultra-violet lines 1665.7 A. U. and 1646.7 A. U. constitutes the second member of the principal series of the Au arc spectrum. In addn. two other ultra-violet lines 1951 A. U. and 1879 A. U. are easily absorbed and are shown to be combinations between the low σ term and two irregular π terms which are not a part of the term system that gives rise to the principal and sharp series. The sharp and diffuse series as given by Thorsen (*C. A.* 17, 3135) are recalcd. with wave lengths reduced to the international system. The three lines 6278 A. U., 5230 A. U., and 5064 A. U. are shown to originate in a transition between the low π levels and a still lower pair of δ levels, the latter constituting a metastable state. The classified lines with their series designations are tabulated. C. C. KIESS

A high-vacuum spectrograph for X-ray measurements and some preliminary results. ROBERT THORAEUS and MANNE SIEGBAHN. *Arkiv Mat. Astron. Fysik* 19A, No. 12, pp. 1-9(1925) (in English).—A new vacuum spectrograph for measurement of the longer X-rays up to and exceeding 20 A. U. is described. Preliminary observations with it yield the following results: 18.37 A. U. for the line $K\alpha$ of Fe; 17.60 A. U. and 17.27 A. U. for the $L\alpha$ and $L\beta$ lines of Fe; 19.48 A. U. and 19.17 A. U. for the $L\alpha$ and $L\beta$ lines of Mn; and 21.69 A. U. and 21.35 A. U. for the corresponding lines of Cr. C. C. KIESS

Wave lengths of additional lines in the many-lined spectrum of hydrogen. T. TANAKA. *Proc. Roy. Soc. (London)* 108A, 592-606(1925).—Two spectrograms of the secondary spectrum of H have been measured to secure wave lengths of faint lines not hitherto published. To eliminate lines due to oxyhydrogen bands spectrograms were made of a H flame fed by a current of O., OH lines were measured between 3525 A. U. and 3428 A. U. These are tabulated. In the H_2 spectrum approx. 600 faint lines were measured between 6572 A. U. and 3295 A. U. These new wave lengths have been used in the analysis of the H_2 spectrum for band series; see preceding abstract. C. C. KIESS

The secondary spectrum of hydrogen at higher pressures. IAN SANDEMAN. *Proc. Roy. Soc. (London)*, 108A, 607-16(1925).—The spectrum of H_2 was photographed when an arc between W electrodes was operated in H at high pressures. The behavior of certain H_2 lines under such conditions of excitation affords a method of relating them in series. In the blue between 4450 A. U. and 5000 A. U. is a group of strong lines which has been classified into a P, Q and R combination. The Q series has 8 members, those corresponding to even quantum integers being more intense than the odd. The P and R branches are short. From the consts. of the series formulas a moment of inertia equal to 19.326×10^{-41} g. cm.² has been calcd. This agrees exactly with the value calcd. for a particular configuration of the static model of H_2 . The P, Q and R combination in the yellow (cf. Richardson and Tanaka, *C. A.* 19, 778) appears under the same conditions of excitation as the blue band, both having the same intensity distributions. C. C. K.

The distribution of intensity in the X-ray spectra of certain long-chain organic compounds. G. SHEARER. *Proc. Roy. Soc. (London)* 108A, 655-66(1925).—Recent studies by various X-ray workers has included many org. compds. having as the basis of their structure a long chain of C atoms. From the viewpoint of the crystal structure of the compds. it is found that there is one set of planes in the crystal with a much longer spacing than any of the others. Two groups of crystals are recognized: (1) those in which the planes are sepd. by the length of a single mol.; (2) those in which they are sepd. by the length of two mols. Theoretical values are calcd. for the intensity of the various orders of X-ray spectra reflected from the planes of crystals of both groups and these are shown to be in agreement with observed results. With the hydrocarbons (group 1) there is a slow decrease of intensity with increase of order. With the fatty acids and alcohols (group 2) the even orders are very weak compared to the odd orders. The ketones and esters exhibit similar behavior. By regarding them as equiv. to two

half-mols. arranged end to end in opposite directions they come under group 2 and exhibit a gradual decrease in intensity with increasing order on which is superposed a periodic variation depending on the distance of the O atom from the end of the mol.

C. C. K.

The intensities of lines in multiplets. II. Observed data. H. N. RUSSELL. *Proc. Nat. Acad. Sci.* 11, 322-8(1925).—The theoretical values for intensities of spectral lines in multiplets (*C. A.* 19, 2782) are compared with the few precise intensity measurements which have been made and the agreement between the two is satisfactory. For the great majority of classified spectrum lines, however, there are no precise intensity measurements, but for many of them there exist intensity estimates made by King in his studies of the variations of spectra with temp. King's estimates are very nearly proportional to the square roots of the actual intensities. The observed estd. intensities of lines belonging to 231 multiplets of 46 types are compared with their theoretical values and the agreement is remarkably close.

C. C. KIESS

Multiple electron transitions and primed spectral terms. A. E. RUARK. *J. Opt. Soc. America* 11, 199-211(1925).—Mg vapor was excited in the force-free space between the cylinder and grid of a 3-electrode tube. It was found that the lines of Mg^+ appeared at voltages which were equal to the ionization potential of Mg plus the voltages required from the series classification of the lines to excite them. The $2p-2p'$ group, included between 2776 A. U. and 2783 A. U., was excited at an applied potential of 7.9 v., which shows that these lines appear at their quantum voltages resulting from single electron impacts which move two electrons simultaneously to higher orbits. Similarly the pp' group of Cd (2239 A. U. to 2329 A. U.) was excited at its quantum voltage. In the Cd low-voltage arc new lines were observed which have been classified as members of the singlet and triplet subordinate series.

C. C. KIESS

The structure of the red lithium line λ 6708. J. B. GREEN. *J. Opt. Soc. America* 11, 213-6(1925).—The red line of Li excited under varying conditions of vapor density and current in a vacuum arc was observed with the high resolution afforded by a Lummer plate to det. its structure. At low vapor densities the line appears as a simple doublet. With increasing vapor density each member of the doublet reverses, the reversals widening until the inner components overlap, giving the appearance of a triplet. At high densities the reversals merge and the line appears as a single reversal with broad wings. (For similar behavior of the green Tl line and other lines see *C. A.* 19, 1374.)

C. C. KIESS

Structure in the secondary hydrogen spectrum. I. O. W. RICHARDSON. *Proc. Roy. Soc. (London)* 108A, 553-61(1925). **II.** *Ibid* 109A, 35-56.—The details of the analysis of the secondary spectrum of H, promised in a previous paper (*C. A.* 19, 778), are tabulated in these 2 papers. Numerous series of the P, Q and R types, some probably tentative, are presented. **III.** *Ibid* 239-66.—Previous work (*C. A.* 19, 778) on the secondary spectrum of H has classified into band series lines which are selectively weakened when the spectrum is excited by the method recently described (*C. A.* 19, 776). Investigation of the series relationships of the remaining lines has permitted the classification of about 130 additional lines into band series with P, Q and R branches. The moments of inertia of the emitting mols. calcd. from the new series coincide with values previously found from the band series already published.

C. C. KIESS

The excitation of the band spectrum of helium. T. R. MERTON AND J. G. PILLEY. *Proc. Roy. Soc. (London)* 109A, 267-72(1925).—Methods and app. for exciting the band spectrum of He are described. In particular the behavior of the bands under varying conditions of excitation was studied. It was found that the green band including lines from 5386 A. U. to 5276 A. U., which has hitherto been observed only faintly, can be selectively enhanced.

C. C. KIESS

The arc spectrum of palladium, its Zeeman effect and spectral type. C. S. BEALS. *Proc. Roy. Soc. (London)* 109A, 369-84(1925).—The Zeeman effect was observed for lines in the spectrum of Pd from 4473 A. U. to 2447 A. U. Comparison of the observed magnetic resolutions with those calcd. from Landé's theory has permitted the assignment of term combinations to all the lines, and has led to the classification into multiplets of some of the lines. The arc spectrum is thus seen to consist of singlet and triplet systems with combinations between the two. The lowest term of the arc spectrum is a triplet d between the components of which the const. wave-no. differences 4972.0 and 3377.6 cm^{-1} occur.

C. C. KIESS

Regularities in the hyperfine structure of spectral lines. GEORG JOOS. *Physik. Z.* 26, 380-2(1925).—The hyperfine structure of a Cd triplet and the Bi λ 4722 line points strongly to the existence of another quantum no. "f." The selection principle is still valid for inner quantum nos. Similarly the fine structure of Hg lines and other

elements is accounted for by term splitting (cf. Ruark, Mohler, Chenault, *Nature* 114, 475).

H. R. MOORE

A note on the spectra of silicon and aluminium. W. C. MCQUARRIE. *Phil. Mag.* 50, 819-21(1925).—In an attempt to det. the lines of Si by measurement of the absorption of the under-water spark, an alloy of 70% Al, 30% Si was used. The same Al absorption lines as found by L. and E. Bloch (*C. A.* 17, 673) were measured and in addn. 12 new ones. Si absorptions were also observed and identified with the Popow series (*C. A.* 9, 884) but were not measured.

S. C. L.

The spectrum of potassium at low voltages. F. H. NEWMAN. *Phil. Mag.* 50, 796-803(1925).—After a discussion of the propagation of an arc at a voltage less than the ionization potential of the vapor, as well as general energy considerations in electron-atom systems, N. described expts. with K vapor at 245° C., when the vapor pressure of K is about 0.1 mm. A table and a plate show the spectral lines obtained with various voltages: for the orbital transfer $1\sigma-1\pi$, 7665 and 7699 with 1.9 v. (1.61 calcd.); for $1\pi-2\sigma$, 12,434 and 12,523 with 2.50 v. (calcd.); for $1\pi-2\delta$, 11,690 and 11,772 with 2.66 v. (calcd.); for $1\sigma-2\pi$, 4044 and 4047 with 3.3 v. (3.05 calcd.); for $1\pi-3\delta$, 6936 and 6965 with 3.7 v. (3.38 calcd.); for $1\pi-3\sigma$, 6911 and 6939 with 3.7 v. (3.39 calcd.); for $1\sigma-3\pi$, 3447 and 3448 with 3.9 v. (3.58 calcd.). The exptl. value for the complete arc spectrum of K vapor was 4.4 v. and the calcd. value 3.32.

S. C. L.

Fine structure, absorption and Zeeman effect of the 2536 mercury line. R. W. WOOD. *Phil. Mag.* 50, 761-74(1925); cf. *C. A.* 19, 776.—The intensity of the 2536 Hg line was increased 8 fold by using a magnet to press the discharge against the wall the discharge tube. A Rochon quartz prism was used to polarize the light. Three different types of Hg arc lamps were employed for different conditions. Five components of the 2536 line were revealed, sepd. by intervals 0.014, 0.010, 0.011 and 0.011 A.U. resp., or a total sepn. of about 0.05 A.U. Reversal may make each of the 5 lines appear double. Absorption nos. between 5 and 10 may be obtained as well as other more complicated types. 3 cm. pressure of N₂ produces the same change in the absorption of Hg as produced by raising its vapor pressure from 0° to 25° C., or about a 10-fold increase. The study of the Zeeman effect was rendered very difficult by the tendency of the magnetic field to extinguish the Hg arc, preventing observation. Various effects were detected at different current strengths through the magnet which will be further studied.

S. C. L.

Optical excitation of the mercury spectrum with controlled orbital transfers of electrons. R. W. WOOD. *Phil. Mag.* 50, 774-96(1925).—This paper contains an account of the orbital transfers or various spectral lines which accompany the excitation of the Hg line 2536 A. U. The transfers are presented in the form of a diagram showing the orbits and orbital transfers for about 30 lines, the wave lengths and intensities of which are given in a table. The prepn., use and results obtained with Br₂ and Cl₂ gas filters as a means of analysis are described; also the very interesting effect of N₂ and other gases. A table is given showing how He and CO affect the intensity of different lines, increasing or decreasing part of them, while leaving others the same. These different effects of foreign gases have been qualitatively distinguished: (1) the accumulation of electrons in the metastable 2p₃ orbit in a large no. of atoms, resulting in the powerful absorption of lines which terminate on that orbit and the enhancement of these lines in the optically excited spectrum; (2) the emission of forbidden lines in the optically excited spectrum which is provisionally ascribed to the excitation of these Hg lines by N₂ brought into the excited state by excited Hg; and (3) an effect produced by foreign gases at very low pressures (0.01 mm.) for which no theory is advanced.

S. C. LIND

The molecular scattering of light in liquids. K. S. KRISHNAN. *Phil. Mag.* 50, 697-715(1925).—Measurements are given of the intensity and imperfection of polarization for different spectral regions of the light transversely scattered by 65 different dust-free org. liquids. Some of the liquids are feebly fluorescent, generally toward the blue end of the spectrum. In some of the liquids there appears to be a genuine dependence on wave length of the depolarization; the imperfection of polarization increases with wave length. The theoretical formula for intensity fails in the liquids of high refraction, which are also the ones showing high polarization. The prominent relations between depolarization and chem. constitution are pointed out.

S. C. L.

Series spectra of two-valence-electron atoms of boron and carbon. I. S. BOWEN AND R. A. MILLIKAN. *Phys. Rev.* 26, 310-8(1925); cf. *C. A.* 19, 2781.—By methods previously described, additional lines of B_{II} and C_{II} are identified. The progression of frequency sepn. and screening const. for regular doublets for Li to O are shown in a table.

D. C. BARDWELL

Measurements of the relative intensities of the doublets of the alkali metals in the principal series. F. W. ÖÖDR. *Z. Physik* 33, 656-7 (1925).—The relative intensities of the doublets of the principal series of Rb and Cs in flames have been measured. The ratio of intensities of $1s-3p_1$ to $1s-3p_2$ and of $1s-4p_1$ to $1s-4p_2$ of Rb in a flame is 2:1 in both cases. The ratio of $1s-3p_1$ to $1s-3p_2$ of Cs in a flame varied widely, but in an arc was found to be 2:1. H. C. U.

Intensity relations of some intercombination lines. T. BOUMA. *Z. Physik* 33, 658-9 (1925).—The ratio of intensities of the mercury lines $1P-2d_3$ to $1P-2D$; $1P-3d_3$ to $1P-3D$; and $1P-4d_3$ to $1P-4D$ were found to be 100:100; 42:100; and 24:100, resp. The lines $1P-nd_3$, $1P-nd_5$, and $1P-nD$ cannot be regarded as a multiplet, since in that case the relative intensities should not vary with n . H. C. U.

The interpretation of complicated spectra. F. HUND. *Z. Physik* 33, 345-71 (1925).—On the basis of the suggestions of Russel and Saunders, Pauli and Heisenberg on the interaction of electrons in emitting light, the spectral terms of some elements have been correlated to definite quantum nos. which specify the arrangements of the electrons in the atoms. For Sc it is found that the first electron to be added to the Sc^{++} ion goes into a $3s$ orbit giving a doublet 2D term as the normal state of Sc^{++} . The next electron enters a $4s$ orbit and gives a 4D term for the normal state for the Sc^+ . The last electron enters a $4s$ orbit and gives a 2D term for the normal state. The predicted terms for the normal states agree with the exptly. observed terms. It is noted that for terms of the same quantum nos. (*i. e.* the azimuthal quantum nos. of the electrons which do not form a closed shell) that term which has the highest multiplicity lies lowest. Making use of this rule it has been possible to give the type of term ($S, P, ^3D, F, G$, etc.) and its multiplicity for the normal states of the second short series of the periodic table and for the elements from Sc to Zn. The predicted term agrees with experiment for all cases in which the spectra are known with the exception of Cr. In this case the term for four electrons in the $3s$ shell and two in the $4s$ shell was predicted and experiment agrees with five electrons in the $3s$ shell and one in the $4s$ shell. The spectra of O, Ne, Sn and Pb are discussed and found to agree with theory. The singly ionized atoms from Ca to Fe inclusive are also considered and excellent agreement between calcn. and expt. is secured. H. C. U.

The phase rule and its application to problems of luminescence and ionization of gases. MEGHNAD SAHA. *Quart. J. Indian Chem. Soc.* 2, 49-60.—The ionization theory is mathematically discussed from the standpoint of the phase rule for the ionization of Ca gas into Ca^+ and e ; for the ionization of Ca gas in an atmosphere containing an excess of electrons; for the double ionization of Ca; and for the double ionization of Ca, but with an arbitrary concn. of electrons. The role of radiation in detg. the equil. is discussed, but the equations are not worked out. MARIE FARNSWORTH

Simple preparation of substances showing both fluorescence and phosphorescence. B. BATSCHA. *Z. physik. chem. Unterricht* 38, 25-8 (1925).—Tiede found recently (*C. A.* 16, 2078) that excellent substances for showing both fluorescence and phosphorescence can be made by suspending various org. compds. in molten boric acid. Fluorescein is particularly suitable. B. finds that by suspending it in melted tartaric or citric acid preps. with very brilliant fluorescence and phosphorescence are obtained. M. B.

Efficiency coefficients of phosphores. FELIX SCHMIEDER. *Ann. Physik* 77, 381-416 (1925).—According to Stokes' law the wave length of emitted phosphorescent light is always greater than that of the exciting source. Nevertheless, the present studies on $CaS-Bi$ phosphores show that the 2 wave lengths are identical within exptl. error. Thus the exciting λ 436μ was found to evoke a fluorescent band max. at λ 440μ . When the temp. of the phosphorescent layer was raised to 550° , the efficiency coeff. (ratio of the wave lengths of exciting and emitted light) was found to be 0.97. This result directly controverts Stokes' law, and indicates transformation of a large no. of small energy quanta into a smaller no. of larger quanta. Apparently the thermal vibration energies of the heat cond. electrons are integrated by some unknown mechanism into quanta of higher frequency. H. R. MOORE

Some properties of ice crystals. E. K. PLYLER. *J. Elisha Mitchell Sci. Soc.* 41, 18, 39-40 (1925).—The ice forming between crystals has a much higher absorption of infra-red light than the crystals. This holds with frozen tap as well as distd. H_2O . The location of absorption bands in the spectra and the corresponding transmission are given. A. L. MEHRING

A note on the photoactivation of chlorine. E. J. BOWEN. *Phil. Mag.* 50, 879-80 (1925).—B. points out the necessity of taking into account the amt. of light absorbed by Cl_2 as depending on the wave length. Assuming absorption to be proportional

to the extinction coeff., the recent table of W. Taylor (*C. A.* 19, 2604) is corrected as follows:

Range of filter λ	Reaction velocity	Light absorbed (light intensity \times mean absorption)
4300-4800	100	100
4550-5000	27	30
4780-5370	14	13
5050-5570	0	0

From which B. concludes that the Ribaud fine-structure bands of Cl_2 are active, and that the reaction rate is proportional to the no. of light quanta absorbed. A similar error of Coehn and Jung is pointed out (*C. A.* 18, 3144). S. C. LIND

Detection of Au formed from Hg (STAMMREICH) 7.

4—ELECTROCHEMISTRY

COLIN G. FINK

Advances in electrochemistry in the last ten years. FRIEDRICH MÜLLER. *Z. angew. Chem.* 38, 766-71, 865-8, 933-41(1925). E. J. C.

Electrometallurgy of iron and steel in Italy. F. GIOLITTI. *Iron & Steel Can.* 8, 103-6(1925).—A review of the growth in elec. steel and pig iron manuf. in Italy, particularly from 1913 to 1922. W. H. BOYNTON

Electrometallurgical plants in France. CH. A. KELLER. *Arts & Métiers*, July, 1925; *J. four élec.* 34, 195-8(1925).—A popular discussion of the location and economics of electrometallurgical plants in France. C. J. BROCKMAN

Duplex furnace operation in a steel company. ANON. *Elec. World* 86, 854(1925).—A brief account of the multiple 3-ton furnace installation at the Burnside Steel Co., Chicago. One set of electrodes and a single unit of control and transformer equipment are used. One furnace is melting its charge while the other is being tapped and recharged. In this way little time is lost between heats. The charge is preheated with oil. The power demand is 1650 kw. and both furnaces produce 20 tons steel per 10 hr. day. A. D. S.

Induction furnaces in a large brass mill. ANON. *Elec. World* 86, 801(1925).—Twenty-four Ajax-Wyatt induction furnaces are connected in a delta to a 3-phase bus. The nominal charge capacity is 600 lbs. (273 kg.). A 230 v. single-phase 60-cycle circuit is used and the av. current is 400 amp. The power factor is 60-75%. During the pouring period, an 80 v. current for holding the heat is applied from a sep. bus and sep. bank of transformers. Av. performance is about 9 lbs. (4.1 kg.) of metal per kw.-hr., the rate \$0.0125 per kw.-hr., and the current cost \$0.0014 per lb. (45 kg.) of metal. Labor costs are low, on account of the continuous operation. A cross-section of 1 furnace is shown. W. H. BOYNTON

High-frequency induction furnaces for high temperatures. G. RIBAUD. *Compt. rend.* 180, 1733-5(1925).—R. made a study of furnaces having, in principle, a porous C cylinder extending above the graphite heating chamber, all of which is surrounded with lamp black. He describes the method of closing the cylinder which made it possible to attain a temp. of 3000° in the interior of the furnace. The results show that a 10 kw. high frequency furnace, with a vol. of 500 cm.³, may reach a temp. of 2500° as compared with 1700° for a C resistance furnace of like vol. and kw. capacity; with a vol. of 100 cm.³ a temp. of 3000° was attained. One of these furnaces has been used for the transformation of the diamond and has produced more than 50 heats at 2000° without the replacement of porous C. These furnaces have been used for calcining refractories, for detg. points of fusion, etc. A. D. SPILLMAN

Silit. ANON. *Electrician* 95, 387-8(1925).—Silit consists of an intimate mixt. of Si and SiO₂ with a volatile binder which is heated until the Si just softens. Exposure of the forms of mixed Si, SiC and C to the action of CO at 1500° produces a product of high fireproof qualities, resistant to atm. influences, and possessing high and variable sp. resistances. Three grades are made: (1) for resistances subject to permanent loads at glowing temps. and to high momentary loads; (2) for elec. heating resistances up to 1400°; and (3) for fireproof material capable of withstanding violent changes in temps. Applications of each grade and several curves showing sp. properties are indicated. W. H. BOYNTON

Electrodeposition of tungsten (from fused electrolytes). J. A. M. VAN LIEMPT. *Z. Elektrochem.* 31, 249-55(1925).—For the deposition of W in the form of a powder a ternary mixt. of Na, K or Li tungstates is workable at 700–1000°; the lower the temp. the better are the results. Anodes may be of graphite, W or W carbide; cathodes may be a crucible of aluminized iron, chrome-iron, chrome-nickel and Ag, or a bar of these metals in a porcelain crucible. A diaphragm need not be used. Pure Na_2WO_4 electrolyzed in a quartz crucible at 950° with a c. d. of 1500 amp. per sq. dm. at 9 v. between 2 W electrodes gave 60–80% yields of a gray powder that contained 99.3% of W, 0.26% of SiO_2 , and 0.30% of alkali. The reaction is supposed to be due to the action of the electrolytically discharged Na on the Na_2WO_4 . The fusion must at all times remain neutral or slightly alk. W may be deposited on sheets of Cu, Ni or Co which have been previously cleaned and are free from oxide. Cathodes of Fe, Pd and Ag are attacked by the fused bath. The anode should be of W. The best metallic coating of W is deposited from an acid electrolyte of the compn. $\text{Me}_2\text{O} \cdot n\text{WO}_3$ ($n > 1$; Me is Li, Na, K, in decreasing order of efficiency). Continued electrolysis deposits a W bronze ($\text{Na}_2\text{W}_2\text{O}_6$) on the first layer of W, but burnishing with a steel brush readily removes it, leaving a good surface of W. The temp. should be 1000–1050°. With an electrolyte contg. 38% Na_2WO_4 , 32% Li_2WO_4 , 30% WO_3 , and a c. d. of 80 amp. per sq. dm. after 15 min. on sheet Cu at 585–670° there was only a deposition of the bronze; from 835° to 870° there was spotted W-plating; above 1020° a complete covering layer of W was deposited. The c. d. must not fall below 20 amp. per sq. dm. In 10–30 min. the W deposit is 30–100 μ thick. To get a heavier coating the first deposit must be burnished to remove the bronze and then be replated. W plating is not attacked by hot acids. The deposition is supposed to be due to a direct electrolytic decompn. of the acid tungstate and W bronze, the latter decomp. so slowly that it accumulates in large quantities on the cathode in about 30 min. Single crystals of 6 or 8 sides may be grown in poor yields on wires in an acid electrolyte (55% Li_2WO_4 , 45% WO_3) at about 900° with a c. d. of 1.5 amp. per sq. dm. With larger c. d. the crystals become irregular.

C. J. BROCKMAN

Electrolytic hydrogen plant for France. ANON. *Elec. World* 86, 800(1925).—An installation of 600 Knowles standard type cells, each with a capacity of 7500 amps. at 2.5 v., is arranged in 3 batteries of 200 each. Production is 70,000 cu. ft. (1981 cu. m.) of H_2 and 35,000 cu. ft. (990.5 cu. m.) of O_2 per hr. on a consumption of 11,250 kw. hrs. The cells are of the multipolar type and possess the following features: (1) "staggered" leads attached so as to insure even distribution over the surfaces of the electrodes; (2) substitution of "hydraulic" seals for glands, permitting simple insulation of the leads; (3) S-pipe gas mains carried by the cells with an almost vertical glass tube insulator between each 2 cells, so that at no point in the main is there a greater p. d. than between 2 adjoining cells while the insulating gland tube, being nearly vertical, remains free from liquid, thereby guarding against a short circuit at this point; (4) "safety" tubes in each cell; (5) washing of the outgoing gases by the incoming water feed which is automatically controlled.

W. H. BOYNTON

Perborate formation by electrolysis with unsymmetrical alternating current. SVEN BODFORSS and AKSEL ARSTAL. *Z. Elektrochem.* 31, 1-5(1925).—Two electrodes were connected to the source of d. c. through the secondary coil of a transformer, the primary coil of which was in the a. c. circuit; this induced an unsymmetrical a. c. between the electrodes. The anode was a Zn rod in a clay cell outside of which a cathode of Fe, Pt or Zn was symmetrically placed. Electrolysis at -4° with a sin wave frequency of 48 gave max. yields in 15 min. with an electrolyte contg. 5 mols. NaOH and 1 mol. H_2BO_3 in 1 l. After 15 min. of electrolysis the yields decreased slowly. The best current yield was 56.7% figured as H_2O_2 with a c. d. of 6 amp. per sq. dm. and $I_{a.e.}:I_{a.c.} = 1:5.57$; ($I_{a.e.}$ is the effective a. c.). Curves showing the influence of c. d., temp., time, ratio of a. c. to d. c., and compn. of the electrolyte are given. Pure a. c. forms no perborate. There is no direct relation between the peroxide formation and the corrosion of the Zn anode. The influence of the a. c. on the course of the reaction is discussed, but no electrode potential measurements are given.

C. J. B.

Conduction by metallic colloids and their electrotechnical applications. H. ANDRE. *Compt. rend.* 181, 243(1925).—In the electrolysis of concd. H_2SO_4 , using 2 Ag electrodes and a c. c., the resistivity diminishes as the p. d. between the electrodes drops. With an electrode of colloidal Ag and an unattackable metallic oxide a current is obtained sufficient to charge accumulators. The effective voltage set up by different cathodes may vary from 8 v., for pure Cu, to 80 v. for Si; a c. d. of 1–2 amp. /cm.² was used. It is possible to obtain a thermionic function in drying out the colloids. The current is established at 300–400° and ceases upon cooling.

A. D. SPILLMAN

The valve as oscillation generator. D. G. BOWER. *Electrician* 95, 412-4 (1925).—B. describes the efficiency of the triode when used as an oscillation generator, the conditions to be satisfied, and the favorable effect on the output. The valve must be capable of amplifying, and it must possess unilateral impedence. The amplitude of the oscillations are detd. by the tube constns. and more particularly by the factors which limit the flow of current through the valve. The conventional form of the triode radio frequency power assembly is illusd. If X equals the efficiency, the output power is given by $P_0 = XP_p/(1-X)$, where P_0 = the power delivered to load, and P_p = power the plate is capable of dissipating. Small valves are operated at high efficiency under constant oscillation production. W. H. BOYNTON

A study of liquid dielectrics. I. Effect of moisture and air content. W. P. DAVEY AND T. A. WILSON. *Gen. Elec. Rev.* 28, 770-81 (1925).—Expts. are described involving the study of the insulating characteristics of *linseed oil* as a means of judging the characteristics of *transil oil*, most of which it possesses to a marked degree. The app. and general exptl. method for d. c. leak tests are fully described. Results show that: (1) absorption of linseed oil by the spacer causes segregation of the originally contained water and air into bubbles; (2) removal of this water and air from the spacer increases the effective resistance of condensers to d. c. leak 12,000 times at room temp. and 900 times at 90°; (3) removal of air from the dielectric increases the effective resistance over 140 times; and (4) extreme removal of contained air, water and volatile oxidation products from spacer and dielectric increase the effective resistance to d. c. leak 4500 times at 90°. W. H. BOYNTON

Sealing composition containing S and fibrous material (U. S. pat. 1,557,231) 18.

Electric batteries. S. APOSTOLOFF. U. S. 1,551,359, Aug. 25. An electrolyte contg. a porous or spongy siliceous material such as pumice or kieselguhr together with a binder, e. g., alum, portland cement, magnesia or silica, is used in batteries of the dry cell type having a "bobbin" of C.

Primary electric battery. I. DARIMONT. U. S. 1,560,379, Nov. 3. A battery of the 2-fluid diaphragm type comprises an "exciter mass" which includes NaCl or other "exciter proper" together with CaCO_3 or other substantially insol. antacid capable of decomposing FeCl_3 , and an agglutinating substance such as starch, glue or flour for emulsifying the antacid powder. The battery has a depolarizer of FeCl_3 , a Cr compd. such as CrO_3 for increasing the elec. capacity of the depolarizer, and a soln. of NaCl for increasing the cond. of the dild. soln. of FeCl_3 and for regulating the osmotic pressure.

Paste electrolyte for dry batteries. B. H. TEITELBAUM. U. S. 1,558,413, Oct. 20. NH_4Cl is dissolved in a ZnCl_2 soln., preferably of a strength of 27° Bé. and at a temp. of about 22°, and the temp. is allowed to fall by the endothermic action to about 0°. A cereal mixt. such as starch and flour is then added which will congeal the product without need of cooking it.

Dry-cell battery. J. HARRIS. U. S. 1,560,798, Nov. 10. Structural features.

Composition for coating battery terminals, etc., to prevent corrosion. R. B. CANUTE and E. H. TANK. U. S. 1,558,589, Oct. 27. Na_2CO_3 64, petroleum jelly 80 and oil of cedar 1 part.

Electrolytic cell. I. H. LEVIN. U. S. 1,560,250, Nov. 3. Structural features.

Electrical connections. W. R. MOTT. U. S. 1,559,349, Oct. 27. Low resistance elec. connections adapted for use in electrodes, rheostats, rectifiers, etc., are formed of graphite compressed upon a conductive metal oxide, e. g., PbO .

Storage battery. T. A. EDISON. U. S. 1,559,562, Nov. 3. Separators are formed from asbestos associated with Na_2CO_3 or other carbonate, which is subsequently removed from the formed separators, e. g., by use of a 3% aq. NaOH soln., to give them increased porosity.

Storage battery. H. L. YOUNG and F. W. PLUMB. U. S. 1,561,392, Nov. 10. Structural features.

Storage battery. W. L. SCARFF. U. S. 1,558,927, Oct. 27. Battery separators are formed of the wood of *Chamaecyparis nootkalensis*, which is very durable.

Storage battery. J. F. MONNOT. U. S. 1,557,602, Oct. 20. Structural features.

Storage battery. W. L. WHIDDEN and L. MCCARTNEY. U. S. 1,557,952, Oct. 20. Structural features.

Electric storage battery. E. A. HARRIS. U. S. 1,556,932, Oct. 13. Structural features.

Storage battery container of wood impregnated and coated with rubber. R. N. CHAMBERLAIN. U. S. 1,560,172, Nov. 3.

Storage battery box formed of united hard and soft rubber portions. J. B. MARRISON. U. S. 1,558,384, Oct. 20.

Lead electrode for storage batteries. A. STRASSER. U. S. 1,559,471, Oct. 27. Pb is alloyed with Na or other alkali metal capable of reducing H_2O and this alloy is introduced into perforated shells of insulating material and these shells are dipped into H_2O fully to ext. the alkali metal from the alloy and produce an active mass of porous recrystd. Pb.

Electrolyte-level indicator for storage batteries. R. N. CHAMBERLAIN. U. S. 1,558,076, Oct. 20.

Electrolyte-level indicator for storage batteries. G. A. JENSEN. U. S. 1,556,838, Oct. 13.

Cathodes for vacuum tubes. W. R. BULLIMORE. U. S. 1,558,961, Oct. 27. Cathodes are formed with a core of relatively high specific resistance and m. p. such as an alloy of Ni 80 and Cr 20% coated with noble metal, e. g., Pt, and an active coating comprising alk. earth metal compds., e. g., oxides of Ca, Ba or Sr.

Liquid electrode for heating liquids. O. MEYER-KELLER. U. S. 1,559,447, Oct. 27. Structural features.

Electric furnace producing annular concentric arcs. S. L. TINGLEY. U. S. 1,556,377, Oct. 6. The furnace is adapted for smelting.

Electric arc furnace adapted for brass melting, etc. C. L. IPSEN. U. S. 1,551,396, Aug. 25.

Electric arc and resistance furnace adapted for heat-treating metal articles, etc. A. D. KEENE. U. S. 1,557,062, Oct. 13.

Electric resistance furnace. F. THORNTON, JR. U. S. 1,557,104, Oct. 13.

Electric resistance furnace. A. M. MACFARLAND. U. S. 1,557,074, Oct. 13.

Induction electric furnace adapted for melting brass waste, etc. R. L. CHARTIER. U. S. 1,561,408, Nov. 10.

Electrolytic treatment of solutions from leucitic rocks. U. POMILIO and F. GIORDANI. U. S. 1,556,543, Oct. 6. Solns such as those obtained by treating leucitic rock with HCl or other acids are neutralized, and are then electrolyzed to remove Fe and prepare the soln. for pptn. of alumina by lime and subsequent fractional crystn. of K salts.

Circulation diaphragm electrolyzer for alkali chlorides. F. GIORDANI and U. POMILIO. U. S. 1,558,085, Oct. 20.

Apparatus for electrolytic production of iron. A. BOUCHER. U. S. 1,556,408, Oct. 6.

Continuous rotary electroplating apparatus. H. B. FARRAND. U. S. 1,557,474, Oct. 13.

Electrode for arc welding. C. J. HOLSLAG. U. S. 1,559,875, Nov. 3. A rod of metal is coated with Na silicate and lampblack which serve to control the action of the electrode on thin Fe or steel sheets to be welded. Asbestos, $CaCO_3$, B or Mg also may be used. Cf. C. A. 19, 1401.

5—PHOTOGRAPHY

C. E. K. MEES

Rongalit in photography. A. MILLER. *Phot. Ind.* 1925, 1064-5; *Brit. J. Phot.* 72, 602(1925).—A reducing agent, known as Rongalit C, used in the dye industry, has been found to act as a photographic developer. It is a combination of the Na salt of the unstable sulfoxylic acid and HCOH. When used with an excess of $NaHSO_3$ and KBr it works satisfactorily, but the substance very readily produces dichroic fog, has an initially slow rate of development, and decomposes after standing a few hours, becoming entirely inactive. A freshly prepd. mixt. of Rongalit C and $NaHSO_3$ may be used as a re-developer for brown tones on prints bleached in ferricyanide, but the soln. gives black tones if allowed to stand.

Silver in photography. LÜPPO-CRAMER. *Z. wiss. Phot.* 23, 294-302(1925).—This is a review of the literature of the question of the color and exact compn. and constitution of the developed Ag images in collodion and gelatin, of print-out images and of "dichroic" fog.

Reactions of silver sulfide. A. SREIGMANN. *Phot. Ind.* 1925, 541-2(1925).—Some reactions of Ag_2S in relation to toning are discussed. Ag_2S prints can be toned with

Au and by previous treatment with such a soln. as "Heliographontstuffer" the resulting tone can be varied from a red brown through purple brown to a Pt black. This depends on the ability of Ag_2S to act as a nucleus for the pptn. of certain non-metals as well as metals. Ag_2S images can also be transformed into colloidal Ag by means of a Ag intensifier, which also strengthens and darkens the image. M. L. DUNDON

Bleached-out pictures in silver iodide. LÜPPO-CRAMER. *Phot. Ind.* 1925, 650-1; cf. C. A. 19, 2918.—A fine-grained AgBr positive plate is given a uniform preliminary exposure, and then converted into AgI by bathing for 10 min. in Renwick's soln. which consists of 10 g. KI, 10 g. Na_2SO_4 , and 30 g. hypo, in 1 l. H_2O . It is washed 30 min. and dried. After the second exposure the plate is developed in alk. amidol of the following compn.: amidol, 5 g.; Na_2SO_4 , 50 g.; H_2O , 500 cc. This soln. is mixed with an equal vol. of 10% Na_2CO_3 or K_2CO_3 soln. immediately before using. Fixing is slow and should be carried out in 35% hypo at a temp. of 30-40°. Direct positives are obtained. The bleaching reaction is sensitized both optically and chemically by sensitizing and desensitizing dyes such as phenosafranine, pinakryptol green, erythrosin, and rhodamine B. On the other hand pinaflavol decreases sensitivity. The greatest effect was obtained by bathing the iodized plate for 1.5 min. in a soln. of the dye 1:10,000 contg. 1% KBr. M. L. DUNDON

Characteristics of photographic materials in the ultra-violet. G. R. HARRISON. *J. Opt. Soc. Am.* 11, 341-56 (1925).—The present methods of spectrophotometry require a knowledge of certain fundamental properties of photographic materials. In this investigation, the speed, the variation of contrast with wave length, and the variation of the exponent p in the Schwarzschild formula have been detd. in the spectral region from 435.0 to 214.4 μ . The radiation from a Hg vapor lamp or Cd spark was dispersed by a large aperture quartz monochromator, the spectral energy distribution being measured by a thermopile and d'Arsonval galvanometer. The rate of energy flux was altered by means of diaphragm and wire screens. No numerical values of speeds are given, the log speed-wave length curves show a small uniform increase in speed from 435 to 250 μ when the speed for all except the Schumann plate decreased very rapidly. The contrast was found to decrease from the visible into the ultra-violet. Some of the plates showed a min. at about 280 μ , reaching a small max. at about 250 μ followed by a very rapid decrease. Bathing the emulsions in certain oils was found to render them more suitable for photographic photometry in the ultra-violet. This treatment did not only increase the sensitivity but also produced a more uniform contrast with wave length. OTTO SANDVIK

Three-color prints by toning. J. C. ARCH. *Brit. J. Phot., Color Supp.* 19, 37-8 (1925).—Instructions are given for making 3-color prints by toning. The blue component is $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$; the green component is $\text{Cu}_2\text{Fe}(\text{CN})_6$; the yellow component is $\text{Pb}_2\text{Fe}(\text{CN})_6 \cdot 3\text{H}_2\text{O}$. Bromide prints made from the three-color negatives are fastened to transparent supports, toned with soln. yielding the above colored salts, and finally assembled on a common base to form the color photograph. G. E. MATTHEWS

Theory and practice of fixing. II. ANON. *Phot. Ind.* 1925, 513-5 (1925).—The simple chemistry of fixation is outlined and typical formulas for acid and hardening fixing baths are given. The use of an indicator such as Aurin to show when a fixing bath becomes alk. is suggested. The useful life of a fixing bath is considered briefly as is also the necessity of thorough and suitable methods of washing. III. *Ibid* 542-6.—Methods of testing for hypo in wash H_2O are discussed, and several substances recommended for destroying hypo are mentioned. The accelerating action of hypo when added to developers, simultaneous development and fixation, development after fixation, and the reducing action of fixing baths are considered briefly. The recovery of Ag from used fixing baths is discussed. The hypo can be regenerated but not satisfactorily as the accumulation of NaBr eventually interferes with the usefulness of the soln. Substitutes for the hypo such as cyanide, etc., are mentioned. M. L. DUNDON

The ripening process. III. LÜPPO-CRAMER. *Z. wiss. Phot.* 23, 137-44 (1925); cf. C. A. 19, 1230.—L.-C. describes an expt. showing the protective action of either acid or basic dyes, against the NH_3 ripening of an unwashed Lippmann emulsion. He then contrasts the behavior of 2 chloro-bromide emulsions similarly prepd. with final excess of sol. bromide, but differing in that in the one case (A) the halides were added to the gelatin- AgNO_3 soln., while in the other (B) the AgNO_3 was added to the gelatin and halides. On heat treatment the latter emulsion was found at a certain point to be much (20° E. H.) more sensitive than the former. After further heating, B developed deep black, while A remained glass clear. Pure chloride emulsions showed a similar difference, in accordance with the order of mixing. No difference in grain size between A and B in either case could be definitely observed. L.-C. considers that the observed

photographic differences are explainable by the more considerable occlusion of gelatin, due to the conditions prevailing during pptn., in the crystals of *A* as compared with those of *B*. He offers explanations of the relatively greater diminution in sensitivity by such an agent as chromic acid, and of a heat-ripened as compared with the original emulsion, and likewise of one that has received a uniform moderate exposure to light, as compared with the unexposed emulsion. IV. *Ibid* 227-32. L.-C. describes an expt. illustrating the diminution in sensitivity by the action of chromic acid on a heat-ripened bromo-iodide emulsion, as compared with practically no action on the unripened emulsion. That the sensitivity of the ripened cannot be reduced as far as that of the unripened emulsion, he explains as due to the greater opacity of the former. He then discusses the theory of printing but and shows that an increase in grain size may be practically detrimental and describes the prepn. of an emulsion for a photometer paper. V. *Ibid* 286-94. L.-C. investigates and discusses the influence of variation in the excess of sol. bromide used, during mixing, on the facility of ripening, and the resulting contrast and speed of bromo-iodide gelatin emulsions. The effect of a large, as compared with a slight, excess of NH_4Br in the making of an ammoniacal bromo-iodide emulsion, was seen as a hastening of sensitivity, solarization, and fog, on ripening by keeping in a thermostat at 45° . The Ag halide grain, also, is both larger and more uniform. A similar excess of NH_4Br added to an emulsion newly mixed with but slight excess restrains ripening. When NH_4Br is replaced by its equivalent of KBr , the effects are similar but usually less pronounced. It is considered that the occlusion of gelatin is inhibited by the great adsorption of sol. bromide when the latter is in large excess in the pptn. medium. E. R. BULLOCK

"Ripening" of photographic emulsions from the standpoint of the doctrine of ion deformation. II. SCHMIDT. *Z. wiss. Phot.* 23, 201-16(1925).—Distinction is drawn between ripening during emulsification, and the ripening that is effected after washing. In the former, the sensitivity and absorption max. are observed to be slowly displaced in the direction of increasing wave length. It is supposed that under the influence of certain salts, NH_4 and gelatin, the lattice type of the individual grains is established at this stage. Adsorption forces, being a function of the structure and size of grain, are dependent on the nature of the ripening during emulsification, and this is thus considered to det. the intensity of the ripening after washing. The latter is regarded as a physico-chem. process which entails a progressive loss by the individual AgBr crystal lattices of their adsorbed Br ions, and consequently the alteration in the deformation forces in the interior of the grains, on which, it is considered, the observed large increase in general light-sensitivity depends. The latent fog that appears on over-ripening, or on continued storage, is attributed to a too great loss of Br ions, leading to excessive deformation and changes in the grain that are equivalent to an exposure to light. In the case of an emulsion prep'd. with excess Ag salt instead of with excess halide, there is observed on emulsification an increased general sensitivity and also an extension in the direction of increasing wave length, but such an emulsion fogs under attempted after-washing ripening treatment; this, it is shown, is in harmony with S.'s theory. E. R. BULLOCK

Suggested method of exposing H. and D. strips. T. THORNE-BAKER and W. A. BALMAIN. *Brit. J. Phot.* 72, 624(1925).—The authors suggest a method of making an H. and D. detn. which involves the use of an enamel contg. RaBr_2 coated in increasing quantities, as x g., $2x$ g., etc. The strip is placed in contact with the photographic plate for a predetd. time. The gamma radiation is the active exposing source and the alpha and beta radiation are screened off. No mechanism is necessary and the exposure is non-intermittent. G. E. MATTHEWS

Developable glass etchings. G. KÖGEL. *Phot. Ind.* 1925, 679-80.—If a gelatin Ag or dichromate image is removed completely from a glass plate and the plate treated with ammonium bifluoride soln. sometimes an etched picture which is a copy of the original picture appears on the glass. K. speculates as to whether this latent effect may be chem. or phys. It is probably related to the Limmer process for photo-etching of clock faces. M. L. DUNDON

Enlargements. G. COLLIN. *Rev. franc. phot.* 6, 277-9(1925).—For local brush development of enlargements a diaminophenol developer is recommended in combination with a retarding bath of NaHSO_3 liquor, 5 cc.; KBr , 10%, 5 cc.; H_2O to make 100 cc. The print is first immersed in the developer until the image appears. It is then quickly rinsed and placed in the retarding bath. Development is finished by local brushing. O. COOK

Color photography. W. V. D. KELLEY and D. TRONOLONE. U. S. 1,561,168,

Nov. 10. A latent image is formed in a colloid layer, developed in neutral or acid diaminophenol soln., toned with an Fe salt and, after clearing with a bath of NH_4Br and $\text{K}_2\text{Cr}_2\text{O}_7$ in H_2O , an image toned with a U salt is formed in the same colloid layer in registry.

Color photography. L. E. TAYLOR. U. S. 1,560,437, Nov. 3. A soln. of CuSO_4 , H_2O_2 and an acid, e. g., H_2SO_4 , in H_2O , is used for etching out the exposed portions of an exposed and developed film, preliminary to coloring of different films for superposing in register. U. S. 1,560,438 relates to mech. features of coloring motion picture films.

Photographic sensitizer. E. E. JELLEY. U. S. 1,560,240, Nov. 3. See Brit. 229,566 (C. A. 19, 3069).

Composition for cementing and coating photographic films. V. L. FARRINGTON and E. T. ALDERMAN. U. S. 1,556,512, Oct. 6. Nitrocellulose 4, acetone 8, ether 1-4, AmOAc 2-8 and alc. 4-8 parts.

Apparatus for dyeing photographic films. J. G. CAPSTAFF. U. S. 1,560,541, Nov. 10.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Chloroferriate substituted ammonium bases; a contribution to coordination chemistry. H. REMY. *Ber.* 58B, 1565-71 (1925).—On the basis of the coordination theory the compds. $\text{M}_2^1(\text{FeX}_6)$ and $\text{M}_4^1(\text{FeX}_7)$ should exist. The following were prepd.: *Methylammonium tetra-chloroferriate*, $(\text{CH}_3\text{NH}_2)(\text{FeCl}_4)$, m. 211° , green-yellow powder. *Methylammonium hepta-chlorohemi-aquoferriate*, $(\text{CH}_3\text{NH}_2)_4(\text{FeCl}_7 + \text{H}_2\text{O})$, orange prisms, m. 161° . *Dimethylammonium tetra-chloroferriate*, $[(\text{CH}_3)_2\text{NH}_2](\text{FeCl}_4)$, green powder, m. $97-104^\circ$. *Dimethylammonium penta-chloroferriate*, $[(\text{CH}_3)_2\text{NH}_2]_2(\text{FeCl}_5)$, yellow-green crystals, m. 98° . *Dimethylammonium hepta-chloroferriate*, $[(\text{CH}_3)_2\text{NH}_2]_2(\text{FeCl}_6)$, dark red crystals, m. 48° . *Trimethylammonium tetra-chloroferriate*, $[(\text{CH}_3)_3\text{NH}](\text{FeCl}_4)$, m. p. not detd. *Trimethylammonium penta-chloroferriate*, $[(\text{CH}_3)_3\text{NH}]_2(\text{FeCl}_5)$, green needles, m. 143.5° . *Tetramethylammonium tetra-chloroferriate*, $((\text{CH}_3)_4\text{N})(\text{FeCl}_4)$, apple-green crystals, m. 308° . *Ethylammonium tetra-chloroferriate*, $(\text{C}_2\text{H}_5\text{NH}_2)(\text{FeCl}_4)$, yellow-green crystals, m. 85° . *Ethylammonium hepta-chloroferriate*, $(\text{C}_2\text{H}_5\text{NH}_2)_2(\text{FeCl}_6)$, orange needles, m. 117° . *Propylammonium tetra-chloroferriate*, $(\text{C}_3\text{H}_7\text{NH}_2)(\text{FeCl}_4)$, black to green crystals, m. p. not detd. *Propylammonium hepta-chloroferriate*, $(\text{C}_3\text{H}_7\text{NH}_2)_2(\text{FeCl}_6)$, orange crystals, softens 110° , m. 118° . *Butylammonium tetra-chloroferriate*, $(\text{C}_4\text{H}_9\text{NH}_2)(\text{FeCl}_4)$, greenish brown crystals, m. 60.5° .

ROSALIE COBB

Constitution of the thionic acids. ISRAEL VOGEL. *J. Chem. Soc.* 127, 2248-9 (1925).—In the study of $(\text{S}_2\text{O}_3)_x$ (V. and Partington, C. A. 19, 2919) it became evident that none of the formulas proposed gave a rational explanation of the exptl. facts recorded. The following formulas are proposed: dithionic acid, $\text{HO}_2\text{S}\cdot\text{SO}_2\cdot\text{OH}$; trithionic acid, $\text{S}(\text{SO}_2\cdot\text{OH})_2$; tetrathionic acid, $\text{S}:\text{S}(\text{SO}_2\cdot\text{OH})_2$; pentathionic acid, $\text{S}:\text{S}:\text{S}(\text{SO}_2\cdot\text{OH})_2$; various exptl. facts are reviewed, with which these formulas are in agreement.

C. J. WEST

Is orthoboric acid volatile with steam? RICHARD ANSCHÜTZ AND KARL RIEFENKRÖGER. *Ber.* 58B, 1734-5 (1925).—Distg. off one-half of a H_3BO_3 soln. at atm. and reduced pressures gave no trace of acid in the distillate, nor loss of acid in the residue. When H_3BO_3 was heated under pressure to $150-180^\circ$ and then distd. at atm. pressure, about 90% of the acid distd. over. H_3BO_3 is not volatile with steam; the $\text{O}:\text{B}:\text{OH}$ formed at higher temps. is volatile with steam.

ROSALIE COBB

Some properties of stannous iodide. P. FREUNDLER AND MILE Y. LAURENT. *Bull. soc. chim.* 37, 1133-5 (1925); cf. C. A. 19, 780.—(1) SnCl_2 and NaI do not form a complex; the monohydrate, $\text{SnI}_2\cdot\text{H}_2\text{O}$, is obtained upon mixing cold concd. solns. This hydrate is stable in the cold but completely hydrolyzed by cold water or transformed by desiccation in the cold to anhyd. SnI_2 . (2) SnCl_2 and KI form yellow needles of $\text{SnI}_2\cdot 2\text{KI}\cdot 3\text{H}_2\text{O}$ in neutral soln., and in cold (22°), warm (45°), and hot acid solns., $\text{SnCl}_2\cdot 2\text{KI}\cdot \text{HCl}$, $\text{SnCl}_2\cdot 3\text{KI}\cdot \text{HCl}$, and anhyd. SnI_2 , resp., are formed. The transformations are reversible. The K complex is stable in neutral soln. but oxidizes in acid soln., especially in sunlight, to a deep brown soln. contg. a periodide. P. B. PLACE

Working-up noble-metal alloys, filings, turnings, etc., in the laboratory or on a small scale. F. W. STEINMETZ. *Chem.-Ztg.* 49, 807 (1925).—Inquartation, granulation, digestion with 36°Bé. HNO_3 , followed by washing, diluting, decanting or filtering,

and then washing, separate Au-Pt residues from Ag soln. The Ag soln. is pptd. with dil. HCl; the washed AgCl is then reduced with Zn strips and HCl, the Ag washed, dried and fused in graphite crucibles. The Au-Pt residue is dissolved in *aqua regia*, dild., and pptd. with SO_2 or FeSO_4 . If Pt be present, the filtrate from AgCl is evapd. with HCl, dild., pptd. with NH_4Cl , filtered and ignited. W. C. EBAUGH

7--ANALYTICAL CHEMISTRY

WILLIAM T. HALL

The use of liquid amalgam in volumetric analysis. III. Determination of phosphoric acid with the aid of lead amalgam. KINICHI SOMEYA. *Z. anorg. allgem. Chem.* 148, 58-64 (1925).—Ppt. NH_4 phosphomolybdate in the usual way and wash the ppt twice by decantation with a soln. of NH_4HSO_4 contg. 25 cc. H_2SO_4 and 15 cc. of concd. NH_4OH per liter. Filter into a Munroe crucible and dissolve in a little hot NH_4OH . Evap. to small vol. in an Erlenmeyer flask, add 50 cc. of concd. HCl, reduce with Pb-Hg, and titrate the reduced soln. with 0.1 *N* KMnO_4 . The results given appear to be remarkably accurate. W. T. H.

Stability of sodium thiosulfate solutions. E. COLLARD, JR. *Ann. chim. anal. chim. appl.* 7, 291-2 (1925).—A standard soln. was found to have the same titer after standing $3\frac{1}{2}$ years. W. T. H.

Evaluation of barium dioxide. E. C. WAGNER. *Ind. Eng. Chem.* 17, 972-4 (1925).—Treat 0.25 g. of sample with 50 cc. of water and 200 cc. of 0.25 *N* HCl contg. 8.5 g. H_3PO_4 and 0.1 g. MnCl_2 crystals per l and not with concd. H_3PO_4 as stated in *C. A.* 19, 2921. The method gives results consistently higher than those by the KMnO_4 method as ordinarily carried out. W. T. H.

Detection of oxygen. HANS SCHMALFUSS AND HANS WERNER. *J. prakt. Chem.* 111, 62-4 (1925); cf. *C. A.* 19, 1110. It is sometimes desirable to detect small quantities of O_2 in gases. A procedure has been developed which permits the detection of 0.002 cc. of O_2 in 200 cc. of a gas mixt. The test depends upon the fact that a piece of filter paper moistened with a drop 1% diphenylamine in 18 *N* H_2SO_4 , and treated with NO becomes blue in the presence of O_2 . Instead of diphenylamine in H_2SO_4 a soln. of α -naphthylamine in dil. AcOH can be used. In the reaction vessel, a little water is placed and a strip of paper is annexed to the dry wall of the vessel with the aid of a rod which has been touched with the reagent. After evacuating the vessel, a little O_2 -free NO is introduced and then the gas to be tested. W. T. H.

Electrometric studies of the precipitation of hydroxides. I. Precipitation of magnesium, manganous, ferrous, cobalt, nickel and thorium hydroxides by use of the hydrogen electrode. HUBERT THOMAS STANLEY BRITTON. *J. Chem. Soc.* 127, 2110-20 (1925).—The various methods which have hitherto been used for the detn. of the basic strength of the hydroxides have not always led to consistent results. In this investigation the order of pptn. was studied by gradually adding dil. alkali hydroxide and measuring the e. m. f. when pptn. took place, with the aid of the H_2 electrode. The order of pptn. was as follows; $\text{Mg}(\text{OH})_2$ at $p_{\text{H}} = 10.4$; $\text{Mn}(\text{OH})_2$ at $p_{\text{H}} = 8.4$; $\text{Co}(\text{OH})_2$ at $p_{\text{H}} = 6.8$; $\text{Ni}(\text{OH})_2$ at $p_{\text{H}} = 6.6$ and $\text{Fe}(\text{OH})_2$ at $p_{\text{H}} = 5.5$. In every case the ppt. contained an appreciable amt. of the original anion of the salt used. These p_{H} values are practically independent of the nature of the anion present and of the precipitant and are affected but slightly by changes in concn. of the metal salts in dil. solns. which have to be attained before any particular hydroxide can ppt. The dependence of these values on the soly. products of the different hydroxides is shown mathematically and it is demonstrated anew that the real reason why NH_4 salt prevents the pptn. of $\text{Mg}(\text{OH})_2$ and $\text{Mn}(\text{OH})_2$ by NH_3 soln. is due to the inability of such a soln. to furnish enough OH^- ions to cause pptn. when sufficient NH_4 salt is present. II. **The precipitation of the hydroxides of zinc, chromium, beryllium aluminium, bivalent tin and zirconium by use of the hydrogen electrode and their alleged amphoteric nature.** *Ibid.* 2120-41 (1925).— $\text{Al}(\text{OH})_3$ begins to ppt. at $p_{\text{H}} = 4.1$; $\text{Be}(\text{OH})_2$ at $p_{\text{H}} = 5.7$; $\text{Zn}(\text{OH})_2$ at $p_{\text{H}} = 5.2$; $\text{Cr}(\text{OH})_3$ at $p_{\text{H}} = 5.35$; $\text{Sn}(\text{OH})_2$ at $p_{\text{H}} = 1.9$ and $\text{Zr}(\text{OH})_4$ at $p_{\text{H}} = 2.8$. In all cases basic salts, rather than pure hydroxides, are pptd. Of all these bases, $\text{Al}(\text{OH})_3$ appears to be the only one which is definitely amphoteric, uniting with one mol. of NaOH, for example, to form NaAlO_2 . Although Hildebrand obtained data indicating similar salt formation with $\text{Zn}(\text{OH})_2$ and $\text{Zr}(\text{OH})_4$, these observations could not be confirmed. In the case of Cr, it would appear that the green modification of the sulfate is due to the hydrolysis of the violet salt and the $\text{Cr}(\text{OH})_3$

bound to colloidal aggregates of basic salt loses its reactivity. The fact that BaCl_2 and AgNO_3 produce incomplete pptn. in the case of the green sulfate and chloride is probably accounted for in the same way that Cl^- in Fe_2O_3 hydrosols is incompletely pptd. by Ag^+ . The Werner coordination theory does not offer as good an explanation of the anomalous behavior of green and violet Cr salts and it is pointed out that the original evidence of Werner and Gubser is unconvincing although Lamb and Fonda (C. A. 15, 2375) have stated that it is the most striking exemplification of the Werner theory of molecular structure. The study of ZrCl_4 and $\text{Zr}(\text{SO}_4)_2$ revealed the fact that both salts in soln. are composed of highly dispersed basic particles and hydrolyzed acid, there being no evidence of the so-called "zirconyl" radical. III. **Precipitation in the cerite group of rare earths and of yttrium hydroxide** by the use of the hydrogen electrode. *Ibid* 2142-7(1925).—In this group, the pptn. of hydroxide, or basic salts, begins at the following p_{H} values: $\text{Yt}(\text{OH})_3$ at 6.78; $\text{Sa}(\text{OH})_3$ at 6.83; $\text{Nd}(\text{OH})_3$ at 7.00; $\text{Pr}(\text{OH})_3$ at 7.05; $\text{Ce}(\text{OH})_3$ at 7.41; $\text{La}(\text{OH})_3$ at 8.35. All these values lie below those of $\text{Mg}(\text{OH})_2$ and $\text{Mn}(\text{OH})_2$ and above that of $\text{Zn}(\text{OH})_2$. The difference between the hydron concn. for the pptn. of $\text{Th}(\text{OH})_4$ and those of the rare earth hydroxides accounts for some of the methods used in sepn. Th from these earths. If sufficient NH_4Cl is present, the pptn. of La and Ce⁺⁺⁺ hydroxides is prevented. IV. **Precipitation of mercuric, cadmium, lead, silver, cupric, uranic and ferric hydroxides** by use of the oxygen electrode. *Ibid* 2148-59(1925).—Although O_2 electrodes cannot be used to det. accurately the changes in hydron concn., they are sufficiently responsive to indicate the character of the changes and to give an approx. idea of the hydron concn. According to the results described in this paper, together with the results of the work with the H_2 electrode, the following table gives the metals in the order of the hydron concns. at which their respective hydroxides or basic salts are pptd. from dil. solns. Although it is not certain that this order represents the actual basic strength of the hydroxides, it can be said that these hydron concns. underlie many of the reactions of the various sepn. which are used in analytical chemistry.

Hydron concn.	Metal ion.
10^{-11}	Mg
10^{-9}	Ag, Mn^{++} , La, Hg^{++}
10^{-8}	Ce ⁺⁺⁺ , Co, Ni, Cd, Pr, Ne, Yt, Sa, $\text{Fe}^{++}(?)$, Pb?
10^{-6}	Zn, Be, Cu, Cr,
10^{-5}	Al,
10^{-4}	U, Th,
10^{-3}	Sn^{++} , Zr, Fe^{+++}

According to this, $\text{Al}(\text{OH})_3$ is a very weak base yet Al occurs higher than Cr in the e. m. f. table. Heyrovsky's system of classification indicates that $\text{Pb}(\text{OH})_2$ is stronger than $\text{Mg}(\text{OH})_2$ and that HgO is weaker than $\text{Zn}(\text{OH})_2$ but the above values indicate that the contrary is true, which would seem more reasonable. The ppt. obtained by adding NaOH to $\text{UO}_2(\text{NO}_3)_2$ soln. was chiefly hydroxide and not $\text{Na}_2\text{U}_2\text{O}_7$ as often stated. Significant changes in color were observed in the titration of uranyl and ferric salts which can be best explained by the colloid theory. W. T. H.

The separation of palladium from platinum. F. KRAUSS AND H. DENEKE. Z. anal. Chem. 67, 86-96(1925).—Several methods for the detn. of Pd and Pt in mixts of their pure salts were tested. The attempt to dissolve out the Pd by means of hot HNO_3 or hot HCl proved unsuccessful. The pptn. of Pd with α -nitroso- β -naphthol can be carried out successfully but the Pd ppt. is very voluminous. The same is true of the ppt. of Pd by means of C_2H_2 and when considerable Pd is present it is difficult to get quant. pptn. The sepn. with dimethylglyoxime has several disadvantages although the expts. show that with a modified procedure it is possible to obtain excellent results. The sepn. with $\text{Hg}(\text{CN})_2$ is capable of yielding excellent results but the reagent is poisonous and expensive to use. Of all the methods tried, the following is preferred in the case of a mixt. of only Pd and Pt. Evap. the soln. several times to dryness with HCl to remove any HNO_3 . Take up the residue in HCl , add an excess of NH_4Cl and evap. again to dryness. Take up the residue with a little water and add some more of a cold. satd. NH_4Cl soln. After a short time, filter off the $(\text{NH}_4)_2\text{PtCl}_6$ and wash with a satd. NH_4Cl soln., until the filtrate is colorless, and then with 96% alc., dissolve the ppt. in hot water and ppt. Pt by adding $\text{N HCO}_2\text{Na}$. Filter off, ignite in H_2 and weigh the Pt. Neutralize the first filtrate with Na_2CO_3 , treat with HCO_2Na and wash the Pd sponge very carefully with hot water. Ignite as with Pt. W. T. H.

The determination of traces of lead in organics and the changes that take place in

very dilute aqueous solutions of lead nitrate. HUGO BERNHARDT. *Z. anal. Chem.* **67**, 97-105(1925).—The method consists in first destroying the org. matter by means of eucblorine or an oxidizing fusion, then pptg. PbS, oxidizing and dissolving it, depositing PbO, electrolytically, dissolving the ppt. in an acid soln. of KI and titrating the liberated I_2 . Before pptg. PbS, it is necessary to add 50 cc. of 10% NH_4 citrate to prevent carrying down phosphates in the nearly neutral soln. It is well to dissolve the PbS ppt. and repeat the pptn. in the analysis of bones. For the electrolysis, a rotating gauze anode is recommended. The soln. should be dild. to about 250 cc. treated with 10 cc. of 60% HNO_3 and electrolyzed with a current of 0.2-0.3 amp. at 2.8-3.2 vs. In work with solns. of $Pb(NO_3)_2$ contg. 10 mg. Pb per cc., it was found that the Pb content diminished as the soln. was allowed to stand in a glass vessel owing to the formation of Pb silicate on the walls of the vessel. W. T. H.

The determination of traces of mercury. I. The sensitivity of the qualitative tests for mercury. A new method for the detection of mercury sensitive to one part in a billion. H. S. BOOTH AND NORA E. SCHREIBER. *J. Am. Chem. Soc.* **47**, 2625-9 (1925).—Some 18 sensitive tests for Hg were studied and greater delicacy was obtained with a new electrolytic test. Place a drop of the soln. on a microscope slide, make acid with HNO_3 , touch with a polished Cu cathode and insert a Pt anode. Pass a current of 1.3-1.5 milliamp. at 1.5-2 v. through the soln. and after 2-3 min. exam the tip of the Cu anode under the microscope. W. T. H.

Detection of gold formed from mercury. H. STAMMREICH. *Z. anorg. allgem. Chem.* **148**, 93-6(1925).—If Hg is distd. *in vacuo* at a low temp., overheating being avoided at the last, all lower-boiling metals are left behind, as has been proved in the case of Pb, Bi, Cd, Na, etc. After treating the last drop of the distn. residue with pure HNO_3 , the Hg will dissolve, leaving the Au behind. Under the microscope the diam. of the residual Au is about 2.3 that of Au in its usual solid condition. If the Au is obtained in Hg which is so highly dispersed that it will not collect to form a liquid, it is desirable to dissolve the Au in HNO_3 with a very little HCl and from the soln. ppt. Au with hydrazine in ammoniacal soln. Owing to the highly absorptive nature of finely dispersed Hg, it is permissible to reject the liquid Hg when both liquid and colloidal Hg are present. A further difficulty arises from the fact that Cu and Fe interfere somewhat with the detection of small quantities of Au. Sometimes shaking with $Hg(NO_3)_2$ helps, but if only traces of Au are present, it is best to dissolve in a little *aqua regia*, ppt. Au with hydrazine and NH_4OH and remove the $Fe(OH)_3$ by the addn. of a little HCl. W. T. H.

The determination of uranium. G. E. F. LUNDELL AND H. B. KNOWLES. *J. Am. Chem. Soc.* **47**, 2637-44(1925).—Contrary to prevailing prejudices, the volumetric method for detg. U is accurate provided a cool, acid soln. is passed through a Jones' reductor and sufficient time is allowed for atmospheric oxidation before titration with $KMnO_4$. The reduction is then to the quadrivalent state. The soln. should contain 1% or less of U and 5% of H_2SO_4 . Similarly the gravimetric method of pptg. with NH_4OH and weighing as U_3O_8 is accurate but it is advisable to add macerated paper pulp; there is no need for special ignition in H_2 or in O_2 . A residue of U_3O_8 can easily be tested volumetrically by titrating with $KMnO_4$ after dissolving in HF and H_2SO_4 and adding boric acid. W. T. H.

The development of organic elementary analysis from Lavoisier to Pregl. C. WEYGAND. *Z. angew. Chem.* **38**, 881-5(1925). B. H.

Azido-dithiocarbonic acid. II. Methods for the determination of the azido-dithiocarbonate radical, $SCSN_2$. A. W. BROWNE AND G. B. L. SMITH. *J. Am. Chem. Soc.* **47**, 2698-702(1925).—Several possible methods for detg. $SCSN_2$ are discussed: (1) titration of the free acid with methyl red as indicator, (2) gravimetric detn. as the Ag salt or as $AgCl$ equiv. to it, (3) titration with $AgNO_3$ as in the Gay-Lussac or Volhard methods for titrating Cl^- and (4) titration with I_2 dissolved in alc. Of these, apparently the Volhard titration method is to be preferred. W. T. H.

A new method of precipitating oxalic acid in the systematic qualitative procedure by means of basic bismuth nitrate. A. KESCHAN. *Z. anal. Chem.* **67**, 81-6(1925).—Oxalic acid, as well as H_3PO_4 , can be removed by pptn. with Bi subnitrate (3 g. subnitrate for 0.88 g. of $C_2O_4^{--}$), in a soln. which is not over 2 N in HNO_3 . Owing to the formation of oxalate complexes, trivalent Fe, Cr and Al interfere somewhat. In dil. soln. Al does no harm and Fe can be easily reduced to the bivalent state by means of $NH_4NH_2.HCl$ or H_2S . With Cr, difficulty is encountered both with respect to the removal of the Cr and of the C_2O_4 anion. By adding 1-2 cc. of N $(NH_4)_2HPO_4$ and boiling with $BiONO_3$ first the oxalate and then the phosphate is pptd. In the absence of Cr and Fe, evap. the filtrate from the 2nd group to a small vol., add a little concd.

HNO₃ and again evap. to small vol., add the necessary amt. of BiONO₃ and dil. with 10–15 vols. of water. Boil a few minutes, dilute with an equal vol. of hot water, allow to cool somewhat and filter while still warm. W. T. H.

Absorption of O and liberation of CO by alkaline pyrogallol solutions (DRAKELEY, NICOL.) 2. Determination of CO in blood and in air (SAVERS, YANT) 11B. Gasometric CaC₂ method for the determination of moisture (JAKOWENKO) 12.

Gas analysis. J. R. CATN. U. S. 1,560,660, Nov. 10. In-letg. C in steel, rubber or CO₂ in carbonates, flue gases, etc., an aq. soln. of Ba(OH)₂ or other suitable electrolyte is used for absorbing CO₂ and changes in elec. resistance of the electrolyte due to the absorption are noted to det. from them the amt. of CO₂ absorbed.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

An X-ray investigation of some finely divided minerals, artificial products, and dense rocks. F. RINNE. *Z. Krist.* 60, 55–69 (1924).—The X-ray diffraction patterns are described (but not analyzed) for: bauxite, hydargillite, diasporite, Al₂O₃, Fe₂O₃, SiO₂, opal, V₂O₅, kaolin, allophane, talc, serpentine, meerschaum, calcite, aragonite (flos-ferri), vaterite, magnesite, hydrozincite, turquoise, boracite, stassfurtite, org. compds. such as asphalt, ozocerite, and dopplerte, and rocks, such as limestone, flint, obsidian, etc.

Beryllium oxide as a mineral, and its crystal structure. G. AMINOFF. *Z. Krist.* 62, 113–22 (1925).—An analysis of an unknown mineral from Långban gave 98% BeO. Properties: dibexagonal pyramidal (isomorphous with ZnO) $c = 1.6288$, hardness 9, uniaxial +, $\epsilon = 1.733$, $\omega = 1.719$. It is named *bromellite*, after the Swedish mineralogist von Bromell. The structure found by McKeehan (*C. A.* 17, 1356) on artificial BeO is verified—ZnO type, $c = 4.36$ Å U and $a = 2.68$ Å U.

Chromite from Mont Djéti, near Atakpame, Togo. M. H. ARSANDAUX. *Bull. soc. franç. minéral.* 48, 70–6 (1925).—The high Al and Mg content places this mineral intermediate between spinel and chromite.

Vaterite and μ -calcium carbonate. R. E. GIBSON, R. W. G. WYCKOFF AND H. E. MERWIN. *Am. J. Sci.* 10, 325–33 (1925).—A critical examn. of the literature on "vaterite" has shown that this name has been applied to 2 entirely different spherulitic habits of CaCO₃. The first of these, which was studied by Vater and later by Johnston, Merwin and Williamson, has now been shown by X-ray powder photographs definitely to be calcite. The second which was studied by Butschli, Spangenberg, Rinne and Heide has been proved to be essentially μ -CaCO₃. A reliable method for the prepn. of crystals of CaCO₃ in fairly large yields has been obtained. From a review of all of the work in this field it may be stated that anhyd. CaCO₃ may exist at ordinary temp. and pressure in 3 distinct cryst. forms, calcite, aragonite and μ -CaCO₃.

The chemical constitution of the monoclinic pyroxenes and amphiboles. B. GOSSNER. *Z. Krist.* 60, 76–124 (1924). The chemical composition of alkali amphiboles. *Ibid.* 302–10 (1924); cf. *C. A.* 19, 952.—The compns. are shown to correspond to combinations in varying proportions of certain simple mols.

The chemical composition of crossite, arfvedsonite, aenigmatite, rhoenite and babingtonite. B. GOSSNER. *Z. Krist.* 61, 538–44 (1925); cf. *C. A.* 19, 952.—Analyses are interpreted to show the relationship of these minerals to the more common members of the amphibole and pyroxene groups.

The FeSiO₃-CaSiO₃-MgSiO₃-NaFeSi₂O₆ system of monoclinic amphiboles. A. N. WINCHELL. *Am. Mineral.* 10, 335–41 (1925).—By plotting the chem. compn. of the minerals of the grunerite-cummingtonite-kupferite series against the optical constants, the influence of each mol. on the optical properties is shown. NaFeSi₂O₆ produces the greatest effect.

Leverrierite as a schist-forming mineral. C. S. CORBETT. *Am. J. Sci.* 10, 247–68 (1925).—Chem. analyses and phys. properties of the hydrous Al silicate, leverrierite show it to be a mineral differing from muscovite chiefly in the fact that K is not essential to its compn. It is the type mineral of a group which includes batchelorite, kryptotile, rectorite, delanouite and pyrophyllite. The similarity in compn. and properties of muscovite and leverrierite suggest that the latter may occur in every situation where

the former is found as a mineral of secondary development, especially in schistose rocks. The distinction between muscovite and leverrierite is not possible by ordinary petrographic or optical methods, nor by microchem. tests in samples which contain an appreciable amt. of K. The specimen giving the most conclusive evidence of the presence of leverrierite by optical and microchem. examn. gave also the best result upon X-ray analysis, and furnishes evidence of the development of this mineral under conditions of anamorphism producing schistose rocks. L. W. RIGGS

Hedyphane from Franklin Furnace, New Jersey. Wm F. FOSHAG AND R. B. GAGE. *Am. Mineral.* 10, 351-3 (1925).—The analysis: Cl 2.98, As_2O_3 29.94, PbO 52.77, (Mn,Fe)O 0.28, CaO 14.98, MgO 0.10, ZnO 0.23, H_2O 0.08%, establishes hedyphane as a new species. Its $\omega = 2.026$, $\epsilon = 2.010$. C. B. SLAWSON

New investigations upon dewindtite: birefringence, chemical composition, and dehydration; comparison with dumontite. ALFRED SCHOEP. *Bull. soc. franç. mineral.* 48, 77-85 (1925).—The crystals are biaxial +, 2H large, and extinction perpendicular. H_2O 7.93, P_2O_5 10.14, UO_3 54.80, PbO 24.85%. C. B. SLAWSON

A new mineral from Långban. G. AMINOFF. *Z. Krist.* 60, 262-74 (1924). The compn. is: Sb_2O_3 54.17, P_2O_5 0.23, Al_2O_3 34.72, CaO 0.94, MgO 0.52, Na_2O 8.50, K_2O 0.21, H_2O 0.39 = 99.68%, corresponding to the formula $Na_2O.2Al_2O_3.Sb_2O_3$. Crystals are hexagonal, with $c = 1.6309$. Uniaxial, negative, ω 1.7724, ϵ 1.7700. This mineral is named *swedenborgite*, in honor of Emanuel Swedenborg. L. S. RAMSDELL

The genesis of the Texada Island magnetite deposits. C. O. SWANSON. Can. Bur. Mines, *Summary Rept.* 1924A, 106-44.—The probable conditions under which Fe_3O_4 was deposited from magmatic solns. are described. L. W. RIGGS

The copper deposits of Capillitas, Patamarea, Argentine. E. KITTL. *Z. prakt. Geol.* 8, 121-4; 9, 140-6 (1925).—The ore deposit is associated with andesite. Primary minerals present are: pyrite, arsenopyrite, chalcopyrite, quartz, kaolin, galena, sphalerite, barite, and tetrahedrite. Minerals formed in the cementation zone are: chalcopyrite, enargite, tetrahedrite, chalcocite, bornite, covellite, pyrite. In the oxidation zone: cerussite, rhodochrosite, native Cu, cuprite, malachite, Au, braunite, limonite, linarite, and $CuSO_4$. W. H. NEWHOUSE

Upper Beaver river area, Mayo district, Yukon. W. E. COCKFIELD. Can. Bur. Mines, *Summary Rept.* 1924A, 1-18.—Deposits of galena with smaller quantities of tetrahedrite and Zn blende are found at McKay hill, Silver hill and Grey Copper hill. These ores generally carry small quantities of Ag. The outlook for profitable mining is unfavorable. L. W. RIGGS

Driftwood Creek map-area, Babine Mts., British Columbia. GEORGE HANSON. Can. Dept. Mines, *Summary Rept.* 1924A, 19-37.—Twelve mining properties are described which show Ag, Pb and small quantities of Au. The deposits are small and discontinuous. Prince Rupert to Burns Lake, B. C. *Ibid* 38-43.—The common minerals contg. Cu, Pb, Zn, Ag, Fe and As are found, also Au ores, but none of them in quantities sufficient to encourage com. development. L. W. RIGGS

Tungsten deposits near Hazelton, B. C. M. E. HURST. Can. Dept. Mines, *Summary Rept.* 1924A, 44-6.—W has been found in 2 claims. L. W. RIGGS

Chilko Lake and vicinity, B. C. V. DOLMAGE. Can. Bur. Mines, *Summary Rept.* 1924A, 59-75.—Au, Ag, Sb and As are found in the Morris mine and in other claims. The ores are low grade. L. W. RIGGS

Pemberton area, Lillooet district, B. C. C. E. CAIRNES. Can. Dept. Mines, *Summary Rept.* 1924A, 76-99.—About 12 mining properties are described, most of which show low Au, Ag and Cu values. Zn and Pb ores are less common. Nickeliferous mineral deposit, Emory Creek, Yale mining division, B. C. *Ibid* 100-5.—The genesis of the Ni deposits and particularly of *pentlandite* is described at length. L. W. RIGGS

Genesis of lithium pegmatites. W. T. SCHALLER. *Am. J. Sci.* 10, 269-79 (1925).—The Li pegmatites as now seen are not the result of an original crystn. of a magma unusually rich in the so-called mineralizers, but the results of later replacement (probably hydrothermal) of an earlier formed rock essentially free from any of the mineralizers. The earlier formed rock in the California field was graphic granite whose peculiar structure and texture served as a key in the interpretation of subsequent rock replacements. L. W. RIGGS

A pigeonite-andesite with diabasic texture from Taodeni, Soudan, Sahara, and the origin of bowlingite from the same locality. M. E. DENAEYER. *Bull. soc. franç. mineral.* 47, 355-7 (1924).—Bowlingite is an alteration product of pigeonite which has an extremely low Ca content. C. B. SLAWSON

Lower muds (older loess) of the vicinity of Paris. AGAFONOV AND MILE. MALICHEF. *Compt. rend.* 181, 300-2 (1925), cf. C. A. 18, 1027.—These muds are much less

changed, less calcareous, more heterogeneous and coarser than the recently deposited muds of the locality. The probable genesis is described. L. W. RIGGS

A new attempt to determine the relative dissemination of the rare elements. G. BERG. *Z. prakt. Geol.* 5, 73-9 (1925).—Discussion of the abundance of each of the elements is followed by a table with the elements listed. W. H. NEWHOUSE

Measurement of the altitude of the ozone layer in the atmosphere. J. CABANNES AND J. DUFAY. *Compt. rend.* 181, 302-4 (1925).—Mathematical calcs. applied to data furnished by photospectroscopic observation upon the absorption of the sun's rays gave about 50 km. as the height of the ozone layer. L. W. RIGGS

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST AND R. S. WILLIAMS

The Hornsey low-temperature process for reducing iron ore. G. HOOGHWINKEL. *Iron Coal Trades Rev.* 111, 326 (1925).—The Hornsey app. consists of 3 rotary furnaces arranged in series. Ore is fed into the upper one, where it is heated to 800° by the surplus gas from the second retort. The ore drops by gravity into the second retort where it is mixed with low-grade coal or other reducing agent. This retort is heated by an auxiliary heating system. In the third retort, the charge is cooled by H₂O sprays to a temp. where reoxidation will not occur. From here it is discharged through an air-tight opening. The retorts are operated at different speeds and at temps. never above 1050°. Fe in the final product is separated magnetically from the gang and is 98-99.5% pure. Ores ranging between 63.4 and 21.0% Fe were used. Steel made from the granular Fe without further additions is of a superior quality. J. F. B.

Notes on blast furnace slags. R. R. F. WALTON. *Iron Coal Trades Rev.* 111, 319 (1925).—The roles of SiO₂, Al₂O₃, CaO, MgS and CaS are discussed. J. F. BYRNE

Dimensions and output of German open-hearth furnaces. HUGO BONSEN. *Iron Coal Trades Rev.* 111, 351-5 (1925). J. F. BYRNE

Pulverized coal as fuel for copper-refining furnaces. E. S. BARDWELL AND ROY H. MILLER. *Trans. Am. Inst. Mining Met. Eng.*, Sept., 1925, No. 1497-D, 8 pp.—The use of pulverized coal in connection with melting and refining of cathode Cu has proved successful and, in case of any great increase in oil price, very profitable. Bituminous coal running less than 8% ash and 2% S is crushed, dried and pulverized. The total loss of coal in a pulverizing plant described in the paper was found to be 0.6%. Screen tests showed 96% through 100 mesh and 80% through 200 mesh. The transportation of the coal dust to the furnace refinery is undertaken in special designed tank cars. These are discharged to the bins over the furnaces by means of high pressure air. No changes were made in the furnace design when changing from grate-firing to coal dust, except for the removal of the fireboxes which proved to be unnecessary, as the burner pipes could be introduced directly over the bridge-wall. In regard to the economies a saving of time was brought about in the elimination of grating and removing of clinkers from the firebox. The conditions of combustion were more uniform; thus a shorter melting period was required. There was at least 40% saving in actual fuel cost. Compared with similar fuel for grate-firing the fuel ratio was 6.8 tons against 4 tons of Cu per ton of coal. The slag produced per ton of Cu increased 28% but contained only 3.4% more Cu than that with grate-firing. This loss also depends largely on the fineness of the coal dust used; thus a finer dust gives less slag. The quality of the Cu was excellent, and the S content seldom exceeded 0.002%. The cost of furnace-repair during a 16 months' period with coal dust firing showed a decrease of 10%. D. MIESSEY

Melting aluminium. RICHARZ. *Chem.-Ztg.* 49, 813-4 (1925).—A general presentation of the principles and practice of Al-melting. The tendency to oxidize is overcome partly through the formation of a skin of Al₂O₃ on the metal; the taking up of N and hydrocarbons increases above 720°; the high sp. ht. (0.232 cal. at 100°) renders melting slower than with Cu, etc., and cooling correspondingly longer; and as Al dissolves Zn, Cu, Ni, Si, etc., readily at high temps. the materials of which crucibles and furnaces are built are important. The advantages of oil- and gas-fired furnaces, and especially of elec. furnaces, are emphasized. W. C. EBAUGH

The technic of examining metals under the microscope. G. PIRK. *Gen. Elec. Rev.* 28, 800 (1925).—A review. C. G. F.

Endurance properties of non-ferrous metals. D. J. MCADAM, JR. *Trans. Am. Inst. Mining Met. Eng.* 1925, No. 1506-E, 22 pp.; cf. C. A. 19, 1397, 1845, 2627.—McA. has carried out expts. on the endurance properties of various non-ferrous metals and alloys (Cu, Monel metal, bronze, Muntz metal, Al-bronze and duralumin). Stress-

the former is found as a mineral of secondary development, especially in schistose rocks. The distinction between muscovite and leverrierite is not possible by ordinary petrographic or optical methods, nor by microchem. tests in samples which contain an appreciable amt. of K. The specimen giving the most conclusive evidence of the presence of leverrierite by optical and microchem. examn. gave also the best result upon X-ray analysis, and furnishes evidence of the development of this mineral under conditions of anamorphism producing schistose rocks. L. W. RIGGS

Hedyphane from Franklin Furnace, New Jersey. Wm. F. FOSHAG and R. B. GAGE. *Am. Mineral.* 10, 351-3(1925).—The analysis: Cl 2.98, As_2O_3 29.94, PbO 52.77, (Mn,Fe)O 0.28, CaO 14.98, MgO 0.10, ZnO 0.23, H_2O 0.08%, establishes hedyphane as a new species. Its $\omega = 2.026$, $\epsilon = 2.010$. C. B. SLAWSON

New investigations upon dewindtite: birefringence, chemical composition, and dehydration; comparison with dumontite. ALFRED SCHOEP. *Bull. soc. franç. mineral.* 48, 77-85(1925).—The crystals are biaxial +, 2F large, and extinction perpendicular H_2O 7.93, P_2O_5 10.14, UO_3 54.80, PbO 24.85%. C. B. SLAWSON

A new mineral from Långban. G. AMINOFF. *Z. Krist.* 60, 262-74(1924).—The compn. is: Sb_2O_3 54.17, P_2O_5 0.23, Al_2O_3 34.72, CaO 6.94, MgO 0.52, Na_2O 8.50, K_2O 0.21, H_2O 0.39 = 99.68%, corresponding to the formula $Na_2O.2Al_2O_3.Sb_2O_3$. Crystals are hexagonal, with $c = 1.6309$. Uniaxial, negative, ω 1.7724, ϵ 1.7700. This mineral is named *swedenborgite*, in honor of Emanuel Swedenborg. L. S. RAMSDELL

The genesis of the Texada Island magnetite deposits. C. O. SWANSON. Can. Bur. Mines, *Summary Rept.* 1924A, 106-44.—The probable conditions under which Fe_3O_4 was deposited from magmatic solns. are described. L. W. RIGGS

The copper deposits of Capillitas, Patamarea, Argentina. E. KITTL. *Z. prakt. Geol.* 8, 121-4; 9, 140-6(1925).—The ore deposit is associated with andesite. Primary minerals present are: pyrite, arsenopyrite, chalcopyrite, quartz, kaolin, galena, sphalerite, barite, and tetrahedrite. Minerals formed in the cementation zone are: chalcopyrite, enargite, tetrahedrite, chalcocite, bornite, covellite, pyrite. In the oxidation zone: cerussite, rhodochrosite, native Cu, cuprite, malachite, Au, braunite, limonite, linarite, and $CuSO_4$. W. H. NEWHOUSE

Upper Beaver river area, Mayo district, Yukon. W. E. COCKFIELD. Can. Bur. Mines, *Summary Rept.* 1924A, 1-18.—Deposits of galena with smaller quantities of tetrahedrite and Zn blende are found at McKay hill, Silver hill and Grey Copper hill. These ores generally carry small quantities of Ag. The outlook for profitable mining is unfavorable. L. W. RIGGS

Driftwood Creek map-area, Babine Mts., British Columbia. GEORGE HANSON. Can. Dept. Mines, *Summary Rept.* 1924A, 19-37.—Twelve mining properties are described which show Ag, Pb and small quantities of Au. The deposits are small and discontinuous. Prince Rupert to Burns Lake, B. C. *Ibid* 38-43.—The common minerals contg. Cu, Pb, Zn, Ag, Fe and As are found, also Au ores, but none of them in quantities sufficient to encourage com. development. L. W. RIGGS

Tungsten deposits near Hazelton, B. C. M. E. HURST. Can. Dept. Mines, *Summary Rept.* 1924A, 44-6.—W has been found in 2 claims. L. W. RIGGS

Chilko Lake and vicinity, B. C. V. DOLMAGE. Can. Bur. Mines, *Summary Rept.* 1924A, 59-75.—Au, Ag, Sb and As are found in the Morris mine and in other claims. The ores are low grade. L. W. RIGGS

Pemberton area, Lillooet district, B. C. C. E. CAIRNES. Can. Dept. Mines, *Summary Rept.* 1924A, 76-99.—About 12 mining properties are described, most of which show low Au, Ag and Cu values. Zn and Pb ores are less common. **Nickeliferous mineral deposit, Emory Creek, Yale mining division, B. C.** *Ibid* 100-5.—The genesis of the Ni deposits and particularly of *pentlandite* is described at length. L. W. RIGGS

Genesis of lithium pegmatites. W. T. SCHALLER. *Am. J. Sci.* 10, 269-79(1925).—The Li pegmatites as now seen are not the result of an original crystn. of a magma unusually rich in the so-called mineralizers, but the results of later replacement (probably hydrothermal) of an earlier formed rock essentially free from any of the mineralizers. The earlier formed rock in the California field was graphic granite whose peculiar structure and texture served as a key in the interpretation of subsequent rock replacements. L. W. RIGGS

A pigeonite-andesite with diabasic texture from Taodeni, Soudan, Sahara, and the origin of bowlingite from the same locality. M. E. DENAEYER. *Bull. soc. franç. mineral.* 47, 355-7(1924).—Bowlingite is an alteration product of pigeonite which has an extremely low Ca content. C. B. SLAWSON

Lower muds (older loess) of the vicinity of Paris. AGAFONOV and MILE. MAITCHEF. *Compt. rend.* 181, 300-2(1925) cf. C. A. 18, 1027.—These muds are much less

changed, less calcareous, more heterogeneous and coarser than the recently deposited muds of the locality. The probable genesis is described. I. W. RIGGS

A new attempt to determine the relative dissemination of the rare elements. G. BERG. *Z. prakt. Geol.* 5, 73-9 (1925).—Discussion of the abundance of each of the elements is followed by a table with the elements listed. W. H. NEWHOUSE

Measurement of the altitude of the ozone layer in the atmosphere. J. CARANNES AND J. DUFAY. *Compt. rend.* 181, 302-4 (1925).—Mathematical calchs. applied to data furnished by photospectroscopic observation upon the absorption of the sun's rays gave about 50 km. as the height of the ozone layer. I. W. RIGGS

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST AND R. S. WILLIAMS

The Hornsey low-temperature process for reducing iron ore. G. HOOGHWINCKEL. *Iron Coal Trades Rev.* 111, 326 (1925).—The Hornsey app. consists of 3 rotary furnaces arranged in series. Ore is fed into the upper one, where it is heated to 800° by the surplus gas from the second retort. The ore drops by gravity into the second retort where it is mixed with low-grade coal or other reducing agent. This retort is heated by an auxiliary heating system. In the third retort, the charge is cooled by H₂O sprays to a temp. where reoxidation will not occur. From here it is discharged through an air-tight opening. The retorts are operated at different speeds and at temps. never above 1050°. Fe in the final product is separated magnetically from the gang and is 98-99.5% pure. Ores ranging between 63.4 and 21.0% Fe were used. Steel made from the granular Fe without further additions is of a superior quality. J. F. B.

Notes on blast furnace slags. R. R. F. WALTON. *Iron Coal Trades Rev.* 111, 319 (1925).—The roles of SiO₂, Al₂O₃, CaO, MgS and CaS are discussed. J. F. BYRNE

Dimensions and output of German open-hearth furnaces. HUGO BONSEN. *Iron Coal Trades Rev.* 111, 351-5 (1925). J. F. BYRNE

Pulverized coal as fuel for copper-refining furnaces. J. S. BARDWELL AND ROY H. MILLER. *Trans. Am. Inst. Mining Met. Eng.*, Sept., 1925, No. 1497-D, 8 pp. The use of pulverized coal in connection with melting and refining of cathode Cu has proved successful and, in case of any great increase in oil price, very profitable. Bituminous coal running less than 8% ash and 2% S is crushed, dried and pulverized. The total loss of coal in a pulverizing plant described in the paper was found to be 0.6%. Screen tests showed 96% through 100 mesh and 80% through 200 mesh. The transportation of the coal dust to the furnace refinery is undertaken in special designed tank cars. These are discharged to the bins over the furnaces by means of high pressure air. No changes were made in the furnace design when changing from grate-firing to coal dust, except for the removal of the fireboxes which proved to be unnecessary, as the burner pipes could be introduced directly over the bridge-wall. In regard to the economies a saving of time was brought about in the elimination of grating and removing of clinker from the firebox. The conditions of combustion were more uniform; thus a shorter melting period was required. There was at least 40% saving in actual fuel cost. Compared with similar fuel for grate-firing the fuel ratio was 6.8 tons against 4 tons of Cu per ton of coal. The slag produced per ton of Cu increased 28% but contained only 3.4% more Cu than that with grate-firing. This loss also depends largely on the fineness of the coal dust used; thus a finer dust gives less slag. The quality of the Cu was excellent, and the S content seldom exceeded 0.002%. The cost of furnace-repair during a 16 months' period with coal dust firing showed a decrease of 10%. D. MIESEY

Melting aluminium. RICHARZ. *Chem.-Ztg.* 49, 813-4 (1925).—A general presentation of the principles and practice of Al-melting. The tendency to oxidize is overcome partly through the formation of a skin of Al₂O₃ on the metal; the taking up of N and hydrocarbons increases above 720°; the high sp. ht. (0.232 cal. at 100°) renders melting slower than with Cu, etc., and cooling correspondingly longer; and as Al dissolves Zn, Cu, Ni, Si, etc., readily at high temps. the materials of which crucibles and furnaces are built are important. The advantages of oil- and gas-fired furnaces, and especially of elcc. furnaces, are emphasized. W. C. EBAUGH

The technic of examining metals under the microscope. G. PIRK. *Gen. Elec. Rev.* 28, 800 (1925).—A review. C. G. F.

Endurance properties of non-ferrous metals. D. J. MCADAM, JR. *Trans. Am. Inst. Mining Met. Eng.* 1925, No. 1506-E, 22 pp.; cf. C. A. 19, 1397, 1845, 2627. —McA. has carried out expts. on the endurance properties of various non-ferrous metals and alloys (Cu, Monel metal, bronze, Muntz metal, Al-bronze and duralumin). Stress-

cycle graphs are presented and compared with the data obtained elsewhere (Univ. of Ill., McCook field) on the same materials. McA.'s graphs indicate that non-ferrous metals have an endurance limit, just as ferrous alloys, while the results of the other 2 labs. give evidence that no endurance limit was reached, neither for Monel metal nor for duralumin. Possible reasons for the discrepancy in results and conclusions are discussed.

H. S. VAN KLOOSTER

• **Cooling causes brittleness.** S. A. RICHARDSON. *Iron Trade Rev.* **77**, 550 2(1925).

J. F. BYRNE

• **Flow in a low-carbon steel at various temperatures.** H. J. FRENCH AND W. A. TUCKER. *Bur. of Standards, Tech. Paper* **296**, 619 40(1925).—Using a low C steel (0.24% C, 0.37% Mn), F. and T. made a study of the flow under fixed loads at const. temp. within the range 20–600°, seeking to find a possible relationship between long- and short-time tensile tests. The steel was tested at 20°, 295°, 430° and 595° and the loads applied varied from 11,000 to 60,000 lb./sq. in. The relation between decrease in applied load and increase in life is approximately hyperbolic. A fixed load at const. temp. causes 3 stages of flow. (1) an initial flow, (2) a secondary flow at rather uniform slow rate and (3) a final rapid flow just previous to rupture. The secondary flow is most important when it comes to finding the possible life of a steel. No flow in the second stage means a very long life. A comparison between the loads producing "no flow" in the second period and the proportional limit in short time tests, at 295°, 430° and 595°, showed that this max. allowable load is well above the proportional limit at 295° and practically equal to it at 430° and 595°. At room temp. little difference exists between loads permitting long life and those producing fracture in a few seconds. A rise in temp. causes a more gradual increase in life with decrease in applied load. The effect of rise in temp. is mainly a reduction in the strain hardening ability of the steel. The latter is max. around 20° and becomes zero at temps. ranging between 400° and 425°.

H. S. VAN KLOOSTER

• **Steel castings and X-rays.** ANCEL ST JOHN. *Iron Age* **116**, 802 1(1925); cf. *C. A.* **18**, 517.—The preliminary work in the detn. of the size of detectable cavities in steel with X-rays is described. Investigations made with "synthetic specimens" under conditions met in actual practice showed that isolated defects having a diam. of $\frac{1}{16}$ the thickness of the part examd. could be easily detected. The X-ray equipment and arrangement of specimens are described in detail together with X-ray photographs.

D. MIESEY

• **Amorphous cement and the formation of ferrite in the light of X-ray evidence.** F. B. FOLEY. *Trans. Am. Inst. Mining Met. Eng.* **1925**, No. 1505-C, 8 pp.—A theoretical discussion based on the results of recent X-ray studies on Fe and steel leads F. to reject the amorphous cement theory. The formation of ferrite at the grain boundaries of austenite is due to a progressive breakdown of the γ -lattice whereby Fe atoms go into the make-up of cube faces (free from C) and C atoms are thrust towards the center of the crystal.

H. S. VAN KLOOSTER

• **Making seamless steel tubes by improved process.** E. F. ROSS. *Iron Trade Rev.* **77**, 1079 83(1925). The Wellman-Peters process, which uses square billets for hot piercing, is described.

J. F. BYRNE

• **Metallurgy of iron drier rolls.** J. W. BOLTON. *Iron Age* **116**, 800 2(1925).—A thoroughly systematic work in regard to mech. and chem. factors in the steel foundry has resulted in the successful casting of seamless drier rolls for paper machines. The metals used must be strong to support the heavy wt.: up to 14,000 lb. and, when molten, be fluid to run the large area, have a low contraction and resist distortion during machining. A mixt. which fulfils these demands has been worked out, and should have about the following compn.: 1.20–1.25% Si, 3.4–3.55% C, 0.4–0.8% Mn, 0.09–0.12% S and 0.35–0.60% P. In particular are the ratio Si/P and the C content of importance. The mech. technology of casting, such as the setting up of molds, removing core and machining, is outlined. Diagrams for phys. tests and analyses of material are given.

D. MIESEY

• **Mechanical properties and structure of solid solutions in systems with limited solubility in the solid state.** Investigations on solid solutions rich in Ag, of the systems Ag-Mg, Ag-Al, Ag-Sb, Ag-Sn, Ag-Zn, Ag-Cd, and Ag-Mn. J. F. SAEFFEL AND G. SACHS. *Z. Metallkunde* **17**, 155 61, 258–64, 294 8(1925).—For a number of binary Ag alloys, forming solid solns. on the Ag side of the diagram, the mech. properties and structure as functions of the concn. were investigated. In order to obtain results comparable with those of other workers it was necessary to bring the alloys, however previously treated, into a "basic" or normal condition. This was accomplished by a cold work deformation of at least 50%, followed by annealing for 30 min. at a temp.

above the recrystn. temp. (T_1) but below the temp. where coarse crystn. sets in (T_2). After the annealing the alloys were slowly cooled to obtain a stable final condition. Curves are drawn for pure Ag and various solid solns. giving the relation between hardness and annealing temp. of the cold-forged alloys. The range of temps. within which annealing can be suitably carried out is usually reduced by metals going into solid soln., since T_1 is raised and T_2 often depressed. Several "basic" mech. properties are discussed. For pure Ag the following data were obtained: When severely cold worked Ag begins to soften at 100° . After being annealed at $500\text{--}700^\circ$, it has a Brinell hardness of 25 kg./mm.^2 , a tensile strength of $12\text{--}13\text{ kg./mm.}^2$, and elongation of $15\text{--}50\%$ and a reduction in area of 90% . • A systematic study of structure and mech. properties, graphically represented by numerous curves and some photomicrographs, brought out the following new facts: In the system Ag-Mg solid solns. are formed up to about 29% Mg. A eutectic line between 7.2 to 12% Mg at 756° does not exist. In the system Ag-Al Ag can (at room temp.) contain a max. of 5.2 to 5.7% Al in solid soln., and in the system Ag-Zn at least 20.4% Zn. The graphs indicated that the mech. properties agreed well with the results of microscopic investigation. The hardening effect of the second metal is the more pronounced the greater the slope in the liquidus line and the larger the solidification range.

H. S. VAN KLOOSTER

Inner structure of alloys. WALTER ROSENHAIN. *J. Roy. Soc. Arts* **73**, 1000-21, 1022-37, 1039-52 (1925). - See C. A. **19**, 2803.

H. J. C.

Equilibrium diagrams of alloys with formation of a single compound. A. MŁODZIEJOWSKI. *Z. physik. Chem.* **117**, 361-86 (1925). - Using the methods first developed by van Rijn van Alkemade (1893) and Bakhuis Roozeboom (1899) M. has theoretically derived a number of equil. diagrams for binary alloys forming a single intermediate compd. These diagrams are obtained from a study of the curves representing the thermodynamic potential ξ as a function of the concn., both for the liquid and the solid phases, at different temps. In case the compd. forms solid solns. with the 2 components, either in all proportions or to a limited extent the ξ - c curve for the solid phase shows one or more minima and more complicated diagrams result, some of which have not yet been realized experimentally. Finally M. points out that it is not permissible, from a thermodynamic point of view, to consider the intermediate compd. as an independent component; in other words one should not, as is often done, consider a complicated diagram as made up of 2 simple diagrams joined together. H. S. VAN K.

The tempering colors in iron-carbon alloys and in the mixed crystals Fe-Ni; Fe-V; Fe-Al. G. TAMMANN AND G. STEBEL. *Z. anorg. allgem. Chem.* **148**, 297-312 (1925); cf. C. A. **17**, 3823. - Curves are given to show the relation between time of tempering, temperature, and thickness of the oxide layer (expressed in terms of the thickness of a layer of air which would give the same interference color) for cementite, pearlite, pearlitic cementite, and troostite. The velocity of the increase of thickness of the oxide layer depends entirely upon the velocity of diffusion of oxygen to the metal surface. The velocity of oxidation of the metal is so large that all O which comes in contact with the metal immediately unites with it. In cementite, the CO and CO₂ which are formed would interfere with the access of O, and the velocity of increase of thickness of the oxide layer would be decreased. In the case of Fe-Ni alloys, the oxide layer is a solid soln. of Fe and Ni oxides. The thickness of this layer varies with the Ni content for any definite time and temp., changing discontinuously at points corresponding to changes in the crystal lattice in the Fe-Ni system. The film thickness changes linearly with the Ni content within any region characterized by a single stable crystal lattice. In the case of Fe-V alloys, there is a discontinuous change in the relation between layer thickness and V content at the point where the α -iron mixed crystal changes to the γ -iron mixed crystal. For Fe-Al alloys, the velocity of oxide formation decreases with increasing Al content, probably because the oxide layer is relatively impervious to O. R. J. H.

The history of the light alloys of aluminium and the present position of their manufacture. LEON GUILLET. *Le genie civil* **84**, 298-303, 319-21, 356-9 (1925). - An account of the development of the alloys of Al with Cu, Mg, Si, Mn, Ni, Zn, etc., and the heat treatment of these alloys to secure more desirable phys. properties. J. J. H., Jr.

Concentrating ores by flotation. C. P. LEWIS. U. S. 1,560,170, Nov. 3. A suitable acid pulp of Cu-bearing slimes or other ore is agitated with a frothing agent such as pine oil and with K xanthate or a similar S deriv. of carbonic acid which serves to render the sepu. more efficient. Cf. C. A. **19**, 3472.

Smelting ores. G. W. PRINCE and A. DOUGLAS. U. S. 1,559,508, Oct. 27. In smelting ores in a reverberatory furnace, the ore is fed into the furnace chamber substantially continuously so that a continuous longitudinal mound is formed and main-

tained with its apex spaced from the side walls of the furnace chamber. U. S. 1,559,509 specifies forming a plurality of ore mounds similarly in a furnace chamber.

Smelting ores. J. A. CHURCH, JR. U. S. 1,559,510, Oct. 27. Ore is fed into a furnace chamber so as to form "gradually widening valleys" for the free flow of the molten material from the firing end toward the flue end of the furnace. U. S. 1,559,511 relates to a furnace for smelting in the same manner.

Ore flotation. F. CREMER. U. S. 1,550,512, Aug. 18. A colloid made up of freshly pptd. sulfide of the metal to be sepd. is added to ore pulps, *e. g.*, a pulp contg. Cu ore, and the pulp is subjected to froth flotation through the exclusive use of this sulfide.

Reducing ores. W. E. TRENT. U. S. 1,557,107, Oct. 13. Fe ore or other ore in finely comminuted form is mixed with carbonaceous fuel particles (such as those of coal heated sufficiently that they are substantially freed of hydrocarbon) and the fuel particles associated with the ore are then burned in a reducing atm. to reduce the ore.

Reducing ores. G. F. GREENWOOD. U. S. 1,558,262, Oct. 20. Fe oxide or other ore and a reducing agent such as C are separately preheated to a temp. above their combining temp. range, then mixed and maintained at a sufficiently high temp. for reduction.

Chloridizing ores. O. B. HOFSTRAND. U. S. 1,556,822, Oct. 13. Ores are subjected to 2 or more roasting stages, in which the materials are mixed with salt, S and coal and then roasted in the presence of air. The S is so proportioned to the other materials that sintering of the mixt. does not take place.

Impact amalgamator for treating gold ore pulps. W. W. GIBSON. U. S. 1,561,152, Nov. 10.

Apparatus for treating gold ore, etc., with cyanide solutions. G. E. C. ROUSSEAU. U. S. 1,559,914, Nov. 3.

Inclined horizontal rotary kilns or furnaces for reducing or roasting ores, etc. G. H. CLAVENGER. U. S. 1,558,965, Oct. 27.

Apparatus for concentrating and amalgamating placer deposits of gold, platinum, etc. J. H. RAE. U. S. 1,557,877, Oct. 20.

Recovering metal values from slag. H. H. STOUT. U. S. 1,559,803, Nov. 3. The entire body of a charge of molten slag, *e. g.*, that derived from the smelting of Cu ore, is brought into contact with non-molten material such as Fe or steel in bar form which reacts with ingredients of the molten slag to ppt. metallic values, *e. g.*, Cu, this non-molten material leaving a residuum which is also persistently non-molten throughout the pptg. reaction. The slag temp. is not increased during this reaction and the non-molten material is used in excess and subsequently sepd. from the slag.

Copper from ores. J. B. DUFAUR. U. S. 1,550,521, Aug. 18. Oxidized or roasted Cu ore is treated with a leaching soln. contg. Fe sulfate and the soln. is treated with SO₂ and air.

Copper from mat. A. H. HENDERSON. U. S. 1,560,574, Nov. 10. In order to facilitate the extn. of Cu from mat., the latter is treated with an alkali carbonate, fluxing agents such as alum and borax and an alkali hypochlorite, at a temp. of about incipient redness.

Treating tin ores, etc. A. A. LOCKWOOD. U. S. 1,556,449, Oct. 6. Ore or other Sn-bearing material is roasted under conditions which render constituents such as Fe oxide magnetic, subjected to magnetic sepn., and the magnetic values are crushed and mixed with non-magnetic material such as sand, the particles of which are larger than those of the Sn content. The material is subjected to a second magnetic sepn. and the residues are treated to sep. the admixed particles from the Sn content.

Tungsten. C. J. SMITHELLS. U. S. 1,559,799, Nov. 3. Before reduction of W compds. such as WO₃ to metallic form, there is added to them not more than 1% of a substance such as thoria which will introduce into the metal a non-volatile oxide irreducible by H and not more than 0.5% of an alkali metal compd. such as NaCl which is later decomposed by H.

Purifying metallurgical gases. H. A. BRASSERT. U. S. 1,560,202, Nov. 3. Metallurgical gases such as those produced in blast furnaces are passed through coke, brick checkerwork or other materials which are heated to a temp. higher than the fusion point of the impurities, so that the latter are sintered. After this treatment, the gas may be used for metallurgical or other purposes.

Vertical furnace for roasting cinnabar, zinc ore, etc. J. NORRISH. U. S. 1,551,424, Aug. 25.

Device for charging and discharging brass-smelting furnaces, etc. M. TAMA. U. S. 1,550,401, Aug. 18.

Furnace for heat-treating iron internal-combustion cylinders with copper fins, etc. C. L. LEE and T. C. VAN DEGRIFT. U. S. 1,557,208, Oct. 13.

Heat-treated zirconium steel. F. M. BECKETT and A. L. FIELD. U. S. 1,550,489, Aug. 18. A heat-treated C steel contg. Zr has higher ductility than steels of comparable strength and hardness which contain no Zr. U. S. 1,550,490 specifies an alloy steel hardened by heat treatment, contg. Zr and Cr, W, V, Mo or Mn.

Increasing the strength of steel or other metals. H. KÄNDLER. U. S. 1,557,367, Oct. 13. The surface of metal bodies is subjected successfully to the action of different corroding agents to remove discontinuities in the body surface beyond the reach of mech. tools.

Quenching and hardening steel sleeves. J. G. WEISS. U. S. 1,561,384, Nov. 10. Mech. features of hardening sleeves for roller-bearing raceways or similar articles.

Composition for cleaning and preserving iron surfaces. B. K. BROWN and E. G. SCHMIDT. U. S. 1,561,053, Nov. 10. A mixt. of mesityl oxide, acetone, 85% H_3PO_4 and H_2O , equal quantities.

Alloy steel resistant to oxidation at high temperatures. G. R. RICH. U. S. 1,560,099, Nov. 3. An alloy steel adapted for making poppet valves of internal-combustion engines contains Cr 7-8, Ni 1.25-2.25, P and S together less than 0.03, Mn 0.45-0.65, Si 0.50-1.0 and C 0.35-0.45%, the remainder being principally Fe.

Steel alloy. M. PETERS. U. S. 1,558,918, Oct. 27. A steel alloy for rollers of 14-roller rolling mills comprises Cr 2, W 1.5 and Ni 1.5%.

Aluminium steel alloy. A. W. MERRICK. U. S. 1,551,418, Aug. 25. Steel in separately melted and previously cast portions of Al steel alloy are introduced into the steel through the slag which protects the metal from the air.

Alloy of zinc, aluminium and tin. F. W. KARITZKY. U. S. 1,559,620, Nov. 3. An alloy of Zn 85, Al 10 and Sn 5% is suitable for making castings and does not shrink in the mold.

Alloy of iron, aluminium and chromium. H. S. COOPER. U. S. 1,550,508, Aug. 18. An alloy which is resistant to high temps. comprises Fe together with Al 10-16 and Cr 5% or more (but less than the % of Al). U. S. 1,550,509 specifies an otherwise similar alloy contg. Cr up to 20% (and in larger proportion than the Al). This greater Cr content serves to produce a metal workable at 600-1200° by forging, rolling or swaging.

Alloy of iron with nickel or cobalt. R. F. FLINTERMANN. U. S. 1,556,776, Oct. 13. Alloys resistant to oxidation at high temps. contain Ni or Co 20-60 and Si 3-9%, the remainder being principally Fe.

Alloys of silicon with iron or other heavy metals. R. WALTER. U. S. 1,560,885, Nov. 10. Alloy components such as ferro-Si and Fe, Mn, Ni or Co are mixed in proportions for the formation of a single homogeneous silicide, the mixt. is heated to a temp. (which may be about 1200-1300° with Fe and ferro-Si) at which exothermic reaction is initiated and the exothermic reaction then serves to melt down the charge.

Iron alloy resistant to corrosion. G. H. CHARLS. U. S. 1,560,207, Nov. 3. An alloy comprises Fe together with Si 0.5-6.0, Cr 3-30 and Mo not exceeding about 0.35%. Cf. C. A. 19, 1849.

Alloy of nickel, copper and aluminium. S. W. PARR. U. S. 1,556,953, Oct. 13. An alloy which is readily worked and resistant to corrosion comprises Ni over 50, Cu over 22, Al 2-8, Mn 0.1-1.0 and Ta 0.1% or more. The Ni should amount to 1.85-2.20 times the Cu.

Nickel-copper alloys. W. F. GRAHAM. U. S. 1,557,044, Oct. 13. Alloys which have high strength and resistance to corrosion comprise Ni 30-35 and Fe 3-7%, the remainder being Cu, free from Pb and Zn.

Nickel-chromium-copper alloy. W. F. COCHRANE. U. S. 1,557,025, Oct. 13. Alloys adapted for making engine valves, etc., comprise Cr 1-5 and Ni 20-40%, the balance being mainly Cu.

Treating copper alloys for hardening, etc. F. HEUSLER. U. S. 1,559,963, Nov. 3. Alloys contg. Cu with smaller proportions of Mn and Al, e. g., an alloy comprising Mn 10-15 and Al 7-10%, after casting, rolling or forging are subjected to a prolonged heat treatment (the duration of which may be about 20-24 hrs.) to increase their hardness and elastic limit. Zn, Sn, Fe and Si may also be present in the alloys.

Low-carbon chromium-iron alloys. P. A. E. ARMSTRONG. U. S. 1,557,132, Oct. 13. In making low-C or substantially C-free alloys of Cr and Fe, Cr, preheated to somewhat below its m. p., is introduced into molten Fe.

Zinc-copper-aluminium alloy. E. MAASS. U. S. 1,550,730, Aug. 25. An alloy which is suitable for bearings, bushings, bands on projectiles, etc. comprises Zn 100, Cu 3 and Al 5 parts.

Aluminium-gold-copper alloy. M. E. PAGE. U. S. 1,560,845, Nov. 10. An alloy which is suitable for denture bases comprises Al 93.20, Au 4.55 and Cu 2.25%.

Gold copper alloy. V. D. DAVIGNON. U. S. 1,557,431, Oct. 13. A homogeneous ductile and malleable alloy comprises Au 58, Cu 37 and Al 5%.

Silver and gold alloy for electric contacts. E. F. KINGSBURY. U. S. 1,561,247, Nov. 10. An alloy adapted for making elec. contacts comprises Au 72 and Ag 26.2%, the balance being base metal such as Ni 1.8%.

Magnesium alloys. W. R. VEAZEY and E. C. BURDICK. U. S. 1,558,066, Oct. 20. In making alloys consisting largely of Mg, other metals such as Al, Sn, Zn, Cu or Cd are first fused with a relatively small quantity of Mg and the resulting alloy is then added to the remaining quantity of Mg in molten state. $MgCl_2$ and NaCl may be used as a flux.

Brass alloy for bearings. J. VADERS. U. S. 1,551,443, Aug. 25. A brass alloy is formed contg. Si 0.6-1.5% and sufficient Mn (usually about 2-2.5%) to counteract the detrimental effects of the Si. Fe and Al in small aunts. also may be added.

Non-rusting alloy. M. S. CLAWSON. U. S. 1,557,981, Oct. 20. An alloy which is suitable for table ware, builder's hardware, etc., comprises Ni 82-96, Si 3-10, Mn 1-5, Cr 1-5, C 0.85-3.5, Fe 1-6, and Cu 0.5-4.0%, together with a small proportion of reducing, deoxidizing, and denitrogenizing elements such as Ti and Al, U or Ce.

Soldering aluminium. S. SPOGANITZ. U. S. 1,550,987, Aug. 25. Hot solder is applied in the presence of a flux formed of beef tallow, mutton tallow, beeswax, heavy machine oil and rosin.

Welding different steels together. J. B. DAILEY. U. S. 1,550,951, Aug. 25. The joint to be welded between high speed steel and low C steel is coated with a mixt. composed of equal parts by wt. of Cu powder and borax, the joint is heated until the mixt. melts and the steels are joined together. The joint is then quenched and the high speed steel simultaneously hardened by immersing the weld and the high speed steel in oil or other tempering fluid.

Gas for use in welding and cutting metals. R. H. BROWNLEE and R. H. UHLINGER. U. S. 1,551,235, Aug. 25. A gas adapted for use with O in cutting or welding metals comprises about 75% or more H and 5% or more hydrocarbons.

Melting and refining bronze, copper, nickel, tin or other non-ferrous metals. D. CUSHING. U. S. 1,556,591, Oct. 13. The metal is melted in direct contact with incandescent pitch coke which is substantially free from ash and materials which would have a deleterious effect on the metal.

Rust-producing composition. R. MATTICE. U. S. 1,559,341, Oct. 27. A mixt. adapted for scaling pores in metal pipes, etc., comprises magnetized Fe filings 60, NH_4Cl 40 and S 0.1-0.5 parts.

Carburizing composition. G. W. PRESSELL. U. S. 1,556,347, Oct. 6. A mixt. is used comprising coke and charcoal 80-90% and 10-20% of C impregnated with cyanide. Na_2CO_3 and $CaCO_3$ also may be present.

"Soldering compound." J. C. SHOTTON. U. S. 1,557,348, Oct. 13. A mixt. adapted for soldering Au comprises borax, glycerol and AuCl or other metal product which is adapted to be fused and decomposed by heat, leaving the metal residue at a temp. below the m. p. of the metal itself.

Galvanizing flux. U. RAJRA. U. S. 1,560,933, Nov. 10. NH_4Cl is mixed with 2-3% of a mixt. formed of $SrCO_3$ or equiv. Sr bearing material 124, S 62.5, a Bi-contg. material such as Bi nitrate 25.6 Na_2CO_3 13.6 and NaCl 5 parts.

Casting ingots. W. P. BROWN. U. S. 1,560,036, Nov. 3. Molten steel is cast into a vertical ingot and its entire exterior portion is chilled to form a solidified shell around the mass. The chilling is regulated to progress downwardly at a higher rate than the inward chilling, which serves to prevent undesirable segregation.

Flux. J. A. SMITH. U. S. 1,556,968, Oct. 13. A flux for welding cast Fe, etc., comprises borax 64, powdered "carbon" 14, graphite 16, Si 4, Ca phosphate 8 and superphosphate 16 parts.

Purifying molten metals. R. MATTICE. U. S. 1,559,342, Oct. 27. In purifying molten metal such as Fe or steel, a container which holds lime, borax and Al (the latter being coarser than 150 mesh) is immersed in the molten metal.

Smelting. J. O. AMBLER, H. H. STOUT and S. BISHOP. U. S. 1,550,655, Aug. 25. A Cu ore or other ore to be smelted is fed into a smelting furnace to form a pile having a portion in contact with one of the outer walls of the furnace and additional ore is fed through this portion of the wall into the interior of the pile to prevent disturbance of the surface of the pile which is exposed to the smelting flame.

Brazing. C. L. PAULUS. U. S. 1,550,629, Aug. 18. In partially brazing together

articles of Fe or steel, portions of the material are coated with a "rejecting coating" comprising Na silicate and graphite and the material is then subjected to dip brazing.

Working metals. J. G. DE LATTRE and H. HARDY. U. S. 1,559,077, Oct. 27. Fe or steel or other metals which are to be drawn, rolled or otherwise mech. worked are preliminarily provided with a metallic lubricating coating of Cu and Hg which are deposited electrolytically to form an amalgam.

Shrink head casings for ingot molds. F. H. CHAPIN. U. S. 1,558,237, Oct. 20. Furnace slag is mixed with about one-seventh as much of a binder such as portland cement, molded and baked at a temp. of 93–121° to remove moisture and render the casing porous.

Coating metal molds. D. H. MELOCHE. U. S. 1,560,838, Nov. 10. A wash for forming a protective coating on molds such as those formed of cast Fe and used for casting Fe comprises a small quantity of "C" grade Na silicate in soln. and a relatively large quantity of fire clay or other refractory powder in suspension.

Mold for casting metals. A. T. GRAHAM. U. S. 1,550,957, Aug. 25. In making molds for dental or other metal castings, granular particles such as sand and metal particles are used in sufficient amt. to give the mold approx. the same coeff. of expansion and contraction as the metal to be cast.

Apparatus for coating molds with lampblack. G. A. EYNON, D. H. MELOCHE and S. M. UDALL. U. S. 1,550,685, Aug. 25.

Thermostatically controlled device for supplying gases to molds for casting metals. S. M. UDALL. U. S. 1,550,719, Aug. 25.

Malleable castings. W. H. SMITH. U. S. 1,556,642, Oct. 13. Sn in fluid state is maintained in contact with the walls of molds such as those formed of metal and in which malleable Fe castings are cast, in order to produce good castings by regulated cooling without need of subsequent heat treatment.

Metal tools and dies. K. SCHRÖTER and W. JENSEN. U. S. 1,551,333, Aug. 25. Tools or dies adapted for drawing wires, etc., are formed of metals of the 4th, 5th and 6th periodic groups fusible above 1000°, e. g., of Ti, Zr, Th, Si, V, Ta, Cr, Mo, W or U, with surface portions of such metal in combination with a metalloid, e. g., C or B.

Bearings of copper, tin and graphite. H. M. WILLIAMS. U. S. 1,556,658, Oct. 13. Compressed bearings are formed of a mixt. of finely divided Cu 100, Sn 10 and graphite 6 parts, the formed material is packed in lampblack in a sealed container and heated to 590–760° for 5–7 hrs., cooled, ground or broached and treated with oil.

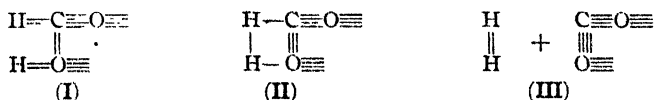
10—ORGANIC CHEMISTRY

CHAS. A. ROUHLER and CLARENCE J. WEST

Recent advances in science: organic chemistry. O. L. BRADY. *Science Progress* 20, 205–11 (1925).—Review of recent work on tautomerism. JOSEPH S. HEBURN

Repulsive action of mutually equal and mutually differing groups in saturated organic compounds. J. BÖESEKEN. *Proc. Acad. Sci. Amsterdam* 28, 371–85 (1925). See C. A. 19, 2193. E. J. C.

The problem of the mechanism of organic reactions. ERICH MÜLLER. *Z. Elektrochem.* 31, 46–50 (1925); cf. following abstr. — A discussion of the decompn. of HCO_2H (I) into CO_2 and H from the point of view of electron affinity. It is suggested that I is in a state of equil. between a large amt. of an inactive form and a small amt. of an active form (specified) which can readily change to CO_2 and H when a suitable catalyst is introduced. I is considered then, metastable, since the catalyst, which cannot add energy, yet causes decompn. It is assumed that in the active or intermediate form, a partial rearrangement of electrons has taken place tending toward the final result, but that this change sets up a chem. polarization or stress, which opposes further change, and which only a catalyst (or depolarizer) can relieve, thus allowing the change to proceed. Thus:



where the lines represent outer-shell electrons. I represents the bulk of HCO_2H , II the active form, and III the final result. Similar forms and reasoning are applied to the catalytic decompn. of AcCO_2H to CO_2 and AcH , the chlorination of CH_4 , the

esterification of acids, and the decompn. of malonic acid to CO_2 and AcOH .

M. A. YOUTZ

The catalytic decomposition of formaldehyde. III. ERICH MÜLLER AND FRIEDRICH MÜLLER. *Z. Elektrochem.* 31, 41-5 (1925).— HCHO (I) is catalytically decompd. by Ru, Rh, Pd and Os to gaseous products (CO_2 , CO , H_2 and CH_4). To 25 cc. of 13% I, free from acid and MeOH , and boiling under a reflux, was added the metal or compd. and the gases were collected and analyzed. Ru metal (0.1 g.), by reduction of $\text{Ru}(\text{OH})_3$ with H at 125° , gave only 8 cc. of gas. $\text{Ru}(\text{OH})_3$ (0.15 g.), pptd. from RuCl_3 with NaOH , gave 441 cc. of gas with 65-66.5% CO_2 , 16.3-17.3% CO , 16.8-17.4% H_2 . Rh metal (0.1 g.), reduced from alk. bicarbonate soln. with HCO_2H , gave 35 cc. of gas with 16.5% CO_2 , 45% CO , 35.6% H_2 , 2.7% CH_4 . Rh oxide (0.17 g.) gave 100 cc. of gas with 50.2% CO , 4.6% CO_2 , 43.0% H_2 , 1.9% CH_4 . Pd metal (0.1 g.), from PdO by H at 150° , gave almost no gas. PdO (0.14 g.), from K_2PdCl_4 and Na_2CO_3 , gave at first 75% CO_2 and the balance CO and H but after an hr., 3.2% CO_2 , 57.0% CO , 39.2% H and no CH_4 . 0.3 g. of K_2PdCl_4 gave practically no gas. Os metal (0.1 g.), from the oxide at 150° with H, gave 75.0-82.5% CO_2 , 1.1-2.5% CO , 11.6-19.2% H, 3.1-4.5% CH_4 . K_2OsO_4 gave a gas with about the same compn. Ir, either as metal or Na_3IrCl_6 , gave little gas. Pt, as metal or H_2PtCl_6 or PtO_2 , gave little gas and this chiefly CO_2 . The following catalytic decompn. reactions of CH_2O are discussed, hypotheacating a complex series of equil., and intermediate substances, various ones of which are attacked by different catalysts to give the products observed: $\text{H}_2\text{CO} + \text{H}_2\text{O} = \text{HCO}_2\text{H} + \text{H}_2$; $2\text{H}_2\text{CO} + \text{H}_2\text{O} = \text{HCO}_2\text{H} + \text{MeOH}$; $\text{H}_2\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + 2\text{H}_2$; $\text{H}_2\text{CO} = \text{CO} + \text{H}_2$; $2\text{H}_2\text{CO} = \text{CO}_2 + \text{CH}_4$; $3\text{H}_2\text{CO} + \text{H}_2\text{O} = \text{CH}_4 + 2\text{HCO}_2\text{H}$; $3\text{H}_2\text{CO} + \text{H}_2\text{O} = \text{CO}_2 + 2\text{MeOH}$.

M. A. YOUTZ

A physico-chemical study of some organic syntheses. CAMILLE MATHIEON. *Bull. soc. chim.* 37, 825-36 (1925).—It is readily possible to decide from the heats of reaction and van't Hoff's equation and the principles of equil. whether certain synthetic reactions starting with simple gaseous substances could be realized, granted a suitable catalyst, or would be entirely unattainable without the introduction of energy in some form. E. g., $\text{CO} + 2\text{H}_2 = \text{MeOH} + 27.2$ Cals. $K = (p_1 \times p_2^2)/x$, where p_1 , p_2 and x are the pressures of the substances concerned in atm. K can be calcd. for any other temp. by the relation $\log K = -27,200/457T + 3.5 \log T + 4.3$. Then for assumed, but possible, values for p_1 , p_2 , x can be calcd. If it is relatively large at the temps. and pressures used, the reaction is possible, but if x is small, the reaction could not possibly be realized. In the above case, at 227° and $p_1 = p_2 = 50$ atm., $x = 1.8 \times 10^3$. At $p_1 = p_2 = 1$, $x = 1/70$. At 327° , the equil. is less favorable but still possible, while at 427° it would be practically useless. Similar calcs. are used to show that primary aliphatic alcs., AcOH and EtCO_2H could be made from CO and H_2 but that CH_3CO could not be. From C_2H_4 and H_2 the satd. hydrocarbons could be formed, also Me_2CO and PrOH from C_2H_4 , CO and H_2 . From CH_4 and H_2O , CO and H_2 might be made at a rather high temp., but CH_4 and CO and H_2 could not give EtOH nor could CH_4 alone give C_2H_6 , etc. Since in general any catalyst which assists a reaction toward equil. also assists the opposite reaction toward equil., the search by catalysts for reactions shown by the above methods to be possible can be simplified by searching for decompn. catalysts for the final substances desired. E. g., find catalysts for the decompn. of AcOH to CO and H_2 , and the same catalysts will serve for the synthesis of AcOH from CO and H_2 .

M. A. YOUTZ

Action of bromine on hydrocarbons. Bromination of isopentane. B. K. MEREFKOWSKY. *Bull. soc. chim.* 37, 861-71 (1925).—1,2,3-Tribromoisopentane (I), made by the action of Br and Fe on $\text{Me}_3\text{CBrCHBrMe}$, $b_{17} 117^\circ$, $b_{30} 128.4^\circ$, $n 1.55801$, 1.562278 , 1.573247 , 1.58141 for α , β , δ and γ at 20° (this same order is followed below), $d_4^{20} 2.11267$, $d_4^{20} 2.08212$. The constitution was established by treatment with AcOK , giving the acetate of an unsatd. Br alc. This was hydrolyzed to the alc. and the latter oxidized with KMnO_4 and the products were examd. 2-Methyl-3-bromo- Δ^2 -3-butene-1-ol, $b_{30} 103-4^\circ$, $n 1.501123$, 1.50500 , 1.513294 , 1.51164 , $d_4^{20} 1.47238$, $d_4^{20} 1.44986$. Acetate, $b_{30} 107-9^\circ$, $n 1.48108$, 1.480948 , 1.48958 , 1.49526 , $d_4^{20} = 1.38054$, $d_4^{20} 1.35523$. I was brominated to a tetrabromide which was shown to be probably a mixt. of 10% of 1,2,3,4-tetrabromo- and the balance 1,1,2,3-tetrabromoisopentane (II), $b_{18} 155-6^\circ$, $b_{16} 160-1^\circ$, $n 1.60167$, 1.60519 , 1.615885 , 1.62768 , $d_4^{20} 2.41822$, $d_4^{20} 2.38358$. Treatment of II with AcOK and AcOH gave the acetate of an unsatd. alc., probably $\text{MeCBr:C}(\text{CH}_3\text{OH})_2$. The alc. $b_{18} 154-6^\circ$. The acetate, $b_{18} 144-6^\circ$, $d_4^{20} 1.5364$, $d_4^{20} 1.5146$, $n_{D_D}^{20} 1.50409$. I with solid KOH gave the unsatd. dibromide in 80% yield. 1,3-Dibromo-2-isopentene, $b_{40} 95.6^\circ$,

b_{751} 179.5° (slight decompn.), n 1.53725, 1.54141, 1.55260, 1.56145, d_4^{20} 1.77529, d_4^{20} 1.74611, oxidized in the air very rapidly. With Br, it gave 1,2,3,3-tetrabromoisopentane, b_{14} 146°, n 1.59557, 1.60157, 1.61222, 1.62725, d_4^{20} 2.36200, d_4^{20} 2.32906. With AcOK and AcOH it gave a product b_{13} 116–7°.

X-rays and the constitution of the hydrocarbons from paraffin wax. S. H. PIPER, DENNIS BROWN AND STANLEY DYMENT. *J. Chem. Soc.* **127**, 2194–200 (1925).—The hydrocarbons isolated by Francis from Scotch paraffin wax (*C. A.* **16**, 2301) as well as synthetic $C_{20}H_{42}$, $C_{27}H_{56}$ and $C_{34}H_{70}$ have been examd. with the X-ray; the results indicate that the hydrocarbons from the wax are identical in constitution with the synthetic normal hydrocarbons: the unknown hydrocarbon line coincides in slope with the line on which the synthetic hydrocarbons lie and the intensity of the lines falls off uniformly with increasing order. The values obtained did not accord with the mol. wt. detns. of F; re-exam. of these detns., by Menzies and Wright's method, gave values agreeing fairly well with those from the X-ray study. The hydrocarbons range from $C_{23}H_{48}$ to $C_{32}H_{66}$.

Hydrogenation of ethylene in the presence of metallic calcium. R. N. PEASE AND LELAND STEWART. *J. Am. Chem. Soc.* **47**, 2763–6 (1925).—Metallic Ca or CaH_2 will catalyze the combination of C_2H_4 and H_2 , but it is very doubtful whether the reaction of C_2H_4 with the CaH_2 is one stage in the reaction.

Polarity and activation. T. M. LOWRY. *Chemistry and Industry* **44**, 970–2 (1925).—Discussion of recent work relating to the theory of polarity in reference to substitution in aromatic compds.

Alkyl and alkylene bromides. OLIVER KAMM AND C. S. MARVEL. *Organic Syntheses I*, 1–13 (1921).—Methods of prepn. of HBr , $CH_3CH_2CH_2Br$, iso- C_4H_9Br , $BuBr$, $EtBr$, $C_7H_{15}Br$ and $(CH_2)_3Br_2$ from $ROH + HBr$ or $ROSO_3H + HBr$.

Butyl chloride. J. F. NORRIS. *Organic Syntheses V*, 27–9 (1925).— $BuOH$, added to a cold mixt. of concd. HCl and $ZnCl_2$ and the mixt. refluxed 3.5–4 hrs., gives 64–6% $BuCl$.

Methylene iodide. ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses I*, 57–9 (1921).—Prepn. of CH_2I_2 from MeI , Na_2AsO_3 and $NaOH$; 90–7% yields.

Trimethylene cyanide. C. S. MARVEL AND E. M. MCCOLM. *Organic Syntheses V*, 103–4 (1925).— $CH_2(CH_2Br)_2$ and $NaCN$ in dil. $EtOH$ are refluxed for 30–40 hrs., giving 77–86% $CH_2(CH_2CN)_2$.

1,2,3-Tribromopropane. J. R. JOHNSON AND W. L. MCEWEN. *Organic Syntheses V*, 99–101 (1925).— $BrCH_2CH_2CH_2Br$ in CCl_4 is brominated at -5° to 0° , giving 96–8% of $BrCH_2CHBrCH_2Br$.

Butyl butyrate. G. ROSS ROBERTSON. *Organic Syntheses V*, 23–5 (1925).— $BuOH$, oxidized by $Na_2Cr_2O_7$ and H_2SO_4 , gives 41–7% $PrCO_2Bu$.

Methylhexylcarbinol (capryl alcohol). ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses I*, 61–6 (1921).—Prepn. of $C_{10}H_{20}O_2$ from castor oil, the yield varying from 23 to 41%.

Allyl alcohol. OLIVER KAMM AND C. S. MARVEL. *Organic Syntheses I*, 15–9 (1921).—Prepn. of $CH_2=CHCH_2OH$ from $C_3H_5(OH)_3$ and HCO_2H .

2,3-Dibromopropene. R. LESPIEAU AND M. BOURGUEL. *Organic Syntheses V*, 49–51 (1925).— $BrClCH_2CHBrCH_2Br$ (200 g.), 10 cc. H_2O and 50 g. $NaOH$ give 74–84% $BrClCH_2CBr=CH_2$.

Catalytic preparation of ether from alcohol by means of aluminium oxide. R. H. CLARK, W. E. GRAHAM AND A. G. WINTER. *J. Am. Chem. Soc.* **47**, 2748–54 (1925).—The max. % of Et_2O was obtained from the catalyst prepd. by dehydration of cryst. $Al(OH)_3$ resulting from the spontaneous decompn. of solns. of $Na_2Al_2O_4$. The highest yield (80.8%) was obtained at 250° . $EtOH$ was obtained from equimol. quantities of Et_2O and H_2O , showing the reaction to be reversible. The position of equil. has been detd. at 250° to correspond to a max. possible conversion to Et_2O of about 85%. The corresponding equil. const. is 8.0. Absolute purity of the catalyst is essential. Impurities may be quickly and completely removed by alternately heating to 350° and washing again. Heating the catalyst to about 400° (but not higher), in drying, was found to give the most active product. The catalysts retain their activity, unimpaired, after long use.

Reactions of β,β' -dichloroethyl sulfide with amino compounds. W. E. LAWSON AND E. EMMET REID. *J. Am. Chem. Soc.* **47**, 2821–36 (1925).—Since NH_2 compds. are important constituents of living tissues, the reactions of $(ClCH_2CH_2)_2S$ (I) with

$\text{CCH(OH)CH}_2\text{CO}_2\text{Me}$ is reduced by Zn and AcOH to the unstable *Me ester*, b_{36} 95–100°, of γ, γ -dichlorobutyric acid, m. 103–4°. The acid is stable, while the esters and salts are unstable; during hydrolysis of the ester, some of the CHCl_2 group is also hydrolyzed. Dichloralurea is reduced to tetrachlorodethyleurea, m. 222° (decompn.). Dichloralthiourea, m. 150–1° (decompn.), is reduced to tetrachlorodethylethiourea, m. 162–3°. Chloralurethan gives dichloroethyleurethan, b_{36} 125–8°, m. about 13° (chloralurethylan, m. 125–8°, gives dichloroethyleurethylan, m. 90–3°; satn with HCl gives the compd. $\text{C}_3\text{H}_3\text{O}_2\text{NCl}$, m. 118–20°). C. J. WEST

The exchange of functional groups between two molecules. The passage of ketones to alcohols and the reverse. A. VERLEY. *Bull. soc. chim.* 37, 871–4 (1925).—The boiling of a mixt. of 40 g. of Me nonyl ketone (I) and 200 g. EtOH, contg. 10 g. of Al as Al(OEt)_3 , did not result in any change of ketone to Me nonyl alc. (II). But the use of $\text{Al(OCHMe}_2)_3$, prepd. from NaOCHMe_2 and AlCl_3 , gave II slowly in about 20 hrs. When 200 g. of I in 500 cc. of EtOH contg. 5 g. Na as NaOEt , was boiled, the reaction was complete in 5–6 hrs. Yield 92%. The reaction is very general except for cyclic ketones such as camphor, pulegone, thujone and menthone. The reverse of this change is illustrated by the change of *sec*-octyl alc. to Me hexyl ketone by boiling with Na and BzMe. The latter was changed to PhCH(OH)Me . The following fairly general reactions seem to occur: $\text{RCOMe} + \text{MeCHR'ONa} \rightarrow \text{RCMe(O'Na)OCHR'Me}$; $\text{RCMe(O'Na)OCHR'Me} \rightarrow \text{RCHMeOCR'(O'Na)Me}$; $\text{RCHMeOCR'(O'Na)Me} \rightarrow \text{RCHMeONa} + \text{MeCOR'}$; $\text{RCHMeONa} + \text{R'CHMeOH} \rightarrow \text{RCHMeOH} + \text{R'CHMeONa}$. Hence the alcoholate is regenerated and only need be present in small amt. M. A. YOURZ

Acetone-isoacetone equilibrium. WM. L. EVANS AND WM. D. NICOLL. *J. Am. Chem. Soc.* 47, 2780–92 (1925).— Me_2CO may be enolized in aq. solns., thus giving rise to the formation of isoacetone, which is in dynamic equlib. with Me_2CO , a relationship entirely analogous to the well-known behavior of $\text{AcCH}_2\text{CO}_2\text{Et}$, $\text{CH}_2(\text{CO}_2\text{Et})_2$, etc. The effect of increasing the concn. of the alkali up to $3.69 \times 10^{-2} M$ is one that gives rise to a corresponding increase in the concn. of the isoacetone mols. The wt. of the basic Hg isoacetone obtained at this concn. of alkali is equiv. to 26.5% of the original Me_2CO used. Beyond this concn. the Me_2CO and isoacetone are in equlib. It is possible to det. quant. the relationship of isoacetone concn. to the alkali concn. at the end of 24 hrs. at 25° through the formation of basic Hg isoacetone, $(\text{Ac} \cdot \text{CH}_2)_2\text{Hg} \cdot 2\text{H}_2\text{O}$, by adding freshly pptd. HgO to aq. soln. of Me_2CO contg. various concns. of KOH. The relationship between 0.2116×10^{-2} and $3.69 \times 10^{-2} M$ KOH soln. was found to be logarithmic. C. J. WEST

Mesityl oxide. J. B. CONANT AND NEAL TUTTLE. *Organic Syntheses* 1, 53–5 (1921).—Prepn. of $\text{Me}_2\text{C}(\text{CHAc})_2$ from $\text{Me}_2\text{C(OH)CH}_2\text{Ac}$ by distg. with a trace of I. C. J. WEST

Pinacolin. G. A. HILL AND E. W. FLOSDORF. *Organic Syntheses* V, 91–2 (1925).—Pinacol hydrate and 6 N H_2SO_4 are distd., giving 65–72% $\text{Me}_2\text{C}(\text{Ac})_2$. C. J. WEST

Benzalpinacolin. G. A. HILL AND G. M. BRAMANN. *Organic Syntheses* V, 15–6 (1925).— $\text{Me}_2\text{C}(\text{Ac})_2$ and BzH, shaken with EtOH–NaOH for 32 hrs. at room temp., give 88–93% $\text{Me}_2\text{C}(\text{COCH} \cdot \text{CHPh})_2$. C. J. WEST

Ethyl orthoformate. W. E. KAUFMANN AND E. E. DREGER. *Organic Syntheses* V, 55–8 (1925).— CHCl_3 , EtOH and Na give 45% CH(OEt)_3 . C. J. WEST

Insecticidal principle of insect powder (*Chrysanthemum cinerarifolium*, Bocc.). RYO YAMAMOTO. *Sci. Papers Inst. Phys. Chem. Research* 3, 193–222 (1925). [In English.]—A collective paper, giving results covered by C. A. 13, 1221; 17, 2704; 18, 3169. C. J. WEST

dl-Methylethylacetic acid. HENRY GILMAN AND H. H. PARKER. *Organic Syntheses* V, 75–7 (1925).— MeEtCHMgBr and CO_2 give 66–7% $\text{MeEtCHCO}_2\text{H}$. C. J. WEST

Oxidation products of oleic acid. II. Degradation of dihydroxystearic acid. ARTHUR LAPWORTH AND F. N. MOTTRAM. *J. Chem. Soc.* 127, 1987–9 (1925); cf. C. A. 19, 2930.—Oxidation of 5 g. dihydroxystearic acid in 10 g. NaOH in 1000 cc. H_2O , to which 3000 cc. ice H_2O was added and then 2000 cc. 1% KMnO_4 at the ordinary temp. for 2.5 hrs. gave at least 80% $\text{HO}_2\text{C}(\text{CH}_2)_4\text{CO}_2\text{H}$; $\text{Me}(\text{CH}_2)_6\text{CO}_2\text{H}$ (70%) and $(\text{CO}_2\text{H})_2$. By Edmed's original method (*J. Chem. Soc.* 73, 628), both suberic and azelaic acid are formed. C. J. WEST

Electrolytic reduction of oximes. II. γ -Isonitrosovaleric acid and α -isonitroso-propionic acid. MASAYOSHI ISHIBASHI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 8A, 37–42 (1925); cf. C. A. 18, 631 [In English].— γ -Isonitrosovaleric acid is electrolytically reduced

(0.5 amp./100 cm.²) at 3–5° in 5% H₂SO₄, giving 84% of the NH₂ acid (61% current yield). With 15% H₂SO₄ the yield drops to 53%; increasing the current d. from 0.25 to 3 amps. gives an increasing yield from 71.5 to 93.1%; at 20°, the yield drops to 5.67% (0.5 amp.); a Hg cathode gave 90.9%; Pb, 80.3%; Sn, 79.5%. α -Isonitrosopropionic acid is reduced (4–5 amp./100 cm.²) at 7–10° in 8% H₂SO₄ with a 95% yield (93% current yield). The NH₂ acid m. 276–8°; mol. wt. 0.1540 g. in 18.5930 g. H₂O (f. p.), 76.6; 0.2302 g., 78.5; 0.3137 g., 81.3; from these values the degree of ionization is calcd. to be: 0.16, 0.13, 0.10. **III. Benzil dioxime.** *Ibid* 383–9.—The electrolytic reduction of β -benzil dioxime in EtOH-H₂O H₂SO₄ (1.5 amp./100 cm.²) for 6 hrs. at 16–8° gives a *toluylene hydrate*, m. 61±2°, mol. wt. in freezing C₆H₆, 201; (PhCNH₂)₂; both *meso* and *dl* forms; tetraphenylaldine; *n*- and isodiphenyloxyethylamine, benzopinacol; desoxybenzopinacol, *n*- and isohydrobenzoin. Both the α - and β -benzil dioxime behaved similarly. C. J. WEST

A. Reaction of bromine with aliphatic acids. Catalytic effect of acyl halides. H. B. WATSON. *J. Chem. Soc.* 127, 2067–82 (1925). The action of Br upon AcOH, EtCO₂H and PrCO₂H at 100° is reported. When no catalyst is present initially, the course of the reaction indicates autocatalysis by the HBr formed: a period of acceleration is followed by the attainment of a max. velocity, and the reaction then becomes steadily slower; variation in the initial concn. of the Br has a marked effect. If HBr is present initially, the reaction proceeds more quickly; a very small amt. of the halogen acid reduces the period of acceleration to a marked extent and in the presence of a moderate initial concn. of HBr (0.2 M) this period disappears. HCl also exerts a catalytic effect but it is somewhat less effective than HBr. Cl₃CCO₂H has no perceptible effect; H₂SO₄ also has but little effect but the bromination is here complicated by side reactions. If Ac₂O is not in excess of the H₂O present in the acid, no catalytic effect is observed. When the anhydride is in excess of the H₂O, a short period of acceleration is followed by a rapid reaction; after the initial period the velocity is proportional to the concn. of the Br and varies directly and almost proportionately with the concn. of the Ac₂O. If HBr, in excess of the Ac₂O, is also introduced, the initial period of acceleration disappears and the velocity is proportional to the concn. of Br from the commencement of the reaction. The actual value of k_1 is somewhat smaller than without the HBr and becomes very considerably smaller when the concn. of HBr is very high. The presence of HCl in excess of the Ac₂O does not destroy the catalytic effect of the latter but exerts a comparatively small retarding influence. When AcBr is not in excess of the H₂O present in the acid, the reaction follows the same course as when HBr alone is introduced, while the AcBr in excess of the H₂O is an exceedingly powerful catalyst. Its effect is similar to that of Ac₂O at equiv. concn. save that the velocity is now proportional to the concn. of Br from the commencement and the values of k_1 are somewhat lower and in agreement with the values obtained in the presence of Ac₂O and HBr in conjunction. The effect of AcCl, when not in excess of the H₂O present, is similar to that of HCl, while if it is in excess of the H₂O the bromination is initially much faster than in the presence of halogen acids, but less rapid than in the presence of AcBr. Other acid bromides bring about an acceleration identical with that produced by AcBr at an equiv. concn. The introduction of BzCl into a reaction mixt. of Br and AcOH produces an effect which is similar to that of AcCl at equiv. concn., except that the velocity is slightly less. For a discussion of the mechanism and the tables and curves showing the results, the original must be consulted. C. J. WEST

Ethyl cyanoacetate. E. P. KOHLER AND C. F. H. ALLEN. *Organic Syntheses* III, 53–6 (1923).—ClCH₂CO₂Na and NaCN are made to react and the resulting NCCl₂CO₂Na is esterified with EtOH in the presence of H₂SO₄. Yield of NCCH₂CO₂Et, 65–75%. C. J. WEST

Ketene. C. DEW. HURD. *Organic Syntheses* IV, 39–42 (1925); cf. C. A. 19, 1853.—The app. and method of prepn. of CH₂:CO from Me₂CO are described. The yields are about 25–30%; the product is identified as PhNHAc. C. J. WEST

Ketenes in the Friedel and Crafts reaction. C. DEW. HURD. *J. Am. Chem. Soc.* 47, 2777–80 (1925).—CH₂:CO, in the presence of AlCl₃, reacts with C₆H₆, PhOMe and C₁₀H₈, to form rather complex mixts. from which ketones may be isolated. Scarcely any reaction occurs between CH₂:CO and PhCOMe. In the case of C₁₀H₈, 21–37% of C₁₀H₇COMe was obtained, being a mixt. of the α - and β -isomers. CH₂:CO and AlCl₃ form an addn. product which is capable of reacting with aromatic compds. with the evolution of HCl; ketones are found in the reaction mixt. C. J. WEST

Acetamide. G. H. COLEMAN AND A. M. ALVARADO. *Organic Syntheses* III, 3–5 (1923).—AcNH₂ in 87–90% yields is obtained by distg. AcONH₄. C. J. WEST

Pinacol hydrate. ROGER ADAMS AND E. W. ADAMS. *Organic Syntheses* V, 87–9

(1925).— HgCl_2 in Me_2CO is added to a mixt. of Mg turnings and C_6H_6 and the resulting Mg complex decompd. with H_2O , giving 43–50% pinacol hydrate. C. J. WEST

Ethylene cyanohydrin. E. C. KENDALL AND B. MCKENZIE. *Organic Syntheses* III, 57–9(1923).— $\text{HO}_2\text{CH}_2\text{CH}_2\text{Cl}$ and NaCN give about 80% of $\text{HOCH}_2\text{CH}_2\text{CN}$. C. J. WEST

Glycerol α -monochlorohydrin. J. B. CONANT AND O. R. QUAYLE. *Organic Syntheses* II, 33–5(1922).—Glycerol in AcOH at $105\text{--}10^\circ$ is treated with HCl for about 4 hrs., giving about 66% of $\text{ClCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$. C. J. WEST

Glycerol α,γ -dichlorohydrin. J. B. CONANT AND O. R. QUAYLE. *Organic Syntheses* II, 29–31(1922).— $\text{C}_3\text{H}_5(\text{OH})_3$ in AcOH is satd. with HCl , giving 57% of $(\text{ClCH}_2)_2\text{CHOH}$. C. J. WEST

Epichlorohydrin. H. T. CLARKE AND W. W. HARTMANN. *Organic Syntheses* III, 47–9(1923).— $(\text{ClCH}_2)_2\text{CHOH}$ and NaOH give 76–81% of epichlorohydrin. C. J. WEST

Pentaerythritol (tetrahydroxymethylmethane). CHEMICAL LABORATORY, PICTON ARSENAL. *Organic Syntheses* IV, 53–6(1925).—Com. HCHO and AcI are condensed by $\text{Ca}(\text{OH})_2$, giving 50–4% of $\text{C}(\text{CH}_2\text{OH})_4$. C. J. WEST

***d*-Mannitol from *Gardenia turgida*.** M. O. FORSTER AND KESHAVIAH ASWATH NARAIN RAO. *J. Chem. Soc.* 127, 2176(1925).—The exudation from *G. turgida* has a pleasant odor, dissolves completely in cold H_2O with slight frothing, giving a pale brown viscous liquid; furfural is not produced by boiling with HCl , and tests for N, aldehydes and ketones were negative. The aq. soln., shaken with basic Pb acetate filtered and concd., deposited 40% of *d*-mannitol. C. J. WEST

Optical activity and the polarity of substituent groups. II. Menthyl esters of substituted acetic acids. H. G. RULE AND JOHN SMITH. *J. Chem. Soc.* 127, 2188–94(1925); cf. *C. A.* 18, 2326; 19, 33.—The rotatory powers of menthyl esters of the acids $\text{XCH}_2\text{CO}_2\text{H}$, where $\text{X} = \text{CN}, \text{CO}_2\text{H}, \text{OH}, \text{OMe}$ and OEt are reported. In all cases the observed rotations could be expressed within the limits of exptl. accuracy by a Drude equation of 1 term; the dispersion is in every case normal and simple. The substituents affect the rotatory power in the order $\text{CN} > \text{OH} > \text{OMe} > \text{OEt} > \text{CO}_2\text{H}$; the values undergo little change with temp. *l*-Menthyl methoxyacetate, b_{18} 141° , m 18° , d_4^{18} 1.0136, 0.9964, 0.9807, 0.9638 where $t = 20^\circ, 40.3^\circ, 60^\circ$ and 80° ; values for $[\alpha]$ are given for the D, yellow, green and violet for $20^\circ, 40^\circ, 60^\circ, 80^\circ$ and 90° . *l*-Menthyl ethoxyacetate, b_{18} 150° , d_4^{18} 0.9545, 0.9379, 0.9242, 0.9070 where $t = 20^\circ, 40.6^\circ, 58^\circ$ and 79.2° ; $[\alpha]$ as above. *l*-Menthyl glycolate, m 87.5° , $d_4^{94.3}$ 0.9469, $[\alpha]$ at 94.3° , -36.50° , -38.09° , -43.23° and -72.71° for the D, yellow, green and violet lines; rotations are also given for C_6H_6 and CHCl_3 solns. *l*-Menthyl cyanoacetate, $d_4^{91.3}$ 0.9406, $[\alpha]$ at 91.3° , -36.71° , -38.28° and -43.28° for the D, yellow and green lines; rotations in C_6H_6 and CHCl_3 are given. *l*-Menthyl H malonate, $d_4^{59.6}$ 1.0238, $d_4^{90.6}$ 1.0008; values for $[\alpha]$ are given for 59.5° and 90.5° for the 4 lines above and for a C_6H_6 soln. *l*-Menthyl glycolate, $d_4^{94.3}$ 0.9469, α -77.09° , -80.48° , -91.26° and -153.6° for the above 4 lines. The 2 types of group effect previously observed, the general effect visible in inductive capacity, acidic strength and chem. reactivity, and the polar effect, as deduced from the electronic theory and traceable in C_6H_6 substitution and electromagnetic rotation, are both to be found in optical activity. C. J. WEST

Bromination of lactic acid and calcium lactate in presence of light. JNANENDRA CHANDRA GHOSH AND KALIPADA BASU. *Quart. J. Indian Chem. Soc.* 2, 39–48(1925).—About $\frac{2}{3}$ of the reaction between lactic acid and Br takes place in the dark and thus the photochem. efficiency of light is not capable of very exact measurement; calcns. indicate that 4 quanta of energy activate 1 mol. of Br; Einstein's law of photochem. equiv. appears not to hold here. The reaction between Br and the Ca lactate is a monomol. one. Increasing the concn. of the salt increases the velocity const., while increase in the concn. of Br gives an irregular const., the reaction tending to degenerate into a 0 mol. one. About 0.75 of the velocity const. is due to dark reaction. When the concn. of the salt is $N/30$, about 2 quanta are necessary for the transformation of 1 mol. of salt; increasing the concn. of $N/15$ decreases the amt. to 1 quantum. C. J. WEST

β -Bromopropionic acid. E. C. KENDALL AND B. MCKENZIE. *Organic Syntheses* III, 25–6(1923).— $\text{HOCH}_2\text{CH}_2\text{CN}$ and HBr give 82–3% $\text{BrCH}_2\text{CH}_2\text{CO}_2\text{H}$. C. J. WEST

Ethyl β -bromopropionate. E. C. KENDALL AND B. MCKENZIE. *Organic Syntheses* III, 51–2(1923).—Crude $\text{BrCH}_2\text{CH}_2\text{CO}_2\text{H}$ in CCl_4 is boiled with EtOH and a catalyst (PhSO_3H), giving 85–7% of the Et ester. C. J. WEST

α -Bromocaproic acid. H. T. CLARK AND E. R. TAYLOR. *Organic Syntheses* IV, 9-10(1925).— $\text{Me}(\text{CH}_2)_4\text{CO}_2\text{H}$ is brominated in the presence of PCl_5 , giving 81-9% of $\text{Me}(\text{CH}_2)_4\text{CHBrCO}_2\text{H}$. C. J. WEST

Constitution of the α -eleostearic acid from Chinese wood oil and its isomer, β -eleostearic acid. J. BOESEKEN AND H. J. RAVENSWAY. *Proc. Acad. Sci. Amsterdam* 28, 386-9(1925).—See C. A. 19, 2475. E. J. C.

Methyleneaminoacetonitrile (α -hydroformamine cyanide). ROGER ADAMS AND W. D. LANGLEY. *Organic Syntheses* IV, 47-8(1925).— NaCN soln., added to techn HCHO and NH_4Cl at 0° , gives 64-74% of $\text{CH}_2=\text{NCH}_2\text{CN}$. C. J. WEST

Glycine. H. T. CLARK AND E. R. TAYLOR. *Organic Syntheses* IV, 31-3(1925).— $\text{CH}_2=\text{NCH}_2\text{CN}$ and HBr give $\text{H}_2\text{NCH}_2\text{CO}_2\text{H}$. HBr , from which the free base is liberated by $\text{C}_2\text{H}_5\text{N}$; yield, 31-7%. C. J. WEST

Isomerism in N -carbalkoxy derivatives of dipeptides which contain a β -amino acid. HERMANN LEUCHS AND PAUL SANDER. *Ber.* 58B, 1528-31(1925), cf. C. A. 2, 3078.—The isomerism of the carbethoxyglycylglycine esters, etc., which was ascribed to the change of a lactam into a lactim group, $\text{EtO}_2\text{CNHCH}_2\text{CONHCH}_2\text{CO}_2\text{Et} \rightarrow \text{EtO}_2\text{CNHCH}_2\text{C(OH)(NCH}_2\text{CO}_2\text{Et)}$, is also found in peptide derivs of β - NH_2 acids. *di-MeCH(NH_2)CH_2CO_2H* (I) with ClCO_2Me in aq. $\text{NaOH-Na}_2\text{CO}_3$ gives 85-97.5% of *N*-carbomethoxy β -aminobutyric acid (II), m. $90-1^\circ$ (cor.), converted by SOCl_2 at 50° into the chloride, light yellow oil of penetrating odor, which with NH_3 in Et_2O gives the amide (0.85 g. from 1 g. II), m. $141-2^\circ$, and with 2.2 mols. $\text{PhNHCH}_2\text{CO}_2\text{Et}$ in Et_2O yields *Et* carbomethoxy β -aminobutyryl-*N*-phenylglycine, $\text{MeO}_2\text{CNHCHMeCH}_2\text{CONPhCH}_2\text{CO}_2\text{Et}$ (III) (6.0 g. from 3.2 g. II), m. $94.5-5.5^\circ$. Shaken 1 hr with 1.1 mols. *N* NaOH , III yields the free carbomethoxyglycine, faintly yellow viscous oil, isolated as the NH_4 salt, $\text{C}_9\text{H}_{13}\text{O}_5\text{N}_3$ (1.3 g. from 1.6 g. III). When heated 6 hrs. at 100° with 3.3 mols. *N* KOH , on the other hand, III, which, from its structure, cannot isomerize as above, consumes no alkali and there is obtained amorphous β -aminobutyryl-*N*-phenylglycine. In the same way with $\text{H}_2\text{NCH}_2\text{CO}_2\text{Et}$ is obtained 90% *Et* carbomethoxy- β -aminobutyryl-glycine (α -series) (IV), m. $99-100^\circ$; free carbomethoxyglycine (V), from IV with 1.1 mols. alkali at room temp., m. $135-6^\circ$; *Me* ester (α -series) (0.5 g. from 0.5 g. V with dil. MeOH-HCl at 40°), m. $101-3^\circ$, amide (α -series) (0.8 g. from 1 g. IV with $\text{NH}_3\text{-MeOH}$), m. $118-9^\circ$. Heated 4 hrs. at 100° with 2.2 mols. *N* KOH , 1 g. IV uses up 2 mols. alkali and yields 0.8 g. *N'* β -aminobutyryl-glycine-*N*-carboxylic acid (β -series), yellow oil, converted by 4% HCl in MeOH into the *di-Me* ester, $\text{MeO}_2\text{CNHCHMeCH}_2\text{C(OH)(NCH}_2\text{CO}_2\text{Me)}$, isomeric with the above α -ester, m. $84-5^\circ$, depresses the m. p. of its isomer to about 65° , gives with $\text{NH}_3\text{-MeOH}$ at 20° β -ureidobutyryl-glycinamide (β -series) (68% yield), tables, prisms or needles with 1 H_2O , m. $95-100^\circ$, solidifies and m. again (anhyd.) 182° . *Et N'*-[carbethoxyglycyl]- β -aminobutyrate (α -series) (12 g. from 15 g. of the *Et* ester of I and $\text{EtO}_2\text{CNHCH}_2\text{COCl}$), m. $56-8^\circ$, gives with 1.1 mols. alkali at room temp. the free acid, isolated as the hygroscopic NH_4 salt, $\text{C}_9\text{H}_{13}\text{O}_5\text{N}_3$, hydrated tables or anhyd. prisms which decomp. on drying at high temps. *N'*-Glycyl- β -aminobutyryl-*N*-carboxylic acid (β -series), from the above α -di *Et* ester with NaOH at 100° , isolated as the β -di-*Et* ester (yield, 72%), m. $103-4^\circ$, which with $\text{NH}_3\text{-MeOH}$ at 100° gives ureidoacetyl β -aminobutyramide (β -series), leaflets with 1 H_2O , sinters $95-100^\circ$, m. about 172° (decomp.). Carbethoxyglycyl- β -aminobutyramide (α -series), obtained in the same way in 0.55 g. yield from 0.9 g. of the α -ester, m. $130-1^\circ$. The only difference observed in the isomerism phenomena of the peptides derived from α - and from β NH_2 acids is that the lactim forms (β -series) of the latter do not, like certain of those of the former, change into azlactones. C. A. R.

Hydrazine sulfate. ROGER ADAMS AND B. K. BROWN. *Organic Syntheses* II, 37-40(1922).—Prepn. from NH_3 and NaOCl . C. J. WEST

α -Aminocaproic acid. C. S. MARVEL AND V. DU VIGNEAUD. *Organic Syntheses* IV, 3-4(1925).— $\text{Me}(\text{CH}_2)_4\text{CHBrCO}_2\text{H}$ and NH_3 give 62-7% of $\text{Me}(\text{CH}_2)_4\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$. C. J. WEST

L-Cystine. R. A. GORTNER AND W. F. HOFMAN. *Organic Syntheses* V, 39-41(1925).—Directions are given for the hydrolysis of human hair and the isolation of l-cystine in 5-5.3% yields. The yield from sheep's wool is about 2.6%. C. J. WEST

Diallylamine. E. B. VLIET. *Organic Syntheses* V, 43-4(1925).— $(\text{CH}_2=\text{CHCH}_2)_3\text{N}$, heated with H_2SO_4 for 6 hrs., gives 80-6% of $(\text{CH}_2=\text{CHCH}_2)_2\text{NH}$. C. J. W.

Diacetone alcohol. J. B. CONANT AND NEAL TUTTLE. *Organic Syntheses* I, 45-7(1921).—Prepn. of $\text{Me}_2\text{C(OH)CH}_2\text{Ac}$ from Me_2CO by boiling with Ba(OH)_2 ; 71% yields. C. J. WEST

Keto-enol tautomerism. V. The desmotropic γ -methylacetylacetones. H. P.

KAUFMANN AND J. LIEPE. *Ber.* **58B**, 1560–3(1925); cf. *C. A.* **19**, 1565.—As in the case of $(\text{AcCHCO}_2\text{Et})_2$ (*C. A.* **17**, 379), so in that of γ -methylacetylacetone (I) in the Meyer method for the detn. of enols both direct and indirect titration give the same values if H_2O is excluded by using alc. NaI instead of aq. KI (enol in 0.1 *N* soln. in abs. alc. after 3 days: direct titration 43, indirect with aq. KI 17–23, indirect with alc. NaI 42%). But H_2O neither disturbs the splitting off of HBr nor does it attack the I, nor do $2\text{-C}_{10}\text{H}_7\text{OH}$ or the HBr or I liberated produce any disturbance, so that provisionally it can only be assumed that the presence of H_2O retards the sepn. of the I; under certain conditions the great sensitiveness of I or of its Br derivs. towards H_2O also plays a role. Attempts to obtain from the I, b.p. 60–5°, the pure enol by cooling the CS_2 soln. in $\text{Et}_2\text{O}-\text{CO}_2$ gave needles contg. 32.9% enol. Decompn. of the Na salt in cold Et_2O with H_2SO_4 gave an oil, m. 7°, with 99% enol. Fractionation of I by the "aseptic distill." method of Meyer (*C. A.* **15**, 2640) finally gave a residue with 93% keto form.

C. A. R.

An occurrence of *d*-glucuronic acid in plant fibers. C. G. SCHWALBE AND G. A. FELDTMANN. *Ber.* **58B**, 1534–9(1925).—A bleached straw cellulose pulp (400 g. dry wt., contg. 16.13% furfural) was autoclaved 1.5 hrs. at 130° in 7 l. of 0.5% NaOH, and the filtrate, which was only faintly alk. to litmus, was treated with H_2SO_4 until it contained about 0.5% free acid and autoclaved 2.5 hrs. at 135°; the ext. contained only 4.38% of the original furfural and the remaining cellulose 66.49%, 29.13% having been destroyed. The cooled liquid, which gave a distinct naphthoresorcinol reaction and at once reduced Fehling soln. even in the cold, was neutralized to Congo with BaCO_3 , filtered and pptd. with $\text{Pb}(\text{OAc})_2$; from the ppt., after decompn. with H_2S , was obtained a small amt. of crystals which in 12% HCl gave a positive furfural reaction (reddening of PhNH_2 AcOH paper) and naphthoresorcinol reaction and were identified as *d*-glucuronic acid (I) through the cinchonine salt, m. 202°, $[\alpha]_D^{20}$ 139.9°. For quant. detns. of the I, the amt. of CO_2 split off by 12% HCl was measured. To destroy carbonates present in the cellulose 100 g. of it was autoclaved 2 hrs. at 135° in 2 l. 1% H_2SO_4 ; the cellulose now remaining contained 0.1365 g., the ext. 0.5743 g. glucurone (II); the amts. of furfural were, resp., 7.9744 and 7.1180 g., i. e., about 1 g. had been destroyed during the cooking. In the alk. cooking described above for the qual. detection of I, the ext. from 100 g. cellulose contained 0.4950, the remaining cellulose 0.5621 g. II (the latter was first boiled 1 hr. with 1% HCl to get rid of the free alkali and carbonate remaining from the previous treatment). Cellulose previously boiled 1 hr. with 1% HCl gave 1.07% II. In a no. of other plant raw materials and celluloses, from which I was not actually isolated, the following % of CO_2 were obtained: wheat straw 1.02; rye straw 1.03; pine wood 0.74 (shavings), 0.75 (raspings), 0.78 (raspings, previously treated with 1% HCl); unbleached alkali wood cellulose 0.60 (Na_2S), 0.19 (NaOH), 0.16 (sulfite).

C. A. R.

Pyruvic acid. J. W. HOWARD AND W. A. FRASER. *Organic Syntheses* IV, 63–4 (1925) — $[\text{CH}(\text{OH})\text{CO}_2\text{H}]_2$ and KHSO_4 , heated at 210–20°, give 50–5% of AcCO_2H .

C. J. WEST

The catalytic decomposition of pyruvic acid. ERICH MÜLLER AND FRIEDRICH MÜLLER. *Z. Elektrochem.* **31**, 45–6(1925).—At 100°, aqueous solns. of AcCO_2H (I) are rapidly decompd. to CO_2 and AcH by the metals Os, Pd, Ru, while without a catalyst practically no decompn. occurs. Os causes the most rapid decompn., more rapid in 50% than in 20% soln. of I.

M. A. YOUTZ

Condensation products of ethyl acetoacetate. I. A new compound of glyoxal and ethyl acetoacetate, formylmethylenebisacetoacetate ester. E. S. WEST. *J. Am. Chem. Soc.* **47**, 2780–9(1925) — Compds. of $\text{AcCH}_2\text{CO}_2\text{Et}$ with sugars or their intermediate oxidation products are of interest because of their possible relation to the "ketolytic" reaction or to antiketogenesis in the animal body. $(\text{CHO})_2$ and $\text{AcCH}_2\text{CO}_2\text{Et}$ in approx. neutral soln. at 20° give 15–20% of *Et* formylmethylenebisacetoacetate (I), m. 109–10°; mol. wt. in boiling AcOEt , 303.6, 312.9 (calcd. for $\text{C}_{14}\text{H}_{20}\text{O}_7$, 300.2); aq. alkali causes resinification; it reduces Tollen reagent in the cold and Fehling and Benedict solns. when heated; it quickly decolorizes neutral KMnO_4 in the cold and absorbs Br in CCl_4 with evolution of HBr. I does not form an addn. product with NaHSO_3 and does not restore the color of Schiff reagent. Hydrazines give smearable products. NH_2OH gives the aldoxime of 4,6-dicarbethoxy-5-formyl-3-methyl- Δ^2 -cyclohexenone, m. 94–5° (decompn.); H_2O and NH_3 are evolved when heated at 100° and 20–30 mm., also when dried over H_2SO_4 in *vacuo* for 18 hrs., giving a compd. m. 140° (decompn.); it does not resinify with alkali and does not reduce Tollen, Benedict or Fehling solns. Color reactions of I with FeCl_3 , $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$, α - and $\beta\text{-C}_{10}\text{H}_7\text{OH}$, etc., are given. Dil. alkali eliminates 1 mol. CO_2 from I. The oily mother liquor from I contains *Et* α' -acetoace-

tate- α -methyl- β -furancarboxylate, the ether of Et β' -hydroxy- α -methyl- γ -furancarboxylate, previously obtained by Polonowski (*Ann.* **246**, 27(1888)) and Et β -hydroxy-crotonate.

C. J. WEST

A new method for the preparation of α -alkyllevulic acids. H. GAULT AND T. SALOMON. *Ann. chim.* [10] **2**, 133-209(1924).—The first attempted method was from $\text{MeCOCH}_2\text{CH}(\text{CO}_2\text{R})_2$ (I) by alkylation of its Na deriv. followed by sapon. and elimination of CO_2 to yield the desired levulic acids $\text{MeCOCH}_2\text{CHRCO}_2\text{H}$ (II); the alkyl derivs. of I could not be purified and their sapon. did not go well, and hence the method was abandoned. By the action of $(\text{NH}_2)_2$ on I methylpyridazinonecarboxylic ester (III) is formed, whose Na deriv. can readily be alkylated, after which HCl and heat liberate $(\text{NH}_2)_2$ and CO_2 with the formation of the desired II compds.; this method is that finally used. $\text{MeCOCH}_2\text{CH}(\text{CO}_2\text{Et})_2$ (IV), prepd. from MeCOCH_2Br (whose prepn. is described) b_{10} 145-7°; its phenylhydrazone, m. 109°, semicarbazone, m. 128-30°, the (di-IV) hydrazone, Δ 43°, being a by-product in the prepn. of III; no oxime or NaHSO_3 compd. could be prepd. Various alkyl derivs. of IV were prepd. from its Na deriv. and RI, in alc., the reaction being carried out under various conditions; the *Me* deriv. could not be prepd.; the *Et* deriv. was obtained in 80% yield, its phenylhydrazone, m. 99-100°, semicarbazone, m. 126-7°; the *iso-Bu* deriv., 72% yield, its phenylhydrazone, m. 72-3°, semicarbazone, m. 128-9°. Various *alkylacetylmalonic acids* (V), were prepd. by sapon. of the foregoing esters or of the corresponding III deriv.; the *unsubstituted acid*, m. 145-6°, its phenylhydrazone, m. 127-8°, semicarbazone, 176-8°. The *Et* deriv. of V (60% yield from the ester), m. 122-3°, its phenylhydrazone, m. 160° or 136° (2 preps.), its semicarbazone, m. 176-7°. The *iso-Bu* deriv. of V could not be isolated in appreciable amts because of decompn. The following *substituted ethyl 6-pyridazinone-5-carboxylates* (VI) were prepd. from I and $(\text{NH}_2)_2$; 3-*Me*, m. 79-80°, its hydrazide, m. 53°, being formed if twice the theoretical amt of $(\text{NH}_2)_2$ is used; 3,5-di-*Me*, m. 43°; 3-methyl-5-ethyl, m. 70-2°; 3-methyl-5-isobutyl, m. 80-1°; all of the foregoing were obtained in approx. 40% yield based on I. From them by the action of cold dil. alkali the corresponding *substituted 6-pyridazinone-5-carboxylic acids* (VII) were obtained as follows; 3-*Me*, 50% yield, m. 130°; 3,5-di-*Me*, 95%, m. 153-4°; 3-methyl-5-ethyl, 90%, m. 137°; 3-methyl-5-isobutyl, yield 90%, m. 122-4°. If in place of cold dil. alkali VI be sapond. with hot HCl , the corresponding α -alkyllevulic acids are obtained in the following yields (based on VI); *unsubstituted*, 75%, m. 31°, b_{15} 152-4°, semicarbazone, m. 187°; *Me*, 60%, b_{13} 144 5°, semicarbazone, m. 189 90°, Fl , 65%, b_{13} 151-2°, semicarbazone, m. 171-2°; *iso-Bu*, 55%, b_{30} 171-3°, semicarbazone, m. 188-9°.

WM. B. PLUMMER

Oxalic acid (anhydrous). H. T. CLARKE AND ANNE W. DAVIS. *Organic Syntheses I*, 67-70(1921).—Prepn. of anhyd $\text{C}_2\text{H}_2\text{O}_4$ from the crystd. acid by dehydrating with CCl_4 .

C. J. WEST

Ethyl oxalate. H. T. CLARKE AND ANNE W. DAVIS. *Organic Syntheses II*, 23-6 (1922).—Esterification of crystd. $(\text{CO}_2\text{H})_2$ by EtOH in the presence of CCl_4 . Yield, 80-4%.

C. J. WEST

Ethyl oxalate. JOSEPH KENVON. *Organic Syntheses V*, 59-61(1925).—Cryst. $(\text{CO}_2\text{H})_2$ is dehydrated by heating on the steam bath for 6-8 hrs. and esterified by EtOH , the H_2O formed in the process being removed from the EtOH by K_2CO_3 ; yield, 80-90%.

C. J. WEST

Precursory compounds in the esterification of oxalic acid with phenols. FRITZ FEIGL AND RIVA KOBILANSKY. *Ber.* **58B**, 1483 8(1925).—Assuming that, like the addn. products with ethers, aldehydes and ketones, phenols (B) add to $(\text{CO}_2\text{H})_2$ (A) at the O of the C:O groups and considering the fact that acid Ph esters of $(\text{CO}_2\text{H})_2$ are unknown, it yet seems quite probable that compds. of the type 2B.A should be capable of existence; the esterification of $(\text{CO}_2\text{H})_2$ might then be considered as proceeding through the following series of reactions (D = dehydrating agent): $2\text{B.A(I)} \rightarrow 2\text{B.A(II)} \rightarrow 2\text{B.A.D(III)} \rightarrow (\text{CO}_2\text{Ph})_2 + \text{H}_2\text{O}$. Compds. of type I have been obtained with PhOH , *p*-cresol and *p*- $\text{C}_6\text{H}_4(\text{OH})_2$, and with PhOH , α - and β - $\text{C}_{10}\text{H}_7\text{OH}$ and *ar*-tetrahydro- β -naphthol compds. of type II which by POCl_3 are converted directly into the corresponding esters; no compd. of type III could be isolated. The mols. in these precursory compds. are probably held together by satn. of secondary valences between the H atoms of the phenols and the doubly bound O atoms of the $(\text{CO}_2\text{H})_2$; phenol ethers (PhOMe , PhOEt , PhOPh) do not form such addn. products, while oxalic esters do. Hydrogenated phenols (cyclohexanol, *al*-tetrahydro- β -naphthol) show no more additive power towards $(\text{CO}_2\text{H})_2$ than do alcs.; the double bonds in the phenols are therefore decisive factors in the stability of these precursory compds. There is no relation between the m. ps. of the precursory compds. and the stoichiometrically equiv.

condensation products except that they are always lower than that of the highest melting constituent. The precursory compds. and the condensation products have different cryst. forms. All the compds. are decompd. into their components by H_2O . *Phenol-oxalic acid*, B.A. from 1 mol. each of the components kept fused for 1 hr., seps. from AcOH in rhombic or trigonal crystals, m. 98°. *Bisphenol-oxalic acid*, 2B.A. from $(CO_2H)_2$ and somewhat more than 2 mols. PhOH refluxed 3 hrs., rhombic cryst. meal, m. 127°. $(CO_2Ph)_2$, obtained in 50% yield from 1 mol. $(CO_2H)_2$, 2 mols. PhOH and 2 mols. $POCl_3$ in C_6H_5N at 0°, monoclinic or triclinic, m. 130°, also obtained from 2B.A. with $POCl_3$ in C_6H_5N . *Bisphenol-di-Ph oxalate*, from $(CO_2Ph)_2$ and more than 2 mols. PhOH refluxed several hrs. in CCl_4 , m. 106°. *Bisphenol-di-Me oxalate*, m. 123°. *Bis-ar-tetrahydro-β-naphthol-oxalic acid*, rhombic, m. 155°. *Bis-ar-tetrahydro-β-naphthyl oxalate*, obtained in 50% yield from 1 mol. each of the naphthol and acid in C_6H_5N , monoclinic, m. 149°. *Bis-ar-tetrahydro-β-naphthol-di-Me oxalate*, m. 147° (yield, very small); *di-Ph oxalate*, m. 122° (yield, small). *Bis-β-naphthol-oxalic acid*, obtained almost quant. from the components, refluxed in AcOH, m. 167°; α-naphthol isomer, m. 163° (yield, very small). *Di-β-naphthyl oxalate*, obtained in about 50% yield from the precursor, rhombic, m. 189°. *p-Cresol-oxalic acid*, obtained in small yield from the components on the H_2O bath, m. 56°. *Di-p-tolyl oxalate*, m. 147°. *Hydroquinol-oxalic acid*, m. 197°. C. A. R.

Action of methyl cyanofornate on organomagnesium compounds. H. FINGER AND R. GAUL. *J. prakt. Chem.* 111, 54-61 (1925). $-NCCO_2CH_3$ and 3 mols. $MeMgI$ give a very small yield of $AcCMc(OH)Me$, b. 140-2°. $EtMgBr$ gives 58% of $EtCOC(OH)Et_2$, b. 68-70°. $PhMgBr$ gives a mixt. of phenylbenzoin and Ph_3COH . α- $C_{10}H_7MgBr$ gives about 50% of the *ketimide*, $C_{10}H_7C(=NH)C(OH)(C_{10}H_7)_2$, m. 150.1° (decompn.), isolated as the *HBr salt*, yellow, m. 205-10° (decompn.); *HCl salt*, light yellow, m. 185-90°; *HNO₃ salt*, yellow, m. 135-6°; *picrate*, bright yellow, m. 165-6°. Moderately concd. KOH and the HBr salt appear to give a *hydrate* of the imide, m. 135-8° (decompn.). C. J. WEST

Ethyl butylmalonate. ROGER ADAMS AND R. M. KAMM. *Organic Syntheses IV*, 11-12 (1925). $-CH_2(CO_2Et)_2$, $EtONa$ and $BuBr$ give 80-90% of $BuCH(CO_2Et)_2$. C. J. WEST

The electrosynthesis of *n*-duotricontanedicarboxylic acid. D. A. FAIRWEATHER. *Proc. Roy. Soc. Edinburgh* 45, 283-5 (1925).—Diethylhexadecanedicarboxylate is obtained by electrolysis of Na Et sebacate and this compd. is half hydrolyzed by NaOH. A soln. of 30 g. in 3 l. of alc. is cooled to 5° and sufficient alc. NaOH added to half sapon. only 20 g. The temp. is kept at 5° for 3 days and then at 10-15° for a week, after which time neutrality is reached. Yield of di-Na salt, 5 g., of Na Et salt, 10 g. *II Et hexadecanedicarboxylate* (m. 71°) is pptd. from a soln. of the Na salt by HCl and recrystd. from MeOH. A soln. of 10 g. of the Na salt in 45 cc. of water sets to a soapy mass at about 40° and cannot be electrolyzed on account of frothing. Alc. (4 cc.) is therefore added and a current of 2-3 amp. passed in for 3 hrs. at 70-75°. Water and alc. are added from time to time to replace loss by evapn. The operation is conducted in a beaker, with Pt electrodes. The oil thus obtained contains 5 g. of *di-Et duotriacontanedicarboxylate*, m. 80°. *Free acid*, m. 123°, is obtained by hydrolysis of the ester. R. C. F.

Rotation-dispersion of optically active compounds. Dimethoxysuccinates and pyridine. T. S. PATTERSON AND J. D. FULTON. *J. Chem. Soc.* 127, 2435-44 (1925).—The difference between the rotation values for 2 colors of light—dispersion—is directly proportional to either value, if calcd. from the point of intersection for these 2 colors—the rational zero. Using the rational zero, a dispersion coeff. may be arrived at which shows very fair constancy under widely differing conditions and may in future prove to be definitely characteristic of a particular substance or group of substances. Because of exptl. difficulties, T-R curves for most active compds. have been ascertained for only a comparatively short range; it has been suggested that these might be constructed by piecing together T-R curves of solns. of the active compd. in question or derivs. of it. The question arises whether the dispersion coeff. derived from such T-R curves would have the same value as for the mother substance, when calcd. from the rational zero. To answer this, *dibenzyl d-dimethoxysuccinate*, b_D 180-90°, n_D^{19} 1.5321, d 1.1730, 1.1551, 1.1320, 1.1064 at 16.4°, 41°, 70.75° and 100°, was studied. The values for $[\alpha]$ were detd. for wave lengths 6716.3, 6234.3, 5790.3, 5460.7, 4959.7, 4358.3 at temps. from 0° to 174.5° (7 in all), in quinoline from 0° to 100°, in $o-O_2NC_6H_4Me$ from 0° to 100°, in $C_6H_2Br_4$ from 0° to 98.8°, in $m-C_6H_4Me_2$ from 16.9° to 98.°, in C_6H_5N from 0° to 99°, in Me_2CO from 0° to 46.6° and for the Me deriv. in quinoline from 0° to 99.6°, the d of the solns. also being detd. Benzyl tartrate in quinoline was also studied. All these curves are of a similar form, although the rotation may be lower or higher.

The dispersion coeff., for the rational zero $[\alpha] = 9^\circ$, is 0.8642, differences occurring in the 3rd decimal place. In the case of Et tartrate, between temps. of 40° and 140° , the rational zero was found to be 7.92° and the mean value of the dispersion coeff. was 0.8660. These results lend support to the idea that even when data are taken from T-R curves apparently on different sides of the max. rotation, the rational dispersion coeff. shows something like a real constancy. Nicotine, $[\alpha]_D^{20}$ 168.02° and 167.78°, d_4^{20} 1.0095 and 1.0100 (2 samples), was then studied. This was used alone, and in HCONH_2 , $\alpha\text{-O}_2\text{NC}_6\text{H}_5\text{Me}$, quinoline, $\alpha\text{-C}_{10}\text{H}_7\text{Br}$, AcOEt , H_2O and excess of H_2SO_4 , the d and rotatory power for the above-named wave lengths being detd. from 0° to 100° . The change of rotation of nicotine with temp. is only slight but the shape of the curve suggests the occurrence of a min. at a temp. probably in the neighborhood of 170° or thereabouts. Its behavior is normal. When dispersion coeffs. are calcd., using the rational zero 3° , the mean value is found to be 0.8674. C. J. WEST

Stereochemistry of the tetrahedral carbon atom. II. Configuration of the diaminosuccinic acids. RICHARD KUHN AND FRITZ ZUMSTEIN. *Ber.* 58B, 1420-32 (1925); cf. C. A. 19, 2177. From the fact that the more difficultly sol. (I) of the 2 optically inactive α,β -diaminosuccinic acids gives *meso*-tartaric acid with HNO_2 and the more easily sol. form (II) yields chiefly racemic acid, Farchy and Tafel concluded (*Ber.* 26, 1985 (1893)) that I and II are the *meso*- and *dl*-forms, resp., and although their method of establishing the configurations cannot be considered as being conclusive, since the replacement of the NH_2 groups by OH proceeds in steps and it is conceivable that the intermediate hydroxyasparaginic acid might undergo a Walden inversion, K. and Z. now show that they were right, for the di-Bz deriv. of II can be resolved into optical antipodes by means of morphine. The 2 acids are sep'd from each other by fractional pptn. with H_2SO_4 and the I is purified by repeated pptn. from NaOH with AcOH and the II by pptn. from HCl with NaOH ; yields, about 120 and 80 g., resp., from 1 kg. $[\text{C}(\text{C}_6\text{H}_5)_2\text{N}(\text{H})\text{CO}_2\text{H}]_2$. II seps. in prisms with 1 H_2O , which it loses at 130° *in vacuo* and quite rapidly absorbs again from the air. Di-Bz deriv. of I, m. $212-3^\circ$ (decompn.); of II, with 1 H_2O , m. 161° (decompn.). Di-HCl salt of I, decomp. $186-7^\circ$, difficultly sol. in cold H_2O ; mono HCl salt of II, decomp. about 200° , easily sol. in cold H_2O . Soly. of I in 100 cc. concd. H_2O at 25° , 3.1 mg.; of II, 20 times greater. The 2 acids do not give with KI HgI_2 and phosphotungstic acid the pptn. reactions characteristic of diaminomonocarboxylic acids; with CuSO_4 they give a deep blue color only after addn. of alkali; the ninhydrin reaction is positive; with $\text{Hg}(\text{NO}_3)_2$ and alkalis they ppt. yellow HgO , which is blackened (reduction) on boiling, considerably more rapidly and completely by I; they do not reduce Liebig-Knapp's alk. Ag soln.; in alk. soln. with Millon's reagent they form a thick white ppt. which is very difficultly sol. even on heating. From 12 g. of the di-Bz deriv. of II and 10.4 g. morphine in 1060 g. boiling H_2O there seps. after 18 days at 0° about 15 g. of morphine *d-dl*[benzoylamino]succinate, $\text{C}_{20}\text{H}_{23}\text{O}_6\text{N}_2 \cdot 1\frac{1}{2}\text{H}_2\text{O}$, decomp. $198-201^\circ$, loses $31\frac{1}{2}\text{H}_2\text{O}$ at 130° *in vacuo*; free acid, $\text{C}_{18}\text{H}_{19}\text{O}_6\text{N}_2 \cdot \text{H}_2\text{O}$, m. $163-4^\circ$, $[\alpha]_D^{20}$ 106.5° (0.1 N NH_4OH). The filtrate from the *d*-salt, decompd. with $\text{NH}_4\text{OH} \cdot (\text{NH}_4)_2\text{CO}_3$ and acidified with H_2SO_4 , yields 4 g. of the *l*-acid, m. $163-4^\circ$ (decompn.), $[\alpha]_D^{20} -104.2^\circ$ (0.1 N NH_4OH). C. A. R.

Glutaric acid. C. S. MARVEL AND W. F. TULEY. *Organic Syntheses* V, 69-70 (1925).—Hydrolysis of $\text{NCCl}_2\text{CH}_2\text{CH}_2\text{CN}$ with HCl gives 83-5% $\text{CH}_2(\text{CH}_2\text{CO}_2\text{H})_2$.

C. J. WEST

Adipic acid. J. F. THORPE AND G. A. R. KON. *Organic Syntheses* V, 9-11 (1925).—Oxidation of cyclohexanol by boiling concd. HNO_3 gives 55-6% adipic acid; the loss on purification is not greater than 10%.

C. J. WEST

Configuration of α,α' -dibromodibasic acids. IV. The α,α' -dibromoglutaric acids. H. R. ING AND WM. H. PERKIN, JR. *J. Chem. Soc.* 127, 2387-99 (1925); cf. C. A. 19, 246. —*Me meso*-dibromoglutarate (I), m. 45° ; the *dl*-ester (II), b_{10} $113-5^\circ$. *Me α,α' -diiodoglutarate* (III), m. 75° ; there is also a liquid form, pale yellow oil, gradually turning brown because of liberation of I. Treating 7 g. of II with 0.25 g. Na in 20 cc. EtOH causes the crystn. of 5 g. I in 10 min.; with larger amts. of MeONa , NaBr ppts and *Me* bromocyclopropanedicarboxylate is formed. At the ordinary temp. III is rapidly converted by MeONa into the *Me* ester (not analyzed) of 1-iodocyclopropane-1,2-dicarboxylic acid, m. $176-7^\circ$. $\text{CHNa}(\text{CO}_2\text{Et})_2$ and the Et dibromoglutarate give a mixt. of $\text{CH}_2(\text{CO}_2\text{Et})_2$, Et 1-bromocyclopropane-1,2-dicarboxylate and Et cyclobutane-1,2,2,3-tetracarboxylate, b_{12} $195-8^\circ$ (yield, about 50% of the original ester). There also is formed a thick oil, $\text{C}_{14}\text{H}_{15}\text{O}_7$, which could not be distd. without decompn., and is considered to be a bridged-ring ester. The condensation with a mixt. of I and II gives a mixt. of solid *Me cyclobutane-1,2,2,3-tetracarboxylate*, m. 78° , and a liquid ester, b_{16} $193-5^\circ$ (the

total yield was about 30%). In C_6H_6 the total yield is about 70–80%. **I** in MeOH treated with MeONa, gives *Me 1-bromocyclopropane-1,2-dicarboxylate*, b_{15} 134–5°; when this is treated with $CHNa(CO_2Me)_2$ in MeOH, there results a *Na deriv.*, $C_{11}H_{11}O_7Na$, giving the *compd.* $C_{11}H_{12}O_7$, m. 207°, which may be CH_2 $\begin{matrix} \diagup C(CO_2Me).CO \\ \diagdown C(CO_2Me).CHCO_2Me. \end{matrix}$

Condensation of Et dibromoglutarate with $NCCH_2CO_2Et$ and EtONa gives *Et 2-cyanocyclobutane-1,2,3-tricarboxylate*, b_{20} 210–5°, which on hydrolysis with cold EtOH-KOH gives a tri-K salt of an amide-acid, $C_8H_6O_7NK_3$; further hydrolysis gives cyclobutanetricarboxylic acid. The corresponding *Me ester* (from **I** or **II**), m. 111–2° or (liquid form) b_{12} 185–90°; the proportion of solid to liquid isomer formed from **I** was 1:2, from **II**, 1:3. *Et 2-benzoylcyclobutane-1,2,3-tricarboxylate*, $b.$ 230–40° (yield, 30%). *Et 2-acetylcyclobutane-1,2,3-tricarboxylate*, b_{18} 195° (30% yield). The resolution of *trans*-cyclobutane-1,2,3-tricarboxylic acid with quinine is described, showing that the acid, m. 172°, has the *dl*-configuration. C. J. WEST

Addition of cyanoacetic ester to esters of glutacetic and β -methylglutacetic acids. E. P. KOHLER AND G. H. REED. *J. Am. Chem. Soc.* **47**, 2803–11 (1925).— $NCCH_2CO_2Me$ can be added without difficulty to di-Me glutaconate, the resulting product b_{11} 203–5°, b_2 172°, hydrolyzed by HCl to $CH(CH_2CO_2H)_2$, m. 126°; the dianilic acid, m. 206° (Ingold reported 192°), thus the mode of addn. is the same as that to any other α,β unsatd. ester. There is no appreciable difference in the case with which $NCCH_2CO_2Et$ combines with the esters of the "normal" and labile forms of β -methylglutacetic acid; the addn. product from both esters is the same and the mode of addn. is that of α,β unsatd. esters. In the hydrolysis of the addn. product, there first results an *imido acid*, $C_8H_{11}O_4N$, m. 155°, hydrolyzed by alkali to $MeC(OH_2CO_2H)_2$, m. 169°. The addn. reactions of glutacetic acids cannot be properly used to support the view that the "normal" forms of these acids cannot be represented by conventional formulas. C. J. WEST

An X-ray examination of maleic and fumaric acids. KATHLEEN YARDLEY. *J. Chem. Soc.* **127**, 2207–19 (1925).—This study was undertaken primarily to det. whether the planosymmetry and centrosymmetry usually ascribed to maleic and fumaric acids, resp., have any actual existence in the cryst. state. The results of the X-ray examn. of maleic acid show that the crystals belong to the space group C_{2h}^2 ; since there are 4 mols. in the unit cell, the maleic acid mol. must be asym.; the planosymmetry usually ascribed to maleic acid from chem. considerations has, therefore, no existence in the cryst. state. Various projections of the unit cell are shown. Fumaric acid crystallizes in the triclinic system, a, b, c = 0.504, 1.0413, α 90° 40', β 88° 30', γ 89° 48'. Its d is 1.625 g./cc. There are 6 mols. of $C_2H_2(CO_2H)_2$ in the unit cell. C. J. WEST

Applications of thallium compounds in organic chemistry. II. Titrations. G. H. CHRISTIE AND R. C. MENZIES. *J. Chem. Soc.* **127**, 2369–73 (1925), cf. *C. A.* **18**, 2328.—The following thallous salts were prepd. by titrating the acids with standard $TlOH$ soln. and phenolphthalein; the accuracy of the titrations is the same as in the cases of NaOH and KOH, the values for the equiv. wts. of the acids being correct to 3 significant figures. *Fumarate*, m. 268° (decompr.); *maleate*, m. 161–6°; *succinate*, m. 246–8°; *phthalate*, m. 268–70°. The palmitate behaves as an anisotropic liquid between 116 and 170°. *Tetrathallium tartrate* deposits when a soln. of the acid and $TlOH$ is made alk. *2-Methylpyridine-3,4,6-tricarboxylate*, crysts. with 1 H_2O . *Et acetoacetate*, m. 91–2°; *benzoylacetone*, yellow, m. 103–5°; *phenol*, m. 231–5°; *m-cresol*, m. 187°; *resorcinol* *Me ether*, m. 146–8°, *guaiacol*, m. 160–1°; α -*naphthol*, m. 180–90°; *vanillin*, m. 193–201°. C. J. WEST

The cyclization of asparagine. Derivatives of aminosuccinimide. E. CHERBULIEZ AND L.-F. CHAMBERS. *Helvetica Chim. Acta* **8**, 395–403 (1925).—*Benzoylasparagine* (**I**) (5 g.) heated to 200°, the residue extd. with EtOH, this soln. cooled, the crystals filtered off (**II**), and the soln. concd. gave 61% of *benzoylamino succinimide* (**III**), m. 225–6°, sol. in 60 parts boiling EtOH, or in 90 parts H_2O , insol. in Et_2O , C_6H_6 and ligroin. The aq. soln. is acid to litmus and does not dissolve $Cu(OH)_2$, but **III** dissolves easily in NaOH. The H_2O soln. is optically inactive. The Na deriv. is obtained by treating **III** in EtOH with NaOH and evapg. the soln. It is sol. in 5 parts EtOH. Acid NH_4 benzoate (0.5 g.), m. 183–5°, sublimes when 5 g. of **I** are heated. The crystals, **II**, consist of *benzoylaspartodiamide*, $H_2NOCCH_2CH(NH_2)CONH_2$. With strong alk. NaOBr, **III** is converted to **I**, solely by the action of the alkali. **III** with CH_2O gives 92% of *N-hydroxymethylbenzoylamino succinimide* (**IV**), m. 155–9°, sol. in 14 parts of boiling EtOH, slowly decomp. on standing in air to **III** and CH_2O again. **IV** with PCl_5 in $CHCl_3$ gives *N-chloromethylbenzoylamino succinimide*, m. 155–7°, sol., on boiling, in 15

parts EtOH, 25 parts CHCl_3 and 110 parts Et₂O, insol in C_6H_6 . *Acetylaspargine*, distd. *in vacuo* (H_2O pump) to a temp. of 200° , gives AcNH_2 . At 280° , a yellow oil distills, solidifying to crystals (19.5% yield) of *acetylaminosuccinimide*, m. $170-1^\circ$, sol. in 7 parts H_2O or 15 parts EtOH. Formylaspargine (V) prepd. from asparagine and HCO_2H , m. $168-9^\circ$ (decompn.), sol. in 3 parts H_2O , or 5 parts EtOH. Heating of V gave a distillate of HCO_2NH_2 . Distn. of the K salt of I gave BzNH_2 , b₁₃ 210° , m. $126-8^\circ$, in 55% yield.

M. A. YOUTZ

d-Glutamic acid. H. B. LEWIS, H. M. CHILES AND G. J. COX. *Organic Syntheses* V, 63-7(1925).—Directions are given for the hydrolysis of gluten from wheat flour, and the isolation of 74-82% *d*-glutamic acid.

C. J. WEST

Rotatory dispersion of derivatives of tartaric acid. II. Acetyl derivatives. P. C. AUSTIN AND J. R. PARK. *J. Chem. Soc.* 127, 1926-34(1925); cf. *C. A.* 19, 249. If special care is taken to eliminate moisture solus. of diacetyltartaric anhydride in Me_2CO or AcOEt do not exhibit mutarotation and the strong *d*-rotations are permanent. The rotations conform to the requirements of "simple" rotatory dispersion. On adding H_2O to the dry solus. a change of rotation soon became apparent, the rate of change increasing with the amt. of H_2O present. With 1 and with 4 mols. of H_2O , final steady values were reached after about 1.5 days and 16 days, resp. That this mutarotation is due to the hydrolysis of the anhydride ring is shown by the isolation of pure diacetyltartaric acid from solns. in which mutarotation was complete. The final readings were strongly *l*-rotatory but the values depended on the amt. of H_2O used. The pure acid, m. 118° , is strongly *l*-rotatory in dry Me_2CO and its rotatory dispersion is also simple. Its mol. rotatory power is identical with that calcd. from the final readings after mutarotation, when 1 mol. of H_2O is used. This indicates that the ale. HO groups are important, though possibly not essential factors, in the development of anomalous rotatory dispersion in tartaric acid. In the mutarotation of the anhydride there is a development of anomalous rotatory dispersion during the transition from the simple dispersion of the *d*-rotatory anhydride to the simple dispersion of the *l*-rotatory acid. A change of a very similar character was observed when a soln. of the anhydride in warm H_2O was cooled to 20° . Values are given for numerous wave lengths for the anhydride in Me_2CO at 20° , in AcOEt at 20° , in wet Me_2CO at 20° , the acid in H_2O at 20° and in Me_2CO at 20° .

C. J. WEST

Ethyl oximalonate. A. W. DOX. *Organic Syntheses* IV, 27-8(1925).— Na_2O_3 , passed into $\text{CH}_2(\text{CO}_2\text{Et})_2$ at 0° , gives 74-6% $\text{CO}(\text{CO}_2\text{Et})_2$.

C. J. WEST

Acetonedicarboxylic acid. ROGER ADAMS, H. M. CHILES AND C. F. RASSWEILER. *Organic Syntheses* V, 5-7(1925).—Citric acid, added to fuming H_2SO_4 (20% SO_3) at -5° , gives 92-7% $\text{CO}(\text{CH}_3\text{CO}_2\text{H})_2$.

C. J. WEST

Ethyl acetonedicarboxylate. ROGER ADAMS AND H. M. CHILES. *Organic Syntheses* V, 53-4(1925).— $\text{CO}(\text{CH}_2\text{CO}_2\text{H})_2$ and EtOH-HCl give 42-6% of $\text{CO}(\text{CH}_2\text{CO}_2\text{Et})_2$.

C. J. WEST

Tricarballic acid. H. T. CLARKE AND T. F. MURRAY. *Organic Syntheses* IV, 77-9(1925).— $(\text{EtO}_2\text{C})_2\text{CHCH}(\text{CO}_2\text{Et})\text{CH}_2\text{CO}_2\text{Et}$, heated with equal vols. of HCl and H_2O until evolution of CO_2 ceases, gives 95-6% of $\text{HO}_2\text{CCH}_2\text{CH}(\text{CO}_2\text{H})\text{CH}_2\text{CO}_2\text{H}$.

C. J. WEST

α,γ -Dichloroacetone. J. B. CONANT AND O. R. QUAYLE. *Organic Syntheses* II, 13-5(1922).— $(\text{ClCH}_2)_2\text{CO}$ is obtained in 65-70% yields from $(\text{ClCH}_2)_2\text{CHOH}$, $\text{Na}_2\text{Cr}_2\text{O}_7$, and H_2SO_4 .

C. J. WEST

Reduction of symmetrical dichloroacetone by yeast. HEMENDRA KUMAR SEN AND CHITITARANJAN BARAT. *Quart. J. Indian Chem. Soc.* 2, 77-81(1925); cf. *C. A.* 19, 816.—Reduction of 9 g. $\text{CO}(\text{CH}_2\text{Cl})_2$ by yeast in the presence of sugar gave 4.8 g. $\text{HOCH}(\text{CH}_2\text{Cl})_2$, b. 178° ; its *allophanic ester*, m. 182° , results by the use of an excess of NH_2COCl .

C. J. WEST

Ethyl propane-1,1,2,3,-tetracarboxylate. H. T. CLARKE AND T. F. MURRAY. *Organic Syntheses* IV, 29-30(1925).— $\text{CH}_2(\text{CO}_2\text{Et})_2$, $(:\text{CHCO}_2\text{Et})_2$ and EtONa give 95-6% of $(\text{EtO}_2\text{C})_2\text{CHCH}(\text{CO}_2\text{Et})\text{CH}_2\text{CO}_2\text{Et}$.

C. J. WEST

Preparation of thiocyanogen from thiocyanic acid. H. P. KAUFMANN AND F. KÖGLER. *Ber.* 58B, 1553-6(1925).—Solns. of HSCN in org. solvents were prepd. by covering solid NaSCN with the solvent (CCl_4 , CS_2 , CHCl_3 , Et_2O), dropping in 50% H_2SO_4 with vigorous stirring and drying carefully over P_2O_5 . At higher concns (e. g. 20%) such solns. are stable only in a freezing mixt. In the present work approx. $N/3$ solns. were used. Such solns. were shaken with dry MnO_2 or PbO_2 , care being taken that the HSCN should be present in excess. There was a slight evolution of heat and samples of the filtered liquid were examd. at definite time intervals. It contained no Mn or Pb, liberated I from aq. alkali iodides (unless previously shaken with H_2O ; the aq. ext.

contained H_2SO_4 and HCN), converted white CuSCN into black $\text{Cu}(\text{SCN})_2$, and polymerized on standing or gentle warming, becoming yellow and depositing yellow flocks. These reactions indicate the presence of free $(\text{SCN})_2$, the amt. of which, however, as detd. by titration of the amt. of I liberated from iodides and comparison with the titer of the original HSCN soln., was at best but a few % of that calcd. from the equation $2\text{HSCN} + \text{O} = (\text{SCN})_2 + \text{H}_2\text{O}$, due allowance being made for the hydrolysis of part of the $(\text{SCN})_2$ by the H_2O produced in its formation. On the other hand, when $\text{Pb}(\text{OAc})_4$ in AcOH or CHCl_3 is treated with somewhat more than the calcd. amt. of HSCN soln., $\text{Pb}(\text{SCN})_2$ is at once pptd. and the Pb-free filtrate contains free $(\text{SCN})_2$ in almost theoretical amt.; with $1\text{-C}_{10}\text{H}_7\text{OH}$ it gives $1,4\text{-C}_{10}\text{H}_6(\text{OH})\text{SCN}$, m. 113° (given by mistake as 87° in C. A. 17, 3480). C. A. R.

Cheno-desoxycholic acid (II) (WINDAUS, SCHOOR) 11A. Reactions of *p*-phenylenediamine with CH_2O and H_2O_2 (LÄTT) 11A.

Benzoic acid. A. GEORGE. U. S. 1,557,153, Oct. 13. PhCCl_3 is hydrolyzed directly with H_2O in the presence of an anhydrous metal compd (such as ZnCl_2 on pumice) at a temp. of $100\text{--}120^\circ$, while agitating the reaction mixt. and adding the H_2O at substantially the rate at which it reacts.

Benzoic acid. H. W. DAUBT. U. S. 1,551,373, Aug. 25. A soln. of phthalic acid or a phthalate is heated to $150\text{--}300^\circ$ to form benzoic acid. The heating may cover a period of 20 hrs.

Benzoyl chloride. A. GEORGE. U. S. 1,557,154, Oct. 13. H_2O is gradually added to an agitated mixt. of PhCCl_3 contg. a catalyst such as ZnCl_2 or other Zn compd in suspension and maintained at a temp. (which may be about $100\text{--}120^\circ$) at which active hydrolysis takes place. Not more than 10 in excess of the theoretically required H_2O (to form benzoyl chloride) is used.

Alkyl chlorides. W. R. WEBB. U. S. 1,560,625, Nov. 10. An olefin, e. g., C_2H_4 , from which $\text{C}_2\text{H}_5\text{Cl}$ is to be produced, is treated with anhyd. HCl in the presence of AlCl_3 and the alkyl chloride is distd. and purified.

Diacetone alcohol. W. J. EDMONDS. U. S. 1,550,792, Aug. 25. Acetone is agitated in the presence of $\text{Ca}(\text{OH})_2$ or other finely divided alk. earth hydroxide, in order to cause the formation of diacetone alc.

Catalytic oxidation of toluene or other aromatic compounds. J. V. MEIGS. U. S. 1,560,297, Nov. 3. The vapor of toluene or other substance to be oxidized is mixed with air or other O-contg. gas and with a gaseous cooling agent such as steam and subjected, at a temp. between 200° and redness, to the action of a vesiculated catalyst which may comprise Fe vanado chromate or a similar compd. and Ag. The process is regulated so that the CO_2 in the exit gases is maintained at 3% or less.

Urea from ammonium carbamate. N. W. KRASE and V. L. GADDY. U. S. 1,558,185, Oct. 20. A mixt. of ammonium carbamate and carbonate is compressed and charged into a heated autoclave.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Lucius L. Van Slyke. R. W. THATCHER. *Ind. Eng. Chem.* 17, 1204(1925).—A brief biography, with portrait. E. J. C.

The fermentive decomposition of nucleic acid. L. ROSENFELD. *Chem. Zelle u. Gewebe* 12, 101–14(1925).—An investigation on the effect of exts. of the thymus, liver, spleen, kidney and pancreas both with and without insulin on the decompn. (as judged by the free H_3PO_4 produced) of the Na salt of thymus nucleic acid, of hexosephosphoric acid and of sucrosephosphoric acid. The largest degree of hydrolysis was caused by exts. of the pancreas and kidney. In each case the addn. of insulin resulted in the production of 10 to 20% increase in free H_3PO_4 . Control expts. in which boiled organ ext. was used showed no hydrolysis. H. J. DEUEL, JR.

The chemical mechanism of fat formation from sugar. H. HAEHN and W. KINTOP. *Chem. Zelle u. Gewebe* 12, 115–56(1925).—A study of the synthesis of fat from sugar and from supposedly intermediary products in the glucose fat transformation by

the yeast fungus *Endomyces vernalis*. Yeast cells after a short preliminary period of growth in the usual nutrient medium were placed in phosphate-buffered solns. ($p_H = 6.8$) of the substance under investigation and the fat formation was followed by microscopic examn. of the cells. Fat formation took place if the cells were suspended in glucose or in 1 to 4% concns. of pyruvic acid, glycerol, lactic acid, acetaldehyde or aldol. This was manifest by the appearance of many small fat droplets in the cell, which increased in size from day to day and ultimately filled $\frac{2}{3}$ to $\frac{3}{4}$ of the cell. These results support the theory that acetaldehyde is one of the intermediate substances in the formation of fat from carbohydrate but they do not indicate whether the decompn. of glucose proceeds *via* lactic or pyruvic acid. Glycerol is assumed to yield first methylglyoxal and then either lactic acid or pyruvic acid from which acetaldehyde is formed by virtue of which fat may be synthesized. H. J. DEUEL, JR.

The chemistry of the cell nucleus and some nucleic acid protein compounds. JOSEF SCHUMACHER. *Chem. Zelle u. Gewebe* **12**, 175-93(1925). H. J. DEUEL, JR.

• **Takadiastase.** • S. NISHIMURA. *Chem. Zelle u. Gewebe* **12**, 202-16(1925).—In takadiastase were found amylase, invertase, maltase, proteases, catalase, lipase, pepsin, lactase, inulase, sulfatase and amidase. These enzymes can be quant. removed with fuller's earth, from which they may be freed by washing with weakly alk. phosphate soln ($p_H = 8.0$). An increased activity of all the enzymes results, the increase (approx. 3 times) being the same within the limits of exptl. error for all the enzymes. The increased activity of the enzymes is explained as due to their removal from an inhibitory substance in the original soln. On a second purification with fuller's earth, there is only a slight increase in the activity of invertase, maltase and protease, while a very large increase in the activity of the catalase and amylase was noted. H. J. D., JR.

The function of insulin, of vitamins and of hormones from a catalytic standpoint. N. R. DIAR. *Chem. Zelle u. Gewebe* **12**, 217-25(1925).—Insulin plays the role as an accelerator of the oxidation of glucose by the air in the presence of enzymes. Since diabetes is traced back to a deficient oxidation of glucose in the blood and tissues, it is recommended to administer preps. of iron salts, colloidal iron, or $Fe(OH)_3$, in the treatment of diabetes. Vitamin A is assumed to be a catalyst aiding in the oxidation of fats, and vitamins B and possibly C are supposed to aid in the oxidation of carbohydrate. Therefore the latter are also recommended in the treatment of diabetes. Hormones are assumed to be general catalysts. H. J. DEUEL, JR.

The osmotic pressure of hemoglobin in the absence of salts. G. S. ADAIR. *Proc. Roy. Soc. (London)* **109A**, 292-300(1925); cf. *C. A.* **18**, 2005—Osmotic pressure detns. for dialyzed Hb made by previous workers varied from 3.5 mm. to 12.1 mm. for a 1% Hb soln. Variations were probably due to impurities of acids or bases. The higher values have been accepted as correct since they agree with the molecular weight of 16,700 as detd. by the analysis for Fe while the lower values have been attributed to aggregations of the mols. caused by the salts. Repetition of the work with isoelec. Hb solns. gave pressures of 3.2 mm. or less and pressures of 10 mm. were only obtained when cond. measurements or detns. of H-ion concn. showed the presence of acid or base. Therefore the mol. wt. of Hb is about four times that of the equiv. wt. (16,700). H. J. DEUEL, JR.

The peptidase economy of man and of our experimental animals. H. PREIFFER AND F. STANDENATH. *Fermentforschung* **8**, 327-58(1925).—For detns. of peptidase in urine and serum the cleavage of glycyltryptophan was estimated by comparing the intensity of the red color obtained from the liberated tryptophan by addn. of Ca hypochlorite. A study was made of the influence of age on the urinary excretion of enzyme. The 1st urine of the new born child was found to contain demonstrable amts. of peptidase. In the 1st few weeks and months after birth the peptolytic index rises to unusually high values, then toward the end of the 1st yr. it diminishes and frequently disappears, as is the case also in the later years of childhood. No definite conclusions can yet be reported regarding the influence of puberty. The urine of males between the ages of 20 and 30 shows as a rule a high peptolytic index. This is attributed in part to undernourishment of the subjects, but is believed to be independent of the moderate use of alc. beverages. Differences due to sex have not been established because of other complicating factors. The urine of healthy, well-nourished subjects of regular habits and of ages between 30 and 50 then shows little or no peptidase activity, as in the later years of childhood. Where peptidase is excreted in demonstrable quantities, the greatest amt. is usually observed in the morning urine. This is probably associated with fullness of the lower bowel. In constipated subjects the urinary peptidase can even be made to disappear by thorough evacuation of the bowel. It may be assumed that congenital as well as acquired variations in permeability of the intestinal wall are an

important factor in detg. the amt. of peptidase excreted in the urine. A 2nd source of the urinary enzyme may be the tissue peptidase liberated with the death of the body cells. Attempts to distinguish between intestinal and cell enzyme by means of adsorption, stability and optimum conditions of activity have not been successful. Rabbits and guinea pigs do not excrete peptidase in the urine, but the enzyme may be demonstrated in the blood serum. A. W. DOX

The reactions of *p*-phenylenediamine with formaldehyde and hydrogen peroxide. A comparison with the reactions of natural peroxidases. BERTHA LATT. *Fermentforschung* 8, 359-422(1925).—The oxidation of *p*-C₆H₄(NH₂)₂ by H₂O₂ is greatly accelerated by the presence of raw milk, soln. of blood pigment, or very dil. CH₂O soln. While the pigment formed through the action of the blood peroxidase seps. rapidly in cryst. form, that obtained by the action of CH₂O remains finely dispersed and does not flocculate out unless an electrolyte is added. The final product is, however, identical in both cases. The color obtained in the presence of milk peroxidase is somewhat different, but the variation is probably due to other constituents of the milk, since the same color is obtained with boiled milk in the presence of CH₂O. The isomeric *o*- and *m*-diamines are less sensitive as peroxidase reagents. The shade and intensity of the color in the case of all 3 activators is altered by the presence of various phenols. Acids tend to displace the color somewhat toward the red, while bases are distinctly inhibitory. The effect of salts is proportional to their concn and consists in the development of turbidity and a displacement of the color. Org. solvents such as Et₂O, CHCl₃, and paraldehyde are without influence. EtOH in 10% concn is inhibitory, while urethan accelerates the oxidation. Colloids (casein, albumin, protein, peptone, starch, etc.) in general produce a turbidity but otherwise their effect varies according to the presence of H- or OH ions. The peroxidase action of CH₂O is shown to a less extent by AcH, while the higher homologs are inactive. The oxidation product of the *p*-C₆H₄(NH₂)₂-CH₂O-H₂O₂ system was isolated and showed a m. p. of 242-3°; hence, it was obtained in a purer form than by Bandrowski, who reported a m. p. of 230-1°. The indophenol obtained as an oxidation product in the system *p*-C₆H₄(NH₂)₂-*o*-MeC₆H₄OH-CH₂O-H₂O₂ was also isolated and gave a m. p. of 155°. A. W. DOX

Studies on the formation of pigments. III. Fermentative micro-detection of 3,4-dihydroxyphenyl- α -aminopropionic acid along with tyrosine. HANS SCHIMALFUSS AND HANS WERNER. *Fermentforschung* 8, 423-7(1925).—By means of test papers prepd. from the hemolymph of *Archia caju* comparative studies were made of the rate and intensity of pigment formation from 3,4-dihydroxyphenyl- α -aminopropionic acid (I) and tyrosine. At a diln. of 0.014 mg. per cc I can be detected in the presence of 28 times this amt. (cold satd. soln.) of tyrosine, the latter alone giving no color in 20 hrs. Most of the pigment develops in a comparatively short time, the rate and intensity of the reaction being proportional to the concn. of enzyme and chromogen. Adrenaline-HCl reacts only in very dil. soln. because of the destructive action of the acid component on the enzyme. A. W. DOX

Malt amylase. I. Determination of dextrinizing and saccharifying action of amylase. II. Influence of various experimental conditions on amylase action. TU. SABALITSCHKA AND C. SCHULZE. *Fermentforschung* 8, 428-48(1925).—Comparative studies of the dextrinizing and saccharifying power of amylase preps. under various conditions were made on aliquots of the digestion mixt. Saccharifying power was detd. by treatment with 0.1 N NaOH and I, the oxidation being allowed to proceed 20 min. and the excess I then titrated with 0.1 N Na₂S₂O₄. Dextrinizing power was detd. by treatment with I in KI soln. and comparing the resulting color with a color scale prepd. by mixing solns. of Prussian blue, carmine, Na nitroprusside, CoSO₄ and K₂CrO₄ in varying proportions. No difference was found between the action of filtered and unfiltered amylase soln. After standing 24 hrs. a very slight acceleration of dextrinizing action was observed. The optimum starch concn. for detus. by the method employed was 0.5%, since a lower concn. results in achromic products and a higher concn. leaves unchanged starch, which interferes with the color comparisons. For the same reason, the optimum concn. of enzyme prepn. was found to be 0.2%. III. Influence of adsorbents on the dextrinizing and saccharifying action of amylase. *Ibid* 149-63. Treatment of amylase soln. with various adsorbents, viz., linden charcoal, kieselguhr, animal charcoal, sponge charcoal, alumina and kaolin, showed no difference in effect on the dextrinizing and saccharifying action. Regardless of the amt. of enzyme removed by adsorption, the 2 curves ran parallel in every case. The evidence supports the view that dextrinizing and saccharifying action are not functions of 2 sep. enzymes. IV. Influence of caffeine and aldehydes on the dextrinizing and saccharifying action of amylase. *Ibid* 464-73.—Neither 0.3% caffeine nor 0.06% sulfonal has any influence

on amylolytic activity. CH_2O at 0.0006–0.006% accelerates the action, at 0.02% it shows no effect; at 0.06% it is strongly inhibitory. AcH and EtCHO are without effect at low concns. and inhibitory at higher concns. Notwithstanding these variations in effect upon amylase, the curves for dextrinizing action and saccharifying action ran parallel in every case.

A. W. Dox

Some scleroproteins. ZDENKO STARY AND INGOMAR ANDRATSCHKE. *Z. physiol. Chem.* **148**, 83–98(1925).—With respect to N distribution, individual scleroproteins differ more from each other than they do from ordinary proteins. The peculiar properties they have in common are probably due to other characteristics such as anhydride linkages. Detn. of N in the various fractions in 6 scleroproteins gave the following results:

	NH_2N	Humic N	Diamino an- cystine N	Mono. N
Human hair	7.93	2.02	28.14	61.9
Gorgonin	3.36	1.11	22.76	72.78
Spongin	6.24	1.49	14.73	77.54
Conchiolin	4.17	6.16	19.33	70.34
Bysus	5.55	4.51	16.02	73.91
Ovokeratin	3.51	2.73	20.91	72.85

A. W. Dox

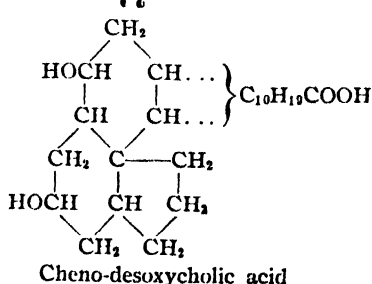
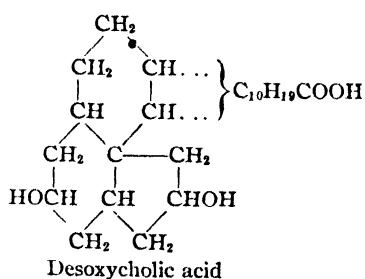
The two-phase action of hormones. The antagonistic actions of internal secretions. H. ZONDEK AND H. UCKO. *Z. physiol. Chem.* **148**, 111–23(1925); cf. *C. A.* **19**, 1868. Not only is the action of hormones increased or decreased by the addn. of electrolytes, such as salts of Ca, K, Mg, or by a change in the H^+ -ion concn., but under certain conditions the direction of activity is reversed. Certain hormones are known to be mutually antagonistic, e. g., thyroid and thymus, thyroid and pancreas, pancreas and suprarenals. It is now shown that one and the same hormone may function in opposite directions. The 2nd phase, which appears to be a reversal of the primary action, had already been observed in the case of adrenaline, pituitrin and insulin, but was regarded as a "reaction" due to a protective device of the living cell which tended to compensate the shock resulting from the poison administered. A study of the effect of insulin on the blood sugar picture of rabbits shows that the administration of min quantities of the hormone such as would function in the normal physiol. process demonstrates clearly the 2nd phase where a rise in blood sugar occurs. For the purpose of maintaining physiol. equil. as regards blood sugar, metabolism, etc., the 2nd phase of the hormone action is as necessary as the 1st phase. Moreover, the injection of a combination of hormone with CaCl_2 or MgCl_2 results frequently in an immediate rise in blood sugar above the normal, whereas the CaCl_2 alone is without effect. The 2-phase antagonism is not peculiar to the hormone itself, but is detd. rather by changes in the cell medium. Cf. Karger (*C. A.* **19**, 2527).

A. W. Dox

The bile acids. XIV. MARTIN SCHENCK. *Z. physiol. Chem.* **148**, 218–24(1925); cf. *C. A.* **19**, 2675.—From sheep bile, after sapon., treatment with various solvents and sepn. of the Ba salts, 4% of cholic acid and 0.4% of chenodeoxycholic acid were obtained. The amts. correspond to those previously obtained from goat bile.

A. W. Dox

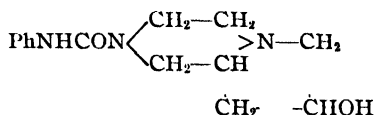
Cheno-desoxycholic acid. II. A. WINDAUS AND A. VAN SCHOOR. *Z. physiol. Chem.* **148**, 225–31(1925).—Desoxycholic acid from beef bile and cheno-desoxycholic acid (I) from goose bile are isomers differing merely in the location of the 2 secondary OH groups. These groups represent the point of attack when the cyclic nuclei are ruptured by oxidizing agents, and from the character of the oxidation products the location of the OH may be detd. The probable formulas are:



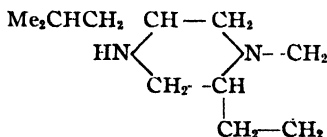
Oxidation of I with NaOBr gives *cheno-desoxybilibanonic acid*, m. 253° in 30% yield. This represents a rupture at the same point as in the oxidation of cholic acid to bilibanic acid. *Me ester*, m. 107°, was prepd. by esterification with CH_2N_2 . The location of the other OH is shown by the oxidation of cheno-dehydrodesoxycholic acid (II) to cheno-desoxybilibanonic acid (III), an isomer of desoxybilibanonic acid and of isodesoxybilibanonic acid; hydrogenation of III then gives lithobilibanonic acid, the constitution of which is known. By treatment of II in AcOH with HNO_3 nitration occurs with formation of a *dinitroketotricarboxylic acid*, $\text{C}_{24}\text{H}_{34}\text{N}_2\text{O}_{11}$, m. 222°. *Tri-Me ester* m. 156°. A. W. D.

Iron studies. I. The action of digestive enzymes on the hemoglobin iron. GEORGE BARKAN. *Z. physiol. Chem.* **148**, 124-54 (1925).—Detns. by the thiocyanate method in the ultra-filtrate showed that 0.4% HCl liberates a small amt. of Fe from blood but this is not due to a cleavage of hemoglobin. The liberation occurs immediately and does not increase when the action of the acid is prolonged. The amt. is equiv. to $1/18-1/20$ of the hemoglobin Fe. Salts of both Fe^{++} and Fe^{+++} added to the blood are recovered quant. in the case of pepsin digestion but only 68-78% in the case of trypsin digestion. Neither pepsin nor trypsin alone nor the 2 in combination causes any perceptible cleavage of Fe from hemoglobin. A. W. DOX

Further studies on the structure of proteins. Anhydride formation from di- and tripeptides. Reduction of gelatin. EMIL ABDERHALDEN AND ERNST SCHWAB. *Z. physiol. Chem.* **148**, 254-63 (1925).—The difference in stability of various proteins toward digestive enzymes appears to depend upon the presence or absence of diketopiperazine rings. The proteinoids contain such groupings, while the proteins which are directly concerned in cell metabolism represent more labile structures. Stability may depend further upon the nature of the amino acids which comprise the diketopiperazine ring, or on the substituent groups present. In a study of the secondary formation of diketopiperazines from dipeptides by heating in glycerol it was found that the yields vary considerably with different peptides. Leucylglycine gives a much better yield of the anhydride than does glycyltyrosine. *Leucyl (glycylleucine anhydride)*, m. 263° (decompn.), obtained by heating leucylglycylleucine in glycerol 8 hrs. at 180-90°, represents a diketopiperazine with an amino acid substitution. A further insight into the structure of the protein mol. may be obtained by reduction without preliminary hydrolysis. Finely powdered gelatin was treated with Na and EtOH, whereupon considerable NH_3 was evolved. The product was neutralized, evapd. to remove EtOH, made alk. with NaOH and extd. with CHCl_3 and Et_2O . By treatment of the ext. with PhNCO a cryst. substance was obtained which represents a condensation product of glycine, hydroxyproline and PhNCO . It decomp. 198° and the structure is believed to be



After hydrolysis by means of HCl to remove PhNH_2 and CO_2 , the piperazine-HCl was obtained in crystals decomposing 190°. From this the Me ether, m. 195°, was prepd. by treatment with CH_2N_2 . In the same manner a 2nd piperazine was obtained from the mother liquor. It is comprised of leucine and proline, m. 181°, and corresponds to the formula:



A. W. DOX

Arginase. II. The determination of arginase in animal organs. S. EDLBACHER AND H. RÖTHLER. *Z. physiol. Chem.* **148**, 264-72 (1925); cf. C. A. 19, 2675.—The arginase unit selected represents the amt. of arginase which liberates from 10 cc. of a 1% soln. of arginine carbonate at p_{H} 9.5 (glycine-NaOH-NaCl buffer) in 60 min. at 38° an amt. of urea which forms 0.34 mg. NH_3 when treated with urease and detd. by the Folin acration method. The glycerol exts. of liver, testes and other organs gave arginase curves of uniform character, the exception being the arginase of the kidneys of birds where the curve assumes a somewhat different form, the extent of cleavage here being proportional to the amt. of enzyme. This anomaly is attributed to the presence of

inhibitory substances. The most accurate detns. are obtained with solns. contg. 4-30 arginase units, and for higher values corresponding dilns. should be made. **III. Arginine metabolism and sexuality.** *Ibid* 273-82.—Both with birds and mammals the arginase content per g. of organ (liver, testis, kidney) is greater in the male than in the female. For domestic fowl the av. values are: male 0.336, female 0.227 units. The enzyme is therefore closely related to reproductive function. In mammals the arginase content of the testes is much greater after than before puberty. In general the arginase values for the female are 60-70% those of the male, in spite of the large differences in abs. values between mammals and birds. The high values for the avian kidney indicate that this organ functions not merely as an excretory organ but has to do also with the sex function of birds. Spleen, thyroid, pancreas, intestinal mucosa, muscle and heart were in all cases negative, while placenta and thymus contained small amts. of arginase. Enzymic cleavage is, however, only 1 possibility in the process of intermediary arginine metabolism; it is probable that oxidative conversion into creatine occurs, especially before puberty or after castration. A. W. Döx.

Bacterial arginase. A. KOSSEL AND F. CURTIUS. *Z. physiol. Chem.* **148**, 282-9 (1925).—By means of flavianic acid (1-naphthol-2,4-dinitro-7-sulfonic acid) the residual arginine from enzyme expts. may be pptd. quant., then converted into the sulfate and examd. polarimetrically. In expts. where the source of arginase was an emulsion of *pyocyanus* approx. 50% of the arginine was thus recovered and showed *l*-rotation. The enzymic cleavage of *dl*-arginine is therefore asymmetrical, contrary to the statement of Hino (*C. A.* **18**, 2538). Not all strains of *pyocyanus* contain arginase, and the presence of the enzyme in a given strain is variable. Addn. of boiled ext. of liver produces no activation. Living cultures, even though arginase-free, break down *dl*-arginine completely, probably by oxidation. A. W. Döx.

The natural synthesis of amino acids and its experimental reproduction. F. KNOOP AND HUBT OESTERLIN. *Z. physiol. Chem.* **148**, 294-315 (1925).—The possibility has been previously suggested that the biol. synthesis of amino acids may involve the hydrogenation of unstable hypothetical imino acids which might be regarded as intermediate stages in both synthesis and degradation and therefore give the reaction a reversible character. Such imino acids, or hydroxyamino acids, have not been isolated, presumably because of their instability, but a system contg. a mixt. of α -keto acid and NH_3 should answer the same purpose for catalytic hydrogenation studies. It was found that α -amino acids can actually be synthesized in good yields by this procedure. α -Ketobutyric acid and NH_3 in EtOH or H_2O when hydrogenated in the presence of Pd black gave 58% of α -aminobutyric acid; with MeNH_2 in place of NH_3 the product was 62% of methylaminobutyric acid. Other examples described are: trimethylpyruvic acid \rightarrow pseudoleucine; oxalacetic \rightarrow aspartic acid (26%); α -ketoglutaric \rightarrow glutamic acid (23%); levulinic \rightarrow α -aminovaleric acid (30%), phenylglyoxylic \rightarrow phenylaminoacetic (60%); phenylpyruvic \rightarrow phenylalanine (62%); phenylketobutyric \rightarrow phenylaminobutyric (65%), benzoylacetic \rightarrow phenyl- β -alanine (30%). Since only NH_3 and MeNH_2 , but not Me_2NH , allow the org. fixation of N in this manner, the mixt. reacts presumably as an imino acid, and the H is added at the double bond β - and γ -keto acids give much less amino acid or none at all. In many cases where the formation of amino acid encounters difficulties the hydroxy acid is formed instead. Such a reduction to the alcohol stage, which is a frequent occurrence in the animal organism and in bacteria, occurs less readily in the above procedure. The ease of reaction between NH_3 and α -keto acids makes it appear probable that this is the natural mode of amino acid formation. It explains also the necessity of urea formation in the animal body. Even though the amino acid synthesis plays only a minor role, the reaction is reversible and the NH_4 ions must be removed before the utilization of protein fragments can proceed. This is accomplished by conversion into urea. A. W. Döx.

Transformation products of the pigments from flesh and blood. VI. A transformation product ("copratin") originating from α -hematin by intestinal putrefaction and the related porphyrin; copratin and the pyridine blood test. O. SCHUMM. *Z. physiol. Chem.* **149**, 1-18 (1925); cf. *C. A.* **19**, 3493.—Spectroscopic examn. of feces, obtained from normal individuals on a mixed diet and from patients with bleeding in the region of the digestive tract, and treated with pyridine and $(\text{NH}_4)_2\text{S}$ or N_2H_4 , H_2O shows the presence of a new pigment differing from the so-called pyridine-hemochromogen. The pigment, for which the name *copratin* is proposed, does not result from the action of pyridine on blood or hematin, but from intestinal putrefaction of α -hematin. It is characterized not only by the pyridine reaction but also by its conversion into a new porphyrin, *copratoporphyrin*, when treated with N_2H_4 , H_2O -AcOH. This differs strikingly from the α -hematoporphyrin obtained from hematin by the same treat-

ment. The porphyrin of coproatin when boiled with $\text{Fe}(\text{OAc})_2$ in AcOH forms an Fe deriv. which shows the same peculiar pyridine reaction as the original coproatin. In this manner the striking difference between coproatin and hematin has been established. The enterogenous origin of coproatin from α -hematin is shown by its presence in the feces of healthy persons on a diet contg. blood or hematin and of patients suffering from stomach bleeding (ulcer, carcinoma). The relative proportions of hematin and coproatin are variable. Bacterial fermentation outside of the human body also gives rise to a pigment probably identical with coproatin. A. W. DOX

The bile pigments. XVII. Copper bilirubin. WM. KÜTSEER. *Z. physiol. Chem.* **149**, 30-43(1925); cf. *C. A.* **19**, 1705.—A Cu complex of bilirubin is easily obtained by treating bilirubin soln. in NH_4OH with CuSO_4 , shaking the mixt. 15-20 min. until the color becomes emerald green, then pptg. the Cu complex by addn. of AcOH . The complex exists in 2 modifications, an amorphous form which can be crystd. from EtOBz and a cryst. form obtained from pyridine soln. It is very stable; it does not oxidize in alk. soln., does not add CH_3N , and is not decompd. by acids. Esterification gives a di-Me ester which forms a tri-HCl salt. By the introduction of Cu the "sensitive" place of the bilirubin mol. is protected and the stability of the mol. greatly increased. An OH remains which can be methylated or benzoylated. Reduction with Na amalgam results in the formation of mesobilirubinogen. Treatment with Zn dust and AcOH probably ruptures a pyrrole ring with liberation of NH_3 . An Fe complex was also prepd. by treating bilirubin with $\text{Fe}(\text{NH}_4\text{SO}_4)_2$ and NH_4OH and pptg. with AcOH . A. W. DOX

The reductase (dehydrogenase) of yeasts. I. HANS V. EULER AND RAGNAR NILSSON. *Z. physiol. Chem.* **149**, 44-51(1925).—The crude co-enzyme ext. from yeast contains a co reductase which activates the decolorization of methylene blue. It is not identical with co-enzyme. It is more easily washed out from bottom yeast H than from top yeast R. The co reductase from dried yeast (MeAc yeast) activates the methylene blue reduction of washed muscle and may therefore be identical with the co-reductase of muscle. A. W. DOX

Inhibition substance of fermentation. KARL MYRBACK. *Z. physiol. Chem.* **149**, 52-9(1925).—A cold H_2O ext. of veal contains a substance which inhibits yeast fermentation. This inhibition substance is adsorbed by kaolin and by $\text{Al}(\text{OH})_3$, and a complete elution may then be effected by 3% phosphate soln. (p_{H} 6.2) but not by H_2O . The substance is destroyed by boiling and is not diffusible through collodion. Elution from the $\text{Al}(\text{OH})_3$ sorbate gives a product 10 times as pure as the original ext. Bottom yeasts are strongly inactivated while top yeasts are not inactivated but even show a slight activation, probably due to the presence of co-enzyme and zymophosphate in the muscle ext. In their behavior toward the inhibition substance bottom yeasts and top yeasts thus show a striking difference. A. W. DOX

The natural porphyrins. XVII. A new conversion of uro- into coproporphyrin and some derivatives of these porphyrins. HANS FISCHER AND JOSEF HILGER. *Z. physiol. Chem.* **149**, 65-70(1925); cf. *C. A.* **19**, 2676.—Assuming that the carboxyls in uroporphyrin are present as malonic acid groupings, it should be possible to convert uro- into coproporphyrin by the expulsion of CO_2 by heat. This reaction was found to occur at 180° with evolution of CO_2 corresponding to 4 CO_2H groups, and in the residue coproporphyrin was identified by means of its Me ester. Fuming HNO_3 converts uroporphyrin Me ester into a new porphyrin, m. 256° , which is not identical with coproporphyrin Me ester since the mixed m. p. shows a depression of 40° . The substance forms a cryst. Cu salt m. $286-7^\circ$ (decompn.). The coproporphyrin Me ester when treated with HNO_3 in the same manner forms a dinitro ester, m. 182° . Complex Cd and Mn salts were obtained from the copro-ester, but Ni_2OH was without action. A. W. DOX

Studies on desmotropic forms of diketopiperazines. EMIL ABERHALDEN AND ERNST SCHWARZ. *Z. physiol. Chem.* **149**, 100-2(1925).—After heating a mixt. of glycine anhydride, tyrosine and glycerol in an oil bath 5 hrs. at $190-200^\circ$ and extg. the condensation product with CHCl_3 , a residue remains which crystallizes from EtOH and decomp. 282° . The analysis corresponds to that of glycine anhydride. The substance is believed to be the tautomeric form of glycine anhydride, $\text{HNCH}=\text{C}(\text{OH})\text{NHCH}=\text{C}(\text{OH})$. Unlike ordinary glycine anhydride it reacts with

CH_3N_2 to form a methyl ether, m. below 100° . Heating of glycine anhydride alone with glycerol gave the same product but in smaller yield. A. W. DOX

The importance of the lipoids and their relation to cell equilibrium. M. RUBNER. *Klin. Wochschr.* **4**, 1849-53(1925).—A bibliographical review. MILTON HANKE

Autolysis of the thyroid gland. V. FERRERO. *Arch. sci. med.* **47**, 294-301 (1925).—In small pieces of the canine thyroid subjected to aseptic autolysis there occurs from the 4th to the 16th hr. a gradual destruction and final complete dissolution of the alveolar colloid, preceding the alterations occurring in the thyroid tissue itself. This is believed to indicate the presence in the gland of an enzyme capable of rendering the colloid sol. and hence capable of absorption during life. M. HEIDELBERGER

Cytochrome, a respiratory pigment, common to animals, yeast and higher plants. D. MELIN. *Proc. Roy. Soc. (London)* **98B**, 312-39 (1925).—Cytochrome is an intracellular respiratory catalyst which is common to animals, bacteria, yeast and higher plants. It is easily oxidized by air and reduced by the normal activity of cells or by a chem. reducing agent. In the reduced state, it has a characteristic absorption spectrum with 4 bands at approx. the same position for all species of organisms (plant or animal): 6046, 5665, 5502, 5210 A.U. the band at 6046 A.U. is composed of 3 secondary bands. In the oxidized state, definite absorption bands do not occur, merely faint shading at 520-540, 550-570. Cytochrome is present in greatest concn. in the thoracic wing muscles of flying insects, striated muscles of birds and mammals, and bakers' yeast. $\text{Na}_2\text{P}_2\text{O}_7$ and 0.0001 *N* KCN stop the oxidation of cytochrome, but do not prevent the reduction of its oxidized form by the cell; alc., HCHO, and Et urethan do not prevent the oxidation, but inhibit the reduction by the cell. Under natural conditions in the living animal, cytochrome is present in either the oxidized or the partially reduced form. The spectroscopy reveals the equilibrium between the rate of oxidation and the rate of reduction at a particular time in the animal organism. Cytochrome consists of 3 hemochromogen-compds., 2 of which contain an Fe-pyrrole nucleus; it yields 3 hemochromogens which form compds. with O_2 and CO; it is entirely distinct from muscle-hemoglobin (myochrome, myoglobin). Cytochrome and its derivs. are at least partly responsible for the peroxidase reactions of organisms. A hemochromogen-like complex (modified cytochrome) and cytochrome itself occur in the uncolored portions of plants, and yield strong KOH characteristic hemochromogens which form compds. with O_2 and CO. Cytochrome is present in aerobic bacteria. The oxyhemoglobin of muscle differs from that of blood only by a slight shift of the absorption bands toward the red end of the spectrum. JOSEPH S. HEPBURN

Experimental study on the excretory activity of the kidneys after injection of secretin from plants with remarks on the work of Halliburton and Souza on the action of spinach secretin. M. DOBREFF. *Z. ges. expil Med.* **46**, 215-23 (1925).—The intravenous or subcutaneous injection in dogs of secretin from plants (spinach, nettle) caused hyperglucemia and glucosuria with a diminished diuresis, the latter due perhaps to a lowering of blood pressure by the secretin. The method described by Halliburton and Souza (*Arch. intern. physiol.* **18**, 231-41 (1922)) for extg. plant secretin does not suffice for obtaining a good yield of active secretin. Hydrolysis with concd. HCl or H_2SO_4 , or very long extn. with boiling H_2O is necessary. HARRIET F. HOLMES

The colloidal state of protein solutions. H. R. KRUYT. *Chem. Weekblad* **22**, 473-5 (1925); cf. Kruyt and Tendeloo, *C. A.* **19**, 3192.—The views of Loeb, Hoffmann and Gortner, Pauli, and others are summarized. The minimum of the alc. no. at the isoelec. point is considered as a necessary consequence of the lower degree of hydration corresponding to the lower charge, since the two factors are interrelated. Tendeloo's results showing that the state of protein is not detd. by p_H alone stress the analogy between proteins and suspensoids against the theory of true NH_2 acid solns. In all probability protein solns. are colloidal systems governed by laws, which in other systems have been recognized as electrocapillary phenomena. MARY JACOBSEN

The chemical state of protein solutions. I. M. KOLTHOFF. *Chem. Weekblad* **22**, 489-94 (1925); cf. *C. A.* **12**, 2575; **17**, 2589; **18**, 2716, 3608.—Proteins are chem. individuals, ampholytes with individual min. equiv. wts. with respect to H^+ and OH^- , the free CO_2H and NH_2 being responsible for the acid and alkali binding capacity. The difficulties by which the adsorption theory is faced and its failure to explain the mechanism of the reactions with alkalis and acids and the influence on these reactions of polyvalent ions with opposite charge is pointed out. The chemist is concerned with the applicability of the mass action law to protein-electrolyte systems. There seems to exist a relation, although not a simple one. In studying the problem it must be borne in mind that the behavior is governed not by the concn. of H^+ or OH^- alone, but by the activity coeff. of all the ions present in the soln. The protein particle in HCl soln., e. g., carries a double layer of H^+ and Cl^- spread uniformly over the entire surface. It is important to establish the state of the double layer and the influence of the valency and the chem. nature of both the ions on the electrolyte binding capacity of the protein. MARY JACOBSEN

The presence of argon in living cells. AMÉ PICTET, WERNER SCHERRER AND LOUIS HELFER. *Helvetica Chim. Acta* **8**, 537-45(1925); cf. *C. A.* **19**, 2687.—The presence of A in yeast, beef blood clot and beef brain was established with the aid of an air-tight, air-free app. CO_2 was absorbed by KOH, O by pyrogallol; N was oxidized by elec. discharge and absorbed by KOH. Blanks without the biol. material gave no trace of A. One g. dehydrated yeast yielded on combustion 0.28-0.31 cc. A. Only about $1/8$ of this amt. was liberated in the course of glucose fermentation. The main part of O, N and A was evolved in the first $1/2$ hr. and their proportion varied during the fermentation. One g. dry blood clot evolved 0.84 cc., 1 g. dry brain 0.86 cc. A. Neither hemoglobin Merck nor fibrin de Haen yielded a trace of A. The conclusion is reached that A is enclosed in the living cells and liberated by their mechanical destruction. It is possibly the product of radioactive transformation of K. MARY JACOBSEN

The determination of amino acids formed by the hydrolysis of proteins. I. Total acids. EMILE CHERBULIEZ AND ROBERT WAHL. *Helvetica Chim. Acta* **8**, 571-82 (1925).—E. Fischer's and Dakin's methods for the isolation and identification of amino acids from protein hydrolysates are tedious and entail losses. A practically quant. method was developed which, however, gives the total amino acids only. After the removal of NH_3 , humin and diamine N in the usual way the remainder is benzoylated in NaHCO_3 soln. with a large excess of BzCl . Three benzoylations suffice to remove practically all N. The benzoylamino acids (I) are pptd. by acidulation. The NaOH -insol., ether-sol. ppt. obtained in the course of each benzoylation consists of the mixed anhydrides of benzoic and amino acids and of benzoylated phenols, carbohydrates, etc. The amino acids are easily recovered from this fraction as Na salts, by treatment with EtONa , while BzOH is ethylated. From the mother liquids the small, water-sol. portion of I is extd. with abs. alc. A very small amt. is lost by the evapn. of the aq. soln. because of the slight volatility of I with steam. Traces of N are present in the small amt. of resin formed. An expt. with com. casein (Hamarsten) hydrolyzed 8 hrs. by boiling with HCl showed that practically all amino acid N was recovered. Since casein contains nearly all the amino acids known this result can be considered as a proof that the method is suitable for the quant. detn. of any amino acid. In ovalbumin (Hopkins) at least 91% of the N was recovered as NH_3 and amino acids, while according to the older methods about 40% of the glucosamine N remained unidentified. Combined with a less destructive method of hydrolysis benzoylation will lead to a better knowledge of the proteins. The purity of the products could be judged only indirectly. The mode of their prepn., the soly. in NaHCO_3 and the absence of coloring matter make contamination by humin substances and colloidal products of an incomplete hydrolysis improbable. Diketopiperazines and polypeptides may be present, but their N can be considered as amino acid N. The sepn. into the individual acids or at least into less complex mixts. may be feasible by fractionating the Et esters of I. In casein about 75% was ethylated to products b_1 up to 200° and separable by fractioning. M. J.

Histological observations on pancreatic secretion. E. S. HORNING. *Australian J. Exptl. Biol. Med. Sci.* **2**, 135-8(1925).—The zymogen grains of the pancreatic cells of the guinea pig are secreted as grains (globules) into the acini, where they are rapidly dissolved. They arise in the cells mainly from the filamentous mitochondria. This suggests the enzymic nature of the latter. They also seem to contain a lipoidal substance. The zymogen grains may be secreted, not only into the acinar ducts, but also into the pancreatic blood vessels. L. W. RIGGS

Chemical mechanism of the principal fermentations of glucose. M. LEMOIGNE. *Bull. soc. chim.* **37**, 1089-1106(1925).—The fermentations are classified into the following groups: (1) Total combustion when the glucose is transformed directly into CO_2 and H_2O . (2) Simple oxidation when the glucose is converted into gluconic and glycuronic acids. (3) Simple division (*dedoublement*), when one mol. of glucose gives 2 mol. of lactic acid. (4) Division and decarboxylation, which is the alcoholic fermentation. The reactions involving lactic and pyruvic acids, glycerol and acetaldehyde as intermediate or side products are discussed. (5) Division, decarboxylation and aldolization. In this division are considered (a) the butylic, butyric, acetic and β -hydroxybutyric fermentations, and (b) butyleneglycolic fermentation. L. W. RIGGS

Hormonal and pharmacologic influence on the oxygen consumption of the blood. I. Relations of the function of the thyroid to the oxygen consumption of the blood. EISHICHIRO TSUKAMOTO. *Tohoku J. Exptl. Med.* **6**, 286-98(1925).—The blood of a rabbit fed with thyroid prepn. shows an increase in its O consumption. In Basedow's disease the O consumption of the blood is increased. Similar changes are shown with blood which has been washed with physiol. saline soln. The action of the thyroid hormone is referred to the biologic properties of the blood corpuscles. L. W. R.

Photochemical action of hematoporphyrin. HANS GAFFRON. *Naturwissenschaften* **13**, 859-60(1925).—Appreciable quantities of hematoporphyrin in human blood causes "light" disease. It was now found that a soln. of this dye in serum (p_H 7.4), exposed to light, absorbs considerable quantities of oxygen, the latter oxidizing serum protein, to which the dye is attached. By a manometric method quantities as low as 0.001 mg dye in some cc serum can easily be detd. B. J. C. VAN DER HOEVEN

Examination of some gum enzymes. G. J. FOWLER AND M. A. MALANIKAR. *J. Indian Inst. Sci.* **8A**, 221-39(1925).—Qual and quant. detns. of the enzymes in gum arabic, myrrh gum and gum from the gum oleoregin of *Boswellia serrata* were made. All three contained diastase and oxidase, the latter being direct in the case of the last 2 gums. The diastases did not act on raw starch. None of the gums was hydrolyzed by its contained enzymes. The gums contained 3.03, 3.02, and 0.16% N, resp. J. J. WILLAMAN

• PEARSON, WALTER A. AND HEPBURN, JOSEPH H. **Physiological and Clinical Chemistry.** Philadelphia and New York: Lea & Febiger, 300 pp interleaved. \$4.00, net. Reviewed in *J. Franklin Inst.* **200**, 692-3(1925).

B-METHODS AND APPARATUS

STANLEY R. BENEDICT

An application of a rubber finger cot to medico-bacteriological researches. RUDOLF DITMAR. *Rev. gen. caoutchouc* **1925**, No. 15, 10.—A rubber finger cot is constructed with bands of red and blue litmus paper, so that on contact with any tissue the reaction of the medium can be detd. and a valuable clue to the nature of the microbial reactions can be obtained. C. C. DAVIS

Pyrotannic acid method for the quantitative determination of carbon monoxide in blood and in air.—Its use in the diagnosis and investigation of carbon monoxide poisoning. R. R. SAYERS AND W. P. YANT. *Bur. of Mines, Tech. Paper* **373**, 18 pp.(1925).—Application of the carmine color produced by HbCO and tannic acid for detg. CO in 0.1 cc. blood. 0.1 cc. blood is withdrawn from the finger, dild. to 2 cc., put into a special test tube, 0.04 g. tannic pyrogallic acid mixt. added, the tube inverted several times, allowed to stand $\frac{1}{2}$ hour and compared with standards made as described below in reflected daylight. The standards made from blood which, if kept in a cool place and airtight, will retain their permanence for one to two weeks, can be prepared from human or beef blood by mixing normal blood (diluted 1 to 10) with an appropriate amt. of blood (dild. 1 to 10) exposed to 3 to 5% CO before dild. From these solns. of approx. pure HbO₂ and HbCO, respectively, mixts. are made which total 1 cc. but vary from 0 to 100% HbCO in steps of 10. These solns. are contained in a test tube of $\frac{5}{16}$ " inside diam. of clear thin glass. To each tube is added 1 cc. of a mixt. of equal parts of a strictly fresh soln. of 2% pyrogallic acid and a 2% soln. of tannic acid after which the tube is inverted twice to insure thorough mixing. The tube is immediately sealed by pouring a little melted paraffin on the tube while it is immersed in cold water to prevent overheating. The temporary seal is later made permanent by covering with sealing wax. Permanent standards can be made from pigments which will keep indefinitely by matching with the blood standards thus prepared. CO detn. in the air may be carried out by equilibrating normal dild. blood (0.1 cc. to 2 cc.) with the sample of air under consideration for 15-20 min. When the equilibration is finished the blood is poured back into the test tube which matches those in which the standards described above have been placed and the pyrogallic tannic acid mixt. added and the HbCO detd. as before. After the detn. of the % of HbCO present in the blood, the percent of CO (pCO) in parts per 10,000 may be detd. with the aid of the formula, $pCO = [HbCO/(100 - HbCO)] \times (2093/300)$. In 0.01% CO the HbCO detn. is carried out to the accuracy of ± 0.005 while with 0.15% the accuracy is about ± 0.02 . A compact field app. is described which is durable, accurate and dependable for these detns. H. J. D., JR.

The preparation of hydroxyhemin. A. HANSIK. *Z. physiol. Chem.* **148**, 99-110 (1925); cf. *C. A.* **19**, 3089.—For the prepn. of pure hydroxyhemin the crude hydroxyhemin anhydride, hydroxyhemin or chlorohemin is first converted into the K salt by repeated treatment with alc. KOH, the salt then transformed into the corresponding hemin by AcOH, alc. (CO₂H)₂ or alc. H₂SO₄, and the product finally hydrolyzed by H₂O. Hydrolysis is, however, not complete and a slight acid residue, especially AcOH or H₂SO₄, remains. Without hydrolysis α -acetylhemins can be obtained, but the prepn. of oxalylhemins was unsuccessful, and the sulfate-hemin was further altered by the action of H₂SO₄. Derivs. of α -hemin are readily changed by acids and bases into the α -pseudo modification, the β -form, or other products which interfere with crystn. The α -form

is, however, not altered by brief treatment with alc. KOH and can thus be extd. from mixts. of the transformation products. α -Prepns. sometimes yield β -salts if the alc. KOH treatment is prolonged. A. W. DOX

Method for the determination of calcium and phosphorus in small amounts of blood. KARL MYRBACK. *Z. physiol. Chem.* **148**, 197-206(1925).—The detn. of Ca is essentially the deWaard method, and the detn. of P_2O_5 a combination of the Emblen pptn. and the Neumann titration method. A. W. DOX

Factors of error in performing blood sedimentation tests. T. H. MCGAVACK. *Hahnemannian Monthly* **60**, 653-62(1925).—The sedimentation time was detd. in 13 normal individuals, 36 obstetrical cases and 21 cases of disease. The time was decreased in all conditions in which evidence existed of toxic absorption or decrease in cell vol. percentage. However, so many, factors influence the detn. that it cannot be applied at the present time with any degree of accuracy in the differential diagnosis and prognosis of disease. A bibliography is appended. JOSEPH S. HEPBURN

A viscometric method for the quantitative determination of amylase. W. C. LAYSON. *Bull. Johns Hopkins Hosp.* **37**, 281-2(1925).—The activity of amylase in various substances may be detd. quantitatively by measuring changes in the viscosity of starch soln. A starch soln. (Lintner) 2.5 times as viscous as water is most suitable. This is added to 100 cc. distd. water, boiled 1 min. and then autoclaved at 18 lbs. pressure for 15 min. and filtered through muslin. The reaction is usually p_H 5.6. This soln. should be used within 24 hrs. after prepn. Ten cc. of this soln. is placed in each of 2 Ostwald viscometers immersed in a glass water bath at 34° and the time for 5 cc. to pass through the capillary tube detd. To one of the viscometers are added 0.1 cc. to 0.4 cc. of amylase prepn. and to the other an equal amt. of the same prepn. after it is boiled to act as control. The viscosity of these is detd. at intervals of 3 or more min. for a period of 1 to 2 hrs. and the results are plotted. G. F. REDDISH

Determination of traces of Pb in organs and the changes that take place in very dilute aqueous solutions of $Pb(NO_3)_2$ (BERNHARDT) 7.

C—BACTERIOLOGY

A. K. BALLS

Are there dextrin-fermenting yeasts? STAIGER AND W. GLAUBITZ. *Z. Spiritus-ind.* **48**, 320-1(1925).—A mash prepd. from rye by treating with 12% malt for 15 mins. at 60° was divided into 2 equal portions. One portion was cooled and divided to make 3 culture solns. of 300 cc. each. Three races of yeast were added to test their power of fermenting dextrin. One culture (a) was seeded with 5 g. yeast race M, (b) with 5 g. Pombe and (c) with 5 g. Mellacci. The other half of the original mash was treated by heating to 90° to destroy the diastase, then cooled, made up to vol. and divided into 3 portions of 300 cc. each and seeded as above. It was found that in the portion not heated to 90° race M fermented dextrin slightly, while Pombe and Mellacci fermented more dextrin than race M. In the portion heated to 90° none of the yeasts fermented dextrin. C. N. FREY

D—BOTANY

B. M. DUGGAR

Effect of climate and other factors on the protein content of North Dakota wheat. C. E. MANGELS. *Cereal Chem.* **2**, 288-97(1925).—A survey of the wheat crops of 1921, 1922, 1923 and 1924 showed a high protein content in 1921 and 1923 and low in 1922 and 1924. Variation in rainfall was found not to have any effect on the protein content. High temp. in June and July characterized 1921 and 1923 when the protein content was high, while low protein years of 1922 and 1924 were characterized by subnormal temp. Low temp. in June and July are associated with high yields per acre, and the yield of protein in lbs. per acre was higher in 1922 and 1924 than in 1921-23. Subnormal temp. increases the growing season by delaying maturity and consequently a long growing season is associated with subnormal temp. and low av. protein. High protein wheat may be produced when climatic conditions favor low protein wheat if sweet clover be used as a preceding crop. Baking quality of flour of wheat showed less seasonal variation, due to compensation of varying quality in gluten. R. B.

Biochemistry of plant diseases. V. Relation between susceptibility to brown rot in plums and physical and chemical properties. J. J. WILLAMAN, N. C. PERVIER AND H. O. TRIEBOLD. *Bot. Gaz.* **80**, 121-44(1925); cf. *C. A.* **16**, 3932.—The plum varieties resistant to brown rot have a higher crude fiber content and a higher pentosan

content than the ones which are susceptible. The toughness of the skin and the firmness of the flesh decrease in all varieties as the ripeness proceeds, but it is most marked in the susceptible varieties. When the plums become ripe, and especially when over-ripe, these relations tend to disappear; and at these stages practically all varieties become susceptible to brown rot.

Physiological study of two varieties of *Ipomoea batatas*. G. R. JOHNSTONE. *Bot. Gaz.* 80, 145-67(1925).—Freshly dug sweet potatoes (Porto Rico and Triumph varieties) increase in their rate of respiration from the date of harvest until a max. is reached, then the rate gradually falls to a nearly const. level. Cured sweet potatoes do not reach so high a max. rate of respiration. Catalase, laccase, peroxidase and amylase are present, but not tyrosinase.

Relation between the development, structure and functioning of the nodules on *Vicia faba*, as influenced by the presence or absence of boron in the nutrient medium. WINIFRED E. BRENCILEY AND H. G. THORNTON. *Proc. Roy. Soc. (London)* 98B, 373-99 (1925).—In the absence of B, a defective vascular supply existed in the nodule on the broad bean, *Vicia faba*. The strands frequently were entirely absent, and, if present, were poorly developed and extended into the nodule for only a short distance. The nodules without vascular strands remained minute, and were usually buried in the cortical tissues; the bacteria failed to produce so-called "bacteroids"; and the number of nodules of macroscopic size were greatly reduced. When poorly developed strands entered the nodule, the amt. of tissue containing bacteroids was closely proportional to the extent of the strands. Very little N was fixed in plants with these defective nodules, the quantity fixed per nodule being less than one-tenth that fixed in normal plants. When vascular strands were absent from, or poorly developed in the nodule, the bacteria tended to become parasitic, attacking the protoplasm of the host, chiefly the more densely protoplasmic cells of the nodule. This change in the relationship between bacteria and host was probably due to a depleted supply of carbohydrates normally brought into the nodule by the vascular strands; as a consequence, the bacteria were compelled to utilize the protoplasm of the host as a source of energy. A bibliography is appended.

Synthesis of starch in plants in the presence of calcium and sodium salts. W. S. H. JIN. *Ecology* 6, 333-51(1925).—Leaves of plants were immersed in weak solns. of maltose or glucose to which varying amts. of CaCl_2 or NaCl were added. Different concns. were required to stop starch formation in different plants. Species growing on lime endure high concns. of CaCl_2 from 0.4 to 0.6 mol. These plants showed low tolerance to NaCl . Plants growing on soils low in lime are very susceptible to CaCl_2 . High concns. of Na are tolerated better by halophytes. A plant particularly resistant to the action of a salt will be placed at a considerable advantage on soils contg. that salt in abundance.

Variation of protein content of corn. IV. H. B. ARBUCKLE AND O. J. THIES, JR. *J. Elisha Mitchell Sci. Soc.* 41, 64-9(1925); cf. *C. A.* 17, 3726; 19, 2970.—The authors are convinced the protein content of corn cannot be changed by use of fertilizers. Climate affects the protein content of corn somewhat but type of soil affects it very little. Variation in inheritance seems to account for the great variation in different ears of the same variety. Corn with const. inheritance has a const. protein content. A. I. M.

E—NUTRITION

PHILIP B. HAWK

The mineral elements in animal nutrition. J. B. ORR. *Chemistry & Industry* 44, 964-70(1925).—A review.

The composition of the food and the need for vitamin. CASIMIR FUNK AND JUAN ANTONIO COLLAZO. *Chem. Zelle u. Gewebe* 12, 195-202(1925).—If pigeons which have been brought into vitamin-B equil. on a diet contg. 12.5% protein are changed to a food with a protein content of 25, 50 or 75% of protein, an increase in wt. occurs approx. proportional to the protein content. The converse occurs when the protein content is lowered and the carbohydrate is increased. This phenomenon is explained by the earlier conception of Funk that the metabolism of protein requires less vitamin B than that of carbohydrate.

Vitamin deficiency and pernicious anemia. N. R. DHAR. *Chem. Zelle u. Gewebe* 12, 225-7(1925).—The opinion is expressed that pernicious anemia can be traced to a lack of vitamins in the food chiefly B and C. It is probable that this disease could be cured by a vitamin-rich diet in the same way as scurvy and beriberi are.

Nomenclature of the vitamins. CASIMIR FUNK. *Science* 62, 157-8(1925).—It

seems advisable at this stage to sep. the active substances, known under the name of vitamins, into two groups, one group which contains nitrogen and is unstable to the action of alkalis to be designated as vitamines, with the original spelling retained, and another group, which does not contain nitrogen and is stable to the action of alkalis, to be designated as vitasterols. In the first class are included vitamins B (antineuritic), C (antiscorbutic), D (yeast growth promoting), and P (antipellagra). Under the classification of vitasterols are A (antixerophthalmic), E (antirachitic), and F (the reproduction vitasterol). H. J. DEUEL, JR.

Studies on the vitamin problem. IV. The influence of avitaminosis on the gastric digestion of white mice. FRANZ GROEBBELS AND FRANZ SPERFELD. *Z. physiol. Chem.* 148, 290-3(1925).—By feeding white mice a vitamin-free diet the formation of pepsin or its precursor is not inhibited, since after 10 days of such feeding much pepsinogen can be demonstrated in the gastric mucosa. On the other hand, an inhibition of pepsin secretion occurs, since the mucosa shows the same response in the digestion expt. as in starvation, *i. e.*, a storage of pepsinogen. Starvation following vitamin-free feeding appears to disturb the formation of pepsinogen, while this is not the case if starvation is preceded by a normal diet. A. W. DOX

Comparative nutritional value of white and whole wheat flour. C. U. MOORE AND JESSIE L. BRODIE. *Arch. Pediatrics* 42, 572-7(1925).—When white mice were fed properly balanced, chemically identical diets, the gain in body wt. was 4 times as great on whole wheat flour as on white flour. The consumption of food was twice as great on the whole wheat flour ration as on the white flour ration. The mice receiving white flour frequently developed paralysis and some died; their fur became clumped and abnormally oily; and they had a decreased resistance to cold weather. When they were transferred to the whole wheat flour ration, they rapidly regained body wt.; and their fur became normal. The white flour is deficient in vitamin B. From the viewpoint of nutrition (cost of food per unit gain in body wt.) whole wheat flour is far superior to white flour. A bibliography is appended. JOSEPH S. HEPBURN

Comparison and interpretation on a caloric basis of the milk mixtures used in infant feeding. G. F. POWERS. *Am. J. Diseases Children* 30, 453-75(1925).—The diln of milk mixts. with water affects the calories per unit mass, but not the percentage relationships of protein, carbohydrate and fat in the total calories. The addn. of an energy-yielding nutrient to milk affects not only the total calories per unit mass but also diminishes the proportional representation in the total calories of the protein, lactose and fat. All milk mixts. used in infant feeding, reduced to the caloric percentage formulae, are identical excepting in concn., degree of denaturation and in qual. differences. Successful feeding mixts. contain 60% of the total calories in whole milk and 40% in added carbohydrate. I. NEWTON KUGELMASS

Vitamin B in tikitiki extract prepared by the Philippine Bureau of Science. F. O. SANTOS AND E. G. COLLADO. *Philippine Agr.* 14, 243-6(1925).—Tikitiki (rice polishings) are high in vitamin B as well as antineuritic vitamin potency. A. L. M.

Experimental rickets in rabbits. HARRY GOLDBLATT AND A. A. MORITZ. *J. Exptl. Med.* 42, 499-506(1925).—Rickets have been produced experimentally in rabbits by the administration of diets deficient in the antirachitic org. factor and P but with a high Ca content. Cod-liver oil added to these ricket-producing diets prevented the development of rickets in rabbits. C. J. WEST

Deficient and surplus consumption of vitamin B: their quantitative relation to weight changes and to vitamin storage in adult pigeons. J. D. PILCHER AND TORALD SOLLMANN. *J. Pharmacol.* 26, 203-13(1925).—The retarding action of yeast administration on the loss of wt. of adult pigeons on a rice diet bears a simple proportional relation to the daily dosage of the yeast ext. (a parabolic curve). The curve of wt. loss on an exclusive rice diet is practically parallel whether it has been preceded by a period of complete or of partial vitamin B deficiency, or whether the preceding period contained full maintenance ration of yeast. If a surplus of yeast is given in the preceding period, the loss of wt. may be delayed by a week; *i. e.*, a week's (7 to 10 days) supply of vitamin B may be stored on a surplus consumption; but none is stored on a maintenance or inadequate consumption. The storage cannot be prolonged beyond this period by increasing the dosage of yeast in the preceding period. Corn diet also provides a store of vitamin that protects against weight loss for the same period (10 days). Liability to polyneuritis is apparently an individual trait, so that pigeons that show neuritis on the 1st expt. with rice and have been cured by corn diet will usually respond by neuritis when again subjected to corn diet. C. J. WEST

F—PHYSIOLOGY

ANDREW HUNTER

Phosphate and calcium content of the blood of guinea pigs and rats during varying administration of C- and A-vitamin. HANS V. EULER AND KARL MYRBACK. *Z. physiol. Chem.* **148**, 180-96(1925).—Guinea pigs are especially sensitive to the lack of C-vitamin and develop typical symptoms of scurvy, while rats respond less readily to lack of C but show rachitic changes with deficiency of A. Changes in the Ca and PO_4 content of the blood following withdrawal of C and A, resp., from the diet of the two animals were detd. The blood of normal rats averaged 0.069 mg. Ca per g. No noteworthy changes were observed in the vitamin expts. The normal blood contained 0.24 mg. PO_4 per g., the serum 0.21 mg. per cc. and the corpuscles from 1 g. of blood 0.105 mg. The values for PO_4 after the vitamin expts. were: excessive feeding of C, blood 0.0264, serum 0.229; without C, serum 0.16, corpuscles 0.067; irradiated peanut oil, blood 0.221, serum 0.205, corpuscles 0.126; without peanut oil, blood 0.171, serum 0.219, corpuscles 0.013. PO_4 values for normal guinea pigs were: blood 1.15, serum 0.31, corpuscles 0.91. After 18 days of C-free diet and development of scurvy these values became: blood 0.87, serum 0.32, corpuscles 0.76. Both total and inorg. PO_4 decreased markedly, the decrease being most striking with simultaneous deficiency of both vitamins. This decrease of phosphate in the blood is suggested as a quant. criterion in C-vitamin investigations on guinea pigs. A. W. Dox

Comparative determinations of the phosphate, calcium and magnesium content in the tibia of rats and guinea pigs. HANS V. EULER AND ROBERT JOHANSSON. *Z. physiol. Chem.* **148**, 207-10(1925).—The tibia of young rats showed a Ca: PO_4 ratio of 0.714, and of guinea pigs 0.66. A. W. Dox

The hexose concerned in biological carbohydrate metabolism. HANS V. EULER AND RAGNAR NILSSON. *Z. physiol. Chem.* **148**, 211-7(1925).—The fact that the glucose resulting from cleavage of zymophosphate, glycogen, etc., in metabolic processes is utilized much more rapidly than either the α - or β form postulates the transitory existence of an additional and less stable form which is designated γ -glucose. Further evidence in support of this assumption is furnished by fermentation expts. When glycogen is fermented in the presence of amylase, the ratio of CO_2 evolved to the glucose concn. of the medium at various stages of the fermentation is about twice that of parallel expts. with ordinary glucose. A. W. Dox

Muscular exercise, lactic acid and the supply and utilization of oxygen. XI. Pulse rate and oxygen intake during the early stages of recovery from severe exercise. R. J. LYTCHGE AND J. R. PEREIRA. *Proc. Roy. Soc. (London)* **98B**, 468-79(1925). The decrease in consumption of O_2 and in heart rate during recovery from severe exercise begin abruptly, or almost abruptly, when bodily movements cease. Consumption of O_2 decreases more rapidly than the heart rate, probably as a result of the suddenly decreased circulation rate of the blood. The intake of O_2 per heart beat decreases immediately and rapidly when exercise ends, even when there is still a considerable demand for O_2 by the tissues. **XII. Note on the technic of determining the resting oxygen intake while breathing concentrated oxygen mixtures.** J. R. PEREIRA. *Ibid* 480-4. The intake of O_2 is practically the same whether (a) air be breathed and the expired air be analyzed by means of the Haldane app., or (b) almost pure (95 to 98%) O_2 be breathed and the expired air be analyzed by means of Krogh's app. "The greater O_2 consumption found at rest while breathing rich O_2 mixts., the expired air being analyzed with the Haldane's gas-analysis app., is due to an error occurring in this case in the Douglas bag technic, viz., the incorrect assumption that the total amt. of N_2 is the same in the inspired as in the expired air. If the amts. of the inspired as well as of the expired air be measured separately by the same meter, no assumption being made as to the constancy of the N_2 , the results obtained as to the O_2 used are identical, whether breathing air or strong O_2 mixts." JOSEPH S. HEBURN

Surface tension theory of muscular contraction. A. V. HILL. *Proc. Roy. Soc. (London)* **98B**, 506-15(1925).—When a muscle fiber 1 cm. long develops a force of 1 dyne, 1.46×10^{-11} g. or almost 10^{11} mols. of lactic acid are produced. These mols. would cover an area of approx. 2.1×10^{-4} cm.² if spread out in a continuous monomol film. If the mech. response of muscle were due to a change of surface tension produced by a film of lactic acid, the requisite coeff. of surface tension would be approx. 4800 dynes per cm., or approx. 230 times the tension of an interface of olive oil and water, therefore an impossible value. In a max. contraction of a frog muscle in good condition, sufficient lactic acid is produced to form a continuous monomol film with an area approx. equal to that of the surface of the fibers composing the muscle, or to 2% of the

surface of the ultimate fibrils. Each gram of the muscle would yield approx. 0.033 mg. of lactic acid which would occupy an area of approx. 470 cm.² J. S. H.

Development of blood plasma. I. The genesis of coagulable material in embryo chicks. J. W. PICKERING AND R. J. GLADSTONE. *Proc. Roy. Soc. (London)* 98B, 516-22 (1925).—The plasma of early embryos contains an excess of material which is protective against the inception of clotting, but does not possess antithrombic properties. At the stage of development prior to the appearance of prothrombin, embryonic blood yields antithrombic material on heating to 60°. Inception of coagulation of embryonic blood may occur at room temp. prior to the agglutination and lysis of thrombocytes. Embryonic and hemophilic bloods are characterized by certain similarities of behavior. A higher concn. of Ca ions is required to permit clotting at room temp. than suffices at 40°. Apparently the impact of a definite number of Ca ions in a definite period of time is an essential factor in the inauguration of coagulation. An increase in the H-ion concn. of the embryonic plasma, produced by its neutralization to litmus, causes clotting at room temp.; the H ions apparently function as a catalyst and cause clotting. •

JOSEPH S. HEBBURN

Recent advances in science: physiology of reproduction. JOHN HAMMOND. *Science Progress* 20, 232-6(1925).—Review of recent work on the influence of the internal secretions on reproduction.

JOSEPH S. HEBBURN

The lipid content of the corpus luteum. HERMSTEIN. *Arch. Gynaekol.* 124, 739-70(1925).—Chemical analyses were made of the corpus luteum from 12 human ovaries at three stages of development. The weight and H₂O content were found to vary but were independent of the stage of development. There was no relation between H₂O content and total lipid content. The total lipid content varied little, though it was slightly higher just before the menses. At height of development the corpus luteum contained chiefly cholesterol, cholesterol esters and phosphatids. After the menses the complex lipoids are less abundant and more fatty acids, neutral fat and soaps are present. Phosphatids are abundant in all phases, particularly at the height of development. The chemical study in general confirms histological studies on the corpus luteum, except that more neutral fats and fatty acids are found in the earlier stages by chemical analysis and phosphatids are found abundantly in the retrogressive phase. H. F. H.

The sexual glands and metabolism. III. The influence of injections of testicular or ovarian emulsions upon the nitrogen and gaseous metabolism of dogs and rabbits. V. KORÉNCHEVSKII. *Brit. J. Exptl. Path.* 6, 158-72(1925).—Exptl. data and observations on patients indicate that testis and ovarian tissue proper contain a hormone or hormones which increase N metabolism but that of corpora lutea decrease it. The latter are only temporary glands, therefore castration in females probably may change the metabolism in either direction according to the content of corpora lutea in the ovaries removed. Expts. on thyroidectomized animals show that in spite of the close interrelationship between sexual and thyroid glands, changes in N metabolism produced by sexual hormones are not exclusively caused by an increased stimulation of the thyroid gland. There was little or no effect on gaseous metabolism of exts. from testis, ovary or corpora lutea.

HARRIET F. HOLMES

A contribution to the origin of urobilin. C. D. DE LANGEN. *Geneeskundig Tijdschr. Nederland. Indie* 65, 461-4(1925).—Urobilin was found in the cerebrospinal fluid in a case of brain hemorrhage in a newborn. This case as well as a few others described in the literature find no explanation in the enterogenous theory. Animal expts. may not be conclusive, since according to Beyers neither urobilin nor bilirubin occurs in the huge hematoma of domestic animals.

MARY JACOBSEN

Glucose, cholesterol and calcium. Their content in the blood of children and their interrelation in the chemical formula of the blood. GIOVANNI DE TONI. *Pediatrics* 33, 987-95(1925).—The serum of 6 normal fasting children of from 1 to 3 years contained in g./1000: 0.9-1.12 (av. 1.0) glucose (I) (Folin-Wu), 1.52-1.97 (1.65) cholesterol (II) (Grigaut) and 0.10-0.12 (0.115) Ca (III) (de Waard). In 28 children over 3 and under 12 years I was 0.8-1.24 (1.05), II 1.47-2.10 (1.74), III 0.1-0.115 (0.110). Generally II and III appear to be higher in children. Sometimes a higher III was accompanied by a raised II and I, in other cases no such relation was present. Comparative detns. in diseased children were inconclusive on account of the variety of the diseases. M. J.

Blood chemistry of the newborn. O. H. SHERMAN, G. W. PUCHER AND H. R. LOHNES. *Am. J. Diseases Children* 30, 496-503(1925).—Blood detns. on 23 newborns the first, third and fifth days showed in the so-called inanition fever a marked increase of blood urea N and amino acids, a marked acidosis but no decrease in the water content. Inanition fevers are not due to increased blood salt concn.

I. N. K.

Inorganic phosphorus in the blood of the newborn. E. A. RIESENFELD, I. HANDEL-

MAN AND A. R. ROSE. *Am. J. Diseases Children* 30, 646-58(1925).—1439 inorg. P detns. were made on the blood of mothers and their newborn infants. The av. of the mother's inorg. P at delivery was 3.10 mg., ± 0.019 mg. % and the newborn infant's was 412 mg., ± 0.028 . No difference was found between the white and negro mothers' or infants' blood. The inorg. P was not affected by the previous habitat of the mother, the time the mother spent out of doors during gestation. The seasonal variation of inorg. P parallels that of rickets.

I. NEWTON KUGELMASS

Methemoglobin restitution. I. *In vitro*. KYUICHI SAKURAI. *Arch. expll. Path. Pharm.* 107, 287-315(1925).—If the blood pigment of freshly defibrinated blood is to some extent converted into methemoglobin by means of amyl nitrite a spontaneous reversion of the methemoglobin occurs simply upon standing. The rate of this spontaneous change is particularly abrupt at first but gradually diminishes. The process of reversion is complete only when the amts. of amyl nitrite added are small; with the addn. of 0.05% or more the original content of oxyhemoglobin is never reached. The reversion process is markedly stimulated in both rate and degree by the addn. of organ. tissues, liver and lung being most active in this respect. Muscle and spleen are less active. With liver or lung present a complete reversion of the methemoglobin produced by the addn. of 0.05% of amyl nitrite is complete, with muscle or spleen a complete restitution is not attained. $\text{Na}_2\text{S}_2\text{O}_3$ favors the reversion; Na succinate and NaCl are inactive. No change in the reversion velocity is effected by conducting air, H, or N through the material. CHCl_3 does not impair the activity of the process. The stimulating effect of organ materials and of thiosulfate is apparently associated with reduction processes.

G. H. S

G—PATHOLOGY

H. GIDEON WELLS

Tumor immunization. N. WATERMAN. *Nederland. Tijdschr. Geneeskunde* 69, II, 577-83(1925).—Mice treated with insulin are less susceptible to the development of a tumor than normal mice following the inoculation of the same tumor cells. This important result is obtained from 3 series of expts. on mice. The amount of insulin injected was 0.2-0.5 cc. of a 0.01 normal standard solution (of the old type of units), daily for a period of 14-40 days previous to inoculation of tumor cells. In the animals treated with insulin, the tumor appears very much later than in not treated animals, and when it appears it has a different appearance, being dark red, while the regular tumor of the kind employed is greyish or light red, as observed in hundreds of control animals, also, in former exptl. work. Those dark red tumors contain only little tumorous parenchyma but much extravasated blood. W. discusses former expts. on spec and non-spec tumor immunization and assumes that in the case of immunization by means of tissue expts. an hormonal influence prevailed as well.

R BEUTNER

Serial refractometric and viscometric examinations of the blood serum in tuberculosis. M. GANSSLEN AND O. MAIER. *Z. Tuberk.* 40, 321-4(1924).—Refractometric exams. of the blood in all stages of tuberculosis revealed normal values. Serial exams. in fatal cases showed a gradual diminution before death. The albumin-globulin relation gave higher values in severe cases, with an increase of globulin in unfavorable and a decrease in improving cases. In meningitis and miliary tuberculosis globulin increase was absent. Marked tuberculin reactions, and intercurrent diseases caused a temporary increase in globulin and a lowering of the refraction.

H J. CORPER

The diagnosis of active tuberculosis, especially with the Wassermann serum reaction. HERTA KALCHER AND ARTHUR SONNENFELD. *Z. Tuberk.* 40, 420-31(1924).—The urochromogen reaction, protein content and globulin to albumin relation in the serum, is unserviceable for the diagnosis and prognosis of tuberculosis. The leucocyte count does not deviate from normal in active tuberculosis, lymphopenia is not constant, and a shift of the leucocyte picture (Arneth) to the left favors activity. Persistent lymphopenia and shift to the left of the neutrophile picture in the absence of eosinophilia is unfavorable prognostically. Accelerated erythrocyte sedimentation rate is not specific for tuberculosis. A normal sedimentation does not exclude active tuberculosis. In only 60% of cases did Wassermann's tuberculosis test show agreement between the serological and clinical findings.

H. J. CORPER

Combined tuberculin testing and erythrocyte sedimentation rate determinations in pulmonary tuberculosis. TEGMEIER. *Z. Tuberk.* 40, 442-8(1924).—Larger tuberculin doses were used than those in the original Gräfe and Reinwein combined tuberculin and sedimentation test. High temp. persisted for some time after the tuberculin injection without influencing the sedimentation rate. Definite changes in the sedimen-

tation rate can occur with active tuberculous processes but the absence, or slight changes, does not exclude active processes. A definite dose of old tuberculin could not be outlined, but observations over longer periods with increasing dosage are recommended.

H. J. CORPER

The cholesterol content of normal pigeons, of those poisoned with hydrocyanic acid and of those suffering from beriberi. N. MESSERLE. *Z. physiol. Chem.* **419**, 103-10 (1925).—The kidney, liver, brain and breast muscle of pigeons suffering from beriberi have a considerably higher cholesterol content than the same organs of normal pigeons. The difference, which is not merely relative, is greatest in the brain and breast muscle and least in the kidney. Pigeons poisoned with HCN also show an increase in cholesterol content but somewhat less marked than that of beriberi pigeons. The increased cholesterol content is probably associated with respiratory insufficiency and represents a secondary effect.

A. W. DOX

Buffer solutions in intestinal diseases. J. S. HEPBURN AND H. M. EBERHARD. *Am. J. Med. Sci.* **166**, 244-9 (1923).—Rectal injection of buffer solns. (phosphate buffer of p_H 8.043, or citrate buffer of p_H 12.364) in cases of chronic saccharo-butyric infection has produced a marked improvement in both the subjective and the objective symptoms. These buffers neutralize the intestinal acidity without the production of gas, and, therefore, are more suitable than $NaHCO_3$ for this purpose. JOSEPH S. HEPBURN

Buffer solutions and their use in intestinal diseases. J. S. HEPBURN. *J. Am. Dietetic Assoc.* **1**, 55-9 (1925).—A 0.4 N soln. of Na metasilicate, which has a p_H of 12.56, may be used as a buffer in the treatment of intestinal diseases. The reserve alkalinity, which becomes available in passing to a p_H of 7.0, is almost 25 times as great in a given vol. of this soln. as in the same vol. of a citrate buffer soln. of p_H 12.364. See preceding abstr.

JOSEPH S. HEPBURN

Inhibitory effect of blood serum on hemolysis. II. ERIC PONDER. *Proc. Roy. Soc. (London)* **98B**, 484-93 (1925).—The inhibition of hemolysis by serum is probably due to the formation of a loose phys. compd. between the lysin and the serum proteins. The reaction is not appreciably influenced by temp. within the exptl. range. J. S. H.

Cytology of tar tumors. R. J. LUDFORD. *Proc. Roy. Soc. (London)* **98B**, 557-77 (1925).—An elaborate study, with bibliography, of the tumors which are produced by regularly painting the skin of mice with tar.

JOSEPH S. HEPBURN

A physico-chemical study of the colloidal benzoin reaction. The benzoin-globulin complex. A. PAPAIOANNO. *Compt. rend. soc. biol.* **93**, 590-2 (1925).—The pptn. of globulin by colloidal benzoin is not dependent strictly upon the p_H of the soln. S. M.

Cholesterol in diabetes with arteritis. LABBÉ AND HEITZ. *Ann. med.* **18**, 108 (1925); *J. Am. Med. Assoc.* **85**, 1259.—A study of 19 cases showed that an exaggerated amt. of cholesterol in the blood of these patients does not seem to be connected with liver disturbances, albuminuria, the arterial pressure or syphilitic lesions. Cholesterol-emia is more pronounced in grave cases with acidosis, or with deficient permeability of the arteries, coinciding with reduction or abolition of the oscillometer findings. The cholesterol content is particularly high in diabetics affected simultaneously with aortitis and arteritis. Arterial obliteration in diabetes is due to localization of cholesterol in the tunica intima. While Na citrate did not display any action on the cholesterol content, insulin markedly reduced its amt.

L. W. RIGGS

Glucemia and cholesterolemia. LANDAU, *et al.* *Ann. med.* **18**, 143 (1925); *J. Am. Med. Assoc.* **85**, 1259.—A study of 16 persons, presumably normal, indicated that food rich in cholesterol and free from carbohydrates increased the content of sugar and cholesterol in the blood. Adrenaline injection, or ingestion of a large dose of sugar, raising the glucemia curve, reduced the cholesterolemia. Hunger increased the cholesterol content of the blood within the first 36 hrs., while lowering the glucemia.

L. W. RIGGS

Source of the protein in the albuminuria of experimental nephritis. C. H. KELLAWAY, G. F. S. DAVIES AND F. ELEANOR WILLIAMS. *Australian J. Exptl. Biol. Med. Sci.* **2**, 139-49 (1925).—In acute U nephritis in cats, where the damage is predominantly tubular, there is present in the urine a definite proportion of sol. protein other than that derived from the plasma, and apart from casts and epithelial debris from the tubules.

L. W. RIGGS

Immediate metabolic disturbances following deep Röntgen-ray therapy. II. Prevention and treatment of untoward reactions. H. P. DOUB, ADOLPH BOLLIGER AND F. W. HARTMAN. *J. Am. Med. Assoc.* **85**, 1299-1303 (1925); cf. *Am. J. Roentgenology* **13**, 54-64 (Jan., 1925).—In the study of 150 patients, treated with a modern deep therapy app., including a water-cooled tube, a high percentage of acute irradiation sickness was found. The rapidly developing alkalosis, and the continuation of this condition after

large doses, are confirmed by the detn. of the p_{H} of the plasma and of the urine, and by use of indicators in the tissues. A study of the expired air showed that the alkalosis is not a result of tissue oxidation or washing out of CO_2 . Expts. with dogs to find agents to counteract these disturbances proved that HCl , NH_4Cl and NaCl had but little effect. The first two of these drugs combat the alkalosis but not the sickness. Some other factor than alkalosis is concerned in the sickness. CaCl_2 , Ca lactate and morphine were beneficial. Morphine prevented the reaction in dogs and was helpful in patients treated over the abdomen. L. W. RIGGS

The etiology of incrustated cystitis with alkaling urine. B. H. HAGER AND T. B. MACARTH. *J. Am. Med. Assoc.* **85**, 1352-5(1925).—It appears that the inorg. salts which are deposited in the mucous membrane in cases of incrustated cystitis with alk. urine are due to a secondary invader, a Gram-negative bacillus, which in its growth liberates an enzyme, a urease capable of converting urea into NH_3 , thereby causing the alky. of the urine. The resulting alky. ppts Ca , Mg and NH_4 salts. The source of the bacillus (*Salmonella ammoniacae*) is the gastro-intestinal tract, and incrustated cystitis with alk. urine is caused by the implantation of the bacillus in a bladder which is already the seat of some inflammatory or tumorous lesion. Incrustated cystitis can be reproduced by expt. in lab. animals. L. W. RIGGS

Chemical analysis of sweat. A preliminary study. R. E. BARNEY. *J. Am. Med. Assoc.* **85**, 1373-5(1925); cf. Riggs, *C. A.* **6**, 505; Plaggemeyer and Marshall, *C. A.* **8**, 1144.—Fourteen normal subjects and 15 patients with eczema, psoriasis, etc., furnished the sweat which was collected in rubber blankets, and was analyzed for total solids and the usual N-partition products by standard methods. There is an apparent diminution in the output of the N constituents of the sweat in so-called senile eczema. This important finding may have an important bearing on the etiology of this condition. The 6 cases of psoriasis show no change from the normal. L. W. RIGGS

The excretion of neutral red into the human stomach. ASHER WINKELSTEIN AND J. M. MARCUS. *J. Am. Med. Assoc.* **85**, 1397-8(1925). A study of 46 cases showed that patients with normal or subnormal free HCl figures excrete the dye in a fairly const. av. time of 21 min. In hyperacidity the time of appearance of the dye is hastened to 17 min. In gastric achylia the excretion time is prolonged to 60 min. or more. In most cases the dye does not appear in the stomach. L. W. RIGGS

Modified physiological processes following the total removal of the liver. F. C. MANN. *J. Am. Med. Assoc.* **85**, 1472-5(1925). The blood sugar decreases from the instant the liver is removed. Muscle glycogen decreases concomitantly. When the blood sugar falls to a certain level the characteristic symptoms associated with low blood sugar appear, and if glucose is not administered, the animal will die in a condition of hypoglycemia. The proper administration of glucose prevents these symptoms and prolongs the life of the animal many hrs. until a different condition develops and the animal dies from causes not yet detd. The action of glucose in the hypoglycemic condition is sp. The decrease in blood sugar following hepatectomy also occurs in the condition of hyperglycemia that follows the extirpation of the pancreas. The transitory hyperglycemia that follows the administration of adrenaline, production of asphyxia and similar procedures does not occur after hepatectomy. An animal will die following the development of hypoglycemia with a considerable amt. of glycogen still present in the muscles. If the blood sugar level is maintained above normal in the hepatectomized animal, muscle glycogen will increase. Urea formation ceases immediately after removal of the liver. The amino acids, which normally would have entered into the process of urea formation, accumulate in the blood and, if the kidneys are active, are excreted in the urine. Uric acid is not destroyed, and it actually accumulates in the blood and tissues or is excreted in the urine if renal activity is maintained. A yellow pigment accumulates in the hepatectomized animal which gives a positive reaction to the chem. tests, and the spectrophotometer tests for bilirubin. L. W. RIGGS

Role of the capillaries in nephritic water retention. I. RUSZNYÁK AND D. KELLNER. *Magyar Orvosi Archivum* **26**, 277-83(1925).—The detn. of changes of refraction and salt content of the serum as well as the no. of red blood cells with nephrectomized rabbits give the same results even if the animals receive at the same time $\text{UO}_2(\text{NO}_3)_2$ and $\text{C}_6\text{H}_5\text{NO}_2$. Consequently, corresponding with the results of Bence, and in contrast to those of Richter, no active role of the capillary wall can be proved in the distribution of water in the body. L. W. RIGGS

Histological genesis of tar carcinoma. B. MELLY AND L. ORNSTEIN. *Magyar Orvosi Archivum* **26**, 306-20(1925).—Expts. with white mice showed that brushing an area with tar so as to produce chronic irritation is not the real cause but only one factor

in the production of epithelial tumors. The alterations in the internal organs, *i. e.*, nephritis, amyloidosis of the spleen and the taking up of tar granules through the reticulo-endothelial app. all prove that the changes produced by the tar are not localized in the skin.

L. W. RIGGS

The alkali content of the blood serum in healthy and diseased children. J. CSAPÓ. *Magyar Orvosi Archivum* 26, 321-4(1925).—A new method is given for the detn. of the alkali content of the blood serum. One cc. of serum from a healthy child contains on the av. the equiv. of 4.8 cc. of 0.01 N alkali of which 1.4 cc. represents free alkali and 3.4 cc. the alkalies combined with albumins. The alkali content of the blood serum changes according to the albumin content. In 100 cc. of blood serum 60 cc. 0.01 N alkali content corresponds to 1% albumin. This is called the alkali-albumin quotient. This quotient and the alkali content are markedly decreased in tuberculosis. **Acid fixation of the blood of healthy and diseased children.** J. CSAPÓ AND G. MIHALOVICS. *Ibid* 325-9.—The total acid fixation of the blood and plasma were detd. by means of the Bosanyi-Csapó method and the relation between plasma and corpuscular elements by means of the hematocrit procedure. With healthy children 1 cc. blood fixes 14-15 cc., and 1 cc. of plasma 7 cc. 0.02 N acid. The acid fixation of the blood increases or diminishes, resp., according to the red blood cell content. From the acid fixation of the blood and the plasma, as well as from the relation of the plasma to the corpuscular elements, could be calcd. the fixed acid quantity corresponding to 1 vol.-per cent of red blood cells, which amounts with healthy children to 0.27-0.31 cc. 0.02 N acid. This figure is called the acid-erythrocyte-quotient. With some children suffering from acute and chronic feverish diseases, both the acid-erythrocyte-quotient and the total acid-fixation capability of the blood was diminished, with other cases it remained normal. **Alkali fixation of the blood serum.** J. CSAPÓ AND S. HENSZELMANN. *Ibid* 330-4.—The alkali fixation of the blood serum was detd. electrometrically for healthy and for diseased children. With the former the 1% of albumin of 100 cc. serum fixes 95 to 100 cc. 0.01 N alkali. Tuberculosis and pleurisy decrease the quantity of alkali corresponding to 1% albumin. The alkali fixation of the serum is less than the acid fixation. This is because the alkali-fixing property of the serum proteins has been engaged partly by the original alkali contents of the serum.

L. W. RIGGS

Oxaluria. F. PICCININNI AND E. LOMBARDI. *Riforma Med.* 41, 726(1925); *J. Am. Med. Assoc.* 85, 1262.—P. and L. present data collected independently which demonstrate that a special strain of the colon bacillus sometimes acquires the property to produce $H_2C_2O_4$. This strain continues to produce $H_2C_2O_4$ in the test-tube, and also in persons free from oxaluria who after ingesting cultures of this strain show $H_2C_2O_4$ in the urine

L. W. RIGGS

Basal metabolism. J. STEPHANI. *Schweiz. med. Wochschr.* 55, 732(1925); *J. Am. Med. Assoc.* 85, 934.—The av. consumption of O is 6.16 cc. per min. per kg. of body wt. in the normal male, and 4.98 cc. in the female both at 760 mm. of Hg. During menstruation the latter figure is decreased about 14%. In mild cases of *exophthalmic goiter* the increase of the metabolic rate may be within the normal limits of 15%. An av. of 2% of the amt. of O that passes through the lung is absorbed in normal persons. This percentage is higher in slender persons and in toxic goiter, and is lower in the obese.

L. W. RIGGS

The blood sugar level and the adrenaline content of the suprarenals of the rabbit in diphtheritic intoxication. SHOZO MIKAMI. *Tohoku J. Exptl. Med.* 6, 299-324 (1925).—Intravenous administration of the diphtheria poison invariably causes hyperglucemia in the normal nourished rabbit, when the toxic quantity is so large that the rabbit dies within 24 hrs. following the injection. The blood sugar content begins to increase immediately after injection, reaches the max. in 3 to 5 hrs. and then decreases gradually. The poisoning depletes the adrenaline storage of the suprarenal glands. The loss is small in the first hrs., but becomes suddenly remarkable about the 6th hr., then the loss falls off so that the normal value is shown at the 8th to 9th hr. of poisoning. Double splanchnectomy arrests completely the occurrence of hyperglucemia as well as the adrenaline exhaustion, so they are of central origin. When the dose of the toxin is selected so that the rabbit can live over one day or more, though somewhat moribund, the hyperglucemia does not appear on the day of inoculation, but in 24 hrs. or later after injection hypoglucemia is unmistakably observed, at which time the suprarenal adrenaline and liver glycogen diminish to a marked degree. The double splanchnectomy cannot protect the animal from a diminution of these 3 substances.

L. W. RIGGS

Behavior of antigens in the animal body, KAKUZO SAKURABAYASHI. *Tohoku J. Exptl. Med.* 6, 390-3(1925).—Well washed pulp of organ cells after intravenous in-

jection in the rabbit disappears much more quickly than serum, and generally is not detectable directly after the injection.
L. W. RIGGS

H—PHARMACOLOGY

ALFRED N. RICHARDS

Treatment of diabetes by raw fresh gland (pancreas). R. CARRASCO-FORMIGUERA. *Brit. Med. J.* 1925, II, 552-3.—Raw fresh pancreas does not affect in the slightest a glucosuria which is rapidly reduced by a moderate dose of insulin. A. T. C.

Experimental investigation concerning the double effect of calcium on the vegetative nervous system. E. BARÁTH. *J. Nervous Mental Diseases* 62, 261-4 (1925), cf. *C. A.* 19, 347.—A résumé of work already published. In tests on hungering and resting individuals (normals and slightly pathological) injection of 5 cc. 10% CaCl_2 intravenously produces a double effect: There is an immediate marked slowing of pulse rate, Aschner's oculocardiac test becomes positive or increasingly positive, and the blood pressure increases 10 to 20 mm. (often with an initial depression). After 5 to 10 min. the pulse is again normal and Aschner's test negative. After, frequently, an initial depression, the blood sugar increases. B. concludes that in contradiction to the results of expts. on surviving organs the effect of Ca on man is manifested by a double reaction, an initial vagus excitement of short duration followed by less strong sympathetic excitement of longer duration (shown by the increase of blood pressure and sugar, and occasional adrenergic mydriasis). A. T. CAMERON

The biocatalysts of carbohydrate metabolism. II. H. V. EULER, E. JORPES AND K. MYRBÄCK. *Z. physiol. Chem.* 149, 60-4 (1925).—Co-enzyme solns. of the highest activity thus far obtained when injected into fasting rabbits showed no insulin action whatever and no toxic effect. A. W. DOX

The binding of complex bismuth salts in the serum. HUGO BAUER AND EDUARD STRAUSS. *Z. physiol. Chem.* 149, 19-29 (1925).—Sol. complex Bi salts (Na mono- and tribismuthyltartrates, glycerol-Bi, mannose-Bi) when dissolved in serum remain partly in soln. as salts, while another part enters into combination with the euglobulin fraction. Even when a large excess was used the Bi was never found combined with pseudoglobulin or albumin. The partition of the complex Bi compd. between the alkali salts and the euglobulin is detd. by an equil. which becomes displaced in one direction or the other according to the reaction. It is probable that the Bi which circulates in the blood is bound to the euglobulin fraction of the serum. A Bi compd. which is sol. in H_2O and dialyzable becomes bound to euglobulin only to a limited extent. This part, however, circulates with the blood and thus reaches the destination for its therapeutic action, while the remainder is rapidly excreted. It is possible that the latter contributes nothing to therapeutic action but on the contrary is responsible for toxic action. A. W. D.

Diffusion of mercury salts injected sub-conjunctivally. S. DEBENEDETTI. *Arch. sci. med.* 47, 261-73 (1925).—Sub-conjunctival injections of HgCl_2 solns. in white rabbits give rise to fixation of the Hg in organic combination mainly in the sub-conjunctival tissue, resorption taking place as in other parts of the body. Penetration is mechanical and only during resorption does it pass into the blood vessels serving the deeper tissues of the eye-ball. Fixation of the Hg in these tissues does not occur. M. H.

Alcohol and human efficiency: experiments with moderate quantities and dilute solutions of ethyl alcohol on human subjects. WALTER R. MILES. *Carnegie Inst. Washington Pub.* 333, 308 pages (1924).—Administration of alc. in doses of 21 to 37.5 g. abs. alc. and in concns. between 2.75% and 22% produced the following effects. The pulse rate during rest and during work, the metabolism (O_2 consumption), temp. of skin of face and of hands, and swaying of the body were increased; the amplitude of the patellar reflex and of the lid reflex were decreased; the latency of the lid reflex, the eye-reaction time, the word-reaction time, the finger-movement speed, and the velocity of eye-movement (both adductive and abductive) became slower; the visual acuity and the elec. threshold sensitivity became less keen; the coordination for the pursuit pendulum and for the pursuit-meter became less adequate; in typewriting, the strokes per sec. were decreased, while the errors and illegibility were increased; the trans-literation of letters in code was decreased. "There is no longer room for doubt in reference to the toxic action of alcoholic beverages as weak as 2.75% by wt. If 27.5 g. of alc. are taken in this form, the well-defined and measurable depression in physical and mental processes is not far short of the result found when 21 to 28 g. of alc. are taken in solns. varying from 14 to 22%. Alcoholic beverages of all strengths may be taken so slowly, in such small amts. or so dild. with food that the content in the blood remains very low and the effects likewise remain minimal." Clearly recognizable char-

acteristic subjective symptoms appeared when 25 g. or more of alc. were dild. to a concn. of 14 to 22% and administered on a relatively empty stomach. Noticeable subjective symptoms also appeared in a majority of the subjects when 27.5 g. of alc. were mixed in 1 l. of dild. grape juice, then ingested; the symptoms were most marked during the first 35 to 40 min. after complete ingestion, and most noticeable on rising, standing, or walking.

Nitrous oxide-acetylene-oxygen, the ideal general anesthetic for extraction of teeth and oral surgery. AARON GOLDMAN AND J. D. GOLDMAN. *Dental Cosmos* 67, 969-79(1925).—An elaborate discussion and description of the use of a mixt. of N_2O , C_2H_2 , and O_2 for the production of general anesthesia.

Nitrous oxide-oxygen: a review of some of the factors contributing to its successful administration. T. C. BONNEY. *Dental Cosmos* 67, 1093-6(1925).—A review.

Atropine and tropine. Effect of the tropine base on the vagus. RENÉ HAZARD. *Compt. rend. soc. biol.* 93, 515-7(1925).—Injections of either the free tropine or of its salts causes a diminution of elec. excitability or even a complete loss of the vagus. Similarly, an injection of adrenaline preceding an injection of tropine has the same effect as when atropine is used, namely, a regular rise in blood pressure, a transitory acceleration of the heart and a suppression of extrasystoles which adrenaline produces through its vagus action. The effect of the 2 drugs is therefore the same.

Intravenous silver therapy. II. Effect of the electrolytes of the body on the solubility of silver salts. K. V. NEERGAARD. *Arch. exptl. Path. Pharm.* 107, 316-48(1925).—The inorg. ions normally present in physiol. concn. other than the Cl ions have no material effect upon the concn. of Ag ions which can be reached in the body. The highest possible concn. of Ag ions is about $1/10,000$ mg. per l. The max. concn. to be attained is reduced by the administration of Br and I salts, and in pathol. conditions the presence of ionized S may very greatly reduce the physiol. max. concn. of Ag. Complex Na-Ag salts are formed in media contg. the physiol. electrolytes, and here again the satn. concn. is primarily detd. by the Cl ions. The max. concn. of the complex salts is approx. 1 mg. per l. In ordinary therapeutic procedures the satn. concn. of Ag is not reached. The reactions which govern the formation of AgCl and of complex Ag salts are intimately related, to the end of maintaining an equil.

Nervous control of secretion by the kidneys. I. AD. M. BROGSITTER AND WILH. DREYFUSS. *Arch. exptl. Path. Pharm.* 107, 349-70(1925).—The functional activities of the normal kidney are modified by atropine to a greater extent than are those of a damaged kidney. Water elimination and the excretion of NaCl, creatinine and uric acid are inhibited. Whether there is an elective action as regards functional changes is open to question. **II.** *Ibid* 371-83.—Sugar excretion in phlorhizin diabetes is inhibited by atropine, a paralysis of the parasympathetic nerve endings of the kidney. Pilocarpine very markedly stimulates the excretion, a vagus effect.

The effect of sodium arsenite on the blood sugar concentration of the rabbit and dog. II. B. VAN DYKE. *J. Pharmacol.* 26, 287-96(1925).— $NaAsO_2$ intravenously administered in doses considerably below lethal causes a distinct but variable hyperglucemia in the rabbit. Accompanying this hyperglucemia there is a reduction in the blood alk. reserve; there is no significant alteration in blood concn. as indicated by detns. of corpuscle volume or % of hemoglobin. The hyperglucemia still appears after bilateral splanchnotomy or right splanchnotomy and left adrenalectomy. $NaAsO_2$ therefore acts peripherally, in all probability by increasing hepatic glycogenolysis. The hyperglucemia may be checked or prevented by insulin. Intravenous injections of $NaAsO_2$ in the dog cause a reduction in whole blood alk. reserve, often with a slight hyperglucemia.

Skin absorption of certain gases. D. C. WALTON AND M. G. WITHERSPOON. *J. Pharmacol.* 26, 315-24(1925).—HCN gas is absorbed by the skin of dogs and guinea pigs; whether or not the outcome is fatal depends upon the concn. of the gas. H_2S is absorbed by the skin of guinea pigs but it is only lethal when large areas of the skin are exposed to the pure gas. CO does not appear to be absorbed by the skin.

I—ZOOLOGY

R. A. GORTNER

The influence of certain factors in the development of the flagellum Prowazekia (Bodo) edax. H. RAAHE. *Bull. soc. chim. biol.* 7, 842-59(1925); cf. C. A. 19, 2375. The initial intensity of development is greater the less the depth of water. Multiplication with normal development takes place most intensely where there is neither excess

nor lack of nourishment. The limit of acidity is p_{H} 4.8. Flagella will develop at an alk. of at least 9.6. A. T. CAMERON

The excretion of water and of gas by frogs submerged in water. A. T. CAMERON AND D. R. McCULLAGH. *Trans. Roy. Soc. Can.* 19, Sect. V, 99-106(1925).—The urine secretion of frogs submerged in water is normal, and is largely governed by temp. The O_2 requirement of the submerged frog is met by gaseous diffusion through its skin, which does not involve passage of water across the skin. The submerged frog liberates a small amt. of gas, chiefly N_2 ; this liberation seems to be to some extent a function of total solid surface in contact with an aq. soln. A. T. CAMERON

Digestion of cellulose by invertebrates. C. M. YONGE. *Science Progress* 20, 242-8(1925).—A comprehensive review with references to the original literature. JOSEPH S. HEPBURN

Study in the nutrition of an invertebrate, *Planaria maculata*. ROSALIND WULZEN. *Univ. Calif. Pub. Physiol.* 5, 175-87(1923). On certain diets (either starch paste or gelatin flavored with liver juice, raw egg yolk plus starch or sugar, raw egg albumin, beef fat) planarian worms decreased in size although sufficient food for growth apparently was ingested. Other diets (raw egg yolk, thyroid, muscle and white matter of the brain) maintained the worms in their original condition and even produced growth to a slight degree. Still other foods (liver, thymus, adrenal, kidney, pineal and gray matter of brain) produced rapid growth and fission. Since planarian worms are perceptibly sensitive to minute variations in the chem. compn of their diet, they are excellent subjects for nutrition expts. JOSEPH S. HEPBURN

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

The development of modern food chemistry. A. BEYTHILN. *Z. Nahr. Genussm.* 50, 14-21(1925).—An address. WILLIAM J. HUSA

The development and problems of the association of German food chemists. J. KÖNIG. *Z. Nahr. Genussm.* 50, 8-13(1925).—An address. WILLIAM J. HUSA

The mineral value of foods. RAGNAR BERG. *Z. Nahr. Genussm.* 49, 378-80(1925).—A reply to the criticism of Pfyl (*C. A.* 19, 682). B. PFYL. *Ibid.* 381 2.---Answer to Berg. WILLIAM J. HUSA

The control of foods eaten raw. H. N. BUNDLES. *J. Am. Med. Assoc.* 85, 1285-9(1925).—This address gives a history of the development of modern food control as applied to dairy products, shell fish, fruits, vegetables, carbonated beverages, raw meat and sausage. L. W. RIGGS

Study of the gases in canned foods. RAY WM. CLOUGH, O. E. SHOSTROM AND E. D. CLARK. *Univ. of Washington Publications in Fisheries* 1, 86-98(1925).—An app. for measuring the vacuum or pressure in a can of food, drawing the gases from the headspace in the can, and analyzing them, is described. The av. daily phys., chem. and bacteriological decompn. changes in 5 species of Pacific Coast salmon, canned at 24-hour intervals during a 6-day period of decompn., are tabulated. Relation between odor and % CO_2 and H_2 in the gases of headspace of the exptl. pack and also of comp. packs is tabulated. In general, as the odor of decompn. becomes more pronounced the CO_2 in the gases increases, and when there is over 20% CO_2 the product usually has a stale or tainted odor. Presence of H_2 indicates considerable decompn. has taken place; but its absence does not indicate absence of decompn. A. P. C.

Presence of indole in sea foods and other food products. RAY WM. CLOUGH, O. E. SHOSTROM AND E. D. CLARK. *Univ. of Washington Publications in Fisheries* 1, 103-8(1925); cf. Clough, *C. A.* 17, 3550.—Examination of 68 samples representing 35 different products from 66 sources showed 0.5-1.5 mg. of indole per 100 g. in 9 samples, 2.5-15 mg. in 9 samples, and 20-5000 mg. in 11 samples. No skatole was found in any of the samples. Unsatisfactory color tests were obtained from all samples which had been heavily spiced. Indole seems to be a normal constituent of some cheeses, e. g., Camembert, Camembert and Limburger. Its presence in the other cheeses in much smaller amounts indicates that it is not a normal constituent, and in some cases where it was found the cheese was clearly abnormal. Its presence in other products may be safely taken as evidence of some degree of decompn. A. PAPINEAU COUTURE

Metallic compounds in foods. M. WAGENAAR. *Pharm. Weekblad* 62, 1109 1st (1925), cf. *C. A.* 19, 2378. —The fate of metallic salts when added to food products, and the org. matter then destroyed by the $\text{H}_2\text{SO}_4\text{-HNO}_3$ method, was detd. in the

case of Sn, Sb, As, Pb, Cu, Bi, Cd, Hg and Zn. Of these, Hg was the only metal which showed any noteworthy loss due to volatilization.

A. W. DOX

Report on (the determination and identification of some) coloring matters in foods. C. F. JABLONSKI. *J. Assoc. Official Agr. Chem.* **8**, 622-6(1925).—To differentiate *guinea green B* (S. & J. No. 433) (I) from *light green SF yellowish* (S. & J. No. 435) (II) it is ordinarily sufficient to ext. a neutral aq. soln. of the dye contg. about 5% NaCl with an equal portion of AmOH, which will remove most of I and only traces of II. For quant. sepn. of the dyes ext. a HCl soln. of the dyes with AmOH and wash the AmOH ext. several times with an equal vol. of a soln. contg. NaCl 250 g., Na acetate 27.2 g., AcOH 24 cc., H₂O to 1 l.; II is extd. by the NaCl-NaOAc soln. and I remains in the AmOH. *Orange I* (S. & J. No. 85) (III), if present, will remain in the AmOH and interfere with I. To sep. the two, ext. the aq. soln. of I and III with several small portions of washed dichlorohydrin which removes all I and some III; remove III by shaking the combined dichlorohydrin exts. first with H₂O and then with NH₃ aq. (1 + 27) till the washings are colorless, and then again with H₂O; finally, dil. the dichlorohydrin with 5 vol. CCl₄ and shake with 25% alc. to remove I. *Yellow AB* (benzocazo- β -naphthylamine) (IV) and *Yellow OB* (o-toluenazo- β -naphthylamine) (V) in alc. soln. give a red coloration with strong HCl. On shaking a 0.001% gasoline soln. of the dye with an equal vol. of a mixt. of 1 part of 40% CH₂O and 4 parts Ac₂O, the dye is extd. by the Ac₂O, IV giving a red soln. and V an orange one. On treating an alc. soln. of the dye with an equal vol. of 84% aq. soln. of citric acid, IV gradually turns rose-red, and V is gradually decolorized. A method for the quant. sepn. of the two is described in detail and consists essentially in extg. IV from the gasoline soln. of the 2 dyes by means of 15% alc. by vol. contg. enough H₂SO₄ to make a 10 N soln., immediately making the alc.-H₂SO₄ soln. alk., and extg. IV by means of Et₂O. The gasoline soln. of V and Et₂O soln. of IV are evapd. to dryness at low temp. (the dyes are somewhat volatile), the residues taken up with 95% EtOH and compared colorimetrically with standard solns. (about 0.001% of the dyes). The quantity of V washed out by the acid is approx. equiv. to the quantity of IV retained by the petroleic ether. To check the detn. of IV dil. the original color soln. to a definite vol., use exactly half for extn., compare the V obtained with the original soln., IV being the difference between the two.

A. PAPINEAU-COUTURE

Collaborative study of moisture methods. G. A. SHUEY. *Cereal Chemistry* **2**, 318-23(1925). The vacuum method (a) of detg. moisture which consists of heating approx. 2 g. accurately weighed in a vacuum oven at 98-100° for 5 hrs. at a pressure not more than 25 mm. Hg was compared with the following routine methods: (b) approx. 2 g. accurately weighed are heated in an air oven at 130° for 1 hr.; (c) same as b except that the temp. was 125°; (d) same as b except that the temp. was 135°. The dishes used for samples were cylindrical Al. 18 mm. high and 60 mm. in diam. with closely fitting covers. During the heating the covers were removed. After drying the dishes were covered tightly and placed in an efficient desiccator, preferably one in which CaC₂ or freshly ignited CaO was used as desiccating agent. The mean of all averaged results from each of the 4 methods studied are as follows: Vacuum 13.38%, (b) 13.25%, (c) 13.218%, (d) 13.306%. Methods b and c compare most favorably with the vacuum method. Data obtained by S. justifies a further study with view to adoption of routine method as a rapid and quick one for mill labs.

RUTH BUCHANAN

Gasometric calcium carbide method for the determination of moisture. W. A. JAKOWENKO. *Z. Nahr. Genussm.* **49**, 360-70(1925). The moisture in bread, flour and other materials was detd. by the gasometric CaC₂ method. In the case of vegetable substances the C₂H₂ was evolved rapidly at first, then at a constantly decreasing rate, while in the case of crust hydrates the rate was const. J. concludes that in amorphous vegetable substances moisture is held in the form of absorption compds.

W. J. H.

Report on (the determination of moisture in) wheat flour. G. C. SPENCER. *J. Assoc. Official Agr. Chem.* **8**, 667-70(1925), cf. C. A. **19**, 1315. Two methods are recommended: a standard or referee method consisting in drying 2 g. to const. wt. (about 5 hrs.) at 98-100° at an abs. pressure of not over 25 mm.; and a routine method consisting in heating 2 g. for 1 hr. at 130° at atm. pressure. Collaborative work showed that the 2 methods give concordant results.

A. PAPINEAU-COUTURE

Note on weight losses of bread. C. B. MORISON AND L. P. GREBER. *Baking Tech.* **4**, 304-6(1925).—The initial moisture content of bread made under known conditions was taken 1 hour after baking and then the bread was exposed on a shelf in the lab. permitting free ventilation and weighed at approx. 24-hour intervals for 40 days. From the 16th day the moisture shows only slight deviations according to general

atmospheric conditions. The moisture content of the bread at the 16th day as calcd. from the initial moisture content and weight of the bread 1 hour after baking and the loss in weight for 16 days ranged from 9.2 to 11.3%.

RUTH BUCHANAN

(Determination of) glutenin in flour. P. F. SHARP. *J. Assoc. Official Agr. Chem.* 8, 678-9(1925).—Preliminary work on the extn. of other proteins from flour by various solvents, preliminary to detg. glutenin, gave the following results: boiling with 0-100% EtOH for 1 hr. under a reflux condenser removed more protein than shaking mechanically for 1 hr.; 5% K_2SO_4 , KCl, $MgSO_4$ and $CuSO_4$ on shaking mechanically for 1 hr. removed more protein than 10% solns. of the same salts; 10% $MgCl_2$ removed more protein than 5% soln.; $MgCl_2$ removed nearly twice as much protein as the other salts used; H_2O removed more protein than any of the salts except $MgCl_2$; the amount of protein extd. by 70% alc. from the residues from the salt extns. was slightly affected by the nature of the salts, but considerably decreased in the case of $CuSO_4$. The results would require confirmation on other flours.

A. PAPINEAU-COUTURE

Report on sampling of flour. G. J. MORTON. *J. Assoc. Official Agr. Chem.* 8, 680-6(1925).—From the results of exptl. work which is described, M. recommends the following method of sampling: draw by means of a suitable trier inserted with light pressure and slow rotation through the middle of the top of the sack (placed in a horizontal position) a core of uniform diameter and from a depth approx. equal to the distance from the edge to the center of the sack; sample at least 10 sacks from 100, 15 from 300, 20 from 600, 30 from 1000; place the composite sample immediately in air-tight containers without mixing; prep. the sample by passing the flour 3 times through a domestic flour sifter, no further mixing being necessary. The trier devised for this purpose is made of heavy sheet Cu, and measures 12 in. long by 1 in. in diameter at the forward end and 1.75 in. at the rear end, and bears marks indicating the different depths.

A. PAPINEAU-COUTURE

Report on (the determination of) chlorine in bleached flour. ARMIN SEIDENBERG. *J. Assoc. Official Agr. Chem.* 8, 676-8(1925).—The Cl in bleached flour is commonly thought to be found in or with the fat. The following modification of Hertwig's neutral extn. methods for lipoids (*C. A.* 17, 3386) was found to give the most complete extn. without formation of emulsions: to 10 g. of flour in a 500-cc. Erlenmeyer flask add 30 cc. of 70% alc., warm very slightly till the flour is evenly distributed throughout the liquid, add 30 cc. of 95% alc., shake thoroughly for 2 min., add 100 cc. of petroleic ether (b. 30-75°), shake, transfer to a sepg. funnel, wash the contents of the flask with 2 25-cc. portions of petroleic ether and transfer to the sepg. funnel, add 30 cc. of water in the funnel, shake, draw off the lower layer, wash (if necessary) with only 10 cc. H_2O , draw off the lower layer, and evap. the petroleic ether at low temp. after addn. of 5 cc. of 4% alcoholic KOH.

A. PAPINEAU-COUTURE

A theory of colloid behavior in dough. C. O. SWANSON. *Cereal Chemistry* 2, 265-75(1925).—Dough is a mass of starch and protein particles covered by films of water. The surface tension forces inherent in these films of water bind the starch particles together as the particles of clay are held together and aid in holding the protein particles together. The colloid behavior is further explained on the assumption that the protein particles form chains or strands which have a rubbery elasticity and that these strands are matted together in a mass ordinarily known as gluten. The quality of the dough is detd. by the no. of particles present which form the strands, by their inherent structure and by the environment of particles. The number of particles are related to the quantity of protein in the flour and their structure to the quality, both being detd. when the wheat is formed. The manner of coherence among the particles and hence the quality of the gluten strands depends on the environment of the particles which consists mostly of water and substances dissolved in water such as sugar, enzymes, and electrolytes. Some of these substances affect the electrical condition and hence the binding force among the particles. Since the environment controls the condition of yeast growth and it is possible for the baker to modify the environment the qualities inherent in the colloid system may be modified to a limited extent.

R. BUCHANAN

Hydrogen peroxide and viscosity. R. K. DURHAM. *Cereal Chem.* 2, 297-305(1925).—The object was to det. if possible the extent of increase in absorption measured as hydration capacity by means of the relative viscosity of flour or wheat in water suspensions. Twenty g. of flour (13.5% moisture bases) and 100 cc. distd. water were mixed so as to break up lumps and yet cause as little foaming as possible, and then 2 cc. of lactic acid was added, the mixt. being stirred for 30 sec. The viscosity was taken by a MacMichael viscometer with a disk bob, No. 30 wire and rotating base 20 r. p. m. To this suspension a drop of 3% H_2O_2 was added and the viscosity again taken. It is shown that H_2O_2 produces increased hydration capacity of flour or wheat meal and

water suspension as thus detd. The investigation further revealed that flour grade and type of wheat are concerned with viscosity. There seems to be little relation between the hardness of wheat and its increase in viscosity with H_2O_2 (excluding durum wheat). Middling flours show greater increase in viscosity than do lower grades. The substance affected by H_2O_2 is shown to be sol. in water. Inferior milling produces a flour which shows a low increase in viscosity with H_2O_2 . RUTH BUCHANAN

Para rubberseed cake. ANON. *Fertilizer, Feeding-Stuffs, and Farm Supplies J.* 10, 14(1925).—A sample of Para rubberseed cake contained H_2O 8.75, crude protein 30.19, other N compds. 5.34, oil 8.71, starch 41.74, fiber 5.01, and ash 5.60%, nutrient ratio 1:2 and food units 139. The compn. of this material closely approximates that of linseed meal. K. D. JACOB

Report on (the sampling and analysis of) cereal foods. RAYMOND HERTWIG. *J. Assoc. Official Agr. Chem.* 8, 657-66(1925); cf. 5 preceding abstracts.—Results, reported above for sampling, detn. of H_2O , ash, glutenin, fat by acid hydrolysis, lipoids and lipid P_2O_5 , and detn. of Cl in bleached flour are briefly reviewed and discussed. The methods for H_2O (umpire vacuum method, and routine method at atm. pressure) and ash are recommended for adoption. R. also recommends adoption for the examn. of flour of the methods for fat (acid hydrolysis), lipoids and lipid P_2O_5 , and H_2O -sol. N precipitable by 40% alc at present incorporated in the official methods for alimentary pastes. A. PAPINEAU-COUTURE

Report on (the determination of) ash in cereal products. C. E. MANGELS. *J. Assoc. Official Agr. Chem.* 8, 671-5(1925); cf. *C. A.* 19, 543.—Collaborative results on ashing by ignition to a grey ash at 550° and by the Hertwig-Bailey method (*C. A.* 18, 2394) showed good agreement between the 2 methods. The latter gives results in less time, but requires either considerable attention to prevent frothing over or else the use of a large Pt dish or crucible. Addn. of $Ca(OAc)_2$ allows of igniting at a higher temp. without volatilization of the ash constituents, 20 mg. CaO (as $Ca(OAc)_2$) preventing fusion of the ash of both clear and patent flours at 1000° , with consequent reduction in the time required for ashing. A. PAPINEAU-COUTURE

Estimation of shells in cocoa. HEINR. FINCKE. *Pharm. Zentralhalle* 66, 565 7(1925).—A critique of the method of Weber and Bötticher. W. O. E.

Effect of low temperature on hen eggs. T. MORAN. *Proc. Roy. Soc. (London)* 98B, 436 56(1925).—After freezing and thawing, the white of an egg is sepd. into a fluid part and a viscous part; the increase of the former at the expense of the latter is governed by the abs. temp. attained and by the time of exposure to that temp. After freezing and thawing, the yolk loses its normal fluidity and becomes a stiff paste, provided freezing and storage occurred at a temp. below -6° ; a time factor is also concerned in this change; apparently lecitho-vitellin is pptd. on freezing and does not redissolve on warming. Permanent changes in vol. also take place. While no visible change occurs in eggs which have been supercooled to temps. as low as -11° , nevertheless an irreversible change actually takes place and gives rise to a decrease in vol. The effect of temps. between -4.6° and 16.2° on the fertile egg was also detd. Eggs rapidly lose their fertility at temps. below 0° and apparently the embryo of the egg dies immediately at approx. -6° to -7° . The optimum temp., at which fertile eggs retain their fertility for the longest period of time, lies in the region of 8° to 10° . J. S. H.

The determination of the content of volatile oils in spices. N. SCHOORL. *Chem. Weekblad* 22, 381(1925).—Steam distn at a slightly elevated temp. (108.8°), with its consequent advantage of more rapid recovery of the oil to be distd., may readily be accomplished by adding an excess of NaCl to the mixture to be distd., and proceeding as usual with steam at 100° . •• DONALD W. MACARDLE

The significance of specific conductivity in the analysis of milk. R. STROHECKER. *Nahr. Genussm.* 49, 342 52(1925); cf. *C. A.* 13, 2936.—The sp. cond. of normal mixed milk varied between 45 and 50×10^{-4} . The observed values for individual cows ran from 42.7 to 74.4×10^{-4} . Values above 50×10^{-4} indicate abnormal or diseased conditions. WILLIAM J. HUSA

The Rupp method for the detection of chlorine in milk. J. T. KEISTER. *Am. J. Pharm.* 97, 638-42(1925).—The Rupp test is not reliable when the milk contains more than 1 part of Cu in 400,000 parts. Fresh milk contains very much less Cu than 1 part in 400,000. It may, therefore, be assumed that the Rupp procedure is admissible for testing a fresh milk for Cl. In fact, in all the tests made on fresh milks including bottled market milks, the Rupp test gave negative results. Nevertheless, it is controllable that under certain conditions bottled milk might take up enough Cu to give a positive reaction with the Rupp test. It would seem, therefore, that in case a milk

gives the Rupp test, the Cu content of the milk should be established in order to avoid an erroneous conclusion as to the presence of added Cl. W. G. GAESSLER

The detection of raw whole milk in pasteurized skim milk. Investigation of the leucocyte count and catalase number of cupped and centrifuged cream. F. HERKMA. *Tijdschr. vergel. Geneeskunde* 11, 310-9(1925).—The detection of raw whole milk in pasteurized skim milk by means of the trypan blue leucocyte stain is too cumbersome for practical purposes. The leucocyte no. is higher in centrifuged (I) than in cupped (II) skim milk. The reverse is the case for the creams. Leucocytes seem to play a rôle in the coagulation of fat globules and spontaneous cream sepn. since I has a considerably greater agglutinating effect on washed fat globules than II. Similarly higher catalase nos. were associated with higher leucocyte counts. MARY JACOBSEN

Variations in, and constant relationships between, the quantity and fat content of milk from morning and evening milkings during different seasons of the year, and for different time periods between the milkings. J. STREMLER. *Rev. agr. Maurice* 2, 536-9(1925).—The quantity and fat content of milk for semi-monthly periods during an entire yr. are shown in 2 charts, and the following conclusions are drawn from the figures obtained: The greater the quantity of the milk, the smaller is its fat content. For this reason less butter is obtained in summer than in winter. The more time elapses between the 2 milkings, the more milk, but of less fat content, is obtained. For 12 hr. intervals there is no difference between the 2 milkings. F. W. ZERBAN

Preliminary investigations in the bacteriology of milk. J. H. WALTON. *Ag. Research Inst., Pusa, Bull.* 159, 14 pp (1925). The bacterial count of the milk supply from the Pusa exptl farm was compared with the English standards. Of 37 daily samples taken during the dry season, 35 contained less than 20,000 bacteria per cc., while during the wet season 23 samples out of 35 contained 20,000 to 100,000 per cc. *B. coli* contamination was also greater in the wet season. The fore milk contained from 3 to 24 times as many bacteria as the middle milk, and milk drawn into open pails contained 2 to 5 times as many bacteria as milk drawn into covered pails. The ratio of the final bacterial count to the initial count on milk stored for 4 hrs. at 10° was 2, and at 30° 8. For 20-hr. storage the ratios were 10° 3, 14° 10, and 30° 72,300. K. D. JACOB

Reinfection of pasteurized cream. I. From factory utensils. A. M. BROWN AND H. H. RANDELL. *Ag. Gaz. N S Wales* 36, 567-70(1925). Scrapings collected from the inside of churns just prior to running in the cream contained in one case 3,000,000 and in another 20,000,000 organisms per cc., two thirds of which were of undesirable types. Rinsing waters run out just prior to commencement of churning contained 1000 to 9,000,000 per cc., practically all of which were injurious types. Utensil rinse waters in which no lime was used contained 800,000 to 9,000,000 bacteria per cc. dependent on the procedure used in washing. Effective control methods are discussed. **II. From impure water.** O. C. BALLHAUSEN. *Ibid* 570-7.—Bacterial counts on H₂O filtered through different filter media were as follows: well water, felt filter changed once or twice per day, 100; creek water, paper pulp filter changed once per week or fortnight, 2000; creek water, candle filter changed once per week, 3000; river water, sand gravel filter, 100; river water, felt filter changed occasionally, 600 per cc. The counts were made on purified H₂O just prior to changing the filters. K. D. JACOB

Treatment of cream for the removal of objectionable flavors and odors. O. F. HUNZIKER. *J. Dairy Sci.* 8, 132-45(1925).—The treatment found most effective in removing off-flavors from cream for butter making consists of standardizing the cream to a reasonably low, definite point of acidity, flash pasteurizing it and spraying it into a high vacuum, then blowing heated air through a continuous spray of the hot cream while still maintaining a partial vacuum. The time of treatment varies from instantaneous to 15-30 min., and even longer, according to the type and intensity of flavor defect. To avoid premature churning and insure butter with a smooth texture free from meanness, the cream must be kept in motion until cooled, and cooled rapidly and without excessive agitation. The treatment is applicable only to volatile or volatilizable off-flavors. A. PAPINEAU-COUTURE

The effect of different percentages of butter fat on the physical properties of ice cream. D. H. NELSON AND H. E. REID. *Missouri Agr. Expt. Sta., Research Bull.* 70, 24 pp.(1924).—With each additional increment of 2% of fat to the mixt. the sp. gr. was uniformly decreased and the viscosity was increased. The overrun increased up to 10% of fat. Above 10% of fat, the overrun decreased although the viscosity continued to increase. No direct relation was found between the fat content of the different mixts. and the hardness of the ice cream. An increase in the fat retarded the melting.

of the ice cream by increasing the resistance offered to summer temps. Variations in the overrun had a decided effect on the stability of the finished product. J. J. S.

Preservatized and non-preservatized butter. ANON. *New Zealand J. Agr.* **31**, 157-8(1925).—The addn. of "boron compd." in amts. ranging from 0.08 to 0.90% had little effect in sustaining the keeping quality of butter either in cold storage or afterwards at room temps. In 7 expts. with butter from different sources the av. was slightly in favor of the preservatized butter. K. D. JACOB

Study of mixtures (of butter with other fats). M ZAAYER. *Chem. Weekblad* **22**, 461-4(1925).—Various analytical methods for the detn. of butter fat are described and their accuracy is compared by tests on known mixts. of butter, coconut- or palm-oil and tallow. The Bertram method (*C. A.* **18**, 556) is very accurate, but requires an inconveniently large sample (25 g.). The Epple and Spitzer method (*C. A.* **18**, 2772) gives inaccurate results. The Gilmour method (*C. A.* **19**, 2713) is accurate but unduly long. Van der Laan's modification (*C. A.* **17**, 2018) of the Kirschner method has been still further modified by van Raalte, giving a procedure which is more rapid, more accurate, and more convenient than any other here studied. For details of method, calcn., and correction for other fats present, the original paper must be consulted. In the analysis of 6 samples contg. 10-20% butter, 40-60% coconut- or palm-oil and 30-40% tallow, the max. error in the butter content was 0.4%. D. W. MACARDLE

Catawba grape juice. B. G. HARTMANN. *J. Assoc. Official Agr. Chem.* **8**, 716-25 (1925).—Analyses of 15 samples each of pasteurized and of sulfured typical com. juices of known purity prepd. from crops of several seasons are tabulated and commented. There is only a slight difference in the solids content of the juices obtained at various stages of the pressing; but the acidity of the free-run juice is appreciably lower than that of the final juice. Juices of different seasons vary, but those of the same season are very similar. There is considerable free tartaric acid and another free acid (probably malic). Low acidity together with low polarization at 870 would indicate watering (generally by addn. of a 20% sugar soln.). Tissier and Francois' method for detection of added water in wines (*C. A.* **8**, 3481) has been adapted to grape juice and the technic is described in detail (cf. following abstract). A. PAPINEAU-COUTURE

Report on (the analysis of) fruit and fruit products. B. G. HARTMANN. *J. Assoc. Official Agr. Chem.* **8**, 626-9(1925); cf. 2 following abstracts.—Wichmann's and Nelson's results are briefly reviewed. A method for detg. added water in white grape juice is described (in detail), and is essentially as follows: Add 1 g. of finely powdered K H tartrate to 50 cc. of filtered juice, shake 1 hr. in a mechanical shaker, and titrate 10 cc. of the treated filtered juice and 10 cc. of the original juice with standard NaOH. Then $x = [0.0188(b-a) - 0.095 - 0.025(T-25)] \cdot 0.006$ where x is the % added water, b and a the acidity of the treated and original juice, resp., in cc. of 0.1 N NaOH per 100 cc., and T the mean temp. before and after shaking. Com. juices show about 1-3% of added water by this method. The method is inapplicable to red grape juice. A. P. C.

Report on pectin in jams, jellies and preserves. (Determination of fruit ash and of total solids.) H. J. WICHMANN. *J. Assoc. Official Agr. Chem.* **8**, 629-37(1925), cf. *C. A.* **19**, 544. To det. fruit ash in a product contg. added P_2O_5 , ash in the presence of a known amt. of MgO (in excess), and subtract the sum of the total P_2O_5 (corrected for that contributed by the fruit present, best estimated from the water-insol. solids in the case of jams and preserves) and the MgO obtained in the blank. If glucose also is present, a further correction must be made, based on the av. ash in glucose solids (approx. 0.396%). Results given on various products indicate that the max. errors by this method are about ± 0.03 g. per 100 cc. of sample. Considerable difficulty may be experienced in obtaining a white ash, requiring extn. of the char with hot water and ashing the residue with repeated applications of HNO_3 . If alum has been added, ash as before with an excess of MgO, and subtract the MgO and anhydrous alum, which may be obtained from either Al_2O_3 (detd. as $AlPO_4$) or SO_3 in the ash (if glucose also is present allow for the SO_3 in the glucose ash). The order of accuracy for true fruit ash is about the same as in the case of added P_2O_5 . The drying method for detg. total solids in fruit products contg. sucrose and org. acids is shown to be unreliable because of the inversion of sucrose during the drying. Results are given which appear to indicate that the n method for total solids is preferable to the drying methods. A. P. C.

Report on (the determination of) fruit acids (in fruit and fruit products). E. K. NELSON. *J. Assoc. Official Agr. Chem.* **8**, 637-40(1925).—Detn. of malic acid in the presence of equal or greater quantities of citric and tartaric acids by the Auerbach method (*C. A.* **18**, 511,868) is inaccurate, only about 70% of the malic acid taken being recovered. Conversion of the acids into Ba salts by treating their alc. soln. with $BaCO_3$ failed entirely owing to the insoly. of the $BaCO_3$ in alc. soln. of the org. acids, and Ba

malate is incompletely sol. in H_2O in presence of Ba citrate and Ba tartrate. The official A. O. A. C. method for *tartaric acid*, a slight modification of the same (holding the soln. contg. the pptd. K H tartrate at a temp. of 20° instead of in the ice box), and the Kling method (*C. A.* 4, 1590; 6, 3382) were submitted to collaborative study under very severe conditions (the tartaric acid constituted only 10% of the total org. acids). Results by the official and modified official methods were widely divergent, mostly high, but in one case very low, probably due to the use of KCl that had an alk. reaction. The Kling method gave uniformly satisfactory results. A. P.-C.

Report on spices and other condiments. (Methods for the analysis of salad dressings.) R. E. ANDREW. *J. Assoc. Official Agr. Chem.* 8, 698-701 (1925).—Collaborative comparison of the present tentative A. O. A. C. method and of a proposed alk. extn. method (described in detail) for fat in salad dressing showed excellent agreement between the two. Collaborative comparison of the Juckenack method and of a proposed method for lipid P_2O_5 (add 5 cc. of 8% alcoholic KOH per g. of fat, evap. to dryness, char over asbestos, treat with dil. HNO_3 (1+2), filter, wash, burn the residue to a white ash, and det. P_2O_5 by the official method) showed lower results by the proposed method in most cases.

A. PAPINEAU-COUTURE

The influence of acidity on the formation of pectin compounds. ALFRED MEHLITZ. *Z. tech. biol.* 11, 134-54 (1925). The extn. of pectin from dried apple juice is carried out most satisfactorily with hot 0.02 N tartaric acid soln. as shown by a series of tests carried out with varying concns. from 0.001 N to 0.1 N. With greater acid concn. than 0.02 N the yield of pectin was decreased. Pectin exts. with a pH of at least 3.1 are well suited for jelly making. As a substitute for tartaric acid in the extn. of pectin only acids with approx. the same dissociation const. can be used such as malic, formic, salicylic and citric.

H. J. DEUEL, JR.

The use of pectin preparations in the manufacture of marmalades, jellies and similar fruit products. C. GRIEBEL AND M. NOTHNAGEL. *Z. Nahr. Genussm.* 49, 352-9 (1925).—A discussion of the compn. and use of com. pectin prepns., with tabulated analyses of 4 such prepns.

WILLIAM J. HUSA

Adulteration of marmalades. A. LABO. *Riv. ital. ess. profum.* 7, 137-9 (1924); 8 (Jan. 15, 1925); *Chimie et industrie* 14, 460 (1925).—A discussion of the commoner forms of adulteration and of their detection.

A. PAPINEAU-COUTURE

Dialysis of lemon juice. GUIDO AJON. *Riv. ital. ess. profum.; Perfumers' J.* 6, No. 9, 12-3, 56, 58 (1925).—See *C. A.* 19, 2865.

A. PAPINEAU-COUTURE

A new fodder (siloed shisham leaves) for dairy cows. P. E. LANDER AND P. L. C. DHARMANI. Agr. Research Inst., Pusa, *Bull.* 158, 11 pp (1925).—A sample of fresh shisham (*Dalbergia sissoo*) leaves contained H_2O 73.11, ash 5.14, fat 0.81, crude fiber 7.40, total N 0.69, protein N 0.57 and amide N 0.02%. A quantity of the fresh leaves was packed into a silo and samples of the material were analyzed at intervals during a period of 9 months. Volatile org. acids and volatile bases increased continuously during the storage period. Amino acids and amide N increased to a max. at 4-months storage and then decreased to approx. the original content. No appreciable change occurred in the other constituents. The siloed leaves had a pleasant aromatic smell, were greenish brown in color, and free from the mucilaginous substance which was particularly noticeable in the fresh leaves. The siloed material was substituted for all green food in the rations of two dairy cows for one month, two animals of approx. the same age and wt. being carried as checks. No deleterious effect was noted in the quality of the milk of the animals fed on the leaves, and the yield though somewhat smaller was fairly well maintained. The animals remained in perfectly good health throughout the test period. Siloed shisham leaves are considered by the authors to be a satisfactory reserve fodder in times of scarcity.

K. D. JACOB

The sunflower as a silage crop—composition and yield at different stages of maturity. W. L. GARNES AND W. B. NEVENS. Univ. of Illinois Agr. Expt. Sta., *Bull.* No. 268, 407-55 (1925).—Yields and chem. compns. of sunflower and corn crops are compared. Sunflowers produce greater yields of dry matter per acre than corn. They also contain more ash, crude fiber and crude fat but less N-free ext. It is desirable to ensile sunflowers at an earlier stage of growth than corn, since the crude fiber of the former more rapidly decreases in digestibility with advance in growth. The ash constituents removed from the soil by a sunflower crop are large, being about 900 lbs. per acre. Marked reductions in total ash of a crop occur toward the end of a growing season. The relative proportions of ash constituents and org. matter vary greatly at different stages of growth but the changes in relative proportions of ash constituents are small.

M. S. ANDERSON

Determination of fat in cacao products (LEPPER, WATERMAN) 27. Detection of coconut and palm kernel oils in cacao butter and fat from milk chocolate (Baughman) 27. Apparatus for disintegrating, emulsifying and mixing milk powder (U. S. pat. 16, 191) 1.

Food mixture. C. W. HOOPER. U. S. 1,557,053, Oct. 13. Finely divided desiccated animal liver, desiccated juice of oranges or other fruits and glucose or other "infant food carbohydrate" material are mixed with dry milk powder to form a food miscible with H_2O and for use in feeding infants.

Food containing rice and edible oils. C. DOERING and H. H. DOERING. U. S. 1,550,681, Aug. 25. Whole rice and ten times its quantity of H_2O are heated together under about 20 lbs. per sq. in. pressure at a temp. of about 120° and then the pressure is reduced while the mass is maintained at the b. p. A "rice milk" is sepd. by straining, agitated and aerated at a temp. of about 100° and allowed to cool. It may be mixed with coconut oil and animal "neutral oil" in the relative proportions 4:3:3 to form a butter substitute.

Food from fish. T. ENDO. U. S. 1,556,772, Oct. 13. Small lumps of flesh such as that of fish or shell fish are treated with a dil. acid soln. such as a 0.7% lactic acid or 0.5% H_2SO_4 soln., after H_2O and oil are squeezed out, and are mixed with cereal refuse, e. g., with parched rice bran or dried bean refuse, and the lumps are converted into "koji" in a hot house by covering them with spores of *Aspergillus oryzae*.

Bread. B. LOWY. U. S. 1,559,330, Oct. 27. Acid milk is mixed with Ca phosphate at 40° to produce a Ca lacto-phosphate, NH_4 tartrate is added, the compn. is mixed with yeast, salt, sugar and H_2O , and this aq. mixt. is used with flour to form a dough in the relative proportions of about 1:100, shortening is added and the dough ingredients are thoroughly mixed at a temp. of about 30° .

Milk substitute from soy beans. G. D. THEVENOT. U. S. 1,556,977, Oct. 13. The beans are ground, freed from husks, soaked in a mixt. of equal amts. of alc and H_2O , dried at a low temp., pulverized and mixed with sugar and salts such as those of Ca, Na or NH_4 to imitate the constituents of cow milk or form a compn. suitable for use in bread making, etc.

Hydrogen-ion concentration of flour. F. I. DUNLAP. U. S. 1,560,045, Nov. 3. In producing crackers, cookies or other bakery products, the shortening effect of the flour is increased by giving it an increased acidity up to about a p_H of 3, at about which point the "shortening" effect is at a max. The flour may be treated with Cl or HCl before use in the dough or the dough may be treated with HCl, H_3PO_4 , $HOAc$, lactic acid or other harmless acids.

Baking powder. R. E. JONES. U. S. 1,558,888, Oct. 27. A baking powder for conversion of some starch into sugar comprises Ca acid phosphate 5.25 oz., $NaHCO_3$ 3 oz., cornstarch 3.66 oz. and taka-diasatase 0.75 drachm.

Beverage extract. B. H. ZIEHLER. U. S. 1,557,917, Oct. 20. Exts. from malted cereal materials such as wheat, rye, corn or rice are heated partially to carbonize and caramelize the extractive material which they contain.

Fruit juices. W. S. PIERCE. U. S. 1,556,572, Oct. 6. The juice and pulp of oranges or other fruits are evapd. together *in vacuo* to a sirupy consistency. Sugar is impregnated with the essential oil of the fruit, this oil-impregnated sugar is added to the evapd. material and the evapn. is continued to obtain a dry product. The vacuum is broken at an intermediate stage of the drying in order to permit stirring of the material.

Preserving citrous fruits. H. R. FULTON and J. J. BOWMAN. U. S. 1,560,558, Nov. 10. A soln. of Li_2CO_3 is used for preventing decay.

Preventing decay of fruits and vegetables. H. R. FULTON and J. J. BOWMAN. U. S. 1,560,559, Nov. 10. A soln. prepd. from borax 5, H_2SO_4 0.43 and H_2O 100 parts is applied to citrous or other fruits or vegetables to retard development of stem-end rot, blue-mold rot, etc.

Apparatus for mixing and steam-treating fruit sauces, jams or other foods. W. A. SMITH. U. S. 1,556,365, Oct. 6.

Preventing decay of fruits and vegetables. H. R. FULTON and J. J. BOWMAN. U. S. 1,557,757, Oct. 20. The surface of citrous fruits or other fruits or vegetables is treated with a soln. of $LiOH$ or other alk. hydroxide. U. S. 1,557,758 specifies the similar use of a soln. of $LiCl$ or a similar compd.

Degasifying and steam-treating fruits for canning. F. G. GRAB. U. S. 1,557,358, Oct. 13.

Bleaching nuts. A. W. CHRISTIE. U. S. 1,558,963, Oct. 27. Walnuts or other

nuts are immersed in a soln. from which nascent Cl is being liberated and then in a soln. of SO_2 .

Apparatus for dehydrating fruits, etc. A. W. PARKER. U. S. 1,560,305, Nov. 3.

Apparatus for treating fruit with antiseptic solutions for preventing decay. W. R. BARGER, W. V. HUKILL and L. A. HAWKINS. U. S. 1,559,733, Nov. 3.

Apparatus for treating grain with powdered copper sulfate, copper carbonate, etc. A. J. BISHOP. U. S. 1,558,580, Oct. 27.

Preserving animal foods. G. SCHEIB. U. S. 1,557,779, Oct. 20. Whole carcasses of meat, fish or fowl, or smaller portions are treated with dil. HCl soln., CO_2 , N, or other gaseous or liquid preservative which is forced into the interior of the material under a pressure which is equal to or slightly greater than an external pressure which is maintained.

Treating green fodder. G. PFISTER. U. S. 1,551,427, Aug. 25. Green fodder is heated to kill bacteria detrimental to its nutritious substances and then superficially coated with HCl or with glue, dextrin, varnish or other material which will further restrict bacterial action and access of air.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Recent developments in the chemical industries of North Carolina. F. C. VILBRANDT. *J. Eliska Mitchell Sci. Soc.* **41**, 115-23(1925).—Recent statistics prepared by the Dept. of Ind. Chemistry of the Univ. of N. C. are analyzed. A. L. MEHRING

Engineering research: An essential factor in engineering education. C. E. MAGNUSSON. *J. Am. Inst. Elec. Eng.* **44**, 1243-5(1925). C. G. F.

A new departure in engineering education. HAROLD PENDER. *J. Am. Inst. Elec. Eng.* **44**, 1208-10(1925).—The Univ. of Pennsylvania has developed a new type of 4-year course. The first 2 years are spent in the academic dept. and the last 2 in the (chemical) engineering school. C. G. F.

Industrial development of electroosmotic processes. H. SARROT DU BELLAY. *Rev. prod. chim.* **28**, 649-55(1925), cf. Prydlender, *C. A.* **17**, 496.—A brief review of com. applications which have actually been effected and of recent progress. A. P.-C.

Utilization in the chemical industry of raw materials from sharks. RUDOLF TANDLER. *Chem.-Ztg.* **49**, 806-7(1925).—Although skins of marine animals were utilized during the World War, industry has not employed them successfully since that time. Yet sharks can be caught in immense numbers in tropical and semi-tropical seas, and if other parts of the carcass, e. g., liver, flesh, etc., are utilized as well as the skin, a remunerative industry can be maintained. Data are appended supporting this view. *Ibid* 841-2. Methods used for tanning the skins, packing the flesh, making stock food, fertilizers and oil are described. Suggestions are offered as to better methods for organizing the industry from the fisheries to the final markets. W. C. E.

Economic products from Dominica. ANON. *Bull. Imp. Inst.* **23**, 275-81(1925).—A sample of camphor was slightly discolored and contained a small quantity of oily impurity which rendered its aq. soln. slightly turbid; but otherwise its properties agreed well with those of a com. sample. Refined by sublimation, it would meet the requirements of the Brit. Pharmacopeia. A sample of ginger had consts. falling within the usual limits for com. ginger and agreed with those specified by the Brit. Pharmacopeia. A sample of crude gommier gum and 2 samples of prepd. gum ("incense gum") showed: loss on heating at 100° 6.78, 0.61, 0.43%; softens at 88° , 85° , 90° ; liquid at $115-20^\circ$, about 95° , $100-5^\circ$; acid value 34.0, 33.9, 33.8; sapon. value 70.8, 56.9, 56.9; ash 0.06, 0.09, 0.09%; completely sol. in EtOH, CHCl_3 , Et_2O , nearly completely sol. in turpentine oil, almost insol. in light petroleum. Cryst. from alc. gave a cryst. resin m. 181° (from crude gum) and 178° (from prepd. gum). For varnish making the crude gommier is of the same technical value as ordinary gum elemi, and the "incense gum" is inferior. Two samples of copra were found of good quality and contained normal amounts of oil of low acidity. A. PAPINEAU-COUTURE

(Solvent) recovery by the Brégeat system. RICHARD BLOCHMANN. *Chem.-Ztg.* **49**, 835-6(1925).—Cresol dissolves the solvent from the air by being brought into intimate contact with it in a closed system consisting of absorption towers acting on the countercurrent principle. The solvent is then expelled from the cresol by heating the mixt. in stage evaporators, and both cresol and recovered solvent are re-used. Initial recovery amounting to 90 or 95% gradually sinks, because of the increase in viscosity of

the cresol resulting from resinification. Keeping the app. clean becomes increasingly difficult. As possible improvements in present practice a lowering of the temp. from 140°, and a diminution of the number of times the cresol is reheated, are suggested.

W. C. EBAUGH

The recovery of volatile solvents. A. D. LUTTRINGER. *Caoutchouc and gutta-percha* 22, 12,627-9, 12,671-2, 12,858-60(1925).—A review of the industries employing volatile solvents, the physics of evapn. and condensation and typical equipment used in the rubber industry for recovering solvents such as benzene.

C. C. DAVIS

Another fatal poisoning by sodium fluosilicate. LÜHRIG. *Chem.-Ztg.* 49, 805-6 (1925).—A vigorous appeal for the recognition of F compds. as poisons from the legal point of view, and for the protection of workers and the public from them. In this, the fourth case, of F poisoning reported by the author, a man took 0.5 teaspoonful of insect powder in mistake for medicine, and in spite of medical aid died 10 hrs. later. The powder was 99.6% Na_2SiF_6 . Symptoms: diarrhea with vomiting, chills, inflammation of the mucous lining of the stomach, etc. Na_2SiF_6 was not found in blood or urine, but was detd. in samples of the alimentary canal and contents, kidneys and liver.

W. C. EBAUGH

Paralysis of the extensors of the hand as an early sign of lead poisoning, and a contribution to the prophylaxis of professional lead poisoning. W. HERGT. *Zentr. Gewerbehyg. u. Unfallverhüt.* [n. s.] 1, 37(1924); *Bul. mens. office internat. d'hyg. publ.* 17, 1036(1925).—H. has been unable to verify the claim of Toley that paralysis of the extensors of the hand is an early sign of lead poisoning although he has examd. hundreds of lead burners of the Badische Anilin und Soda Fabrik.

JACK J. HINMAN, JR.

Workshop and factory hygiene. III. Accident prevention and accident frequency. GEORG WOLFF. *Chem.-Ztg.* 49, 814-5(1925); cf. C. A. 19, 3555.—A comparative study of laws and statistics concerning accidents in industry, with the conclusion that efforts at accident prevention and medical care have brought about a great improvement in conditions for workers, and in savings for operators.

W. C. E.

Crystallizing various substances. H. HOWARD U. S. 1,559,703, Nov. 3. A suspension of crystals of the substance to be crystd. is maintained in an ascending current of a soln. of the material so that deposition from the soln. upon the crystals is induced. Crystals to be "grown" are supplied to the ascending current by introducing a relatively small stream of a supersatd. soln. of the substance into the current.

Removing suspended particles from materials forming viscous fusions. E. THOMSON. U. S. 1,559,203, Oct. 27. After fusing quartz or similar materials, the fusion is centrifuged to sep. suspended particles and then allowed to solidify so that the sepd. material can readily be sepd. mechanically from the solidified purified layer.

Controlling catalytic reactions. H. E. HAGGENMACHER. U. S. 1,557,687, Oct. 20. In order to control catalytic reactions and avoid or minimize side-reactions, fresh catalyst is continuously supplied and used catalyst is withdrawn after once falling through the reacting gases.

Absorbing vapors from gaseous mixtures. J. H. BRÉGRAT. U. S. 1,558,336, Oct. 20. Gas-vapor mixts. are subjected to the absorbing action of an absorbent liquid contg. a hydrogenated phenolic compd., e. g., hexahydrophenol or hexahydrocresol.

Heat insulation for pipes, boilers, etc. A. M. EHRET. U. S. 1,559,564, Nov. 3. Heat insulation formed of MgCO_3 and asbestos fibers is treated with a soln. of $\text{Mg}(\text{HCO}_3)_2$ in order to improve its strength and temp.-resisting properties.

14--WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Short history of the Keighley (England) Water Works. M. R. BARNETT. *Water and Water Eng.* 27, 345-9(1925).—The original supply from wells or springs established in 1816 was superseded in 1891 by slow sand filtered system. Water is treated with Na_2CO_3 before filtration to reduce plumbosolvency and after passing through slow sand filters passes through beds of polarite. Illus.

JACK J. HINMAN, JR.

The water supply of the city of Aberdeen. GEORGE MITCHELL. *Water and Water Eng.* 27, 56(1925); cf. C. A. 19, 1317.—The old works 20 miles west of the city is described. The new scheme authorized for the water supply in 1916 is based on 40 imp. gals. per day per person for a population of 240,000. It consists of a screen and intake chamber leading to a 60" conduit and a new 24 mg. concrete storage reservoir. There are 3 new filters

of a total area of 14 acres arranged to be cleaned by squeegeeing instead of scraping. The water of the Dee is very clear. JACK J. HINMAN, JR.

Supervision over the safety of Chicago's water supply. A. E. GORMAN. *Proc. Illinois Eng. Soc.* 40, 57-63(1925); cf. *C. A.* 19, 1319, 2097.—Water is obtained through 6 cribs in Lake Michigan 2 to 4 miles from shore. Calumet River is the chief source of contamination. Backing up of the Chicago River is an occasional menace. Dumping of dredged materials into the lake for fill and sewage from lake vessels are also important. Hourly tests for free Cl are made to check the adequacy of treatment at each station. 3000 lbs. liquid Cl are applied to 800 million gal. on the av. JACK J. HINMAN, JR.

Filters for Chicago's water supply. ANON. *Public Works* 56, 293-4(1925).—A general description is given of the proposed filtration plants projecting into Lake Michigan. C. C. RUCHHOFF

New gravity water supply for Whitehall, N. Y. JAS. P. WELLS. *Eng. News-Rec.* 95, 344-5(1925).—The new 3-m.g.d. supply of soft and bacteriologically satisfactory water from Pike Brook and Pine Lake, replacing the supply from the Metawee River which was moderately hard and at times unsatisfactory in quality, is described briefly. R. E. THOMPSON

Supplying of drinking water to vessels in the U. S. J. I. CONNOLLY AND A. E. GORMAN. *Public Health Reports* 40, 1042-55(1925).—Water supplies for U. S. vessels are obtained from (1) sources ashore and (2) from overboard. One system is provided on the ships for drinking water and one for water used for fire, boiler and cleaning purposes. If taken from ashore, sanitary precautions are confined to the purity of the source and methods of loading. If taken from overboard the water is usually treated by distn., ultra-violet rays, ozone or hypochlorites. Thirty-three vessels on the Great Lakes use ultra-violet ray treatment. Typhoid among seamen dropped from 150 per year in 1905 to 20 per year in 1924. Continued pollution of inland waters make close inspection necessary. Several cuts are shown of water connections, fountains and loading devices. BEN H. PETERSON

Great Lakes passenger vessels have pure drinking water. A. E. GORMAN. *Nations Health* 7, 604-5(1925).—A description of the ultra-violet ray sterilizers, chlorometers and ozonators used on Great Lakes steamers. BEN H. PETERSON

Primary filtration for municipal water supply. J. A. BERNARD. *Technique sanitaire* 20, 25-6(1925); *Water and Water Eng.* 27, 162(1925).—Details of the St. Denis plant. Water is taken from St. Denis River. The settling basin has 4 compartments each: inlet, discharge channel, 2 Cu screens, drain and opening and closing mechanism. Water enters the base of the filters and passes upward to the service tank and thence to the mains. JACK J. HINMAN, JR.

The "Guta" automatic chemical control apparatus. E. DEPLANTADE. *Technique sanitaire* 20, 106-10(1925).—Control of chemical feed is effected by varying the head on an orifice connected by a tube to a soln. reservoir. Control of the height is accomplished by a float connected to the orifice tube by a cord carried over a pulley or by a counterpoised vessel contg. a variable quantity of water. The rate of flow of the water supply detcs. the height of liquid in the float chamber or counterpoised vessel. J. J. H. JR.

Surface tension as a factor in the priming of steam boilers. E. B. MILLARD AND T. E. MATSON. *Ind. Eng. Chem.* 17, 685-6(1925).—No connection exists between surface tension and priming of boiler waters. JACK J. HINMAN, JR.

Observations on the working of slow sand filters. V. GOVINDA RAU. *Water and Water Eng.* 27, 350-2(1925).—The custom of wasting water from maturing filters is very wasteful since the water could be chlorinated and used. Re-sanded beds which give bad water for a time after re-sanding could receive chlorinated raw water and the effluent could be used. There is no deterioration of quality of effluent with high loss of head provided violent fluctuation of rate of filtration does not occur. In Bengal filter life is too short (2-6 weeks). Chlorination of raw water and suppression of algae should prolong use. Filters usually operate much more slowly than necessary. A drop of 2" per hr. was noted when 4" would have been better. Wasteful regulation of settling basins is common. Chlorination of raw water applied to slow sand filters is to be preferred to chlorination of filtered water. JACK J. HINMAN, JR.

River pollution. F. A. B. PRESTON. *Surveyor* 68, 101-2(1925).—The existing laws (England) with the unstandardized condition of chem. indices of pollution make it difficult to prevent pollution of streams by trade wastes. R. E. GREENFIELD

Is stream pollution necessary? C. M. BAKER. *Proc. Eng. Soc. Wisc.* 17, 77-84(1925).—It is not feasible to do away with stream pollution entirely under present

civic and industrial conditions, but it should be controlled and kept within reasonable limits.

Methods and policies of preventing stream pollution. H. V. PEDERSON. *Munic. and County Eng.* 68, 133-5 (1925).—The stream pollution situation in Iowa is discussed and a conservative policy in the prevention of stream pollution is advised.

Determination of minute amounts of phenols in polluted natural waters. J. R. VORCE. *Ind. Eng. Chem.* 17, 751 (1925).—Two or 3 l. of water are freed as well as possible from Ca, Mg, etc., by treatment with NaOH and filtration. H_2O_2 free from compds with benzene nucleus is added and allowed to stand overnight. The resulting soln. is then concd. to 200 cc. in strong alk. condition. This soln. is then made acid by addn. of citric acid crystals and distd. In the distillate the phenol is detd. colorimetrically by the use of the Folin and Denis phenol reagent.

Work accomplished by the Milwaukee Metropolitan Sewerage Commission. WM. R. COPELAND. *Proc. Eng. Soc. Wis.* 17, 71-2 (1925).

Activated-sludge sewage-disposal plant at Milwaukee. J. A. WILSON. *Mech. Eng.* 47, 837-41 (1925), cf. *C. A.* 19, 1465, 2251.—The sewage disposal plant is being completed. It contains coarse screens, fine screens and an activated sludge plant, using compressed air. The disposal of 1,275,000 gals. of waste activated sludge produced daily is a most serious proposition. It has been shown that the addn. of H_2SO_4 or $Al_2(SO_4)_3$, or heating, or combinations, greatly increased the efficiency of filtering processes, so that the sludge can be dried and prepd. for use in fertilizers.

Methods of sewage purification, activated sludge or bio-aeration process. F. W. HARRIS. *Surveyor* 68, 197-8 (1925).—A review.

Purification of sewage in France. F. DIENERT. *Technique sanitaire* 20, 153-4 (1925). A reply to Bezault (cf. following abstr.). D insists that knowledge of the character of the particular sewage to be treated in each case and other local features must be taken into consideration.

Sewage purification in France during the last 25 years. BEZAULT. *Technique sanitaire* 20, 132-7 (1925).

Columbus sewage disposal. ANON. *Public Works* 56, 359 (1925).—Chemical results, operating data and costs for 1924 are given.

Hydrogen ion concentration and p_H . L. H. ENSLOW. *Public Works* 56, 361-6 (1925).—A general description of the significance of p_H and its role in practical filter plant operation.

Normalcy in chemical treatment of sewage. J. F. JACKSON. *Public Works* 56, 379-82 (1925).—J. presents the results of the following methods of sewage treatment which he tried at New Britain and South Manchester. (1) Miles acid treatment followed by aeration with activated sludge; (2) Miles acid effluent neutralized and aerated with activated sludge; (3) saltpeter treatment followed by aeration with activated sludge; (4) lime treatment followed by aeration with activated sludge; (5) straight activation. None of these methods produced as good results as the straight bio-processes. Expts. with heat and acid treatment of sludge reduced the moisture content from 99.55 to 88.2% and demonstrated that even greater reductions were possible with well designed units.

Sewage treatment at Newark, England. ANON. *Public Works* 56, 316-7 (1925).—The plant with a capacity of 250,000 gals. per day has 5 pairs of 18 foot square Dortmund tanks in series. The first two pairs of tanks are used for preliminary settling, the third pair for activation and the last two pairs for final settling. The mixing and aeration chambers are fitted with revolving scoops which dip an inch under the surface.

Sewerage plans for New Jersey municipalities. ANON. *Public Works* 56, 318-9, 341-5 (1925).—Changes in the rules and regulations of the State Dept. of Health governing the prepn. and submission of plans for sewerage and sewage treatment plants are given.

Syracuse sewage treatment works. ANON. *Public Works* 56, 241-6 (1925).—The plant has a capacity of 27 million gals. of sewage per day and includes a grit chamber, mechanically cleaned fine screens, a sewage pumping station and 4 Dorr settling tanks. The effluent from the settling tanks is discharged into a lake and the sludge is pumped through a 12,000 ft. force main to a lagoon.

Data from state health boards. ANON. *Public Works* 56, 253-64, 297-306, 341-7 (1925).—Sewerage statistics and data on sewage disposal plants for cities in the U. S. are tabulated.

Sewage treatment in West Virginia. ANON. *Public Works* 56, 290-2 (1925).—

The treatment plant at Martinsburg with a capacity of 500,000 gals. per day includes an Imhoff tank, two sludge drying beds, sprinkling filters and two secondary settling tanks. The plants at Weston and Bluefield for treating the sewage from 1200 and 3000 persons, resp., are described.

C. C. RUCHHOFF

Sewage plant operation in Wisconsin. CHAS. I. CORP. *Proc. Eng. Soc. Wisc.* **17**, 63-6(1925).—Details of examples of difficulty with small plants due to neglect and operation by inexperienced persons

JACK J. HINMAN, JR.

Novel sewage disposal plant at Johnson Creek, Wis. W. G. KERCHOFFER. *Munic. and County Eng.* **68**, 188-9(1925).—The plant consists of 2 Imhoff tanks in series with an air lift pump in each tank to circulate the sludge. The air lift pumps are run 3 times per hour 5 min. at a time. The pump in the first tank discharges into a manhole about 50 feet in front of the plant and the one in the second tank discharges into the central cone of the first tank.

C. C. RUCHHOFF

Objectives in sewage treatment. J. J. HINMAN, JR. *Munic. and County Eng.* **68**, 167-72(1925).—The objectives which are legal and the actual improvement of the phys., chem., and bacterial state of the waste bearing liquors are discussed in a general way. The following objections to water pollution are discussed: (1) the nuisance of objectionable odors; (2) the possibility of contamination of water supplies; (3) the possibility of the steam being rendered dangerous as a source of water supply for domestic animals; (4) the killing of fish and the interference with the use of the stream for swimming and boating, and (5) various poorly defined health hazards.

C. C. R

Sludge drying and handling. ANON. *Public Works* **56**, 170-1(1925).—Sludge drying, handling and utilization, utilization of gas from sludge and glass covered sludge beds are briefly discussed

C. C. RUCHHOFF

Lime in sewage treatment. T. C. SCHMITZLE. *Public Works* **56**, 171-2, 201-3(1925).—At the Hagerstown, Maryland, sewage works 1800 gals. of raw sludge with a water content of 92.7% is removed from the Dorr clarifiers daily and treated with 300 lbs. of lime. The lime-treated sludge can be spread on farm land with less nuisance from odor than from raw sludge. Difficulty in drying the lime-treated sludge is overcome by adding FeSO_4 at the rate of 124 grams per gal.

C. C. RUCHHOFF

Cleaning Haskell septic tanks. ANON. *Public Works* **56**, 211-2(1925).—The sludge was pumped with a 3 in. diaphragm force pump through 700 ft. of 2 in. hose to a field.

C. C. RUCHHOFF

Biochemical oxygen-demand test. J. A. CHURDS. *Public Works* **56**, 218-9(1925).—The application is discussed of the O demand test to the operation of sewage treatment plants and to the study of industrial wastes and stream pollution.

C. C. R

Sewage treatment plant at Boonton. CYRIL POISS. *Public Works* **56**, 231-4(1925).—The plant described is designed for a population of 20,000 and consists of settling tanks, sep. sludge digestion tanks, sludge beds, contact beds, sand filters and sterilization plant.

C. C. RUCHHOFF

Control of odors from sewage treatment plants. J. F. SKINNER. *Surveyor* **67**, 499-500(1925), cf. *C. E.* **19**, 2097. Liberal design and proper placing of the plant are at the present the most efficient method of odor control.

R. E. GREENFIELD

Percolating bacteria beds. J. T. THOMPSON. *Surveyor* **68**, 31-4(1925).—Percolating beds successfully purify sewage pptd. with iron and lime at Leeds, England. A 24-hr. B. O. D. test on the effluent is advocated for sewage plant control using the "Miller" method for dissolved O.

R. E. GREENFIELD

Sewerage of towns on tidal waters. N. BALFOUR. *Surveyor* **68**, 100-10(1925).—Discharge of sewage in tidal streams or estuaries is often unsatisfactory. Where sewage is discharged in such a way as to reach the open sea quickly, especially if the sewage has been clarified, conditions are usually less objectional.

R. E. GREENFIELD

"Distillery waste liquor" and their purification. (LITTLEFIELD) **16**. Filter for water (U. S. pat. 1,556,426) (U. S. pat. 1,558,608) **1**.

Purifying air containing ammonia. G. ST. J. PERROTT and M. YARLICK. U. S. 1,559,980, Nov. 3. Air which is vitiated by a large content of NH_3 is rendered respirable by passing it through a dry granular mass contg. crystals of hydrated CuSO_4 which may be mixed with pumice.

Preventing hard scale formation in boilers. J. SCHERT. U. S. 1,557,349, Oct. 1. Scale is removed and its formation prevented by emulsifying olibanum or other resin with the boiler H_2O by the use of gum arabic, agar agar or other org. protective colloid.

Filter for water. C. B. DEMAREE. U. S. 1,559,941, Nov. 3.

Combining soda ash and water. J. A. BRADBURN. U. S. 1,557,974, Oct. 20. Mech. features.

Portable water filter. A. M. CAPRA. U. S. 1,556,913, Oct. 13.

Apparatus for deaerating water. B. BROIDO. U. S. 1,560,754, Nov. 10.

Apparatus for softening water with base-exchange material. O. R. SWENEY. U. S. 1,557,117, Oct. 13

15. SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

What is humus? S. A. WAKSMAN. *Proc. Nat. Acad. Sci.* **11**, 463-8 (1925).—Soil humus may be divided into 2 fractions, α and β . The α fraction is sol in dil alkali and not pptd by dil acid. The β fraction is sol both in dil acids and dil alkalis and is pptd at a more or less definite isoelectric point which lies close to pH 4.8. Analyses of the α and β fractions of a muck soil and of fertilized and unfertilized Sassafras soil are given. Fertilizing greatly increased the α fraction of the Sassafras soil, while the β fraction was little changed. The muck contained 31.5% α fraction and only a trace of the β . M. S. ANDERSON

Some adsorption effects. F. GIRAUD. *Rec. agr. Mauricie* **2**, 507-9 (1925).—Examples of adsorption effects are cited. Eight samples of Mauritius soils were digested in $(NH_4)_2SO_4$ solns. of varying concn., and the NH_4 was detd. at the beginning and again after 18 hrs. From the av. results the following equation is derived: $A = 1.23 M^{0.69}$, where A is NH_4 adsorbed by 100 g. of soil, and M is NH_4 in 100 cc. of the final soln. It is concluded that even an excessive rain would not diminish the NH_4 in the soil, but would even increase it, through its own NH_4 content. Cane trash also adsorbs NH_4 , as is shown by a distinct temp. rise noted. It is probable that stable litter has a similar effect. F. W. ZERBAN

Disperse systems in soils. K. GLINKA. Separate 178 pp. Publishing house "Obrasovaniye," Russia (1924). This monograph from the eminent Russian authority is a concise statement of the present status of the subject soil colloids. The subject is treated under the following headings: conception of dispersed systems, soil suspensions, soil colloids, the phenomenon of adsorption in suspensions and colloids; elec. adsorption and coagulation, mutual pptn. of colloids, protective influence of humus sols, chemical (exchange) adsorption in soils, adsorption of gases and liquids (water) by soils, soil soln., application of the facts of dispersed chemistry to the problems of soil genesis. The monograph gives a comprehensive historical review of each subject treated and an extensive bibliography. J. S. JOFFE

Remarks on the determination of the acidity of the soil by the Liechti method. JAC. VAN DER SLEK. *Verslag Onderzoek. Rijkslandbouwk. proefsta.* **30**, 206-19 (1925).—Besides the large salt error of azolitmin, its colloidal character renders it unsuitable for use as an indicator for the detn. of the acidity of the soil. This is thought to be due to the pptg. action of the salt solns. on the colloids (clay and indicator), as well as the reaction of the azolitmin with the soil. The method is not recommended as a means of detg. the lime requirement of the soil. R. M. BARNETTE

Colloidal complications in the thiocyanate method of estimating soil acidity. F. O. ANDERSON and R. P. LUTZ. *Ind. Eng. Chem.* **17**, 1153-4 (1925).—Ferric thiocyanate in 95% alcohol when added to an air dry soil, hydrolyzes sufficiently to complicate the thiocyanate test for soil acidity. The $Fe(OH)_3$ formed by hydrolysis may be adsorbed by the colloidal clay of a soil, resulting in a shifting of the end point. The blue or green color often developed when soils high in Mn are treated with thiocyanate is thought to be due to a mutual pptn. of the negative colloidal Mn compds. and the positive $Fe(OH)_3$. M. S. ANDERSON

The soil with reference to some of its inorganic constituents. M. CARBERY. *Agr. J. India* **20**, 277-9 (1925).—Red laterite soil is of a fairly acid nature and contains a large % of Fe, Al and K_2O . It lacks P_2O_5 and N. The addn. of P_2O_5 in the form of bone was found to be very efficient. Liming was also necessary. The detn. of K_2O gave very good results with pte, although chem. analysis of the soil showed an ample supply of K_2O . Lab. expts. showed that the application of increased amts. of CaO decreased the amt. of available K_2O and, to a lesser extent, the P_2O_5 in soln. An application of 10 maunds of CaO per acre was found to be ample, although this quantity is not sufficient to bring the soil to neutrality. Field results are corroborating these lab. expts. RUSSEL M. JONES

A preliminary study of the effect of pressure upon the nitrogen changes in the soil.

E. H. PANGANIBAN. *Philippine Agr.* **14**, 235-42(1925).—Analyses of 3 soils from the vicinity of Cornell University are given. An additional pressure of 15 lbs. per sq. in. had no appreciable effect upon ammonification, nitrification, denitrification nor nitrogen fixation in soil. Eight references are given. A. L. MEHRING

Nitrogen fixation in the Punjab. P. E. LANDER AND BARKAT ALI. *Mem. Dept. Agr., India, Bact. Series* **2**, 28(1925).—Normal soils possess the power of rapidly fixing large quantities of N without the addn. of any carbohydrate. Under certain conditions, at present not exactly known, a rapid loss of N takes place. Light soils possess greater power of N fixation than heavy soils. More denitrification occurs in heavy soils than in light soils. Fixation of N occurs more often than denitrification. The rapid exhaustion of N from the soil will not occur from the above causes alone. Nature has provided to a certain degree a remedy for the loss of N which takes place by the removal of crops. A soil becomes suitable for N fixation after it has been exposed to climatic conditions for several months after the removal of wheat. RUSSEL M. JONES

A study of the secondary effects of hill fertilization. H. J. HARPER. Iowa Agr. Exp. Sta., *Research Bull.* **87**, 223-51(1925).—A field, lab. and greenhouse study of secondary effects of hill fertilization was made with 3 soil types. When fertilizers are applied in the hill acid phosphate had more effect on the H-ion concn. of the soil soln. than either $(\text{NH}_4)_2\text{SO}_4$ or KCl. There was no accumulation of NH_3 in the soil when the fertilizers were applied in the hill. Accumulation of NO_3 was retarded in a sandy soil, but no appreciable increase or decrease occurred in a loam or silt loam. There was very little leaching of NO_3 and other plant foods from a loam and silt loam from 1 in. of rainfall, while 2.56 inches caused a considerable movement of NO_3 . Hill applications of P in a loam soil were leached slightly by 1 in. of rain. During an entire season in which 15.27 inches of rain fell, the P_2O_5 from acid phosphate was not leached to a depth greater than 2 inches in a silt loam or greater than 4.5 inches in a loam. K is leached into the lower layers of soil more rapidly than P. No decrease in root development was detected between fertilized and unfertilized plants when the rate of hill fertilization did not exceed 200 lbs. per acre and the N content of the fertilizer did not exceed 3% of NH_3 . J. J. SKINNER

The experimental sullage farm, Lyallpur. P. E. LANDER. Agr. Research Inst., Pusa, *Bull.* **157**, 25 pp (1925).—The expts. are being carried out to det. the value of sewage H₂O as a fertilizer in India. Sep. exptl. plots were irrigated with full-strength sewage, 50 and 25% sewage dild. with canal H₂O, and canal H₂O alone, resp. The quantity of N applied during the growing season varied from about 75 lbs. with full strength sewage to 8 lbs. per acre with canal H₂O alone. Full-strength sewage gave the best results on maize and the yields paralleled the strength of the sewage regardless of the original fertility of the land. The highest yields of wheat were obtained with 25% and the lowest with full strength sewage, the latter producing a marked lodging effect on the wheat. Except in great dildn., sewage H₂O tended to cause cracking and bursting in root crops such as turnips and carrots, and produced an unpleasant flavor. Above-ground vegetables such as spinach and cauliflower were improved in condition and flavor by sewage applications. Variations in the total, nitrous, and nitric N content of the plots during the season are tabulated. K. D. JACOB

The phosphatic nodules of Trichinopoly and the availability of flour phosphate as a manure for paddy. M. R. RAMASWAMI SIVAN. *Mem. Dept. Agr., India, Chem. Series* **7**, 145-200(1925).—A deposit of phosphatic nodules, contg. 56 to 59% $\text{Ca}_3(\text{PO}_4)_2$, 17 to 20% CaCO_3 , 7% Fe_2O_3 and Al_2O_3 and 7% SiO_2 , is present in the cretaceous formation in the Trichinopoly district, lying on the surface and imbedded in soft yellow clay. A full description of the locality is given. The nodules are not suitable for superphosphate manuf., as the high % of CaCO_3 , Fe_2O_3 and Al_2O_3 will result in the waste of the acid. The conversion of the $\text{Ca}_3(\text{PO}_4)_2$ of the nodules into $\text{Ca}_2\text{H}_2(\text{PO}_4)_2$ is not feasible at present because of the lack of hydroelec. power. The nodules have, therefore, to be applied to the soil in a finely powd. condition. H₂O contg. CO_2 dissolves $\text{Ca}_3(\text{PO}_4)_2$ to an appreciable extent. The decompn. of org. matter, in the form of green manure, under swampy conditions of cultivation, results in the formation of sufficient CO_2 to convert appreciable quantities of $\text{Ca}_3(\text{PO}_4)_2$ into $\text{Ca}_2\text{H}_2(\text{PO}_4)_2$ which is sol. in soil H₂O. The availability of the phosphate in composts made with green manure and cattle manure was measured and found to be greatest in one week's compost and to decrease in longer kept composts. The results of pot expts. show that, when sufficient N is present in the soil, green manure renders the flour phosphate available to the paddy plant. Field expts. at the Manganallus Agr. Sta. and on the standardized plots of the central farm Coimbatore showed an increased yield of grain in favor of flour phosphate green manure, of 18 and 9%, resp. RUSSEL M. JONES

Pasture top-dressing trials at Te Kumi. T. H. PATTERSON. *New Zealand J. Agr.* 31, 88-92(1925).—With the check plots as 100 the relative av. yield of hay from unlimed plots receiving, resp., superphosphate, basic slag, and ground raw rock phosphate at the rate of 300 lbs. per acre each year over a period of 4 years, was 191, 152 and 149. On limed plots the relation was, check 100, superphosphate 178, and ground raw rock phosphate 130. With the 3 phosphatic materials the yield of hay progressively increased each year, the check plot showing practically no increase in yield. The limed superphosphate plot was practically free from weeds at the end of the fourth year and in this respect the other plots stood in the following order: superphosphate, unlimed; basic slag; rock phosphate, limed; rock phosphate, unlimed. The check plots showed an increase in weed vegetation. The soil used was a light loam with a somewhat stiffer subsoil. On medium volcanic loam and heavy alluvial soil the response from phosphatic fertilizing was less pronounced. K. D. JACOB

Liming and top-dressing at Winton experimental area. Botanical analysis, of pasture. R. MCGILLIVRAY. *New Zealand J. Agr.* 31, 107-10(1925); cf. preceding abstr.—Exptl. plots were sown to mixed pasture in 1920 and treated in 1924 with basic slag and ground, Nauru raw rock phosphate, resp., at the rate of 300 pounds per acre. In addn. to the phosphates, the plots also received either ground limestone at the rate of 1.8 to 3.6 or burnt lime at the rate of 1 to 2 tons per acre. With the check plots as 100, the relative yield with basic slag was 111 and with raw rock phosphate 91. On the av., higher yields were obtained from the plots receiving ground limestone than from those receiving burnt lime. Hay from the plots receiving both phosphate and lime lost 74% of its wt. on air-drying while hay from the check plots lost 76 to 80%. The percentage of weeds was practically the same on all plots. The basic slag plots contained the highest percentage of clover and the check plots the lowest. K. D. J

Trials with sulfur as a top-dressing at Yanco. R. J. DAVIDSON. *Agr. Gaz. N. S. Wales* 36, 548(1925).—S applied as a top-dressing, alone and in combination with superphosphate, did not appreciably increase the yield of lucerne. K. D. JACOB

The relation of sulfur to alfalfa production. O. C. BRUCE. *J. Agr. Research* 30, 937-47(1925).—S applied to a soil which contained as much of the fertilizing elements and a little more S than the av. Kansas soil failed to give any marked increase in yield or root development of alfalfa. S is, therefore, considered not to be the limiting factor in alfalfa production on this type of soil. In general the acidity of the soil was increased by the S. The N content of the tops and the S content of roots and tops were not influenced by the S applied. W. H. ROSS

The influence of sulfur and gypsum upon the composition and yield of legumes. J. R. NEILLER. Washington Agr. Expt. Sta., *Bull.* 190, 47 pp.(1925).—On Ritzville soil in the greenhouse yields of alfalfa were increased by the use of S and gypsum and contained an appreciably greater percentage of N. This suggests that S benefits alfalfa indirectly through its action on the nodule bacteria by enabling them to fix more N to be incorporated into the proteins of the plant. Results in similar expts. with clover grown on Ritzville loam were much the same as those with alfalfa, except that both S and gypsum increased the clover yields even more than those of alfalfa. The results on several soils show that when S is effective it causes an increase in the percentage of N as well as in the yield of legume crops. S proved to be more effective when used as a top dressing, in the surface layer of alfalfa sod, than when mixed with the surface soil before planting. This again points to the direct action of S upon the nodule bacteria since most of the nodules are found on roots near the soil surface. Although the sulfured and unsulfured crops contained approx. equal quantities of Fe it is believed that the Fe exists in a different state in sulfured crops because it has a different appearance when pptd. as a hydroxide. Analyses of alfalfa grown in Ritzville silt loam under plant-house and field conditions showed that the field crop contained larger quantities of N and S while the K, Ca, and P contents were about the same. In sulfured soils the plant-house crops contained slightly greater quantities of N and S. J. J. SKINNER

Limestones for agricultural use. F. T. LEIGHTON. *New Zealand J. Agr.* 31, 175-7(1925).—The CaCO_3 content and the general phys. characteristics of 39 samples of limestone from as many different localities in New Zealand are tabulated. K. D. J.

Seychelles guano deposits. P. R. DU PONT. *Fertilizer, Feeding-Stuffs and Farm Supplies J.* 10, 214(1925).—The deposits are of bird origin. They are estd. at 200,000 tons contg. over 50% $\text{Ca}_3(\text{PO}_4)_2$ and approx. 1,000,000 tons of lower-grade guano. K. D. J.

"Leuna"-saltpeter (ammonium sulfate-nitrate). C. H. VAN HARREVELD-LAKO. *Arch. Suikerind.* 33, 685-92(1925).—A review of previous articles on the subject by

Jänecke (Pamphlet, 1924), Kast (C. A. 18, 2079), Wöhler (Z. angew. Chem. 1924, 497), Schreinemakers and Hoenen (C. A. 3, 1733).

Sources of ammonia in potato fertilizers. J. G. LIPMAN. New Jersey Dept. Agr., Bull. 39, 171-7 (1924).—Mineral nitrates are more effective in potato fertilizers than animal ammoniates. The cost of each is discussed and the physical condition of mixts. made from various N sources is given consideration.

Experiments on the control of wart disease of potatoes by soil treatment with particular reference to the use of sulfur. W. A. ROACH, M. D. GLYNNE, W. B. BRIERLEY and E. M. CROWTHER. Ann. Applied Biol. 12, 152-90 (1925).—S applied to a light sandy soil at the rate of 100, 200, 300, 400, 500, and 1000 lb. per acre reduced the degree of infection of the potato wart disease in direct ratio from 73% for untreated soil to 8% for 1000 lb. per acre. Larger applications did not completely eradicate the disease. Heavy soils required larger applications of S to ensure clean plots. Gas works spent oxides were less effective than S, probably due to the coarseness of the material. S inoculated with *Thiobacillus thiooxydans* showed no increased efficiency over uninoculated S.

A study of essential plant foods recoverable from the manure of dairy cows. C. F. WELLS and B. A. DUNBAR. J. Agr. Research 30, 983-8 (1925).—About $\frac{4}{5}$ of the K_2O , $\frac{2}{5}$ of the P_2O_5 and $\frac{2}{3}$ of the N fed to lactating cows are recovered in the manure. The actual quantities of these constituents so recovered vary with the type of animal and with the daily milk production. In a very general way the recovery of K_2O and N is in inverse relation to milk production, while the P_2O_5 recovered parallels the production of milk.

Variations in samples of copper carbonate. A. A. RAMSAY. Agr. Gaz. N. S. Wales 36, 482-4 (1925).—The compn. of 6 samples of com. Cu carbonate sold for the treatment of bunt in wheat, and contg. $CaCO_3$ as a filler, varied as follows: Na_2CO_3 0.26-1.85, $NaHCO_3$ 0.53 (one sample only), Na_2SO_4 3.46-16.19, $CaCO_3$ 10.64-36.68, Fe_2O_3 and Al_2O_3 0.60-2.16, basic Cu carbonate 35.99-72.36, basic Cu sulfate 0.98-12.00, and insol. matter 0.19-10.06%.

Some orchard conditions affected by arsenicals, marls and other factors. W. P. HEADDEN. Colorado Agr. Expt. Sta., Bull. 294, 31 pp. (1924).—The unfavorable conditions of many orchards in Colorado are due to (1) corrosive action of As in the crowns of the trees which produces acute poisoning, (2) development of injurious quantities of nitrates in the soil, (3) spray materials finding their way in the soil and made soluble by the soil ingredients and (4) presence of marl in the many soils. A discussion of each factor is given. It was found that sick trees contained a higher percentage of ash in wood and bark than healthy trees. A complete chem. analysis of trees and orchard soils is given.

Effects of spraying citrus trees on the composition and flavor of the fruit. C. F. JURITZ. J. Dept. Agr. Union S. Africa 11, 240-3 (1925).—The acid and sucrose content of oranges from trees sprayed with Pb arsenate mixt. varied inversely as the amt. of spray used. The av. content of 80+ specimens from unsprayed, lightly sprayed (26 ounces of spray mixt. per tree), and heavily sprayed (53 ounces per tree) trees was, acid 1.12, 0.49 and 0.18%; and sucrose 4.14, 3.65 and 1.12%, resp. In general approx. the same ratio existed with different varieties of oranges. Spraying with Pb arsenate impaired the flavor of the fruit but produced no change in external appearance.

The dormant spraying of fruit trees. THEODORE PARKER. Fertilizer, Feeding-Staffs and Farm Supplies J. 10, 15 (1925).—A review of the properties and relative value of the more important sprays used for the dormant spraying of fruit trees.

Destruction of charlock and other weeds by finely ground kainite. G. A. COWIE. Fertilizer, Feeding-Staffs and Farm Supplies J. 10, 303-4 (1925).—Kainite ground to 80% through a 60-mesh sieve and dusted on at the rate of 600 to 800 lbs. per acre killed as high as 90% of the charlock present. For optimum results the kainite should be applied while the leaves are wet and before the weeds reach the flowering stage. Young clover was not injured when the kainite was applied at the proper stage of weed growth. Finely ground kainite was also effective against thistles, runc, spurry and stinging, and hemp nettles.

Calcium salts of the phenols from low-temperature tar. FREDERICK GREENBAUM. Chem.-Ztg. 49, 754 (1925).—The Ca salts of low temp. tar phenols were prepd. by boiling the phenols with an excess of $Ca(OH)_2$ in $CaCl_2$ soln., filtering off the ppt., and washing with C_6H_6 . The product contained 55% of the original phenol used. Tests showed it to be of no value as an insecticide for boll-weevil.

T. S. CARSWELL

Sulfur: Its uses as an insecticide and fungicide. THEODORE PARKER. *Fertilizer, Feeding-Stuffs and Farm Supplies J.* 10, 96-7(1925).—A review of the properties, compn., efficiency and methods of application of 7 S prepn.s. used as insecticides and fungicides. K. D. JACOB

Latex. Insecticide preparation for combating plant parasites. RUDOLF DITMAR. *Rev. gén. caoutchouc* 1925, no. 15, 9-10.—Rubber latex is an effective insecticide when used in either of 2 ways. On painting the tree trunks or branches, a sticky coating remains on evapn., to which the parasites adhere. By sprinkling the infested areas with the latex the insects are suffocated. In the first case honey can be added to dild. latex, or a soln. of rubber in benzene or benzine may be used, the former being particularly effective against ants. The efficacy of such prepn.s. is enhanced by the fact that oxidation due to sun and air renders them still stickier. C. C. DAVIS

Soap and its uses for spraying purposes. THEODORE PARKER. *Fertilizer, Feeding-Stuffs and Farm Supplies J.* 10, 211-2(1925).—Expts. were carried out to det. the relation between the strength and the spreading power of soap solns. used for spray purposes. The soap contained K_2O 8, fatty acids 40, and H_2O 50%. The hardness of the water used was 12.8 grains per gal.

Lbs. of soap per 100 gal. of water	Greased plate	Surfaces sprayed	
		Washed Ivy leaves	Unwashed
1	Bad	Bad	Good
2	Bad	Very good	Excellent
3	Very poor	Fair	Excellent
4	Fair	Good	Excellent
5	Fair	Good	Excellent
8	Moderately good	Good	Excellent
10	Good	Excellent	Excellent
20	Excellent	Excellent	Excellent

The unwashed leaves were covered with a thin adhesive layer of dust which appeared to reduce the natural resistance of the leaves and facilitate the spreading of even the most dil. soln. The importance of using relatively soft water in the prepn. of soap soln. for spray purposes is emphasized. K. D. JACOB

The poisoning of fruit flies. The killing efficiency of certain arsenicals. T. MCCARTHY. *Ag. Gaz. N. S. Wales* 36, 667 (1925). The expts. were carried out to det. the efficiency of certain As compds. as poisons for fruit flies (*Ceratitis capitata*). Flies were bred in the lab. from infested fruit and placed in glass lamp chimneys for a few days before being fed on the poison mixts. The baits were composed of a mixt. of molasses, H_2O , and Pb arsenate, Ca arsenate, As_2O_3 , Na arsenite, or K arsenate. On the basis of the time required to kill the flies after addn. of the poison to the glass chimneys, Na arsenite, K arsenate and As_2O_3 were the most effective, followed by Ca arsenate and Pb arsenate. The max. time required to kill all flies varied from 24 hrs. with As_2O_3 to 90 hrs. with Pb arsenate. The time required for death after actual feeding of the poison was detd. with individual flies with the following results: As_2O_3 25 to 78, Na arsenite 25 to 75 and K arsenate 45 to 65 min. K. D. JACOB

Fertilizer. J. GÖRNING. U. S. 1,550,537, Aug. 18. Waste liquor from the manuf. of cellulose is mixed with sufficient lime to form a dry fertilizer.

Fertilizer containing colloidal magnesium antimonate. M. NAMBA. U. S. 1,550,585, Aug. 18.

Insecticide. G. E. SEIL and O. F. HEDENBURG. U. S. 1,559,961, Nov. A dil. aq. soln. of ethanohydrin of acetone is adapted for spraying on plants, etc.

Fungicide containing sulfur. H. W. BANKS, 3D. U. S. 1,550,650, Aug. 18. A compn. contg. colloidal S is prepd. by melting S and mixing it with bentonite or other "morg. H_2O absorptive jell-forming medium" before it congeals.

16 THE FERMENTATION INDUSTRIES

C. N. FREY

The assimilative nitrogen in beer worts. PAUL KOLBACH. *Wochschr. Brauerei* 42, 245-6(1925).—The N in beer worts may be classified into 2 groups, one group contg. ammonia, amino and polypeptides N, the other contg. albumins, peptones and proteins. Yeast offers a means of testing for the compds. assimilated because only the

substances passing through membranes can be used by yeast. To avoid yeast autolyses, only a few cells of known purity are used for inoculation. All N measured as amino N by formol test is not fermentable and may not all be amino N. All N of arginine is probably not fermentable and some sol. nitrogenous substances may not yield to formol titration. This is true of certain polypeptides and of amides whose N content is only partly indicated by formol titration. The difference between the Van Slyke N and formol N gives the amt. of diamino acids. The polypeptide N may be detd. by using the same indicators but different solvents and titrating according to Willstätter's method. In 50% alc. polypeptides may be quant. titrated with phenolphthalein but amino acids only 28%. In 97% alc. both may be titrated quant. By these methods it is hoped to obtain some information regarding the N compounds assimilated by yeast. C. N. FREY

Malt content of worts and degree of fermentation. P. PETIT *Brasserie et malterier* 15, 177-80, 193 6, 209-12(1925).—The mechanism of fermentation is discussed from the standpoint of explaining the apparent inconsistencies frequently observed between detns. of "crude maltose" and of max. degree of fermentation and the degree of fermentation actually obtained. P. concludes that the detn. of max. degree of fermentation is of greater value than that of "crude maltose" (reducing sugars calcd. as maltose). A. PAPINEAU-COUTURE

"Distillery waste liquids" and their purification. R. D. LITTLEFIELD *Chemistry and Industry* 44, 860 7(1925).—Methods for the disposal of steep water, pot ale, spent lees and wash waters are given. Drawings illustrate the equipment used. C. N. F.

Observations on Sarcinae. F. STOCKHAUSEN *Wochschr. Brauerei* 42(1925); *Bull. assoc. inst. sup. fermentations Gand* 26, *Ann. soc. brasserie* 34, 272 3(1925).—Degree of fermentation seems to have considerable effect on the development of Sarcinae. It is considerably hampered by toxic substances from the hops and by the O dissolved in the wort. On addn. of the yeast, Sarcinae begin to develop as a result of absorption of O by the yeast and diffusion of the decompn. products of the yeast. Slow fermentation with poor yeast development greatly favors development of Sarcinae, as does the use of low diastatic malts which leave a large amount of residual dextrins in the wort and gives beers with abnormal acidity. Beers with low acidity are especially liable to Sarcinae infection. Development can take place with a p_H of 4.3-6.3, the optimum being 5.33. A. PAPINEAU-COUTURE

Fusel oil and the methods of producing it. D. E. LÜDDE *Z. Spiritusind.* 48, 297(1925).—The origin and methods of production of fusel oil are discussed. C. N. F.

Are there dextrin-fermenting yeasts? (STAIGER, GLAUBITZ) 11C. Chemical mechanism of the principal fermentations of glucose (LEMOIGNE) 11A.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The stability of calcium acetylsalicylate. N. SCHOORL *Pharm. Weekblad* 62, 1166-72(1925).—The Ca salt of acetylsalicylic acid, or "soluble aspirin," marketed under various trade names, undergoes decompn. unless prepd. in the anhydrous state and protected from atm. moisture by sealing the bottle with lime. In a cork-stoppered bottle decompn. is noticeable within 5 years. A. W. DOX

Alkaloids of ipecac (Uragoga ipecacuanha) IV. O. KELLER AND X. BERNHARD *Arch. Pharm.* 263, 401-24(1925); cf. *C. A.* 8, 2700; 11, 3093.—Emetine HBr, emetine and cephaeline were prepd. in pure condition and investigated anew. The behavior of both alkaloids on methylation via Hofmann-Nölting was compared with the result that both the quaternary iodides thereby formed are shown to be dissimilar in that the phenol OH of cephaeline is not methylated by this method. The behavior of emetine, cephaeline and the quaternary emetonium base was followed on distn. with Zn dust in an improved app. (illustrated) and the new compd. formerly designated "base X" again studied insofar as the scanty material permitted. The phenol isolated in this operation proved to be guaiacol. These expts. prove that not only cephaeline but pure emetine as well yields guaiacol though in somewhat smaller amt. Freshly prepd. emetine-HBr contains 3 mols. H_2O of crystn. but gradually passes into a more stable form contg. 4 mols. of H_2O . The pure emetine base was isolated in cryst., form m. 68°. The fully methylated emetine, via Hofmann-Nölting trimethylemetine diiodide m. 222° and contained 3 mols. H_2O of crystn. The "base X" resulting from distg.

both emetine and cephaeline with Zn dust yields an aurate and platinate indicating similarity to but not complete identity with NMe₃. The article concludes with a bibliography covering work heretofore reported on the alkaloids of ipecac. W. O. E.

Unpleasant taste of radix primulae. R. WASICKY. *Arch. Pharm.* 263, 424-30 (1925).—An exptl. study of the root shows that the terrestrial portions of both *Primula veris* as also of *elatior* contain a substance or mixt. of substances to which is due the unpleasant or irritating taste peculiar to preps. of the root. This substance, while not identical with saponin but may be sepd. therefrom, is sol. in both neutral, alk. and acid H₂O. The composition of this substance, temporarily designated "Pr.melkratzstoff," is still under investigation. W. O. E.

Constitution of hydrargyrum salicylicum and related compounds. F. BOEDECKER AND O. WUNSTORF. *Arch. Pharm.* 263, 430-5 (1925).—As ordinarily carried out, the mercurization of salicylic acid yields a variable mixt. of *o*- and *p*-hydroxymercurisalicylic acid, with which KCN reacts in concd. aq. soln. to yield the corresponding K salts of cyanmercurisalicylic acid, the one designated "salt A," C₆H₄O₂NHgK + 2½H₂O, forming short needles; the other "salt B," C₆H₄O₂NHgK + 2H₂O, long needles. A dissolves in H₂O to a clear neutral liquid of unlimited stability. Both salts yield with iodized KI iodosalicylic acids, that from A m. 197.5-198°, while the one from B m. 196°; their mixt. m. 170°. W. O. E.

Chaulmoogra oil and its saponification. FREDERICK GREENBAUM. *Oesterr. Chem.-Ztg.* 28, 109-10 (1925).—Based upon the sapon. value of 204 to 213, 50 g. of the oil were shaken in a glass-stoppered cylinder with 14.25 g. of NaOH dissolved in 50 g. of H₂O. The clear bright yellow oil became cloudy, thickened after a few min. and finally yielded a white cake. After standing 12 hrs. the sapon. is complete and the product may then be dissolved in hot H₂O to a clear golden yellow liquid, the soap soln. having a strength of 10% and contg. about 5% chaulmoogra oil. A higher concn. is obtainable only after recourse to alc. sapon. To this end shake 13 cc. of chaulmoogra oil with 40 cc. of a 10% alc. NaOH soln. The sapon. is immediate, the oil solidifying in 1 to 2 min. to a bright yellow cake. On adding cold H₂O to this product a clear soln. immediately results without application of heat. The soap thus prepd. is much more readily sol. in H₂O than that made with aq. NaOH. Thus a 20% soap soln. was easily obtained contg. 10% chaulmoogra oil, likewise a 40% soap soln. contg. 20% oil, which latter was perfectly clear and so remained even on long standing. Since the soap was desired for intramuscular injection in the treatment of tuberculosis, the alc. was first eliminated by heating the product in vacuum and the free alkalinity neutralized by the addn. of about 2 cc. of concd. HCl. W. O. E.

Preparation of extracts under diminished pressure. ERNST RICHTER. *Pharm. Ztg.* 70, 1348 (1925).—A procedure is outlined for the lab. prepn. of dry exts. under diminished pressure by the aid of a H₂O-blast pump. W. O. E.

Stability of iodoform gauze. SCHULTZEN. *Pharm. Ztg.* 70, 1348 9 (1925).—Examin. of CHI₃ gauze prepd. for the Ger. army during the period of 1915-18 showed very little loss or deterioration. W. O. E.

Mel depuratum D. A.-B. V. PAUL ARAUNER. *Pharm. Ztg.* 70, 1349 (1925).—A discussion of this product from the Ger. pharmacopeial standpoint. W. O. E.

Scientific principles of galenical pharmacy. A. TSCHIRCH. *Pharm. Zentralhalle* 66, 549-52 (1925).—A discussion of the principles involved in the prepn. of galenicals, whether made from the fresh or dried plant, in connection with the contemplated Swiss pharmacopeial revision. Also in *Am. J. Pharm.* 97, 694-9 (1925). W. O. E.

Adsorption value of carbo medicinalis. FRANZ KÖNIG. *Pharm. Zentralhalle* 66, 645-8 (1925); cf. *C. A.* 17, 2473.—The adsorption value of various samples of charcoal (powdered, granulated and tabletted) with respect to its "sublimate titer" (= the no. of mg. of HgCl₂ adsorbed by 1 g. of carbo medicinalis after a 5 min. contact with 0.02 N HgCl₂ soln.). It is suggested that this test be made as supplementing that with methylene blue. W. O. E.

Argentum permanganicum. J. MESSNER. *Pharm. Zentralhalle* 66, 650-1 (1925).—This rather unusual medicament is discussed from the standpoint of pharmaceutical availability and probable application in gonorrheal therapy. W. O. E.

Examination of ammoniated mercury ointment (Unguentum hydrargyri album). JOH. PINNOW. *Pharm. Zentralhalle* 66, 685-9 (1925).—In a discussion and exptl. consideration of the factors affecting the accuracy of Rupp's procedure in the evaluation of this ointment, it is shown that the reduction of HgKI₂ in alk. soln. by CH₂O is a time reaction, being practically complete in 2 min. Lowering of temp. and especially the presence of undue amts. of free mineral acid in the Hg salt soln. affect the reaction unfavorably, even when, after completion of the reduction, the liquid reacts alk. The

acid ext. of the salve prep'd. *via* Ger. Pharm. V. contains sufficient HCl to inhibit completion of reduction in 2 min. This difficulty may be overcome by the addn. of a larger initial amt. of alkali (det'd. by titration of an aliquot with methyl orange as indicator), otherwise the reduction should be extended over a period of 1.5 hrs. before the addn. of AcOH. The action of CH_2O on the I soln. is not appreciably prejudicial to Rupp's procedure, statements by Kolthoff and Keijzer to the contrary notwithstanding. W. O. E.

Estimation of arsenic in iron pills. ALBERT HANSEN. *Pharm. Zentralhalle* 66, 701 (1925).—In a 300 cc. Kjeldahl flask (special form by Ramberg and Sjöström provided with a ground in delivery pipet, the upper limb of which is bent at an angle of about 45°) contg. 10 to 15 cc. of H_2O introduce 5 to 10 pills, and after $1\frac{1}{2}$ hr. 20 cc. of fuming 80% HNO_3 in small portions (cooling if necessary to avoid loss by undue foaming), then follow with 25 to 28 cc. of H_2SO_4 in small portions, finally heating the flask placed obliquely on an asbestos gauze with a small flame until most of the HNO_3 has been expelled. While the liquid still boils run in drop by drop 8 cc. of fuming HNO_3 , heat more strongly until SO_3 fumes appear. If on cooling any gray or black particles are observable among the pptd. sulfates, add 10 cc. additional fuming HNO_3 and boil until SO_3 fumes again appear. To the residue thus freed from org. material add 30 cc. of sat'd. $(\text{NH}_4)_2\text{C}_2\text{O}_4$ soln., whereby nitrous fumes should appear. Again boil until SO_3 fumes appear, continuing for 10 min. to insure complete destruction of the $\text{C}_2\text{O}_4\text{H}_2$. After cooling add 20 cc. of H_2O , mix and cool completely, then add 30 g. KCl, 1 g. $(\text{NH}_4)_2\text{SO}_4$ (or 0.5 g. FeSO_4), 25 cc. of concd. HCl and 0.5 g. of KBr. Mix thoroughly, adjust obliquely on a wire gauze, connect with the ground-in and bent pipet (lower end of which extends 1 cm. into 150 cc. of H_2O cont'd. in an Erlenmeyer flask, the latter being surrounded by 2 l. of cold H_2O). Now distil with such rapidity that the bent portion of the pipet becomes hot after 4 min., the bulb portion after 8 min., cooled, from the time of applying the heat. The distn. is complete after the lapse of 10 min. Raise the retort and attached pipet before extinguishing the flame, remove and drain the pipet, add 2 drops of methyl orange soln. (1:2500) to the distillate, then run in drop by drop from a buret a soln. contg. 0.2812 g. KBrO_3 per l. until the red color entirely disappears. This addn. of KBrO_3 must be very slow at the end. When the liquid begins to fade such addn. should not exceed 1 drop per min. The color change should not be immediate, but gradual. After the titration is finished add another drop of methyl orange soln. whereupon the red color should persist at least 1 min. 1 cc. KBrO_3 reagent = 0.5 mg. As_2O_3 . The app. employed is shown in 2 illustrations in the original. W. O. E.

Determination of chloroform in chloroform liniment. T. M. WILLGERODT. *Am. J. Pharm.* 97, 584 (1925).—W. recommends the following method based upon the conversion of the CHCl_3 into chlorides and detn. of the latter by the usual Volhard method: Pipet a 5 cc. sample of CHCl_3 liniment into a 100 cc. pressure bottle contg. 40 cc. of alc. KOH. The latter is made by dissolving 30 g. KOH in 30 cc. water, and when cool, adding enough MeOH to make 100 cc. Close the bottle, shake and boil 10 min. on a water bath. Start counting the time only when the water is actually boiling. Allow the mixt. to cool. Transfer with water into a 500 cc. volumetric flask, make up to vol. with water, pipet a 10 cc. portion into a 100 cc. volumetric flask, add a few cc. of HNO_3 , add a little water and then 50 cc. of 0.1 N V. S. AgNO_3 . Make up to vol. with water. Shake thoroughly. Filter off the chlorides with a dry filter. Take a 50 cc. aliquot portion, add a few cc. ferric ammonium sulfate soln. and titrate with a 0.1 N V. S. KCNS. Each cc. of 0.1 N AgNO_3 V. S. is equiv. to 3.98 mg. of CHCl_3 . W. G. GAESSLER

Studies on the toxicity of iron cacodylate. PETER MASUCCI AND GEO. A. SLOTHOWER. *Am. J. Pharm.* 97, 587-8 (1925).—Solns. of iron cacodylate on the market when injected intravenously give rise to abnormal irritation, pain and systemic reactions. By hydrolyzing the salt and converting the iron into the colloidal form, the drug is better adapted for intravenous use. Animal expts. show that the colloidal iron is one-half as toxic as the iron in the ionic state. Clinical results show very conclusively that when the iron is in the colloidal state the administration of the drug is not attended by any objectionable features. W. G. GAESSLER

Studies in the genus *Mentha*. VII. An examination of an oil of *Mentha piperita*, L., produced in 1922. R. E. KREMERS. *Am. J. Pharm.* 97, 658-64 (1925).—An oil derived from the strain of *M. piperita*, L., which has been grown for a number of years in the gardens of the Wisconsin Pharmaceutical Expt. Sta. was studied. This investigation has not settled either the entire compn. of the oil or the reasons for the difficulty in the crystn. of menthol. The previously well-known constituents cineole, *l*-menthol,

and *l*-menthone were identified. Neither 1-methyl-3-cyclohexanone nor pulegone was found in the cohobated oil of this year. Neither pinene nor phellandrene nor limonene, which have been previously reported, was definitely characterized. The possibility of another terpene being present in the mixt. of low-boiling substances is worth considering. *d*-Piperitone was identified in both the cohobated and primary oil. A menthenone closely resembling pulegone was found in the primary oil. Although no conclusive evidence was obtained, the indications were that other alcs. than *l*-menthol were present in the menthol-menthone fractions and were the principal cause for the failure of *l*-menthol to crystallize from high concns. W. G. G.

Stability of iodated tincture of iodine. E. COLLARD, JR. *Ann. chim. anal. chim. appl.* 7, 292-3 (1925).—A tincture of I_2 prepn about $3\frac{1}{2}$ years old was analyzed by the method previously described (Collard, *C. A.* 16, 4008). Its d had increased from 0.901 to 0.910, the KI content from 2.66 to 3.02 and the total I from 6.67 to 7.28 while the alc. content was reduced from 93° to 89.5° . The changes were so slight, however, that the values testify to the fact that the tincture prepd. according to *Codex* has good keeping qualities. W. T. H.

Extraction of nicotine from waste Turkish tobacco. F. W. PETTY AND A. SKIBBE. *J. Dept. Agr. Union S. Africa* 11, 294 (1925).—Preliminary expts. on the prepn. of home-made tobacco exts. showed that contrary to general opinion only about 3% of the total nicotine was lost by boiling the tobacco in H_2O for 30 min. or longer. Exts. from equiv. amts. of tobacco treated with cold H_2O for 12 hrs. or with boiling H_2O for 30 min. contained 0.083 and 0.076% of nicotine, resp. Exts. contg. from 0.05 to 1% nicotine were effective against the black peach aphid. K. D. JACOB

Water content of export butter. Results of testing for year 1924-25. ANON. *New Zealand J. Agr.* 31, 184-5 (1925).—Of 145,780 samples of butter examd. 828 contained an av. of 16.38% H_2O and the remainder an av. of 15.04%. The legal limit is 16%. K. D. JACOB

Farnesol. J. GROSJEAN AND J. MARTINET. *Chimie et industrie* 14, 363-7 (1925).—Review of the chem. properties and constitution of farnesol and of *nerolidol*. A. P.-C.

Oil of "Blumea Balsamifera." ÉTABLISSEMENTS A. CHIRIS. *Parfums de France* No. 31, 257 (Sept., 1925). According to R. JONAS (*C. A.* 3, 1908) this oil consists mainly of *l*-borneol, together with some cineol limonene, palmitic and myristic acids, *l*-camphor, sesquiterpene alcs., and the dimethyl ether of phloracetophenone. A sample from the Langson region, Tonkin, was found to consist mostly of *d*-camphor, with a small proportion of borneol, which could not be definitely identified as the *l*- and *d*- variety. A. PAPINEAU-COUTURE

Oil of "bergamot-mint" (*Mentha citrata*). ANON. *Parfumerie moderne* 18, 205-6 (1925). A sample distd. from *M. citrata* grown in Michigan had d_{25} 0.9234, α (100 mm.) -7.8° , n 1.4598, sol. in 15 vol. of 70% alc. and in 5 vol. of 60% alc., residue on evapn. 23%, esters (as linalyl acetate) 57. alcs. (as linalool) 14.6%. Tables are given showing the color, d_{25} , α (100 mm.), and n of the fractions obtained by steam distn.; and the color, d_{15} , d_{25} , α (100 mm.), n , acid no., ester no., % of esters (as linalyl acetate) or of alc. (as linalool) and soly. in 70% alc. of the various fractions on distg. under 15 mm. pressure. A. PAPINEAU-COUTURE

Identification by chemical methods of drugs containing tannin. A. H. WARE. *Pharm. J.* 115, 131-5; *Chemist and Druggist* 103, 174-5 (1925).—I. A specific method for the detection of aromadendrin. (A.) Shake an aq. ext. of powd. kino or cutch with Et_2O , dissolve 0.005 g. of the evapd. Et_2O ext. in 5 cc. of 90% $EtOH$, and reduce with Zn or Mg and HCl. A strongly pink color appears which later fades. NaOH added at the max. intensity causes a yellow color. The various kinos are classified according to their content of A as shown by this test. Flavonols, e. g., quercetin, give similar colors, except that with NaOH added at the max., the color is purple; added after fading, it is green. A, as well as anthoxanthins, gives the *kino-yellow test*: To a few cc. of an alc. ext. of kino in a white dish add a little dil. H_2SO_4 and heat thin films of the fluid to a temp. short of carbonizing. A very decided, at times brilliant, but evanescent yellow color is produced; it is also given with quercetin, luteolin and less strongly with gentisin. A weak indication of A runs parallel with an indistinct reaction for kino-yellow. A is probably benzophenone and resembles catechins (*C. A.* 18, 3183). II. Two new classificatory tests for tannins (cf. *C. A.* 19, 623, 3034). No. 1: Boil 5 cc. of dil. ext. with 10-12 drops of 33% $AcOH$ and 5 cc. of an aq. soln. of $Fe-NH_4$ citrate (Brit. Pharm.), cool, filter and add NH_4Cl 1 g., again boil. Pyrogallol tannin, but no phlobatannin, is pptd. Test for the latter in the filtrate by Stiasny's test (*C. A.* 18, 3684). This method differentiates sharply between the 2 classes, types of which are listed; *kousso* proved to contain pyrogallol tannin. No. 2: Boil 5 cc. of the ext. with

1.5 g. of small crystals of NaH_2PO_4 , filter and boil the filtrate with the ferric citrate soln. Gallotannins are pptd. partially or completely as violet Fe compds., and ellagitannins as green-black ppts.; hamamelitannins are not pptd., but give a deep brown soln. Phlobatannins are not pptd., but are better identified by the 1st test. The results by test No. 2 agree with those by Mitchell (*C. A.* 19, 2004) and certain other tests (*C. A.* 19, 3144). III. Table for the identification of seventeen kinos. A systematic application of the various tests for tannins.

S. WALDBOTT

The picrates of the opium alkaloids. C. W. MAPLETHORPE AND N. EVERS. *Pharm. J.* 115, 137-9, 178; *Chemist and Druggist* 103, 176-7 (1925); cf. *C. A.* 16, 1721.—The prepn. and analysis, and the methods of detn. of m. p., and soly. in H_2O , EtOH and acetone, are described. Sketches of the crystals are given (in *Pharm. J.*). The m. p. of the picrates of thebaine (217°), narcotine (174°) and narceine (195°) differ widely from those given by Fuller (*C. A.* 15, 1057). Soly. at 20° in H_2O , abs. EtOH and acetone of the picrate of morphine is, resp., 0.22, 0.14, 13.86%; codeine 0.11, 0.095, 3.89%; thebaine 0.20, 0.10, 10.1%; narcotine 2.02, 0.13, 0.30%; narceine 0.027, 0.01, 5.23%; papaverine 0.007, 0.052, 1.89%. At 15° the picrates of cryptopine (A), gnoscopine (B) and xanthaline (C) showed soly. in the same solvents of: A 0.007, 0.009, 0.162%; B 0.009, 0.04, 2.34%; C 0.01, 0.022, 0.34%.

S. WALDBOTT

Increase in specific gravity of Easton's sirup and Syr. ferri phosph., Brit. Pharm., on keeping. C. M. CAINES AND N. EVERS. *Pharm. J.* 115, 139, 178; *Chemist & Druggist* 103, 177 (1925).—The sp. gr. of a sample of Easton's sirup increased in 4 months from 1.2714 to 1.2828; another in 3 months from 1.2818 to 1.2945. The sp. gr. of a sample of syr. ferri phosph., Brit. Pharm., rose in 3 months from 1.2765 to 1.2890. In all cases the increase ran parallel with a decrease in optical rotation. The change is sufficiently accounted for by the inversion of the cane sugar content (cf. Rosenblum and Callaghan, *Australian J. Pharm.* 1924, 1114).

S. WALDBOTT

Identification of alkaloids. W. M. CUMMING AND D. G. BROWN. *Pharm. J.* 115, 140-3, 178; *Chemist & Druggist* 103, 177-8 (1925).—Results obtained previously (*C. A.* 19, 2826) on the action of ferro- and ferricyanides on alkaloids in neutral, acid or alc. solns. are given in a table contg. the formulas and the (characteristic) % of Fe for each of 36 compds. Micrographs of 14 salts are shown (in *Pharm. J.*). Also cf. *C. A.* 18, 59, 1799, 2330.

S. WALDBOTT

Note on the official process for assaying galenicals of hydrastis. H. B. MACKIE AND H. A. CLEARY. *Pharm. J.* 115, 145-6, 179; *Chemist & Druggist* 103, 179-80 (1925).—In the Brit. Pharm. process, the sepn. of berberine and hydrastine as HI compds. while incomplete is unimportant because the subsequent removal of hydrastine by means of a solvent effects a good sepn. Sources of error are the adsorption of hydrastine by the berberine-HI ppt.; also the soly. of hydrastine in excess of NH_4OH , possibly affecting the subsequent soly. in Et_2O ; hence excess of NH_4OH should be avoided. A process of extn. involving only the use of a suitable solvent is in prepn.

S. WALDBOTT

Some experiments on phosphorus pill, Brit. Pharm. F. J. DYER AND R. MELVILLE. *Pharm. J.* 115, 146-7, 179-80; *Chemist & Druggist* 103, 180 (1925).—The Brit. Pharm. formula yields a mass which melts in the hands and is difficult to form into pills. The use of dried Na_2SO_4 in the Brit. Pharm. prepn. seems to have little advantage upon the disintegration of the pill which, with or without Na_2SO_4 , melts at 37° in 5 min. Formulas with stearin, suet and wax, used in place of cocoa butter, gave a more manageable mass, but the pills failed to disintegrate in 1 day. The formula: phosphorated suet 10 g., powd. licorice 56 g., glucose 34 g., CS_2 20 cc., worked as in the Brit. Pharm. prepn., gave an excellent mass, fuming very little, easily rolled, cut and rounded. The pill disintegrates at 37° in 1 hr. The use of free P in pill form should be replaced by some other method, e. g., Oleum phosphoratum administered in capsules.

S. WALDBOTT

Note on oiled mercury. F. J. DYER AND KATHLEEN METCALFE. *Pharm. J.* 115, 147-9, 180; *Chemist & Druggist* 103, 180 (1925).—To obtain a uniform product, triturate HgO 20 g. with 90% EtOH 5 g., and to the moist mass add oleic acid 80 g. Heat on the water bath for 20 min., stirring occasionally. The result is a translucent, unctuous, lemon-yellow substance which should not darken or become opaque on keeping. One g. shaken with 20 cc. Et_2O produces a translucent soln. from which no yellow or gray particles sep. on standing.

S. WALDBOTT

Note on morphine hydrate. D. B. DORR. *Pharm. J.* 115, 137; *Chemist & Druggist* 103, 181 (1925).—Powd. morphine (0.5 g.) heated to 98.5° in a closed space surrounded by steam became anhyd. in 2 hrs. +. At 90° (e. g., on a water bath) the loss of H_2O is very slow. Heating to 100 - 110° in an air bath is recommended, but loss

through scattering of crystals, caused by tenaciously held H_2O , should be avoided.

Bismuth carbonate; some factors affecting its physical condition. A. J. JONES. *Pharm. J.* 115, 143-4, 179; *Chemist & Druggist* 103, 179(1925).—The formation of Bi carbonate of max. bulk depends on a restricted set of conditions in which the concn. of the Na_2CO_3 soln. remaining at the end of the reaction (1.26%), and the temp. of the reaction (45°) are the dominant factors. Deviations from these conditions tend to the formation of denser products.

Colorimetric estimation of benzoic acid in cordials, etc. A. J. JONES. *Pharm. J.* 115, 144-5; *Chemist & Druggist* 103, 181(1925).—A modification of the Halphen-Grossfeld reaction is used. Ext. a mixt. of 10 cc. of sample and 5 cc. 10% H_2SO_4 with 20 cc., then 10 cc. of a mixt. (equal vols.) of petroleum ether and Et_2O , and remove $BzOH$ with 5 cc. H_2O contg. 0.3 cc. 20% $NaOH$, then with 5 cc. H_2O . Evap. to dryness, add a total of 8 cc. of a mixt. (1 + 9) of HNO_3 (d 1.42) and H_2SO_4 (d 1.84) and heat in a test-tube by direct flame to 155-160° for exactly 3 min. Cool, add 20 cc. H_2O , again cool, then ext. with 15 and 10 cc. Et_2O . Ext. the Et_2O soln. with a mixt. of 8 cc. H_2O and 2 cc. NH_4OH (d 0.880), then with 2×5 cc. H_2O . Now add 3 cc. NH_4OH and 1 g. $NH_4OH.HCl$ and warm to 35-40°. A fine red color of $m-C_6H_3(NH_2)_2CO_2NH_4$ appears. After 20 min. dil. to 50 cc. and compare with a standard representing 5 grains of $BzOH$ per pint of sample if the standard is prepd. from 5.7 mg. $BzOH$ by the above method (6.7 mg. by calcn.). The deviation is caused by the fact that the color intensity is not strictly proportional to the amt. of $BzOH$ originally present. Salicylic acid at the high temp. of the method gives a negative test; saccharin reacts but slightly.

S. WALDBOTT

Filter for beverages, pharmaceutical solutions, etc. (U. S. pat. 1,560,266) 1.

Mercurial "prophylactic." O. LOWY. U. S. 1,559,899, Nov. 3. $HgCl_2$ is added to diaminodihydroxyarsenobenzene in a carrier of firm gelatinous material such as gelatin and glycerol which becomes substantially fluid at body temp.

Calcium lactate composition adapted for pharmaceutical uses. H. UMBER. U. S. 1,559,478, Oct. 27. A compn. comprising Ca and Na lactates and H_2O of crystn. is prepd. by mixing concd. lactic acid, $NaOH$ and quicklime.

Complex gold compounds. M. BOCKMÜHL, G. EHRHART and P. FRITZSCHE. U. S. 1,558,584, Oct. 27. A Au salt, e. g., K auribromide, is caused to act upon thiobenzimidazolecarboxylic acids and the Au compds. thus obtained are converted into salts, e. g., by use of $NaOH$. The products are yellowish powders, sol. in H_2O , adapted for therapeutic uses.

Acetylene as an anesthetic. H. WIELAND. U. S. 1,561,130, Nov. 10. C_2H_2 in such purified form as to be non-toxic is mixed with geraniol, linalool or other "cyclic fragrant alc."

Dentifrices. L. MANDELSTAMM. U. S. 1,559,732, Nov. 3. Glycerol and neutral cleansing and abrasive materials such as powdered chalk, soap, KCl and flavorings are mixed with small quantities of V and Ra compds., e. g., the chlorides.

Medicinal compounds of quinine and arsenic. DAFERT-SENSSEL-TIMMER. U. S. 1,558,241, Oct. 20. Quinine compds. such as the hydrochloride or the free alkaloid or quinidine and an As halide, e. g., $AsCl_3$ or AsF_3 , by reaction together (at a temp. of about 16-25° or lower in $CHCl_3$) form double compds. which are adapted for intravenous or intramuscular injection.

Acridinium salts soluble in fats and oils. L. BENDA. U. S. 1,550,420, Aug. 18. Mineral acid salts, e. g., the chloride of a 3,6-diamino-10-alkylacridinium compd., are caused to interact with Na stearate or other salts of such fatty acids as are contained in natural fats. The dry products are orange-red powders, insol. in H_2O but sol. in fatty oils and alc. They are adapted for use as therapeutic agents.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Control of the density of milk of lime by a simple titration. M. BECKMAN. *Arch. Suikerind.* 33, 1004-7(1925).—Instead of measuring the d. of milk of lime with a Baumé spindle, which is a very inaccurate method, it is better to titrate with HCl in a Vision tube, about 20 cm. long over all, and 17.5 cm. from bottom to beginning of neck. The

diam. of the tube is 23-25 mm. and of the narrow part of the neck 14-15 mm. The zero mark is placed at the point reached by 10 cc. Above that a graduation mark is placed every 2 cc. up to the 20 mark which indicates, therefore, 40 cc. added acid. If the 15 mark is to indicate milk of lime of 15° Bé., the HCl used must be 1.76 N. If it is preferred to use 1.5 N HCl, the cc. of this acid necessary to neutralize 10 cc. milk of lime of from 10 to 20° Bé. may be found from a table shown. Phenolphthalein is used as indicator.

F. W. ZERBAN

Potash from greensand (glaucanite). J. W. TURRENTINE, C. W. WHITTAKER AND E. J. FOX. *Ind. Eng. Chem.* 17, 1177-81 (1925).—A process is described for the recovery of K_2O from greensand which consists in digesting the ore with H_2SO_4 ; filtering, concg. the filtrate to crystallize out the sulfates of Fe, Al and K; roasting the mixt. of sulfates at 500° to decompose the sulfate of Fe into Fe_2O_3 with regeneration of SO_3 ; and lixiviating the roasted mass to yield high-grade Fe_2O_3 , alum and K_2SO_4 . The insol. residue remaining after the digestion of the greensand with H_2SO_4 yields when purified by washing, drying and screening an absorptive siliceous material to which has been assigned the trade name of "Glaucosil."

W. H. ROSS

The manufacture of artificial horn (galalith). O. MEIER. *Caoutchouc and gutta-percha* 22, 12595-7, 12639-42, 12682-3, 12718-21, 12790-4, 12830-5, 12868-70 (1925).—The article includes the history and development of the industry, the principles, process, equipment and technic of manuf. with diagrams and illustrations, the raw materials employed and their treatment, the drying of casein and its properties, analysis and evaluation, the present status of the industry, prospects for its future and production statistics.

C. C. DAVIS

Ethylene glycol. A contribution of chemistry to the automobile antifreeze problem. G. O. CURME, JR. AND C. O. YOUNG. *Ind. Eng. Chem.* 17, 1117-20 (1925).— $CH_2(OH)-CH_2(OH)$ (b. 197°) possesses advantages of both $EtOH$ and $C_2H_5(OH)_2$, with disadvantages of neither, as an antifreeze soln. A 40% (by vol.) aq. soln. freezes at -15° F. (-26° C.). Its solns. are non-electrolytes, non-corrosive to metals and finishes, do not destroy rubber, are not lost through evapn. of the glycol and so can be brought back to strength by the addition of H_2O , maintain temps. near the b. p. of pure H_2O when used in condns. indicated, and therefore give optimum engine temps., have high heat capacity and low viscosity, are odorless and noninflammable. Glycol can now be made in quantity without disturbing the production of other commodities and at diminishing rather than increasing cost.

W. C. EBAUGH

Occurrence of I in cement flue dust (KEYSSNER) 20.

Sulfuric acid. J. V. SKOGLUND. U. S. 1,559,292, Oct. 27. In recovery of nitrous gases from H_2SO_4 manuf., the gases are treated with H_2O and residual gases are then absorbed with H_2SO_4 .

Ammonia synthesis. H. HARTER. U. S. 1,550,806, Aug. 25. A mixt. of H and N under a pressure not exceeding 60 atm. is conducted through a plurality of contact chambers arranged in successive furnaces. The NH_3 formed in each contact chamber is removed from the gas mixt. before its entry into the next chamber (without replacing the quantity of gas mixt. transformed into NH_3).

Catalyst for ammonia synthesis. H. HARTER. U. S. 1,550,805, Aug. 25. Fe itself or other metal of the Fe group is smelted with an oxide of Mo, W, Ti, V, Th or Mg which is not easily reduced by H, and with a third substance for producing a glaze. Chamotte, kieselguhr or clay sand may be used as a carrier.

Oxidation of ammonia. C. ELLIS. U. S. 1,558,598, Oct. 27. A mixt. contg. NH_3 and air is passed in contact with a catalyzer contg. a metal of the Co group and an "acid-forming element which is capable of increasing its catalytic activity," e. g., V in the form of Co vanadate.

Calcining alkaline earth carbonates. H. MEHNER. U. S. 1,550,557, Aug. 18. In calcining $CaCO_3$ or similar materials, a charge is supported on a previous grate in the lower portion of a furnace-generator and relatively cool combustible gas and steam are admitted to a zone immediately above the charge. Air is admitted into an upper zone of the furnace-generator, this being a combustion zone where the combustible gas is burned and is sepd. from the charge by the intermediate layer of relatively cool combustible gas and steam through which heat radiates to the charge. Products dissociated from the charge are drawn off from a zone below the grate.

Sodium carbonate. G. N. LIBBY. U. S. 1,558,901, Oct. 27. In making Na_2CO_3 , finely divided MgO is added to a satd. soln. of trona.

Anhydrous magnesium chloride. P. COTTRINGER and W. R. COLLINGS. U. S. 1,557,660, Oct. 20. Partially dehydrated $MgCl_2$ is intermixed with the normal hydrated salt, both in solid form and the mixt. is then directly heated to drive off H_2O . A countercurrent of combustion gases may be used for the heating and dehydration.

Aluminium chloride. H. I. LEA and C. W. HUMPHREY. U. S. 1,558,897, Oct. 27. $Al_2(SO_4)_3$ is decomposed, e. g., by heating. The S oxides thus formed are used with Cl for the production of a chlorinating agent, and the latter is used for chlorinating the Al_2O_3 produced from the $Al_2(SO_4)_3$.

Titanium sulfate. H. N. McCOY. U. S. 1,559,113, Oct. 27. Sol. titanate sulfate is formed by reacting upon basic Ti sulfate with fuming sulfuric acid.

Zinc sulfide. G. DE HEDOUVILLE and P. PIPEREAU. U. S. 1,560,380, Nov. 3. In making crystd. ZnS , H_2S gas is caused to act on $ZnSO_4$ or other solid oxygenated compds. of Zn at temp. between 250° and redness.

Nitrogen oxides. H. G. A. RAMSAY. U. S. 1,558,046, Oct. 20. "Lime nitrogen" or other solid metallic CN compds. are burned in the presence of O air or O_2 at $850-950^\circ$ to produce N oxides.

Sulfur in allotropic form. H. H. WILKINSON. U. S. 1,560,926, Nov. 10. S is heated *in vacuo* in a still until it is liquefied and vapors are evolved. The vapors are then transferred (still *in vacuo* and assisted by a current of inert gas such as N, CO_2 or flue gas) into a vacuum receiver and condensed *in vacuo*. The product forms finely divided, deep yellow, highly purified, light weight, allotropic S of substantially equal sized particles and is free from SO_2 .

Stabilizing solutions containing "loosely-combined oxygen." V. WINTSCH, JR. U. S. 1,559,599, Nov. 3. A sol. "pyrophosphate salicylate" such as 1% of the Na compd. is used for stabilizing solns. of H_2O_2 , Na perborate or of similar compds. U. S. 1,559,600 also specifies the use of sol "pyrophosphate salicylate" (such as may be prepd. by heating Na pyrophosphate with salicylic acid) for the same purpose. The stabilized solns. of compds. thus prepd. are adapted for bleaching vegetable fibers, etc.

Apparatus for purifying talc, etc., by screening and action of suction air currents. G. F. HANNAM. U. S. 1,560,910, Nov. 10

Urea from calcium cyanamide. J. BRESLAUER and G. DARIER. U. S. 1,559,516, Oct. 27. Raw Ca cyanamide is introduced in small portions and in finely divided condition into H_2O maintained at a temp. of about $30-40^\circ$ to which there is also added an acid such as CO_2 which forms insol. salts with "metallic" impurities which are present in the cyanamide. The pptd. compds. are sepd. and the purified free cyanamide in the soln. is converted into urea by the action of H_2SO_4 and heating to $60-70^\circ$. U. S. 1,559,517 specifies converting free cyanamide into urea by the action of an acid salt such as an acid phosphate. U. S. 1,559,518 specifies adding finely divided successive portions of raw Ca cyanamide to H_2O acidified with an acid substance such as acid phosphate which will ppt. metallic constituents of the raw material, while agitating the aqueous liquid. After removal of the insol. salts formed from the resulting soln. of free cyanamide, the latter is treated with an acid sulfate, e. g., $NaHSO_4$, and heated to about $60-70^\circ$ to hydrate the free cyanamide in soln. to urea.

Hydrated alumina. G. L. WILLIAMS. U. S. 1,559,489, Oct. 27. Hydrated alumina in granular form is obtained by pptg. a soln. of K aluminate with boiler furnace gases.

Dry composition for producing iodine. W. C. MOORE. U. S. 1,557,266, Oct. 13. A dry mixt. for producing free I on contact with H_2O comprises KI, KIO_3 , partially dehydrated cryst. $Al_2(SO_4)_3$ and KCl or similarly constituted and reactive materials.

Moldable composition containing phenolic condensation product. E. E. NOVOTNY and C. J. ROMIEUX. U. S. 1,557,318, Oct. 13. Paper, cloth, asbestos or other fibrous filler together with lanolin is used with a binder of phenolic condensation product for forming sheets or other molded articles.

Decolorizing material. P. L. WOOSTER. U. S. 1,558,137, Oct. 20. The C is removed from bone char by heating and the material is then exposed to vapors arising from heating or incomplete combustion of bitumen or other hydrocarbon material. The product is adapted for treating sugar solns., etc.

Active charcoal. H. THIENEMANN. U. S. 1,551,074, Aug. 25. A paste of finely ground peat and a soln. of $FeCl_3$ or other suitable substance "contg. an inorg. acid radical" is formed into compact bodies, dried and calcined. U. S. 1,551,075 specifies heating H_3PO_4 and finely ground brown coal.

Recovering diatomaceous earth after use for clarifying sugar solutions or for similar purposes. R. C. WILLIAMS. U. S. 1,561,042, Nov. 10. "Mud-cake" such as is left after treating sugar solns. is used for making bricks, tiles, heat insulation or other molded

articles after a preliminary treatment, *e. g.*, either a preliminary fermentation or admixture with a germicide to prevent disruptive fermentation in the molded article.

Molded articles from casein "artificial horn." A. BARTELS and O. MIECH. U. S. 1,560,368, Nov. 3. A prep'd. comparatively firm casein mass is passed through an extrusion app., molded under yielding pressure and the formed articles are then hardened and dried.

Adhesive from starch. H. V. DUNHAM. U. S. 1,551,472, Aug. 25. Starch is treated with saccharate of Sr or other saccharate of an alkali-forming metal and heated with H₂O to at least the bursting temp. of the starch granules.

Absorptive carbon. A. W. SMITH. U. S. 1,559,054, Oct. 27. Fibrous vegetable material such as sawdust treated with molasses is charged after impregnation with metallic compds. such as Ni(NO₃)₂ and the metal is then reduced to elemental form in the material, *e. g.*, by heating and treating with H. The product is adapted for use in decolorizing sugar solns., oils, etc.

Hydrating lime. D. R. BONE, SR. U. S. 1,556,670, Oct. 13. Lump lime is placed on a screen-bottom car, the car is dipped in H₂O and then drained of excess H₂O.

Foam for extinguishing fires. G. J. ESSELEN, JR. U. S. 1,558,599, Oct. 27. The residue of neutralized and evap'd. sulfite waste liquor is used as a foam-maintaining and evapn.-preventing material.

Sealing composition containing sulfur and fibrous material. F. A. ADAMSKI. U. S. 1,557,231, Oct. 13. A compn. adapted for *sealing dry cell elec. batteries*, etc., comprises S mixed with asbestos or other fibrous material and an inert granular material such as sand.

Cement containing resin and rubber. W. M. MARLETT. U. S. 1,561,095, Nov. 10. A cement adapted for *fastening rubber tires to wheels* is formed from resin 3.75, coal tar pitch 1, linseed oil 0.25, vulcanized rubber 1.5 and sufficient gasoline (about 1.5 parts) to bring the mixt. to the consistency of heavy molasses.

Friction facings for brakes and clutches. I. J. NOVAK. U. S. 1,551,045, Aug. 25. Asbestos fiber is sheeted on a paper machine, calendered to the desired thickness, formed into friction facings and sat'd. with a "topped crude oil" having an asphaltic base, and then heated to harden the binder.

Heat-generating composition. J. M. DENNISON. U. S. 1,558,248, Oct. 20. A compn. adapted for producing heat on adding H₂O is formed from oxidized Fe filings 100, NH₄Cl 2, CaO 4, and H₂SO₄ 6 parts.

Sound records. F. W. JONES, JR. U. S. 1,558,175, Oct. 20. Disk records are formed under pressure from one or more porous disks of a thermoplastic material such as a compn. contg. cellulose acetate, a gelatinizer, acaroid resin, barytes, SiO₂ and vegetable black.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

Suitability of certain Nyasaland clays for the manufacture of bricks, tiles, drain-pipes and pottery. ANON. *Bull. Imp. Inst.* 23, 281-91 (1925).—A sample described as "marl," stated to occur on the Tangasi River, southwest of Chiromo, as part of the shale series of the local coal measures, was found suitable for use in the manuf. of building bricks, roofing tiles and unglazed drain-pipes. A sample described as "superficial clay from the roadside opposite Mission Garden, Vungu Vungu Valley" was found unsuitable for the manuf. of bricks, tiles or drain-pipes. "Karoo clay from the crossroads, Manchewe Valley," mixed with sand (70 clay to 30 sand) (through a 50-mesh sieve for pipes and through 20-mesh sieve for bricks and tiles), gave bricks suitable for ordinary building purposes, satisfactory drain-pipes, and tiles which were much weaker than ordinary com. tiles, but which would probably be suitable for local use. "Karoo clay from white clay pit, mission brickfield" could be used for the manuf. of rough pots, plates, cups, etc., by suitable firing (1050° for 6 hrs. and 1120° for 2 hrs.), and could be glazed either by dusting the unfired ware when damp with siliceous galena and firing at about 1000-50°, or preferably by moistening the ware (fired at not less than 1050°) with a slightly adhesive comp'd. (dild. gum or molasses) and then dusting with galena and refiring to about 950°.

Dolomites and magnesite. J. DAUTREBANDE. *Rev. chim. ind.* 34, 246-9, 276-7 (1925).—Brief review of their properties and uses.

A. PAPINEAU-COUTURE

A. PAPINEAU-COUTURE

Artificial magnesia from dolomite. G. D. *Rev. chim. ind.* **34**, 278-81(1925).—Brief outline of some of the more important processes proposed for production of practically CaO-free MgO.

Optical method of determining the fusion points of refractories. ENRIQUE HAUSER. *Rev. mat. constr. trav. pub.* **190**, 159-61B(1925).—By the use of a Féry optical pyrometer H. detd. the fusion points of numerous refractories. The pyrometer was sighted on the end of a molded test piece, through an opening in a wall to minimize the extraneous light. The heating was accomplished by means of an oxy-hydrogen flame. Seger cones heated at the base melted at temps. to within 10° to 20° of their rating. The method is not adaptable for the m. p. detns. of oxidizable metals. L. NAVIAS

Etching and staining process for testing refractory materials. E. STEINHOFF AND F. HARTMANN. *Stahl. u. Eisen* **45**, 337-43(1925).—The etching and staining process, well known in petrological practice, has been applied to the testing of refractories (cf. Scott, *Trans. Geol. Soc. Glasgow* **16**, 393-414(1918)). The etching soln. consists of equal parts of concd. HCl and satd. AlCl_3 soln. The gelatinized ingredients are stained by the action of a concd. soln. of methylene blue. For the detn. of structural ingredients contg. lime, anthrapurpurin is used as the staining medium. In this case, the staining action does not represent an adsorption process; hence, etching is not essential. The success of the method depends upon the selective staining of the individual components. E. g., clay fired at, or below, 1000° is stained a deep blue; fired at 1100° it is stained light blue; fired at 1200° it is scarcely colored, and fired at 1300° it remains colorless. Unmodified quartz is colorless under the treatment, while modified quartz is stained sky blue. Differentiation is also effected between the various "contact zones," e. g., clay-lime, clay-magnesia, clay-iron oxide, quartz-clay and quartz-iron oxide. Both the clay-lime and the clay-magnesia contact zones are stained dark blue by methylene blue, but they are distinguishable when treated with anthrapurpurin, which gives a typical reddish brown color with ingredients contg. lime. Examples of the practical application of the method are given. The complete test supplies data on the following: the firing temp. of fired clays and the amt. of undesirable impurities present; the firing temp. of fireclay-grog bricks, the occurrence and distribution of quartz and localized lime and magnesia fusions, and the degree of modification of the quartz; the presence and position of thin layers of kaolin in quartzites, and the progress and type of the quartz modification; the extent of the quartz modification in silica bricks, and the behavior of the silicate fusions.

B. C. A.

Refractories for water gas sets (RUSSEL) 21.

Glass resistant to sudden temperature changes. V. HORAK. U. S. 1,557,540, Oct. 13. In making a glass which will stand a sudden fall of temp. from 320° to 0° , a batch is melted (at about 1200°) which is formed from sand 60-70, H_2BO_3 15-30, K_2CO_3 1-2, Na_2CO_3 3-6, kaolin 2-6, muscovite 1-4, ZrO_2 1-3 and TiO_2 1-3%.

Variegated glass. I. H. FREESE. U. S. 1,529,947, March 17, 1925. Streams of molten glass of different colors are united by enveloping one of the streams within the other, the glass being then molded into marbles or other articles.

Etching glass. C. C. MINTER. U. S. 1,556,796, Oct. 13. Na_2CO_3 or other alkali carbonate is heated to at least its fusion point and then brought into contact with a glass surface to be etched.

Mold for glass. F. J. FRINK and R. L. FRINK. U. S. 1,556,925, Oct. 13. Molds formed of Al-Ca, Al-Ba, Al-Mg (or of similar metal alloys contg. Cu instead of Al) have vascular or pitted inner surfaces which are formed by the action of an alk. metal hydroxide. By treating such molds with H_2O before use, need of coating compns. is avoided.

Reinforced glass sheets. G. B. RILEY. U. S. 1,560,321, Nov. 3. Glass sheets to be cemented to opposite sides of a sheet of celluloid are preliminarily treated with a soln. of "isinglass" and dextrin gum. The sheet of celluloid is treated with a soln. of colophony and castor oil and the glass and celluloid are united under the action of heat and pressure.

Metallizing porcelain or glass. A. F. RIJSEN. U. S. 1,558,853, Oct. 27. A dull surface is rubbed with a very small quantity of a viscous polyvalent alc. such as glycerol by use of a metal brush (e. g., a brass brush); a further coating of metal, e. g., Cu, is then deposited electrolytically.

Leer for annealing glassware. V. MULHOLLAND. U. S. 1,560,481, Nov. 3.

Glass-melting furnace. W. A. YUNG. U. S. 1,561,393, Nov. 10.

Glass-melting tank-furnace. T. C. MOORSHEAD. U. S. 1,557,078, Oct. 13.

Ceramic materials. H. SPURRIER. U. S. 1,559,652, Nov. 3. Gases are evacuated from ceramic materials such as those for making crucibles, pottery, tile or spark plugs, and after this the vacuum is suddenly broken in order to render the material compact.

Refractory articles. S. A. MYLER. U. S. 1,559,275, Oct. 27. Molds, crucibles, bricks, electrodes or other refractory articles are formed by mixing graphite and pulverized coal with petroleum oil to form a putty-like mixt., molding and heating until the oil is dried from the compn., then dipping in tar and completely carbonizing the product.

Basic refractory material. K. P. McELROY. U. S. 1,551,201, Aug. 25. Granular fragments of shrunk, burnt dolomite are provided with an exterior coating of less refractory dolomite material, *e. g.*, dolomite fines.

Baking enamels. T. E. THOMPSON. U. S. 1,558,517, Oct. 27. Powdered fused enamel is applied to automobile bodies or other articles to be coated together with a fluid vehicle such as linseed oil or varnish which leaves a binding residue, and the coated articles are then baked at a temp. below the fusion point of the enamel.

Frit kiln. F. P. VOGEL. U. S. 1,550,474, Aug. 18.

Tunnel oven or kiln. H. FRANCART. U. S. 1,557,040, Oct. 13.

Casting and shaping fused quartz. H. A. WAYRINGER. U. S. 1,551,351, Aug. 25. Mech. features.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

The occurrence of iodine in cement flue dust. E. KEYSNER. *Chem.-Ztg.* **49**, 821(1925).—An examn of cement flue dust showed the presence of 50 mg. I per kg. In contradistinction to the accepted view that I gets into the dust from traces of the element present in the limestone used, it is shown that the fuel may supply I. Coal contg. only 0.000092 g. I per kg. may yield a soot running 0.038 g. I per kg. W. C. E.

The movement of materials in industrial plants. V. BEZOLD. *Chem.-Ztg.* **49**, 833-4(1925).—An elementary presentation of the theory and practice of conveyor systems. W. C. EBAUGH

Calcium sulfate retarders for portland cement. E. E. BERGER. *Rock Products* **28**, No. 22, 56-9; Bur. Mines, *Repts. of Investigations* No. 2705, 20 pp (1925).—Plaster of Paris, gypsum and anhydrite alone and in mixts. were tested in the lab. Plaster is the most efficient retarder and is necessary for quick setting clinker, but does not control plasticity satisfactorily. Mixts. of plaster with gypsum or anhydrite produce more satisfactory cement than plaster alone provided there is enough plaster to retard the set. In com. practice, some of the gypsum is probably calcined to plaster in the tube mill. A series of mill tests is recommended. RAYMOND WILSON

Effect of storage of calcined gypsum on linear expansion of plaster. L. E. SMITH. *Rock Products* **28**, No. 20, 54-6(1925).—Freshly calcined gypsum hydrates gradually on exposure to air. Test specimens made from calcined gypsum which had been exposed to the air for 6 months showed greater changes in vol. due to humidity changes than specimens made from freshly calcined gypsum. RAYMOND WILSON

The use of tar in highway surfacing. HANS LÜER. *Gas u. Wasserfach.* **68**, 635-6(1925).—A brief economic discussion, recommended specifications being cited. WM. B. PLUMMER

Paving material. D. V. SNOWGOOSE. U. S. 1,551,065, Aug. 25. Pulverized asphalt rock is heated to remove the light oils from it and then mixed with 10-20% as much hard asphalt while heated.

Colored concrete mixture. J. J. CONNELLY. U. S. 1,556,759, Oct. 13. A dried pulverized product formed from a semi-pulpy mixt. of wood, paper and a mineral pigment, a crushed clay product (hardened by burning and similarly colored) and a cement, *e. g.*, a lime or magnesia cement, is adapted for making flower pots, pottery, etc.

Electrolytic coating of roofing materials. J. H. GILLIS. U. S. 1,559,040-1, Oct. 27. Mech. and elec. features of coating roofing felt with Cu or similar coating operations.

Apparatus (burning powdered fuel) for production of cement clinker. T. FUJIIYAMA. U. S. 1,561,070, Nov. 10.

Rotary kiln adapted for heating cement-forming mixtures. M. VOGEL-JØRGENSEN. U. S. 1,557,475, Oct. 13.

Plastic composition. M. BROJNICK. U. S. 1,556,641, Oct. 13. A mixt. adapted for making plaster board, veneer cores, etc., is formed of corn and similar stalks 25, reduced to a pulp with an alkali, e. g., K_2CO_3 2 and an adhesive such as flour paste 5 parts.

Treating roads. T. J. A. JACOMET. U. S. 1,558,172, Oct. 20. The residue from alc. distn. is applied to roads to render them "dust-free."

Preserving wood. J. H. JAMES. U. S. 1,561,164, Nov. 10. A wood preservative contg. alcs., aldehydes and aldehyde fatty acids is prepd. by the partial oxidation of petroleum hydrocarbons, e. g., by passing petroleum oil vapor and air over blue oxides of Mo at 200–500°, with or without steam.

Impregnating wood with preservatives or coloring substances. C. SCHANTZ. U. S. 1,550,395, Aug. 18. Wood or similar material capable of being distd. by moisture is treated with steam or vapor of a volatile org. substance such as a hydrocarbon, alc. or CCl_4 , admixed with cresol or other homolog of phenol, in order to shorten the time required for the treatment.

Impregnating wood with montan wax. J. R. COOLIDGE, 3RD. U. S. 1,556,570, Oct. 6.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Recent developments in fuel technology. R. WIGGINTON. *Fuel in Science and Practice* 4, 371–2, 417–9, 461–2 (1925), cf. C. A. 19, 3361—Brief reviews in abstract form C. C. D.

Physico-chemical investigation of four liquid fuels prepared from primary tar obtained from waste products of the Saar mines. Introduction. J. SAINTE-CLAIRE DEVILLE. *Chaleur et industrie* 6, 311–2 (1925).—Hand sorted shale (55–65% ash) was distd. in a semi-con. rotary retort, the products of distn. leaving the retort at 300–430°. H_2O and light spirit were removed from the tar by heating 30 kg. of the latter for 15 hrs. at 120° while coal gas was passed through the charge. The "crude spirit" thus obtained (6–10% of the tar) is washed with NaOH, H_2SO_4 and H_2O and the residual oil rectified into 3 fractions: 65–130° (fuel I), 130–50° (fuel II), 150–80° or 200° (fuel III), which were clarified by filtration through calcined bauxite. "Medium phenol oil" is obtained from the dehydrated tar by gradually heating to 180°, washing the oil with H_2SO_4 and NaOH (loss of nearly 50%) and filtering through calcined bauxite, giving fuel IV. Purification by rectification is useless because the oil could not bear the cost and is too liable to cracking. **Investigation of the liquid fuels obtained from the tar.** M. AUBERT AND R. MOUTTE. *Ibid* 312–9, 373–9, 429–31.—Very detailed results are given of the investigation of the phys., optical and thermodynamical properties and of the compn. of fuels I, II, III and IV, for which the original article should be consulted. **Motor tests of liquid fuels obtained from low-temperature carbonization of coal.** KRAKOWSKY, ELOY, SCHREINER AND J. SAINTE-CLAIRE DEVILLE. *Ibid* 431–3.—Tests carried out with a Deutz locomotive with a one-cylinder engine showed that addn. of 10–20% of fuel IV to benzene caused no trouble, required no change in the adjustment of the motor and (with the higher proportions of fuel IV) developed more power than with benzene alone. With better rectification (e. g., in a con. distg. column) up to 30% could probably be used. Tests carried out on an automobile engine showed that fuel I can be mixed in all proportions with the usual motor fuels and can even be used alone without requiring any change in the motor; and that fuel II cannot be used alone, but can be mixed up to 20–5% with the ordinary motor fuels.

A. PAPINEAU-COUTURE

Tests for fuels for aircraft by Navy Bureau of Aeronautics. E. E. WILSON. *Oil & Gas J.* 24, No. 9, 110 (1925).—The Bur. of Aeronautics has tested fuels which are at numerous points available and which meet the requirements of high compression (5 to 1) in order to develop a fuel which will permit better performance on decreased weight. It has been shown that Stellarine and cyclo gas can be successfully used while Ethyl Fluid constitutes the only material which meets all the requirements. Two innovations, a new spark plug, and variation of spark advance under throttled conditions have also been developed.

M. B. HART

Fuel charge mixing and flame propagation. A. H. DENISON. *J. Soc. Autom. Eng.* 17, 273 (1925).—The fuels studied were distillates 32–36° Bc. fuel oil, 40–41° fuel oil, an unrefined kerosene, a 58° gasoline with from 25 to 27% benzene added and a 68–70° straight-run gasoline. Two engines of special and similar design were used,

air and fuel being mixed previously to ignition, without preheating. Conclusions reached are that the rate of flame propagation through an optimum fuel-air mixt. varies (a) probably directly with the phys. mixt. condition at the time of ignition; (b) very slowly within certain limits with different grades of fuel and (c) very slowly with the condition of the fuel at the moment of ignition; (d) with different compression pressures it varies in an undefined manner; (e) very much higher rates of flame propagation than are being obtained in present engines seem to be an inherent property of common fuels. Detonation may be due to further phys. mixing of fuel and air by pressure and flame waves set up during the first burning period which may cause another cycle or a chem. transformation similar to cracking may occur, causing a new mixt. condition.

M. B. HART

Processes for the production of light oils for internal-combustion engines. M. BRUTZKUS. *Chimie et industrie* 14, 171-85, 358-62(1925).—van't Hoff's equation, $d(\ln K)/dT = Q/TR^2$, is expressed as follows: "Any chem. reaction can be directed and accelerated in a certain direction by continuous and simultaneous external variations in pressure, temp. and concn., acting in a direction contrary to that of the corresponding variations caused by the desired reaction." B. suggests that the desired variations in pressure, temp. and concn. can easily be obtained by operating in a compressor constructed and operated substantially as a Diesel engine. The application of such a method for cracking or hydrogenation under various conditions (exothermic and endothermic reactions), for the treatment of petroleum, tar oils, turpentine, fats, sugars and molasses, cellulose compds., and coal and for the synthesis of light oil from CO, CO₂ and H₂ is discussed, and compared with corresponding processes at present in use or proposed. Very high temps. and pressure could be used and catalyzers could be eliminated.

A. PAPINEAU-COUTURE

Valuable fuel from wood. ANON. *Allgem. Österr. Chem. Tech. Ztg.* 43, 115-6(1925).—A résumé of the present method of wood carbonization is given. A new app. is described whereby wood is lowered into a shaft while indifferent heating gases are passed through upwardly. The wood is first dried, then the gas is extd. and finally the ordinary charcoal is hardened by a special process. Such an invention is of great importance to Europe as it, together with the proposed charcoal generator for automobiles, will eliminate present dependence on imported motor fuels. M. B. H.

Fuel of high calorific value from wood. STRACHE. *Allgem. Oesterr. Chem. Tech Zte* 43, 115(1925).—The new method of making charcoal of greater hardness than usual is described. Wood waste is heated by gases in a retort. The gases do not contain any O and are brought in direct contact with the wood. The charcoal so obtained is called "Lignizik." The by-products are recovered and the charcoal so obtained is harder than usual and has more applications and uses.

M. B. HART

A new procedure for obtaining raw peat and its manufacture into briquets with recovery of by-products. RUDOLF SCHADE. *Z. tech. Biol.* 11, 129-34(1925).

H. J. DEUEL, JR.

Bitumen and bituminous coal. Definitions. E. R. FRANZ. *Fuel in Science and Practice* 4, 494-7(1925).—A compilation of definitions from various standard dictionaries, encyclopedias, textbooks and original articles.

C. C. DAVIS

Rapid determination of the strength of brown coal briquets. RUDOLF JACOB. *Braunkohle* 24, 636-8(1925).—A rapid graphical method for taking into account the variations in size of briquets in calcg. the strength from the breaking load is given (for method of testing cf. Hentze, C. A. 19, 1936).

W. B. P.

Changes in brown coal deposits formed in contact with basalt. H. WINTER. *Braunkohle* 24, 653-8(1925).—Proximate and ultimate analyses of various types of brown coal are given which presumptively show the catalytic effect of the basalt on the coal.

WM. B. PLUMMER

The conversion of coal into oil by hydrogenation. J. I. GRAHAM. *Colliery Guardian* 130, 973-5(1925).—A review of systematic work on the action on coal of H up to 200 atm. at 300-450°, the greater part of which has already been published (cf. C. A. 19, 1188, 1767). In a study in progress on the action of high-pressure steam on coal to det. the temp. at which coal dust reacts with H₂O, coal was ground in a colloid mill fine enough for a suspension in H₂O still to contain 30 g. per 100 cc. after some days.

C. C. DAVIS

Low-temperature carbonization of coal. (I) Treatment of coal at 500° in Fischer's aluminium retort. AKIRA SHIMOMURA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 8, 397-411(1925).—The standard Al retort and accessory app. as described by Fischer (C. A. 15, 8149) was used, with 20 g. air-dried coal ground to pass 0.25 mm., the temp. in the retort being brought to 500° in 45 min. and held there 45 min. Results are given for 15

oriental coals ranging from bituminous to anthracite, of which the following are typical (the properties and results are given in the order of the various coals as named; all data are on air-dried samples) Koyaki (Japan), Sakito (Japan), Nansu (Sumatra), Matsushima (Japan), Kaiping (China), Poshan (China), Rogaty (Sakhalin), Tsun-Chin (China), Mallien (India). *Coal analyses*.—% Moisture, 1.52, 1.54, 3.42, 2.26, 1.42, 0.74, 1.32, 1.84, 3.99; % volatile combustible matter 38.24, 36.66, 32.72, 32.81, 27.10, 21.58, 18.98, 8.59, 3.41; % ash, 8.65, 11.95, 4.03, 12.34, 13.24, 11.30, 9.40, 11.63, 15.95; % fixed C, 51.47, 49.85, 59.83, 52.59, 58.24, 66.39, 70.23, 77.94, 76.65; % S, 0.78, 2.03, 0.61, 1.42, 0.95, 0.61, 0.46, 0.67, 0.83; % N, 1.64, 1.15, 1.35, 1.33, 1.16, 1.44, 1.69, 1.49, 0.66; (the % C and % H are also given). *Carbonization yields*.—% Tar, 15.28, 17.42, 11.48, 15.22, 11.35, 6.85, 5.97, 0.64, 0.55; % NH_3 (as such), 0.0558, 0.0324, 0.0315, 0.0388, 0.0233, 0.0244, 0.0333, 0.0596, 0.0118; gas, cc./g., (at normal temp. and pressure), 68.6, 56.7, 68.6, 63.7, 51.7, 52.2, 60.2, 12.0, 0.0; % volatile matter of semi-coke, 11.33, 11.60, 11.17, 10.50, 10.85, 9.30, 9.35, 6.60, 2.58, other data are given, including gas analyses and ultimate analyses of the semi-coke. The character of the semi-coke was of 4 types; swollen, spongy and fragile, Sakito and Poshan; swollen and spongy but of hard, firm structure, Koyaki and Kaiping; dense and firm but little swollen, Matsushima and Rogaty; non-coherent and powdery, Nansu, Tsun-Chin and Mallien.

WM. B. PLUMMER

The liquefaction of wood and cellulose and some general remarks on the liquefaction of coal. H. E. FIERZ-DAVID. *Chemistry & Industry* 44, 942-4 (1925). Attempts to prep. liquid fuel by the Bergius process yielded disappointing results. When cotton cellulose was treated with $\text{Ni}(\text{OH})_2$, dried and heated to 450–70° under 150–220 atm. of H, almost all of the cellulose distilled over as a yellow liquid, η_{20} 1.017, contg. aldehydes, ketones, phenols, alkylfurans, and fatty acids, with a calorific value of 9275 cal. F. Fischer has shown that CO and H under 100 atm. and 410°, in the presence of Fe and alkali carbonate, form liquid fuels, b. 80–250°. T. S. CARSWELL.

Enrichment of coal gas by the injection of oil into the retorts during carbonization. ANON. (Dept. Sci. & Ind. Research) *Fuel Res. Bd. Tech. Paper No. 14*, 61 pp (1925).—Steaming in ams. up to 20% by wt. of the coal in continuous vertical retorts of the Glover-West type has been found previously (*C. A.* 17, 3088; 18, 319) to give high gas making efficiency and increased by-product recovery, but at the expense of a decrease in the calorific value of the gas, so that the addn. of carburetted water gas is necessary to maintain a standard B. t. u./cu. ft. value. To avoid additional plant investment and operating expense for carbureters was the object of the present expts. The oil was injected through a small pipe protected by a 2.5 in. water jacket and inserted vertically down the center of the retort, the open end of the pipe being 10.5–12.5 ft. down from the top, deeper immersion forming undue ams. of H_2 , less immersion not giving complete fixation of the oil. Tests were carried out on Wearmouth and Mitchell Main coals, of which the latter results only will be cited here; this latter coal had 1.5% moisture, 32.5% volatile combustible matter, 60.7% fixed C, 5.3% ash. A light gas oil was used, the efficiency of cracking (increase in total B. t. u. in gas/B. t. u. in oil used) was 76%; when 4.8 gal./ton coal and 53% at 9.4 gal./ton were used. The presence of the water-cooled tube alone caused a loss of 450 cu. ft./ton but increased the B. t. u./cu. ft. from 518 to 529, or a net loss of 0.67 therms./ton in the gas (therm = 100,000 B. t. u.); both of these effects are due to the lowered center temp. and decreased cracking. A large no. of tests covering various pipe positions, oil and steam rates, etc., are reported in detail. The final "com. tests" were so arranged as to give a constant B. t. u. gas at various loads; the carbonizing temp. was 1200°, the coal rate 2.5 tons/retort/24 hrs., steady state being maintained 72 hrs. in each test. *Blank test*, injection tubes not in position, 5.05% steam used; *min. load*, injection tubes in position, no oil used, 8.51% steam; *mean load*, 4.83 gal. oil/ton, 11.95% steam; *max. load*, 7.13 gal. oil/ton, 20.14% steam. Results, in the order given, were as follows: gas B. t. u./cu. ft., 518, 522, 525, 520; gas yield, cu. ft./ton, 15,600, 16,270, 17,370, 18,180; gas yield, as % increase over blank test, —, 4.3, 11.3, 16.9; fuel gas used/retort/hr., therms, 15.2, 15.8, 16.4, 16.9. The process is evidently a com. possibility. Further expts. are being carried out on dropping the oil down the center of a vertical pipe having no cooling system, so as to avoid the cooling water losses of the present method, preliminary work indicating the possibility of such injection. Results are also given for normal steaming tests, lab. retort assays, etc., for the coals mentioned. Analyses of coal, coke, (fuel, flue and make) gas, temps. and pressures within the retorts, etc., are given in detail for all tests reported. W. B. P.

Technical advances of gas. ANON. *Gas u. Wasserfach* 68, 623–5, 636–9 (1925).—Brief description with sketches or photographs of numerous improved burners, furnaces and furnace installations, temp. controllers, etc. WM. B. PLUMMER

The relation between heating value of gas and its usefulness to the consumer. E. R. WEAVER. *Bur Standards, Tech. Paper No. 290*, 347-463 (1925).—A critical review of available data regarding the relative usefulness of gases of different heating values, the data being divided into 2 classes, *viz.*, (a) the direct detn of useful effects actually obtained by burning gas in various appliances and (b) statistics regarding the relative quantities of gas used by various consumers or in various communities before and after changes in the heating value. The data of both classes are quite consistent, leading in each case to the conclusion that the usefulness to the consumer of a given vol. of gas is accurately proportional to its heating value. Results of tests, statistics and critical discussions from all available sources are given in detail with many curves, etc., and are individually and collectively discussed. WM. B. PLUMMER

Gas heating value as a measure of usefulness. KURT BLUME. *Gas u. Wasserfack* **68**, 675-8 (1925).—Recent discussion in the U. S. is cited, and it is pointed out that in many German cities the cost of gas per B. t. u. is 100% over pre-war figures, caused by the use of mixed gas at an increased price per unit volume. Theoretical flame temps for a (mineral or bituminous) coal gas is calcd as 1737°, for a mixed gas contg. 23.9% water gas 1757°, for one contg. 12.8% producer gas 1720°, the heating value of the former being 4640 kg. cal./cu. m., of the 2 latter each 4200. The conclusion drawn is that the decrease in heating value is not compensated for by the change in flame temp. WM. B. PLUMMER

The industrial importance of the natural gas of Roumania. P. STÄHELIN. *Monit. petrole Roumain* **24**, 971-6 (1925).—Transylvanian natural gas contains 98-99.5% methane. Data are given showing the compn. of various gaseous fuels together with their ds. and calorific value. Acetylene has a max. of 13,800 cal. per cu. m.; natural gas (Transylvania) 9500 cal. per cu. m. M. B. HART

The increase of sulfur in gas during benzene washing. FRITZ WEHRMANN. *Gas u. Wasserfack* **68**, 658-9 (1925).—Fresh wash oil contg. 0.67% total S, in a lab. expt., lost S to gas bubbled through it at such rate as to increase the S of the gas by 0.0003%, but a sample of recovered wash oil (light oil distn. residue) contg. 2.24% total S showed a much higher rate of loss. Gas contg. no H₂S may pick up enough to darken Pb(OAc)₂ paper during passage through benzene scrubbers, but the increase will not be of any importance unless the total S of the wash oil exceeds 1.0%. WM. B. PLUMMER

Helium in natural gas from oil wells. J. CLAY. *Proc. Acad. Sci. Amsterdam* **28**, 529-30 (1925).—See C. A. **19**, 3234. E. J. C.

The back-run process (for water gas. Report of sub-committee). A. H. ANDERSON. *Proc. Am. Gas Assoc.* **1925** (advance copy), 14 pp. Operating results are tabulated in detail for plants using back-run operation, 15 of them using coke fuel, 13 using anthracite, bituminous, or mixts. of these with coke. Considerable gains in capacity and fuel and oil efficiencies are reported by some operators, while others report but slight gains, and in some cases even losses; the results cannot therefore be summarized but must be examined individually. Operating conditions with respect to clinkering and cleaning labor were either unchanged or improved; the life of checkers was increased in most cases. WM. B. PLUMMER

Modification of water gas sets for the use of heavy oil. W. D. STEWART. *Proc. Am. Gas Assoc.* **1925** (advance copy), 1 p.; cf. C. A. **19**, 2404.—Operating results are given for the modified set as previously described. The oil used was Mexican fuel, 0.9776 sp. gr. or 13.3 Bé., having a coke residue of 16.9% and S content of 4.7%. Results were coke fuel 31.0 lbs./1000 cu. ft. gas, oil 3.6 gals./1000 cu. ft. gas, gas B. t. u. 535, oil efficiency 86.5 B. t. u./gal., H₂S in gas 520 grains/100 cu. ft., fixed S in gas 40 grains/100 cu. ft., steam from waste heat boiler 75 lbs./1000 cu. ft., life of checker brick 1000 hrs. The fuel used was run-of-retort coke contg. all breeze made. WM. B. PLUMMER

The use of Illinois coal with the pier process (for water gas). M. P. NOVAK. *Proc. Am. Gas Assoc.* **1925** (advance copy), 8 pp. —Results with standard water gas sets using bituminous coal have shown the activity of the fire to be concentrated around the edge, with resultant inefficiencies. The present process eliminates the inactive central portion of the fuel bed by placing a refractory pier at the center of the grate, and extending up to about 1-2 ft. below the top of the fuel. In a 9 ft. inside diameter shell the pier is 2.75 ft. outside diameter, tapering somewhat at the top; it may be hollow and cooled by passing the air-steam blast up a pipe centered in the pier, then down, and up under the grate, but solid piers are apparently as satisfactory if properly constructed. Although the grate area is thus reduced 11.1% the gas-making capacity was increased 62% with a saving in fuel of 10-13%, due to the smoother operation of the set; other advantages are the saving in oil, decrease in blown-over fuel, and uniformity

of clinker formation with consequent reduction of clinkering time by 30–40%. Operating results are tabulated for several coals, of which the following are typical. Standard 11 ft. sets (9 ft. inside diam.), operating on a 5.5 min. cycle, 35% blow, 65% run (49% down run), air purge 17 sec., blow run on cycle 17 sec., 2 min. blow run after cooling, 2 straight runs after cooling, the rest split; coaling 3200–4500 lbs., every 7–9 runs. Using unscreened 1 25 in. Indiana lump coal, without and with pier, resp., the operating results of a 4 day (4 sets) test were as follows: 1000 cu. ft. gas make/set/day, 1158, 1877; blown over fuel lbs./1000 cu. ft. gas, 3.80, 1.64; net fuel used, lbs./1000 cu. ft. gas, 49.69, 44.89; oil, gals./1000 cu. ft. gas, 3.52, 3.59; gas, B. t. u./cu. ft., 551.551.

WM. B. PLUMMER

The use of bituminous coal (as water gas generator fuel) —results at various plants. W. G. RUDD. *Proc. Am. Gas Assoc.* 1925 (advance copy), 5 pp.; cf. *C. A.* 19, 2399, 2400 — Operating results for 6 plants using 40–100% coal are tabulated in some detail. The decrease in fuel efficiency in most cases was slight at mixtures around 80% and not serious even at 100% coal.

WM. B. PLUMMER

Gas analyses with mixtures of soft coal and coke in the water gas process. L. J. WILLIEN. *Proc. Am. Gas Assoc.* 1925 (advance copy), 1 p. — Average analyses for finished gas using 0, 40, 43 and 48% coal, with 10 sec. and 15 sec. blow runs in the last 2 cases, resp., show slight increases in inerts, CO₂ and illuminants. Analyses of samples from the top of the washbox during each run between coalings, using 100% coal, show max. CH₄ and min. CO in the 2nd run after coaling, and max. illuminants in the 3rd run, no blow run gas being included in the samples.

WM. B. PLUMMER

Non-clinkering gas generators. ANON. *J. usines gaz* 49, 299–301 (1925). — A brief description, with sketches and a résumé of operating data, of a battery of 6 producers having water cooled shells as installed by the Seaboard Co. at their plant "near New York."

WM. B. PLUMMER

The use of oxygen in water gas machines. A. C. FREY. *Proc. Am. Gas Assoc.* 1925 (advance copy), 9 pp. — Mainly a description and discussion of the Jeffries Norton process for O₂ manuf. using the principle of rectification of liquid air under high pressure and expansion from the still in engines having thermally insulated cylinders. It is estimated that by this process O₂ can be produced at 10 cents/1000 cu. ft. by a plant having a capacity of 2000 cu. ft./min., the cost increasing up to 50 cents for a 100 cu. ft./min. plant. Tests on oil gas production (in a model Dayton Oil Gas Furnace) showed an av. thermal efficiency of 71.5% (due to limited O₂ supply the test was stopped after 1.75 hrs. at which time the thermal efficiency was 88%); other data for the test were gas made/hr., 1730 cu. ft.; oil/1000 cu. ft., 5.47 gals.; O₂/1000 cu. ft., 235 cu. ft.; gas B. t. u. 543; gas analysis, av. of 2 samples, CO₂ 6.7, illuminants 6.05, O₂ 0.65, CO 42.5, H₂ 23.45, CH₄ 18.90, N₂ 1.75%, S 9.35 grains/100 cu. ft. WM. B. P.

Refractories (for water gas sets). W. M. RUSSELL. *Proc. Am. Gas Assoc.* 1925 (advance copy), 8 pp. — Continued tests of carborundum Bernitz blocks for water gas sets (cf. *C. A.* 19, 2405) show them to have considerable advantages as regards long life and decreased clinkering trouble; in one case a total saving of \$825 on one lining is estimated. Straight carborundum linings have lasted in 2 cases reported 6687 and 5548 hrs., but special precautions must be observed in laying the brick with close joints, penetration of air into seams causing swelling even to the point of shearing the rivets on the vertical seams of the shell.

WM. B. PLUMMER

Heating horizontal retort settings in small gas plants by coke breeze. C. A. WINKLER. *J. usines gaz* 49, 289–95 (1925). — A description of the Wilton hearth for burning fine fuels, and of its application in small horizontal retort plants, the economic advantages being considerable.

WM. B. PLUMMER

A notable advance in tar distillation. ALFRED OTT. *Apparatchau* 37, 243–4, 253–6, 274–5, 287–8 (1925). — Description, with 5 cuts, of the "Hermev semi-continuous, high-capacity process" in which the de-watering is continuous and the distn. is intermittent, with almost complete utilization of waste heat. Plans for a plant of 40 tons per day are given, the coal consumption being about 2000 kg. per day against about 5270 kg. for the usual methods.

J. H. MOORE

The recovery of brown coal tar in the production of cold producer gas in various plants in the Rhine district. HERMANN BECKER. *Braunkohle* 24, 633–6 (1925). — Yields of producer tar from brown coal briquets are 1.2–3.2%, from raw coal 1.0–1.7%. Operating and tar recovery costs are given for various types of plants. WM. B. P.

Determination of the apparent specific gravity of coke products. M. DOLCH. *Z. angew. Chem.* 38, 889–91 (1925). — A pycnometer and method of operation are described for the detn. of apparent sp. gr. of coke, etc., with sand, small shot, flax seed, etc., as filling materials. The accuracy of the method is approx. 2%. WM. B. P.

Pulverized coal as fuel for Cu-refining furnaces (BARDWELL, MILLER) 9. Evaporation of gasoline and benzene (FORMANEK, ZDARSKY) 22. Ca salts of the phenols from low temperature tar (GREENBAUM) 15.

Motor fuel. J. F. P. DE LARIBOISIERE. U. S. 1,557,257, Oct. 13. A mixt. of gasoline and C_6H_6 or a similar hydrocarbon fuel is mixed with aniline 1-3 and ether or acetone $1/2$ -3%.

Burning heavy hydrocarbon fuels. J. F. P. DE LARIBOISIERE. U. S. 1,558,967, Oct. 27. "Diesel oil," "fuel oil" or similar heavy hydrocarbon fuels are burned in the presence of a small proportion of dibenzyl diselenide or similar compd. of a hydrocarbon radical and a metal, in order to obtain increased efficiency, *e. g.*, in Diesel engines.

Burning liquid fuels. J. B. SWORD. U. S. 1,557,741, Oct. 20. The atomized fuel is mixed with a whirling stream of hot gaseous combustion products contg. O sufficient only partially to burn the fuel and then is burned substantially completely in a different portion of the combustion app. with additional O or air.

Fuel briquets. T. A. GOSKAR. U. S. 1,561,322, Nov. 10. See Brit. 231,934 (C. A. 19, 3583).

Fuel briquets. J. F. O'DONNELL. U. S. 1,557,320, Oct. 13. About equal amts. of fine anthracite and semibituminous coal dust are mixed with each other, molded under pressure and subjected to a temp. of about 510° for 3-6 min. (Cf. C. A. 19, 1343.)

Agglomerating coal particles. W. W. STENNING and W. H. BEASLEY. U. S. 1,560,116, Nov. 3. Finely divided coal is suspended in H_2O , mixed with a binding medium such as coal tar or pitch and subjected to heat and agitation without aeration, in order to effect agglomeration of the particles and prepare them for briquetting.

Carbonizing retort and gas generator for "total gasification" of coal or similar fuels. A. McD. DUCKHAM. U. S. 1,560,337, Nov. "

Apparatus for carbonizing and distilling coal, etc. N. H. FREEMAN. U. S. 1,558,974, Oct. 27.

Illuminating gas. L. S. STILES. U. S. 1,558,124-5, Oct. 20. App. is specified for making and carburetting water gas.

Combustion control. E. P. G. WÜNSCH. U. S. 1,550,410, Aug. 18. Waste gases from the combustion to be controlled are fed into contact with a wire (which may be formed of Pt or Pd or coated with these metals), and changes in elongation of the wire (induced by contact combustion of the waste gases catalyzed by it) are used to actuate regulating devices.

Portable testing apparatus for determining the gasoline content of natural gas. R. PONSLE. U. S. 1,556,712, Oct. 13.

Combustible gas. H. MEHNER. U. S. 1,550,558, Aug. 18. A bed of coal or other carbonaceous material is supported on a grate in the lower portion of a generator having an upper arch. Steam is admitted to a zone immediately above the carbonaceous material and combustible gas is admitted to a zone above the steam zone. Air is admitted to an upper combustion zone of the generator for heating the upper arch whence heat is radiated downwardly upon the carbonaceous material to produce gas which is drawn off from a zone below the grate.

Combustible gas. M. KLÖTZER. U. S. 1,559,622, Nov. 3. A mixt. of powdered fuel (such as semi-coke from coal distn.) and steam is introduced into a gas generating chamber over a heat-radiating bath of molten slag, the fuel mixt. is stirred by pulsation over the slag bath and gasification is effected by heat derived from the slag.

Gas producer. F. H. TREAT. U. S. 1,550,991, Aug. 25.

Retort for carbonizing wood, coal, shale, lignite or other solid fuels. A. L. J. QUENEAU. U. S. 1,560,855, Nov. 10.

Vertical apparatus for continuous distillation of lignite, peat, etc. J. PIETERS. U. S. 1,560,311, Nov. 3.

Coking-retort oven. J. BECKER. U. S. 1,556,749, Oct. 13.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Oil refining at Llandarcy. SIR J. CADMAN. *Petr. Times* 14, 17, 18, 71-4(1925) — Descriptive.

Study of nitrogen compounds in petroleum. J. R. BAILEY. *Refiner and Nat.* M. B. HART

Gasoline Mfr. 4, No. 9, 46, 48, 50, 53-4, 56(1925).—The work of previous investigators in this field is discussed, and the conclusion reached that California petroleum can probably be made to furnish a cheap source of quinoline bases which may be used as dye intermediates.

M. B. HART

Physico-chemical discussion of the source and storing of petroleum. M. A. RAKUZIN. *Petr. Z.* 21, 1258(1925).—The suggested formation of optically active petroleum is given in the following periods: formation period, racemization period, carbonization period and decompn. period.

M. B. HART

Evaporation of gasoline and benzene. J. FORMANEK AND J. ZDARSKY. *Petr. Z.* 21, 1197(1925).—The evapn. of gasoline and benzene was experimentally examd. In free evapn. of gasoline the air becomes more satd. with vapors than when air is bubbled through it; but in the latter case the air becomes quickly and uniformly satd. In the free evapn. expt. a certain time is required before the gasoline vapors diffuse uniformly in the air. The evapn. depends on temp., quantity of gasoline and size of container; and small pressure or vacuum exercises no great influence. Gasolines with sp. gr. less than 0.745, which contain over 30% boiling below 100°, give off combustible but not explosive gases, while gasolines with sp. gr. greater than 0.745 which contain less than 30% of a fraction boiling below 100° give off explosive or non-explosive vapors depending upon the temp. Benzene gives a non-explosive vapor air mixt. above 15°; below that temp. care has to be taken.

M. B. HART

Absorbers in natural gasoline plants. F. P. PETERSON. *Oil and Gas J.* 24, No. 16, 146(1925).—The combination of steel shavings with pans having perforated bottoms is the best filler for absorbers used in recovering gasoline from gas. The absorber should be anchored to the bottom. Time of contact between the gas and oil should be about one minute.

M. B. HART

Pressure in filtrating lubricants and washing filters. P. TRUESDELL. *Nat. Pet. News* 17, No. 31, 73(1925).—A description with diagram of the filtering process as conducted at the Tiona Refining Co.

M. B. HART

The measuring of viscosity by the Ostwald viscometer; conversion to time by the Redwood viscometer. S. T. MINCHIN. *J. Inst. Petr. Tech.* 11, 284(1925).—Ostwald viscometers were substituted for Redwood viscometers and conversion factors detd. By so doing, much time was saved and a smaller amt. of sample was needed. Results were as accurate as those in Redwood seconds and, further, the Ostwald tubes were more easily held at const. temp. in a thermostat.

M. B. HART

Determining the absorption and permeability of oil and gas sand. A. F. MELCHER. *Bull. Am. Assoc. Petroleum Geol.* 1925, 442; *Oil Weekly* 8B, No. 9, 37-8, 40(1925).—By means of specially designed app., which is described, oil and gas sand samples may be subjected to accurately measurable pressures, under which reliable quant. detn. of absorption and permeability of the sands for certain fluids such as oil, fresh and salt water, and gas can be made.

M. B. HART

An oil-bearing shale of North Carolina. FRANK C. VILBRANDT. *J. Elisha Mitchell Sci. Soc.* 41, 108-14(1925).—The distn. products of a shale from the Deep River coal field are given.

A. L. MEHRING

The prevention of explosions in air receivers. W. F. PARISH AND W. B. SMITH WHALEY. *J. Inst. Petr. Tech.* 11, 305(1925).—Air receiver and line explosions which are caused by explosive mixts. due to air and lubricating oil may be prevented by a receiver scavenger method. A scavenging valve allows air to enter and leave the receiver through the same opening and allows the pressure to open a passage for the compressed air to the top of the tank which process sweeps all vapors and gases from the receiver.

M. B. HART

Effect of heat upon the viscosities of lubricating oils. H. R. ARBUCKLE. *J. Elisha Mitchell Sci. Soc.* 41, 19-20(1925).—The oil showing the lowest viscosity at 70° F. had the highest at 150°, 200° and 225° of any tested. None of the oils tested, which were the grades available on the market, showed sufficient viscosity at 200° to be good lubricants.

A. L. MEHRING

Asphaltenes and resinous constituents of petroleum. A. SACHANEN. *Petr. Z.* 21, 1441(1925).—Natural and artificial asphalts are colloidal solns. of asphaltenes in resins and heavy oils.

M. B. HART

Valuable fuel from wood (ANON) 21. Apparatus for approximate or comparative melting points of fats, waxes and petroleum (STEVENS) 1. Fuel of high calorific value from wood (STRACHE) 21. Foam for extinguishing fires (U. S. pat. 1,558,599) 18.

Purifying oils. E. EICHWALD. U. S. 1,550,523, Aug. 18. In treating petroleum, tar oil from lignite or similar oils, for sepn. of aromatic from aliphatic and hydro-aromatic oil-like compds., furfurole is admixed with the oils, the mixt. is allowed to stand, and the layers which form are sepd. from each other.

Distilling oil. L. E. HIRT. U. S. 1,559,701, Nov. 3. A thin film of oil to be distd. flows through a series of tubes in which distn. takes place and a gaseous material such as steam is forced through the tubes mech. to remove vaporized constituents of the oil.

Petroleum oil conversion. C. P. DUBBS. U. S. 1,550,607, Aug. 18. A stream of oil such as gas oil, kerosene or pressure distillate bottoms is heated to conversion temp., while passing through a pipe coil under superatm. pressure and thence is passed into an enlarged reaction chamber from which vapors pass on to a dephlegmator. Charging oil passes in heat-interchange relation with the vapors and condensate in the dephlegmator and a second stream of oil is passed directly to the inlet of the heating coil. The preheated charging oil and condensate from the dephlegmator are passed to a pump which forces them into the second stream of oil to be passed to the heating coil. Cf. C. A. 19, 2742.

Cracking emulsified petroleum oil. G. EGLOFF and H. P. BENNER. U. S. 1,550,892, Aug. 25. Emulsified petroleum oil is subjected to surface heating alone to vaporize it at a cracking temp. and pressure.

Treating cracked oils. B. T. BROOKS. U. S. 1,550,673, Aug. 25. Lighter hydrocarbon oils obtained from the cracking of heavier oils are subjected, alone and in liquid form, to a high temp. (which may be about 275-360° below that at which any appreciable cracking occurs, under high pressure (which may amount to about 250 lbs. per sq. in.)) and the treatment is continued, preliminary to distn., until volatile coloring substances are converted into substances non-volatile during the subsequent distn.

Condensing hydrocarbon vapors. E. W. ISOM and J. E. BELL. U. S. 1,558,811, Oct. 27. Vapors such as those from petroleum cracking stills are passed into a stream of condensate which is maintained in circulation, by the action of the vapors, to and from a cooler.

Bleaching, desulfurizing and other treatment of petroleum oils. HERMAN REINBOLD and HUGO REINBOLD. U. S. 1,558,631, Oct. 27. LiCl is used with hydrous silicic acid for distg. oil to effect decolorization, desulfurization and formation of products of lower b. p. U. S. 1,558,632 specifies the use of LiCl and AlCl₃ together for the same purposes.

Dehydrating emulsified petroleum oils. G. EGLOFF and H. P. BENNER. U. S. 1,559,035, Oct. 27. The oil is passed through a series of spaced foraminous plates with foraminations of gradually decreasing size, under pressure, and simultaneously subjected to the action of elec. current as it passes through the plates.

Dehydrating petroleum oils. G. EGLOFF and J. C. MORRELL. U. S. 1,559,036, Oct. 27. A material such as NH₃, SO₂, Cl₂, H₂ or CO₂ is dissolved in the oil and H₂O to improve its conductivity and the material is then subjected to elec. and settling treatments.

Cracking hydrocarbon oils. R. T. POLLOCK. U. S. 1,550,568, Aug. 18. A restricted stream of oil, e. g., gas oil, is passed through a tube where it is heated to a cracking temp. and into an enlarged zone where conversion occurs. Vapors are passed to a dephlegmator through which charging stock is fed (in indirect heat-interchange relation) and condensate in the dephlegmator forms in pools through which the vapors pass. Reflux condensate and charging stock, though not permitted to mix in the dephlegmator, are afterward mixed and fed to the heating tube. The cracking operation is conducted under superatm. pressure.

Cracking or conversion of hydrocarbon oils. C. P. DUBBS. U. S. 1,551,090, Aug. 25. A stream of reflux condensate and charging oil is passed through a heating tube where the mixt. is heated to cracking temp. without, however, carrying the heating so high as to cause a substantial deposition of C in the tube. The heated mixt. is thence passed to an enlarged chamber where vapors and C sep. from the oil. The operation is carried out under pressure. Cf. C. A. 19, 2742.

Cracking fuel oil or gas oil. L. P. LITZINGER and P. F. CONERTY. U. S. 1,551,410, Aug. 25. Petroleum oils or residues of high b. p. undergoing cracking under pressure are subjected to a forced circulation of the oil toward a cool part of the still where the oil is agitated to prevent C deposition, a sepn. of the C particles being effected at the termination of a still run.

Avoiding "shock chill" in precipitating mineral "wax" from oil or other substances. L. D. JONES. U. S. 1,558,619, Oct. 27. In pptns. such as those of waxy substances from oils, the liquid from which the pptn. is taking place is cooled at a substantially

constant rate by heat absorption in a refrigerant; *e. g.*, brine, cooled at a rate bearing appropriate constant relation to changes in temp. of the liquid, so that a discontinuous ppt. is formed which is readily sepd. from oil by centrifuging.

Separating waxes from petroleum oils. F. PETTY U. S. 1,559,981, Nov. 3. A paraffin base crude mineral oil is refrigerated and subjected to centrifugal sepn. to sep. wax from the oil and the wax is subsequently distd. to drive off a cryst wax distillate, leaving as a residue wax which is mainly in amorphous form. U. S. 1,559,982 specifies subjecting a crude paraffin base oil to refrigeration and centrifugation to sep. wax, distg. the wax-free oil to obtain distillates of different b. p., dilg. the residue with a petroleum oil of low b. p., subjecting the blended materials to successive treatments with acid and alkali and then to distn.

Gasoline recovery by absorption. H. B. BERNARD U. S. 1,560,137, Nov. 3. A liquid absorbing medium with associated gasoline which may have been absorbed from natural or casinghead gas is subjected to distn. and the heated liquid residuum from the distn. is passed in countercurrent flow and in "indirect contact" with the distd. vapors and gases under a pressure lower than that prevailing in the distn. treatment. U. S. 1,560,138 specifies absorption of gasoline from natural gas, casinghead gas or the like, in a liquid absorbing medium followed by a preliminary heating and distn. and passing of the liquid from the distn. treatment while hot in countercurrent flow and in "indirect contact" with the distd. gases and vapors. Both pats. describe app.

Still for cracking petroleum oils. W. I. BAGWILL U. S. 1,560,891, Nov. 10. A still body is formed with a substantially ovate cross section with flat sides and the apex at the bottom, provided with continuous combustion passages which extend through the body lengthwise from end to end. The uppermost passage is of the largest diam. and the other passages are of progressively diminishing diam. and the passages are so mounted in the still that the oil between the passage and the lateral walls of the still is substantially the same thickness for each passage.

Still for petroleum oils. W. M. FRASER U. S. 1,561,428, Nov. 10. A fluid motor inside a still and actuated by oil as fed into the still serves to operate a chain mechanism or other agitating device within the still which loosens C deposits from the inner surface of the still.

Apparatus for distillation of mineral oils. H. G. W. KITTREDGE U. S. 1,561,169, Nov. 10.

Apparatus for separating oil from water at oil wells. W. B. SMITH U. S. 1,557,103, Oct. 13.

Tank for separating gas and water from oil. F. A. RAY U. S. 1,551,329, Aug. 25.

Apparatus for forming bituminous emulsions. I. KIRSCHBAUM U. S. 1,560,826, Nov. 10.

Superposed horizontal cylindrical retorts for distillation of oil shale or similar materials. W. H. ALCORN U. S. 1,556,894, Oct. 13.

Lubricant. M. F. WEBSTER U. S. 1,559,592, Nov. 3. A lubricant for use on tank car valve parts, etc., which may be subjected to the action of gasoline and H_2O , comprises castor oil 80 and carnauba wax 20%.

Lubricant. A. G. MARSHALL U. S. 1,561,261, Nov. 10. In prepg. a lubricant adapted for use in internal combustion engines, castor oil and mineral oil are heated together until soln. is effected, the soln. is allowed to cool until a sepn. into layers is completed, and the lower layer is then drawn off and admixed with such a further quantity of castor oil as will prevent any further sepn. at 0°.

Solid lubricant. F. T. MANLEY U. S. 1,550,912, Aug. 15. A lubricant adapted for use in heavy journal bearings, etc., comprises soap 60, a paraffin base cylinder stock 15, H_2O 10, an asphaltic base residue 15 parts and a small quantity of graphite.

Lubricating oil. W. F. FARAGHER, R. W. HENRY and W. A. GRUSE U. S. 1,550,608, Aug. 18. A basic Al oleate in which the ratio of Al to oleic acid is about 1 to 1 is used for thickening mineral oils.

Treating lubricating oils from crank cases, etc. V. S. ALLEN U. S. 1,550,396, Oct. 6. Crank case oil or similar used lubricating oil, after setting while warm, is centrifuged, steamed to free it from volatile oils, again centrifuged and treated with fuller's earth. Decolorizing C is added to the oil prior to one of the centrifugings.

Destructive distillation of wood. D. P. SHAW U. S. 1,559,994, Nov. 3. A mass of wood is progressively burned from one end of a kiln to the other, in a substantially horizontal direction, and the distd. vapors are withdrawn from a zone in advance of the progressively burning portion in a manner substantially to avoid intermixing of the vapors with any combustion gases which contain no tar vapors.

Apparatus for wood distillation. J. L. WEAVER U. S. 1,560,517, Nov. 3.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The depolymerization of cellulose. E. HEUSER. *Z. Elektrochem.* **31**, 498-502 (1925).—The first step in depolymerization is the methylation of the variously pre-treated cellulose preps. to obtain water-sol. products. Treatment of this water-sol. material in different ways, as by HCl, yields products whose decreased mol. wt. indicates that changes have been brought about by depolymerization. The mol. wt. of copper ammonium cellulose lies between 3000 and 3500. Visco-cellulose gives a high degree of depolymerization. Curves show the change in important properties of cellulose with decrease in mol. wt. Discussion follows.

ROSALIE COBB

Determination of pentosans in wood. WALTER GIERISCH. *Cellulosechemie* **6**, 61-74, 81-93 (1925).—By correlating the results of a no. of equal color reactions that were applied to the distillates obtained by heating various carbohydrates, beech wood, spruce wood, and hydroxymethylfurfural *I* with 12% HCl (as in Tollens' pentosan method), G. concludes that the first few cc. of the HCl wood distillate contain appreciable amts. of *I*. The color reactions of *I* are disguised as the distn. proceeds by the intensive colorations given by furfural *II*. *I* in HCl gives a red color with resorcinol, a green color with orcinol red, followed by violet with peptone, a yellow color with very slight reddish tone with α -C₁₀H₇NH₂ and a yellow color with barbituric acid. Very similar colors are given by the same reagents with the HCl distillates of beech and spruce, and with the first 35 cc. of distillates obtained from various hexoses. On the other hand, *II* obtained from xylose, and methylfurfural *III* obtained from rhamnose gave very different colors, especially with peptone and resorcinol. The color reactions did not serve to differentiate between different hexosans occurring in the wood. G. also critically studied various pentosan methods. In the case of wood, the phloroglucinol method serves only to det. the sum total of *I*, *II* and *III* in the Tollens distillate. The attempted use of EtOH as a solvent for the phloroglucide of *III* with a view towards detg. *II* fails utterly, since the phloroglucide of *I* is partially sol. in EtOH, and gives high values for both *II* and *III*, when applied to the analysis of woods. In fact the presence of *III* in the HCl wood distillates was not indicated by the usual color reactions, but these negative results do not necessarily prove its absence. If present, however, *III* occurs in relatively small amts. The semioxamizide method cannot be applied directly to the Tollens distillate, because of its high acidity. Modifications of the method serve no useful purpose, since it ppts. *I* and requires the detn. of a set of factors to permit the calen. of *II*. Barbituric acid served as the best reagent in the pentosan detn. It ppts. *II* and *III* with the min. pptn. of *I*. Pure *I* is pptd. by barbituric acid only when concns. are quite high. When *I* is subjected to the Tollens distn. an appreciable amt. is converted into *II*. On the other hand, carbohydrates giving rise to *I*, when heated with HCl, yield very small amts. of *II*, since *I* is distd. off as rapidly as it is formed. The barbituric acid method when applied to woods gives the best values for *II*, and is recommended for the pentosan detn. The yields of *II* vary with the size of the sample taken for analysis, and for comparative results the amt. of sample should not be varied. When the phloroglucide of *II* is extd. with alc., AmOH and AcOAm, adsorption of the solvent takes place, and causes an actual gain in wt. even after protracted drying. The phloroglucide of *II* is very insol. in AmOH. Fractional HCl distn. of red beech wood using both the phloroglucinol and the barbituric acid methods gives the following insight into the hydrolysis of pentosans and hexosans in the wood: in the first 60 cc. of the HCl distillate *I* is found in gradually decreasing amts., which reach a min. between 60 and 90 cc. From this point on until the end of the distn. (420 cc.) an increase of *I* occurs. The production of *II* rises from the beginning of the distn., reaches its max. between 30 and 60 cc. and is complete when 150 cc. have been distd. *III* if it occurs at all is not produced after the first 150 cc. G.'s interpretation of these data is that the hemicellulose hexosans are rapidly hydrolyzed and converted into *I* at the outset of the distn., and that the later production of *I* is due to the degradation of cellulose. The technic of the Tollens method is simplified by adding 200 cc. of boiling HCl directly to the 2 g. wood sample, and maintaining the reaction mixt. at 140° by use of a CaCl₂ bath. The distn. is complete in about 1.25 hrs. and the addn. of 30 cc. portions of HCl is obviated. G. gives complete tabulated data as well as graphs. LOUIS E. WISE

Metallurgy of Fe drier rolls (BOLTON) 9.

Chlorination of cellulosic materials. A. R. DE VAINS. U. S. 1,556,497, Oct. 6.

In neutralizing the acids set free by the chlorination of ligno- and pecto-cellulose or similar cellulosic materials and dissolving out the chlorinated derivs., an alk. earth metal compd. such as $\text{Ca}(\text{OH})_2$ or CaCO_3 is used for the neutralization and an alk. compd., *e. g.*, NaOH , NH_4OH or Na_2CO_3 , for dissolving the chlorinated derivs. U. S. 1,556,498 specifies continuous chlorination of cellulosic materials by continuously introducing a chlorinating agent, *e. g.*, a Cl soln., and the materials into a chlorination vessel, controlling the supply of chlorinating agent by the pressure in the chlorination vessel and regulating the supply of cellulosic material in accord with the discharge of chlorinated product. Cf. C. A. 13, 1347.

Halfstuffs and cellulose from vegetable fibers. R. RUNKEL. U. S. 1,557,338, Oct. 13. Vegetable fibrous materials of various kinds, including peat or wood chipings, are treated with Cl and alkalis such as soda soln. simultaneously, and, with repeated addn. of alkali, the obtainment of a pure white cellulosic material is possible.

Cellulose acetate. E. S. FARROW, JR. U. S. 1,557,147, Oct. 13. CHCl_3 sol., cellulose acetate is dissolved in a soln. of H_3PO_4 "of a type which is liquid above its m. p.," *e. g.*, H_3PO_4 of 70–85% strength, and while so dissolved is partially hydrolyzed to render it sol. in acetone. Cf. C. A. 19, 729.

Cellulose acetate. E. S. FARROW, JR. U. S. 1,560,554, Nov. 10. For sepg. and subdividing cellulose acetate from a reaction mixt. of high viscosity, blades are forced through the mixt. and H_2O in liquid form is gradually added until cellulose acetate is pptd. in subdivided form.

Cellulose acetate. A. F. SULZER. U. S. 1,560,620, Nov. 10. A cellulose acetate reaction mixt. contg. volatile acetic values is heated to a temp. (suitably about 40–80° *in vacuo*) to volatilize the acetic values without degrading the cellulose acetate, and the vapors evolved are removed and liquefied.

Cellulose acetate composition. S. J. CARROLL. U. S. 1,560,542, Nov. 10. A compn. adapted for making sheets or films comprises a soln. of colloiddized acetone-sol. cellulose acetate contg. cresyl *p*-toluenesulfonate.

Paper pulp. B. T. MCBAIN, J. H. ALEXANDER and G. GENBERG. U. S. 1,560,591, Nov. 10. In making light colored paper from resinous wood, the wood is treated by the usual sulfate process and the resulting pulp is then cooked with acid sulfite soln.

Sizing paper. J. A. DECEW. U. S. 1,558,845, Oct. 27. Pptn. of rosin from size is effected after completion of the beating action of the Jordan engine. U. S. 1,558,846 specifies treating paper pulp with rosin emulsions and colloidal $\text{Al}(\text{OH})_3$, and, after the rosin emulsions are coagulated, adding $\text{Al}_2(\text{SO}_4)_3$.

Sizing paper "in the pulp." J. PELZER. U. S. 1,550,632, Aug. 18. In sizing with rosin size, the concn. and alkalization during sizing are controlled to produce as large an amt. as possible of a compd. of the formula $\text{C}_{20}\text{H}_{30}\text{O}_2\text{Na} \cdot 3\text{C}_{20}\text{H}_{30}\text{O}_2$ in the soln.

Apparatus for hydrating, beating and refining stock for paper making. E. B. FRITZ. U. S. 1,556,926–7, Oct. 13.

Device for testing the rate of absorption of liquids by fibrous sheet materials. F. A. SESLER. U. S. 1,561,285, Nov. 10. The app. is especially adapted for testing the absorption of binders by paper or textile fabrics.

Chemical wood pulp. G. A. RICHTER. U. S. 1,557,880, Oct. 20. Chips are exposed to the action of combustion gases which have been suitably cooled partially to dry the chips. The gases are in part recirculated. An app. is described. Cf. C. A. 19, 2878.

Pulp and by-products from resinous wood. J. H. WALLACE. U. S. 1,560,446, Nov. 3. Resinous wood such as pine is subjected to extn. with a distillate from resinous wood, b. 170–185°, or a similar solvent as long as extn. of resinous substances readily is accomplished. The ext. is then sepd. and the wood disintegrated with a heated alk. soln. such as NaOH to produce pulp. Residual non-volatile and solid resinous substances are recovered from the spent alk. soln. U. S. 1,560,447–8 also relate to similar processes.

"Quick-Cook" sulfite pulp manufacture. P. C. ULMEN, H. H. BECKER and R. T. MANN. U. S. 1,560,881, Nov. 10. In discharging "quick-cook" sulfite digesters, the spent liquor is strained off and cold H_2O is simultaneously injected quickly to reduce the temp. and pressure within the digester. The cooked chips are then washed out.

Recovering values from waste sulfite liquor. V. DREWSON. U. S. 1,560,900, Nov. 10. The waste liquor is concd. until it contains only about 50% H_2O and mixed with niter cake and with 10–30% of hydrated lime to fix the organically combined S and minimize its elimination. The mixt. is then incinerated and melted to produce Na_2CO_3 and Ca sulfide, Na salts are leached out, and the residue is treated to form

SO₂ which is combined with the Na salts to form Na monosulfite for prepg. pulp cooking liquor

Recovering sodium acid sulfite from waste sulfite liquor. J. BEVERIDGE. U. S. 1,560,649, Nov. 10. A portion of waste sulfite liquor, after draining from the pulp, is neutralized, e. g., with NaOH or Na₂CO₃, evapd, mixed with unneutralized liquor, carbonized, and the carbonized product is leached with H₂O to form a soln. contg. Na sulfite, etc.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

The dangers in autogenous work. GEORG EPSTEIN *Apparatebau* 37, 248-9, 263-4, 278-9, 291(1925) —Discussion of the sources of explosions of C₂H₂, H and of cylinders, with a few precautions.

Aerosols in industry. W. F. GIBBS *Colliery Guardian* 130, 972(1925) —A description of the principles involved in the formation of aerosols, their properties and the factors involved in dust explosions in industry.

Explosion of gunpowder press house at factory, No. 38, Kent. R. A. THOMAS Special Rept H. M. Inspectors of Explosives, No. CCN111 July, 1925 Mimeographed, 8 pp. —The explosion occurred May 16, 1925, at the time when mill powder from the "charge" house and powder dust from the corning-house (which was being brought to the press house by a boat on the canal running alongside of the press house) was about to be discharged from the boat. It was learned that the bow of the boat was shod with galvanized iron and that the boatman was behind his schedule. The evidence clearly showed that the powder aboard the boat exploded before that in the press house. It was concluded that the boatman, in his hurry, passed beyond his landing place; that the bow of his boat struck the concrete wall at the end of the canal; and that the friction ignited powder dust which fired the powder charges on the boat and eventually caused the charges in the press house to explode. CHARLES E. MUNROE

Prevention of explosions in air receivers (PARISH, WHALEY 22.

Explosive. E. M. WERNER U. S. 1,550,639, Aug. 18 KClO₃ for use in explosives is associated with a substance such as glycerol and a vegetable oil which will reduce the sensitiveness of the powdered chlorate to friction without inhibiting its usefulness in explosive mixts when ignited by detonators.

Explosive. H. A. LEWIS. U. S. 1,560,426, Nov. 3 A condensation product is formed from ethylene glycol or other polyhydric alcohol contg. not more than 3 OH groups and 4-dinitrochlorobenzene or other nitrochloro aromatic compd. and this condensation product is then nitrated with HNO₃ and H₂SO₄ to form an explosive for detonators, "booster" charges, etc.

Explosive. R. C. MORAN. U. S. 1,560,427, Nov. 3 A condensation product is formed from aminocethyl alc or other amino aliphatic alc and 2,4-dinitrochlorobenzene or other nitrochloro aromatic compd. and this condensation product is then nitrated.

Propellent explosives. G. C. HALE and F. OLSEN U. S. 1,550,960, Aug. 25. In incorporating nitroguanidine and nitrocellulose, the nitroguanidine is treated with a solvent such as *p*-tolylmethylketone, benzaldehyde, diacetin or urethan which also acts as a colloidng agent for the nitrocellulose Cf C. A. 19, 3021

Coating grains of nitrocellulose explosives. T. L. DAVIS U. S. 1,561,219, Nov. 10. Sym-dimethyl-(or diethyl-) urea or other urea symmetrically substituted by only 2 alkyl groups is used for coating or colloidng.

Fuse for explosives. W. O. SNELLING. U. S. 1,561,366, Nov. 10 A powder core of a fuse is covered with a waterproofing coating formed from a material (such as China wood oil, a synthetic resin or rubber mixed with S and (CH₂)₆N₄) which tends to vulcanize with increasing temp. This coating serves to avoid preignition by the fuse.

Projectiles filled with guanidine picrate. F. OLSEN U. S. 1,558,565, Oct. 27 The guanidine picrate is compressed to a d. of not less than 1.50. Paraffin, TNT, etc., may also be added.

Dynamite cartridges. M. BRANDT. U. S. 1,550,670, Aug. 25. Dynamite is enclosed directly in rubber-treated paper of such character as to be consumed when the cartridge is exploded.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

A list of the principal group names of commercial dyes and pigments with their classification as regards application and the manufacturer's address. CHAS. E. MULLIN. *Textile Colorist* 47, 706-7 (1925).—A directory of dyestuff manufacturers and dealers.

CHAS. E. MULLIN

The relation between constitution and dyeing properties. HANNS JOHN. *Z. angew. Chem.* 38, 903-4 (1925).—2-Phenyl-4-methyl-6-hydroxyquinoline (I) has been coupled with 12 diazo compds. and the resultant colors have been compared with those produced by using the same diazo compds with β -C₁₀H₇OH (II) or naphthol AS (III). The colors from I had more fastness to alk.-soap than those of II or III, but the same or less to light. The tone was less lively than with II or III; the shades were much more yellow than those of III and in most cases than those of II also.

WM. B. PLUMMER

Dyeing of acetate silk. C. E. MULLIN. *Am. Dyestuff Rept* 14, 182-4, 510-1, 517-21, 554-6, 577-8, 588-93, 622-7, 653-8, 694-9 (1925); cf. *C. A.* 19, 2748.—This series of papers closes with a list of precautions in part as follows: Always wet process acetate silk at temps. below 85° and preferably below 80°. Avoid the use of strong alkalies especially on Celanese. Use only neutral soap solns whenever possible. Use no mineral acids on acetate silk if it can be avoided. Use AcOH and HCO₂H. On Lustron whatever the dyeing process the last rinse water should contain about 15 g. of NaHCO₃ per gal. The goods should be dried from this rinse so as to finish slightly alk. Acetate silk should not be run over bare Cu drying cans or other hot metal; it should be dried below 85°. In finishing goods must not be stretched beyond the gray width. In laundering the goods should be handled in the same manner as real silk rather than cotton.

L. W. RIGGS

The dyeing of cellulose acetate silk and of mixed fabrics containing cellulose acetate. E. DUNEM. *Tiba* 3, 1067-77 (1925).—An address briefly reviewing the various processes.

A. PAPINEAU-COUTURE

The formation of colors (in vat dyeing). KURT BRASS. *Z. angew. Chem.* 38, 853-7 (1925).—Expts. have been carried out on the affinity of the cellulose fiber for the free leuco acid and for the Na salt thereof of various vat dyes, viz., indanthrene blue RS, yellow R, orange gold G and orange RRT. By using a closed flask with suitable inlets the cotton was treated for 1 hr. at 60° with the usual dye bath (Na salt of the leuco compd.) in an atm. of CO₂, N₂ or O₂, then boiled up with soap soln., the same atm. being maintained and finally oxidized in air. With CO the final color was deeper than the control run in air, while if N₂ were used the soap soln. extd. the leuco salt from the fiber, the final oxidation giving merely a discolored product. Evidently the dyeing process requires the pptn. of the free leuco acid and the fiber by the CO₂ of the air. On carrying out the process in O₂ the final color was apparently developed during the first step of the above expts., but on boiling with soap soln. it was almost completely extd., showing that the free leuco acid must be adsorbed by the fiber before oxidation.

WM. B. PLUMMER

Testing the fastness of dyed colors to light. H. B. GORDON. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 158-62, 167-73, *Am. Dyestuff Rept* 14, 488-92, 497-503.—In order to be suitable for testing the fastness of colors the light used should (1) give essentially the same results with all dyes as does sunlight, (2) act more rapidly than sunlight on all colors, (3) operate without much attention and (5) be accurately reproducible in order that similar results may be obtained in different labs. Among the lights studied, the violet carbon arc best meets the foregoing conditions. L. W. R.

Some uses of lactic acid in the textile industry. N. BOURGUIGNON. *Tiba* 3, 1011-9 (1925).—Brief review of the properties of lactic acid, its utilization for producing silk effects, and its technical control.

A. PAPINEAU-COUTURE

Weights and measures of the finishing department. H. D. MARTIN. *Textile Colorist* 47, 699-700 (1925).—The importance of checking the wt. and measurements of cloth as received for finishing as well as after this operation.

CHAS. E. MULLIN

Finishing of linen. F. BRADBURY AND W. HAGGAN. *Textile Recorder* 42, No. 505, 67-9, No. 506, 63-5 (1925); cf. *C. A.* 19, 1951.—A description of the app. and methods of moistening, starching, drying, stentering, calendaring, glazing, chasing and mangling.

CHAS. E. MULLIN

Woolen and worsted cloth finishing. TINDAIRS. *Textile Recorder* 43, No. 507,

63-5; No. 508, 59-61; No. 509, 61-3, 69(1925).—A description of the app. and methods.

CHAS. E. MULLIN

Processing of cotton. S. V. DEFOREST. *Chemicals* 24, No. 15. 31-2(1925).—A discussion of cotton impurities and their removal.

CHAS. E. MULLIN

Deleterious substances in wool. F. B. HINTON. *Agr. Gaz. N. S. Wales* 36, 495-6(1925).—Admixed jute fibers from coverings used on the bales of wool, and certain compds. such as CuSO_4 and coal tar, frequently present in sheep-branding specifics and blow-fly remedies, produce imperfections and discolorations in the dyed product. Expts. to det. the best methods for eliminating these undesirable features are being carried out.

K. D. JACOB

Classification of raw silk by means of mechanical tests. K. R. MOORE. *Am. Dyestuff Rept.* 14, 551-2, 579-83, 619-21, 689-90(1925).—The phys. and structural properties which are examd. in classifying silk in accordance with mech. measurement are as follows: color, luster, handle (resiliency), nature (soft, medium, hard), cohesion, strength, ductility, evenness and cleanness. The defects are classed as: slugs, bad throws, waste, split ends, bad knots, hairiness, nibs, corkscrews and loops. The procedures for carrying out the phys. tests, instruments employed and the method of recording results are described.

L. W. RIGGS

The manufacture of balloon fabrics. DAMBROISE. *Rev. gén. caoutchouc* 1925, No. 15, 16-8.—A general description, including the rubberizing process, curing with S_2Cl_2 , testing and the use of protective pigments.

C. C. DAVIS

Study of N compounds in petroleum [source of quinoline bases] (BAILEY) 22. Device for testing the rate of absorption of liquids by fibrous sheet material (U. S. pat. 1,561,285) 23. Dyeing rubber (U. S. pat. 1,559,343) 30

Dyes. W. HERZBERG and G. HOPPE. U. S. 1,556,326, Oct. 6. 2-Hydroxy-3-(2'-nitrophenylmercapto)-1,4-naphthoquinone is dissolved in NaOH soln. and decolorized with Na hyposulfite and then treated with air until it assumes a dark brown color, and acidified. The liquid thus formed solidifies, more readily when warmed, to a thick violet dye magma. The dye may be obtained as a cryst. powder. A similar thiazine dye is obtained from 2-hydroxy-3-(2'-nitro-4'-chlorophenylmercapto)-1,4-naphthoquinone (a brownish yellow powder m. 210° and obtained from 2-nitro-4-chloro-1-thiophenol). Other examples also are given of the formation of similar dyes from analogous starting materials. The dyes produce on wool green chrome lakes of good fastness to light.

Dyes. J. G. DINWIDDIE. U. S. 1,558,252, Oct. 20. A dibrominated (or other halogenated) isatinchloride is condensed with 2-hydroxy-3-methyl-5-chlorothionaphthene, forming dyes which give fast violet shades on cotton.

Dyes of the anthraquinone series. A. H. DAVIES, R. F. THOMSON and J. THOMAS. U. S. 1,531,260, March 24, 1925. Isodibenzanthrone is oxidized, e. g., by the action of H_2SO_4 and MnO_2 , and the product is alkylated or otherwise treated to produce dyes which in general produce fast blue dyeings of various shades. The oxidized isodibenzanthrone may be subjected to a partial reduction before alkylation.

Dyes from dibenzanthrone, etc. A. H. DAVIES and R. F. THOMSON. U. S. 1,531,261, March 24, 1925. Alkyl derivs. of dibenzanthrone and similar compds. form dyes of various shades among which are green, violet, blue and brown which give fast dyeing on cotton. Numerous examples are given. U. S. 1,531,262 specifies treatment of the oxidation product of dibenzanthrone with Me_2SO_4 . A blue-green dye is produced. U. S. 1,531,263 specifies oxidation and subsequent reduction of substituted dibenzanthrones such as dichlorobenzanthrone to form dyes which give green or blue shades on cotton.

Green-blue dyes of the triphenylmethane series. R. GESING and R. REYHER. U. S. 1,550,534, Aug. 18. Dyes fast to alkali are obtained by condensing 1 mol. proportion of *o*-sulfobenzaldehyde with 2 mol. proportions of alkylbenzylarylamines which are substituted in the benzyl residue by halogens and sulfonic groups, and oxidizing the condensation products.

Azo dyes. J. HALLER. U. S. 1,529,739, March 17, 1925. Diaminodisazo dyes are prepd. by combining tetrazotized aromatic diamines free from sulfonic groups with amines which can be further diazotized. The tetrazo compds. of these diamino-diazo dyes yield, when combined with arylides of 2,3-hydroxynaphthoic acid, insol coloring substances which in general are black or blue-black. The middle components should be free from sulfonic groups. Suitable amines are: *m*-aminoacetanilide, acetyl-

toluylenediamine, *m*-toluidine, lidine, ~~pyridine~~ *N*-phenylamine and its derivs. with a free 4 position.

Azo dyes. H. FRITZSCHE. U. S. 1,539,353, May 26, 1925. Polyazo dyes are obtained by reacting on 2 mol. proportions of 1-aminoaryl-3-pyrazolones (*e. g.*, 1, 3'-aminophenyl-5-pyrazolone-3-carboxylic acid) in any desired sequence, with 1 mol. proportion of phosgene and 2 mol. proportions of diazotized azo dyes, *e. g.*, the diazo deriv. of 4-amino-3-tolueneazo-2'-toluene-4'-sulfonic acid (which gives a dye producing orange tints on cotton).

Chromium compounds of azo dyes. H. FRITZSCHE, E. REBER and F. STRAYB. U. S. 1,529,995, March 17, 1925. Complex compds. of azo dyes with Cr are obtained by the action of chroming agents as Cr_2O_3 , $\text{Cr}(\text{OH})_3$ or their compds. with alkalis or weak acids, upon *o*-hydroxyazo dyes which are obtained by coupling 1-aryl-5-pyrazolones carrying an SO_2NH_2 group in their aryl nucleus with *o*-hydroxydiazocompds. They form dark powders sol. in alk. aq. solns. and dye wool in an acid bath orange to blue-red tints fast to fulling and to light. Several examples are given.

Disazo dyes. R. C. MILLER. U. S. 1,557,265, Oct. 13. Diazo compds. of *p*-aminoazoxylenes are combined with β -hydroxynaphthoic acids. The products are insol. in H_2O , fast to light and dye red to blue shades. They may be used with oils, waxes, rubber, lacquers and other non-aq. substances.

Disazo dyes containing a diphenylurea nucleus. L. W. GELLER. U. S. 1,538,934, May 26, 1925. Azo dyes for use on unmordanted cotton and also adapted for use on wool, silk and other fibers (giving yellow dyeings) are obtained by converting into a urea compd. the aminoazo dyes produced by combining diazotized 3-amino-4-methylbenzene-1-sulfonic acid with an equimol. proportion of a 4-alkoxy- (*e. g.*, 4-methoxy- or 4-ethoxy)-3-amino-1-methylbenzene.

Vat dyes of the anthraquinone series. P. NAWIASKY and K. SAURWEIN. U. S. 1,539,689, May 26, 1925. Anthraquinonecarboxylic acid amides in which a H atom of the amide group attached to a carboxyl is substituted by an anthraquinone residue (corresponding to the general formula A-CO-NH-A' , in which A and A' are anthraquinone residues) may be used as vat dyes provided one or both of the anthraquinone residues contain at least 1 amino group which may be either a primary amino group or substituted by any radical other than an anthraquinonecarboxylic acid residue. Other substituents may also be present in one or both of the anthraquinone residues. The dyes generally produce red shades but some give orange or violet. Several examples are given.

Dyeing sulfur colors on silk. F. L. REMLEIN. U. S. 1,551,330, Aug. 25. The alkalinity of the dye bath is reduced with Na hyposulfite and NaHSO_3 , gum soap also being added to the amt. of 0.75-5%.

Artificial silk. O. LEUCHS and E. HÜBERT. U. S. 1,558,375, Oct. 20. Before spinning filaments, the portions of the app. used which come into contact with the pptg. liquid are freed from accumulated air in order to avoid breaks in the filaments produced.

Artificial silk. H. P. BASSETT and T. F. BANIGAN. U. S. 1,560,965, Nov. 10. A soln. of acetyl nitrocellulose in acetone is passed from a spinneret through a shallow body of acetone and H_2O and then delivered through a body of air.

Artificial silk from cellulose acetate. H. S. MORK and C. F. COFFIN, JR. U. S. 1,551,112, Aug. 25. A soln. of cellulose acetate in $\text{C}_2\text{H}_5\text{Cl}_4$, alc. and kerosene or other aliphatic hydrocarbon material is coagulated in a bath which also contains an aliphatic hydrocarbon material such as kerosene 90 together with $\text{C}_2\text{H}_5\text{Cl}_4$ 10%.

Artificial silk from viscose. I. O. E. LAMS. U. S. 1,558,265, Oct. 20. Viscose threads are subjected to the action of an aq. soln. contg. NH_4 formate 13-15 and Na formate 13-18%, the threads are drawn while so coagulated, and are then converted into cellulose hydrate.

Apparatus for manufacture of artificial silk filaments. H. KEMPF. U. S. 1,558,371, Oct. 20.

Gutter or channel for treating imitation-silk yarns, etc., with acid liquids. E. ELSAESSER and W. ZUR LÖWEN. U. S. 1,561,445, Nov. 10.

Acid-circulating system for mercerizing yarn. L. A. STEAD. U. S. 1,558,060, Oct. 20.

Apparatus for bleaching, dyeing and other treatments of textile fabrics. JOHN BRANDWOOD, THOMAS BRANDWOOD and JOSEPH BRANDWOOD. U. S. 1,558,460, Oct. 27.

Viscose. J. HUBER and P. ECKERT. U. S. 1,550,360, Aug. 18. Na silicate or other inorg. colloid capable of modifying the physical properties of the formed viscose is added to the lye in which the xanthate is to be dissolved in the manuf. of formed viscose. U. S. 1,550,361 specifies the similar addition to the lye of an emulsoid such

as agar-agar in prepg. viscose for the manuf. of artificial silk of especially soft texture, high degree of toughness, tensile strength and extensibility.

Treating cellulose fibers with sulfuric acid and formaldehyde. F. L. BARRETT and R. P. FOULDS. U. S. 1,558,453, Oct. 27. See Can. 248,412 (C. A. 19, 3163).

Bleaching piece goods. J. C. McDOWELL. U. S. 1,558,104, Oct. 20. In bleaching piece goods contg. yarns dyed with vat colors, the material is boiled under pressure for 6-10 hrs. in an aq. soln. contg. Na silicate and Na_2CO_3 which serve to prevent undesirable changes in the dyed portions.

Bleaching washed goods. M. G. DONK and W. D. MARSHALL. U. S. 1,550,518, Aug. 18. The goods are agitated in a soln. of Na_2CO_3 or other alk. soln. and Cl⁻ is introduced. The alkalinity of the soln. is maintained at such a point that no substantial amt. of HOCl will be formed.

Preparing fibers for spinning. L. UBBELOHDE. U. S. 1,550,598, Aug. 18. The spinning qualities of wood pulp, "cottonized" flax or similar fibers is improved by agitating the fibers with sharp-edged chip like material such as glass powder, carborundum or infusorial earth.

Oiling cotton raw stock. R. B. SMITH. U. S. 1,550,396, Aug. 18. Lubricating oil in liquid form is applied to the stock prior to the completion of the drawing operation and the oil is permitted to penetrate the stock during the drawing operation.

26--PAINTS, VARNISHES AND RESINS

A. H. SABIN

The effect of adding zinc oxide to iron oxide paints. H. A. NELSON. *Drugs, Oils and Paints* 41, 101, 51-4 (1925).—The results of a large no. of exposure tests of iron oxide linseed oil paints on iron panels are presented, with photographs. These show that the addn. of 15 to 20% ZnO to the pigment portion of the paints increases the useful life of the paint films to approx. double that of the paint contg. no ZnO. It is necessary that the ZnO be present in the film next to the metal. A large variety of Fe_2O_3 pigments was used, in general it appears that the oxides of very high Fe_2O_3 content such as Indian red, and the Venetian reds are not suited for use in metal priming paints.

F. A. WERTZ

Uniform procedure for the simple testing of paints and varnishes. ANON. *Farben-Ztg.* 30, 3052 3(1925); *Farbe u. Lacke* 1925, 443-5.—Uniform elementary comparative methods for testing brushing quality, spreading rate, drying time, color permanency, etc., of paints, as adopted by the producers, dealers and consumers, are given. Cf. C. A. 19, 900.

F. A. WERTZ

The drainage of fire hazardous liquids in the varnish and paint industries. S. ROEDER. *Farbe u. Lacke* 1925, 493.—A review of the fire hazards resulting from running of waste liquids contg. volatile combustible matter into drainage sewers, with suggestions for minimizing the danger by use of separator basins, etc.

F. A. W.

Cobalt colors. R. K. GOSSELTZ. *Farbe u. Lacke* 1925, 491-2.—A review of the history of the use of Co colors, of their manuf. and uses.

F. A. WERTZ

The permanency of pigment colors to light. KAISER. *Farben-Ztg.* 30, 3121 3 (1925).—Review.

F. A. WERTZ

Commercial practice in the washing of earth colors. ANON. *Farbe u. Lacke* 1925, 445.

F. A. WERTZ

Newer ideas for waterproof coatings. ALBERT REICHERT. *Farbe u. Lacke* 1925, 458-9.—A review of patents covering the use of metallic soap solns., etc., for waterproofing.

F. A. WERTZ

Kaolin. ANON. *Farbe u. Lacke* 1925, 460.—A brief review of the source, compn. and uses of kaolin in the manuf. of lakes, ultramarine pigments, etc.

F. A. WERTZ

The production of zinc white. ANON. *Farbe u. Lacke* 1925, 468-9.—A very brief review.

F. A. WERTZ

Mars yellows. ANON. *Farbe u. Lacke* 1925, 469.—A review of the methods of manuf. of Mars yellows. All of these consist of Fe hydrates or oxides pptd. on a base of ZnO, CaSO_4 , clay, etc.

F. A. WERTZ

The poisoning action and dangers of organic solvents and their prevention. ANON. *Farbe u. Lacke* 1925, 422-3, 433-4.—A review of the toxic effects of alcs., ketones, turpentine, benzene, C_6H_6 , chlorinated and hydrated hydrocarbons, CS_2 , etc., of the fire hazards involved, and of preventive measures.

F. A. WERTZ

Cellhorn (zellhorn), Cellon, cellulose ester lacquers. III. C. R. HALL. *Farbe*

u. Lacke 1925, 424.—A review of cellulose ester products, of solvents employed, of aviation dopes, etc. F. A. WERTZ

The chemistry of drying oils. II. G. W. ELLIS *J. Soc. Chem. Ind.* **44**, 469-72, 486T(1925); cf. *C. A.* **19**, 3380, 3603.—Linoxyn appears to develop aldehydic structures on treatment with H_2O , as shown by the marked reaction with phenylhydrazine and Schiff's reagent. It probably contains a considerable proportion of its compn. in the form of a hexanone ring structure; and probably contains a number of OH groups. When linseed oil is oxidized under dry conditions, no appreciable amt. of H_2O -sol. acid products results. The volatile products formed during oxidation of linseed oil in dry oxygen or air at ordinary temps. were detd. by absorption in H_2SO_4 and in KOH by a variety of methods. There is little justification for regarding more than a small portion of the volatile products as due to the primary oxidation process, and this small proportion may represent a reaction secondary to that which forms linoxyn. At 0° and in darkness, linseed oil does not appreciably oxidize in dry O at a pressure of 2 atm. In dry O, linoxyn is comparatively stable but in the warmth of direct sunlight, it absorbs O and undergoes appreciable decompn., forming a thick yellow oil and evolving CO_2 . This is perhaps the reaction which gives rise to the volatile products usually obtained. All expts. are described in detail. F. A. WERTZ

The drying of fatty oils. A EIBNER *Farben-Ztg* **30**, 3055-6; *Farbe u. Lacke* 1925, 457. —A review. F. A. WERTZ

Wood oil and the possibilities in its treatment. H. RASQUIN. *Farbe u. Lacke* 1925, 420-1, 418.—A brief review is given of the patents claiming to effect the production of a heat bodied wood oil, similar to "stand oil," without the formation of a gel. Preliminary expts. were made in heating mixts. of raw wood oil and of wood oil heated 2 hrs. at 200° , with various solvents under reflux condensers, until the consistency of the soln. after cooling approached that of varnish. The films produced by these varnishes were then examd. for drying, freedom from the frosting effect characteristic of raw wood oil, hardness, gloss, etc. Those produced from solns. in turpentine and in other solvents with b. p. around 165° showed that the necessary degree of polymerization had not yet been reached to produce a clear hard, glossy film; but those produced from decalin, b. $190-200^\circ$, produced good films. The method is suggested for research to det. its com. manufg. possibilities. F. A. WERTZ

Esterification. ANON. *Farbe u. Lacke* 1925, 421.—A brief review of the esterification of rosin glycerol to produce ester gum. F. A. WERTZ

The production of printing inks. HANS HADERT. *Farbe u. Lacke* 1925, 419-51.—A review with formulas. F. A. WERTZ

The inter-esterification on heating of fatty acid glycerides with resin acids. K. PISTOR. *Farben-Ztg* **30**, 3056-7; *Farbe u. Lacke* 1925, 156.—Abietic acid, colophony, run Congo gum, acid albertol and neutral albertol were heated separately with tristearin, and with refined linseed oil, with variations in the proportions used and in the time, and temp. of heating. The free acids were then sep'd by distn. *in vacuo*, and the quantity of free fatty acids found was taken as a measure of the interchange from fatty acid glyceride to resin acid glyceride. The tabulated results show that the reaction follows the laws of mass action and depends on time and temp. of heating. In the manuf. of oil-resin varnishes very little inter-esterification takes place because of the short period of heating. F. A. WERTZ

A new method for the determination of the color of resins, varnishes, oils, etc. E. FONROBERT. *Farben-Ztg.* **30**, 3057(1925).—Aq. solns. of I in KI form the best color standards for these products. It is proposed that the color number of the substance be the mg. of free I in 100 cc. of I-KI soln. of the same color. The detn. is made by comparing in transmitted light, a column of definite height of the sample with a column of variable height of the I-KI soln. and then titrating the free I present. All measurable color nos. will range from plus 4 to plus 1000. The color numbers for the present standard American rosin grades are tabulated. F. A. WERTZ

The alleged volatility of bakelite resins with spirit vapors. JOH. SCHEIDER. *Z. anorg. Chem.* **38**, 904-5(1925).—The volatility of bakelite resins with the solvent vapors in bakelite varnishes cannot be confirmed: the sol. resins are entirely non-volatile at 100° . If the varnish applications are heated to 140° , the sol. "A" resin is transformed to the insol "C" resin with accompanying losses of H_2O and phenol products resulting from the polymerization. These products might produce the deposits noted on the walls of drying ovens, but they are not produced to the extent previously reported by v. d. Heyden & Typke (*C. A.* **19**, 2277). F. A. WERTZ

Waterproof paint. J. GALLIAN. U. S. 1,560,075, Nov. 3. A paint adapted for

use on cement or brick walls is formed of white lead, ZnO , BaSO_4 , turpentine, damar gum, beeswax, KNO_3 and linseed oil.

Paint- and varnish-remover. C. A. KING and C. M. WARLICK. U. S. 1,556,694, Oct. 13. A coating of paint or varnish to be removed is treated with a concd. soln. which may be formed from H_2O , NaOH and $\text{Ca}(\text{OH})_2$, with or without $\text{K}_2\text{Mn}_2\text{O}_8$ and is then sprinkled with a small amt. of H_2O . Chem. action is then allowed to take place before the coating is removed.

Red lead. H. HOCKING. U. S. 1,556,820, Oct. 13. See Brit. 220,609 (C. A. 19, 709).

Varnish. S. P. ASHMORE. U. S. 1,557,961, Oct. 20. English rosin 1 lb., Na salicylate 3 oz., ether 2 oz., a drier such as japan drier 1 pint, a drying oil vehicle such as boiled linseed oil 1 pint, turpentine 1 pint and MeOH 1 pint.

Synthetic resin varnish. C. ELLIS. U. S. 1,557,519, Oct. 13. A varnish base is formed from linseed oil or other drying oil and an oil-sol. cresol-S resin.

Decorating surfaces with copal and shellac varnishes. G. L. GUENOT and G. MAURICE. U. S. 1,561,324, Nov. 10. Surfaces such as those of walls or furniture are treated with copal varnish, formed with turpentine as solvent, and before the varnished surface is dry a shellac varnish, contg. alc., is applied, which serves to produce a contrasting mottled finish.

Solvent and vehicle for use with varnishes and similar compositions. C. D. HOCKER. U. S. 1,558,880, Oct. 27. Castor oil, gelatinized with copal, is treated with a free fatty acid, e. g., fatty acids from Chinese wood oil.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL.

The detection and estimation of small amounts of chromium in fats. A. O. SNODDY. *J. Oil & Fat Ind.* 2, 20-5(1925).—Fats are sometimes bleached with Cr salts. Therefore detn. of traces of Cr in them is desirable. The following colorimetric method for detecting and estg. small amts. of Cr by means of diphenylcarbazide has proved satisfactory. Burn carefully 200 g. of fat in a Pt dish and ignite to ash preferably in a muffle to avoid losses which are apt to occur over free flame. Add 5 g. of an equimol. mixt. of Na_2CO_3 and K_2CO_3 , heat to fusion to convert all Cr^+ to Cr^- , cool and dissolve the melt in H_2O , faintly acid with HCl, making up to 200 cc. in the case of fats having about 1 part per million Cr. Compare in Nessler tubes the color obtained by mixing an aliquot of this soln. with 5 cc. of 20% HCl after dilg. to definite vol., and adding 1 cc. of diphenylcarbazide soln. with various dilns. of a standard $\text{K}_2\text{Cr}_2\text{O}_7$ soln. made with approx. the same concn. of Na_2CO_3 and K_2CO_3 , and treated the same as the unknown. The diphenylcarbazide soln. is made by dissolving 0.1-0.2 g. of the reagent in 10 cc. glacial AcOH and dilg. the 100 cc. with 95% EtOH. The violet color formed by the reaction reaches a max. in less than 10 min. and varies directly with the amt. of Cr present. Small amts. of Fe, Al, Cu and Si, which occur in the ash of fats, do not interfere in the reaction.

H. S. BAILEY

Iodine-bromine number via L. W. Winkler. K. SCHEFFLER. *Pharm. Zentralhalle* 66, 533-8(1925).—A series of expts. is described showing that the Winkler method is far more simple and quicker than that of v. Hübl, being only about $1/8$ as expensive and yielding satisfactory values in the case of fats with I no. as high as 120. In the case of higher values than that cited the comparative findings were only moderately in agreement.

W. O. E.

Modern processes for refining oil. E. WEISS. *La nature* 53, ii, 219-23(1925); cf. C. A. 19, 2570, 3167.—An illustrated description of the deacidification, decoloration and deodorizing of vegetable oils.

C. C. DAVIS

Some analytical data on the oils from sharks and rays. ALLEN ROGERS. *J. Am. Leather Chem. Assoc.* 20, 497-8(1925).—Analyses of oils from the livers of sand shark, tiger shark, hammerhead, nurse shark, devil fish and saw fish.

J. A. WILSON

Detection of coconut and palm kernel oils in cacao butter and fat from milk chocolate. W. F. BAUGHMAN. *J. Assoc. Official Agr. Chem.* 8, 703-5(1925).—Sapon. 5 g. of sample with 10 cc. of KOH (25 g. KOH in 200 cc. EtOH), evap. the alc., add 5 cc. H_2O , evap., dissolve in 10 cc. H_2O , cool, add with stirring 100 cc. of satd. NaCl, let stand 15 min. with occasional stirring, filter on a Büchner funnel; to 100 cc. of the filtrate add with stirring 100 cc. of satd. NaCl, let stand 15 min., filter and slightly acidify the filtrate with HCl. With pure cacao butter the soln. will remain clear when acidi-

fied; with fat from milk chocolate it will become faintly turbid, and if coconut or palm kernel oil is present it will become turbid or milky. A. PAPINEAU-COUTURE

Method for the rapid and accurate determination of fat in cacao products. H. A. LEPPER AND H. C. WATERMAN. *J. Assoc. Official Agr. Chem.* 8, 705-10 (1925).—Detn. by continuous extn. with anhyd. Et_2O is inaccurate owing to extn. of theobromine and a trace of resin-like material, and troublesome owing to required preliminary drying and possibility of the sample running through the filtering medium. Petroleum ether exts. saponifiable glycerol esters, phytosterols and lecithins, but the 2 latter may be regarded as normal fat constituents. L. and W. describe in detail a method consisting essentially in exhausting the sample with petroleic ether (usually 10 extns.) in a Knorr tube and collecting the ext. in a tared Erlenmeyer flask under a filtering bell jar, evapp. the solvent and drying to const. wt. at 100° . A. PAPINEAU-COUTURE

Report of Smalley Foundation Committee of A. O. C. S. on check meal samples. H. C. MOORE. *J. Oil and Fat Ind.* 1, 12-8 (1924).—The results of 78 chemists who detd. gasoline ext. and NH_3 on 30 samples of cottonseed meal are summarized and discussed. H. S. BAILEY

Waxes. A new chemical index. R. ROSSEAU. *Bull. sci. pharmacol.* 32, 449-63 (1925).—This paper is an abridgement of a 78-page thesis on waxes, particularly the vegetable waxes, in which the subject is considered from the standpoints of histologic botany and of chemistry. The detn. of the acetyl index by the method of Leys is emphasized. The ratio of (acetyl index of ales. esterified) to (acetyl index of total ales.) was found to be practically const. for the same kind of wax, and, therefore, of value in the detn. of the purity of a given sample. L. W. RIGGS

Report of Soap Stock Committee of A. O. C. S. for 1924. A. A. ROBINSON. *J. Oil and Fat Ind.* 1, 18-23 (1924).—Corn oil and soy bean oil soap stocks were analyzed for unsaponifiable, free oil and total fatty acids by 7 collaborators. Details of methods used and results obtained are given. The drying of the total fatty acids in CO_2 is not necessary to prevent oxidation, even with the easily oxidized acids of corn and soy bean oils. H. S. BAILEY

Effects of age on soap solutions. ROSALIE M. COBB. *Ind. Eng. Chem.* 17, 1134-5 (1925).—The resistance of sodium oleate-Nujol emulsions to salting out by NaCl varies periodically with the age of the soap soln. The aging effect is manifest to greater degree on lather values of commercial soaps. R. M. COBB

Colored goods and the laundry. GEO. W. JOHNSON. *Am. Dyestuff Rept.* 14, 681-5 (1925).—The modern methods of laundry works founded on research supported by the Laundryowners' Nat. Assoc. are described. Goods as received in the family bundle are divided into 12 classes and the directions for the treatment of each class are given. These directions show the kind and quantity of soap or other chemical if any are to be used, also the number, vol., and temp. of the baths used. The factor of temp. is too often ignored in unscientific laundering. The dyer of goods which are to be laundered should know the conditions of laundry work and select dyes capable of meeting those conditions. L. W. RIGGS

Apparatus for approximate or comparative melting points of fats, waxes and petroleum (STEVENS) 1.

Refining vegetable oils. C. H. HAPGOOD and G. F. MAYNO. U. S. 1,560,084, Nov. 3. See Brit. 228,889 (C. A. 19, 3028).

Soap. A. WELTER. U. S. 1,560,626, Nov. 10. Fatty acid soap stock or other fatty acids are mixed, at a temp. approx. their m. p., with water-free alk. carbonate such as Na_2CO_3 in double the quantity required for the complete saponification of the fatty acids so that the excess carbonate is sufficient to absorb the CO_2 resulting from the saponification and produce a soap contg. no stronger alkali than NaHCO_3 .

Shaving soap. C. A. SIPE. U. S. 1,558,642, Oct. 27. The reaction products of "lye," fat and H_3BO_3 are mixed with smaller quantities of acetanilide and H_2O_1 .

Glycerol soap. W. T. GUSSINKLO. U. S. 1,550,540, Aug. 18. A hard soap is formed from coconut oil, NaOH soln. and glycerol, the glycerol constituting at least 75% of the vol.

Detergent mixture. H. M. HECKMAN. U. S. 1,559,960, Nov. 3. A compn. adapted for cleaning terra cotta walls, etc., comprises soap and blast furnace slag which has been granulated by introducing it into H_2O while hot.

Porous soap-tablets containing bran, oatmeal, linseed meal, sawdust or other absorbent material. C. J. ATKINSON. U. S. 1,556,576, Oct. 13.

Composition for cleaning grease or paint from fabrics. C. ELLIS. U. S. 1,557,520, Oct. 13. A mixt. of C_2HCl_3 80-75 and $EtOAc$ 15-20%, substantially free from fats, soaps and waxes.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

• **Report on meetings of technical advisers in the Java sugar industry, April 22 and 23, 1925.** ANON. *Arch. Suikertnd* 33, Part 4(1925), cf. *C. A.* 19, 2754. **Joint meeting of chemical and technical sections, 1-120 pp.** **Meeting of chemical sections, 121-35 pp.**—A round table discussion on the same topics as at the previous meetings, with the following new agenda: steam turbines, and new juice strainers. F. W. Z.

• **Results of Claassen's methods of boiling and crystallization.** E. O. VON LIPPMANN. *Deut. Zuckertnd* 50, 681-5(1925).—I. has used these methods in refinery operation since 1906. Third liquor, consisting of affination sirup and of the sirup from II b product, is used, the mixt. dild. to 65 Brix, filtered according to Soxhlet, brought to the proper temp., and taken to the pan. It is essential that the liquor be absolutely clear and always of the same temp. A part of the sirup from the product preceding II b is also worked up in the same manner, in varying quantities depending on market conditions. The polarization purities varied greatly from yr. to yr., from 91.7 to 94.7, av. 92.7 for II b liquor, from 81.2 to 86.7, av. 85.0 for III liquor, and from 59.5 to 66.6, av. 64.3 for molasses. The sucrose purities are lower than these, but run more or less parallel with the apparent purities. The wide annual variations, due to quantity and nature of non-sugars, are partly caused by weather conditions, but largely influenced by the quality of the work in the raw sugar factory. It was definitely shown that the high purity of the molasses obtained in certain yrs. could not be further reduced, and conversely that low purities are no indication of exceptionally good work. Prolonged stirring of the magma is not advisable, especially in yrs. of high raffinose content, because it tends to break up the crystals and leads to losses in purging. The av. compn. of product II b (a) and III (b) was as follows: Dry substance (a) 99.5, (b) 99.1; polarization (a) 98.5, (b) 97.0, ash (a) 0.6, (b) 0.7, org. (a) 0.6, (b) 1.4. F. W. ZERBAN

Temperature and analytical changes in sugar liquor during bone black filtration. H. I. KNOWLES. *Ind. Eng. Chem.* 17, 1151-3(1925). A char filter was equipped with 9 sampling pipes and 4 of them had thermometers, as shown in a diagram. Filtration tests were made, mostly with 2nd liquor, through char of known mesh distribution, the temp., color, and compn. of the effluent being detd. The temp. changes at the side and in the center of the filter during an entire cycle are shown in a graph. After contact of char and liquor there was noted no additional removal of color. At the side of the filter the decolorization and removal of non-sugars are poor, on account of the low temp. At the center there is actually production of color, because the temp. rises too high; but removal of non-sugars there is also slight. Various explanations are offered for this. Analyses of the different portions of the effluent show that at least $\frac{1}{3}$ is delivered at the side. Two independent tests showed that the mesh size of the char is largely responsible for differences in efficiency. Besides the factors named, time and p_H are also important, especially with sugars that are poorly buffered. Washed sugar liquor should issue from the filter with a p_H of not less than 6.8, while with 2nd liquor even 6.5 appears safe. F. W. ZERBAN

Physical examination of sugar juices. K. R. LINDFORS. *Ind. Eng. Chem.* 17, 1155-6(1925).—Analyses of sugar factory products by the usual methods do not furnish reliable information on the efficiency of filtration and other factory processes. I. has devised several phys. methods which serve this purpose and are easily carried out. Surface tension, which is roughly inversely proportional to % of gums, is measured by Du Noüy's app. (*C. A.* 18, 2822). The viscosity of green sirup, 2nd fillmass and molasses is detd. by means of a jacketed 100 cc. pipet, at 20° or corrected to 20°, pure sucrose soln. of varying concn. being used as standard. "Viscosity Brix" of a product is defined as the Brix which a pure sugar soln. showing the same viscosity would have. "Viscosity purity" is based on "viscosity Brix." An increase in the viscosity purity denotes a removal of gums, and *vice versa*. "Visible" turbidity, that observable in diffuse light, is detd. by comparison in a Jackson turbidimeter with a standard prepd. by dispersing bentonite (*C. A.* 19, 628) in water with gum arabic. "Colloidal" turbidity is estd. in a Horne turbidiscopes (*C. A.* 18, 1927) by comparison with a more dil. bentonite prepn. colored with caramel. A slit of variable thickness in the turbidiscopes permits more accurate comparisons to be made. An example of the application of

these methods is shown. They may also be used in deciding the point at which Steffen molasses should be discarded. The methods are described in detail, and discussion is invited.

F. W. ZERBAN

Reheating of sirup. PHILIPPE CANTIN. *Rev. agr. Maurice* 2, 524-6 (1925).—Heating the sirup to 80° after the addition of acid phosphate, as advocated by Béranger (*C. A.* 19, 1960), has not given good results. It was found necessary to keep within 65-70° to avoid excessive inversion. Even at the lower temp. some inversion takes place, but the advantages of the method outweigh the disadvantages from the com. standpoint. Better sugar is produced; it washes up better in the centrifugals; and there is less remelt sugar.

F. W. ZERBAN

The Lafeuille crystallizer. H. SORNAY. *Rev. agr. Maurice* 2, 520-4 (1925).—This app. is described as a "tubular, rotary crystallizer," without further details. It is claimed that it reduces the time of crystn. of high purity massecuites to 3 hrs., and of low purity massecuite to 24 hrs. instead of 8 days or more as at present. In spite of this, uniform grain, without false grain, is obtained. Yield and quality of sugar are better, less after-product has to be worked up, and 1 crystallizer will replace 3 of the older type of the same size. It can be worked under vacuum. A chart shows comparative exptl. data on Brix, temp and purity for the new and old type, for a refinery. Similar results are predicted for the raw sugar factory.

F. W. ZERBAN

Mill equipment in the year 1924 (Java). G. E. FERGUSON. *Arch. Suikerind.* 33; *Mededel. Proefstation Java Suikerind.* No. 10, 311-74 (1925).—A series of tables showing, for each single mill, maker, dimensions, use of hydraulics, gear ratio and data on driving engine; it is preceded by a summary and discussion.

F. W. ZERBAN

Preliminary operations before centrifuging and the centrifuging operation itself. ALFRED SALOMON. *Centr. Zuckerind.* 33, 1309-12 (1925).—A very general qual. discussion.

W. L. BADGER

Messchaert grooves. L. BAISSAC. *Rev. agr. Maurice* 2, 526-8 (1925).—Detailed dimensions of Messchaert grooves are given for 2 tandems in Hawaii, and recommendations are made for the construction and installation of efficient scrapers.

F. W. ZERBAN

Purification of caramel. A PRINS. *Arch. Suikerind.* 33, 910 (1925).—The fine black ppt. which forms in the com. prepn. of caramel cannot be filtered off through a centrifugal screen, but is retained completely by a layer of sugar which has just been purged in a centrifugal. The small amt. of sugar dissolved by the caramel causes no trouble in its subsequent drying.

F. W. ZERBAN

Brix determination in molasses. I. JOHANSEN. *Arch. Suikerind.* 33, 1008-10 (1925).—The present method (in Java) of detg. Brix of molasses, after dilg. 1:10, either by spindle or pycnometer, is not satisfactory. The ordinary Westphal balance is not accurate enough. A more exact balance, based on the same principle, may be constructed from an ordinary sugar balance. One arm is removed entirely and replaced by a plummet made from an old elec. light bulb. The fitting of the bulb is removed, the wires are bent into a loop, and the hole in the neck of the lamp is filled with sealing wax. Then the point of the lamp is broken off carefully under Hg. about 550 g. of Hg is permitted to run into the bulb, and then the opening is sealed again in the flame. The vol. of the plummet at the standard temp. is detd. from its wt. in air and in H₂O. The sp. gr. of the molasses soln. is calcd. from $(l-m)/k$, where l is the wt. of the plummet in air, m its wt. in the molasses soln., and k its vol. A table may be constructed giving directly the Brix corresponding to a given wt. of the plummet in molasses soln. The app. is illustrated.

F. W. ZERBAN

Cooling of the massecuites and its effect on the boiling scheme and on the exhaustion of the molasses. G. E. VAN NES. *Arch. Suikerind.* 33; *Mededel. Proefstation Java Suikerind.* No. 8, 305-24 (1925).—In the boiling method at present practiced in Java the A-massecuite gives a sugar yield of about 60%, but the B-massecuite only 14%, and the C-massecuite 41%. This low recovery in the last 2 is undoubtedly due to the increased viscosity of the massecuites by prolonged heating. It is proposed to cool the massecuites, except that yielding molasses sugar, to 40° before purging. It is calcd. that by this method the no. of massecuites could be reduced from 4 to 3, the purity of the run-off from A massecuite being reduced to about 59, of the run-off from B-massecuite to 41.5, and the purity of the molasses to 25.1. It will, of course, be necessary to dil. the massecuites before purging, and this can be done in practice by the hot purging of 1 out of every 3 strikes, the resulting run-off being used for dilg. the other 2. By this scheme the capacity would be increased 12% and the com. sugar yield 1.18% on the dry substance. However, more molasses sugar would also be produced, and to overcome this difficulty it is proposed to boil one A-strike as usual, purging at 65°, then boil a 2nd strike, drop about 20% of its draw in run-off from the 1st strike,

and then proceed as indicated before. A molasses purity of only 23, and an increased com. sugar yield of 1.73% may be expected by this method of boiling. All the calcs. are given in detail, and the boiling scheme is shown in a graph. The proposed method has not been tried yet.

F. W. ZERBAN

Equipment for weighing and dumping cane in Java sugar factories. G. E. FERGUSON. *Arch. Suikerind.* 33; *Mededeel. Proefstation Java-Suikerind.* No. 9, 325-39 (1925).—A summary, in form of tables, for 174 factories, with brief discussion.

F. W. ZERBAN

Occurrence of sereh disease in mill and plant cane (Java), in 1925. J. KUYPER. *Arch. Suikerind.* 33; *Mededeel. Proefstation Java-Suikerind.* No. 11, 375-90 (1925).

F. W. ZERBAN

Observations on the Sachs-Le Docte method, used in titer contracts for determining the sugar content of beets. E. PARISI. *Star. sper. agrar. ital.* 57, 336-42 (1924).—Low results are obtained if, instead of the prescribed 4% soln. of basic lead acetate in ordinary water, a soln. of acetate to which powdered Ba(OH)₂ has been added is used.

ALBERT R. MERZ

Recovering diatomaceous earth after use for clarifying sugar solutions (U. S. pat. 1,561,042) 18.

Separating sugar from molasses. C. G. LEONIS. U. S. 1,558,551, Oct. 27. Molasses, *c. g.*, the discard molasses from the Steffen process, is dried on a belt conveyor or otherwise pulverized and treated with 1¹/₂ to 2 times its wt. of 99¹/₂% HOAc for 2-4 (usually about 6) hrs. at a temp. of 15-30° to effect a "precipitation" of the sugar. Mother liquor surrounding the sugar crystals is removed by washing with a solvent such as alc., toluene or C₆H₆, in which the sugar is insol.

Dextrose from starch. A. W. H. LENDERS and J. M. WIDMER. U. S. 1,556,854, Oct. 13. The content of insol. protein in starch is reduced until it is not substantially in excess of 0.35% (based on dry wts.) and substantially all the sol. protein is removed. The starch is then converted by acid hydrolysis to the glucose state, the liquor is neutralized in the presence of H₂PO₄ and filtered, treated with tannic acid to coagulate solubilized albuminoids, subjected to an adsorption filtration, *c. g.* with C or bone char, converted to a dextrose content of more than 90%, neutralized and treated to effect the solidification and crystn. of the entire body of converted liquor.

Dextrose hydrate. W. B. NEWKIRK. U. S. 1,559,176, Oct. 27. A dextrose hydrate which is not detrimentally affected by ordinary exposure to atm. moisture is prepd. by partially dehydrating a dextrose hydrate contg. the normal proportion of H₂O of crystn., *e. g.*, by exposure to currents of heated air in revolving drums until the H₂O content is reduced from about 10% to about 6%.

Continuous thickening and filtration of limed and carbonated sugar juices or similar materials. A. L. GENTER. U. S. 1,560,796, Nov. 10. Mech. features.

29—LEATHER AND GLUE

ALLEN ROGERS

Report of work in progress at the Darmstadt Institute for Leather Chemistry. E. STIASNY. *Gerber* 51, 165-7, 173-6 (1925).—A study of antiseptics for use in soaking has shown that ZnCl₂ is very effective, and has no bad effect on the leather. Attempts to carry out *unhairing* by means of *pepsin* were fruitless; pepsin attacks collagen more readily than the malpighian layer. The action of *trypsin* on collagen, promoted by neutral salts, probably plays a part in *bating*. By the action of *pepsin* on collagen a high-grade gelatin can be produced. *Chrome tanning* experiments have shown that the sign of the charge on the Cr-complex is immaterial. Negatively charged *sulfite-chrome* and *oxalo-chrome* complexes are fixed slowly but firmly by collagen, and the resulting leather has many desirable properties. By adding increasing amounts of sulfite to Cr(OHSO₄) soln., the pptn. value is first decreased, then increased, and becomes infinite when 1.5 mols. sulfite are added to 1 mol. Cr(OHSO₄). At very high sulfite concns. tanning is inhibited, but strong tanning action is manifested even when pptn. of Cr cannot be brought about by any amt. of alkali. Under suitable conditions very large amts. of Cr (15-18%) can be fixed, producing a very firm leather, without damage to the grain. A study of the relation between size of particles in vegetable tan liquor (as detd. by salting out expts.) and tanning power has shown that as the degree of association decreases the tanning power increases, to a certain point, after which it decreases with further decrease in molecular complexity. The material salted out of

tan liquors is not comparable with that deposited from lyophobic sols since no permanent sepn. into particles of definite size limits can be effected, the pptd. larger particles giving particles of all sizes on redispersion. A method for analyzing *sulfonated oils* based on a sepn. into 2 fractions—(1) sulfonated oil, sol. in EtOH (80%), insol. in gasoline, and (2) unsulfonated oil, insol. in EtOH (80%), sol. in gasoline, has been worked out and applied to the study of the sulfonation of different oils. The optimum conditions for emulsification, with sulfonated oils as emulsifying agents, are found at $p_H = 7.7$. Pure *polypeptides* react with acids only through their amino groups; with alkalies only through their carboxyl groups at $p_H < 10.5$, but at higher p_H values the peptide linkage also reacts with alkali.

H. B. MERRILL

Determination of moisture in leather. F. P. VEITCH, *et al.* *J. Am. Leather Chem. Assoc.* 20, 504-5(1925); cf. C. A. 19, 2573. —Discussion J. A. WILSON

Some suggested tests on shoe upper leather. ALLEN ROGERS. *J. Am. Leather Chem. Assoc.* 20, 495-7(1925).—The tests suggested for chrome upper leather are the stitch tear, tensile strength and boiling test. J. A. WILSON

Analysis and specifications for miscellaneous materials. C. R. OBERFELL, *et al.* *J. Am. Leather Chem. Assoc.* 20, 503-4(1925), cf. C. A. 19, 1962. —Discussion J. A. WILSON

Hide and leather imperfection caused by follicular mange. R. W. FREY, *et al.* *J. Am. Leather Chem. Assoc.* 20, 507-9(1925); cf. C. A. 19, 2884. —Discussion J. A. WILSON

Destructive and preservative effect of neutral salts upon hide substance. A. W. THOMAS AND S. B. FOSTER. *Ind. Eng. Chem.* 17, 1162-4(1925).—Neutral sulfates retard hydrolysis of hide substance while alkali halides accelerate it. Thus Cauber's salt is a far better preservative for hides than common salt, which is being used almost universally. J. A. WILSON

Action of ultra-violet light on hide protein. A. W. THOMAS AND S. B. FOSTER. *J. Am. Leather Chem. Assoc.* 20, 490-4(1925).—When subjected to ultra violet rays for several weeks, hide powder assumed a canary yellow color and about 28% of it was rendered sol. in water, giving a yellow soln. The irradiated collagen showed a much smaller capacity to combine with hemlock tannin than ordinary collagen, but no difference was found in capacity to combine with quinone, indicating a difference in nature of vegetable tanning and quinone tanning. J. A. WILSON

Veiny hides. A. J. MAY, *et al.* *J. Am. Leather Chem. Assoc.* 20, 509-14(1925). —Discussion of causes and possible cures. J. A. WILSON

The campaign against anthrax in hides and animal skins in Great Britain. SIR GEORGE BUCHANAN. *Bul. mens. office internat. d'hyg. publ.* 17, 972-5(1925).—Public disinfection plants operating by approved processes have been valuable. J. J. H., JR.

New tanning materials and tannery sundries. LEOPOLD POLLAK. *Gerber* 51, 176-4(1925); cf. C. A. 19, 2884.—Description of the following proprietary substances: nicol, chromalin and purgatoil. H. B. MERRILL

Analysis of raw tanning materials. J. S. ROGERS, *et al.* *J. Am. Leather Chem. Assoc.* 20, 501-3(1925). —Discussion J. A. WILSON

Distribution of tannin in the American chestnut tree with particular reference to stumps and roots. R. W. FREY, *et al.* *J. Am. Leather Chem. Assoc.* 20, 514-6(1925), cf. C. A. 19, 3613. —Discussion. J. A. WILSON

Direct measurement of plumping power of tan liquors. R. E. PORTER, *et al.* *J. Am. Leather Chem. Assoc.* 20, 498-501(1925), cf. C. A. 19, 2279. —Discussion J. A. WILSON

A straight-line function in the tan wheel. R. M. COBB, *et al.* *J. Am. Leather Chem. Assoc.* 20, 505-7(1925); cf. C. A. 19, 2572. —Discussion. J. A. WILSON

Utilization in the chemical industry of raw materials from sharks (TANDLER) 13.

Tanning. J. R. BLOCKEY. U. S. 1,557,011, Oct. 13. The degree of swelling of pH is regulated by a preliminary treatment with a soln. such as a dil H_2SO_4 soln., the acidity of which is maintained substantially the same as that of the tanning liquor by the addn. of a neutral salt, e. g., NaCl. Cf. C. A. 19, 3614

Decreasing hides and skins by use of volatile solvents. A. J. HANGLIN. U. S. 1,556,598, Oct. 13. The material is heated in a closed drum with a solvent such as naphtha to develop pressure at a temp. sufficiently low as not to injure the hides or skins, and, after agitation, while under pressure, the soln. or emulsion of solvent, grease and H_2O formed is withdrawn.

Tanning. H. YOUNG. U. S. 1,551,000, Aug. 25. Hides are subjected to a tanning

mixt. composed of terra japonica $1\frac{1}{2}$ and pulverized alum $\frac{1}{2}$ lb. and H_2O for several days, the hides being removed for airing at intervals.

Tanning composition. C. IMMERHEISER and H. WOLFF. U. S. 1,557,844, Oct. 20. By the treatment of crude $C_{14}H_{10}$ or "anthracene waste" with H_2SO_4 and adding Cl, NaOCl or oxalic acid a sulfonated crude anthracene is obtained which slowly produces a pure brown coloration on hides suspended in its dil. acid soln. Formaldehyde also may be added.

Tanning composition. G. W. LANGLEY and A. A. HOWELL. U. S. 1,557,174, Oct. 13. A mixt. of ext. of wild cherry bark, ext. of sumac gum, gambier and H_2O .

Tanning substances. O. SPENGLER and A. THURM. U. S. 1,550,589, Aug. 18. Tanning compns. which are dark hygroscopic powders sol in H_2O are produced by heating alicyclic acid sulfochloride or other arylsulfochloride at $160-200^\circ$ with phenol or other hydroxyaryl compds. without addition of condensing agents.

● **Glue globules.** A. OBERSOHN, W. WACHTEL, D. SAKOM and P. ASKENASY. U. S. 1,559,126, Oct. 27. A hot coned glue soln is sprayed under pressure to form drops which are cooled by passing through a cooling gas under pressure. Cf. C. A. 19, 1744.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Something about the drying and smoking of rubber. R. RIEBL. *Arch. Rubbercultuur* 9, 794-812(1925).—An address. F. H. YORSTON

Viscosity of rubber solutions. C. L. ABERNETHY. *India Rubber J.* 70, 775-83 (1925).—Various methods which have been developed for detg. the viscosity of liquids, particularly rubber solns., are described, with an extended discussion of the physics involved in the falling sphere viscometer. By the aid of the latter an exptl. study was made of the viscosity of rubber solns. In these expts. the variation in viscosity of rubber solns. with variation in concn. and with change of temp. at different concns. was detd. for 10-30% solns. and temps. of 10-60°. The results are given in tables and graphs. At a given temp. the abs. viscosity increases with the concn. at a slowly increasing rate up to 15% rubber, after which the viscosity varies directly with the concn. At all concns. the abs. viscosity in PhMe is less than that in C_6H_6 . The decrease in viscosity with increase in temp. is greatest in highly coned solns., the temp. effect becoming less and less with increase in diln. Likewise for a given concn. the change in viscosity for a given change in temp. becomes less and less as the temp. increases. Further work to derive a relation between viscosity and concn., in which the applicability of the logarithmic formula of Arrhenius (cf. *Z. physik. Chem.* 1887, 1, 285) as well as more recent ones was tested, shows that none of these log. formulas is applicable to rubber solns. But by plotting the sq. roots of the concns. against the logs. of the viscosities, straight lines are obtained, the relation $\eta_c = K e^{k\sqrt{c}}$ being derived, where η_c is the viscosity in C. G. S. units of a soln. contg. c g. of rubber in 100 cc. of soln., K and k are consts. and e is the base of the Napierian logs. Calcn. from the graphs shows K to be $e^{-6.102}$ for all temp. and k to be 2.413 at 10° and 2.176 at 60°. Extrapolation in turn shows the viscosity of milled rubber itself to be 22,400,000 and 2,290,000 C. G. S. units at 10° and 60°, resp. This ten-fold decrease in viscosity between 10° and 60° emphasizes the importance of accurate temp. control in any method for detg. the relative viscosity of rubber. Below 1% concn. Arrhenius' equation is valid, perhaps for the reason advanced by Hatschek for 2-phase emulsoid systems in general (cf. C. A. 7, 3873). Application of the method to solns. of raw unmilled rubber at 15.5° showed the following viscosity in C. G. S. units: 2%, 5.04; 3%, 35.63; 4%, 162.8; 5%, 464.4; 6%, 1577. In this case also, the new equation $\eta_c = K e^{k\sqrt{c}}$ was valid. Application of the latter to other published work, e. g., Me_2CO solns. of nitrocellulose (cf. C. A. 14, 3153) shows the validity of the new equation with solns. other than those of rubber. C. C. D.

Plasticity determination in crude rubber. IV. Difference between smoked sheet and pale crepe. O. DE VRIES. *Arch. Rubbercultuur* 9, 813-36(1925); (In English *Ibid* 837-43).—The av. d_{30} and II (cf. C. A. 19, 2281-2) for 13 crepes prepd. on a small mill were 1.395 and 0.070, resp. and for corresponding air-dried sheets 1.595 and 0.083. Accordingly crepe was the more plastic rubber. There was a smaller difference of about 0.1 between the d_{30} of crepes and of sheets prepd. on an estate by R. Riebl. A distinct plasticizing effect was noted on long maceration of the rubber. Great diln. of the latex before coagulation also gave a definite decrease in d_{30} . No marked change in plasticity could be ascribed to rolling into sheets (compared with air-drying of fresh

or matured coagulum without mechanical treatment), to the use of H_2O on the rolls, to soaking freshly rolled sheets in H_2O , to heating the wet rubber or to smoking. These conclusions refer to rubber tested within a month of its prepn. under which conditions there was no important difference between fresh crepe and sheet. An earlier statement that crepe was the harder rubber was based on an examn. of a no. of samples some of which had hardened on keeping. The change in the plasticity of stored rubber is being studied.

F. H. YORSTON

A simple control test for the distribution of sulfide-containing ingredients in rubber goods. ANON. *Gummi-Ztg.* 40, 277(1925).—A preliminary communication. Sulfides decomposable by acids in rubber goods can be detected very easily by the appearance of colored spots when the rubber is treated with an acid and the H_2S acts on AgBr or $HgCl_2$. As a simple technic, a smooth fresh surface of rubber is pressed for 3-5 min. against AgBr paper which has been unattacked by light and which has just been steeped in 30% H_2SO_4 . The paper is then immersed in an acid-fixing bath, washed and dried. A fresh surface of rubber is necessary, since with old rubber oxidation of the original surface obscures the test. The method shows the uniformity and the degree of dispersion of the ingredients. Reproductions of rubber samples contg. lithopone are given.

C. C. DAVIS

Aging tests on rubber coagulated with acetic acid and *p*-nitrophenol. II. P. STEVENS. *Bull. Rubber Growers' Assoc.* 7, 496-8, 565-7(1925); cf. *C. A.* 19, 3616.—In using $p-O_2NC_6H_4OH$ as a mold preventive it is now found best to dissolve an amt. equal to 0.03% of the latex in the HOAc used for coagulation. Samples of sheet prepd. with this soln. cured, in a rubber-S mixt., about 10% faster than did the controls. A specimen which was vulcanized for 3 hrs. and was over-cured deteriorated greatly after 3 days aging at 70°, while the control reached the same stage in 4 days. A specimen cured 2 hrs. was at first somewhat stronger, but after aging for 6 days was somewhat weaker, than the control. Samples vulcanized for 105 and 120 min. reached the state of cure of controls vulcanized for 120 and 135 min., resp., and they deteriorated at practically the same rate as did the controls during aging for 210 hrs. The difference in rate of cure of $p-O_2NC_6H_4OH$ prepd. rubber and ordinary rubber was greater in a mixt. contg. ZnO but no added org. accelerator, probably because of the destruction of part of the fatty acids in ordinary rubber by molds.

F. H. YORSTON

Smoked sheet rubber coagulated with acetic and formic acids containing *p*-nitrophenol. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 7, 612-3(1925); cf. preceding abstr.—Satisfactory vulcanizates were prepd. from samples which had been coagulated with 1% solns. of HOAc and of H_2CO_2 contg. $p-O_2NC_6H_4OH$.

F. H. YORSTON

Report on further experiments on the spotting of crepe rubber. W. BROWN. *Bull. Rubber Growers' Assoc.* 7, 522-32(1925); cf. *C. A.* 19, 2144.—Since fungi invade dry rubber only slowly, their behavior was more conveniently studied on strips which had absorbed about 25% H_2O by soaking at 47°. A *Penicillium* which had been isolated from crepe produced spotting on this rubber without the addn. of any nutrient. Very rapid spotting took place when the rubber was inoculated with a *Fusarium* in the presence of traces of NH_4 salts. The last of many washings from a piece of crepe contained enough nutrient to stimulate distinctly the germination of spores. Extn. of rubber with cold acetone removed much nutrient, since it reduced spotting to an extent for which the lessened swelling of the rubber in H_2O could not account. Spotting was most rapid at 30° and was very slow at 35°. Neither fungus germinated at 38°, and the spores of the *Fusarium* were killed by exposure to this temp. for 4 days. An increase of 5° in the temp. of the drying sheds should prevent spotting, both by retarding germination and by increasing the rate of drying. A concn. of 0.01% $p-O_2NC_6H_4OH$ in neutral or faintly acid soln. prevented the germination of both fungi.

F. H. YORSTON

Determination of balata in balata-rubber mixtures. J. T. CHARLSON. *India Rubber World* 72, 470(1925).—Correction (cf. *C. A.* 19, 1967). For "cool to 12°," read "cool to -12°."

C. C. DAVIS

Vulcanization. III. The cure. G. BERNSTEIN. *Rev. gén. caoutchouc* 1925, No. 15, 13-4; cf. *C. A.* 19, 3387.—A brief general description of the physics and chemistry of the vulcanizing process.

C. C. DAVIS

Latex. Insecticide preparation for combating plant parasites (DITMAR) 15. Manufacture of balloon fabrics (Dambroise) 25. Recovery of volatile solvents (LUTINGER) 13. Cement containing resin and rubber (U. S. pat. 1,561,095) 18.

Rubber composition. G. W. ACHESON. U. S. 1,560,132, Nov. 3. A solid inorg. substance such as china clay is deflocculated and the dry deflocculated material is

mixed with a rubber soln. and pptn. of the rubber is then effected by use of acetone or equiv. organic liquid. The rubber mixt. thus formed, after sepn. from associated liquid, is adapted for working or further blending, etc.

Rubber composition. L. R. KLUG. U. S. 1,550,968, Aug. 25. A compn. adapted for making mats, jars, etc., is prepd. by mixing scrap and reclaimed rubber with S, and adding "uncured friction."

"Compounding" rubber. C. C. LOOMIS and H. E. STUMP. U. S. 1,558,688, Oct. 27. Particles or ingredients such as clay, S, ZnO or lampblack which are subsequently to be mixed with rubber are preliminarily given a thin coating of rubber, *e. g.*, by treatment with ammoniacal latex and then with $Al_2(SO_4)_3$.

Ornamenting rubber surfaces with overlying rubber compositions of contrasting appearance. C. D. HOPKES. U. S. 1,560,472, Nov. 3. Different fluid rubber compns. are successfully applied and vulcanized together.

Variegated rubber. F. T. ROBERTS. U. S. 1,560,862, Nov. 10. Mech. features of uniting differently colored layers of rubber, exhausting the air from the united layers and then slicing to produce sheets with colored striations.

Treating rubber with carbon and absorbed gases. E. B. SPEAR. U. S. 1,560,488, Nov. 3. Rubber is mixed with a portion of unactivated C at least partially satd. with diethylamine or NH_3 and another portion of unactivated C containing CS_2 or CO_2 which will react to form a vulcanization accelerator.

Treating reclaimed rubber. H. HUNTER. U. S. 1,558,546, Oct. 27. A mass of small pieces of reclaimed rubber is exposed to the air, agitated and repeatedly dropped through the air to sep. them and expose them fully to the action of the air, while maintaining the relative humidity of the air between 15 and 75% and the temp. above 43°. This treatment serves to remove moisture from the rubber.

Retarding oxidation of rubber. S. M. CADWELL. U. S. 1,556,415, Oct. 6. Vulcanized rubber is treated with a reaction product of acetaldehyde and aniline or other material unable to activate O but adapted to absorb activated O. Numerous examples are given. Cf. C. A. 19, 750.

Treating latex. M. C. TRAGUE. U. S. 1,550,466, Aug. 18. Latex is thickened and stabilized by adding Na silicate or other easily decomposable colloidal silicate and an alkali, *e. g.*, NH_4OH .

Dyeing rubber. D. J. MEYERINGH and P. C. WIJNAND. U. S. 1,559,343, Oct. 27. Raw rubber in sheet form is treated with a soln. of coloring matter in a solvent such as C_6H_6 or CS_2 which is capable of penetrating throughout the rubber treated. The raw rubber is treated with S and vulcanized by the action of actinic rays.

Vulcanizing rubber. T. W. MILLER. U. S. 1,551,012, Aug. 25. Rubber contg. a metal oxide such as ZnO is subjected to the action of a soln. such as naphtha contg. CS_2 and a "class A" accelerator. S and an accelerator of "class B" are added as required.

Vulcanizing rubber. T. WHITTLESBY and C. E. BRADLEY. U. S. 1,559,393, Oct. 27. A substantially halide-free reaction product of a S halide and an amine, *e. g.*, the reaction product of aniline and S chloride, is used for vulcanizing.

Vulcanizing rubber. H. A. WINKELMANN and H. L. TRUMBULL. U. S. 1,559,925, Nov. 3. Rubber is mixed with ZnO and S or other vulcanizing agent and with an aldehyde-thiourea condensation product as an accelerator.

Vulcanizing rubber. C. M. CARSON. U. S. 1,560,465, Nov. 3. NH_3 and CH_2O , H_2S , CO_2 or other vulcanization accelerator components are introduced into rubber in a plurality of sep. portions by means of a carrying agent such as activated C to secure accurate control of vulcanization.

Vulcanizing rubber. S. B. MOLONY. U. S. 1,558,707, Oct. 27. Thiuram disulfide is used as an accelerator.

Vulcanizing rubber. G. H. STEVENS. U. S. 1,559,196, Oct. 27. Tetratolytri carbodiimide is used as an accelerator. U. S. 1,559,197 specifies tetraxylitricarbodiimide. U. S. 1,559,198 specifies tetraphenyltricarbodiimide.

Molds for vulcanizing. R. L. SHLEFY. U. S. 1,559,289, Oct. 27. Surfaces of molds are sprayed with a dil. aq. soln. of "Na sulfonate" (from petroleum acid sludge), which serves to prevent sticking of the rubber.

Adding rubber latex to facilitate milling of unvulcanized rubber. E. E. A. G. MEYER. U. S. 1,558,701, Oct. 27.

Composition for sealing punctures in tires. E. J. HOUDRY. U. S. 1,556,834, Oct. 13. A puncture-sealing mixt. is prepd. by boiling bran and soda soln., adding salicylic acid to the cooled material and also adding kieslguhr and asbestos.

Puncture-sealing composition. T. R. LAW. U. S. 1,561,332, Nov. 10. A mixt. for closing punctures in pneumatic tires comprises ground asbestos 16, pulverized slippery elm bark 1 and H_2O about 48 parts.

CHEMICAL ABSTRACTS

Vol. 20.

JANUARY 20, 1926

No. 2

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

The possibility of using chemists in the machinery and apparatus construction industries. FRICH GUNDERMANN. *Chem. App.* 12, 155-6, 191-2(1925).—A discussion of the advantages to be derived from the cooperation of chemists in these industries.

J. H. MOORE

Aluminium as a material in the apparatus-building industry. H. BUSCHLINGER. *Apparatebau* 37, 241-2, 253-4, 273-4, 285-6, 297-8(1925).—Comparative tables of the expansion coeffs. of Al and other metals, of the cond., expansion and phys. properties of Al and Cu and the resistance of Al to org. acids are given.

J. H. MOORE

A simple new apparatus for the determination of helium in mixtures of natural gases and in minerals. WITALIUS CHLOPIN AND A. LUKASUK. *Ber.* 58B, 2392-6 (1925).—About 200 cc. of the gas mixt., measured in a gas buret, are transferred to an evacuated system that includes a coconut charcoal tube cooled in liquid air and a Plücker tube. The unsorbed He, after being tested spectroscopically for impurities, is pumped into and measured in a small-bore gas buret graduated in 1/100 cc. The second transfer is conveniently accomplished by means of a modified McLeod gage. A small-bore gas buret replaces the usual gage capillary and can be shut off from the gage bulb by a stopcock. Manipulation of the Hg level and the stopcock pumps the He into the buret. Detn. of as little as 0.0005 vol. % of He in a 200 cc. gas sample is claimed. The method can also be used to det. He evolved from small samples of minerals.

R. L. DODGE

Apparatus for rectifying current in the investigation or determination of electric transport of colloids. G. REBIÈRE. *Chimie et industrie Special No.*, 390-1(Sept., 1925).—The app. is based on the property of thermionic valves (triple-electrode lamps) the hot filament of which emits electrons which allow current to pass between the filament and plate but only when the latter is at the higher potential. A single valve cuts off half the current and gives an intermittent current. By suitably mounting 4 such valves in the arms of a Wheatstone's bridge the current flowing in both directions can be utilized, the liquid investigated being connected across the bridge. With liquids contg. not more than a trace of electrolytes, voltages up to 1000 and more can be used.

A. PAPINEAU-COUTURE

Improved thickener filter for chemical operations. NOEL CUNNINGHAM. *Chem. Met. Eng.* 32, 750-2(1925); cf *C. A.* 19, 2427, 2468.—This app. consists of a thickener with a filter bottom, thus giving increased capacity and crystal clear filtrate.

L. A. P.

Tools of the chemical engineer. V. Filling and labeling small packages. D. H. KILLEFFER. *Ind. Eng. Chem.* 17, 1130-4(1925).—Automatic machinery for filling, closing, labeling and packing bottles, for pill making and for miscellaneous packaging operations, is described.

WM. B. PLUMMER

Precision X-ray spectrometer for chemical investigations. G. L. CLARK, H. C. WEBER AND R. L. HERSHEY. *Ind. Eng. Chem.* 17, 1147-50(1925).—A description of equipment installed in C.'s lab. at the Mass. Inst. of Technology, including details of technic recommended for similar installations.

G. L. CLARK

The Pierre Breuil volumometer. ANON. *Caoutchouc & gutta-percha* 22, 12915-6 (1925).—The app. is designed primarily for detg. the apparent d. of wood, but is applicable to general use, e. g., rubber. It consists of a vertical cylindrical chamber, near the bottom of which is a horizontal tube contg. a piston. The latter penetrates the vertical chamber and can be screwed back and forth. The tube carrying the piston is graduated micrometrically and a sleeve moving with the piston also has a micrometer scale, so that the motion of the piston can be very accurately detd. The vertical chamber can be opened and closed, the cover having a small tube with funnel. The chamber is filled with Hg and the piston micrometer read when the Hg reaches a mark on the funnel tube. The sample, e. g., 20 × 20 × 30 mm, or any irregular shape, is

introduced and the Hg again brought to the mark. The vols. corresponding to the micrometer readings being known, the vol. of the sample is detd. To avoid errors due to absorption of Hg, the sample is weighed, the first reading made with the sample in the app and finally a reading made after removal of the sample. C. C. DAVIS

Portable cutting and polishing machine with flexible cord drive. BERNHARD KLEINSCHMIDT. *Apparatebau* 37, 300-2(1925); 6 cuts. J. H. MOORE

A wash-bottle valve. H. C. STEPHENSON. *Chemistry & Industry* 44, 1112(1925).—A sliding valve in the portion of the mouth piece which passes through the stopper can be controlled by the thumb. E. H.

Steam measurement. M. SCHAAK. *Apparatebau* 37, 231-3, 245-6, 252-3, 276-8, 289(1925).—Descriptions with 13 cuts, of meters, gages and recorders, with mathematical discussion. J. H. MOORE

Flow meters in the accounting of process steam. CHAPLIN TYLER. *Chem. Met. Eng.* 32, 755-6(1925).—Steam flow meters in a soap plant pointed the way to substantial savings in steam costs. Tables are given showing cost and distribution of steam before and after installing steam meters. L. A. PRIDGEON

Optical pyrometer. F. E. BASH. U. S. 1,561,583, Nov. 17.

Thermometers. A. T. HESPE. U. S. 1,561,925-6, Nov. 17.

Metallic weighting and weight-adjusting band for attachment to the necks of testing bottles, flasks, etc. P. KIER. U. S. 1,561,984, Nov. 17.

Annular kiln for drying and carbonizing coal, ores, etc. O. DOBBELSTEIN and H. HESS. U. S. 1,556,571, Oct. 6.

Apparatus for drying wet coal or other materials by the action of hot gases. D. V. SHERBAN. U. S. 1,558,119, Oct. 20.

Rotary kiln for calcining, clinkering, etc. E. G. STONE. U. S. 1,550,591, Aug. 18.

Nonaerating apparatus for centrifugal purification of oil or other liquids. S. H. HALL. U. S. 1,561,784, Nov. 17.

Apparatus for "fatigue" tests of materials. A. AMSLER. Brit. 232,817, May 17, 1924.

Impact apparatus for fatigue tests of materials. A. AMSLER. Brit. 232,905, April 23, 1924.

Apparatus for concentrating saline solutions or other liquids. F. L. ANTISELL. U. S. 1,561,898, Nov. 17. Heat-conducting elements, which may be formed of ferro-Si, extend from a combustion chamber, through a partition, into an evap. chamber beneath the combustion chamber where they dip into the liquid to be evapd.

Apparatus for extracting oils, gelatin, etc., from animal or vegetable materials by grinding, steaming, etc. K. HOLTER and S. THUNE. Brit. 232,601, April 16, 1924.

Apparatus for drying "ceramic and chemical products." P. KIESS. Brit. 232,851, Sept. 11, 1924.

Grid for supporting purifying material in gas purifiers. J. A. SPENCER. Brit. 232,791, May 16, 1924. Structural features.

Evaporating apparatus for evaporating liquids in film form in tubes. GRISCOM-RUSSELL Co. and L. E. SEBALD. Brit. 232,925, April 25, 1924.

Electron-discharge device. J. R. WILSON. U. S. 1,562,403, Nov. 17. A cathode is supported by a Mo hook passing through a resilient helix of Monel metal. The hook carries a Ni sheave welded to the hook and to the helix.

Cathode for electric discharge tubes. H. SIMON. Can. 254,172, Sept. 20, 1925. A cathode contains an alk. earth metal and one or more of the rare metals.

Thermoelectric couple. R. P. BROWN. U. S. 1,561,593, Nov. 17. In a device comprising a primary couple and 2 extension elements, one of the extension elements is formed of an alloy contg. Cu 54, Ni 45 and Mn 0.25-1 part. This extension is attached to a primary element of Ni-Al alloy and the other extension (of pure Cu) is attached to a primary element of Ni-Cr alloy.

Retort furnace with rotary cylinders adapted for destructive distillations. O. D. LUCAS. U. S. 1,561,735, Nov. 17.

Tilting furnace for the fusion of basalt, etc. P. DIER. U. S. 1,558,250, Oct. 20.

X-ray apparatus. W. D. COOLIDGE. U. S. 1,550,506-7, Aug. 18.

Ultra-violet ray apparatus. R. G. PADDOCK. U. S. 1,559,770, Nov. 3. The app. is especially adapted for therapeutic purposes.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

The appeal of science to the community. ALEX. FINDLAY. *Science* **62**, 357-63 (1925).—An address. E. J. C.

Organization of chemists in the United States. CHAS. E. MUNROE. *Science* **62**, 313-7 (1925). E. J. C.

Chandler: the teacher and the chemist. M. I. PUPIN. *Science* **62**, 499-501 (1925). **Chandler and the Columbia School of Mines.** GEO. B. PIGRAM. *Ibid* 501-3. E. J. C.

Edward DeMille Campbell. A. H. WHITE. *Ind. Eng. Chem.* **17**, 1203 (1925).—An obituary, with portrait. E. J. C.

The pigments of the ancient Romans as described in the natural history of the elder Pliny. K. C. BAILEY. *Chemistry & Industry* **44**, 1135-7 (1925). E. H.

Dimensional system of notation. V. PETROVSKY. *Gen. Elec. Rev.* **28**, 757-61 (1925).—Mathematical difficulties may be eliminated by the use of a dimensional system of notation in which the phys. quantities are treated entirely algebraically. Empirical formulas presented in the numerical system must be accompanied by a list of "units" involved. By an algebraical transformation any empirical formula can be converted to a dimensional form requiring no additional explanations and independent of any system of units. Applications are illustrated in such cases as magnetic field intensity, power loss, sp. wt., and sp. vol. W. H. BOYNTON

The discovery of aluminium. KARL GOLDSCHMIDT. *Chimie et industrie* **14**, 368-70 (1925).—Controversial with Matignon and Faurholt (*C. A.* **19**, 1212). G. considers Al was discovered by Wöhler, not by Oersted. Also in *Z. angew. Chem.* **38**, 1057-8 (1925). C. MATIGNON. *Ibid* 370. —Reply to Goldschmidt. A. P. C.

Two new elements of the manganese group. I. Chemistry. W. NODDACK AND I. TACKE. *Sitzb. Preuss. Akad. Wissenschaften* **1925**, 400 5. II. **Röntgen spectroscopy.** O. BERG AND I. TACKE. *Ibid* 405-9. —The properties of elements 43 and 75 are computed from those of neighboring elements; their presence in Pt ores and columbite is indicated by chem. tests, and confirmed by the measurements of the $K\alpha_1$, $K\alpha_2$ and $K\beta_1$ lines in the X-ray emission spectra of element 43, and of the $L\alpha_1$, $L\alpha_2$, $L\beta_1$ and $L\beta_2$ lines of element 75. They are given the names and symbols: 43 masurium, Ma; 75 rhenium, Re. GEORGE CALINGAERT

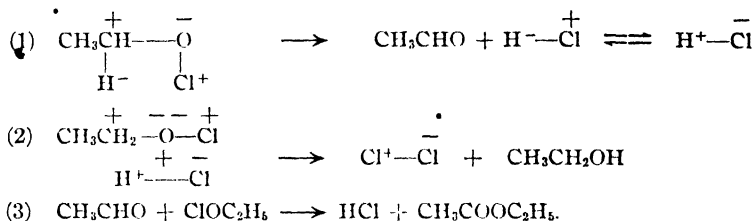
Two new elements, masurium and rhenium. R. SWINNE. *Z. tech. Physik* **6**, 464 5 (1925); cf. *Nature*, **115**, 954. —A short history of events leading up to the discovery of masurium (Ma) [43] and rhenium (Re) [75]. J. H. P.

Cryoscopic molecular weight determinations with liquid ammonia. I. SCHMIDT AND B. BECKER. *Ber* **58B**, 1968-71 (1925). —Measurements of the depression of the f. p. of anhyd. NH_3 by soln. of poly-saccharides will be useful in detg. the degree of polymerization or association in the polysaccharide mol. Before such information can be obtained it is necessary to det. the f. p. const. of anhyd. NH_3 . This const. was measured, with mannitol and acetanilide as solutes. The concn. range investigated was for mannitol 0.1266-0.2785 g. per 17.1 g. NH_3 , and for acetanilide 0.0438-0.2328 g. per 17.1 g. NH_3 . The app. employed was essentially a Beckmann app. with Pt resistance thermometer. The mean observed f. p. const. was 13.18. The mol. wt. of *inulin*, as detd. from cryoscopic measurements in anhyd. NH_3 over the concn. range 0.0333-0.2602 g. per 17.1 g. NH_3 , corresponded to the formula $\text{C}_{12}\text{H}_{20}\text{O}_{10}$. R. L. DODGE

A study of the physical properties of nitromethane. J. W. WILLIAMS. *J. Am. Chem. Soc.* **47**, 2644-52 (1925); cf. *C. A.* **18**, 1605, 2637. —In order to investigate the tautomeric equil. in nitromethane the following properties, in samples subjected to various drying treatments, were studied: (1) Sp. heat, (2) vapor pressure, (3) density and (4) absorption spectra. The variation of these properties with temp. was investigated at small intervals from 15° to 65° and in the sp. heat-temp. curves marked irregularities were noticed which were influenced in part by the previous drying treatments. This was taken as evidence of the presence of more than 1 species of mol. Empirical equations for the effect of temp. on the above properties are given. CH_3NO_2 contg. traces of H_2O gives a gel with P_2O_5 . The probability of an abnormal b. p. as a result of intensive drying is indicated. R. E. GIBSON

Hypochlorous esters and the question of the polarity of valences. J. F. DURAND AND R. NAVES. *Bull. soc. chim.* **37**, 1147-55 (1925); cf. *C. A.* **19**, 2807. — EtOCl decomposes spontaneously to give AcH , AcOEt , EtOH and free Cl_2 . The authors explain these reactions by applying the theory of the polarities of the atoms or groups in a

compd (cf. W. A. Noyes, *C. A.* **18**, 3497). They emphasize that such polar characteristics are purely relative and show that Cl_2 must be regarded as functioning as a positive atom in hypochlorous salts and esters. The polar formula, $\text{Et}-\overset{+}{\text{O}}-\overset{-}{\text{Cl}}$, is given to EtOCl and supported by its reactions with halogens and halogen acids. EtOCl is to be regarded as an ethylate of Cl rather than an ester of HOCl . The auto-compn. is formulated as follows:



R. E. GIBSON

Homopolarity of halides of the fourth group as indicated by the additive character of their melting points. A. HANTZSCH AND H. CARLSOHN. *Ber.* **58B**, 1741-6(1925).—Halides of the 4th group are characterized as homopolar because their m. and b. ps. are only slightly affected by association. For such cases the well-known rule holds abs. m. p./abs. b. p. = 0.62 (approx.). That this rule applies to the alkali metal halides was shown by R. Lorenz and W. Herz (cf. *C. A.* **15**, 3237). Tables showing the m. ps. and b. ps. of the halides of Si, Ge, Sn, Ti and Pb indicate that the rule applies to them. The const. varies regularly from 0.58 to 0.63 for the alkali halides, decreasing from Cl to I. For the 4th-group halides the const. increases regularly from 0.62 to 0.70. The m. ps. of the 4th-group halides can be calculated fairly accurately from the empirical formula: $(M_{m.p.} + nX_{m.p.})/(n + 1) = m.p. \text{ of the halide}$. $M_{m.p.}$ designates the m. p. of an element having a valence n and $X_{m.p.}$ designates the m. p. of the corresponding halogen. This leads to the conclusion that, on uniting with the halogens, the atoms are changed only slightly. This is a contradiction to Fajans' theory of deformation (K. Fajans and G. Joos, *C. A.* **18**, 2103), according to which these compds. should be built up with heteropolarity from highly deformed ions.

R. A. BAKER

Pseudo- and nonelectrolytes; their similarity to the noble gases as a basis for the calculation of their melting and boiling points. HEINRICH CARLSOHN. *Ber.* **58**, 1747-52(1925), cf. Paneth and Rabinowitsch, *C. A.* **19**, 2460.—A no. of curves are shown in which the m. p. and b. p. of A, Kr and Xe are plotted against the corresponding properties of inorg. halides and hydrides and aliphatic and aromatic halides, resp. On the basis of the relationships shown by these curves between the properties of noble gases and nonelectrolytes, C. proposes two laws: (1) The m. p. of non-associated pseudo- and nonelectrolytes are directly proportional to the m. ps. of their corresponding noble gases. (2) The b. ps. of nonassociated pseudo- and nonelectrolytes are directly proportional to the b. ps. of their corresponding noble gases. C. concludes that nonelectrolytes and pseudoelectrolytes like HCl do not consist of several ions; rather the whole mol. represents one structure which is similar to that of the noble gases. In nonelectrolytes the positive ion and not the valence electrons takes up the free electron spaces of the negative atoms. For example, the Sn of SnCl_4 does not give up 4 electrons to 4 Cl atoms, but the 4 electrons are shared by the Sn and Cl. By means of the 2 laws proposed it is possible to det. whether a compd. is homopolar and whether it is associated in the solid or liquid state.

R. A. BAKER

The structure of ammonia. H. MARK AND E. POHLAND. *Z. Krist.* **61**, 532-7(1925).— NH_3 is cubic between -77° and -160° . The unit cube contains 4 mols. and $a = 5.19 \text{ A. U.}$ The N atoms are arranged according to T^4 , with $u = 0.220$.

L. S. RAMSDELL

Structure of carborundum (SiC). H. OTT. *Z. Krist.* **61**, 515-31(1925); cf. *C. A.* **19**, 1212, 3393.—Carborundum (type II) can be considered as having a zinc blende structure twinned along a trigonal axis. The compd. is non-polar.

L. S. R.

Molecules, atoms and ions in crystal structure. W. HERZ. *Arch. Pharm.* **263**, 521-37(1925).—A discussion.

W. O. E.

The lattice structure of ethane and diborane (B_2H_6). H. MARK AND E. POHLAND. *Z. Krist.* **62**, 103-12(1925).—Both compds. crystallize in the hexagonal system with

very similar structures. The unit cell contains 4 mols. For ethane and diborane, resp., the dimensions in A. U. are $a = 4.46, 4.54, c = 8.19, 8.69$, and the vol. in (A. U.)³ occupied by the mols. are 70.6 and 78.0. The distance of nearest approach of atoms is C—C = 1.5—1.6, and B—B = 1.8—1.9 A. U. L. S. RAMSDELL

Structure investigations by the Debye-Scherrer (powder) method. S. V. OLSHAUSEN. *Z. Krist.* **61**, 463-514(1925).—Data are given for KI, RbCl, Al, Nb, Mn, red P, PbSe (clausthalite), HgS (cubic and hexagonal), As, Te, Se, (Ni, Fe) AsS (gersdorffite), and CaCO₃ (calcite, aragonite and vaterite). Vaterite, shown by Rime (*Z. Krist.* **60**, 66(1921)), to be distinct from calcite, is found to be hexagonal. A mathematical method for interpreting the diffraction patterns is described, and tables are given for use with this method. L. S. RAMSDELL

The arrangement of micro-crystals in aluminium wire. TAKEO FUJIWARA. *Mem. Coll. Sci. Kyoto Imp. Univ.* **8A**, 339-52(1925).—(In English.) Pinhole(transmission) photographs with Mo X-rays show that the *micro-crystals in drawn wires of Al and Cu* have trigonal axes approx. parallel to the direction of drawing, with a random orientation in other respects. Detailed examn. in the case of Al wire showed that crystals with trigonal axes inclined at an angle of 7° to the axis of the wire (direction of drawing) predominate. Wires were drawn about 50 times, from an initial diam. of 8 mm. to a final diam. of 1-0.6 mm. R. J. HAVIGHURST

The arrangement of the micro-crystals in rolled platinum plate. I. SHINSUKE TANAKA. *Mem. Coll. Sci. Kyoto Imp. Univ.* **8A**, 319-36(1925).—(In English.) Photographs of the Mo X-ray spectra reflected from the surface of rolled Pt foil and pin-hole (transmission) X-ray photographs show that the micro-crystals are arranged so that a (110) plane is parallel to the surface of rolling. The trigonal axis which is contained in the same (110) plane is perpendicular to the direction of rolling. There is slight deviation of the orientation from this ideal arrangement. Pt foil 0.5 mm. thick was heated almost to melting, then quenched, then rolled to a thickness of 0.03 mm. R. J. HAVIGHURST

The orientations of crystals in electrodeposited metals. R. M. BOZORTH. *Phys. Rev.* **26**, 390-400(1925).—Electrodeposited films of Cu, Zn and Cd were found by X-rays to have crystals oriented at random, but Fe, Ni and Co showed special orientations. The special orientation is thought to be associated with the strain developed during deposition because of H₂ liberated. A graphical method of interpreting X-ray fiber diagrams is given. D. C. BARDWELL

An application of X-ray crystallography to the structure of nickel catalysts. G. I. CLARK, W. C. ASBURY AND R. M. WICK. *J. Am. Chem. Soc.* **47**, 2661-7(1925).—Powder diffraction photographs in a new, inexpensive, but precise spectrograph have been taken of Ni catalysts of widely different hydrogenation and dehydrogenation activities, prepared by reduction with C, alc., AcOEt, H₂ and Na hypophosphite. Except for the last, which appeared colloidal, all give identical lines for Ni, $d_{100} = 3.536$ A. U. Hence the difference in activities is not to be ascribed to a difference in lattice type or dimensions. Precision photodensitometer curves from the films were prepared and used to measure relative intensities and widths of lines. The intensities for all were approx. the same and in fair agreement with the calcd. values for a face-centered lattice. The Ni catalysts do not obey the Debye-Scherrer equation connecting line width with particle size, defined for colloidal dimensions. A rough parallelism is found between decreasing line width and increasing catalytic activity. X-rays give no information concerning the surface of catalysts. Precision measurements on NiO (simple cubic) gave $d_{100} = 4.16$ A. U. Ni₂O₃ gave only the lines of the monoxide, proving it to be NiO.NiO₂. Photographs of the dioxide in its two forms gave no diffraction lines, explaining the nonappearance of these lines on the sesquioxide film. Ni₃O₄ was also amorphous. G. L. CLARK

The influence of the lanthanide contraction on the lattice dimensions of cubic metals of the platinum group. TOM. BARTH AND GULBRAND LUNDE. *Z. physik. chem.* **117**, 478-90(1925); cf. *C. A.* **19**, 2764.—"Lanthanide contraction" is the term applied to the volume contraction of the atoms in the rare earth series Ce-Cu. This contraction opposes the progressive increase of at. vol. in each vertical column of the periodic table, causing the pairs Ag-Au, Pd-Pt, Rh-Ir, and Mo-W to have very nearly equal lattice constns. Precision measurements by the powdered-crystal method of X-ray analysis were made to det. this effect quant. Films were calibrated by means of NaCl lines from salt which was mixed with each metal powder. The lengths of cube sides for Rh, Ir, Pd, Pt, resp. are: 3.795, 3.823, 3.873, 3.903 A. U. R. J. H.

Body-shaped (somatoid) crystal forms. V. KOHLSCHÜTTER AND C. EGG. *Helvetica Chim. Acta* **8**, 457-69(1925).—A review of previous work and a summary of

mixt. composed of terra japonica $1\frac{1}{2}$ and pulverized alum $\frac{1}{2}$ lb. and H_2O for several days, the hides being removed for airing at intervals.

Tanning composition. C. IMMERHEISER and H. WOLFF. U. S. 1,557,844, Oct. 20. By the treatment of crude $C_{14}H_{10}$ or "anthracene waste" with H_2SO_4 and adding Cl , $NaOCl$ or oxalic acid a sulfonated crude anthracene is obtained which slowly produces a pure brown coloration on hides suspended in its dil. acid soln. Formaldehyde also may be added.

Tanning composition. G. W. LANGLEY and A. A. HOWELL. U. S. 1,557,174, Oct. 13. A mixt. of ext. of wild cherry bark, ext. of sumac gum, gambier and H_2O .

Tanning substances. O. SPENGLER and A. THURM. U. S. 1,550,589, Aug. 18. Tanning compns. which are dark hygroscopic powders sol in H_2O are produced by heating alicyclic acid sulfochloride or other arylsulfochloride at $160-200^\circ$ with phenol or other hydroxyaryl compds without addition of condensing agents.

● **Glue globules.** A. OBERSOHN, W. WACHTEL, D. SAKOM and P. ASKENASY. U. S. 1,559,126, Oct. 27. A hot concd. glue soln. is sprayed under pressure to form drops which are cooled by passing through a cooling gas under pressure. Cf. C. A. 19, 1744.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Something about the drying and smoking of rubber. R. RIEBL. *Arch. Rubbercultuur* 9, 794-812(1925).—An address. F. H. YORSTON

Viscosity of rubber solutions. C. I. ABERNETHY. *India Rubber J.* 70, 775-83 (1925).—Various methods which have been developed for detg. the viscosity of liquids, particularly rubber solns., are described, with an extended discussion of the physics involved in the falling-sphere viscometer. By the aid of the latter an exptl. study was made of the viscosity of rubber solns. In these expts. the variation in viscosity of rubber solns. with variation in concn. and with change of temp. at different concns. was detd. for 10-30% solns. and temps. of $10-60^\circ$. The results are given in tables and graphs. At a given temp. the abs. viscosity increases with the concn. at a slowly increasing rate up to 15% rubber, after which the viscosity varies directly with the concn. At all concns. the abs. viscosity in $PhMe$ is less than that in C_6H_6 . The decrease in viscosity with increase in temp. is greatest in highly concd. solns., the temp. effect becoming less and less with increase in diln. Likewise for a given concn. the change in viscosity for a given change in temp. becomes less and less as the temp. increases. Further work to derive a relation between viscosity and concn., in which the applicability of the logarithmic formula of Arrhenius (cf. *Z. physik. Chem.* 1887, I, 285) as well as more recent ones was tested, shows that none of these log. formulas is applicable to rubber solns. But by plotting the sq. roots of the concns. against the logs. of the viscosities, straight lines are obtained, the relation $\eta_c = K e^{k\sqrt{c}}$ being derived, where η_c is the viscosity in C. G. S. units of a soln. contg. c g. of rubber in 100 cc. of soln., K and k are consts. and e is the base of the Napierian logs. Calcn. from the graphs shows K to be $e^{-6.102}$ for all temp. and k to be 2.413 at 10° and 2.176 at 60° . Extrapolation in turn shows the viscosity of milled rubber itself to be 22,400,000 and 2,290,000 C. G. S. units at 10° and 60° , resp. This ten-fold decrease in viscosity between 10° and 60° emphasizes the importance of accurate temp. control in any method for detg. the relative viscosity of rubber. Below 1% concn. Arrhenius' equation is valid, perhaps for the reason advanced by Hatschek for 2-phase emulsoid systems in general (cf. C. A. 7, 3873). Application of the method to solns. of raw unmilled rubber at 15.5° showed the following viscosity in C. G. S. units: 2%, 5.04; 3%, 35.63; 4%, 162.8; 5%, 464.4; 6%, 1577. In this case also, the new equation $\eta_c = K e^{k\sqrt{c}}$ was valid. Application of the latter to other published work, e. g., Me_2CO solns. of nitrocellulose (cf. C. A. 14, 3153) shows the validity of the new equation with solns. other than those of rubber. C. C. D.

Plasticity determination in crude rubber. IV. Difference between smoked sheet and pale crepe. O. DE VRIES. *Arch. Rubbercultuur* 9, 813-36(1925); (In *English Ind* 837-43).—The av. d_{30} and H (cf. C. A. 19, 2281-2) for 13 crepes prepd. on a small mill were 1.395 and 0.070, resp. and for corresponding air-dried sheets 1.595 and 0.083. Accordingly crepe was the more plastic rubber. There was a smaller difference of about 0.1 between the d_{30} of crepes and of sheets prepd. on an estate by R. Riebl. A distinct plasticizing effect was noted on long maceration of the rubber. Great diln. of the latex before coagulation also gave a definite decrease in d_{30} . No marked change in plasticity could be ascribed to rolling into sheets (compared with air-drying of fresh

or matured coagulum without mechanical treatment), to the use of H_2O on the rolls, to soaking freshly rolled sheets in H_2O , to heating the wet rubber or to smoking. These conclusions refer to rubber tested within a month of its prepn. under which conditions there was no important difference between fresh crepe and sheet. An earlier statement that crepe was the harder rubber was based on an examn. of a no. of samples some of which had hardened on keeping. The change in the plasticity of stored rubber is being studied.

F. H. YORSTON

A simple control test for the distribution of sulfide-containing ingredients in rubber goods. ANON. *Gummi-Ztg.* 40, 277(1925).—A preliminary communication. Sulfides decomposable by acids in rubber goods can be detected very easily by the appearance of colored spots when the rubber is treated with an acid and the H_2S acts on $AgBr$ or $HgCl_2$. As a simple technic, a smooth fresh surface of rubber is pressed for 3-5 min. against $AgBr$ paper which has been unattacked by light and which has just been steeped in 30% H_2SO_4 . The paper is then immersed in an acid-fixing bath, washed and dried. A fresh surface of rubber is necessary, since with old rubber oxidation of the original surface obscures the test. The method shows the uniformity and the degree of dispersion of the ingredients. Reproductions of rubber samples contg. lithopone are given.

C. C. DAVIS

Aging tests on rubber coagulated with acetic acid and *p*-nitrophenol. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 7, 496-8, 565-7(1925); cf. *C. A.* 19, 3616.—In using $p-O_2NC_6H_4OH$ as a mold preventive it is now found best to dissolve an amt. equal to 0.03% of the latex in the $HOAc$ used for coagulation. Samples of sheet prepd. with this soln. cured, in a rubber-S mixt., about 10% faster than did the controls. A specimen which was vulcanized for 3 hrs. and was over-cured deteriorated greatly after 3 days aging at 70°, while the control reached the same stage in 4 days. A specimen cured 2 hrs. was at first somewhat stronger, but after aging for 6 days was somewhat weaker, than the control. Samples vulcanized for 105 and 120 min. reached the state of cure of controls vulcanized for 120 and 135 min., resp., and they deteriorated at practically the same rate as did the controls during aging for 210 hrs. The difference in rate of cure of $p-O_2NC_6H_4OH$ -prepd. rubber and ordinary rubber was greater in a mixt. contg. ZnO but no added org. accelerator, probably because of the destruction of part of the fatty acids in ordinary rubber by molds.

F. H. YORSTON

Smoked sheet rubber coagulated with acetic and formic acids containing *p*-nitrophenol. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 7, 612-3(1925); cf. preceding abstr.—Satisfactory vulcanizates were prepd. from samples which had been coagulated with 1% solus. of $HOAc$ and of H_2CO_2 contg. $p-O_2NC_6H_4OH$.

F. H. YORSTON

Report on further experiments on the spotting of crepe rubber. W. BROWN. *Bull. Rubber Growers' Assoc.* 7, 522-32(1925), cf. *C. A.* 19, 2144.—Since fungi invade dry rubber only slowly, their behavior was more conveniently studied on strips which had absorbed about 25% H_2O by soaking at 47°. A *Penicillium* which had been isolated from crepe produced spotting on this rubber without the addn. of any nutrient. Very rapid spotting took place when the rubber was inoculated with a *Fusarium* in the presence of traces of NH_4 salts. The last of many washings from a piece of crepe contained enough nutrient to stimulate distinctly the germination of spores. Extn. of rubber with cold acetone removed much nutrient, since it reduced spotting to an extent for which the lessened swelling of the rubber in H_2O could not account. Spotting was most rapid at 30° and was very slow at 35°. Neither fungus germinated at 38°, and the spores of the *Fusarium* were killed by exposure to this temp. for 4 days. An increase of 5° in the temp. of the drying sheds should prevent spotting, both by retarding germination and by increasing the rate of drying. A concn. of 0.01% $p-O_2NC_6H_4OH$ in neutral or faintly acid soln. prevented the germination of both fungi.

F. H. YORSTON

Determination of balata in balata-rubber mixtures. J. T. CHARLTON. *India Rubber World* 72, 470(1925).—Correction (cf. *C. A.* 19, 1967). For "cool to 12°," read "cool to -12°."

C. C. DAVIS

Vulcanization. III. The cure. G. BERNSTEIN. *Rev. gén. caoutchouc* 1925, No. 15, 13-4; cf. *C. A.* 19, 3387.—A brief general description of the physics and chemistry of the vulcanizing process.

C. C. DAVIS

Latex. Insecticide preparation for combating plant parasites (DITMAR) 15. Manufacture of balloon fabrics (Dambroise) 25. Recovery of volatile solvents (LUTINGER) 13. Cement containing resin and rubber (U. S. pat. 1,561,095) 18.

Rubber composition. G. W. ACHESON. U. S. 1,560,132, Nov. 3. A solid inorg. substance such as china clay is deflocculated and the dry deflocculated material is

mixed with a rubber soln. and pptn. of the rubber is then effected by use of acetone or equiv. organic liquid. The rubber mixt. thus formed, after sepn. from associated liquid, is adapted for working or further blending, etc.

Rubber composition. L. E. KLUG. U. S. 1,550,968, Aug. 25. A compn. adapted for making mats, jars, etc., is prepd. by mixing scrap and reclaimed rubber with S, and adding "uncured friction"

"Compounding" rubber. C. C. LOOMIS and H. E. STUMP. U. S. 1,558,688, Oct. 27.* Particles or ingredients such as clay, S, ZnO or lampblack which are subsequently to be mixed with rubber are preliminarily given a thin coating of rubber, e. g., by treatment with ammoniacal latex and then with $Al_2(SO_4)_3$.

Ornamenting rubber surfaces with overlying rubber compositions of contrasting appearance. C. D. HOPKES. U. S. 1,560,472, Nov. 3. Different fluid rubber compns. are successfully applied and vulcanized together.

• **Variegated rubber.** F. T. ROBERTS. U. S. 1,560,862, Nov. 10. Mech. features of uniting differently colored layers of rubber, exhausting the air from the united layers and then slicing to produce sheets with colored striations

Treating rubber with carbon and absorbed gases. E. B. SPEAR. U. S. 1,560,488, Nov. 3. Rubber is mixed with a portion of unactivated C at least partially satd. with diethylamine or NH_3 and another portion of unactivated C containing CS_2 or CO_2 which will react to form a vulcanization accelerator.

Treating reclaimed rubber. H. HUNTER. U. S. 1,558,516, Oct. 27. A mass of small pieces of reclaimed rubber is exposed to the air, agitated and repeatedly dropped through the air to sep. them and expose them fully to the action of the air, while maintaining the relative humidity of the air between 15 and 75% and the temp. above 43° . This treatment serves to remove moisture from the rubber.

Retarding oxidation of rubber. S. M. CADWELL. U. S. 1,556,415, Oct. 6. Vulcanized rubber is treated with a reaction product of acetaldehyde and aniline or other material unable to activate O but adapted to absorb activated O. Numerous examples are given. Cf. C. A. 19, 750

Treating latex. M. C. TEAGUE. U. S. 1,550,466, Aug. 18. Latex is thickened and stabilized by adding Na silicate or other easily decomposable colloidal silicate and an alkali, e. g., NH_4OH .

Dyeing rubber. D. J. MEYERINGH and P. C. WIJNAND. U. S. 1,559,343, Oct. 27. Raw rubber in sheet form is treated with a soln. of coloring matter in a solvent such as C_6H_6 or CS_2 which is capable of penetrating throughout the rubber treated. The raw rubber is treated with S and vulcanized by the action of actinic rays.

Vulcanizing rubber. T. W. MILLER. U. S. 1,551,042, Aug. 25. Rubber contg. a metal oxide such as ZnO is subjected to the action of a soln. such as naphtha contg. CS_2 and a "class A" accelerator. S and an accelerator of "class B" are added as required.

Vulcanizing rubber. T. WHITTELEY and C. E. BRADLEY. U. S. 1,559,393, Oct. 27. A substantially halide free reaction product of a S halide and an amine, e. g., the reaction product of aniline and S chloride, is used for vulcanizing.

Vulcanizing rubber. H. A. WINKELMANN and H. L. TRUMBULL. U. S. 1,559,925, Nov. 3. Rubber is mixed with ZnO and S or other vulcanizing agent and with an aldehyde-thiourea condensation product as an accelerator.

Vulcanizing rubber. C. M. CARSON. U. S. 1,560,465, Nov. 3. NH_3 and CH_2O , H_2S , CO_2 or other vulcanization accelerator components are introduced into rubber in a plurality of sep. portions by means of a carrying agent such as activated C to secure accurate control of vulcanization.

Vulcanizing rubber. S. B. MOLONY. U. S. 1,558,707, Oct. 27. Thiuram disulfide is used as an accelerator.

Vulcanizing rubber. G. H. STIEVENS. U. S. 1,559,196, Oct. 27. Tetratolyltricarbondiimide is used as an accelerator. U. S. 1,559,197 specifies tetraxyliltricarbodiimide. U. S. 1,559,198 specifies tetraphenyltricarbodiimide.

Molds for vulcanizing. R. L. SIBLEY. U. S. 1,559,289, Oct. 27. Surfaces of molds are sprayed with a dil. aq. soln. of "Na sulfonate" (from petroleum acid sludge) which serves to prevent sticking of the rubber.

Adding rubber latex to facilitate milling of unvulcanized rubber. E. E. A. G. MEYER. U. S. 1,558,701, Oct. 27.

Composition for sealing punctures in tires. E. J. HOUDRY. U. S. 1,556,834, Oct. 13. A puncture-sealing mixt. is prepd. by boiling bran and soda soln., adding salicylic acid to the cooled material and also adding kieselguhr and asbestos.

Puncture-sealing composition. T. E. LAW. U. S. 1,561,332, Nov. 10. A mixt. for closing punctures in pneumatic tires comprises ground asbestos 16, pulverized slippery elm bark 1 and H_2O about 48 parts.

CHEMICAL ABSTRACTS

Vol. 20.

JANUARY 20, 1926

No. 2

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

The possibility of using chemists in the machinery and apparatus construction industries. ERICH GUNDERMANN. *Chem. App.* 12, 155-6, 191-2(1925).—A discussion of the advantages to be derived from the coöperation of chemists in these industries.

J. H. MOORE

Aluminium as a material in the apparatus-building industry. H. BUSCHLINGER. *Apparatebau* 37, 241-2, 253-4, 273-4, 285-6, 297-8(1925).—Comparative tables of the expansion coeffs. of Al and other metals, of the cond., expansion and phys. properties of Al and Cu and the resistance of Al to org. acids are given.

J. H. MOORE

A simple new apparatus for the determination of helium in mixtures of natural gases and in minerals. WITALIUS CHLOPIN AND A. LUKASUK. *Ber.* 58B, 2392-6 (1925).—About 200 cc. of the gas mixt., measured in a gas buret, are transferred to an evacuated system that includes a coconut charcoal tube cooled in liquid air and a Plücker tube. The unsorbed He, after being tested spectroscopically for impurities, is pumped into and measured in a small-bore gas buret graduated in 1/100 cc. The second transfer is conveniently accomplished by means of a modified McLeod gage. A small-bore gas buret replaces the usual gage capillary and can be shut off from the gage bulb by a stopcock. Manipulation of the Hg level and the stopcock pumps the He into the buret. Detn. of as little as 0.0005 vol. % of He in a 200 cc. gas sample is claimed. The method can also be used to det. He evolved from small samples of minerals.

R. L. DODGE

Apparatus for rectifying current in the investigation or determination of electric transport of colloids. G. REBIÈRE. *Chimie et industrie Special No.*, 390-1(Sept., 1925).—The app. is based on the property of thermionic valves (triple-electrode lamps) the hot filament of which emits electrons which allow current to pass between the filament and plate but only when the latter is at the higher potential. A single valve cuts off half the current and gives an intermittent current. By suitably mounting 4 such valves in the arms of a Wheatstone's bridge the current flowing in both directions can be utilized, the liquid investigated being connected across the bridge. With liquids contg. not more than a trace of electrolytes, voltages up to 1000 and more can be used.

A. PAPINEAU-COUTURE

Improved thickener filter for chemical operations. NOEL CUNNINGHAM. *Chem. Met. Eng.* 32, 750-2(1925); cf. *C. A.* 19, 2427, 2468.—This app. consists of a thickener with a filter bottom, thus giving increased capacity and crystal clear filtrate.

L. A. P.

Tools of the chemical engineer. V. Filling and labeling small packages. D. H. KILLEFFER. *Ind. Eng. Chem.* 17, 1130-4(1925).—Automatic machinery for filling, closing, labeling and packing bottles, for pill making and for miscellaneous packaging operations, is described.

WM. B. PLUMMER

Precision X-ray spectrometer for chemical investigations. G. L. CLARK, H. C. WEBER AND R. L. HERSHEY. *Ind. Eng. Chem.* 17, 1147-50(1925).—A description of equipment installed in C.'s lab. at the Mass. Inst. of Technology, including details of technic recommended for similar installations.

G. L. CLARK

The Pierre Breuil volumometer. ANON. *Caoutchouc & gutta-percha* 22, 12915-6 (1925).—The app. is designed primarily for detg. the apparent d. of wood, but is applicable to general use, e. g., rubber. It consists of a vertical cylindrical chamber, near the bottom of which is a horizontal tube contg. a piston. The latter penetrates the vertical chamber and can be screwed back and forth. The tube carrying the piston is graduated micrometrically and a sleeve moving with the piston also has a micrometer scale, so that the motion of the piston can be very accurately detd. The vertical chamber can be opened and closed, the cover having a small tube with funnel. The chamber is filled with Hg and the piston micrometer read when the Hg reaches a mark on the funnel tube. The sample, e. g., 20 × 20 × 30 mm, or any irregular shape, is

introduced and the Hg again brought to the mark. The vols. corresponding to the micrometer readings being known, the vol. of the sample is detd. To avoid errors due to absorption of Hg, the sample is weighed, the first reading made with the sample in the app and finally a reading made after removal of the sample. C. C. DAVIS

Portable cutting and polishing machine with flexible cord drive. BERNHARD KLEINSCHMIDT. *Apparaturbau* 37, 300-2(1925); 6 cuts. J. H. MOORE

A wash-bottle valve. H. C. STEPHENSON. *Chemistry & Industry* 44, 1112(1925).—A sliding valve in the portion of the mouth piece which passes through the stopper can be controlled by the thumb. E. H.

Steam measurement. M. SCHAAK. *Apparaturbau* 37, 231-3, 245-6, 252-3, 276-8, 289(1925).—Descriptions with 13 cuts, of meters, gages and recorders, with mathematical discussion. J. H. MOORE

• **Flow meters in the accounting of process steam.** CHAPLIN TYLER. *Chem. Met. Eng.* 32, 755-6(1925).—Steam flow meters in a soap plant pointed the way to substantial savings in steam costs. Tables are given showing cost and distribution of steam before and after installing steam meters. L. A. PRIDGEON

Optical pyrometer. F. E. BASH. U. S. 1,561,583, Nov. 17.

Thermometers. A. T. HESPE. U. S. 1,561,925-6, Nov. 17.

Metallic weighting and weight-adjusting band for attachment to the necks of testing bottles, flasks, etc. P. KIER. U. S. 1,561,984, Nov. 17.

Annuular kiln for drying and carbonizing coal, ores, etc. O. DOBBELSTEIN and H. HESS. U. S. 1,550,571, Oct. 6.

Apparatus for drying wet coal or other materials by the action of hot gases. D. V. SHERBAN. U. S. 1,558,119, Oct. 20.

Rotary kiln for calcining, clinkering, etc. E. G. STONE. U. S. 1,550,591, Aug. 18.

Nonaerating apparatus for centrifugal purification of oil or other liquids. S. H. HALL. U. S. 1,561,784, Nov. 17.

Apparatus for "fatigue" tests of materials. A. AMSLER. Brit. 232,817, May 17, 1924.

Impact apparatus for fatigue tests of materials. A. AMSLER. Brit. 232,905, April 23, 1924.

Apparatus for concentrating saline solutions or other liquids. F. L. ANTISELL. U. S. 1,561,898, Nov. 17. Heat-conducting elements, which may be formed of ferro-Si, extend from a combustion chamber, through a partition, into an evap. chamber beneath the combustion chamber where they dip into the liquid to be evapd.

Apparatus for extracting oils, gelatin, etc., from animal or vegetable materials by grinding, steaming, etc. K. HOLTER and S. THUNE. Brit. 232,601, April 16, 1924.

Apparatus for drying "ceramic and chemical products." P. KIESS. Brit. 232,851, Sept. 11, 1924.

Grid for supporting purifying material in gas purifiers. J. A. SPENCER. Brit. 232,791, May 16, 1924. Structural features.

Evaporating apparatus for evaporating liquids in film form in tubes. GRISCOM RUSSELL Co. and L. E. SEBALD. Brit. 232,925, April 25, 1924.

Electron-discharge device. J. R. WILSON. U. S. 1,562,403, Nov. 17. A cathode is supported by a Mo hook passing through a resilient helix of Monel metal. The hook carries a Ni sleeve welded to the hook and to the helix.

Cathode for electric discharge tubes. H. SIMON. Can. 254,172, Sept. 29, 1925. A cathode contains an alk. earth metal and one or more of the rare metals.

Thermoelectric couple. R. P. BROWN. U. S. 1,561,593, Nov. 17. In a device comprising a primary couple and 2 extension elements, one of the extension elements is formed of an alloy contg. Cu 54, Ni 45 and Mn 0.25-1 part. This extension is attached to a primary element of Ni-Al alloy and the other extension (of pure Cu) is attached to a primary element of Ni-Cr alloy.

Retort furnace with rotary cylinders adapted for destructive distillations. O. D. LUCAS. U. S. 1,561,735, Nov. 17.

Tilting furnace for the fusion of basalt, etc. P. DHE. U. S. 1,558,250, Oct. 20

X-ray apparatus. W. D. COOLIDGE. U. S. 1,550,506-7, Aug. 18.

Ultra-violet ray apparatus. R. G. PADDOCK. U. S. 1,559,770, Nov. 3. The app is especially adapted for therapeutic purposes.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

- The appeal of science to the community.** ALEX. FINDLAY. *Science* **62**, 357–63 (1925).—An address. E. J. C.
- Organization of chemists in the United States.** CHAS. F. MUNROE. *Science* **62**, 313–7 (1925). E. J. C.
- Chandler: the teacher and the chemist.** M. I. PUPIN. *Science* **62**, 499–501 (1925). **Chandler and the Columbia School of Mines.** GEO. B. PEGRAM. *Ibid* 501–3. E. J. C.
- Edward DeMille Campbell.** A. H. WHITE. *Ind. Eng. Che* **17**, 1203 (1925).—An obituary, with portrait. E. J. C.
- The pigments of the ancient Romans as described in the natural history of the elder Pliny.** K. C. BAILEY. *Chemistry & Industry* **44**, 1135–7 (1925). E. H.
- Dimensional system of notation.** V. PETROVSKY. *Gen. Elec. Rev* **28**, 757–61 (1925).—Mathematical difficulties may be eliminated by the use of a dimensional system of notation in which the phys. quantities are treated entirely algebraically. Empirical formulas presented in the numerical system must be accompanied by a list of "units" involved. By an algebraical transformation any empirical formula can be converted to a dimensional form requiring no additional explanations and independent of any system of units. Applications are illustrated in such cases as magnetic field intensity, power loss, sp. wt., and sp. vol. W. H. BOYNTON
- The discovery of aluminium.** KARL GOLDSCHMIDT. *Chimie et industrie* **14**, 368–70 (1925).—Controversial with Matignon and Faurholt (*C. A.* **19**, 1212). G considers Al was discovered by Wöhler, not by Oersted. Also in *Z. angew. Chem* **38**, 1057–8 (1925). C. MATIGNON. *Ibid* 370.—Reply to Goldschmidt. A. P. C.
- Two new elements of the manganese group.** I. Chemistry. W. NODDACK AND I. TACKE. *Sitzb. Preuss. Akad. Wissenschaften* **1925**, 400–5. II. **Röntgen spectroscopy.** O. BERG AND I. TACKE. *Ibid* 405–9.—The properties of elements 43 and 75 are computed from those of neighboring elements; their presence in Pt ores and columbite is indicated by chem. tests, and confirmed by the measurements of the $K\alpha_1$, $K\alpha_2$ and $K\beta_1$ lines in the X-ray emission spectra of element 43, and of the $L\alpha_1$, $L\alpha_2$, $L\beta_1$ and $L\beta_2$ lines of element 75. They are given the names and symbols 43 masurium, Ma, 75 rehenium, Re. GEORGE CALINGAERT
- Two new elements, masurium and rehenium.** R. SWINNE. *Z. tech. Physik* **6**, 464–5 (1925); cf. *Nature*, **115**, 954.—A short history of events leading up to the discovery of masurium (Ma) [43] and rehenium (Re) [75]. J. H. P.
- Cryoscopic molecular weight determinations with liquid ammonia.** I. SCHMID AND B. BECKER. *Ber* **58B**, 1908–71 (1925).—Measurements of the depression of the f. p. of anhyd. NH_3 by soln. of polysaccharides will be useful in detg. the degree of polymerization or association in the polysaccharide mol. Before such information can be obtained it is necessary to det. the f. p. const. of anhyd. NH_3 . This const. was measured, with mannitol and acetanilide as solutes. The concn. range investigated was for mannitol 0.1266–0.2785 g. per 17.1 g. NH_3 , and for ace. anilide 0.0438–0.2328 g. per 17.1 g. NH_3 . The app. employed was essentially a Beckmann app. with Pt resistance thermometer. The mean observed f. p. const. was 13.18. The mol. wt. of inulin, as detd. from cryoscopic measurements in anhyd. NH_3 over the concn. range 0.0333–0.2602 g. per 17.1 g. NH_3 , corresponded to the formula $\text{C}_{52}\text{H}_{106}\text{O}_{54}$. R. L. DODGE
- A study of the physical properties of nitromethane.** J. W. WILLIAMS. *J. Am. Chem. Soc.* **47**, 2644–52 (1925); cf. *C. A.* **18**, 1605, 2637.—In order to investigate the tautomeric equil. in nitromethane the following properties, in samples subjected to various drying treatments, were studied: (1) Sp. heat, (2) vapor pressure, (3) density and (4) absorption spectra. The variation of these properties with temp. was investigated at small intervals from 15° to 65° and in the sp. heat-temp. curves marked irregularities were noticed which were influenced in part by the previous drying treatments. This was taken as evidence of the presence of more than 1 species of mol. Empirical equations for the effect of temp. on the above properties are given. CH_3NO_2 contg. traces of H_2O gives a gel with P_2O_5 . The probability of an abnormal b. p. as result of intensive drying is indicated. R. E. GIBSON
- Hypochlorous esters and the question of the polarity of valences.** J. F. DURAND and R. NAVES. *Bull. soc. chim.* **37**, 1147–55 (1925); cf. *C. A.* **19**, 2807.—EtOCl decomposes spontaneously to give AcH, AcOEt, EtOH and free Cl_2 . The authors explain these reactions by applying the theory of the polarities of the atoms or groups in a

very similar structures. The unit cell contains 4 mols. For ethane and diborane, resp., the dimensions in A. U. are $a = 4.46, 4.54, c = 8.19, 8.69$, and the volume (A. U.)³ occupied by the mols. are 70.6 and 78.0. The distance of nearest approach of atoms is $C-C = 1.5 - 1.6$, and $B-B = 1.8 - 1.9$ A. U. L. S. RAMSDELL

Structure investigations by the Debye-Scherrer (powder) method. S. V. OLSHAUSEN. *Z. Krist.* **61**, 463-514(1925).—Data are given for KI, RbCl, Al, Nb, Mn, red P, PbSe (clausthalite), HgS (cubic and hexagonal), As, Te, Se, (Ni, Fe) AsS (gersdorffite), and $CaCO_3$ (calcite, aragonite and vaterite). Vaterite, shown by Rimsie (Z. Krist. **60**, 66(1921)), to be distinct from calcite, is found to be hexagonal. A mathematical method for interpreting the diffraction patterns is described, and tables are given for use with this method. L. S. RAMSDELL

The arrangement of micro-crystals in aluminium wire. TAKEO FUJIWARA. *Mem. Coll. Sci. Kyoto Imp. Univ.* **8A**, 339-52(1925).—(In English.) Pinhole(transmission) photographs with Mo X-rays show that the micro-crystals in drawn wires of Al and Cu have trigonal axes approx. parallel to the direction of drawing, with a random orientation in other respects. Detailed examn. in the case of Al wire showed that crystals with trigonal axes inclined at an angle of 7° to the axis of the wire (direction of drawing) predominate. Wires were drawn about 50 times, from an initial diam. of 8 mm. to a final diam. of 1.06 mm. R. J. HAVIGHURST

The arrangement of the micro-crystals in rolled platinum plate. I. SHINSUKE TANAKA. *Mem. Coll. Sci. Kyoto Imp. Univ.* **8A**, 319-36(1925).—(In English.) Photographs of the Mo X-ray spectra reflected from the surface of rolled Pt foil and pinhole (transmission) X-ray photographs show that the micro-crystals are arranged so that a (110) plane is parallel to the surface of rolling. The trigonal axis which is contained in the same (110) plane is perpendicular to the direction of rolling. There is slight deviation of the orientation from this ideal arrangement. Pt foil 0.5 mm. thick was heated almost to melting, then quenched, then rolled to a thickness of 0.03 mm. R. J. HAVIGHURST

The orientations of crystals in electrodeposited metals. R. M. BOZORTH. *Phys. Rev.* **26**, 390-400(1925).—Electrodeposited films of Cu, Zn and Cd were found by X-rays to have crystals oriented at random, but Fe, Ni and Co showed special orientations. The special orientation is thought to be associated with the strain developed during deposition because of H_2 liberated. A graphical method of interpreting X-ray fiber diagrams is given. D. C. BARDWELL

An application of X-ray crystallography to the structure of nickel catalysts. G. L. CLARK, W. C. ASHURY AND R. M. WICK. *J. Am. Chem. Soc.* **47**, 2661-7(1925).—Powder diffraction photographs in a new, inexpensive, but precise spectrograph have been taken of Ni catalysts of widely different hydrogenation and dehydrogenation activities, prepared by reduction with C, alc., AcOEt, H_2 and Na hypophosphite. Except for the last, which appeared colloidal, all give identical lines for Ni, $d_{100} = 3.536$ A. U. Hence the difference in activities is not to be ascribed to a difference in lattice type or dimensions. Precision photodensitometer curves from the films were prepared and used to measure relative intensities and widths of lines. The intensities for all were approx. the same and in fair agreement with the calcd. values for a face-centered lattice. The Ni catalysts do not obey the Debye-Scherrer equation connecting line width with particle size, defined for colloidal dimensions. A rough parallelism is found between decreasing line width and increasing catalytic activity. X-rays give no information concerning the surface of catalysts. Precision measurements on NiO (simple cubic) gave $d_{100} = 4.16$ A. U. Ni_2O_3 gave only the lines of the monoxide, proving it to be NiO NiO_2 . Photographs of the dioxide in its two forms gave no diffraction lines, explaining the nonappearance of these lines on the sesquioxide film. Ni_3O_4 was also amorphous. G. L. CLARK

The influence of the lanthanide contraction on the lattice dimensions of cubic metals of the platinum group. TOM. BARTH AND GULBRAND LUNDE. *Z. physik. Chem.* **117**, 478-90(1925); cf. *C. A.* **19**, 2764.—"Lanthanide contraction" is the term applied to the volume contraction of the atoms in the rare earth series Ce-Cu. This contraction opposes the progressive increase of at. vol. in each vertical column of the periodic table, causing the pairs Ag-Au, Pd-Pt, Rh-Ir, and Mo-W to have very nearly equal lattice constns. Precision measurements by the powdered-crystal method of X-ray analysis were made to det. this effect quant. Films were calibrated by means of NaCl lines from salt which was mixed with each metal powder. The lengths of cube sides for Rh, Ir, Pd, Pt, resp., are: 3.795, 3.823, 3.873, 3.903 A. U. R. J. H.

Body-shaped (somatoid) crystal forms. V. KOHLSCHÜTTER AND C. EGG. *Helvetica Chim. Acta* **8**, 457-69(1925).—A review of previous work and a summary of

papers to be published on the external shape of some ppts. K. and E. divide the "somatoid forms" in 3 groups: disk-shaped (scheiben), produced when the presence of a colloid in the soln. holds the precipitate in gelatinous form; (2) *a*-forms, in which the lattice forces are hindered to a greater or lesser degree by slow diffusion and mechanical action; (3) *b*-forms, same as *a*-forms, except that the influence of the lattice forces is outweighed by that of the accompanying colloids and by the aggregation processes.

GEORGE CALINGAERT

• **Modification of the habit and change in the crystal shape of calcium carbonate due to substances present in the solutions.** V. KOHLSCHÜTTER AND C. EGG. *Helvetica Chim. Acta* **8**, 470-90(1925).— CaCO_3 pptd. from bicarbonate solns. by air blowing crystallizes as calcite below 30° and as aragonite above. The presence of KCl and NaCl (in contradistinction to K_2SO_4) gives bigger but fewer crystals. Bivalent metal ions have a stronger effect. The appearance of aragonite below 30° , in the presence of Mg or Sr salts, was never observed, but the presence of these salts in great amts. modifies the shape of calcite crystals and gives "somatoid forms" (cf. preceding abstract), which previous authors may have described as aragonite. Salts of bivalent metals (Cu, Ni, Co, Zn) cause the appearance of hydrated CaCO_3 crystals of which are more stable when occluding traces of these compounds. The formation of somatoid forms may be considered as a highly hindered crystn.

G. CALINGAERT

A method for the determination of the orientation of crystallites in conglomerates. G. TAMMANN. *Z. anorg. allgem. Chem.* **148**, 293-6(1925).—If a metal conglomerate is cut and then etched on the cut surface, light is reflected from the crystallite faces in certain well-defined maxima as the conglomerate is rotated about a normal to the cut surface. These maxima occur 4, 3 or 2 times in a complete rotation of the sample, corresponding to reflection from the cube, octahedral and dodecahedral planes, resp. By detg., with the aid of a microscope, the relative nos. of reflecting planes in different positions of the sample, it is possible to det. the probability of the occurrence of each kind of face. This probability may be calcd. for a haphazard orientation. Only in a conglomerate with purely chance orientation will the direction of the cutting plane have no effect upon the measured probability for each crystal face.

R. J. H.

The flow of solid matter, especially natural salts. F. RINNE. *Z. Krist.* **61**, 389-424(1925).—R. discusses the behavior under pressure of amorphous material, single crystals and cryst. aggregates and the effect of time and temp. Optical and X-ray observations are given for deformed NaCl and KCl. The geological flow of salts is briefly considered.

L. S. RAMSDELL

Vaporization of crystals. G. AMINOFF. *Z. Krist.* **61**, 373-9(1925).—A. shows that vaporization in crystals is a vector property, analogous to soln. Spheres cut from crystals of thymol developed recognizable crystal faces when vaporized under reduced pressure.

L. S. RAMSDELL

Experiments upon the solution of concave forms (etch figures) upon crystals. G. FRIEDEL. *Bull. soc. franç. mineral.* **48**, 6-11(1925).—Definite chem. compns. of solns. favor the development of certain crystallographic forms. The process may be reversed in dil. solns. By controlling the compn. of the solvent, the rate of soln. of various faces on crystals of *K-alum* was controlled.

C. B. SLAWSON

Modulus of elasticity, temperature and melting point. W. WIDDER. *Physik Z.* **26**, 618-22(1925).—The modulus of elasticity is assumed to be a linear function of the temp. and approaches zero at the m. p. The m. ps. of a paraffin and a wax are thus detd. to be 45.1° and 49.0° , resp. After correlating the data in the literature on the modulus of elasticity, and with the above assumptions, W. calcs. the m. ps. of Fe, Cu and Al to be: 1532.8° , 1083.6° and 657° , resp., which are in very good agreement with the exptl. results. The testing of this method for other metals must await more accurate exptl. data on the variation of the modulus of elasticity with the temp.

J. H. PERRY

Variation of logarithmic decrement with amplitude and viscosity of certain metals. II. G. SUBRAHMANYAM. *Phil. Mag.* **50**, 716-22(1925); cf. *C. A.* **19**, 2151.—Logarithmic decrement and amplitude curves have been constructed for Al, Fe, eureka (constantan), manganin, and German silver. With the first 3 solids the decrement remains const. over a certain range and then increases linearly. For manganin the value is const. within the amplitude used. The logarithmic decrement for wires made of German silver does not tend to any const. value, but falls off steadily for decreasing amplitudes. Viscosities of these materials are: Al 2.763×10^8 , Fe 14.16×10^8 , eureka 1.506×10^8 , manganin 1.101×10^8 , and German silver 9.067×10^8 dynes per sq. cm.

S. C. L.

Isotherms of monatomic substances and of their binary mixtures. XXV. Same

of diatomic substances. **XXI.** The compressibility of hydrogen and helium between 90° and 14° absolute. F. P. G. A. J. VAN AGT AND H. KAMERLINGH ONNES. *Verslag. Akad. Wetenschappen Amsterdam* **34**, 625-37(1925).—The work of Onnes and Martinez (C. A. **18**, 1219) was continued at lower temps. The values of A and B in the empirical equation $p = A + Bd + Cd^2 \dots$ were accurately detd. from 14° to 90° K. for H_2 , $16-70^\circ$ K. for He. The Boyle point of He was found to be at 22.1° K. From these data the corrections are derived applicable in this temp. region to the temp. scale of the international H_2 and He thermometers. The measurements confirmed the view of O. and M. that there is no reason to adopt a term due to quantum influence ($Qd^{3/2}$) in the equation of state.

B. J. C. VAN DER HOEVEN

Isotherms of diatomic substances and of their binary mixtures. XXXII. The behavior of hydrogen relative to the law of corresponding states. F. P. G. A. J. VAN AGT. *Verslag. Akad. Wetenschappen Amsterdam* **34**, 638-43(1925).— B and t from the measurements in the preceding abstract are transformed into the "reduced" B and t quantities of the law of corresponding states. $B = f(t)$ curves for He, A, Ne, H_2 , N_2 , and O_2 are compared (partly using values of Cath and Onnes). Above $t = 1$ the values spread out according to the crit. temps. The curves all seem to intersect at a point very near $t = 1$.

B. J. C. VAN DER HOEVEN

The theories of state of matter. II. Internal pressure, co-volume and association. F. SCHUSTER. *Ber.* **58B**, 2183-6(1925); cf. C. A. **19**, 3394.—The internal pressure of a substance can be measured but cannot be directly related to mol. constitution. Mol. co-vol., on the other hand, is not easily measurable, but forms a basis for the calcul. of degree of association, which is one way of expressing mol. constitution. By means of simple equations connecting internal pressure and co-vol. it is possible to obtain information as to mol. association from a knowledge of internal pressure. The equations are: $b_s = v_s - (RT_c)/B_s$ and $b_k = (RT_c)/(8p_k)$. Where b_s = the van der Waals co-vol. at the b. p. in l. v_s = the mol. vol. at the b. p. in l. R is the gas const. in l-atm., T_c = the abs. b. p., B_s = the internal pressure at the b. p. in atm., b_k = the van der Waals co-vol. at the crit. pt. in l. and T_c and p_k are the crit. temp. and pressure, resp. With these equations S has calcd. the 4 values ($v_s - b_s$), b_s , b_s/b_k and $(v_s - b_s)/b_s$ for 20 inorg. and 29 org. substances. The B_s values are taken from a previous publication of S.'s (C. A. **19**, 3394), the v_s values from Walden (C. A. **3**, 2077), and the other necessary values from van Laar (Die Zustandsgleichungen Leipzig 1924). For normal, non-associated substances it was found that $b_s = 0.64 b_k$ and $v_s - b_s = 0.23 b_k$. These conclusions are compared with Traube's results obtained by a different method (*Ber.* **30**, 265(1897)). Small errors in the values for the crit. temp. make large errors in the ratios as calcd. by these equations.

R. L. DODGE

The vapor pressures of solid and liquid cyanogen. J. H. PERRY AND D. C. BARDWELL. *J. Am. Chem. Soc.* **47**, 2629-32(1925).—The vapor pressures of $(CN)_2$ were measured from -93° to the triple point for the solid and from the triple point to -7° for the liquid. The equations for the solid and liquid are, resp., $\log_{10} P(\text{mm.}) = (-1695.122/T) + 9.65530$, and $\log_{10} P(\text{mm.}) = (-1818.554/T) - 5.0813 \log_{10} T + 22.30083$. The calcd. triple point is -27.90° at 552.2 mm. The normal b. p. is -21.17° . The heats of sublimation, fusion and vaporization have been calcd.

J. H. P.

The viscosity of liquids under pressure. P. W. BRIDGMAN. *Proc. Nat. Acad. Sci.* **11**, 603-6(1925).—The viscosities of 43 liquids have been measured in the pressure range between atm. and 12,000 kg./cm², and at 30° and 75° . H_2O is unique in that at low temps. and pressures its viscosity decreases with rising pressure, while above 25° the min. disappears and the viscosity increases just as it does for all the other liquids at all temps. Beyond a pressure of about 1000 kg. the rate of increase is so rapid that a logarithmic curve is necessary. The increase under 12,000 kg. varies from 10-fold for MeOH to at least 10^7 -fold for eugenol. There is a correlation between the increase in viscosity under pressure and the complication of the mol., particularly well-marked in homologous series. Phillips' theory that viscosity is a function of vol. only, and Brillouin's theory involving a more complicated vol. function are both proven far from correct. An actual interlocking effect between mols. must be taken into account.

GEORGE L. CLARK

The Darcy filtering law. OTTO EMERSLEBEN. *Physik. Z.* **26**, 601-10(1925); cf. *Bautechnik* **2**, 73-6(1924).—Mathematical. An application of the zeta function to a study of the flow of ground water.

J. H. PERRY

The behavior of crystals and lenses of fats on the surface of water. I. The mechanism and rate of spreading. ARTHUR CARL AND E. K. RIDEAL. *Proc. Roy. Soc. (London)* **109A**, 301-17(1925).—An exptl. study of the process of surface spreading

on H_2O and 0.01 N HCl solns. of org. compds. contg. a long chain terminating in a polar group, including acids, esters, ethers, phenols and nitrites proves that monomol. films spread from crystals as well as lenses, and that a definite equil. surface tension or 2-dimensional pressure characteristic of the substance is established. The method consisted in measuring the force which almost breaks a Pt ring through the surface by a chainomatic balance arrangement. The spreading of a cryst. fat on a H_2O surface takes place in two stages: (1) the surface is covered with a monomol. film under 0 compression. The rate at which myristic acid mols. leave a crystal is 36.2×10^{13} mols. per sec. per cm. of length of the crystal face, giving an av. life on the surface of 0.60×10^{-7} secs. (2) The expanded film packs with increase in 2-dimensional pressure till equil. results between surface soln. and recondensation. For expanded films a simple eqn. of state is obeyed: $F = K'[(1/a) - (1/a_0)]$ where F is the surface pressure, a and a_0 are the areas per mol. at F and $F = 0$ resp. Hence there is a limit of expansibility explained by inelastic mol. collisions in the surface. Spreading oil films appear to be pushed out from the source (lens or crystal) by the further entry of mols. into the surface layer, rather than pulled over the surface by the attraction of uncontaminated H_2O . **II. The effect of temperature on the equilibrium pressure.** *Ibid* 318-30. This effect is considered in detail for films of fatty acids and their esters. The stability of monomol. films is directly related to this equil. pressure. With some compds. the water-oil interfacial tension rises with increasing temp. Such an interface can exist in either of 2 modifications corresponding to the condensed and expanded states. The phenomena are discussed from the standpoint of the phase rule. By an application of the Clapeyron eqn. the latent heats of fusion of some of the compds. are calcd. **III. The effect of the polar group on the equilibrium pressure.** *Ibid* 331-8. The expts. of Part II are extended to other long-chain compds. with more complicated polar heads. No general conclusions are possible except that one portion of the curves is detd. by the hydrocarbon chain and another by the polar group. The same must be said of expts. with impure compds. and mixts. The course of the temp.-surface tension curves is extremely sensitive and only the very purest materials yield the parallel linear curves. Cf. also *Nature* 115, 457-9(1925). G. L. CLARK

Polymolecular and monomolecular films. W. D. HARKINS AND J. W. MORGAN. *Proc. Nat. Acad. Sci.* 11, 637-43(1925).—New measurements have been made of the spreading of several liquids on water or on aq. solns of CaCl_2 , and on the collapse of compressed films. Monomol. films are formed by the following arranged in the order of increasing mean thickness (in \AA . U.) at collapse: phenyl-dibiphenyl-methyl-amine on CaCl_2 (8.4); phenanthrol on CaCl_2 (12); stearic acid on H_2O (30); *sym*-di-*β*-tri-phenylethylurea on CaCl_2 (14); on H_2O polymolecular, (42). The following form polymol. films: 9,10-dibromanthracene on CaCl_2 (111); Ph_3CCN on CaCl_2 (120); phenanthrene on CaCl_2 (132); di-*β* naphthylamine on H_2O (158); hexachlorobenzene on CaCl_2 (248); α -bromonaphthalene (105). The solns. of CaCl_2 have the advantage that the surface tension is 100 as compared with H_2O , 72, and hence that many liquids will spread on it which have a negative coeff. on H_2O . Young's moduli are detd. for the films; steel is 12,000, stearic acid on H_2O , 39, and dibromanthracene (polymol.) <2. Two substances each of which forms a monomol. film, also form a monomol. film when they are mixed. Several of these are studied in detail as above. G. L. CLARK

The oriented-wedge theory of emulsions. W. D. HARKINS AND NORVIL BEEMAN. *Proc. Nat. Acad. Sci.* 11, 631-7(1925). Finkle, Draper and Hildebrand (*C. A.* 18, 607) and Harkins and Keith (*C. A.* 18, 2095) found exptl. evidence for the oriented wedge theory of Harkins, Davies and Clark (1917) in the dependence of size of the drops in emulsions upon the positive ion of the emulsifying soap (decreasing as the ion size increases from Na to Cs). New measurements under more carefully controlled conditions seem to invalidate these exptl. interpretations, for the drop distribution curve is the same in stanolax emulsions for Na, K or Cs soaps. This in no way affects the oriented-wedge theory but points to ionization of the soaps and to the improbability of a mol. of soap being able to affect a drop with a radius at least 250 times greater (the diam. of the greatest no. of drops is 15,000 \AA . U. as compared with a soap mol. length of about 30 \AA . U.). G. L. CLARK

The surface-tension crystal vs. saturated solution. The concentration cell: finely divided salt|supersaturated solution|saturated solution|large crystals. LEO SOEP. *Phil. Mag.* 50, 675-81(1925).—A mathematical treatment of the e. m. f. of the above cell. S. C. L.

The statistical foundation of Volmer's equation of state for adsorbed substances and the formula for the concentration. S. C. KAR. *Physik. Z.* 26, 615-8(1925).—An application of quantum statistics proves: (1) that Volmer's equation of state,

$(\pi(\Omega - \beta) = R T$, where π is the decrease of the surface tension of the liquid adsorbent, Ω is the surface concn. per mole of the adsorption layer, and R is the gas const.) is correct; (2) that the formula for the concn. is not that of Volmer but is identical with Langmuir's formula, $c = k/(1 - \eta\beta)$ where $\eta = 1/\Omega$ and $c = 1/v$; and (3) that $k = (2M)^{1/2}(\pi)^{1/2}(kT)^{1/2}e^{-\alpha/KT}$ where M is the mol. wt., α the vaporization or adsorption potential per mol., N is Avogadro's no.; and k is Planck's const. J. H. PERRY

Adsorption and superficial energy of interfacial boundaries. BORIS ILIIN. *Physik. Z.* 26, 497-501(1925).—The equations of Gibbs and Sziszkovski (Sziszkovski, *C. A.* 3, 133; Rehinder, *C. A.* 19, 1079), also Langmuir's (*C. A.* 11, 2849, 39, 1848(1917)), are shown to apply satisfactorily to data in the literature on gas-soln., vapor-liquid and solid-gas systems. The ratio of superficial energies at the boundary depends on the surface tension of the sep. phases *in vacuo*. G. CALINGAERT

Emulsification of sodium stearate and sodium palmitate. N. A. JAJNIK AND BAKSH ILAHI. *Kolloid-Z.* 37, 139-44(1925).—The emulsifying power of Na stearate and Na palmitate has been compared by detn. of the smallest quantity of soap which was just sufficient to emulsify equal vols. of different oils. The purity of the soaps was very important. They were prepd. by neutralizing solns. of stearic or palmitic acid in 98% alc. with a soln. of Na_2CO_3 , evapg. to dryness and then extg. with 98% alc. The final vol. of soap soln. and oil used for each emulsion was 100 cc. The curves (wt. of soap in g. with cc. of oil) of cottonseed and poppy-seed oils were similar and those of mustard-seed, sesame, olive and coconut oils were of the same type. For each increase of 10 cc. of oil the amt. of soap increased but this increase in amt. of soap was not directly proportional to the increase in vol. of oil, i. e., the emulsifying power of the soap increased with increase in concn. In general the emulsifying power of Na palmitate was > that of Na stearate. The soap soln. with the lowest surface tension possessed the greatest emulsifying power. H. M. McLAUGHLIN

The action of protective colloids. I. TRAUBE AND E. RACKWITZ. *Kolloid-Z.* 37, 131-8(1925).—The theory proposed considers 3 adhesion intensities: (a) that of the protecting colloid to H_2O ; (b) that of the colloid to be protected to H_2O ; (c) that of the 2 colloids towards one another. Surface-active substances, such as saponin, soap and salts of bile acids, possess less adhesion intensity to H_2O and should exert less protective action than surface-inactive substances, such as gelatin, albumin and dextrin having a high adhesion intensity to H_2O . In order to test the theory protective nos. of surface-active and surface-inactive colloids were detd. by methods similar to Zsigmondy's Au no. detns. The surface-active colloids frequently exerted little protective action on lyophobic colloids, e. g., sols of Au, Ag and C but with other colloids, e. g., S and As_2S_3 , possessing less adhesion intensity to H_2O this difference in the behavior of surface-active and surface-inactive colloids was not evident. A new method for detn. of the protective colloid action is given which depends on the distribution of the dissolved colloid, e. g., Au or Ag, in the presence of a protective colloid between 2 solvents, e. g., H_2O and CHCl_3 , C_6H_6 , CCl_4 or CS_2 . By shaking an aq. soln. of a lyophobic sol contg. a small quantity of a surface-inactive substance as a protective colloid with CHCl_3 or C_6H_6 , the lyophobic sol (Au or Ag) was removed quant. from the H_2O phase and formed a CHCl_3 or C_6H_6 emulsion. Under the same conditions with a surface-active protective colloid present in any amt. the entire quantity of lyophobic sol remained in the H_2O phase. The results are explained by the consideration that the lyophobic colloid adheres to the surface-inactive colloid and then the gelatin with the Au encloses the little drops of CHCl_3 ; but the surface-active colloid because of its smaller adhesion intensity to the Au does not adhere to the Au particles. H. M. McL.

Solubility of hydrogen selenide. AYA JOSEPHINE McAMIS AND W. A. FELSING. *J. Am. Chem. Soc.* 47, 2633-7(1925).—At a pressure of 1 atm. of H_2Se its soly. in water falls from 0.09789 mole per l. at 14° to 0.07317 mole per l. at 35° . The soly. at 1 atm. pressure and 25° in solns. of HI increases from 0.08415 mole per l. in H_2O to 1.11012 mole per l. in a soln. contg. 2.73 moles HI per l. Calcd. from the preceding values, the heat of soln. in water at 25° is 2431 cal. per mole of H_2Se and the free-energy decrease for the reaction H_2Se (1 mole) = H_2Se (760 mm.) is approx. 1450 cal. JAMES M. BELL

Solubility relations of isomeric compounds. I. Introduction. JOHN JOHNSTON. *J. Phys. Chem.* 29, 882-8(1925).—An introduction to the study of the equil. relations between ortho, meta and para isomers. In many systems of the 3 isomers of a given compn., the soly. of any one component in mixt. with either of the others or with both is in accordance with the law of the ideal soln. and is therefore calculable from a small no. of consts. pertaining to the pure components. The theory of ideal solns. is discussed and it is shown, in the case of such solns., that the complete ternary diagram may be constructed from 6 observations, 3 of which are the melting temp. of the pure

components; the other 3 are the heats of melting or appropriate soly. measurements, which, in general, are simpler to carry out. II. **Determination of freezing temperatures on binary mixtures.** D. H. ANDREWS, G. T. KOHMAN AND JOHN JOHNSTON. *Ibid* 914-25.—An app. is described for making accurate time-temp. curves for systems such as the disubstituted benzenes singly or in binary or ternary mixts. The effective temp. head is controlled and measured; only about 1 cc. of material is needed and its temp. is read by means of a thermo-element of small heat capacity and small lag. The theory of cooling curves under a controlled temp. head is discussed on the basis of Newton's law, which is found to be valid for the app. This leads to a mode of interpreting the cooling curve of a binary mixt. which yields correct results. III. **Mutual solubility of the three dinitrobenzenes.** D. H. ANDREWS. *Ibid* 1041-7.—Complete data on the neutral soly of the dinitrobenzenes derived from observations of freezing temp. are given and compared with results calcd. from coulometric data by means of the law of ideal solus. The solns. are found to differ slightly, if at all, from the ideal, implying that the crystals of each isomer from mixts with the other 2, are pure and that the mixing is not attended by an appreciable change in heat content or vol. Data are given on the soly. of each isomer in several solvents. The data depart comparatively little from the ideal curve.

HARRY B. WEISER

The conductivity of uni-univalent salts in methanol at 25° C. J. E. FRAZER AND HAROLD HARTLEY. *Proc. Roy Soc. (London)* 109A, 351-68(1925).—The elec. cond. between 0.0001 and 0.002 N of 15 univalent salts in MeOH is measured and confirmation of the applicability of Kohlrausch's law of independent mobility of ions obtained. Kohlrausch's square root relation holds good within the range of concn. examd. In this respect the results are in complete accord with Debye and Hückel's theory of cond. but in other respects the theory may require modification; for example the differences in slope in the cond. curves for salts with almost the same values for l_a and l_c (mobilities of single anions and cations) such as KI, KNO₃ and AgNO₃ are incompatible with the D and H equations. In MeOH as in H₂O the mobilities of the ions of alk. metals increase with increasing at. no. and at. wt. but the rise in MeOH is more regular; for the halogens there is a regular rise which is not true in aq. solns., since the value for Br is highest. The relative speeds in MeOH are lower than would be expected from its low viscosity; $l_{\text{MeOH}}/l_{\text{H}_2\text{O}} = \eta_{\text{H}_2\text{O}}/\eta_{\text{MeOH}}$ (viscosity) = 1.64 in accordance with Stokes' law is not found true.

G. L. CLARK

Note on the theory of interionic attraction in strong electrolytes. S. R. PIKE AND G. NONHEBEL. *Phil. Mag.* 50, 723-8(1925).—P. and N. discuss the applicability of the Milner and the Debye and Hückel equations for the properties of electrolytic solns. At the lowest concn. in HCl and TiCl solns. examd. by Randall and Vanselow (*C. A.* 19, 428) the actual curves for f - p lowering fall about half way between those of M. and of D. and H.

S. C. L.

The activity coefficients and transport number of solutions of hydrogen chloride in methanol. GORDON NONHEBEL AND HAROLD HARTLEY. *Phil. Mag.* 50, 729-49 (1925).—The activity coeff. and transport nos. of solns. of HCl in CH₃OH have been obtained by measurements of e , m , f . The activity coeffs. of HCl in the 3 solvents, H₂O, CH₃OH and C₂H₅OH, agree fairly well with those calcd. from Milner's equation for the interionic elec. energy in a soln. of a completely dissociated electrolyte, but do not agree with those calcd. from Debye's equations. The relation between the activities of electrolytes in different solvents has been pointed out, and it has been shown how the partial pressure of HCl over its solns. in one solvent may be calcd. from its vapor pressure over a second solvent and a series of e , m , f measurements in both solvents.

S. C. L.

Ionic equilibria across semipermeable membranes. NAOTO KAMEYAMA. *Phil. Mag.* 50, 849-64(1925).—The expts. of Donnan and Allmand on the unequal distribution of KCl across a Cu ferrocyanide membrane between a pure aq. soln. and one contg. K ferrocyanide have been recalcd. and discussed from the point of view of activity and the ionic strength principle of G. N. Lewis. Except when the KCl concn. is small in comparison with that of the ferrocyanide, the results of the distribution equil. expts. of Donnan and Allmand are in agreement with the ionic strength principle. New expts. carried out with a more reliable method of analysis and an improved technique render it probable that the marked deviations from the ionic strength principle referred to are due to exptl. errors.

S. C. L.

Optical research on electrolytic aqueous solutions. A. HEYDWEILLER. *Physik. Z.* 26, 526-56(1925).—A comprehensive review of the work done by H. and his collaborators over the period 1910-1914 and abandoned since. Includes density, refraction, absorption, magnetic rotation. 36 references.

G. CALINGAERT

The influence of traces of water on solution equilibria. I. ERNST COHEN AND W. D. J. VAN DOBBENBURGH. *Verslag Akad. Wetenschappen Amsterdam* **34**, 518-29 (1925).—Salicylic acid was recrystd. in 3 ways: from water, crystals dried over P_2O_5 , from ether (redistd. over P_2O_5) and from benzene (also redistd.). The soly. of these preps. in benzene at 30.50°, approaching equil. from high and from low temps. and using different samples of salicylic acid, varied from 1.03 to 1.38 (g. per 100 g. satd. soln.), depending upon the previous history of the acid; preps. recrystd. from H_2O always showed the higher values. This phenomenon is due to the influence of minimal traces of water, occluded in the crystal during crystn. Whereas the soly. of salicylic acid in dry benzene was found to be 1.01, a water content of 0.00147% caused it to increase to 1.05; 0.00374% to 1.10; 0.00682% to 1.19; 0.01042% to 1.31; 0.01478% to 1.35; excess water to 1.36. On this phenomenon a method may be based for the detn. of small amts. of water in crystals.

B. J. C. VAN DER HOEVEN.

Equilibria in systems in which phases are separated by a semipermeable membrane. X. F. A. H. SCHREINEMAKERS. *Verslag Akad. Wetenschappen Amsterdam* **34**, 530-8 (1925).—Previous papers are continued (C. A. **19**, 3200). Properties and conditions are discussed of systems with more than 1 membrane and with a double membrane.

B. J. C. VAN DER HOEVEN

The mechanism of gaseous chemical reactions. M. KROGER. *Z. physik. Chem.* **117**, 387-431 (1925).—Answers are sought to the 2 questions. (1) is there any such thing as a pure monomol. gaseous decompn. reaction proceeding without mol. collisions? and (2) is there any such thing as an exothermic binol. reaction in which at the moment of reaction no other mols. or atoms are in close proximity to the reaction pair? A ray of I mols., traveling through a highly evacuated glass vessel, passed in its path axially through a tubular Pt foil heated electrically. The side of the glass vessel on which the ray impinged was cooled in liquid air and the character of the I deposit on the glass gave an indication of the amt. of dissociation of the I mols. into atoms that had been caused by the radiant energy emitted from the foil. The I ray was produced by vaporizing I through an aperture, the walls of which were cooled by liquid air. The entire system was continuously evacuated to less than 10^{-6} mm. Hg to avoid disturbances from other gases. The Pt heater was maintained at temps. from 775° to 1100°. For a given temp. (rate) of vaporization, chosen as 29.3°, the time taken to deposit a definite amt. of I on the glass opposite the aperture was measured. The amt. deposited was measured by the change in color of the thin film. The time necessary to bring about a color change from gray to green, with no current through the heater, was chosen as the standard. It was assumed that if dissociation of the I mols. in the ray took place under the influence of the Pt heater, the atoms so formed would be expelled in such directions that they would not condense on the same spot as the undissociated mols. As a result the time taken to form the film of standard thickness would be increased in proportion to the amt. of dissociation. No evidence was obtained to indicate dissociation of I mols. greater than 1%, the limit of accuracy of the measurement. Two methods were employed in attacking the second problem. The reactions chosen were $Cd + I_2$, $Cd + Se_8$ and $Cd + S_8$. The rays of Cd and I, Se or S, produced as above, were caused to cross at an angle inside an evacuated vessel in such a way that the Cd and I, Se or S deposits were made on opposite sides of the vessel. The space between the 2 deposits was closely examd. for the reaction product. The color change of the deposit was used as a measure of the amt. formed. The reaction product deposited in these expts. was so small that it was masked by the normal scattering of the reacting materials from their respective rays. The second method consisted in causing the beams to cross in a vessel immersed in liquid O. The amt. of O evapd. was a measure of the combined energy liberation due to latent heat of vaporization of the reactants and heat of reaction. The former was measured by blank detns. with the reactants singly. With $Cd + S_8$ a more rapid vaporization of liquid O was observed than for the reactants singly. Chem. analysis of the deposit confirmed the belief that with $Cd + S_8$ there was observed a chem. union by collision of a poly-at. mol. with 1 or 2 atoms. Details of experimentation with at. and mol. rays are given.

R. L. DODGE

Catalytic action of colloidal metals of the platinum groups. XVII. Colloidal cobalt. C. PAAL AND HANS BORTERS. *Ber.* **58**, 1542-6 (1925); cf. C. A. **8**, 3275.—The different preps. of colloidal $Co(OH)_3$ in aq. soln. were reduced with H_2 in the presence of colloidal Pd-hydrosol, in an app. as described by Paal and Gerum (cf. C. A. **2**, 1729). During the first 3 days the reduction proceeded at room temp. and atm. pressure but during the remaining 4-11 days the temp. was 50° and the pressure was increased by 100 mm. Hg. Of the 3 preps. (cf. C. A. **20**, 4) 2 were used in solid form: (1)

prepd. with Na protalbate as the protective colloid and oxidized with air; (2) prepd. with Na lysalbate as the protective colloid and oxidized with H_2O_2 ; and one was used in gel form, (3) prepd. with Na protalbate as the protective colloid and oxidized with H_2O_2 . The relative quantities of $\text{Co}(\text{OH})_3$ used in (1), (2) and (3) considered as the ratio Co:Pd were, resp., 9:1, 23:1 and 10:1. The $\text{Co}(\text{OH})_3$ was completely reduced to the metal as shown by: (a) the fact that the cc. of H_2 used was very slightly > the theoretical amt. required for reduction; (b) analysis of the product for Co; (c) the amt. of H_2 formed by treating the product with dil. H_2SO_4 . H. M. McLAUGHLIN

The catalytic splitting of acetoacetic acid by strong acids and bases. HANS V. EULER AND ARNE ÖLANDER. *Z. anorg. allgem. Chem.* **147**, 295-311(1925).—The catalytic splitting of acetoacetic acid and its salts differs from the usual splitting of esters of org. acids in that (1) the reaction products are different in acid and alk. solns., and (2) the rate of reaction is not proportional to the H or OH-ion concn. In acid soln. the predominating reaction is $\text{CH}_3\text{COCH}_2\text{COOH} \rightarrow \text{CH}_3\text{COCH}_3 + \text{CO}_2$, while in strongly alk. soln. it is $\text{CH}_3\text{C}(\text{ONa})\text{CHCOONa} + \text{H}_2\text{O} \rightarrow 2\text{CH}_3\text{COONa}$. The reaction velocity const. for the 2 reactions were detd. at 37° over the alkali concn. range $p_{\text{H}} = 11.11$ to $p_{\text{H}} = 15.07$ (?). The observed const. were $p_{\text{H}} = 11.11$, $k_1 = 3.01 \times 10^{-5}$, $k_2 = 0$; $p_{\text{H}} = 13.21$, $k_1 = 3.37 \times 10^{-5}$, $k_2 = 0$; $p_{\text{H}} = 13.60$, $k_1 = 3.98 \times 10^{-5}$, $k_2 = 0.80 \times 10^{-6}$; $p_{\text{H}} = 13.90$, $k_1 = 1.52 \times 10^{-5}$, $k_2 = 2.18 \times 10^{-6}$; $p_{\text{H}} = 14.19$, $k_1 = 0$, $k_2 = 19.6 \times 10^{-6}$; $p_{\text{H}} = 15.07$, $k_1 = 0$, $k_2 = 130 \times 10^{-6}$. The reaction rates were detd. by measuring the acetone concn. of the soln. at definite time intervals. Both reactions were considered monomol. The acetone was detd. by the Messinger-Hupfer iodometric method (cf. *Ber.* **21**, 3366(1888)). The H-ion concn. was measured electrometrically. It is probable that the acid and basic catalysts act on different parts of the acetoacetic acid mol. through the intermediation of ions. In strongly alk. soln. the splitting probably takes place at the enol groups of the acetoacetic salt.

R. L. DODGE

The composition of reduced nickel catalysts. BENNOSUKE KUBOTA AND KIYOSHI YOSHIKAWA. *Sci. Papers Inst. Phys. Chem. Research* **3**, 223-31(1925).—A reduced Ni catalyst has not one definite form but is composed of many active unstable hydrides coexisting in the catalyst. The nature and no. of these hydrides depend on the reduction temp. The hydrides can be sepd. into 3 classes according to their sp catalyzing power: (1) those capable of hydrogenating the aromatic nucleus, (2) those capable of hydrogenating ethylenic compds. and (3) those capable of hydrogenating at. groups such as nitro groups. The activity of each of these classes can be completely and selectively destroyed by suitable poisons. Those of the first class are poisoned by thiophene, the second by Pt_2S and the third by H_2S . The relative amts. of each class of hydrides are detd. by measuring the sulfide content of the Ni catalyst when it has become completely and successively poisoned for each of the 3 hydrogenation reactions. Such detns., carried out on catalysts that had been reduced at 250°, 350°, 450°, 550°, 650°, and 700°, showed that the amt. of all 3 classes of hydrides was decreased by increasing the reduction temp. but that the ratios of the 3 classes remained essentially the same. By a calcn. based on the sulfide content of the poisoned catalysts Y. assigns hypothetical formulas to the active Ni hydrides, ranging from NiH_2 to Ni_{10}H_1 , depending on the reduction temp.

R. L. DODGE

The effect of X-rays on the platinum catalyst in the contact sulfuric acid reaction. G. L. CLARK, P. C. McGRATH AND M. C. JOHNSON. *Proc. Nat. Acad. Sci.* **11**, 646-51(1925).—X-rays do not activate the Pt catalyst when it is rayed in an atm. of dry air. At 300° the conversion in the presence of 0.0130 g. H_2O per g. of air is increased from the dry value of 3.25% to about 88%; after irradiation for 3 hrs. with X-rays from a W tube at 100,000 v. the conversion rises to 94%. This value is maintained for 5 hrs., followed by a rapid drop to below the unrayed value, a subsequent recovery to over 87% after 9 hrs.—and a gradual decrease to a const. value of 84.3%. After a second raying the rise is only to 87% with a final return to the same value of 84.3%. A satisfactory lab.-scale app. and method of sepn. of SO_2 and SO_3 , depending upon the pptn. of SO_2 mist and its filtration in Gooch funnels, are described.

G. L. CLARK

Binary mixtures. J. SAMESHIMA. *J. Faculty Sci. Tokyo Imp. Univ.* **1**, 63-103(1925); cf. *C. A.* **12**, 2470.—S. presents a simplified Duhem-Margules' equation for the partial pressures of the 2 components of a binary mixture: $p_1 = p_1^0 e^{(1-x)^2\alpha}$; $p_2 = p_2^0(1-x)e^{x^2\alpha}$, where p_1 , p_2 = partial pressure of components, P_1 , P_2 = their satn. pressures in the pure state at the same temp., x = mol. fraction of 1st component in the liquid phase, α , exptl. const., which is shown to be: $\alpha = \ln[(1/P_1)((dP/dx)_{x=0} + P_1)]$ and $\alpha = \ln[(1/P_2)((dP/dx)_{x=1} + P_1)]$. α can thus be detd. from the known values of P_1 and P_2 , plus the slope of the total pressure curve (P) at either end. Aver-

aging the 2 values so obtained in the case of $C_6H_6-CS_2$; Me_2CO-Et_2O ; $CCl_4-C_6H_6$; $EtI-EtOAc$. S. obtains calcd. values of p_1 and p_2 which are in very good agreement with the exptl. data. In a further section S. shows the additivity of the dielec. const. ($D-1$) for non-associated liquids, and calcs. the degree of association of $EtOH$ at 18° from the deviations from additivity for an $EtOH-Et_2O$ mixt.

G. CALINGAERT

Ternary systems. III. Silver perchlorate, toluene and water. A. E. HILL AND F. W. MILLER, JR. *J. Am. Chem. Soc.* **47**, 2702-12(1925).—The soly. of $AgClO_4$ in C_7H_8 has been detd. from -73.5° to $+75^\circ$. At room temp. (25°) the soly. is 50.3%. Below 22.6° the solid phase is the compd. $AgClO_4 \cdot C_7H_8$. The ternary system, $AgClO_4-C_7H_8-H_2O$, has been studied from the ternary eutectic at -94° up to $+91.75^\circ$. There exist 7 quintuple points, each of which was detd., and 20 4-phase equilibria. The system shows, in addn. to the soly. curves for the 3 solid phases ($AgClO_4$, its hydrate and its compd. with toluene), 2 binodal curves, one of which is submerged and does not reach any of the 2-component axes at any temp. The intersection of the 2 binodal curves, at certain points which are not their plait points gives rise to a 3-liquid system which is stable from -24.1° to above $+90^\circ$.

JAMES M. BELL

Carbon dioxide-ammonia compounds. ROBERT MEZGER AND THEO. PAYER. *Gas u. Wasserfach* **68**, 651-5, 672-5, 687-91(1925).—Vapor-tension detns. are presented by tables and curves for a large no. of systems including the following aq. solns: those contg. 2% NH_3 only; 5 solns. contg. 2% NH_3 , and amts. of CO_2 corresponding to various possible definite compds., between 10° and 80° ; 6 solns. of from 1 to 4% NH_3 only, between 10° and 40° ; 19 solns. contg. 2% NH_3 and with NH_3/CO_2 ratio varying from 1/1 to 1/2.7, at 25° only. The application of the data presented to the control of NH_3 recovery systems is discussed briefly.

WM. B. PLUMMER

Systematic affinity principle. XXXII. Higher ammoniates of halides in the iron group. WILHELM BILTZ AND ERICH RAHLFS. *Z. anorg. allgem. Chem.* **148**, 145-51 (1925); cf. *C. A.* **19**, 3226.—Isothermic decompn. curves at -78.5° and tension curves were detd. of Mn, Fe, Co and Ni halide ammonia compds. Five new compds. were found from these data and the following properties detd. (continuation of earlier work, *C. A.* **18**, 606): $MnCl_2 \cdot 10NH_3$: 7.28 cal. (heat of formation per NH_3 mole from the next lower compd.), -61° (temp. corresponding to an NH_3 pressure of 100 mm.), 11.15 cal. (total heat of formation from halide plus gaseous NH_3 per mole NH_3); $MnCl_2 \cdot 12NH_3$: 7.15 cal., -65° , 10.48 cal.; $MnBr_2 \cdot 10NH_3$: 7.16 cal., -64° , 11.78 cal.; $FeCl_2 \cdot 10NH_3$: 7.25 cal., -62° , 11.70 cal.; $CoCl_2 \cdot 10NH_3$: 7.20 cal., -63.5° , 12.02 cal. Nickel decammines could not be found. The $CoCl_2 \cdot 10NH_3$ is different in its properties from the one of Clark, Quick and Harkins (*C. A.* **15**, 456). The Mn and Fe salts were white, the Co salt was dull rose.

XXXIII. Ammoniates of beryllium halides. WILHELM BILTZ AND CARL MESSERKNECHT. *Ibid* 157-69.— $BeCl_2$ forms compds. with 2, 4, 6 and 12 mols. NH_3 . $BeBr_2$ binds 10, 6 or 4 mols. NH_3 , BeI_2 13, 6 or 4. All tetrammines decompose at high temps., giving NH_4Cl (ammonolysis); at 200° the chloride tetrammine gives diammine and NH_4Cl . From the vapor-pressure values the partial heat of formation (dissociation heat) of the ammine from the next lower NH_3 compd. was calcd.; the total heat of formation from salt + gaseous NH_3 was evaluated from detns. of the heat of soln. of the compd. in HCl . The 2 values are as follows (one value of the vapor-pressure curve is added, as far as this was measured (heat values per mole NH_3)): $BeCl_2 \cdot 12NH_3$: 7.77 cal., 16.5 cal., $p_{-50^\circ} = 168.3$ mm.; $BeCl_2 \cdot 6NH_3$: 8.04 cal., 25.4 cal., $p_{-50^\circ} = 90$ mm.; $BeCl_2 \cdot 4NH_3$: 18.12 cal., 34.1 cal., $p_{111^\circ} = 0.49$ mm.; $BeCl_2 \cdot 2NH_3$: (50.0 cal.), 50.0 cal.; $BeBr_2 \cdot 10NH_3$: 7.85 cal., 19.1 cal., $p_{-50^\circ} = 138.6$ mm.; $BeBr_2 \cdot 6NH_3$: 8.76 cal., 26.6 cal., $p_{-30^\circ} = 96.8$ mm.; $BeBr_2 \cdot 4NH_3$: 35.6 cal.; $BeI_2 \cdot 13NH_3$: 7.92 cal., 17.1 cal., $p_{-68^\circ} = 31.0$ mm.; $BeI_2 \cdot 6NH_3$: 8.90 cal., 27.9 cal., $p_{-30^\circ} = 69.1$ mm.; $BeI_2 \cdot 4NH_3$: 37.0 cal. It appears from these data that Be takes an extreme place with its tridecammine iodide and with total heat values for the ammine formation more than double the usual values, in many cases larger than heats of hydration.

XXXIV. Ammoniates of cadmium and mercury halides. WILHELM BILTZ AND CARL MAU. *Ibid* 170-91.—The following data were obtained for partial heat, total heat, both per mol. NH_3 , temp. corresponding to $p_{NH_3} = 100$ mm. and $d_{25^\circ}^\circ$: $CdCl_2 \cdot 1NH_3$: 18.1 cal., 18.1 cal., $+228^\circ$, 3.166; $CdCl_2 \cdot 2NH_3$: 16.5 cal., 17.3 cal., $+183^\circ$, 2.681; $CdCl_2 \cdot 4NH_3$: 10.7 cal., 14.0 cal., $+23^\circ$, 1.984; $CdCl_2 \cdot 6NH_3$: 10.2 cal., 12.7 cal., $+20^\circ$, 1.687; $CdCl_2 \cdot 10NH_3$: 7.4 cal., 10.6 cal., -54° ; $CdBr_2 \cdot 1NH_3$: 18.1 cal., 18.1 cal., $+228^\circ$, 4.012; $CdBr_2 \cdot 2NH_3$: 16.9 cal., 17.5 cal., $+188^\circ$, 3.350; $CdBr_2 \cdot 6NH_3$: 10.7 cal., 13.0 cal., $+42^\circ$, 2.069; $CdBr_2 \cdot 12NH_3$: 7.6 cal., 10.3 cal., -64° ; $CdI_2 \cdot 2NH_3$: 16.6 cal., 16.6 cal., $(+186^\circ)$, 3.641; $CdI_2 \cdot 6NH_3$: 11.68 cal., 13.3 cal., $+63^\circ$, 2.311. Complete discussion of the mol. vol. data will follow later. The expts. with $HgCl_2$ confirmed earlier work on the diammine (m. p. in NH_3 atm. 250°) and yielded 2 new compds.; with $HgBr_2$ one new compd. was found;

slightly more complicated are the relations for HgI_2 on account of the formation of a mixed compd. $\text{HgI}_2 \cdot \frac{4}{3}\text{NH}_3$ or more probably $2(\text{HgI}_2 \cdot \text{NH}_3)(\text{HgI}_2 \cdot 2\text{NH}_3)$, described by Francois (*Compt. rend.* **129**, 296(1899)). The following data were obtained: $\text{HgCl}_2 \cdot 2\text{NH}_3$: 25.6 cal., $d_4^{25} = 3.77$; $\text{HgCl}_2 \cdot 8\text{NH}_3$: 8.1 cal., 12.5 cal., -43° ; $\text{HgCl}_2 \cdot 9\frac{1}{2}\text{NH}_3$: 7.2 cal., 11.7 cal., -58° ; $\text{HgBr}_2 \cdot 2\text{NH}_3$: 16.2 cal., $d_4^{25} = 4.335$; $\text{HgBr}_2 \cdot 8\text{NH}_3$: 7.8 cal., 9.9 cal., -51° ; $\text{HgI}_2 \cdot \frac{4}{3}\text{NH}_3$: 13.0 cal., 13.0 cal., $+95^\circ$; $\text{HgI}_2 \cdot 2\text{NH}_3$: 11.5 cal., 12.5 cal., $+40^\circ$, $d_4^{25} = 4.45$; $\text{HgI}_2 \cdot 6\text{NH}_3$: 7.55 cal., 9.2 cal., -48° ; $\text{HgI}_2 \cdot 12\text{NH}_3$: no data given. The results of some other d. measurements are: $\text{HgCl}_2 \cdot d_4^{25} = 5.440$; $\text{HgCl} \cdot \text{NH}_3$: 5.381; HgBr_2 : 109; HgI_2 : 6.360 (red modification). Some observations are given on mercurous halides. $\text{HgCl} \cdot \text{NH}_3$ (about 14.8 cal.) occurs, also $\text{HgBr} \cdot \text{NH}_3$ (13.1 cal.). XXXV.

Ammoniates of aurohalides. WILHELM BILTZ AND WALTER WEIN. *Ibid* 192-206.—Pure AuCl was prepd from dry HAuCl_4 by slow evap. *in vacuo* (10 mm.) at temps. between 150° and 200° . Prepus from synthetic AuCl_3 were never sufficiently pure. AuBr was prepd. in a similar way and from this AuI . The data obtained follow. $\text{AuCl} \cdot \text{NH}_3$: 24.6 cal., 24.6 cal.; $\text{AuCl} \cdot 2\text{NH}_3$: 13.9 cal., 19.3 cal., $+80^\circ$; $\text{AuCl} \cdot 3\text{NH}_3$: 7.2 cal., 11.2 cal., -58° ; $\text{AuCl} \cdot 12\text{NH}_3$: partial heat not detd., vapor pressure equal to that of pure NH_3 , total heat about 9 cal.; $\text{AuBr} \cdot \text{NH}_3$: 22.7 cal., 22.7 cal.; $\text{AuBr} \cdot 2\text{NH}_3$: 12.2 cal., 17.5 cal., $+51^\circ$; $\text{AuBr} \cdot 3\text{NH}_3$: 8.3 cal., 14.4 cal., -43° ; $\text{AuBr} \cdot 4\text{NH}_3$: 8.1 cal., 12.8 cal., -44° ; $\text{AuBr} \cdot 6\text{NH}_3$: 7.95 cal., 11.2 cal., -46° ; $\text{AuI} \cdot \text{NH}_3$: 15.6 cal., 15.6 cal., $\text{AuI} \cdot 2\text{NH}_3$: 9.1 cal., 12.4 cal., -20° ; $\text{AuI} \cdot 3\text{NH}_3$: 8.9 cal., 11.2 cal., -25° ; $\text{AuI} \cdot 6\text{NH}_3$: 8.0 cal., 9.6 cal., -46° ; $\text{AuI} \cdot 8\text{NH}_3$: about 9 cal. XXXVI. **Ammoniates of cuprihalides.** WILHELM BILTZ, HANS BROHAN AND WALTER WEIN. *Ibid* 207-16.—Fifteen compds. were found, many forming easily mixed crystals (the $3\frac{1}{3}$ ammine is probably one). The color, sky-blue for $\text{CuCl}_2 \cdot 10\text{NH}_3$ becomes more deep for each halide series on passing the $3\frac{1}{3}$ compd. and is generally of a darker shade for the iodides. $\text{CuCl}_2 \cdot 2\text{NH}_3$: 21.9 cal., 21.9 cal.; $\text{CuCl}_2 \cdot 3\frac{1}{3}\text{NH}_3$: 14.1 cal., 18.8 cal., $+84^\circ$; $\text{CuCl}_2 \cdot 5\text{NH}_3$: 12.2 cal., 16.6 cal., $+58^\circ$; $\text{CuCl}_2 \cdot 6\text{NH}_3$: (8.4 cal., 15.2 cal.); $\text{CuCl}_2 \cdot 10\text{NH}_3$: 7.6 cal., 12.1 cal., -62° ; $\text{CuBr}_2 \cdot 2\text{NH}_3$: 21.0 cal., 21.0 cal.; $\text{CuBr}_2 \cdot 3\frac{1}{3}\text{NH}_3$: 15.6 cal., 18.9 cal., $+118^\circ$; $\text{CuBr}_2 \cdot 5\text{NH}_3$: 12.9 cal., 16.9 cal., $+68^\circ$; $\text{CuBr}_2 \cdot 6\text{NH}_3$: (9.1 cal.), 15.6 cal.; $\text{CuBr}_2 \cdot 10\text{NH}_3$: 7.8 cal., 12.3 cal., -61° ; $\text{CuI}_2 \cdot 2\text{NH}_3$: no data; $\text{CuI}_2 \cdot 3\frac{1}{3}\text{NH}_3$: 15.2 cal. (partial heat), $+109^\circ$; $\text{CuI}_2 \cdot 5\text{NH}_3$: 13.2 cal., $+75^\circ$; $\text{CuI}_2 \cdot 6\text{NH}_3$: (9.8 cal.); $\text{CuI}_2 \cdot 10\text{NH}_3$: 7.0 cal., -64° . B. J. C. VAN DER HOEVEN

The measurement of very low temperatures. XXXII. **The thermal dilatation of Jena glass 16 III.** F. P. G. A. J. VAN AGT AND H. KAMERLINGH ONNES. *Verslag Akad. Wetenschappen Amsterdam* **34**, 618-24(1925).—Of a Dewar one m. long glass the displacement of the inner wall, cooled to the b. p. of C_2H_6 , O_2 or H_2 was measured relative to the outer wall at room temp. (13.1°). The following changes in length were observed for 1000.00 mm glass: inner wall at $+97.8^\circ$ 0.671 mm; at -102.8° -0.770 mm; at -182.5° -1.176 mm; at -252.8° -1.294 mm; they can be represented by an equation $l = l_0[1 + 10^{-6}(at/100) + b(t/100)^2 + c(t/100)^3 + d(t/100)^4]$ with coeffs. $a = 716.8$; $b = 48.33$; $c = 9.02$; $d = 10.9$; t is the temp. The mean linear expansion coeff is between -97.8° and $+13.1^\circ$ $10^6\alpha_{1/2} = 7.93$; between $+13.1^\circ$ and -102.8° 6.64; between -102.8° and -182.5° 5.10; between -182.5° and -252.8° 1.65. This coeff. has at low temp. a temp curve similar to the sp.-heat curve with proportionality to T^3 (Debye) rather than to T (Born). B. J. C. VAN DER HOEVEN

The ratio of the specific heats of hydrogen. J. R. PARTINGTON AND A. B. HOWE. *Proc. Roy. Soc. (London)* **109A**, 286-91(1925).—Using the app. and methods previously described for use with air, CO_2 , O_2 and N_2 , P and H₂ find $C_p/C_v = \gamma = 1.4113 \pm 0.0002$; hence $C_p = 2.397$ and $C_v = 3.383$ g. cal. These values are compared critically with the results of previous investigators. G. L. CLARK

Heat of formation of lead carbonate. A. L. MARSHALL AND B. BRUZS. *J. Phys. Chem.* **29**, 1184-6(1925).—Correction. The last sentence in the abstract (C. A. **19**, 3114) and the summary in the journal should read: The values of ΔH (negative "heat of reaction") for $\text{PbO} + \text{CO}_2 = \text{PbCO}_3$ and $\text{PbO} + \text{PbCO}_3 = \text{PbO} \cdot \text{PbCO}_3$ are -21.1 and -0.34 K. cal., resp. B. BRUZS

The difference between several forms of thermodynamic principles. WITOLD JAJZYNA. *Physik. Z.* **26**, 622-8(1925).—A theoretical treatment of the conversion of heat into work and the detn. of the state of a substance. J. H. P.

The equation of state and its relation to the fundamental laws of thermodynamics. N. J. KOLTSCHIN. *Z. anorg. allgem. Chem.* **147**, 312-20(1925).—K. continues the work of R. Lorenz (cf. *Festschrift zur Jahrhundertfeier des Physikalischen Vereins*, Frankfurt, A. M. 1924) on the question as to the limiting conditions of the relation between

V and S within which the equation of state can be derived without restriction and in finite form from the general requirements (the first and second laws) of thermodynamics. He concludes that the condition $V = V(T)$ is not sufficient, but that it is further necessary that $S = S(vT)$. However, the equation of state in its differential form must not be inconsistent with the requirements $V = V(T)$ and $S = S(pT)$. These different conclusions, brought about by the presence of p or v in S , depend on the special form of the elementary work $dR = A p dv$. In a general case, however, if $dR = f_1 dd\phi + f_2 dv + f_3 dT$, where f_1, f_2, f_3 are condition functions, and under the conditions $U = U(T)$ and $S = S(vT)$, it is possible that the equation of state can appear in differential, not integrable form.

R. L. DODGE

The difference between several forms of the thermodynamic principle. WITOLD JAZYNA. *Physik. Z.* **26**, 622-8(1925).—A discussion of: (1) the transformation of heat into work, and (2) the detn. of the state of a substance, particular use being made of the $p-v$ diagram.

J. H. PERRY

Further experiments with liquid helium. X. The electrical resistance of pure metals, etc. XIV. The influence of elastic deformation on the superconduction of tin and indium. G. J. SIZOO AND H. KAMERLINGH ONNES. *Verslag Akad. Wetenschappen Amsterdam* **34**, 606-17(1925); cf. *C. A.* **18**, 495.—The resistance-temp. curve was detd. for a Sn wire 16.5 cm. long, 0.30 mm. diam. (30 ohms at room temp.) with and without an extending weight of 197 g. (2.52 kg./sq. mm.). The line on which the resistance disappears (at 3.7° K.), shifts slightly (0.007°) to higher temp. (as detd. from He pressure) under tension. By subjecting a Sn wire coil to a uniform pressure in compressed He it was found that the line shifted to lower temps. For 300 kg./sq. cm. pressure a change of 0.005° was observed; this max. was reached practically for 193 kg./sq. cm. No change in the normal resistance curve occurred; the elastic limits were never reached. Similar results were obtained by compression of pure indium wires. For a pressure of 200 kg./sq. cm. the leap-point changes over -0.006° (it lies at 3.4° K.). These results seem to indicate that a relatively large space between the atoms is favorable for superconduction.

B. J. C. VAN DER HOEVEN

The measurement of single boundary potentials. EMIL BAUR. *Z. Elektrochem.* **31**, 514-7(1925); cf. Wild, *C. A.* **17**, 920; Buchi, *C. A.* **19**, 1222. According to Buchi, a sufficient condition for elimination of diffusion potential is that the 2 solns have equal cond. The cond. of AmOH solns. in distribution equil with N and 0.1 N KCl, N and 0.1 N CaCl₂ and 0.1 N HCl aq. solns. are, resp., 6.4, 1.9, 1.7, 0.37 and 23×10^{-6} mhos. The e. m. fs. of the chains: $\text{Hg} | \text{HgCl} | N \text{ KCl(aq.)} \rightleftharpoons N \text{ KCl(AmOH)} | N \text{ CaCl}_2(\text{AmOH}) \rightleftharpoons N \text{ CaCl}_2(\text{aq.}) | \text{HgCl} | \text{Hg}$ and a similar one using 0.1 N solns. instead of N are 0.026 and 0.022 v., resp. Those of the corresponding chains where an equiv. HCl soln., in equil. with AmOH, is inserted between the middle boundary (d) are 0.0015 and 0.0012. Thus the phase boundary potential, g , may be said to be 0.

D. S. VILLARS

Potential of fluorine as determined by measurement of the decomposition potentials of molten fluorides. BERNHARD NEUMANN AND HELMUT RICHTER. *Z. Elektrochem.* **31**, 481-3(1925).—The previously described app. (cf. *C. A.* **19**, 3205) was used with a Pt crucible and graphite electrodes. The av. potential (referred to H₂ as zero) of the F electrode in molten fluorides was extrapolated to 18° and is $1.923 \pm .01$ v. A direct measurement of the H₂F₂ decompn. potential in acid KF gave 1.9285 v. The potential of the Al electrode extrapolated to 18° was 0.844 ± 0.015 v. The negative temp. coeff. observed for chlorides, bromides and iodides is almost the same but that observed for fluorides is much more negative. Heats of formation calcd. from the temp. coeff. agree as well as could be expected with calorimetric data. D. S. VILLARS

Current-electromotive force curves for nickel and aluminium. E. LIEBREICH AND W. WIEDERHOLZ. *Z. Elektrochem.* **31**, 6-15(1925).—Current-e. m. f. curves have been detd. for Ni in 0.1% H₂SO₄, 1% H₂O₂ + H₂SO₄, 0.1% H₂SO₃, and 2 N NaOH, and for Al in 0.1 N NaOH, 0.1 N HCl and 0.1% H₂SO₄. The small Ni or Al wire was first made the cathode and the e. m. f. increased to vigorous H₂ evolution; readings of current and e. m. f. were then taken as the latter was decreased to 0, reversed, increased to complete anodic polarization, and finally back again to cathodic polarization. Curves plentifully annotated as to miscellaneous points of H₂ evolution, etc., are given for each of the above electrolytes.

WM. B. PLUMMER

Studies of electrolytic polarization. III. The diffusion layer. SAMUEL GLASSSTONE. *J. Chem. Soc.* **127**, 1824-31(1925).—"An examn. of the difference between the direct and the extrapolated overvoltages at Pb and Hg cathodes in various electro-

lytes has lead to the conclusion that the thickness of the diffusion layer at an electrode from which gas is being liberated freely decreases as the c. d. is increased; this is probably due to the stirring caused by the rapid evolution of bubbles. This view has been confirmed by an analysis of the abnormal fall in the back e. m. f. of a Hg cathode in a dil. soln. of H_2SO_4 contg. an excess of alkali sulfate, and of various cathodes in N HCl satd. with Cl. In previous work it has been found that O diffusing from the anode may influence the initial fall of the back e. m. f. of a Hg cathode in a manner which depends on the material of the electrode vessel and the c. d.; a similar abnormality has been observed as the result of the diffusion of anodic Cl toward a Hg cathode in HCl soln." R. H. LOMBARD

Researches on the paramagnetic salts. MME. E. COTTON-FEYTIS. *Ann. chim.* 4, 9-78(1925).—A monograph giving in full the results of elaborate investigations extending over a number of years, and correlating data published in earlier preliminary notes in *Compt. rend.* (1911, 1913), etc. The coeff. of magnetization was measured for a no. of salts in the solid state. The results are interpreted as indicating that in the case of certain ions dissociation begins in the crystal. It was found possible to detect certain reactions by magnetic measurements and also to distinguish between water of crystn. and "water of constitution". W. W. STIFLER

Doubly refractive white phosphorus. D. VORLÄNDER, WERNER SELKE AND GEORG KREISS. *Ber.* 58, 1802-6(1925).—The change of regular white P to the strongly doubly refractive variety was observed through the polarization microscope. On heating, the change occurred at -68° , and at -75° on cooling. P crystd. from CS_2 at -80° , and from ether at -100° gave 6-sided crystals, similar to those of K_2PtCl_6 . Neither As, the diamond, Au, NaCl, nor KI gave a similar doubly refractive product at the temp. of liquid O. The expts. will be continued with the use of liquid H. R. C.

The geometrical solution of color mixture problems. J. GUILD. *Trans. Opt. Soc. (British)* 26, No. 3, 139-75(1924-5). D. E. SHARP

The anomalous electrical double refraction of sodium vapor. R. LADENBURG AND H. KOPFERMANN. *Sitzb. preuss. Akad. Wissenschaften* 420-4(1925).—In a strong elec. field, the D-line of Na is displaced a little toward the red (0.01-0.02 Å. U.). The D_2 -line is polarized by an elec. field and the π -component, parallel to the field, is displaced more than the σ -component. The D_1 -line shows no difference in both polarizing directions. Using crossed Nicols with quarter-wave-length plates and inserting a field of 30,000 v./cm., the phase difference of the π - and σ -components is 6 arc degrees or $n_\pi - n_\sigma = 3.5 \times 10^{-7}$. Using half-shadow apparatus, $\lambda_\pi^0 - \lambda_\sigma^0$ is about 9/10 of the simultaneous displacement $\lambda_\pi^0 - \lambda_\sigma^0$, so that the π -component is displaced about 10 times as much as the σ -component. Analysis shows that the π -component should be made up of 2 components, the π_1 -component which is displaced as strongly as the π -component and is about $1/3$ as intense as the π_2 -component which is not displaced. MARIE FARNSWORTH

The spectral pyrometry of glowing bodies. HERMANN SCHMIDT. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Dusseldorf.* 6, 61-9(1925).—A mathematical paper which shows that the comparison of the intensity and color of the rays of an optical radiator with the rays of a black body leads to a varying definition of the temp. S . $S_m < T < S_F$, where S_m is the temp. of the monochromatic rays, T is the temp. of the radiator and S_F is the color temp. A higher and lower limit for T cannot be detd. from the spectral position of the energy max. in union with the Wien displacement law and the analogous law for bright Pt. T cannot be detd. from the intersection point of the logarithmic isochromatic lines so long as their absorption behavior in dependence on wave length is unknown; temp. detn. from the position of the ray I_{max} is somewhat successful. S_F is detd. from the intersection of the isochromatic lines; and in case the color temp. is independent of the wave length, by the position of the ray max. M. F.

The production of optical activity in silver by circularly polarized light. H. ZOCHER AND K. COPER. *Sitzb. preuss. Akad. Wissenschaften* 426-31(1925).—Circular optical asymmetry is produced in AgCl by irradiation with circularly polarized light; this asymmetry consists in an optical activity or differential refraction of different circular lights, recognized by a rotation of the vibration direction or polarization plane as a circular dichroism or Cotton effect. In the expts. a Ag mirror was converted into AgCl, and very fine Ag was pptd. from this by the action of light, the effect observed being due to the presence of this Ag. G. L. CLARK

The scattering of light by liquid boundaries and its relation to surface tension. III. C. V. RAMAN AND L. A. RAMDAS. *Proc. Roy. Soc. (London)* 109A, 272-9(1925); cf. C. A. 19, 3059, 3208.—The observations on the surface-scattering of light by clean

water and comparisons of its brightness (visual) with those of 28 other liquids indicate that the intensity of surface opalescence increases with decreasing surface tension or increasing values of n . Introduction of traces of oleic acid, etc., markedly increase the intensity as would be expected from the formation of a thin film of lower surface tension. Similarly the intensity of surface opalescence of liquid CO_2 increases as the crit. pt. is approached, although the directions of max. brightness are more nearly parallel to the surface than is ordinarily the case, and the polarization of the scattered light is only complete in the immediate vicinity of the regularly reflected rays. Similar observations have also been made of the interfacial scattering by the boundaries between CS_2 and MeOH mixts., as the crit. soln. temp. is approached.

G. L. CLARK

X-ray studies of the ultimate structures of commercial metals (CLARK, *et al.*) 4. The relations of zirconium phosphate toward acids and bases (BOER, ARKEL) 6. A deviation of the law of Poiseuille (MARZETTI) 30. Course of electrochemical reduction of solid electrodes (FISCHBECK) 4.

HENRIQUES, F. DE CARVALHO: *Vocabulario Tecnico: Português-Inglês-Francês*. Lisbon, Portugal: F. De Carvalho Henriques. Cloth, pp. 216. \$1.65 postpaid. Reviewed in *Eng. News-Rec.* 95, 315(1925).

3-SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Post-arc conductivity and metastable helium. CARL HCKART. *Phys. Rev.* 26, 454-64(1925). D. C. BARDWELL

Physically degenerate systems and quantum dynamics. J. C. SLATER. *Phys. Rev.* 26, 419-30(1925). D. C. BARDWELL

The estimation of maximum coefficients of absorption. R. C. TOLMAN. *Phys. Rev.* 26, 431-2(1925). D. C. BARDWELL

A study of a certain type of air discharge tube at the critical resistance for flashing. JAMES TAYLOR AND L. A. SAYCE. *Phil. Mag.* 50, 916-37(1925); cf. *C. A.* 19, 1810. S. C. L.

Diffraction by line screens. L. R. WILBERFORCE. *Phil. Mag.* 50, 967-70(1925). S. C. L.

Thermoelectric power and the Hall coefficient. C. W. HEAPS. *Phil. Mag.* 50, 1001-9(1925). S. C. L.

The Fulcher lines in the hydrogen spectrum. C. R. BURY. *Phil. Mag.* 50, 1139-43(1925). S. C. L.

Emission and absorption bands of carbon dioxide in the infra-red. J. W. ELLIS. *Phys. Rev.* 26, 469-74(1925). D. C. BARDWELL

A treatment of radiation pressure and gas pressure as due to inter-molecular forces. J. Q. STEWART. *Phys. Rev.* 26, 491-4(1925). D. C. BARDWELL

Influence of radiation on ionization equilibrium. J. WOLTJER, JR. *Nature* 115, 534(1925).—Results obtained by Saha and Sve for their theory of the stationary state (cf. *C. A.* 19, 1811) may be obtained by starting from Einstein's paper on Planck's radiation law and from Milne's extension to the photo-elec. effect. This alternative method is based on the formulation of the conditions required, for a stationary state by means of probability laws governing the elementary processes involved.

FLORENCE N. SCHOTT

Scattering of α -particles by atomic nuclei and the law of force. E. RUTHERFORD. *Phil. Mag.* 50, 889-913(1925).—Previous expts. of R. and his collaborators have shown that the close approach of α -particles to heavy atoms like U follows the inverse-square law of force, but that the approach to light atoms like Mg and Al departs from the law and indicates a combination of both repulsive and attractive forces on penetrating into the light nuclei. The present expts. with Au, Mg and Al further demonstrate the same principles. With Au no departure from the inverse-square law is observed, but with Al and Mg, a great drop in scattering is observed in passing from the low velocity toward the higher velocity particles. A min. value is attained and the still swifter particles again show increased scattering. These minima seem to require the assumption of both attractive and repulsive forces, and R. tentatively assumes 3 shells, the middle one being negative and the outermost and innermost ones positive. Out-

side all, the inverse square law is obeyed. Between the first positive and negative, the repulsive force diminishes, so that a particle with sufficient velocity to reach this zone produces less scattering. Inside the negative shell the repulsive force (and scattering) again increases. The equiv. voltage for which this minimum occurs is about 3 million v. or about the same as that necessary to cause the ejection of a proton emission of a swift H particle. This indicates that such emission does not take place until the α -particle actually penetrates the satellite system. This min. scattering for both Al and Mg corresponds to a distance of approach of about 7.8×10^{-13} cm. S. C. LIND

A method of analyzing radioactive radiation by means of absorption. MME. J. S. LATTES *Compt. rend.* **180**, 1400-2(1925).—The technic (giving results already reported; cf. C. A. **19**, 1986 and *Compt. rend.* **176**, 867, 963; **177**, 798) consists in interposing a "radiator" or screen of fixed thickness and various absorbing "analyzing screens" within the series—radiating source, electromagnet and ionizing chamber. The radiator absorbs the primary β -radiation completely but emits secondary β - and γ -radiation. Five groupings of app. give the intensities of primary β - and γ -radiation of desired groups of rays. L.'s experience has shown that to each definite group of primary γ -rays there corresponds a definite group of secondary β -rays. A mathematical derivation of the intensity of the latter for any thickness of screen is given in detail. In all of L.'s work secondary γ -radiation produced by primary β -radiation has been less than the exptl. error C. M. BOUTON

The decay constant of radium-argon. MARIETTA BLAU. *Sitzb. Akad. Wiss. Wien Abt. IIa*, **133**, 17-22(1924).—New detns. of the decay const. of Ra-A give $\lambda_A = 0.2273 \pm 0.0007$ min.⁻¹ $T_A = 3.05 \pm 0.009$ min. where T_A is the half life of Ra-A. These values are in good agreement with those of Rutherford and Robinson. D. C. BARDWELL

Theory of the number of β -rays associated with scattered X-rays. G. E. M. JAUNCEY AND O. K. DEFOE. *Phys. Rev.* **26**, 433-51(1925)—A correction factor applied to the ratio of the scattering coeff. to the absorption coeff. brings the theoretical value of the ratio of the recoil to photoelectron tracks to 0.097 as against an exptl. value of 0.10 (cf. Compton and Simon, C. A. **19**, 1534). D. C. BARDWELL

Some properties of monatomic hydrogen. HERMANN SENFTLEBEN. *Z. Physik* **33**, 871-8(1925).—Monatomic H was produced by illuminating a mixt. of H₂ and Hg vapor with light of $\lambda = 2537$ Å. U. H is produced by collisions of the second kind between excited Hg atoms and H₂ mols. and the H atoms conduct heat from an electrically heated wire more rapidly than the H₂ mols., as is to be expected. An anomalous effect in the conduction of heat from the wire was noticed and traced to a poisoning effect of the surface of the wire by O. S. measured the absorption of light by the gas and on the assumption that each quantum produced 2 atoms of H the rate of atomization was secured, and at "equilibrium" this is the rate of recombination. From this and measurements of the heat cond. of the non-illuminated and illuminated gas a value for the velocity const. of recombination was secured. The mean life of H is found to be about $1/4$ sec., agreeing well with other observations. H. C. U.

The significance of the magnetism of the rare earths to atomic theory. F. HUND. *Z. Physik* **33**, 855-9(1925).—Using the methods of a preceding paper (cf. above) H. has assigned the electrons of the 4_f shell of the rare earths and calcd. the magnetic moments of their ions. The 4_f shell is filled beginning with Ce⁺⁺⁺ and ending with Eu⁺⁺⁺. The 4_u shell is filled from Gd⁺⁺⁺ to Cp⁺⁺⁺. The calcd. values for the magnetic moments agree remarkably well with the observed values except in the case of Eu⁺⁺⁺. This element usually contains Gd as an impurity and this may account for the discrepancy. A table is given of the predicted ground terms of the neutral atoms. A similar calcn. of the magnetic moments of the ions of the elements from Sc to Zn was unsuccessful. H. C. U.

The problem of the relativity fine structure. GREGOR WENTZEL. *Z. Physik* **33**, 849-54(1925).—Three postulates in regard to a modified perturbation theory for at. systems are discussed with reference to the relativity fine structure. The original should be consulted since a brief abstract is impossible. One of these postulates is practically identical with the theory of Heisenberg (C. A. **19**, 3064). H. C. U.

The capture and loss of electrons by α -particles. G. H. HENDERSON. *Proc. Roy. Soc. (London)* **109A**, 157-65(1925); cf. C. A. **17**, 1375.—By the use of an ionization method the ratio of He⁺⁺/He⁺ was found to be independent of the nature of the material through which the rays pass, contrary to the prediction of Fowler (C. A. **18**, 1237). This ratio varies with the velocity raised to a power n which, however, decreases as the velocity increases; $n = 6.4 - 4.2 V/V_0$ approx. The results agree with those obtained by Rutherford (C. A. **18**, 1081) using the scintillation method. F. O. ANDEREGG

The absorption and scattering of γ -rays. N. AHMAD. *Proc. Roy. Soc. (London)* **109A**, 206-23(1925); cf. *C. A.* **18**, 2105, 3312.—The absorption of γ -rays from Ra B and C obeys the same general laws of absorption as do ordinary X-rays. The results agree well with Compton's formula; but are only from 0.2 to 0.33 as great as predicted by the classical theory. F. O. A.

The industry of radioactive compounds. CAMILLE MATIGNON AND (MISS) G. MARCHAL. *Chimie et industrie* **14**, 343-57(1925).—Brief historical review of its development, with a description of the more important radioactive minerals, their treatment for the extn. of Ra, and the applications of the latter. A. PAPINEAU-COUTURE

The occurrence of helium and neon in vacuum tubes. R. W. RIDING AND E. C. C. BALY. *Proc. Roy. Soc. (London)* **109A**, 186-93(1925).—The results of Collie, Patterson and Masson (*C. A.* **9**, 20) have been confirmed by bombarding nitrides of Al or Mg with cathode rays. He, Ne and H are set free but are usually occluded by spluttered metal. On strong heating they are set free. The H and He seem to be formed by the disintegration of N, the He in such a highly active condition as to allow synthesis of Ne. Of 2 induction coils tried only the smaller, which gave a 6" spark, produced results. F. O. ANDEREGG

The chemical activity of helium. E. H. BOOMER. *Proc. Roy. Soc. (London)* **109A**, 198-205(1925); cf. *C. A.* **19**, 753.—Expts. with intense electronic discharge from a W filament in low-pressure He led to the belief of a stable WHe_2 being formed. At a pressure of 0.1 to 0.45 mm. the rate of disappearance of He was greatest, reaching 5 cu. mm./min. at 1000 v. The loss in W was detd. by weighing the filament. The presence of Hg reduces the amt. of this compd. formed, although it increases the evapn. of W. The He is liberated on heating the spluttered material on the wall above the softening point of the glass or by treating with 20% HNO_3 or KOH. Any W present as compd. was dissolved by KOH but excess metallic W was not affected. Mixts of He, H and N gave only negative results. F. O. ANDEREGG

The chemical action of gaseous ions produced by α -particles. VI. Reactions of the oxides of carbon. S. C. LIND AND D. C. BARDWELL. *J. Am. Chem. Soc.* **47**, 2675-97(1925); cf. *C. A.* **18**, 3139.—With radon as a source of ionization, the reactions thereby produced in the following gases and gaseous mixts. were studied: CO, CO + O₂, CO₂, CO + H₂, CO₂ + H₂. A comparison is made between the no. of mols. reacting and the no. of ion pairs generated in the reactants, and the ratio is in all cases except CO₂ a large fraction of or a small multiple of unity. An ionic mechanism is proposed for several of the reactions. D. C. BARDWELL

Predicted ionization-potentials of niton and hydrofluoric acid. GEORGE GLOCKLER. *Phil. Mag.* **50**, 997-1001(1925).—On the basis of a rule relating quantum defect and at. no. Turner (*C. A.* **19**, 435) predicted a value for the ionization potential of Rn of 27.5 ± 1.5 v., which is higher than that of the lower members of the noble gases. In general, ionization potentials are higher for the lower members of a series and accordingly from He, Ne, etc., G. predicts a value for Rn of 10 ± 0.9 v. and of 15.7 ± 0.7 v. for HF. The kinetic theory radius of Ne is estd. from Eve's rule to be 1.29 A. U. and of Rd 2.8 ± 0.25 A. U. S. C. LIND

Contributions to the knowledge of atmospheric electricity. LXV. The characteristics of current in weakly ionized gases. EGON SCHWEIDLER. *Sitzb. Akad. Wiss. Wien Abt. IIa*, **133**, 23-7(1924).—If a weakly ionized gas contains adsorption kernels, which can form heavy ions, the rate of ion recombination is shown mathematically to be proportional to the ion concn. Formulas are developed showing the proportionality between the cond. of a weakly ionized gas and the satn. deficit. "Half potential" is defined as that potential at which the current at the electrodes of a condenser is half the satn. current. The application of these conceptions to the study of atm. electricity is discussed. LXVI. **Experimental studies on the characteristics of current in a weakly ionized gas.** WALTER SCHLENCK. *Ibid* 29-33.—It is found that the rate of recombination of ions in a weakly ionized gas is proportional to the ion concn. and that the proportionality factor is dependent upon the concn. of dust particles present. D. C. BARDWELL

The mobility of argon and hydrogen ions in air. H. A. ERIKSON. *Phys. Rev.* **26**, 465-8(1925); cf. *C. A.* **19**, 437.—By methods previously described, 2 positive ions and 1 negative ion were found for A and H₂ as in the case for air. The initial H ion was found to transform into the second. The following mol. ions have the same mobility in air at normal pressure: monatomic A, initial + and -; diatomic air, initial + and -; diatomic H₂, initial +; and triatomic CO₂, initial + and -. Thus the mobility of these ions seems to be independent of the masse. Initial H₂⁻ has higher mobility. D. C. BARDWELL

Probability of ionization of gas molecules by electron impact. K. T. COMPTON AND C. C. VAN VOORHIS. *Phys. Rev.* **26**, 436-53(1925).—Measurements are made from which the no. of ions per cm. of path produced by an electron moving through a gas at 1 mm. pressure are calcd. for: H_2 , He, Ne, A, N_2 , Hg and HCl. In each case there is a voltage at which the no. goes through a max. The probability of ionization upon collision is calcd. for the max. conditions, assuming kinetic-theory values for electronic mean free path. The results are summarized and compared with previous results.

D. C. BARDWELL

The excitation of the O-energy levels in tungsten by electron bombardment. OTTO STUHLMAN, JR. *J. Elisha Mitchell Sci. Soc.* **41**, 20(1925).—When thermoelectrons liberated from a W filament were accelerated and allowed to impinge on a W grid, secondary electrons were emitted by the grid. The no. emitted were measured by means of a galvanometer in series with the grid and a plate maintained at a const. positive satn. potential. The O-energy levels so far discovered have n/R values as follows: $O_2-O_1 = 0.608$, $O_4-O_3 = 2.96$ and $O_5 = 5.20$.

A. L. MEHRING

The migration of ions in solid electrolytes. II. M. LE BLANC AND M. KRÖGER. *Z. Elektrochem.* **31**, 359-60(1925); cf. *C. A.* **18**, 3516. —A reply to the article of Tubandt and Reinhold (*C. A.* **19**, 1520).

D. C. BARDWELL

The effect of light upon the thermal conductivity of selenium. R. E. MARTIN. *Phys. Rev.* **26**, 475-85(1925).—Evidence is given which indicates that the thermal and electrical cond. in metals depends to a considerable extent upon the same factors.

D. C. BARDWELL

Thermoelectric effect in single-crystal zinc wires. E. G. LINDER. *Phys. Rev.* **26**, 486-90(1925).

D. C. BARDWELL

The J phenomenon in X-rays. II. Application to scattered X-rays. C. G. BARKLA AND S. R. KHASTGIR. *Phil. Mag.* **50**, 1115-34(1925); cf. *C. A.* **19**, 2450. —The nature of the X-radiation scattered by paper has been examd. by means of its absorption. The scattered radiation either has definitely the same absorption as the primary, or else differs markedly from it. The change is not a Compton effect and yet it is connected with it in some way. When a change of wave length occurs the J discontinuities are the steps from one level to another and the change of activity is the J transformation. The dependence on some unknown crit. condition is characteristic of the phenomenon.

S. C. L.

Magnetic quality in crystals. J. FORREST. *Phil. Mag.* **50**, 1009-18(1925).—An attempt is made to establish magnetic crystal lattices and to compare them with the X-ray lattices in different crystal systems.

S. C. L.

Reflection of X-rays from potassium bromide crystals. HELMUTH KULENKAMPFF. *Physik. Z.* **26**, 657-8(1925).—Clark and Duane (*C. A.* **16**, 4134; **17**, 2230, 2660; **18**, 346, 3316) reported anomalous reflection of X-rays from alk. halide crystals, attributing the phenomenon to the excitation of the K series of some of the constituents of the crystals. Recently, Armstrong, Duane and Havighurst (*C. A.* **19**, 1817) obtained only normal reflections from well-formed crystals of KI and CsI. Walter (*C. A.* **18**, 1430) and Mic (*C. A.* **17**, 2820; **18**, 18) were unable to confirm the anomalous reflection. K. presents further evidence for the nonexistence of the phenomenon.

F. C. KRACEK

Total intensity of scattered X-radiation. O. K. DEFOE AND W. W. NIPPER. *Nature* **115**, 607(1925).—A Coolidge tube with a Mo target, which was operated at about 5 ma. and 25 kv. peak was used in a room about 22 × 25 ft. and 10 ft. high. It was located about 2 ft. from one side and equidistant from the ends of the room. The effect of the radiation on a photographic film placed about 50 cm. from the tube, and on a fluoroscope indicates that the intensity of the scattered radiation inside the room is nearly of the same order as that of the direct radiation (cf. *C. A.* **19**, 210).

FLORENCE N. SCHOTT

Spectroscopic evidence of J-transformation of X-rays. S. R. KHASTGIR AND W. H. WATSON. *Nature* **115**, 604-5(1925).—Attention is directed to irregularities occurring in the relation between the at. no. of a radiator and the wave lengths of its X-ray emission spectrum of K-series. At $n = 52$ and 56 there is an increase in wave lengths K_{α_1} of about 0.01 A. U. in each case. These irregularities also occur in K_{α_2} and K_{β} but not in K_{α} . The wave lengths at which these sudden increases take place correspond very well with 2 of the crit. absorbabilities for J-transformation, which with Al are $(\mu/\rho)_{Al} = 1.9$ and 0.7 (cf. *C. A.* **12**, 20, 2279). Conclusion: These irregularities are due to the J-transformation of X-radiation taking place in the calcite crystal used for the analysis of the radiation or possibly in the anticathode or walls of the X-ray tube. This suggests the view (cf. *C. A.* **18**, 623; **19**, 932, 1093, 2450) that the apparent

increase of wave length as observed by Compton and others in the scattered radiation is due to the same J-transformation during transformation in the crystal or in the radiator, and is not part of the phenomenon of scattering. FLORENCE N. SCHOTT

The Compton and Duane effects. G. E. M. JAUNCEY. *Nature* 115, 456-7 (1925).—The excess variation in the long wave-length limit of the modified band is explained by taking into account the momentum of the scattering electrons in their Bohr orbits. With a large variation of ϕ the intensity would be greatest at the short wave-length limit of the band as observed by Duane with a large scattering block. However, Compton, using a smaller scattering block and a spectrometer of less resolving power than Duane, finds for $\phi = 90^\circ$ that the wave-length change of the most intense part of the modified band is 0.0242 A. U. For a large scatterer the intense portion becomes indistinct and hence tends to obscure the existence of the Compton wave-length change. A spectrometer of low resolving power will show the Compton wave-length change better than one of high resolving power.

FLORENCE N. SCHOTT

A note on the summation rules for the intensities of spectral lines. R. H. FOWLER. *Phil. Mag.* 50, 1079-83 (1925); cf. *C. A.* 19, 2600.—It is the object of this note to give as accurate theoretical interpretation as possible of the well-known summation rules of Ornstein, Burger and Dorgelo by a refined application of the correspondence principle, in order to see in what sense the summation rules are to be interpreted when applied to associated lines whose frequency differences are not entirely negligible. It is shown that if the intensities are reckoned in nos. of quanta per sec., then the summation rules ought to be fulfilled to the degree of accuracy with which the Fourier coeffs. of the original electronic system are left unaltered by the superposed perturbation which splits the radiation up into the associated group of lines.

S. C. L.

Experiments on the absorption of the Balmer lines in hydrogen. RUBY V. JOLOWICZ. *Phil. Mag.* 50, 1089-96 (1925).—An attempt is made to absorb lines of the Balmer series of H, by passing them through H being excited by bombardment of thermoelectrons propelled at suitable voltages. The negative result is taken to mean that but few excited H atoms were present and the ions known to be present were of the mol. type H_2^+ which are produced at about 16 v.

S. C. L.

Fine structure of spectrum lines. A. E. RUARK AND R. L. CHENAULT. *Phil. Mag.* 50, 937-56 (1925).—After a general consideration of the facts of fine structure lines, the treatment is confined to the case where several components arise from one spectral level all characterized by the same total, azimuthal and inner nos. A table shows the character of spectral levels for 21 elements and the fine structures of Al, Cd, Tl, Cu, Pb, Bi, Mn, Br and I. The spectral classifications of Mn are effected by the aid of fine structure and some predicted lines have been found.

S. C. L.

The molecular structure and infra-red spectrum of methane. D. M. DENNISON. *Astrophys. J.* 62, 84-103 (1925).—An attempt is made to treat the CH_4 mol. by the quantum theory and to det. the frequencies which it may absorb or emit. The assumption is made that in the normal state the 4H nuclei lie at the corners of a regular tetrahedron while the C nucleus lies at the center, and that, following an infinitesimal displacement of the nuclei the potential energy depends on the squares of the displacements along the lines between the nuclei. This model yields 4 normal frequencies, which through the use of two undetd. constns. may be made to coincide closely with the 4 fundamental frequencies found exptly. by Cooley (cf. following abstract). By studying the change of the electric moment the relative intensities of these 4 bands are predicted in satisfactory agreement with the exptl. intensities. W. F. MEGGERS

The infra-red absorption bands of methane. J. P. COOLEY. *Astrophys. J.* 62, 73-83 (1925).—Previous investigations on CH_4 with prism spectrometers have shown 3 absorptions bands at 7.7μ , 3.31μ and 2.35μ . By using diffraction gratings with 2800 or 7200 lines per inch these bands have been partially resolved into lines. Hollow brass cylinders, $1/2$ mm. to 30 cm. in length with thin sheets of mica for ends, were used as containers for the gas; the source of light was a Nernst glower; the detecting system consisted of thermopile and galvanometer. About 50 lines in the region 3.31μ were measured and arranged in positive and negative series. Between these and masking part of the negative or longer wave-length series, lies a narrow region of intense absorption corresponding to the zero branch. The band at 7.7μ is similar to the one at 3.31μ . Twelve lines in the negative series and 18 in the positive series have been measured but again in the zero branch no fine structure appears. The resolving power of the app. was insufficient to show much detail in the band at 2.35μ . In the positive and negative branches near 7.7μ the frequency difference between adjacent lines is 77 cm^{-1} , and near 3.31μ it is 5.41 cm^{-1} . A fair band of 12 lines near 3.5μ has a frequency difference about 15.3 cm^{-1} . Corresponding to these 3 frequency differences

the moments of inertia of the CH_4 mol. are 5.66×10^{-40} , 10.2×10^{-40} and 3.61×10^{-40} g sq. cm.

W. F. MEGGERS

The red neon lines. KEVIN BURNS. *J. Optical Soc. Am.* **11**, 301-10(1925).—The relative values for the wave lengths of some 20 lines in the Ne spectrum are tested with the interferometer and with const. differences in wave nos.; the values of these standards are sufficiently accurate to justify taking the means to 4 places of decimals in A. U.

W. F. MEGGERS

The auroral green line. J. C. McLENNAN. *Nature* **115**, 382(1925); cf. *C. A.* **19**, 2782.—The line $\lambda 5577.35 \pm 0.15$, thought to be identical with the auroral green line, is observed in the spectrum of a mixt. of air and an excess of He. The line was not observable in the spectrum of purified O, H, N or He. No mixts. of any 2 of these gases other than O and He gave this spectral line. *Ibid* 607.—The line $\lambda 5577$, which McL. thinks is identical with the auroral green line, can be obtained with a mixt. of O_2 and excess of He at room temp. with suitable pressure. This line probably has its origin in O.

FLORENCE N. SCHOTT

The resonance radiation from thallium vapor. A. L. NARAYAN AND K. RANGAD-NAMA RAO. *Nature* **115**, 534(1925).—N. and R. confirm previous exptl. results showing that $1\pi_2$ is the ground orbit of the valence electron in the Tl atom. Tl vapor, subjected to radiation $\lambda 5350$ ($1\pi_1 - 1\sigma$), does not emit any radiation, while when illuminated by radiation $\lambda 3775$ ($1\pi_2 - 1\sigma$) it acquires the ability of emitting radiation $\lambda 5350$ and 3775, the fluorescent track in this latter case being of a beautiful green color.

FLORENCE N. SCHOTT

The spectrum of potassium excited during its spontaneous combination with chlorine. L. A. RAMDAS. *Nature* **115**, 533-4(1925).—The spectrum emitted by K burning in Cl at normal pressure spontaneously was photographed with the quartz spectrograph. A very strong emission band in the red is shown extending from about 7200 to 6150, corresponding to the emission and absorption bands obtained by McLennan and Ainslie in the fluorescence and absorption spectra, resp., of dense K vapor. Many are lines of moderate intensity and the enhanced lines are seen: 4466, 4388, 4307, 4220 and 4115. Since no external elec. forces were used these enhanced lines are excited by the electron affinity of the Cl atom, together with the temp. attained by the K vapor as a result of the chem. reaction.

FLORENCE N. SCHOTT

Intensities of band spectrum lines. H. HÖNL AND F. LONDON. *Naturwissenschaften* **13**, 756(1925).—Preliminary report on a new calcn. method (cf. Fowler, *C. A.* **19**, 2600). Publication in *Z. Physik* will follow.

B. J. C. VAN DER HOEVEN

The structure of the mercury line 2536 A. U. R. W. WOOD. *Nature* **115**, 461(1925); cf. *C. A.* **20**, 17.—The structure of the Hg line 2536 A. U. photographed by Nagaoka is not the true structure, caused by the absorption of the Hg vapor in the neck of the Arous lamp, which is in a state of ionization from its contact with the arc. The true structure, observed with a water-cooled vertical quartz Hg arc, has 5 components of uniform intensity; 4 are at sensibly equal intervals; the fifth is at a slightly greater septn.

FLORENCE N. SCHOTT

The doublet structure of a class of band spectra. R. MECKE. *Naturwissenschaften* **13**, 755-6(1925).—According to Landé the width $\Delta\nu$ of doublet terms for alk. metals and some other elements is proportional to Z^2/n_a^3 ($Z_s = Z - s$ is the effective at. no.; s is the screening coeff. averaging 4; n_a is the effective main quantum no.). This rule is applied to those compds. which are comparable to alk. metals in that 1 valence electron is free to emit a (band) spectrum: CN , BO , C^+O , N_2^+ , also singly ionized alk. earth halides. For the latter it is empirically found that the ratio of the doublet widths for CaCl^+/K , SrBr^+/Rb and BaI^+/Cs is practically const. and equal to 1.35. Assuming for this reason that the width is proportional to $1/2(Z_s^2 + Z^2)$ for the halides, M. proceeds to calc. approx. values of Z_s for the halogens and for the alk. earths; n_a varies for the 9 (ionized) alk. earth halides from 2.11 to 2.23 (n_a for K, Rb and Cs runs from 2.23 to 2.34). It appears that the light electron obtains its doublet energy by penetrating into the L levels of both the constituent atoms. For fluorides similar results were obtained with the only difference that the entire doublet energy is derived from the alk. earth atom ($\Delta\nu \sim Z_s^2$); n_a for MgF^+ , CaF^+ and SrF^+ is 2.28.

B. J. C. VAN DER HOEVEN

The specific lines of the arc spectrum. A. T. WILLIAMS. *Anales soc. argent. Argentina* **99**, 13-84(1925).—A careful analysis of the exptl. results of Kayser and Runge, Exner and Haschek, Huppers and others has led to the following conclusions. The arc spectrum presents characteristic lines absent from the spark spectrum. The hypothesis of their being caused by accidental impurities is disproved by the fact that they can be classified in series and that the structure of these spectra is similar for

elements of similar electronic structure and chem. properties. The lines not yet classified may be attributed to series corresponding to instable states of elements (ortho elements). This could serve as a basis for classification. The variations due to isotopes do not seem to influence the structure of the spectra. With a few exceptions the principle of selection applies strictly to all lines of class A. Whenever there is an exception, the spectrum always contains combination lines of the same class; for these lines the variation of the azimuthal quantum nos. is 0. The intensity of the arc lines is in harmony with Bohr's theory. The relation A/C (A no. of arc lines, C no. of spark lines) varies periodically with the at. no., the minima occurring at the end of each period. A/C is always 0 for the halogens. The curve representing this relation ought to be the reverse of the one representing the variation of ionization potentials, as soon as the latter can be established from data relative to the structure of spectra. A factor of influence on the structure of spectra is the no. of electron, situated in the orbit adjacent to the optical electron shell. The result is periodicity of certain spectral consts within each column of the periodic system. This relation is intimately connected with the conception of the actual charge of the nucleus, which is detd. by the screen effect produced by the electrons situated between the nucleus and the outer orbit.

MARY JACOBSEN

Absorption spectra of morphine solutions in the ultra-violet. LUIS A. BONTEMPI. *Anales soc. cient. Argentina* 99, 209-28(1925).—A morphine-HCl soln shows on addn of NaOH a displacement of the absorption toward the red. The displacement reaches its max. when 1 equiv. NaOH is added, and is not affected by excess NaOH. Since morphine isolated in crystals (by addn. of NaOH to the HCl salt) has the same spectrum it is concluded that the latter is characteristic for the free base, that the displacement is due to some rearrangement taking place in the moment of its liberation and that HCl has no influence on the spectrum. The tertiary phenol group is made responsible for the displacement, since the same phenomenon was observed in phenols. A more intimate interpretation may be gained by means of the quinonoid theory of Hantzsch, the residual affinity of Baly or the electronic valence theory of Stark. The keto-enol equil. does not lend itself to the explanation.

MARY JACOBSEN

The absorption spectrum of aluminium. KANAKENDU MAJUMDER AND NALINE KANTA SWE. *Nature* 115, 459(1925).—Expts on the absorption spectrum of Al were made to det. whether the $2p$ orbit is the normal stage, as has been obtained from the analysis of its arc spectrum and corroborated by the absorption expts with In, Ga and Tl. The vacuum furnace designed by Saha for ionization work was used. No Al lines are obtained below 1500° . At 1520° the pair $\lambda = 3961, 3944$ come out reversed. At 1650° the leading members of $2p$ - md come out reversed. The higher members of $2p$ - ms series require a higher temp. The $2p$ - ms lines and $2p$ - md lines of Ga occur rather prominently, indicating its presence as an impurity in ordinary Al. The high temp. required to produce sufficient vapor for absorption work is sufficient to convert any lower ls orbit to the $2p$ orbits. If the $2p$ orbits are the normal orbits of Al atom, the $2p$ - mx lines do not dominate the spectrum to the same extent as the ls orbits of alkalis dominate their spectra.

F. N. S.

The energy-distribution law appropriate to the theory of chemical reaction velocity. C. N. HINSHELWOOD AND C. W. THORNTON. *Phil. Mag.* 50, 1135-9(1925).—The change of rate of bimol. reactions as a function of the temp. is again considered. The assumption is made that the energy increment may be contributed by addn. of the energies of both components, and the chance that the 2 mols. in collision shall have

$$-(E_1 + E_2),$$

the crit. energy will be $e^{-\frac{K_1}{RT}}$. Assuming the energy of activation to be entirely kinetic, a correct distribution law for energy of translation is developed and applied to the 3 bimol. decompns. Cl_2O , HI and N_2O . It was not possible to decide in this

way the form of the distribution law, and provisionally $e^{-\frac{E}{RT}}$ may be used. Unsuccessful efforts are also made to distinguish between the 3 forces of energy, translational, vibrational and rotational. All 3 may contribute to a state of activation. In general thermal quanta are small compared with heat of reaction, and the thermally activated state is built up by a no. of quanta.

S. C. L.

The critical increment of chemical reactions. W. E. GARNER. *Phil. Mag.* 50, 1031-3(1925).—Replying to Hinshelwood (*C. A.* 19, 3409) regarding the probability of reaction of activated mols. The effect of temp. on the probability factor is further discussed (cf. *C. A.* 19, 1819).

S. C. L.

The glow of phosphorus. H. J. EMELEUS. *Nature* 115, 460-1(1925).—The phenomena of the glow of P have been suggested as due to the slow oxidation of P_4O_6 .

formed in a preliminary non-luminous oxidation. A spectroscopic study of the nature of the light emitted from glowing P and that from the element burning normally gives the same spectrum. This is continuous in the visible region, and has five bands in the ultra-violet between $\lambda = 2370$ A. U. and $\lambda = 3290$ A. U. (cf. C. A. 19, 2452). The light from glowing P_2O_3 and from spontaneously inflammable PH_3 burning in O_2 gives this same spectrum. Hence these 2 oxidations are analogous but not necessarily identical chem. processes.

FLORENCE N. SCHOTT

4—ELECTROCHEMISTRY

COLIN G. FINK

Electric furnaces in 1925 (in Great Britain). W. S. GIFFORD. *Electrician* 95, 617-27(1925)—Two illus. A review with particular emphasis on the rapid development of the induction, low and high frequency, type of elec. furnace. C. G. F.

The electrothermic zinc industry. CANAUD. *Rev. métal.* 22, 571-80(1925)—A review of recent progress in the electrothermal metallurgy of Zn. A. P.-C

Recent progress in electrochemistry and electrometallurgy. L. ANDRIEUX AND R. FLUSIN. *Technique moderne* 17, 693-705(1925)—A review. A. P.-C.

Course of electrochemical reduction of solid electrodes. KURT FISCHBECK. *Z. anorg. allgem. Chem.* 148, 97-129(1925).—The purpose is to prove that the reduction to the metal of difficultly sol. metallic conducting compds. which are not attacked by acids or alkalis proceeds because the outer layer in contact with the electrolyte conducts the current electrolytically and the anions present in this layer are thereby enabled to pass off into the soln. A *coulometer* is described which instantly measures quantities of electricity as small as 10^{-3} coulombs. This is done by observing the vol. of H_2 evolved from a Pb cathode in a 2% H_2SO_4 soln. The reduction yield (%) of total current which is used to reduce the solid) of powders of SnO_2 , CuS , CuO , $FeCuS_2$, PbS or Sb_2S_3 on a platinized electrode are about 75, 100, 100, 35, 55 and 60%, resp. These vary with the current strength. A melted piece of AgI is reduced according to Faraday's law. This proves that the place of reduction is at the compd./electrolyte interface. When H_2 evolution accompanies the reduction of solid coherent electrodes, the amt. reduced is a linear function of the time. With decreasing c. d. the reduction yields of Sb_2S_3 and $FeCuS_2$ increase and approach 100%. The H_2 evolved on the dissoln. of the reduced Fe makes the reduction yield of FeS_2 approach an apparent limit of 50%. The reducing part of the current J_r may be expressed: $J_r = A \log(1 + B.J)$, where J is the total current and A and B are consts. The increase in p. d. of the electrode due to the current is: $\Delta E = RT/nF \ln(1 + B.J)$. J_r should therefore be a linear function of the p. d. and, to test this, reductions were made where J_r was the whole current (where there was no H_2 evolution). Ag electrodes covered with a layer 100-500 μ thick of a Ag compd. were used. For AgI, AgBr, AgCl and Ag_2S the current gradually decreases with time until the last trace of halide disappears when there is a sudden decrease to the value obtaining at an equil. between diffusion and discharge of H^+ . The no. of coulombs necessary for reduction were independent of the current strength. A smaller no. of coulombs were required for the thinner layers (100-400 μ) than were to be expected. This is because the detn. of the time of disappearance of the layer entails a larger exptl. error for the smaller layers. The p. d. current curve is independent of the thickness of the layer. For high c. ds. it is a straight line function. Such a curve for an electrode with no layer is logarithmic. For small c. ds. the p. d. decreases much more rapidly with decreasing current and the curve is continuous for negative currents (anodic polarization). The combination Ag/AgX (solid)/aq. electrolyte changes from electrolytic cond. (by Ag^+ ion in the AgX layer) for anodic and small cathodic polarization to metallic cond. for cathodic polarizations over 0.055, 0.009, 0.015, 0.018 v., for Ag_2S , AgI, AgBr and AgCl, resp. (potentials where Ag starts to sep. out at the contact layer of AgX/electrolyte). D. S. VILLARS

Plates base metal with nickel. J. D. KNOX. *Iron Trade Rev.* 77, 247-8(1925).—The resistance of steel to take a coating of Ni by the electrolytic process is overcome by eradicating the surface gases. In the *Madsen process*, anodes of 99.8% Ni are used. With a c. d. of 35 amps. per sq. ft., 0.002 in. of Ni is deposited per hr. 55° is the optimum temp.

Electrical gas purification. WALTHER DEUTSCH. *Z. tech. Physik* 6, 423-37(1925).—The following topics are discussed: (1) a survey of the industrial application, methods and history of the process; (2) the theory of the charge, migration velocity and the pptn. of dust; (3) the detector action effect of positive point discharge, and the dis-

J. F. BYRNE

turbance phenomena resulting from it. The following data are given: Radius of dust particle (cm.) 10^{-3} , 10^{-4} , 10^{-5} , 10^{-6} , 10^{-7} and 10^{-9} (ion). No. of elementary charges, 4640, 376, 28, 2, 1, 1. Migration velocity in a field, 1 (c. g. s.) cm./sec., 0.69, 0.56, 0.42, 0.35, 1.5, 450. A bibliography of 40 references is included. J. H. PERRY

Electric precipitation of dusts. A. DELASALLE. *Chimie et industrie, Special No.*, 134-7 (Sept., 1925).—Brief review of its development in the U. S. and in France.

A. PAPINEAU-COUTURE

Metal tank mercury arc rectifiers. F. D. NEWBURY. *Elec. J.* 22, 570 (1925). C. G. F.

New galvanizing process (ANON.) 9. The orientation of crystals in electrodeposited metals (BOZORTH) 2. Dimensional system of notation (PETROVSKY) 2. Tempering light alloys (U. S. pat. 1,562,269) 9.

Storage battery. W. E. GOSSLING. U. S. 1,562,159, Nov. 17. Structural features.

Wood separators for storage batteries. C. C. CARPENTER. U. S. 1,561,774, Nov. 17. After treatment of wood separators with NH_4OH the NH_3 is eliminated by boiling with H_2O contg. caustic lime.

Storage battery plates. C. C. CARPENTER. U. S. 1,561,775, Nov. 17. H_2SO_4 is applied to the face of storage battery plates and the plate surface is simultaneously subjected to a rolling pressure and subsequently dried by heating.

Electrolytic cell adapted for refining aluminium. W. HOOPES. U. S. 1,562,090, Nov. 17. The cell has a bottom lining of C with a tapping well extending below its surface.

Coating electrodes for vacuum tubes. J. E. HARRIS. U. S. 1,562,164, Nov. 17. An alk. earth oxide such as BaO and SrO is applied to a metal such as W, Fe, Ni or Mo, the oxide of which is combinable with alk. earth metal compds. to form compds. not reducible to alk. earth metal oxide by heating *in vacuo*. The coating with oxide is effected by prepg. an electrolyte composed of an alk. earth metal compd., e. g., Ba and Sr salts, placing a filament of the metal to be coated in the electrolyte and electrolytically depositing on the filament an alk. earth metal coating which is convertible, in part at least, to alk. earth metal oxide upon exposure to air.

Electrolytic production of floats or other hollow metal articles. C. C. CLELAND and J. C. MULLINIX. U. S. 1,560,017, Nov. 3. The deposition is made upon a partially immersed core which is intermittently reversed in the electrolyte.

Solutions of alkali metal silicate. L. W. CODD. U. S. 1,557,491, Oct. 13. An alkali silicate soln. is subjected to limited electrolysis without substantial sepn. of silica until a soln. is obtained in which the ratio of silica to soda is less than 15 to 1.

Electric arc furnace for melting metals. F. KOSTKA. U. S. 1,561,731, Nov. 17.

Electric furnace adapted for shaping plastic silica. L. B. MILLER. U. S. 1,562,115, Nov. 17. The furnace is arranged for extrusion of silica from a refractory container so as to form tubing or similar articles.

Electric resistance furnace adapted for heating buildings. J. SECHOWSKI. U. S. 1,562,261, Nov. 17.

Automatic control for electric furnace electrodes. R. CARLSTEDT. U. S. 1,562,204, Nov. 17.

Dielectric composition. BRITISH THOMSON-HOUSTON CO., LTD., and W. P. DAVEY. Brit. 232,920, April 22, 1924. A plate-spacing material for elec. condensers comprises a non-conducting material such as cellulose contg. a compd. of unsatd. fatty acids such as linseed oil, China wood oil or castor oil.

Apparatus for the electrodeposition of metals on wires and strips. J. A. PARKER. Can. 254,956, Oct. 27, 1925.

Nickel-plated articles. F. M. BECKET. U. S. 1,561,900, Nov. 17. Ni-plated articles are formed of ferrous metal alloyed with sufficient Cr (usually about 10-20% or more) to render the metal substantially non-rusting under atm. conditions.

Electroplating apparatus. J. M. GAUSS. U. S. 1,561,602, Nov. 17.

Tungsten wires. H. M. FERNBERGER. U. S. 1,558,000, Oct. 20. W filaments substantially free from sagging and off-setting are produced by dissolving WO_3 in an alk. soln. contg. K, Rb or Cs, e. g., a soln. of NH_4OH and K_2CO_3 , obtaining crystals of a double salt of K and W from the soln., and using these crystals for the production of W metal.

Electrodes for arc lamps. F. BAHR. U. S. 1,562,277, Nov. 17. Material of high electron emissivity is transferred from one electrode of an arc to another, e. g., from an

electrode formed of metal and Th oxide to one formed of W, by establishing an arc between the electrodes in a sealed container. This stabilizes the arc and facilitates starting.

5--PHOTOGRAPHY

C. E. K. MEES

Present status of sensitometric methods (for the examination of photographic emulsions). L. P. CLERC. *Chimie et industrie, Special No.*, 405-11 (Sept., 1925).—A review with bibliography of 27 references.

A strong intensifying process. G. ZELGER. *Chimie et industrie, Special No.*, 413 (Sept., 1925).—The bleaching soln. is made up of: (A) Cu sulfate 5 g., glacial AcOH 28 cc., H₂O 500 cc.; (B) NH₃ aq. (22° Bé.) 46 cc., KI 5 g., H₂O 250 cc.; mix A and B and cool before using. Immerse the well-washed negative in the bleaching soln. till yellow, wash for not less than 20-30 min., immerse in AgNO₃ soln. (2 g. in 750 cc. H₂O) till completely black, rinse, wash 1-2 min. in 1% NH₃ to remove sol. Ag on the gelatin, wash and dry. The operation may be repeated a 2nd and 3rd time, provided the negative is washed at least 30 min. each time; but the 3rd treatment has a tendency to cloud the whites. The process allows of using negatives which showed but a faint image. It can be used on cinematographic films, but washing must be prolonged (but not over 1 hr.) on account of impregnation of the wooden frames by the baths. Wooden or slate tanks should be used, and Pb linings avoided.

Infra-red photography by phosphorescence. A. A. GUNTZ. *Chimie et industrie, Special No.*, 414-5 (Sept., 1925).—Instead of ZnS with green phosphorescence due to a trace of Cu, G. uses ZnS with orange-yellow phosphorescence due to sensitization with a trace of Mn, which has the following properties: after insolation it rapidly loses part of its phosphorescent energy, but retains the remainder practically undiminished for several days, under the action of infra-red light, the residual phosphorescent energy reappears quite brilliantly. The photographic process is as follows: Insolate the ZnS film, make the infra-red exposure (which may be of several hrs. duration), place in contact with an orthochromatic plate sensitive to yellow in a frame having a screen transparent to infra-red light, and expose to a source of infra-red light. The latter acts on the "blacks" of the phosphorescent plate and renders them luminous (orange-yellow) so that they impress the orthochromatic plate, which is unaffected by the excess of infra-red so that the "whites" remain white.

The chemistry of selenium toning. A. AND I. LUMIERE AND A. SEYEWETZ. *Chimie et industrie, Special No.*, 416-7 (Sept., 1925).—In Se toning of chlorobromide papers, either with an alk. selenosulfide (NaSSe) or with hyposelenosulfite (Na₂SSeO₃), the image does not fix any S but is formed of a complex of Ag and Se. The ratio of Se:Ag is considerably higher in the toning of citrate than of chlorobromide papers. The quantity of Se fixed seems to be affected by the fineness of the grain of the image, increasing with the latter.

Contribution to the study of the properties of latent photographic images and their development in daylight after fixing. A. SEYEWETZ. *Chimie et industrie, Special No.*, 418-23 (Sept., 1925); cf. C. A. 19, 1825; Leffmann, C. A. 18, 205.—To reduce to a min. destruction of the latent image by the fixing bath, use a 30% Na₂S₂O₃ soln. contg. 10 cc. of aq. NH₃ (21° Bé.) per l., and do not fix more than 5 min. Caustic alkalis or Na₃PO₄ can be used instead of NH₃. Prolonged washing with water destroys the image, but no appreciable destruction takes place in 1 hr. The destruction is retarded if the water is alk., and accelerated if it is acid. If development is limited to 1 hr. the Ag grains are much smaller than those obtained in ordinary development; but they gradually increase in size by deposition of Ag if development is continued, and after about 10 hrs. they are of the same size as those obtained by ordinary development. The grains continue to grow on prolonging development still further, and tend to become hexagonal polyhedra, thus behaving like crystals. The image developed after fixing is highly transparent, but can be rendered more or less opaque by intensifying, during which the size of the Ag grains increases. Either fast or slow emulsions can be developed after fixing, even when given the normal exposure for the usual development before fixing.

The riddle of the photographic plate. F. C. TOY. *Phot. J.* 1925 (Exhibition number), 31-5.—Since the beginning of qual. photographic research the study of photographic densities as a whole has gone over to that of the grains, in particular and now would seem to be the study of the minute spots on the grain. The sensi-

tiveness of the emulsion is that of the component grains. Sheppard and his co-workers have shown that the sensitiveness of the grain is due to substances deposited locally from minute quantities of impurity in the gelatin used in emulsion making.

K. C. D. HICKMAN

Amidol: Its chemistry and use in development. J. G. F. DRUCE. *Camera Craft* 32, 334-6(1925).—The use of trioxymethylene, "stannous tartrate," metol, hydroquinol and adurol for decreasing the rate of oxidation of amidol is mentioned. An oxidized amidol developer is also recommended for use as a desensitizer.

B. LABAR

A proposal for a uniform expression of developing formulas. L. AUSSERWINKLER. *Phot. Rund.* 62, 139-40(1925).—To make various developer formulas comparable A. advocates expressing all quantities in moles per l. Molar quantities may be easily converted into g. by the use of a table of chem. formulas and at. wts. In a developer in which only the reducing agent and sulfite are used the molar concn. of the sulfite should be 6-8 times that of the reducer, while in a developer in which alkali is also used, the molar concn. of the sulfite should be 3-4 times that of the reducer.

M. W. SEYMOUR

A use for old fixing baths and developers. A. STEIGMANN. *Phot. Ind.* 1925, 731.—FeS gel is a suitable reagent for pptg. Ag from an old fixing bath. The mixt. of an old fixing bath with a used developer which contains quinonic substances might be made to produce useful dyes.

M. L. DUNDON

Contributions to development in bright light. A. HÜBL. *Phot. Rund.* 62, 111-7 (1925); cf. *C. A.* 19, 2305.—Used in the developer, a desensitizer has a greater effect than when used in the same concn. in a pre-bath. That this is not entirely due to the desensitizing action of oxidation products of the developer is shown by the fact that fresh developers also enhance the action of the desensitizer. The green-sensitiveness of a plate sensitized with eosin is almost totally destroyed by desensitizers while its blue-sensitiveness is reduced by only a fraction. The desensitizer should be added to the developer immediately before use, since it tends to ppt. in time.

M. W. S

Yellow fog of developing papers. R. G. ROCA. *Phot. Ind.* 1925, 808-10.—Yellow stain on prints is often due to colloidal silver and corresponds to dichroic fog on plates. It is caused by a Ag solvent in the developer such as too much sulfite, too high a temp. of development or the presence of developer in the print when put into the fixing bath. Papers differ greatly in their tendency to give such stain and for use in hot climates papers should be tested before general use.

M. L. DUNDON

Fixation of colored substances on positive silver images on glass or film. A. SEYEWETZ. *Bull. soc. franç. phot.* [3] 12, 197-208(1925).—The various mordants for basic dyes are enumerated as follows: AgI, Ag₄Fe(CN)₆, ferrocyanides of Pb, Cu, U, Fe and Co; Cr compds., Ag₂S, thiocyanates of Ag and Cu and the compd. resulting from the action of a mixt. of quinone and alkali Br on the Ag image.

J. I. C.

The effect of gelatin on photographic sensitivity. A. AND L. LUMIÈRE AND A. SEYEWETZ. *Rev. franç. phot.* 6, 291-2(1925).—The authors claim to have made discoveries in 1906 similar to those recently announced by Sheppard on sensitizing bodies in gelatin, but did not publish them for industrial reasons. One part of gelatin was digested with 10 parts of H₂O at 16° for 12 hrs., and then given nine successive washes with 5 parts of H₂O for 20 min. each. On evapn the extrn. water gave an active residue that sensitized inactive gelatin and contained S and N. Since 1910, as the result of trials of 900 substances a no. of materials have been used to modify emulsions. Some of these are esculin, salts of codeine, thebaine, diethylenediamine, thiocarbamide, guanidine thiocyanate and Cu and V salts.

O. COOK

The effect of dyes on the sensitivity of silver bromide gelatin. L. GORINI AND A. DANSI. *Phot. Ind.* 1925, 788-91.—The desensitizing power of several dyes was tested and results showed that they lie in the following order of increasing effectiveness: safranin, safranin, naphthosafranin, aminosafranin, diaminosafra-nine, phenosafranin, tolusafranin, pinakryptol, pinakryptol yellow, pinakryptol green. Plates were tested on a quartz spectrograph with a spark spectrum from electrodes of Eder's alloy and iron. The evidence did not support the hypothesis of Luppo-Cramer relative to the importance of amino groups in desensitizers.

M. L. DUNDON

The influence of desensitizers on the color of the developed image. LUPPO-CRAMER. *Phot. Ind.* 1925, 730-1.—The work of Milbauer and Lauschmann (*C. A.* 19, 2171) on this subject is shown to be in agreement with previously published work of L.-C. A colored image may be the result of slow surface development or it may be composed of colloidal Ag produced by physical development due to the presence of a Ag solvent.

M. L. DUNDON

Desensitizing with mercury salts. A. STEIGMANN. *Phot. Ind.* 1925, 490-2.—

Mercuric salts are probably adsorbed to Ag halide in minute amts. and act as oxidizing agents. They are not practically useful desensitizers but their action supports the oxidation theory of desensitization.

M. L. DUNDON

Imbibition printing. I. E. J. WALL. *Am. Phot.* 19, 600-12(1925).—Reliefs can be obtained by (a) developing with a developer such as pyrogallol whose oxidation product tans the gelatin; (b) by treating the developed image with a suitable chromic acid bath, and (c) by treating the Ag image with a bleach bath contg. H_2O_2 . The H_2O_2 is decomposed with the evolution of gas in the region of the Ag and this gas evolution disrupts the gelatin, which is then more easily washed away. Under (a) are recommended in the order of preference, pyrogallol, pyrocatechol and a pyrogallol mixt. Since the oxidized developer is the active agent, sulfite should be regarded as a restrainer. The following formula is recommended: pyrogallol 5 g., dry Na_2SO_3 2.5-10 g., KBr 3 g., Na_2CO_3 50 g., H_2O 1 l. In method (b) with $Na_2Cr_2O_7$ or CrO_3 , the gelatin is tanned by the action of the so-called chromium chromate, formed by interaction with the Ag image. A formula giving good results is: $K_2Cr_2O_7$ 25 g., H_2SO_4 10 cc., KBr 5 g., H_2O 1 l. A negative image is necessary for the third method (c) and a pyro-soda developer is to be preferred followed by fixation in an acid $Cr_2(SO_4)_3$ bath and thorough washing. Good results are claimed for the following etch bath: H_2O_2 330 cc., $CuSO_4$ 15 g., strong HNO_3 5 cc., KBr 0.5 g., water to make 1 l. Small variations in Br have a considerable effect on the action of the bath since the bromide acts as a restrainer.

G. E. MATTHEWS

Sodium sulfite as a fixing agent in the printing-out process. F. FORMSTECHER. *Phot. Ind.* 1925, 729-30. —A 9% soln. of Na_2SO_3 will dissolve 1 g. of AgCl per 100 cc. and can be used as a fixing bath for printing-out paper. It causes the whites to become stained and so is not practically useful. Its only use lies in sensitometry of such papers as it does not produce any fading of the printed-out image during fixation such as occurs with a $Na_2S_2O_3$ bath.

M. L. DUNDON

Silver bromide papers for bromoil prints. R. E. LIESEGANG. *Phot. Rund.* 62, 118-9(1925).—Some bromide papers are too hard, while others are too soft for the amount of swelling requisite for successful bromoil work. Even if the emulsion possesses the correct amt. of hardening immediately after manuf., it may alter and become useless in the course of a few months. Ordinarily the paper must be kept for one month and tested before it is marketed for bromoil purposes. To avoid waste of time, L. recommends acceleration of the aging process by keeping the paper in a moist warm atm. In two days, the paper reaches the same stage that would otherwise require one month. The entire roll of paper need not be so treated, but only a strip test.

M. W. SEYMOUR

Magnesium light for the sensitometry of photographic plates. J. M. EDER. *Phot. Ind.* 1925, 703-6. —Mg burning in air gives a nearly continuous spectrum and is suitable for a light source in sensitometry. Its exact spectral characteristics are discussed. Two mg. of Mg ribbon ignited by a non-luminous gas flame 3 m. from an Eder-Hecht wedge sensitometer provides satisfactory illumination for ordinary plates. A table is given based on a wedge const. of 0.40 in which for each Eder-Hecht no. the relative sensitivity, the Schwellenwert in m. c. s. and the corresponding Scheiner and H. and D. speeds are given.

M. L. DUNDON

Abrasion markings in film. ANON. *Filmtechnik* 1, 112-3(1925).—Expts. show definitely that the triboluminescent effect produced in film does not give enough light to reach the threshold value of even a high-speed emulsion. It is suggested that the abrasion marks result from an alteration of the space lattice structure of the AgBr crystals. All methods of preventing the development of abrasion, such as the use of KI, are open to practical objections and are not satisfactory. After-treatment with reducers is not successful. The best way of removing the abrasion is the mech. reduction of the film by rubbing with cotton soaked with alc.

O. COOK

Fluorescent screens. L. A. LEVY and J. W. MASON. *Brit.* 232,696, Jan. 25, 1924. A fluorescent screen consists of a thin sheet of cellulose nitrate or acetate or similar transparent waterproof material with which fluorescent material is incorporated, with an adhering backing sheet of celluloid or similar material.

Color screens for use in making or projecting pictures. K. RÄNRSCH and K. KÜBLER. *Brit.* 232,602, April 15, 1924. The screens may be made of gelatin, agar agar, fish glue, etc., and colored with various org. dyes such as fuchsin, crystal-violet or "patent blue."

Metallic screens for luminous projections. P. J. MARTIN. U. S. 1,557,530, Oct. 13. In prepg. screens for moving pictures or other projections, a coating of fine grains

of flint is applied to a plain backing, followed by a coating of Al contg. a small proportion of Au.

Packing photographic films or plates. PATHÉ CINÉMA ANCIENS ETABLISSEMENTS PATHÉ FRÈRES. Brit. 232,604, April 19, 1924. Sheets of gelatin, cellulose esters or other inert materials are interposed between sensitized coatings and wrappings of paper.

Reproducing half-tone printing plates. E. A. KUNZ. U. S. 1,559,710, Nov. 3. Chalk is rubbed upon the plate to fill up its depressions but leave the printing surface clean, the chalk is hardened and the plate is rolled with black ink and photographed.

Photomechanical printing plates. A. GALETZKA. U. S. 1,557,354, Oct. 13. A base such as Zn, Al, glass, cellon or stone is coated with an elastic non-sensitive layer such as pure gelatin and with an overlying sensitive layer and the object to be printed is photographically transferred onto the sensitive layer.

Photographic roll-film cartridges. PATHÉ CINÉMA, ANCIENS ETABLISSEMENTS, PATHÉ FRÈRES. Brit. 232,605, April 19, 1924. The paper protecting-band is coated with a "cellulose varnish" or other inert varnish on the side in contact with the sensitive coating of the film. Layers of gelatin also may be used.

Filter system for motion pictures in colors. J. SHAW. U. S. 1,562,066, Nov. 17.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Higher oxides of silver. I. Ag₂O₂. FRANZ JIRSA. *Z. anorg. allgem. Chem.* **148**, 130-40 (1925).—See C. A. **19**, 2460. E. J. C.

The constitution of manganese hydroxide. FELIX HEBLER. *Farben-Ztg.* **31**, 155-6 (1925).—Com. Mn hydrates are of variable compn. and their variously ascribed formulas are Mn₂O₃·H₂O, MnO₂(OH)₂, HMnO₂, etc. Actually they are hydrogels, analogous to the Fe hydroxides, and their H₂O content is dependent on the method of manuf., their age, the temp. and vapor pressure of the surrounding air, etc. It is therefore impractical to try to express analytical results on Mn hydrates by formulas.

F. A. W.

The meaning of manganese hydroxide (Manganoxhydroxyhydrat). FELIX WILBORN. *Farben-Ztg.* **31**, 338-9 (1925); cf. preceding abstr.—The naturally occurring manganite is a well-defined compd. of compn. Mn₂O₃·H₂O; and compds of the same definite compn. have been produced by various methods by several experimenters. Some of the com. compds. owe their indefinite compn. to the method of manuf. by pptn. of an aq. soln. of a Mn salt with alkali. The resultant Mn(OH)₂ rapidly oxidizes to a hydrated Mn₂O₄ and is then slowly converted to a colloidal hydrated Mn₂O₃. Other com. processes produce a product of much more uniform compn. F. A. WERTZ

A new complex of osmium. I. CHUGAEV. *Z. anorg. allgem. Chem.* **148**, 65-8 (1925).—(Published by E. Fritzmann.) Only one series of basic osmium salts, (OsO₄·4NH₃)X₄, was known previously. When Na₂OsCl₆ and CS(NH₂)₂ were heated to boiling in H₂O and cooled with addn. of much HCl and LiCl, 2 products resulted. The one, sol. in EtOH (reddish brown leaflets), was Os 6(NH₄·CSNH₂) Cl₃OH, the Os having a valence of 4 and coordination no. 6. Cryoscopic and cond. data show 4 ions. Fritzmann states that the formation of the chloride of this base is a *qual. test* for Os. On boiling H₂O 5 min. with CS(NH₂)₂ and HCl the soln. turns bright red in the absence of Os, and rose color with 0.001% Os. Similar tests with pyridine, picoline, quinoline and urotropine are mentioned.

A. W. FRANCIS

Products of oxidation of complex sulfites of trivalent cobalt. G. SCAGLIARINI AND G. TARTARINI. *Atti accad. Lincei* [6], **2**, 191-4 (1925).—Many sulfates and sulfites are known in which Co constitutes part of the complex cations or anions but only a few are known in which it constitutes part of both ions. The purpose of this work was to obtain oxidation products of the cobaltamine sulfites (cf. Riesenfeld, C. A. **18**, 1092). A suspension of CoCO₃ in H₂O was treated with excess SO₂. To this soln. (NH₄)₂CO₃ was added in slight excess to neutralize all of the SO₂. The yellow-brown soln. was fld. and exposed to the light and air for 10 days and sepd. yellow-gold crystals of the cobaltiaquodisulfite monosulfate of hexamminecobalt, Co(NH₃)₆ Co(SO₃)₂(SO₄)(H₂O)₃·2H₂O, stable in the air. Through a soln. like the above, but more concd., a current of air was passed and the cobaltiaquotrissulfate of aquotriamminecobalt, [Co(NH₃)₃(H₂O)₃]₂·[Co(SO₄)₂(H₂O)₃], was sepd. as yellow crystals insol. in H₂O. It was difficult to obtain this salt free from less thoroughly oxidized products. It is logical to assume that the complex [Co(NH₃)₆]₂[Co(SO₃)₂(H₂O)₃] is first formed (cf. Künzel, *J. prakt. Chem.* **72**, 209

(1857)) and that this by successive oxidation forms the mono-, di- and trisulfate complexes having the following anions: $\left[\begin{smallmatrix} (\text{SO}_3)_2 \\ \text{Co}(\text{SO}_4) \\ (\text{H}_2\text{O})_2 \end{smallmatrix} \right]'''$, $\left[\begin{smallmatrix} (\text{SO}_4) \\ \text{Co}(\text{SO}_4)_2 \\ (\text{H}_2\text{O})_2 \end{smallmatrix} \right]'''$ and $\left[\begin{smallmatrix} (\text{SO}_4)_3 \\ \text{Co} \\ (\text{H}_2\text{O})_2 \end{smallmatrix} \right]'''$.

The disulfate is still lacking to complete the series. The insol. of these complex salts in H_2O makes it impossible to obtain salts contg. other metals in place of the cobalt-ammino cation.

E. J. WITZEMANN

The chemistry of lithium. V. The polybromides and polychlorides of the alkalis. G. F. HÜTTIG AND OTTO SCHLIESSMANN. *Z. anorg. allgem. Chem.* **148**, 87-92(1925).—The existence of compds. between alkali halides and the corresponding halogens was tested by elaborate pressure measurements at various temps. No evidence was found for LiBr_3 , LiCl_3 , KCl_3 , CsCl_3 nor CaCl_4 , the pressures being practically the same as for pure halogen, and the monohalides being almost insol. in the halogens. The pressure indicated the existence of RbBr_3 , which decompd. in the range 35° to 78° ; and probably also NH_4Br_3 , but this was not completely stable at 0° .

A. W. FRANCIS

The reduction of tungstates. VICT. I. SPITZIN. *Z. anorg. allgem. Chem.* **148**, 69-83(1925).—Acid or neutral tungstates of the alkalis or alk. earths, when ignited and reduced by various means, give "tungsten bronzes," which are compds. of the type, $\text{Na}_2\text{O} \cdot \text{WO}_2 \cdot n\text{WO}_3$, have metallic luster and bright colors, and are resistant to acids, alkalis and aqua regia, etc., but can be dissolved with ammoniacal AgNO_3 . The necessary conditions for the formation of any one compd. were not known previously. Na_2WO_4 , $\text{Na}_2\text{W}_2\text{O}_7$, $\text{Na}_{10}\text{W}_{12}\text{O}_{41}$, $\text{Na}_2\text{W}_4\text{O}_{13}$, and $\text{Na}_2\text{W}_6\text{O}_{16}$, resp., were heated in an elec. oven in a stream of H_2 at various temps. At 650 - 700° the only residues were Na_2WO_4 and W as shown by the wt. loss of O. At higher temps. the bronzes were formed in the order, blue-violet-red-yellow. At 900° reduction to W was complete; Na_2O was also volatilized.

A. W. FRANCIS

Reducing power of sodium hyposulfite in alcoholic solution. JOS. POKORNY. *Rev. gen. mat. color.* **29**, 288(1925); cf. *C. A.* **19**, 3228.—To 2000 cc. of ordinary denatured alc. is added 100 g. $\text{Na}_2\text{S}_2\text{O}_4$ (concd. powder B. A. S.) and the silk, previously moistened and dried, is introduced. No reaction is apparent. Upon the addn. of 600 cc. H_2O , a brisk reduction takes place and the silk is bleached. The reduction is so energetic that indigo on bits of cotton used as test pieces is not reoxidized by dichromate, although a similar test with an aq. soln. of $\text{Na}_2\text{S}_2\text{O}_4$ shows a ready reoxidation. The bleaching operation requires about 15 min. The white obtained is much superior to the white produced by an aq. soln. of $\text{Na}_2\text{S}_2\text{O}_4$.

L. W. RIGGS

The relations of zirconium phosphate toward acids and bases. J. H. DE BOER AND A. E. VAN ARKEL. *Z. anorg. allgem. Chem.* **148**, 84-6(1925).—Phosphates of Hf and Zr only are insol. in strong mineral acids. $\text{Zr}_3(\text{PO}_4)_4$ is sol. in HF and, if freshly pptd., in concd. H_2SO_4 and $(\text{COOH})_2$. It dissolves even in the cold in strong NaOH in the presence of org. oxy-acids, e. g., tartaric, malic and lactic, and polyatomicals, with OH groups on adjacent C atoms, e. g., glycerol glucose, sucrose, pyrocatechol, pyrogallol, but not with hydroquinone, phloroglucinol, and picric acid, etc. When such solns. are nearly neutralized with acid, $\text{Zr}(\text{OH})_4$ is pptd. PO_4^{---} can be pptd. from the solns. with BaCl_2 . $\text{Zr}(\text{OH})_4$ is dissolved by NaOH and H_2O_2 , forming a perzirconate which gives a cryst. ppt. with EtOH. Hf shows similar reactions.

A. W. FRANCIS

Addition compounds between halides of tin and of titanium with organic bases. G. SCAGLIARINI. *Atti accad. Lincei* [6], **2**, 269-74(1925).—In extending some previous work on addition compds. of halides of Sn and Ti (*C. A.* **19**, 2789) addn. compds. with org. bases were prepd. A cold satd. soln. of SnCl_4 in CHCl_3 was treated gradually with a cold satd. soln. of caffeine in CHCl_3 and gave a white cryst. ppt. of the addn. compd. $4\text{SnCl}_4 \cdot 3\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2 \cdot \text{CHCl}_3$. A soln. of SnBr_4 treated similarly gives $2\text{SnBr}_4 \cdot 3\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2 \cdot 3\text{CHCl}_3$ as a yellow ppt. An insufficient amt. of a soln. of SnI_4 in CHBr_3 was added to a soln. of hexamethylenetetramine (I) in CHBr_3 and gave a yellow cryst. ppt. of $\text{SnI}_4 \cdot 4\text{C}_6\text{H}_{12}\text{N}_4 \cdot 5\text{CHBr}_3$. A cold concd. soln. of SnI_4 in CHBr_3 was added dropwise to a soln. of (I) and gave a dark violet ppt. of $\text{SnI}_4 \cdot 5\text{C}_6\text{H}_{12}\text{N}_4 \cdot 8\text{H}_2\text{O}$. A dil. soln. of TiCl_4 in CHCl_3 was added to a cold satd. soln. of I in CHCl_3 and gave a white ppt. of $\text{TiCl}_4 \cdot 12\text{C}_6\text{H}_{12}\text{N}_4 \cdot 3\text{CHCl}_3$. An excess of a satd. soln. of I in CHBr_3 was treated with a soln. of TiCl_4 in CHBr_3 and pptd. yellow $\text{TiI}_4 \cdot 4\text{C}_6\text{H}_{12}\text{N}_4 \cdot 5\text{CHBr}_3$. In these addn. complexes the solvent also enters. The halogenated solvents were used because of their low dielectric consts. which appear to be necessary to impede the ionization of the halides used and to reveal the secondary valences to a max. degree for the formation of complexes. The structure of these compds. is difficult to interpret and Werner's coordination theory is inadequate.

E. J. WITZEMANN

Ferric acid and ferrates. L. LOSANA. *Gazz. chim. ital.* **55**, 468-97(1925).—

K_2FeO_4 was prepd. by 2 methods: (1) according to Fremy Fe powder was thrown into fused KNO_3 ; the yield is small; (2) a rapid current of Cl_2 was passed through a suspension of $Fe(OH)_3$ in concd. KOH . K_2FeO_4 is insol. in KOH but the product contains $Fe(OH)_3$ and KOH , which cannot be removed by washing. CO_2 decomp. K_2FeO_4 easily. A soln. of K_2FeO_4 with $Ba(NO_3)_2$ ppts. $BaFeO_4$, which is even more sensitive to CO_2 . Ag_2FeO_4 was best prepd. by suspending 5 g. finely powdered $BaFeO_4$ in 50 cc. boiled H_2O . To this was added the calcd. amt. of $AgNO_3$ in 50 cc. H_2O . After 6 hrs. the red $BaFeO_4$ had disappeared and black Ag_2FeO_4 remained. Hg_2FeO_4 was prepd. similarly. A 2.5% soln. of $TiNO_3$ reacting as above with $BaFeO_4$ gave a brown powder, a mixt. of 2 compds. $SrFeO_4 \cdot 2H_2O$ and $CaFeO_4 \cdot 2H_2O$ were prepd. like $BaFeO_4$. 2% $Hg(NO_3)_2$ with $BaFeO_4$ as above did not give $HgFeO_4$. $CuFeO_4$, $PbFeO_4$, $ZnFeO_4$, $NiFeO_4$, $CoFeO_4$, $Fe(FeO_4)$, $Al_2(FeO_4)_3$, $Fe_2(FeO_4)_3$, $Cr_2(FeO_4)_3$, $Th(FeO_4)_2$ were all prepd. similarly. A detailed study of the properties of these compds. was made. The salts of Ag, Ba, Sr, Ca, Cu, Pb, Zn, Ni and Co could be dried without decompn. and analyzed; their thermal decompn. was studied systematically. Those of Fe'' , Fe''' , Al and Th were too unstable to be dried. With Mn, Ti and Hg^I definite products could not be obtained; Mg does not react at all. The ferrates of Ba, Sr, Ca and Cu contain H_2O that is held even when they are dried to const. wt. over H_2SO_4 . Those of Ba and Sr lose this H_2O at temps. below the decompn. temp., and therefore these can exist in the hydrated and anhydrous state. Those of Ca and Cu lose this H_2O in the evolution of the active O_2 . The thermal decompn. of the ferrates takes place according to the following reactions: (1) $4M_2FeO_4 \rightarrow 4M_2O + 2Fe_2O_3 + 3O_2$; (2) $4MFeO_4 \rightarrow 4MO + 2Fe_2O_3 + 3O_2$; (3) $4M_2(FeO_4)_3 \rightarrow 4M_2O_3 + 6Fe_2O_3 + 9O_2$; (4) $2M(FeO_4)_2 \rightarrow 2MO + 2Fe_2O_3 + 3O_2$. The active O_2 is always $\frac{3}{8}$ of the total O present. $Fe(FeO_4)$ is an exception to this rule. The active O_2 is only $\frac{1}{4}$ of the total amt. and this may be interpreted by 2 successive reactions: (1) $4FeFeO_4 \rightarrow 2Fe_2O_3 + 4FeO + 3O_2$; (2) $4FeO + O_2 \rightarrow 2Fe_2O_3$ and by adding these $4FeFeO_4 \rightarrow 4Fe_2O_3 + 2O_2$. The temp. of decompn. of the various ferrates is variable: the Ba salt loses H_2O at 108° and decomp. at 123° , while the Sr and Ca salts decomp. at lower temps. and those of Ni and Co are decompd. at 30° . All of these compds. decomp. continuously when heated to the proper temp. except $BaFeO_4$. The decompn. of $BaFeO_4$ at 123° proceeds to a compn. corresponding to $BaFeO_3$ and remains unchanged until 144° is reached, when it gives up the remaining calcd. amt. of active O . The compds. of univalent metals are unstable and those of the bivalent metals behave irregularly. The ferrates of the trivalent metals are more unstable than those of the bivalent metals and less than those of the quadrivalent metals. Some of the ferrates remain unchanged when kept *in vacuo* over H_2SO_4 at $15-20^\circ$, while others lose H_2O and active O . The compds. of Ba and Sr lose neither H_2O nor O_2 ; those of Ca and Pb give a slow but complete decompn.; the salts of Ag, Cu, Zn, Co and Ni change rapidly; nothing can be said about the decompn. of the others, because they changed too rapidly. The compd. $FeFeO_4$ showed physical and chem. properties by which it could be identified as FeO_2 prepd. in another way by Pellene and Meneghini (*Gazz.* 39, I, 381(1909); cf. C. A. 4, 428). In $Fe_3(FeO_4)_4$ the ratio $Fe:O$ was greater than 2. In some cases in which the products are capable of secondary oxidations various final products are obtained. In the case of Mn a mixt. of various higher oxides is probably obtained and with the Cr salt H_2CrO_4 seems to be formed. Other work on these compds. is under way.

E. J. WITZEMANN

A carbonyl compound of gold. W. MANCHOT AND H. GALL. *Ber.* 58B, 2175-8 (1925); cf. C. A. 18, 3559; 19, 941, 942, 1544.—By periodic arrangement of the metals which form carbonyl compds., certain analogies are observed: the behavior of Au is particularly striking. CO unites with anhyd. $AuCl_3$ readily at 95° ; $AuCl$ or $AuBr$ may also be used, but with no advantage. Strongly refractive, colorless crystals of $AuCl \cdot CO$ are produced. The compd. is unstable, and must be protected from moisture and light.

ROSALIE COBB

A carbonyl compound of rhodium. W. MANCHOT AND J. KÖNIG. *Ber.* 58B, 2173-4 (1925).—The union of CO with hydrated $RhCl_3$ proceeds readily at 140° . Dark red needles of $Rh_2Cl_4 \cdot 3CO$ result, m. 125.5° ; they are sol. in H_2O , CCl_4 , glacial $AcOH$, and benzene. The melt has a blue fluorescence. On standing or heating the solns. become turbid through sepn. of Rh, and they reduce ammoniacal solns. of Ag salts. $Pb_2Cl_2 \cdot 3CO$ reacts strongly with H_2SO_4 . The difference between the formula of the Rh carbonyl compd. and that of $Pt(PtCl_2 \cdot 3CO)$ emphasizes the tendency of Rh to form basic salts.

ROSALIE COBB

The preparation of auric chloride. MARC PETIT. *Bull. soc. chim.* 37, 1141-7 (1925); cf. C. A. 19, 2592.—P. reviews the previous results of Debray, Thomsen, Kruss, Rose, Lindet and Meyer and attempts to det. the optimum conditions for the prepn.

of pure, anhyd. cryst. AuCl_3 but limits himself to the use of liquid or gaseous Cl_2 . Action of liquid Cl_2 . Gold leaf in a sealed tube of liquid Cl_2 becomes coated with fine red needles of AuCl_3 . Soly. of the crystals in the Cl_2 , the difficulty of control and the small yield render this method unsatisfactory. Action of gaseous Cl_2 . P. passes Cl_2 at a pressure of 6-8 cm. of Hg above atm. at a rate of 2 bubbles per sec. over leaf gold heated in a tube furnace especially designed to allow temp. control and to facilitate collection of the resulting sublimed chloride. The yield starts at 180° , increases to a max. at 250° and then decreases. The following results at 3 temp. ranges were fairly const. and agree with the results of Rose and with expectations based on dissociation and vapor pressures. $223-228^\circ$, 0.095 g. per hr., 70%; $245-250^\circ$, 0.150 g. per hr., 79%; $300-310^\circ$, 0.040 g. per hr., 62%. The yield percent is the ratio between the yield and the amt. of AuCl_3 corresponding to the loss in wt. of the gold leaf. Pressures greater or less by 20 cm. of Hg than atm. were not feasible with the app. used. After long runs a decrease in the yield results, apparently due to the coating and toxic effects of AuCl on the gold leaf. Conclusion. The action of Cl_2 at pressures slightly above atm. upon Au at a temp. of 250° is most favorable to the production of pure, anhyd., cryst. AuCl_3 . P. B. P.

Systematic affinity principle. Ammoniates of halides in the iron group, of Be halides, of Cd and Hg halides, of aurohalides and of cuprihalides (BILTZ, *et al.*) 2.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Contradictions and errors in analytical chemistry. VI. The ferrous sulfate test and the diphenylamine reaction. FRIEDRICH L. HAHN AND GUSTAV JAEGER. *Ber.* 58B, 2340-3(1925) - Faurholt (*C. A.* 17, 1199) was not able to detect 10 mg. of KNO_3 in 2 cc. of soln. by means of the well-known ring test with FeSO_4 . If the test is properly applied, however, 0.1 mg. of KNO_3 can be detected in 1 cc. of soln. To the nitrate soln. add 0.2-0.3 as much of a satd. soln. of FeSO_4 contg. some H_2SO_4 . Mix and add an excess of H_2SO_4 or, if HBr is present, sirupy H_3PO_4 . Not more than 10 mg. of NaBr should be present. In the diphenylamine reaction the test is positive with 1 cc. of soln. contg. 0.1 mg. HNO_3 per l. if carried out as recommended by Tillmans (*C. A.* 5, 3211) but the reaction is not as specific as might be desired and is often affected by oxidizable or reducible substances in the concd. H_2SO_4 used. W. T. H.

Diphenylamine test. LAD. EKKERT. *Pharm. Zentralhalle* 66, 649-50(1925).—The color changes produced with HNO_3 , HNO_2 , HClO_4 , HClO_3 , HBrO_3 , HIO_3 , H_2CrO_4 , $\text{H}_2\text{Cr}_2\text{O}_7$, H_2MoO_4 , HVO_3 , $\text{H}_3\text{Fe}(\text{CN})_6$ and H_2O_2 are described as well as the effect of HCl , H_2SO_4 , H_3PO_4 , CHCl_3 and EtOH upon the colors. W. O. E.

Solid hydrogen peroxide. A new analytical reagent. J. R. BOOER. *Chemistry and Industry* 44, 1137(1925).—An account of the properties of *hyperol*, a solid compd. of H_2O_2 and urea of the formula, $\text{CO}(\text{NH}_2)_2 \cdot \text{H}_2\text{O}_2$, which is advantageous as a substitute for H_2O_2 solns. in the lab. W. T. H.

The use of sodium rhodizonate as a reagent for barium, strontium and lead. I. M. KOLTHOFF. *Pharm. Weekblad* 62, 1017-20(1925).—The di-Na salt of rhodizonic acid (1,2-dihydroxyquinoyl) which Feigl (*C. A.* 19, 1108) proposes as a reagent for Ba and Sr is also a sensitive reagent for Pb in neutral soln. The reagent readily oxidizes in aq. soln. and should be freshly prepd. The test for Ba and Sr is rendered much more delicate by the addn. of an equal vol. of EtOH . A. W. DOX

The determination of nitrate nitrogen. G. H. G. LAGERS. *Verslag. Land. Onderzoek. Rijkslandbouwproefsta.* 30, 224-48(1925).—A comparison of the Schlösing, the Devarda, the Arndt, and the Ackermann method for the detn. of nitrate N was made with the conclusion that the Ackermann method alone was unsuitable as a comparative method. R. M. BARNETTE

An extremely sensitive and altogether specific test for nitrate. F. L. HAHN AND GUSTAV JAEGER. *Ber.* 58B, 2335-40(1925).—By the diazo test (reddening of sulfanilic acid and α -naphthylamine in AcOH) it is possible to detect 0.001 mg. of NaNO_3 in 1 l. of aq. soln. by using only 1 cc. Directions are given for prepg. the diazo reagent, water free from HNO_2 , for reducing HNO_3 to HNO_2 by means of Pb formate, and for applying the test for the detection or approx. colorimetric detn. It was found difficult to reduce HNO_3 quant. to HNO_2 alone but if 1 mg. of alkali nitrate is present per l. it is easy to get a good test and by comparison with a series of standards it is possible to det. fairly closely the alkali nitrate content when only a few mg. are present per l. This test is more sensitive than the ring test with Fe^{++} and, unlike the diphenylamine reaction, is not

common to other oxidizing agents. The original paper must be consulted for details concerning preparing the reagents and method of applying the test. W. T. H.

A volumetric method of assaying mercuric iodide, mercuric chloride, and some other mercury compounds. S. ELLMAN. *Am. J. Pharm.* 97, 672-4(1925).—E. recommends the following procedure: Dissolve about 0.5 g. of dried HgI_2 in 10 cc. of a 20% KI soln. Dil. to 50 cc., sat. with H_2S and allow the ppt. to settle. Filter and wash the ppt. with cold distd. water. Transfer the filter paper with the ppt. to a 250-cc. flask, add 10 cc. of 20% KI soln. and 30 cc. of 0.1 N I V. S. Stopper tightly with a paraffined cork through which a glass tube is passed connecting with a 50-cc. flask contg. 10 cc. of KI soln. (10%). Place the 250-cc. flask on a water bath and heat for about $\frac{1}{2}$ hr. Shake the 250-cc. flask from time to time till no more black particles are visible. Now cool and wash the tubing and cork with the KI soln. of the smaller flask and titrate the contents of both flasks with 0.1 N $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$. $\text{HgS} + \text{I}_2 = \text{HgI}_2 + \text{S}$. $\text{HgI}_2 + 2\text{KI} = \text{K}_2\text{HgI}_4$. The excess of I is titrated. W. G. GAESSLER.

Analysis of materials containing a mixture of metallic iron and iron oxides. H. C. M. INGELBERG. *Ind. Eng. Chem.* 18, 1261-2(1925).—(1) Det. the total Fe. (2) Det. the tervalent Fe after treatment with KCuCl_4 and citric acid, finally dissolving the residue in HCl. (3) Det. the quantity of Cl_2 required to oxidize all the Fe to the tervalent condition. To do this, treat the material in a Bunsen app. with KCuCl_4 and FeCl_3 in an atm. of CO_2 . After 3 hrs. add 1 g. of MnO_2 and det. the Cl_2 evolved iodometrically. Test the MnO_2 alone to det. how much served to oxidize the Fe. W. T. H.

Assay of potassium chlorate. A comparison of methods. LABORATORIES OF LEHN AND FINK. *Ind. Eng. Chem.* 17, 1277-8(1925).—Methods depending on the reduction of chlorate to chloride proved unsatisfactory. A method based on the reduction of by standard TiCl_3 is accurate but impractical. The method outlined in the U. S. Pharmacopoeia is accurate but the modification used by the Frankford Arsenal is in some respects better. This method depends on the treatment of 0.1 g. KClO_3 in 35 cc. of water with 50 cc. of 4% Mohr's salt soln. After boiling 2 min. with a Bunsen valve in the neck of the flask, the excess of Fe^{++} is titrated. W. T. H.

The evaluation of chlorates. E. C. WAGNER. *Ind. Eng. Chem.* 17, 1183-6(1925).—Bunsen's evolution method, the iodometric method of Ditz involving an original treatment with KBr and HCl , the iodometric method of Kolb and Davidson based on the direct treatment with KI and HCl , the FeSO_4 method involving the titration of the excess Fe^{++} with KMnO_4 and the gravimetric methods based upon reduction to chloride by ignition with NH_4Cl , evapn. with HCl or reduction with SO_2 were all tested very carefully. All of the 7 methods, except that of Kolb and Davidson, were found to be accurate and suitable for exact analytical work. The volumetric methods are excellent for routine work especially the FeSO_4 method. In the gravimetric way, the reduction with HCl is simplest but reduction with SO_2 and subsequent pptn. as AgCl is more accurate. W. T. H.

The electrometric titration of fluoride ions. W. D. TREADWELL AND A. KÖHL. *Helvetica Chim. Acta* 8, 500-7(1925).—Based on the work of Guyot, Grefci (C. A. 7, 3939) has shown that F^- can be titrated by means of Fe^{+++} with CNS^- as indicator. The method is based upon the formation of the complex anion $(\text{FeF}_6)^{---}$. If, however, less than 20 mg. of F is present, the end point is obtained too soon and the method is inaccurate. The same reaction can be utilized for an electrometric titration and if the end point is obtained in this way, the method can be adapted to the detn. of as little as 0.1 mg. F. For titrating 0.5 mg. or more of F, use not over 100 cc. of concd. soln. which has been made barely acid to phenolphthalein, satd. with NaCl and made to contain about 48% alc. Stir the soln. by means of a stream of CO_2 and titrate with 0.1 N FeCl_3 soln. contg. about 1% of FeCl_3 . When a little more than enough FeCl_3 than is required to form the complex fluoride ion has been added, there is a sudden change in the Fe^{++} - Fe^{+++} oxidation potential as shown by the millivoltmeter which is connected directly to an AgCl standard cell and is in circuit with a Pt wire dipping into the soln. With smaller app., the method can be made more sensitive. A series of expts. was made along similar lines with elements other than Fe for the titration of F^- ions, with Cr, V, U, Ti, Cb, Zr, etc., but none proved as good as Fe. By means of conductometric titration, it is possible to titrate F^- with Al^{+++} but the results have not proved altogether satisfactory. W. T. H.

Detection of sodium as oxalate. L. W. WINKLER. *Pharm. Zentralhalle* 66, 600-79(1925).—The addition of a satd. soln. of $\text{K}_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and alc. causes the pptn. of less sol. Na oxalate. The test is about as sensitive as the tartrate test for K. Directions are given for applying the test to various typical Na compds. W. O. E.

Volumetric estimation of ortho-, pyro- and meta-phosphoric acids in mixtures. S. AOYAMA. *J. Pharm. Soc. Japan* No. 520, 553-6 (1925).—Make the soln. neutral with NaOH, add a measured vol. of 0.1 N AgNO₃, and add enough alc. to make the content 50%. Filter, wash with 50% alc. and det. excess Ag by the Volhard method. Call *a* the Ag required to ppt. the 3 acids. Treat the ppt. with H₂S water, filter off the Ag₂S and wash till the filtrate is neutral to methyl orange. Conc. to 40°, keeping the temp. below 40°, and add 100 cc. of satd. NaCl soln. Titrate first with NaOH, using methyl orange (to get the result *b*) and then phenolphthalein (to get the result *c*). Then if *x*, *y* and *z* represent the millimols. of H₃PO₄, H₄P₂O₇ and HPO₃, resp., and *a*, *b* and *c* are expressed in milli-equivs. then $3x + 4y + z = a$, $x + 2y + z = b$ and $2x + 4y + z = c$. S. T.

A new method for measuring the dust in air and industrial gases. W. ALLNER. *Farbe u. Lacke* 1925, 451.—The dust collector recommended consists of a cylinder provided with suitable filter cloths which are removable for weighing. The correct detn. of the dust content in gas streams is possible only when the pressure in the sampling tube is identical with that in the main stream. F. A. WERTZ

The separation of zirconium from iron. P. WENGER AND M. MÜLLER. *Helvetica Chim. Acta* 8, 512-3 (1925).—When ZrO₂ is fused with soda, some Na zirconate is formed which is insol. in water but sol. in hot HCl. For technical work, however, the Zr can be sepd. fairly well from Fe, Si, etc., with a loss of only about 0.5% ZrO₂ as follows: Fuse the sample with 6 times as much soda in an open Pt crucible for 2 hrs. Extract the melt with warm water, filter and wash with dil. NH₄NO₃ soln. Ignite the residue strongly and digest 2 hrs. with concd. HCl on the water bath. After dilg. and filtering nearly all the ZrO₂ remains unattacked. W. T. H.

Determination of butadiene with other gaseous olefins. B. SOROKIN AND A. BELIKOV. *J. Ind. Chem. (Russia)* 1, 28-9 (1925).—Better results than by the usual brominating method were obtained by chlorinating butadiene with a 14.5% soln. of Cl in CCl₄. The gas contg. butadiene was passed through 3 flasks contg. the chlorinating soln. at 0°. The contents of the flasks were mixed and after 2 hrs. standing, the excess Cl was neutralized with soda, the chlorinated liquid product washed with water, dried over CaCl₂, the CCl₄ removed by evapn. and the residue fractionated. After this treatment, propylene and isobutylene gave a mixt. of chlorides but butadiene gave the tetrachloride (m. p. 70°; b. p. 118-22°) and the yield was at least 95% of the theoretical. BERNARD NELSON

Systematic detection of traces of aldehydes. E. C. CROCKER. *Ind. Eng. Chem.* 17, 1158-9 (1925).—Detailed directions are given for applying various tests for aldehydes and the sensitivity of the tests is indicated. Odor is a good indication especially for the higher aliphatic aldehydes. The fuchsin test is rapid and very suitable for detecting HCHO. The resorcinol test is sensitive and also very good for HCHO. The phloroglucinol test distinguishes between aliphatic and aromatic aldehydes and is somewhat selective in the aromatic series. Guaiacol is splendid for HCHO and other aliphatic aldehydes. The aniline test indicates moderate amts. of cyclic aldehydes. The Ag reduction test is sensitive but likely to be caused by other reducing agents. W. T. H.

The analysis of a mixture of aniline and toluidines. H. F. LIDDELL. *J. Soc. Chem. Ind.* 44, 506T (1925).—If these bases are present in a large vol. of aq. soln. the conventional method of analysis is tedious. For a soln. contg. 10-20 g. of mixed amines per l. the following procedure has proved satisfactory: To 50 cc. of soln. add a slight excess of acid and titrate with NaNO₂ in the usual way, keeping the temp. below 5°. Mix another 25 cc. of soln. with 25-30 cc. of 45% HBr and titrate with 3.34% KBrO₃ soln. Then, if *a* is the wt. of NaNO₂, *b* the Br equiv., *x* the wt. of aniline and *z* the wt. of toluidine per l., then $x = 0.5813b - 2.696a$ and $z = 4.632a - 0.6688b$. W. T. H.

Cochineal, the utility of assay methods in the estimation of comparative color values. A. O. BENTLEY AND S. MEAKIN. *Pharm. J.* 115, 135-7, 178; *Chemist & Druggist* 103, 175-6 (1925).—The ordinary methods for the estn. of cochineal are of little use in the valuation of the color of the soln. This color varies according to the H-ion concn. which is influenced by the methods of killing the insects, and the common adulterants used. However, the colors can be controlled by including AcONa as a buffer soln. As the amt. of cochineal (10%) in the official tincture is needlessly high, the following formula is proposed: cochineal 50 g., N NaOH 7 cc., N AcOH 10 cc., 90% EtOH 500 cc., H₂O 510 cc. Macerate the drug in the mixed liquids for 48 hrs., strain through glass wool, set aside for 2 weeks, then filter. The amt. of buffer mixt. used is sufficient to control the color even on diln., but is small enough to be without pharmacol. action. S. WALDBOTT

New color reaction for lactic acid. L. EKKERT. *Pharm. Zentralhalle* 66, 552-3

(1925).—Dissolve a few cc. pyrocatechol in 5 to 6 cc. of concd. H_2SO_4 , then superimpose thereon 1 to 2 cc. of dil. lactic acid (3 drops of 75% lactic acid in 10 cc. H_2O), whereupon a bright blood-red color develops. The test is sensitive to a diln. of 0.02% lactic acid.
W. O. E.

The detection of sugar by the Molisch-Udransky reaction. J. C. L. DEFIZE. *Chem. Weekblad* 22, 467-8(1925).—A positive M.-U. test may be given by pure water which has been filtered through ordinary filter paper, unwashed with HF. The positive test may be due to the hydrolysis of cellulose fibers carried with the filtrate, or to the presence of oxycellulose in the unwashed paper.
DONALD W. MACARDLE

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Tenth list of new mineral names; with an index of authors. L. J. SPENCER. *Mineralog. Mag.* 20, 444-77(1925).—S. lists 167 new names that have appeared since 1922. A brief description including compn. and reference to the original article is given in each case.
W. F. HUNT

Iron coloration in rocks and minerals. G. R. MACCARTHY. *J. Elisha Mitchell Sci. Soc.* 41, 135-7(1925).—Analysis of Fe-bearing rocks and minerals and calcn. of the ferrous-ferric ratio led to the following conclusions: Ferrous compds. occurring in rocks and soils are colorless or nearly so. Ferric compds. are brown, red or yellow according to the concn. Hydrous ferroso-ferric compds. are blue. The black color of certain Fe minerals may be due to dehydration of ferroso-ferric compds. Mixts. of ferroso-ferric with large and small proportions of ferric compds. are colored purple and green, resp. Three references are appended.
A. L. MEHRING

Native iron in granite injections and mica schists from Oulmes. G. CORNAND. *Ann. soc. géol. Belg.* 48, 386-8(1925).—Small elongated metallic particles with apophyses extending between the mineral grains have the phys., chem. and magnetic properties of Fe. The metal is coated in places with oxide and elsewhere with a yellow stain believed to be sulfide.
O. F. POINDEXTER

The structure of aragonite. S. I. TOMKEIEFF. *Mineralog. Mag.* 20, 408-34(1925).—A new method is presented for detg. the leptonic structure of crystals from their etch-figures. This method applied to aragonite indicates it to be monoclinic-holoedra. The monoclinic leptons (groupings of Ca, C and O atoms) are arranged on an orthorhombic space-lattice, so that aragonite is pseudo-orthorhombic.
W. F. HUNT

Calcite and barite from Bioul. H. BUTTENBACH. *Ann. soc. géol. Belg.* 48, B63-8(1925).—Crystallographic descriptions are given.
O. F. POINDEXTER

Albite and other authigenic minerals in limestone from Bengal. EDMONDSON SPENCER. *Mineralog. Mag.* 20, 365-81(1925).—Idiomorphic albite crystals were found disseminated in certain zones in a limestone at Raipure, India. It is highly probable that this feldspar is authigenic in origin, and the same seems true of the associated quartz, mica, pyrite, rutile and possibly tourmaline.
W. F. HUNT

Chlorophaeite in the dolerites (tholeiites) of Dalmahoy and Kaimes Hills, Edinburgh. ROBERT CAMPBELL AND J. W. LUNN. *Mineralog. Mag.* 20, 435-40(1925).—These dolerites have been found to be rich in chlorophaeite, at times making up more than 15% of the rock. It is bright olive green when freshly fractured but the color changes rapidly upon exposure to dark green and finally black within 20 min. Weathered surfaces show a chocolate brown color. It occurs in vesicular cavities or in isolated groups of thin parallel veinlets. In thin section it shows green or red color, at times with minute tubular bodies resembling microorganisms. Its sp. gr. = 1.81, and it is isotropic with $n = 1.498$, probably being a colloid. Its compn. is SiO_2 32.95, TiO_2 0.62, Al_2O_3 5.40, Fe_2O_3 12.37, FeO 9.18, MnO 0.33, MgO 4.75, CaO 3.05, Na_2O 0.68, K_2O 0.36, H_2O at 105° 23.90, $\text{H}_2\text{O} + 105^\circ$ 5.20, sum 99.79%.
W. F. HUNT

Relation of texture and composition of clays. F. F. GROUT. *Bull. Geol. Soc. Am.* 36, 393-415(1925).—Twelve Minnesota clays were sepd. mechanically into 5 fractions and each was analyzed. SiO_2 tends to concn. in the sand (0.05-0.5 mm.) while Al_2O_3 , Fe_2O_3 and K_2O tend to concn. in the finer sizes (silt and clays). CaO , MgO , Na_2O and K_2O vary erratically. Kaolinite and ferric minerals are more abundant in the finer sizes; quartz and carbonates are less abundant.
W. F. HUNT

Analyses and composition of fourmarierite. J. MELON. *Ann. soc. géol. Belg.* 47, B200-2(1925).—The mineral is difficult to sep. from kasolite and torbernite, so the 3 were analyzed together and the fourmarierite was derived by subtracting the known

compus. of the others. The av. of 2 analyses is: H_2O 10.07, PbO 12.26, UO_3 77.67%, corresponding to the formula $\text{PbO} \cdot 5\text{UO}_3 \cdot 10\text{H}_2\text{O}$.

O. F. POINDEXTER

Chemical equilibrium in the formation of the German potash deposits. ERNST FULDA. *Kali* 19, 333-7(1925).—It is pointed out that the compn. of the salts crystg. from a given brine is affected by the degree of supersatn. of the brine at the time of formation of the deposit. An attempt is made to explain the origin of the various mixts. found in K salt deposits on this basis.

WM. B. PLUMMER

The influence of water on the migration of petroleum in rocks. P. FOURMARIER. *Ann. soc. geol. Belg.* 47, B192-7(1925).—Expt. shows that petroleum can pass through sand contg. water in the pellicular state and gain a higher level. If the water is in the capillary state it acts as a barrier. For intermediate stages, however, the petroleum can fill the spaces between the grains and also displace some of the water around the grains and raise it to a higher level. Reversing the position of the 2 shows that water cannot displace petroleum as rapidly as the petroleum can displace the water.

O. F. POINDEXTER

Résumé of considerations regarding the origin of petroleum. 1. P. VOITESITI. *Mon. pétrole roumain* 24, 961-70(1925).—A review of the various theories regarding the inorg. and org. origin of petroleum, with a comprehensive bibliography.

M. B. HART

Plant life as possible source of petroleum deposits. G. G. BARTTE. *Oil Weekly* 38, No. 5, 46-7(1925).—Algae, resins, spores, pollen grains, etc., contain oily substances and are abundant enough to have been the source of all petroleum resources. Older theories are discussed.

M. B. HART

Evidence of liquid immiscibility in a silicate magma, Agate Point, Ontario. T. L. TANTON. *J. Geology* 33, 629-41(1925).—The discovery in a quartz-porphry of abundant globules of glass of a compn. different from that of the main mass is pointed out as indicating the existence of immiscibility in silicate magmas.

W. F. HUNT

Basic dike injections in magmatic vein sequences. J. E. SPURR. *Bull. Geol. Soc. Am.* 36, 545-82(1925).—The following temp. scale for consolidation below the surface is suggested: 600-700°, granites and rhyolites; 500-600°, diorites, andesites, diabase, granitic pegmatites, Sn, Au-quartz, W and Ni; 400-500°, basalts, ultrabasic rocks, Cu, Zn and Pb.

W. F. HUNT

The Vermilion batholith of Minnesota. F. F. GROUT. *J. Geology* 33, 467-87(1925).—A petrographic-chem. study of the largest batholith in Minn., which reached its position by pushing aside its walls and stoping through mica schist. The main body is a biotite granite with quartz 25%, orthoclase 30, microcline 20, oligoclase 20, biotite 2, and accessories. Around the border hornblende types occur which have differentiated into syenite, shonkinite, pyroxenite and magnetite rock. Nine complete rock analyses of the various phases are recorded.

W. F. HUNT

The Giant's Range batholith in Minnesota. I. S. ALLISON. *J. Geology* 33, 488-508(1925).—A description of the structure, petrography and petrology of the Giant's Range granite and associated rocks, which occupies an area of 1000 sq. miles in north-east Minn. The batholith is a complex of intrusive rocks ranging from diabasic gabbro, hornblende, and shonkinite through monzonite and syenite to granite. Ten complete analyses are given of the various types.

W. F. HUNT

Amount of assimilation by the Sudbury norite sheet. G. W. BAIN. *J. Geology* 33, 509-25(1925).—Assuming the basal margin as representing the compn. of the original injected magma, chem. analyses show considerable variation from the base upward, which cannot be explained by magmatic differentiation. The evidence indicates a minimum assimilation of 63% in the southwest end of the basin and 67% around the eastern end. Quartzite, arkose and iron-formation may have constituted the assimilated material.

W. F. HUNT

A peculiar rock from Lower Salmien. J. ANTEN. *Ann. soc. geol. Belg.* 48, B93-4(1925).—A greenish rock, compact and with sp. gr. = 3.14, contains quartz, specular hematite, ilmenite and spessartite, the latter not in crystals but as irregular masses, indicating that the metamorphism of the rock was not complete at the time but that an intermediate stage is represented. Pressure rather than temp. is believed to have played the most important role.

O. F. POINDEXTER

Some rocks from Famennien. M. BELLIERE. *Ann. soc. geol. Belg.* 48, B69-72(1925).—A green sandstone contg. quartz, feldspars and heavy minerals has as cement mica in all stages of alteration to chlorite, giving rise to the color. A second rock nearby has the same general compn. but shows secondary growth on the quartz grains. A red sandstone, contg. rhombohedrons of calcite which are clear in the center

and impregnated with Fe compds. at the border, showed on analysis CaCO_3 34.32, FeCO_3 0.9, MgCO_3 1.12, insol. 61.29%. O. F. POINDEXTER

The rate of solution of gypsum. F. H. LAHEE. *J. Geology* 33, 548-9(1925).—The rate of soln. was detd. on a gypsum block contg. a painted inscription. In 7 yrs. the soln. of the gypsum caused the protected painted letters to acquire a relief of $1/4$ in. The annual pptn. in the region, Stonewall Co., Tex., is 23 in. W. F. HUNT

Geophysical methods for discovering water-bearing strata in subterranean salt deposits. J. KOENIGSBERGER. *Kali* 19, 353-4(1925).—Local observations of the elec. cond. of salt deposits indicate the nearness of water-bearing strata, the salt minerals in such cases being permeated with minute veins and filaments of aq. solns. which increase the cond. WM. B. PLUMMER

Brief notice of a new radioactive method of determining the age of the earth. J. H. SWARTZ. *J. Elisha Mitchell Sci. Soc.* 41, 21-2(1925).—The method depends upon the ratios U:Th and U-Pb:Th-Pb in minerals. A. L. MEHRING

The flow of solid matter, especially natural salts (RINNE) 2. Solution of concave forms upon crystals (FRIEDEL) 2.

PAWLOWSKI, AUGUSTE: *Les bauxites françaises, études géologiques, statistiques, et industrielles.* 48 pp. Paris! Librairie scientifique et générale Jules Charles et A. Brunet. Reviewed in *Le Genie civil* 87, 240(1925).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

French metallurgy (1889-1925) and the important part played by France in the past. ROBERT HADFIELD. *Chemistry & Industry* 44, 1029-44(1925).—Historical. E. H.

Possible improvements in metallurgical practice relating particularly to the zinc industry. GILBERT RIGG. *Bull. Inst. Mining Met.* 1925, No. 253, 12 pp.—Cost items in Zn smelting are divided into: raw material, labor and fuel, of which labor is probably the greatest. Possible direct and indirect labor-saving improvements are discussed. In the distn. process the former lie mainly in performing discharging and charging operations by mech. means and the latter in shortening of the time during which the retorts are nonproducing. Labor-saving possibilities in the electrolytic process are not as great. W. H. BOYNTON

Consumption of reagents used in flotation, 1923-24. THOMAS VARLEY. *Bur. Mines, Repts. of Investigations No.* 2709, 6 pp.(1925). E. H.

Leaching mixed copper ores with ferric sulfate; Inspiration Copper Co. G. D. VAN ARSDALE. *Trans. Am. Inst. Mining Met. Eng.* 1925, No. 1502-D, 17 pp.—A description of lab. and pilot plant expts. which led to the development of a method for leaching the mixed ores contg. chalcocite and silicates of Cu by means of solns. acidified with H_2SO_4 and carrying $\text{Fe}_2(\text{SO}_4)_3$. Fe is added to the solns. and Fe^{+++} is regenerated electrolytically to a percentage high enough to act as an efficient solvent. The decreased yield is partly compensated for by a higher c. d. A diagrammatic flow sheet of a 4500-ton leaching plant is shown. W. H. BOYNTON

Antimony and its smelting. R. JAHN. *Montan. Rundschau* 17, 565-8(1925).—The ground and dried ore is roasted, the Sb_2O_3 formed is volatilized and at once reduced in vapor form with any reducing gas. The roasting temp. must be kept at $380-420^\circ$ to keep the formation of nonvolatile oxides at a min. The material must be kept fairly dry, as any moisture regenerates Sb_2S_3 , and a calcd. amt. of air must be passed slowly over the material, whereby the ground ores are kept in rotation to present as large a surface as possible for the oxidation. Ores of 5-20% may be used. The oxidation products contain 90-93% tartaric acid-sol. Sb_2O_3 , 3.7-5.8% Sb_2O_4 and the rest as impurities. An excess of 10-15% reducing gas is necessary. The purity of the metal obtained varied with different reducing gases. Reduction with H gave a 97% metal, water gas 98.4, illuminating gas 98.29 and generator gas 96.63%. The metal appears as a very fine dust and is melted together. 0.5-1% Sb remained in the residues from roasting together with noble metals. The yield of metal as volatilized Sb_2O_3 is 93-95%. The amt. of fuel required is very small as the combustion gases can be fully utilized. The roasting process is also suitable for the production of pure Sb_2O_3 . D. T.

Equilibria in systems involving ferrous oxide. J. B. FERGUSON. *Trans. Faraday Soc.* June, 1925 (advance proof).—Attention is called to the great lack of agreement in the

results obtained by various investigators of the systems Fe-O-H and Fe-O-C . The relation of the FeO phase to these discrepancies is discussed. Fairly conclusive evidence has been presented that this phase is variable in compn. It is also believed by Eastman and Evans, and by Matsubara, that the iron phase is variable. Different investigators who do not agree on the solid phases present at equil., do agree on the numerical values of the consts., for the three-phase system. The occurrence of ferrous oxide of variable compn. may be expected to lower the temp. of transformation of FeO to Fe_3O_4 and Fe . This would account for the many futile attempts to prep. pure FeO . The evidence advanced by Eastman and Evans indicating that FeO may take up Fe in solid soln. is not conclusive, since it involves some rather large errors in the compn. of the solid phases. After a critical study of the equil. consts. found by various workers Eastman has listed the best values. The results by Chaudron and those by Ferguson differ from these by more than the probable exptl. error. At 772° the discrepancy for the ratio $P_{\text{H}_2\text{O}}/P_{\text{H}_2}$ is from 0.54 to 0.67. This may be compared to the limiting values 0.575 and 0.675 of the ratio ascribed to the iron phase by Eastman and Evans. It is suggested that these variations in the value of the ratio were due to the formation of two different ferrous oxide phases. This would also account for the diversity of the reported equil. consts. The possible formation of FeO solid solns. would make more difficult the prepn. of the most stable phase whether this be pure FeO or a given solid soln. in any given case. The formation of unstable solid solns. on either side of the stable phase might occur. In this case oxidation and reduction expts. should probably lead to the same values for the equil. consts. though the solid compns. might be quite different. It is felt that this interpretation is more in accord with metallurgical practice than is the assumption of an oxygen-bearing iron phase. D. F. MCFARLAND

The function of ferric oxide in acid and basic open-hearth slags. J. H. WHITELEY. *Trans. Faraday Soc.* June, 1925 (advance proof).—This paper discusses the action of Fe_2O_3 in carrying O from the furnace gases to the metal bath in the open-hearth. Fe_2O_3 changes at 1350° under furnace conditions to magnetic oxide which may be regarded as a compound of FeO and Fe_3O_4 . The latter is readily reduced to FeO by metallic Fe at high temps. This reaction does not proceed to completion although the equil. const. probably increases with the temp. This reduction of Fe_3O_4 by Fe enables the oxide to function as a carrier of O, since the FeO is easily oxidized again. Direct evidence of the reaction may be obtained in the acid open-hearth process during the finishing stages after the bath has dropped off the boil, especially if the iron content is above 20%. While a vigorous boil is in progress, the Fe_2O_3 in the slag remains well under 0.50%. After the C drops below 0.20% the Fe_2O_3 rises and may reach 3.0%. At the same time there is a steady rise in total Fe content of the slag. This increase must be due to transference of O from the gas to the metal by means of Fe_2O_3 . Evidently a certain amt. of dissociated FeO must exist in the molten slag, which is converted to Fe_3O_4 at the slag surface by contact with oxidizing furnace gases, and is again partly reduced to FeO by contact with the molten metal below. Fe_2O_3 thus functions as an O carrier throughout the boiling period, although accumulation of Fe_2O_3 and increase of Fe are prevented by the velocity of the C reaction and the presence, in and out of the slag, of great numbers of minute globules of Fe. Gas oxidation by agency of Fe_2O_3 greatly accelerates the removal of C. In the basic process the same effects are observed to a still greater extent. During the refining period the ratio of Fe_2O_3 to FeO is always much higher than in the acid process. Much less metallic Fe in globules is held in suspension. The presence of CaO , MgO and MnO in excess of the quantity required to satisfy the acids keeps FeO uncombined and favors its oxidation by gases. In view of the large percentage of Fe_2O_3 in the basic slag a very considerable amt. of gas oxidation should be expected; and the greater oxidizing power of a basic slag may thus be explained by the activity of its larger Fe_2O_3 content and its action as carrier of O. A fairly definite relationship exists between the percentage of Fe_2O_3 and SiO_2 and P_2O_5 , and this leads to the conclusion that the basicity of the slag is a factor upon which the Fe_2O_3 largely depends. The analyses upon which this conclusion is based are somewhat variable because of difficulties in analysis and because of variable bath conditions, such as the effect of the quantity of CO passing through the slag, temp., slag viscosity and iron content, and the vol. of air used to burn the gases in the furnace. Fe_2O_3 increases with the basicity of the slag and since gas oxidation is facilitated by presence of Fe_2O_3 in the slag, this should also increase with basicity. No definite information is available on this point but a highly basic slag will permit the complete working of a charge from a fairly high C without use of either ore or scale. D. F. MCFARLAND

Slag reactions. P. M. MACNAGR. *Trans. Faraday Soc.* June, 1925 (advance proof), cf. C. A. 19, 27.—In steel-making processes a heterogeneous system of four phases—

solid lining, liquid metal, more or less liquid slag and furnaces' gases—has to be considered. The slag is in immediate contact with the other three and there must be a tendency to form equil. with each of these. Equil. between slag and lining gives the essential difference between acid and basic practice. Intimate contact between the various constituents is necessary if rapid chem. change is to take place; hence the rate is much greater in liquid than in solid or viscous phases. Slag consisting of various oxides tends to absorb constituents from the lining and becomes more viscous, thereby setting up an "inactive" stage in the steel-making operations due to decreased rate of reaction caused by the increased viscosity. This is not necessarily a state of equil. In acid practice the slag tends to absorb SiO_2 from the banks, or similarly alter in compn. by reduction of FeO , till at about 60% SiO_2 for open-hearth temps. it becomes viscous and inactive. This compn. is practically independent of the amts. of CaO , FeO or MnO present. In basic slags, the inactive state is reached at about 60% CaO , 40% SiO_2 , and low FeO , while with increasing amts. of FeO or MnO , the SiO_2 content diminishes. The condition for stabilization of P_2O_5 in the slag is that the SiO_2 content is less than that required for the limiting slag of the same CaO , FeO content. D. F. McFARLAND

Preparation of cerium and of ferro-cerium. E. GEAY. *Rev. chim. ind.* **34**, 302-5 (1925).—Brief description of their com. manuf. A. PAPINEAU-COUTURE

Magnetic analysis needs more study. R. L. STANFORD. *Iron Trade Rev.* **77**, 555-9 (1925).—A review of the present status and possibilities of magnetic analysis of metals. J. F. BYRNE

X-rays in the examination of metals. V. E. PULLIN. *Electrician* **95**, 614-6 (1925); 7 illus.—A review. C. G. F.

New X-ray studies of the ultimate structures of commercial metals. G. L. CLARK, E. W. BRUGMANN AND S. D. HEATH. *Ind. Eng. Chem.* **17**, 1142-6 (1925).—The value of the monochromatic pinhole X-ray method is emphasized for ascertaining the exact condition of com. metals as regards mech. and heat treatment, grain size, and for use in testing for uniformity, establishing the relation of structure to desired properties, and developing a mfg. technic. Seventeen X-ray diagrams are reproduced as examples of the sensitiveness of the method and of the desirability of use of X-rays in industrial problems. A new multiple app. combining the pinhole and usual powder diffraction methods is shown. G. L. CLARK

Thermo-electricity of metals and alloys. J. GALIBOURG. *Rev. métal.* **22**, 400-34, 527-38, 610-30 (1925).—G. has devised a method and app. for detg. directly the curves $E = f(t)$ with short test bars (instead of wires) up to temps. above 900° , so that the samples can be subjected to uniform thermal treatment over their whole lengths. Clear curves were obtained. Production of a large no. of curves with different types of alloys showed that they are quite regular and have no singular points below 700° . An app. and method have also been devised for classifying steels according to their thermo-e m.f. (*C. A.* **16**, 2295) for distinguishing between different types of steels, and a no. of results obtained with it are given. The theoretical significance of the results obtained are discussed at considerable length. The article contains a large no. of tables and of graphs, and a bibliography of 78 references. A. PAPINEAU-COUTURE

Definition of steel and cast iron. KOTARO HONDA. *Iron Coal Trade Rev.* **111**, 450 (1925). J. F. BYRNE

Passivity of iron and other metals. A. S. RUSSELL. *Nature* **115**, 455-6 (1925).—Cr, Mn, Fe, Co and Ni show passivity. R. suggests that these elements in the active state each have 2 electrons in the 4th quantum orbit, and that the elements become passive when one of these electrons is removed to a third quantum orbit. R. prepd. and kept metals permanently in the passive state and obtained their electrode potentials by amalgamating 2 at a time in Hg and comparing their powers of reducing solns. in H_2SO_4 of various oxidizing agents. On comparing the order of the potentials of the metals in Hg with that of metals in the free state it is seen that the metals known to show passivity fall out of order. This suggests that passivity is produced and maintained when the metal is amalgamated which is consistent with Lambert's discovery that pure Fe is a noble metal when its surface is electrically neutral. The ions of these passive metals, however, do not behave as if they were ions of noble metals. With the active Fe atom having 2, 8, 14, and 2 electrons in the 1st, 2nd, 3rd and 4th quantum orbits, resp., passive Fe may be represented as having the configurations 2, 8, 15, 1 or 2, 8, 13, 8, probably the former. Metals when dissolved in Hg are far more efficient reducing agents in the presence of H_2SO_4 than when in the free state. FLORENCE N. SCHOTT

Crystallization of iron on annealing as a method of investigation of internal stresses. S. P. WOLOGDINE. *Ann. inst. polytech. Novotcherkassk (Don)* **8** (1920-22); *Rev. métal.* **22** (Extraits), 386-7 (1925).—Soft Fe which has been subjected to cold working crys-

tallizes on being annealed at a given temp., and the size of the grains increases by coalescence. W. proposes this as a method of studying the internal stresses resulting from the working of the metal.

A. PAPINEAU-COUTURE

Effect of pickling on pressed steel elastic washers. BRENIER. *Rev. métal.* 22, 568-70 (1925).—Pressed steel washers which had rusted during storage broke up on placing in acid to remove the rust. This is shown to have been due to the high tensions caused by the flattening of the but slightly annealed washers.

A. P.-C.

Some problems in connection with selection and treatment of drill steel. G. BERGSTROM AND L. NORDENFELT. *J. Chem. Met. Soc. South Africa* 26, 1-9 (1925).—There is no reliable lab. test for drill steel by means of which the quality of actual performance may be predicted. Testing by drilling against solid steel is also unsatisfactory, and drilling tests on rock are required. This should be done at a definite testing station, and a test is estd. to require 80 min. time with 20 re-sharpenings. Eleven causes of rock-drill failure are described, with their respective remedies. To reduce the tendency to break where the hardened end joins the normalized center, more drastic normalizing is advocated so that the heating when the end is hardened would not make the normalized part so weak; and the period of heating before hardening should be as short as possible. Abuse of steel in the mine and in the blacksmith shop must be avoided. Fatigue failures are described in detail, with emphasis on their gradual development from overstrained places. No remedy is possible after a crack has formed, but in the earlier stages time and heat are beneficial. These remedies are difficult to apply at a mine. A steel with max. fatigue resistance should be used, with the best compn. and structure, to be detd. by research, and it might be rested or normalized occasionally between definite periods of use. Pyrometers should be carefully used to control temp., and precautions in their use are quoted from the A. S. T. M. pamphlet A-35-24. G. F. C.

Temperature control system for dressing and tempering fishtail bits. C. H. SHAPIRO. *Bur. Mines, Repts. of Investigations No. 2712*, 18 pp. (1925).

E. H.

Special nickel brasses. OLIVER SMALLEY. *Trans. Am. Inst. Mining & Met. Eng.*, Oct., 1925 (advance proof), 35 pp.—Chill-cast brasses contg. Ni and other adnns. were tested as cast, and also in some cases as forged and heat-treated, all variables except compn. being eliminated. The results are summarized in tables and excellent photomicrographs are shown. Between 1 and 4% Ni in brass gives a general improvement in properties, but more reduces the strength. Ni refines the grain-size and reduces the amt. of β -brass. Small quantities of Al increase the yield point and strength of brass, but over 3% produces weakness and brittleness. Forging may be performed between 620° and 700°, the alloys being fragile between 225° and 560°. Al increases the amt. of β -brass. Sn above 0.75% impairs the ductility of brass; 0.5% increases the yield-point and strength, and 1% may be permitted in forged brass. The tensile and shock-resisting properties are improved by 1% Fe, but more gives no improvement. Fe introduces a new constituent and refines the grain-size. The form of the grains is made more regular by Fe in cast brass and forging by causing interpenetration of the grains improves the ductility. The Al-Ni brasses are in general disappointing as the improvement in properties is not commensurate with the cost. However, the alloy with 3% Ni, 3% Al and 34% Zn is valuable for high-strength castings, being similar to Monel metal but easier to make. The brass with 3% Al was generally improved by 1% Fe, but more Fe reduced the ductility and impact strength as cast. Fe had about the same effect in Ni-Al brass, refining the grain-size. The addn. of 0.75% Sn gave a slightly higher yield point, but impaired the ductility. Pb up to 0.7% if uniformly distributed does no harm. As, Cd, Sb, Bi and especially Si, Mg, P over 0.15%, and gases are harmful impurities. A little P-Cu may be added, however, as a deoxidizer in brasses contg. Mn; otherwise a little Mn-Cu is beneficial. The details of practice in melting, fluxing, casting, gating, feeding and pouring are discussed. The alloys should be superheated from 6 to 15% for pouring, the casting temps. ranging from about 930° to 1030°.

GEO. F. COMSTOCK

Corrosion. E. C. TRAX. *J. Am. Water Works Assoc.* 14, 255-9 (1925).—A summary of existing knowledge as applied to pumps and piping.

D. K. FRENCH

Corrosion in oil refining plants. I. GINSBERG. *Ref. & Nat. Gasoline Mfr.* 4, No. 47, 40, 42 (1925).—Electrolytic corrosion of Fe which occurs with all types of oils is due to stray currents from elec. lines or from the formation of an elec. couple. Acid remaining in the refined oil together with traces of water forms an electrolyte at the bottom of the tank. $K_2Cr_2O_7$ soln. sent through the intakes with the oil prevents corrosion. $MgCl_2$ present in the brine which is found in the crude oil is the source of HCl which causes corrosion. NH_3 has been successfully used to neutralize the acidity. The best method to prevent corrosion is to remove the brine from the crude oil by dehydration.

M. B. HART

David steel wheel and its manufacture in England. W. R. MARTIN. *J. Iron and Steel Inst.* Sept., 1925 (advance proof), 11 pp.

Welding on boilers. S. W. MILLER. *Ind. Eng. Chem.* 17, 1169(1925).—Notes as to the procedure (as regards inspection, testing, etc.) which should be followed in making boiler repairs by welding.

New galvanizing process. ANON. *Brass World* 21, 350(1925).—A nonpeeling, noncracking Zn coating on Fe wire is obtained by a process involving a preliminary treatment in a bath of molten salts before passage to the Zn bath. The structure of the coating is divisible into 3 layers: next to the Fe a solid soln. of Zn and Fe, second a layer of Zn-Fe alloys and probably a solid soln. relatively high in Zn and third, a layer of practically pure Zn. The layout is shown.

Inspecting aluminium castings with X-ray. R. J. ANDERSON. *Iron Trade Rev.* 77, 374-6(1925).—X-ray examn. is especially applicable to Al castings because of their transparency as compared to steel. A depth of 2.5 in. can be penetrated in 30 secs., with 165 kilovolts and 2 milliamps. with an intensifying screen, or in 3 min. without the screen. Defects are clearly revealed.

The arrangement of the micro-crystals in rolled Pt plate. (TANAKA) 2. Arrangement of micro-crystals in Al wire (FUJIWARA) 2. Kiln for drying and carbonizing ores (U. S. pat. 1,556,571) 1.

Cyanide solutions for treating ores. K. F. COOPER. U. S. 1,562,295, Nov. 17. A crude cyanide compd. such as prepd. from fusion of crude Ca cyanamide and NaCl, which contains CaC_2 and S in the form of sulfides, is dissolved in H_2O (to get rid of the carbide) and the soln. is aerated with a gas contg. O, e. g., with air, to change the sulfide S into thiocyanate form.

Reduction of ores. H. E. COLEY. Can. 253,802, Sept. 22, 1925. Ores or oxides are brought to a reducing temp. and liquid hydrocarbon is injected directly into or onto the mass so that the hydrocarbon comes into contact with the heated mass before the hydrocarbon decomposes and reduction is effected by the formation of nascent C.

Vanadium. A. WITTEG. U. S. 1,550,998, Aug. 25. See Brit. 215,734 (C. A. 18, 3457).

Molybdenum from ore. W. H. RIDGOUT. U. S. 1,562,125, Nov. 17. An aq. pulp of Mo ore is mixed with double its quantity of a compn. formed from H_2O 90 gals., paraffin 10 gal. soda 4 oz. and "lye" 1 lb., agitated and allowed to stand until the Mo values are sepd. by flotation.

Separating cobalt from nickel. C. G. RICHARDSON. U. S. 1,557,879, Oct. 20. Purified speisses contg. Ni, Co, As and Sb are roasted to such a point that an amt. of As equiv. to the amt. necessary for combination with the Co has been eliminated. The material may then be smelted with fluxes to produce a slag contg. the Co and a new speiss contg. the Ni, As and Sb.

Cupola furnace. A. POUMAY. Brit. 232,630, April 18, 1924. The CO produced in the melting zone is burned by a supply of secondary air introduced at a higher level. The furnace is constructed with 3 sets of tuyères.

Apparatus for refining lead or other metals. H. HARRIS. U. S. reissue 16,213, Nov. 17. See original pat. 1,465,128, C. A. 17, 3673.

Aluminothermic reduction of metals. A. PACZ. U. S. 1,562,041, Nov. 17. Material such as Fe_2O_3 and zirkite is intimately mixed and briquetted with finely divided Al above 80 mesh and the material is ignited. U. S. 1,562,042 specifies forming B-Fe alloys by briquetting material such as oxides of Fe and B with Al and igniting to effect reaction and reduction. U. S. 1,562,043 specifies castings adapted for internal-combustion engine parts, which consist mainly of Fe with 0.75-4% B, having a tensile strength of over 50,000 lbs. per sq. in.

Coating rotating molds. D. H. MELOCHE. U. S. 1,561,561, Nov. 17. The wall of a rotating cylindrical mold (such as steel molds used for casting pipe) is sand-blasted and then brushed while heated with a soln. contg. a small quantity of Na silicate with a considerable quantity of fire clay in suspension. Cf. C. A. 20, 37.

Sand cores for molding metals. W. G. THOMAS. U. S. 1,561,956, Nov. 17. Cores are formed of sand mixed with emulsified asphalt and H_2O .

Carburizing iron. N. E. PHILLIPS. U. S. 1,561,482, Nov. 17. The material to be carburized is enclosed within a mass of closely consolidated charred leather or other pulverized carboniferous substance of substantial thickness surrounded by another similarly consolidated packing of bone meal or other C-bearing substance. The material, thus packed, is heated at white heat of the enclosed Fe, for 4-10 hrs.

Iron and cement production, etc. NORSK ALUMINIUM CO., AND H. PEDERSEN. Brit. 232,930, April 23, 1924. Bauxite in lump form, diasporic or other material contg. Al_2O_3 , limestone in small lumps, finely divided Fe ore, coke and anthracite fines are smelted together in an elec. or other furnace. The aluminous slag produced may be used as the raw material for producing port. cement or the alumina may be recovered by leaching the crushed slag with warm Na_2CO_3 soln. and pptg. the alumina by CO_2 (after removing excess silica by autoclaving the soln. with lime). The Fe obtained is of low S content.

Gas furnace for heating iron, steel or other metal articles for hardening, etc. A. W. MACHLET. U. S. 1,550,911, Aug. 25.

Nonmagnetic steel wire. P. H. BRACE. U. S. 1,561,306, Nov. 10. A substantially non-magnetic ferrous alloy adapted for use in elec. meters, etc., comprises Mn 10-18, Cr 2-8, Ni 5-10, Si 0.5-5, V 0.1-1 and C 0.5-1.5%, the remainder being Fe and minor impurities.

Alloy steels. J. BERTRAM. Brit. 232,591, April 15, 1924. Alloys for cutting-tools, etc., contain Fe up to 40%, and Ni 5-40%, Cr 10-60, W 5-50, C 3% or less or B 0.2%, with or without V, U or Ta.

Alloy. J. N. EARLY. Can. 254,501, Oct. 13, 1925. An alloy contains Si 1.21, S 0.14, P 0.57, Mn 0.21, free C 1.76, combined C 1.51% and the balance Fe.

Iron-nickel-chromium alloys. R. A. HADFIELD. Brit. 232,656, Dec. 27, 1923. Fe-Ni-Cr alloys contain up to about 1% C, 0.4-8% Mn, Cr 8-25, Ni 5-17 and Si 0.7% or more, with or without W or Mo 1-10% or, in some cases, Co, V, Ti or Al up to 6%. Cf. C. 4, 19, 631.

Molybdenum and vanadium alloys. J. J. BOERCKE. U. S. 1,562,201, Nov. 17. High percentage alloys of Mo or V are produced by reducing an aluminio-thermic mixt. consisting of the Mo or V compd., e. g., Ca molybdate, the alloying metal, e. g., ferrous material, a reducing metal such as Al and a quantity of Ca(OH)_2 , fluorspar or other indifferent flux materially in excess of that for the purposes of standard aluminio-thermic practices.

Refractory oxides and alloys. T. R. HAGLUND. Brit. 232,549, April 17, 1924. Oxides such as those of Al, Mg, Cr or Zr are obtained from crude materials (which, for Al, may be bauxite, clay, alundum, firebrick, feldspar, alum, shale, lepidolite, carboniferous clay, coal dross, etc.), by fusing a mixt. of the raw material with coke, coal, charcoal or CaC_2 , a sulfide of Fe, Cu, Pb or other heavy metal or of Al, Ca, Ba, Mg or Na or a mixt. of sulfate of Ca or Ba and a sulfide. An elec. arc furnace may be used and Fe may be added if much S is present. Reducible metals and Si form an alloy which is easily separable from sulfide slag in which the refractory oxide is dissolved. The slag is cooled and treated with H_2O , acid, alkali or steam to dissolve or decompose the sulfide and leave the oxide. The cryst. product may be further purified by electrostatic or electromagnetic sepn. and treatment with acid and alkali.

Tempering light alloys. G. L. WILLIAMS. U. S. 1,562,269, Nov. 17. Alloys such as those contg. Al, Mg and Gl are immersed in a hot soln. of a salt of a heavier metal, e. g., Cu, Ni or Fe salts and the soln. while heated is subjected to the action of an electrolyzing current with the alloy as cathode until the alloy surface has taken up metal from the soln. It is then quenched in cold H_2O . This treatment serves to harden the surface of the metal.

Alloy steel tools for shaping metals. E. G. HONES. U. S. 1,561,857, Nov. 17. Tools for shaping metals in forming tubes, etc., are formed of alloy steel contg. Cu 0.1-3.0, Zr 0.1-3.0 and Co 0.1-3.0%.

Welding rod. W. F. STODDY. U. S. 1,559,015, Oct. 27. A rod adapted for use in welding is formed of Fe together with Cr 7, Mn 4 and Si 1.25%.

Welding steel rails or other metals by the thermo-aluminic process. H. GOLDSCHMIDT. U. S. 1,562,227, Nov. 17. Mech. features.

Flux for welding, brazing and tempering. G. V. IRELAND. U. S. 1,562,330, Nov. 17. A dry mixt. contg. powd. borax 85, Fe carbonate 12.5 and NaHCO_3 2.5%.

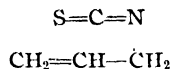
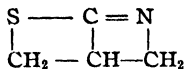
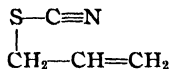
10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

History of stereochemistry. B. RASSOW. *Naturwissenschaften* 13, 819(1925).—Reply to Ernst Cohen (C. A. 19, 3178).

Transformation of thiocyanates into mustard oils. B. J. C. VAN DER HOEVEN. O. BILLETER. *Helvetica Chim. Acta* 8, 337-8(1925).—It is suggested that when an unsatd. thiocyanate changes

to a mustard oil the process involves a shift of the double bond and the C atom at the other end of the chain:



If this is true then thiocyanates of the formula $\text{CNSCH}_2\text{CH}:\text{CHR}$ would give mustard oils with a different though isomeric radical, $\text{SCNCH}_2\text{CH}:\text{CHR}$. It was found that cinnamyl thiocyanate, $\text{PhCH}:\text{CHCH}_2\text{SCN}$ does not isomerize to a mustard oil when heated but decomps. If only the SCN group were involved it would not be expected that the Ph group would prevent the change and the above fact is negative evidence for the theory. Work still incomplete indicates that crotonyl thiocyanate, $\text{NCSCNCH}:\text{CHMe}_2$, gives a mustard oil with a different radical, as expected from the theory.

Diallylcyanamide. E. B. VLIET. *Organic Syntheses V*, 45-7(1925) — Na_2NCN (prepd. from CaNCN and NaOH) is treated with $\text{CH}_2:\text{CHCH}_2\text{Br}$, giving 52-6% $(\text{CH}_2:\text{CHCH}_2)_2\text{NCN}$. M. A. YOUTZ

Nitrourea. A. W. INGERSOLL AND B. F. ARMENDT. *Organic Syntheses V*, 85-6 (1925).— $\text{CO}(\text{NH}_2)_2$, HNO_3 , added to concd. H_2SO_4 at -3° to 0° , gives 70-87% of $\text{H}_2\text{NCONHNO}_2$. C. J. WEST

Semicarbazide sulfate. A. W. INGERSOLL, L. J. BIRCHER AND M. M. BRUBAKER. *Organic Syntheses V*, 93-7(1925).—Directions are given for the electrolytic reduction of $\text{H}_2\text{NCONHNO}_2$ in H_2SO_4 , the yield of $\text{H}_2\text{NCONHNH}_2 \cdot \text{H}_2\text{SO}_4$ being 61-94%. C. J. WEST

Creatinine. GRAHAM EDGAR AND W. S. HINEGARDNER. *Organic Syntheses IV*, 15-7(1925).—Com. creatine hydrate (I) is warmed with dil. HCl for 24 hrs and then treated with NH_3 , giving 80-1% of creatinine. I, heated with ZnCl_2 to fusion, gives 76-8% of creatinine- ZnCl_2 . The product of heating I and HCl , treated with picric acid, gives 89-90% of the picrate. C. J. WEST

Velocity of the oxidation of sugars by permanganate. RICHARD KUHN AND THEODOR WAGNER-JAUREGG. *Ber.* 58B, 1441-7(1925); cf. *C. A.* 19, 1649.—In the literature of recent years are many papers on the behavior of carbohydrates and related compounds towards KMnO_4 , from which it would seem that the γ -sugars are especially reactive. These conclusions, however, are based on qual. observations which may easily lead to errors if the exptl. conditions are not carefully controlled. It is not sufficient to make expts. with a few drops of very dil. KMnO_4 when there is no guarantee of the abs. purity of the substance in question. K. and W.-J. have devised a quant. method, based on titration of the KMnO_4 in solns. kept at an approx. const. small acidity by means of phosphate mixts. The more important sugars are characterized by the "permanganate reaction time" (*pri*), i. e. the time in min. required by 5.00 g. hexose or the equiv. amt. of pentose or disaccharide to reduce to 25% 20 cc. of 0.1 N KMnO_4 in 100 cc. of 0.04 N $\text{KH}_2\text{PO}_4\text{-H}_3\text{PO}_4$ mixt. (1:1) at 18° . These values for α, β -equil. solns. are: maltose 9.0, fructose 9.5, arabinose 10.0, galactose 13.5, lactose 34.0, mannose 21.0, glucose 30.5. The β -sugars react more rapidly than their α -isomers, the $\alpha:\beta$ -*pri* for glucose, galactose and mannose being about 1.7:1, for lactose (5.0% soln. at 20.5°) 1.25:1. In the case of fructose, no difference greater than the exptl. error could be detected in the *pri* of the β - and the α, β -forms. With fructose at varying degrees of acidity a min. in *pri* is found at pH = about 4; the curve previously obtained by the decolorization method could not be confirmed by the new titration method. On testing by the new method the observation of Haworth and Law that fructose in pure H_2O does not reduce KMnO_4 unless it has first been allowed to stand for some time in acid soln. and then treated with KMnO_4 after neutralization it was found that the *pri* at a const. pH is independent of whether or not the fructose has previously been exposed to an acid. On the other hand, Armstrong's and Hilditch's statement that a sugar soln. reacts more rapidly with KMnO_4 if it has previously been allowed to stand in alk. soln. has been confirmed; this cannot be ascribed to the establishment of the equil. between fructose, glucose and mannose, for fructose, the sugar which reacts most rapidly with KMnO_4 , likewise shows increased reactivity after treatment with a dil. alkali. If the phenomenon were due exclusively to the formation of enol mols. of the sugar, as believed by A. and H., the *pri* of the neutralized soln. would be expected gradually to return to the normal value, but as a matter of fact on standing there is only a slight increase of the *pri* (about $1/6$ of the decrease produced by the alkali). Sucrose solns. quickly hydrolyzed with saccharase showed, after interruption of the enzyme action, only a slight decrease in *pri*, whence K. and W.-J. conclude that either there is no difference in the *pri* between ordinary

fructose and that form of it contained in sucrose or that the rearrangement of the latter form is so rapid that its intermediate formation cannot be detected. In carrying out the velocity measurements, 10-cc. portions of the reaction mixt. are poured at definite time intervals into 15 cc. of a $M/15$ $\text{KH}_2\text{PO}_4\text{-H}_3\text{PO}_4$ mixt. (1:1) + 1 cc. of 10% KI and the liberated I is titrated with 0.02 N $\text{Na}_2\text{S}_2\text{O}_3$. C. A. R.

Glycose or glucose. EDMUND O. VON LIPPIMANN. *Z. angew. Chem.* **38**, 631 (1926).—A discussion of the etymology of the words, preferring glycose to glucose. M. A. Youtz

New methyl derivatives of *d*-glucose. EUGEN PACSU. *Ber.* **58B**, 1455-64 (1925); cf. *C. A.* **18**, 3044.—Condensations of *d*-glucose dibenzyl mercaptal (I) with MeCOEt analogous to those previously carried out with Me_2CO have been effected. Owing to the slight soly. of the I in MeCOEt the condensation proceeds very slowly and the mixt. of mono- and diketone mercaptals in the sirupy reaction product is much more difficult to sep. than that obtained with Me_2CO ; the mono compd. (II) can be isolated only in small amt. No solid PhSO_2 deriv. of the diketone compd. (III) can be obtained but methylation of the mixt. proceeds as smoothly as with the Me_2CO compds.; the ketone residues can be rapidly split off from the methylated derivs. with HCl , the products being identical with those obtained from the Me_2CO compds. The mono-Me deriv. (IV) of I treated in abs. EtOH with more than 2 mols HgCl_2 (cf. *C. A.* **19**, 2056), yields $2\text{PhCH}_2\text{SHgCl} + 2\text{HCl} +$ a methylglucose Et glucoside (V). The V need not be isolated; it can be hydrolyzed directly with dil. HCl to a methylglucose (VI) differing entirely from the 3 known methylglucoses with a hydrofuran ring. The tri-Me deriv. (VII) of I with 2 mols HgCl_2 in abs. MeOH likewise yields a trimethylglucose Me glucoside (VIII) easily hydrolyzed by HCl to a trimethylglucose (IX), a thick sirup drying *in vacuo* to an easily pulverized mass which, however, soon changes again to a thick sirup in the air. IX, which is undoubtedly a mixt. of the α - and β -forms, yields an osazone, showing that the HO group on the 2-C atom is not methylated and hence that II must be the 2,3 ketone compd. and that the 2nd ketone residue in III can be attached only through the HO groups on C atoms 4 and 5 or 5 and 6, and since the VI differs entirely from Helferich and Becker's 6-methylglucose (*C. A.* **19**, 250) III must be the 2,3,5,6-diketone compd. and VI a 4-methylglucose. (If the H and B compd. should really be a 5-methylglucose, a possibility which has not been entirely excluded, VI might be a 6-Me deriv., but its great instability towards KMnO_4 and its striking optical properties all indicate that it is not of the furoid type, an assumption which would be quite arbitrary and contrary to all previous experience if it were a 6 Me deriv.) When IX, which must be a 4,5,6 trimethylglucose, is acetylated in the usual way with the aid of concd. H_2SO_4 it yields an oily product which no longer reduces Fehling soln. and must therefore be 1,2-monoacetone-4,5,6-trimethyl-*d*-[1,3]-glucose; hence IX is in all probability a deriv. of the unknown [1,3]-glucose. VI can also not belong to the furoid type, but as it forms no condensation product with Me_2CO it is not possible as yet to det. which of the 4 possible non-furoid structures it has. Degradation of IV and VII with only 1 mol. HgCl_2 yields methylated thioglucosides, the product from VII is oily but that (X) obtained from IV is a well crystd. substance showing no mutarotation and is provisionally assigned a [1,5]-glucose structure. 2,3-Monomethylethylketone-*d*-glucose dibenzyl mercaptal (II) (0.5 g. from 10 g. I), m. 90 $^{\circ}$, $[\alpha]_D^{15}$ -6.56° in $(\text{CHCl}_3)_1$, -117.58° in alc. The cor. m. p. of VII, previously given as 73 $^{\circ}$, is 96 ; on very low concn. of its alc. soln. at room temp. it may be obtained in very large crystals (weighing over 1 g.), either monoclinic-prismatic hexangular tables or long rhombic-bipyramidal columns. 4-Methyl- β (?)-*d*-[1,5(?)]-glucose (VI) (2.8 g. from 8.48 g. IV), begins to sinter 149 $^{\circ}$, m. 156-7 $^{\circ}$, is faintly sweet, shows mutarotation in H_2O ($[\alpha]_D^{15}$ 18.57 $^{\circ}$ 3 min. after soln., 61.92 $^{\circ}$ (final value) after 4 hrs.), and in alc. ($[\alpha]_D^{15}$ 32.44 $^{\circ}$ (initial), 52.58 $^{\circ}$ (final, after 52 hrs.)); the change in rotation proceeds according to the equation for a bimol. reaction, the mean k at 15 $^{\circ}$ in H_2O being 0.01935. The reversibility of the process is shown by the fact that the sirup obtained from the evapd. soln. slowly changes into a cryst. mass having the original rotation. The apparently bimol. course of the mutarotation may possibly be due to a shifting of the O bridge with the simultaneous formation of the α - and β -forms. In H_2SO_4 VI reduces KMnO_4 about 6 times as rapidly as glucose under the same conditions. Osazone, yellow, decomps. 198 $^{\circ}$ on rapid heating (1 $^{\circ}$ in 7 sec.), 192-3 $^{\circ}$ on slower heating (1 $^{\circ}$ in 15 sec.), shows mutarotation in $\text{C}_6\text{H}_5\text{N}_3\text{N}_3\text{O}_2\text{H}$ ($[\alpha]_D^{15}$ -50.33° (initial), -34.84° (final, after 19 hrs.)). 4,5,6-Trimethyl-*d*-[1,3] glucose (IX), $[\alpha]_D^{15}$ 75.81 $^{\circ}$ (alc.), shows no mutarotation in alc. but shows it in H_2O ($[\alpha]_D^{15}$ 65.94 $^{\circ}$ (initial), 61.13 $^{\circ}$ (final, 4 hrs.)); osazone, yellow, m. 156-7 $^{\circ}$, $[\alpha]_D^{15}$ -32.63°

(initial), —15.46° (final, 21 hrs.) in alc. 4-Methyl- α -benzylthio-[1,5(?)]-glucoside (X) (0.76 g. from 2.12 g. IV), m . 136°, $[\alpha]_D^{15}$ 249.61° (alc.). C. A. R.

Preparation of raffinose from cottonseed meal. D. T. ENGLIS, R. T. DECKER AND A. B. ADAMS. *J. Am. Chem. Soc.* **47**, 2724–6 (1925).—A modification of Ritt-hausen's extn. of raffinose from cottonseed meal, using MeOH instead of EtOH to effect a saving in solvent, is described. The crystn. of the raffinose from the ext., following the directions of Hudson and Harding (*C. A.* **8**, 3777) for crystg. from purified raffinose solns., can be made directly with the yield obtained by them (2.5% of pure recrystd. sugar). C. J. WEST

Molecular coefficients of refraction in the series of polymethylene compounds. FRITZ EISENLOHR. *Fortschritte der Chemie, Physik, physikal. Chem.* **18**, 521–66 (1925).—The values given below after the b . p. arc, resp. $d_4^{20_{vac}}$, and n for α , He, β and γ at 20°. Cyclopentane, b_{755} 50°, 0.7510, 1.40383, 1.40609, 1.41126, 1.41536. Methylcyclopentane, b_{755} 70–70.5°, 0.7459, 1.40750, 1.40947, 1.41465, 1.41868. Ethylcyclopentane, b_{755} 100.5–1°, 0.7610, 1.41612, 1.41840, 1.42332, 1.42798. Propylcyclopentane, b_{754} 129.5°, 0.7718, 1.42285, 1.42470, 1.43040, 1.43474. Isopropylcyclopentane, b_{754} 128–9°, 0.7717, 1.42255, 1.42470, 1.43010, 1.43454. Isobutylcyclopentane, b_{755} 148–9°, 0.7795, 1.42738, 1.42950, 1.43516, 1.43980. Cyclohexane, prepd. from C_6H_6 in AcOH with Pt and H, b_{755} 80.3°, 0.7783, 1.42476, 1.42680, 1.43229, 1.43668; from C_6H_6 passed over Ni at 180–90°, b_{755} 80.5°, 0.7782, n 1.42496, 1.42700, 1.43260, 1.43705. Methylcyclohexane, prepd. by reduction of PhMe in AcOH with Pt and H, b_{755} 100°, 0.7748, 1.42395, 1.42630, 1.43190, 1.43658; from cyclohexanone and MeI, b_{755} 99.5–100°, 0.7708, 1.42175, 1.42390, 1.42931, 1.43367; decompn. of p -methylcyclohexanone semicarbazone with EtONa, b_{770} 100°, 0.7725, 1.42265, 1.42500, 1.43040, 1.43474. Ethylcyclohexane, b_{755} 129.5°, 0.7840, 1.43041, 1.43251, 1.43803, 1.44272. Propylcyclohexane, b_{755} 154.5–5.5°, 0.7898, 1.43388, 1.43592, 1.44160, 1.44616. Isopropylcyclohexane, b_{755} 152–3°, 0.7902, 1.43428, 1.43642, 1.44225, 1.44686. Isobutylcyclohexane, b_{754} 169°, 0.7950, 1.43686, 1.43904, 1.44467, 1.44920. *cis-o*-Dimethylcyclohexane, b_{750} 126.5°, 0.7822, 1.42859, 1.43060, 1.43635, 1.44088. *trans-o*-Dimethylcyclohexane, b_{755} 124.5°, 0.7798, 1.42778, 1.42990, 1.43546, 1.44008. *cis-m*-Dimethylcyclohexane, b_{760} 121°, 0.7735, 1.42385, 1.42600, 1.43170, 1.43628. The *trans*-deriv. b_{756} 119°, —, 1.42265, 1.42480, 1.43030, 1.43493. *cis-p*-Dimethylcyclohexane, b_{755} 120.5°, 0.7671, 1.42064, 1.42270, 1.42833, 1.43299. The *trans*-deriv. b_{760} 119°, 0.7655, 1.41833, 1.42000, 1.42578, 1.43046. A 2nd sample b . 119–9.5°, 0.7638, 1.41914, 1.42120, 1.42686, 1.43163. *cis*-Hexahydrohemellitol, b_{755} 144–6°, 0.7930, 1.43475, 1.43682, 1.44259, 1.44724. The *trans*-deriv. b_{762} 142–3.5°, 0.7914, 1.43373, 1.43582, 1.44150, 1.44606. *cis*-Hexahydroseuodumene, b_{760} 141.5°, 0.7850, 1.43120, 1.43341, 1.43902, 1.44361. The *trans*-deriv. b_{755} 138.5–9.5°, 0.7813, 1.42909, 1.43121, 1.43675, 1.44135. *cis*-Hexahydromesitylene, b_{750} 139.5–40.5°, 0.7765, 1.42768, 1.42990, 1.43536, 1.43990. Mesitylene from mesidine, b_{763} 165°, d_4^{20} 0.8642, n_{He}^{20} 1.49957, gave a sample of the *cis*-deriv., b_{762} 140–40.5°, 0.7773, 1.42808, 1.43010, 1.43586, 1.44028. The *trans*-deriv. b_{760} 138–9°, 0.7720, 1.42506, 1.42710, 1.43279, 1.43735. Isodurene, b_{760} 195–7°, $d_4^{20_{vac}}$ 0.8906, n_{He}^{20} 1.51126, on hydrogenation with Pt and H gives *cis*-hexahydroisodurene, b_{762} 168–70°, 0.8166, 1.44621, 1.44847, 1.45472, 1.45963. The *trans*-deriv. b_{765} 162–4°, 0.8140, 1.44440, 1.44657, 1.45212, 1.45667. *cis*-Hexahydrodurene, b_{755} 171°, 0.8122, 1.44420, 1.44647, 1.45252, 1.45756. The *trans*-deriv. b_{760} 166–8°, 0.8100, 1.44230, 1.44446, 1.45003, 1.45470. *cis-o*-Methylcyclohexanol, b_{755} 170°, 0.9280, 1.46003, 1.46225, 1.46841, 1.47353. The *trans*-deriv. b_{750} 168.5°, 0.9254, 1.45943, 1.46165, 1.46771, 1.47284. The *cis-m*-methylcyclohexanol, b_{760} 175.5°, 0.9250, 1.45873, 1.46086, 1.46692, 1.47196. The *trans*-deriv. b_{762} 174.5–4.7°, 0.9234, 1.45723, 1.45931, 1.46544, 1.47020. *cis-p*-Methylcyclohexanol, b_{750} 175.5°, 0.9223, 1.45704, 1.45926, 1.46534, 1.47039. The *trans*-deriv. b_{760} 174.5°, 0.9172, 1.45503, 1.45727, 1.46336, 1.46831. *o*-Methylcyclohexanone, b_{767} 165°, 0.9240, 1.44181, 1.44747, 1.45332, 1.45845. The *m*-deriv. b_{755} 170.5°, 0.9182, 1.44270, 1.44526, 1.45122, 1.45598. The *p*-deriv. b_{755} 171.5°, 0.9128, 1.44099, 1.44346, 1.44924, 1.45401. Values recorded by other observers are given and the interrelationships of the values discussed. C. J. WEST

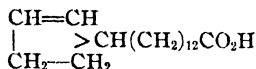
Synthesis and reactions of 1-anilino-cyclopentane-1-carboxylic acid. S. G. P. PLANT AND J. E. FACER. *J. Chem. Soc.* **127**, 2037–40 (1925).—The $NaHSO_4$ compd. of $(CH_3)_2CO$ was treated with HCN, the cyanohydrin extd. with C_6H_6 , treated with $PhNH_2$ and boiled for 12 hrs. and the excess $PhNH_2$ extd. with dil. HCl, giving 1-anilino-1-cyanocyclopentane, m . 58°, decomp. on distn. Cold H_2SO_4 gives the amide, m . 161°. Nitrosamine, m . 122°, of 1-anilino-cyclopentane-1-carboxylic acid, m . 162° (nitrosamine, m . 124° (decompn.)). On heating the acid at 230°, it decomp., giving $PhNH_2$ and

H₂O and the lactone of 1,1'-hydroxycyclopentane-1'-carboxylanilino-cyclopentane-1-carboxylic acid, (CH₂)₄:C.CO.O.C[: (CH₂)₄].CO.NPh, m. 142° (*Ac deriv.*, m. 195°).

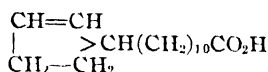
Heating the acid with EtONa and KOH at 270–320° gave some carbazole but not the expected ψ -indoxylspirocyclopentane.

Cyclopentanone. J. F. THORPE AND G. A. R. KON. *Organic Syntheses V*, 37–8 (1925).—HO₂C(CH₂)₄CO₂H, heated with crystd. B₂(OH)₂ at 285–95°, gives 75–80% of cyclopentanone.

Structure of chaulmoogric and hydnocarpic acids. I. R. L. SHRINER AND ROGER ADAMS. *J. Am. Chem. Soc.* **47**, 2727–39 (1925); cf. Power and Gornall, *J. Chem. Soc.* **85**, 838, 851 (1904); Barrowcliff and Power, *Ibid* **91**, 557 (1907).—The formula for chaulmoogric acid (I) is discussed in the light of Power's work and shown to be I; hydnocarpic acid (II) is II. I (14 g.) in 200 cc. 95% EtOH is reduced to the dihydro deriv. in 1 min. by 0.1 g. Pt oxide catalyst at 2–3 atms. II is reduced equally readily, the dihydro acid m. 6.4–5°. Me dihydrochaulmoograte, b₁₀ 204–5°, m. 27°, d₂₅²⁰ 0.9018, n_D³⁰ 1.4536 *Me dihydrohydnocarpate*, b₁₀ 187–8°, d₂₅²⁰ 0.9057, n_D³⁰ 1.4523. I and 31% HBr in glacial AcOH, warmed at 100°, for 1 hr., give bromodihydrochaulmoogric acid, m. 37–8°; refluxed with 2.5 mol. equivs. of EtOH-KOH, a mixt. of acids contg. 22% I was regenerated, with α_D 13.8°. Oxidation of isochaulmoogric acid by KMnO₄ gives pentadecane- γ -keto- α,α' -dicarboxylic acid, m. 125–6°, which is reduced by amalgamated Zn and 10% HCl to hexadecane- α,α' -dicarboxylic acid, m. 118°, which was also prepd. by the electrolysis of K Et sebacate. O₃ and I in glacial AcOH give a glassy pentadecane- α,γ -dialdehyde- α' -carboxylate (III), analyzed as the NH₄ salt, which is oxidized by Cr₂O₃ to pentadecane- α,α',γ -tricarboxylic acid, whose tri-Me ester, m. 37–8°, was prepd. by Power. O₃ and the Me ester of I gave the Me ester of III, whose dioxime m. 93–4°; another sample m. 102–3° (there are 4 possible isomers).



(I)



(II)

C. J. WEST

Formation and stability of associated alicyclic systems. II. The formation and disruption of dicyclic dihydroresorcinols. E. H. FARMER AND JOHN ROSS. *J. Chem. Soc.* **127**, 2358–69 (1925); cf. C. A. **14**, 2620—1-Methyl- Δ^1 -cyclohexen-3-one (I), b. 199–202°, condensed with CHNa(CO₂Et)₂ by heating 16 hrs. at 100°, gives about 10% of red oils giving purple colors with FeCl₃, 65% of Et β -methylpimelate- β -acetate (II), b₁₈ 200°, the remainder consisting principally of III. Hydrolysis of II gives the free acid, m. 123–4°; heating with excess AcCl for 15 hrs. gives an anhydro acid, m. 83°; Et ester, b₁₈ 200°. Condensation at room temp. gave Et 1-methylcyclohexan-3-one-4-carboxylate-1-acetate (III), b₁₈ 182° and gives a deep purple color with FeCl₃. Hydrolysis with HCl gives 1-methylcyclohexan-3-one-1-acetic acid, b₁₅ 196°, m. 37°; semicarbazone, m. 189°; Ag salt; Et ester (IV), b₁₅ 147°, whose semicarbazone, m. 158–9°. The presence of Et ethane-1,2-di-*II*^{1,4}-1-methylcyclohexa-3,5-dione-2-carboxylate (V) was probably responsible for the resinous material obtained on hydrolysis of the ester mixt.; boiling with EtOH-EtONa gave II. Intramol. condensation of II by heating with Na in C₆H₆ or PhMe gave 75% of III; some V, b₁₈ 190–200°, m. 111°, gives a deep color with FeCl₃ after 10 min.; some Et H ester corresponding to III, m. 91°, gives an immediate color with FeCl₃. No definite products were obtained from IV. Oxidation of III with 3% KMnO₄ gives MeC(CH₂CO₂H)₃, m. 172°. Oxidation of the mixt. from the condensation of IV gives β -methyladipic- β -acetic acid, m. 148–9°, whose ester imide, m. 169°; this is also obtained from Et levulate, CNCH₂CO₂Et and alc. NH₃. β -Methylpimelic- β -acetic acid, m. 124–5°, was likewise synthesized from AcCH₂CH₂CH₂CO₂Et through the ester imide, m. 138–9°.

C. J. WEST

***o*-Chlorocyclohexanol.** G. H. COLEMAN AND H. F. JOHNSTONE. *Organic Syntheses V*, 31–2 (1925).—Cyclohexene reacts with HOCl (prepd. by passing Cl into a cold soln. of HgCl₂ and NaOH, finally adding HNO₃) to give 70–3% *o*-chlorocyclohexanol.

C. J. WEST

Cyclohexene. G. H. COLEMAN AND H. F. JOHNSTONE. *Organic Syntheses V*, 33–4 (1925).—Cyclohexanol and concd. H₂SO₄, distd. at 130–40°, give 78–87% cyclohexene.

C. J. WEST

Cyclohexene oxide. A. E. OSTERBERG. *Organic Syntheses V*, 35–6 (1925).—*o*-Chlorocyclohexanol and aq. NaOH give 70–3% cyclohexene oxide.

C. J. WEST

Interaction of ethyl acetoacetate and *o*-hydroxydistyryl ketones. II. I. M. HEILBRON, T. A. FORSTER AND A. B. WHITWORTH. *J. Chem. Soc.* 127, 2159–67(1925); cf. *C. A.* 19, 484.—The present work definitely proves that, in all cases examd., cyclohexenones alone are formed as products of the condensation. $\text{AcCH}_2\text{CO}_2\text{Et}$ and $o\text{-HOC}_6\text{H}_4\text{CH:CHCOCH:CHC}_6\text{H}_4\text{NMe}_2\text{-}p$, condensed by EtOH-KOH at room temp. give *Et 3-*p*-dimethylaminophenyl-5-*o*-hydroxystyryl- Δ^6 -cyclohexen-1-one-2-carboxylate* (I), orange-yellow, m. 196° and crystg. with 1 mol. EtOH or C_6H_6 ; the constitution is established by oxidation with KMnO_4 , giving $o\text{-HOC}_6\text{H}_4\text{CO}_2\text{H}$. Heating with NaOH gives the free acid, yellow, m. 225° , which, boiled with 20% H_2SO_4 in AcOH , gives *3-*p*-dimethylamino-5-*o*-hydroxystyryl- Δ^6 -cyclohexen-1-one*, yellow, m. 232° . Methylation in Me_2CO gave the *5-*o*-MeO deriv.* (II) of I, lemon-yellow, m. 164° , giving a yellow soln. in EtOH-KOH and red in concd. H_2SO_4 . *Et 3-*o*-methoxyphenyl-5-*p*-dimethylaminostyryl- Δ^6 -cyclohexen-1-one-2-carboxylate* (III), orange, m. 114° , extremely hygroscopic; traces of II also are formed. III in EtONa , heated with MeI for 2 hrs., gives *Et 1-methoxy-3-*o*-methoxyphenyl-5-*p*-dimethylaminostyryl- $\Delta^{1,6}$ -cyclohexadiene-2-carboxylate*, pale yellow, m. 148° . *Et 3-*p*-dimethylaminophenyl-5-*p*-dimethylaminostyryl- Δ^6 -cyclohexen-1-one-2-carboxylate*, orange-yellow, m. $174\text{--}5^\circ$; *phenylhydrazone*, m. 239° . *Et 3-*p*-dimethylaminophenyl-5-methylcyclohexan-5-ol-1-one-2-carboxylate*, m. 149° , from $\text{AcCH}_2\text{CO}_2\text{Et}$ and $\text{MeCOCH:CHC}_6\text{H}_4\text{NMe}_2$; *phenylhydrazone*, m. 179° . The corresponding cyclohexenone, m. 66° , results upon heating with 10% NaOH . *Et 3-*p*-dimethylaminophenyl-5-[3'-methoxy-2'-hydroxy]styryl- Δ^6 -cyclohexen-1-one-2-carboxylate* (IV), yellow, m. $197\text{--}8^\circ$. *3-[4'-Methoxy-2'-hydroxy]phenyl-5-*p*-dimethylaminostyryl- Δ^6 -cyclohexen-1-one*, orange-red, m. 218° . The [5'-methoxy-2'-hydroxy] deriv corresponding to IV, yellow, with 1 C_6H_6 , m. $196\text{--}7^\circ$. Crystn. from aq. $\text{C}_6\text{H}_6\text{N}$ gives *3-[5'-methoxy-2'-hydroxy]phenyl-5-*p*-dimethylaminostyryl- Δ^6 -cyclohexen-1-one*, orange, m. 250° . With $\text{NCCH}_2\text{CO}_2\text{Et}$ and $o\text{-HOC}_6\text{H}_4\text{CH:CHCOCH:CHC}_6\text{H}_4\text{NMe}_2\text{-}p$, there results γ -*p*-dimethylaminocinnamyl- β -*o*-hydroxyphenylpropane- α,α' -dicarboxylic acid, orange, m. 220° .

C. J. WEST

Constitution of benzene and the substitution process in the benzene nucleus. MICHELE GUÀ AND RODOLFO PETRONIO. *J. prakt. Chem.* 110, 289–308(1925); cf. *C. A.* 18, 2874.—The effects of various substituents on the lines of force in the C_6H_6 mol. are discussed and illustrated by typical reactions. $2,4\text{-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{Cl}$ and H_2NCN give the light yellow *2,4-dinitrophenylcyanamide*, m. $168\text{--}9^\circ$; dissolved in fuming HNO_3 and pptd. with H_2O , there results *2,4-dinitrophenylnitrourea*, yellowish red, m. $146\text{--}7^\circ$ (decompn.); EtOH-HCl gives nearly quant. $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{NHCNHNH}_2$, m. 178° . *4,6-Dinitro-m-tolylcyanamide*, Au-yellow, m. $161\text{--}2^\circ$; concd. HCl gives *4,6-dinitro-m-tolylurea*, pale yellow, m. $205\text{--}6^\circ$ (decompn.); fuming HNO_3 gives the *nitro deriv.*, yellow m. $168\text{--}9^\circ$ (decompn.). *2,4-Dinitro-m-tolylurea*, pale yellow, m. $224\text{--}5^\circ$. *2,4,6-Trinitrophenylsemicarbazide* (*purylsemicarbazide*), yellow, m. $218\text{--}9^\circ$ (decompn.); the corresponding *semioxamamide*, yellow, m. $249\text{--}50^\circ$ (decompn.). β -Trinitrotoluene and PhCH-NEt give *2,4-dinitro-m-ethyltoluidine*, m. $68\text{--}9^\circ$; the γ -deriv. gives the *4,6-dinitro deriv.*, yellow, m. $125\text{--}6^\circ$. *2-Ethylamino-3,5-dinitro-*p*-toluic acid*, light yellow, m. $190\text{--}1^\circ$. *2,4-Dinitropropyl-m-toluidine*, light yellow, m. $64\text{--}5^\circ$; the *4,6-dinitro deriv.*, yellow, m. $106\text{--}7^\circ$. *4,6-Dinitro-m-isoamyltoluidine*, yellow, m. $87\text{--}8^\circ$. C. J. W.

Mesitylene. ROGER ADAMS AND R. W. HUFFERD. *Organic Syntheses II*, 41–5 (1922).—About 13–15% of $\text{C}_6\text{H}_3\text{Me}_3$ is obtained from Me_2CO and concd. H_2SO_4 .

C. J. WEST

Propylbenzene. HENRY GILMAN AND C. H. MEYERS. *Organic Syntheses IV*, 59–61(1925).— PhCH_2MgCl and Et_2SO_4 give 55–65% PrPh .

C. J. WEST

Phenylacetylene. J. C. HESSLER. *Organic Syntheses II*, 67–9(1922).— PhCH:CHBr and KOH at 200° give 67% of PhC:CH .

C. J. WEST

***o*- and *p*-Chlorotoluenes.** C. S. MARVEL AND S. M. McELVAIN. *Organic Syntheses III*, 33–5(1923).— $o\text{-H}_2\text{NC}_6\text{H}_4\text{Me}$, diazotized and treated with CuCl , gives 74–9% $o\text{-ClC}_6\text{H}_4\text{Me}$. The *p*-deriv. is obtained similarly in 70–9% yields.

C. J. WEST

***p*-Bromotoluene.** L. A. BIGELOW. *Organic Syntheses V*, 21–2(1925).—Diazotized $p\text{-MeC}_6\text{H}_4\text{NH}_2$, treated with HBr and CuBr , gives 70–3% $p\text{-BrC}_6\text{H}_4\text{Me}$.

C. J. WEST

The reduction of nitro derivatives by calcium hydride. J.-F. DURAND AND SHERILL HOUGHTON. *Compt. rend.* 180, 1034–6(1925).— MeNO_2 (I), in cold Et_2O with powd. CaH_2 (II) gives 1 mol. of H per mol. of I, and the salt $(\text{CH}_3\text{NO})_2\text{Ca}$. If II is boiled with PhNO_2 in ligroin (b. $75\text{--}95^\circ$) green vapors are given off and these condense to a green liquid contg. PhNO (III). But if the mixt. is refluxed for 2 hrs. azoxybenzene (IV) is formed. If III is likewise refluxed, IV is formed. IV is not affected by II in 5 hrs. of refluxing.

M. A. YOUTZ

1,3,5-Trinitrobenzene. H. T. CLARKE and W. W. HARTMAN. *Organic Syntheses* II, 93-4(1922).—Crude $(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$ is neutralized with NaOH, glacial AcOH added and the mixt. heated, giving 43-6% of 1,3,5- $\text{C}_6\text{H}_3(\text{NO}_2)_3$ (calcd. on the $(\text{O}_2\text{N})_3\text{-C}_6\text{H}_2\text{Me}$). C. J. WEST

***m*-Nitrochlorobenzene.** W. W. HARTMAN and M. R. BRETHEN. *Organic Syntheses* III, 79-81(1923).— $\text{m-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ is diazotized and treated with CuCl, giving 68-71% $\text{m-O}_2\text{NC}_6\text{H}_4\text{Cl}$. C. J. WEST

***m*-Nitrotoluene.** H. T. CLARKE and E. R. TAYLOR. *Organic Syntheses* III, 91-3(1923).—The diazo compd. from 3,4- $\text{O}_2\text{N}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{NH}_2$ is decompd. by EtOH, giving 67-77% of $\text{m-O}_2\text{NC}_6\text{H}_4\text{Me}$. C. J. WEST

Influence of nitro groups on the reactivity of substituents in the benzene nucleus.

VIII. **2,3- and 2,5-Dinitro-*p*-chlorotoluenes.** JAMES KENNER, C. W. TOD and ERNEST WITAM. *J. Chem. Soc.* 127, 2343-9(1925); cf. *C. A.* 17, 2567.—Nitration of 4,2- $\text{Cl}(\text{AcNH})\text{C}_6\text{H}_3\text{Me}$ in $\text{AcOH-H}_2\text{SO}_4$ by fuming HNO_3 and hydrolysis give a mixt. of 4-chloro-5-nitro-*o*-toluidine, m. 163-4° (*Ac* deriv., m. 181-2°), reduced by SnCl_2 and HCl to 5-chloro-2-methyl-*p*-phenylenediamine, m. 145-6° (*Ac* deriv., m. 301°); and the 3-nitro deriv., light brown, m. 60-62.5° (*Ac* deriv., m. 194-5°). 4-Chloro-6-nitro-*o*-toluidine (I), yellow, m. 120-1° (*Ac* deriv., m. 134-5°). The isomeric 2-nitro deriv. (II), lemon-yellow, m. 52-3° (*Ac* deriv., m. 210-2°). I was converted through the diazo compd. to the 4,5,2- $\text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{Me}$, which, with MeOH and Na, yields 4-chloro-6-nitro-*m*-tolyl Me ether (III), straw-colored, m. 121-2°. 4-Chloro-2,3-dinitrotoluene, lemon-yellow, m. 106.5°; MeOH- NH_3 for 8 hrs. at 140-50° gives II. MeOH- NH_3 and 4,2,5- $\text{Cl}_3(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{Me}$, heated at 160° for 16 hrs., then extd. by boiling concd. HCl, gave III, a small amt. of the corresponding cresol and I. MeONa gives III nearly quant. In all these cases the group that is displaced is that in the *m*-position to the Me group rather than that in the *m*-position to the Cl atom. C. J. WEST

Benzalaniline. M. T. BOGERT. *Organic Syntheses* V, 13-4(1925).—One mol. each of BzH and PhNH_2 , heated at 125° for 5 hrs., give 85-6% PhCH:NPh . C. J. W.

Phenylurea. T. L. DAVIS and K. C. BLANCHARD. *Organic Syntheses* III, 95-7(1923).— PhNH_2 , HCl and $\text{CO}(\text{NH}_2)_2$, boiled for about 2 hrs., give 52-5% PhNHCONH_2 and 38-40% $(\text{PhNH})_2\text{CO}$. C. J. WEST

A rapid method for the preparation of thiocarbamilide. S. J. C. SNEDKER. *J. Soc. Chem. Ind.* 44, 486T(1925).—To a mixt. of 372 g. of PhNH_2 and 380 g. CS_2 , 400 cc. of 40% NaOH is added with cooling and agitation. H_2O is added to make the mixt. more fluid, and the $(\text{PhNH})_2\text{CS}$ is filtered, washed and dried. T. S. C.

Velocity of benzylation of certain amines. II. D. H. PEACOCK. *J. Chem. Soc.* 127, 2177-80(1925); cf. *C. A.* 19, 766.—The following velocity coeffs. in MeOH for PhCH_2Cl , $\text{m-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$ and $\text{p-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$ are reported at 35° and 45°: PhNH_2 , 0.00368, 0.00185, 0.0144, 0.0092, 0.00451, 0.00365. $\text{p-MeC}_6\text{H}_4\text{NH}_2$, 0.00596, 0.00407, 0.00276; 0.0147, 0.00874, 0.00667. $\text{o-MeC}_6\text{H}_4\text{NH}_2$, 0.00269, 0.00123, 0.000832; 0.00596, 0.00256, 0.00207. PhNMe_2 , 0.00278, 0.000671, 0.000404; 0.00609, 0.00132, 0.00092. In all cases the concn. of the base was 0.8 *M*, of the chloride, 0.2 *M*. Data for 0.2 *M* PhCH_2Cl and the following bases also are reported: $\text{m-MeC}_6\text{H}_4\text{NH}_2$, 0.8 *M*, 35°, 0.00494; $\text{m-O}_2\text{NC}_6\text{H}_4\text{NH}_2$, 0.8 *M*, 45°, 0.00168; $\text{p-O}_2\text{NC}_6\text{H}_4\text{NH}_2$, 0.4 *M*, 45°, 0.0002; PhNHMe , 0.8 *M*, 35°, 0.00644; 45°, 0.0187; PhNHCH_2Ph , 0.8 *M*, 45°, 0.00335; $\text{p-BrC}_6\text{H}_4\text{NMe}_2$, 0.8 *M*, 45°, 0.00175. The introduction of a NO_2 group into the nucleus of the base considerably reduces the reaction velocity. The effect of concn. on the velocity coeffs. and energies of activation depends on the character of the base employed. It is suggested that the formation of a loose mol. complex precedes activation and the energy of activation measured in the cases cited is the energy of activation of such a complex. C. J. WEST

Reactions of azoxy compounds. I. The action of light. WM. M. CUMMING and G. S. FERRIER. *J. Chem. Soc.* 127, 2374-9(1925).—Azoxybenzene, exposed to ultra-violet light, gives the *o*-HO deriv., m. 82-3°; the yields (% of the *o*-HO deriv. after 50 hrs. illumination) obtained with various solvents were: 85% EtOH, 20.5; 100% EtOH, 28.0; MeOH, 24; PrOH, 26.3; C_6H_6 , 7.7; boiling EtOH, 22.3. Increasing the time of exposure of the 85% EtOH soln. to 100 and 200 hrs. raised the yield to 44 and 63.3%, resp. Exposed 3 months in 85% EtOH to sunlight there resulted from 31 to 37% of the *o*-HO deriv., depending upon the type of vessel. There was no change after exposure to electric light for 50 hrs. 2,2'-Azoxytoluene in 85% EtOH, exposed to ultra-violet light, gave an orange-red product, m. 47.5-8.5°, while the product formed in C_6H_6 consisted of red needles, m. 92-3°; the 3,3'-deriv. gave the 2-HO deriv., red, m. 61.5-2.5°; the 4,4'-deriv. gave 10% of the 3-HO deriv., m. 150-1°. 4,4'-Azoxyanisole, 4,4'-azoxyphenetole and 4,4'-dinitroazoxybenzene reacted slightly or not at all. Con-

trary to the work of Janovsky and Reimann (*Ber.* 22, 40(1889)) there is no indication of the existence of an isomer of 4,4'-azoxytoluene. C. J. WEST

Methyl red. H. T. CLARKE AND W. R. KIRNER. *Organic Syntheses II*, 47-51 (1922).—Directions for prepn. of Me red from o -HO₂CC₆H₄NH₂ and PhNMe₂. C. J. WEST

Phenylhydrazine. G. H. COLEMAN. *Organic Syntheses II*, 71-4(1922).—Detailed directions for the prepn. of 80-4% of PhNHNH₂ from PhNH₂. C. J. WEST

Substituted isodiazomethanes. F. D. CHATTAWAY AND A. J. WALKER. *J. Chem. Soc.* 127, 2407-14(1925).— o -O₂NC₆H₄CH:NNHPh (I) and 2 mols. Br in AcOH give ω -bromo- o -nitrobenzaldehyde p -bromophenylhydrazone, amorphous red solid, which easily loses HBr (best by warming in C₆H₆ with concd. aq. NH₃), giving 1- q -bromophenyl-3- o -nitrophenylisodiazomethane, yellow, explodes 144° without melting; this is best prepd. by adding to 5 g. I and 10 g. AcONa in AcOH 6 g. Br in AcOH (yield, 5 g.). I and 3 mols. Br give the ω -bromo-2,4-dibromo deriv., pale yellow, m. 110° (70% yield); it also results from 1 mol. Br and o -O₂NC₆H₄CH:NNHC₆H₄Br₂. A soln. in C₆H₆ shaken with NH₄OH or treated with NH₃ gas, an AcOH soln. shaken with AcONa or an EtOH soln. gently boiled for a few min. gives 1-2,4-dibromophenyl-3- o -nitrophenylisodiazomethane (II), yellow, explodes 145-6° without melting; mol. wt. in CHCl₃, 373. ω -Bromo- o -nitrobenzaldehyde 2,4-dichlorophenylhydrazone (III), pale yellow, m. 122°. NH₄OH gives the 1-2,4-di-Cl deriv. corresponding to II, bright yellow, explodes 140°. The 2,4,6-tri-Cl deriv. corresponding to III exists in 2 polymorphic modifications: light yellow needles, transformed in warm AcOH to pale yellow compact prisms, m. 115-6°. The 2,4,6-tri-Cl deriv. corresponding to II, bright yellow, explodes 163° mol. wt. in CHCl₃, 365. The 3,4,5-tri-Cl deriv. corresponding to II, pale yellow, m. 170° (decompn.); with NH₄OH it gives the 3,4,5-tri-Cl deriv. corresponding to III, yellow, explodes 151°. 1- p -Chlorophenyl-3- o -nitrophenylisodiazomethane, bright yellow, explodes 147°. ω -Chloro- o -nitrobenzaldehyde 2,4-dichlorophenylhydrazone, yellow, m. 132°; the 2,4,6-tri-Cl deriv., yellow, m. 107°. With NH₄OH these give the derivs. described above. All the ω -halogen derivs. yield deep green colors with a trace of oxidizing agent in concd. H₂SO₄. All these derivs. are decompd. by EtOH-KOH or EtOH-NH₃, yielding a halogen-substituted benzene. C. J. WEST

β -Phenylhydroxylamine. OLIVER KAMM. *Organic Syntheses IV*, 57-8(1925).—PhNO₂ is reduced by Zn dust and NH₄Cl, giving 62-7% of PhNH₂. C. J. WEST

4- m -Nitrophenylsemicarbazide and certain derivatives. A. S. WHEELER AND T. T. WALKER. *J. Am. Chem. Soc.* 47, 2792-6(1925); cf. *C. A.* 19, 478.—O₂NC₆H₄NHCONH₂ and 2 mol. equivs. of 42% N₂H₄·H₂O give 36% 4- m -nitrophenylsemicarbazide, pale yellow, m. 138-9°. It reduces Fehling soln. and AgNO₃·NH₄OH in the cold; it dissolves in about 4 parts boiling EtOH; strong alkalis give a red color. HCl salt, sol. in about 10 parts hot EtOH and readily hydrolyzed by aq. solns. of strong alkalis. The following derivs. were prepd.: acetone, yellow, m. 210-1°; chloroacetone, pale yellow, m. 238°; methyl ethyl ketone, pale yellow, m. 205°; acetophenone, m. 211-2°; benzophenone, light yellow, m. 133-6°; camphor, m. 240-2°; cyclohexanone, m. 219-20°. C. J. W.

Phenylcarbamyl derivatives of nitrophenols. O. L. BRADY AND JACK HARRIS. *J. Chem. Soc.* 127, 2175-6(1925).—The O₂NC₆H₄OH (4.8 g.) is gently boiled with 5 g. PhNC in PhMe for 3 hrs. The product crystg. on cooling is washed with cold 2 N NaOH and crystd. from CHCl₃. m -Nitrophenyl phenylcarbamate, m. 129°. C. J. W.

Cupferron. C. S. MARVEL. *Organic Syntheses IV*, 19-21(1925).—Moist PhNH₂ in Et₂O is satd. with NH₃ and then treated with BuONO (the stream of NH₃ being continued during the addn.). There results 85-90% of PhN(NO)ONH₂. C. J. WEST

Sodium p -hydroxybenzenesulfonate. W. G. CHRISTIANSEN AND A. J. NORTON. *Organic Syntheses IV*, 65-8(1923).—PhOH and H₃AsO₄, heated at 155-60°, give 33% of HOC₆H₄AsO₃H₂. C. J. WEST

Arsanilic acid. W. L. LEWIS AND H. C. CHEETHAM. *Organic Syntheses III*, 13-6(1923).—Prepn. from PhNH₂ and H₃AsO₄. C. J. WEST

Relative rates of conversion of phenoxyphenyldichloroarsines and its chloro derivatives into chlorophenoxarsines. ELWYN ROBERTS AND E. E. TURNER. *J. Chem. Soc.* 127, 2004-12(1925); cf. Turner and Sheppard, *C. A.* 19, 1699.—T. and S. showed that PhOC₆H₄AsCl₂ (I) gave 5-chlorophenoxarsine when distd. *in vacuo* and suggested that polarity effects might account for this unusual ring closure. The work has been extended to Cl derivs. of I and it is shown that the polarizing effect of the Cl atom is not the sole detg. influence affecting ring closure. 2-Chloro-2'-nitrodiphenyl ether (II), yellow, m. 48°, b₂ 209°; 55% yield. The 3-Cl deriv. (III), yellow oil, b₂ 204°; 58% yield. The 4-Cl deriv. (IV), yellow, m. 44-5°, b₁ 208°; 75% yield. These are reduced by Fe filings and H₂O. 2-Chloro-2'-aminodiphenyl ether, m. 44-5°, b₂ 185°; 90% yield;

HI salt, m. 171–3°; 3-*Cl* deriv., b_p 195°; 91% yield; *HCl* salt, m. 149–51°; *Bz* deriv., m. 106°. 4-*Cl* deriv., yellow oil, b_p 202°; *HI* salt, m. 190–1°; *Bz* deriv., m. 108–9°. These were converted into arsenic acids by neutralizing the diazo soln. with NaHCO_3 , treating with a little CuSO_4 soln., and then adding an arsenite soln. contg. 0.75 mol. As_2O_3 , 2 mols. NaOH , 0.7 mol. Na_2CO_3 , 7 mols. H_2O and a little CuSO_4 . 2-*o*-Chlorophenoxyphenylarsinic acid, m. 195–5.5°; 18% yield; 2-*m*-*Cl* deriv., m. 177–9°; 18% yield; 2-*p*-*Cl* deriv., m. 187–8°; 24% yield. 2-*o*-Chlorophenoxyphenyldichloroarsine, pale yellow oil, b_p 217°; 2-*m*-*Cl* deriv., pale yellow, b_p 220°; 2-*p*-*Cl* deriv., pale yellow, m. 67–8°, b_p 220°. 8-Chlorophenoxyarsinic acid, m. 250–2°; the 7-*Cl* acid, m. 240–2°. Reduction gave 5,8-dichlorophenoxyarsine, m. 125°, and the 5,7-deriv., m. 144–5°; 5,9-deriv., pale yellow, m. 99°. The 5,8-deriv. was synthesized as follows: 5-chloro-2-nitrodiphenyl ether, m. 85°, was reduced to the 2-amino deriv., indefinite m. p., this transformed into 4-chloro-2-phenoxyphenylarsinic acid, m. 82°, then into 4-chloro-2-phenoxyphenyldichloroarsine, m. 91–2° and finally into the 5,8-deriv. The rate of conversion was detd. by heating about 1 g. in an atm. of CO_2 , the HCl liberated being absorbed by 0.1 *N* KOH . The % decompn. is given for 1–6 hrs. The initial and final values reported are: I, 23.7, 56.6; II, 1.86, 24.3; III, 8.90, 37.8; IV, 1.09, 27.0. C. J. WEST

Sulfur content of arspenamine and its relation to the mode of synthesis and the toxicity. V. W. G. CHRISTIANSEN, A. J. NORTON AND J. B. SHOHAN. *J. Am. Chem. Soc.* 47, 2712–24(1925); cf. C. A. 17, 2475.— $3,4\text{-O}_2\text{N}(\text{OH})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ is reduced by NaHSO_3 in 3 ways: In boiling H_2O , the C-As bond is severed and $o\text{-O}_2\text{NC}_6\text{H}_4\text{OH}$ is obtained. At room temp. in H_2O the Na salt is reduced mainly to 3-nitro-4-hydroxyphenylarsenious oxide, yellow, reduces I and is reduced by H_3PO_2 to a pale yellow insol. substance. The dry powder causes sneezing. The mother liquor shows the presence of a sulfamic acid. The tri-Na salt under these conditions is reduced to salts of sulfamic acids which are very sol. in H_2O and which can be isolated by a tedious process. There were isolated and analyzed *di*-Ba 2-hydroxy-5-arsonobenzenesulfamate, yellow; with H_2SO_4 these results impure $3,4\text{-H}_2\text{N}(\text{OH})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$; *tri*-Ba 2-hydroxy-3-sulfo-5-arsonobenzenesulfamate, needles, yielding on hydrolysis with concd. H_2SO_4 3-amino-4-hydroxy-5-sulfophenylarsonic acid, m. 243–4°; *tetra*-Ba 2,2'-dihydroxy-5,5'-diarsonosulfonamide-*N,N'*-disulfonate, yellow, which yields $3,4\text{-H}_2\text{N}(\text{OH})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ on hydrolysis. $3,1\text{-O}_2\text{N}(\text{MeO})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ is also reduced by NaHSO_3 to very sol. compds. of the sulfamic acid series. When mixts. of the sulfamic acids which are formed by the action of NaHSO_3 on $3,4\text{-O}_2\text{N}(\text{OH})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ and $3,4\text{-H}_2\text{N}(\text{OH})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ are reduced by $\text{Na}_2\text{S}_2\text{O}_4$, the rate of formation of insol. reduction products is much less than when the NH_2 acid is reduced to arspenamine base in the usual way and the products sep. from the soln. in a different condition from that of arspenamine base. The behavior of these bases in MeOH-HCl is also quite different from that of arspenamine base. These products are more toxic and contain more S than arspenamine prepd. from the NH_2 acid. When $3,4\text{-O}_2\text{N}(\text{OH})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ is reduced with $\text{Na}_2\text{S}_2\text{O}_4$ to $3\text{-H}_2\text{N}(\text{HO})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$, 2 by-products are formed which may be isolated and sep'd. by means of their Ba salts. Reduction of a mixt. of I of these by-products and the pure NH_2 acid yields a product which is much more toxic and contains more S than arspenamine prepd. from the NH_2 acid. BaBr_2 is recommended for the prepn. of Ba salts when EtOH solvents are used. Its prepn. is described. C. J. WEST

Organic compounds of arsenic. III. Reaction between arsenic trichloride and α -naphthyl compounds of mercury. KAORU MATSUMIYA. *Mem. Coll. Sci. Kyoto Imp. Univ.* 8, 391–6(1925); cf. C. A. 19, 3086; (in English).— AsCl_3 and $\alpha\text{-C}_{10}\text{H}_7\text{HgCl}$ at 160° give $\alpha\text{-C}_{10}\text{H}_7\text{AsCl}_2$ and HgCl_2 . Heating ($\alpha\text{-C}_{10}\text{H}_7$) $_2\text{Hg}$, AsCl_3 and C_6H_6 in a sealed tube at 145° for several hrs. gives HgCl_2 , $\alpha\text{-C}_{10}\text{H}_7\text{HgCl}$, ($\alpha\text{-C}_{10}\text{H}_7$) $_2\text{AsCl}$ and ($\alpha\text{-C}_{10}\text{H}_7$) $_3\text{As}$. SbCl_3 and $\alpha\text{-C}_{10}\text{H}_7\text{HgCl}$ remained unchanged after heating in $\text{C}_6\text{H}_6\text{Me}_2$ at 145° for 8 hrs. On heating ($\alpha\text{-C}_{10}\text{H}_7$) $_2\text{Hg}$ and SbCl_3 at 145° for 8 hrs, there result $\alpha\text{-C}_{10}\text{H}_7\text{HgCl}$, SbCl_3 and an Sb compd. of unknown compn. C. J. WEST

o-Chloromercuriphenol. F. C. WHITMORE AND E. R. HANSON. *Organic Syntheses* IV, 13–4(1925).— PhOH and $\text{Hg}(\text{OAc})_2$ give $\text{HOC}_6\text{H}_4\text{HgOAc}$, which is treated in soln. with NaCl , giving 44% of *o*- $\text{HOC}_6\text{H}_4\text{HgCl}$. C. J. WEST

Mercury di-*p*-tolyl. F. C. WHITMORE, N. THURMAN AND FRANCES H. HAMILTON. *Organic Syntheses* III, 65–6(1923).— $\text{MeC}_6\text{H}_4\text{HgCl}$ and NaI give 78–85% of (MeC_6H_4) $_2\text{Hg}$. C. J. WEST

p-Tolylmercuric chloride. F. C. WHITMORE, F. H. HAMILTON AND N. THURMAN. *Organic Syntheses* III, 99–100(1923).— HgCl_2 and *p*- $\text{MeC}_6\text{H}_4\text{SO}_3\text{Na}$ give 51–7% $\text{MeC}_6\text{H}_4\text{HgCl}$. C. J. WEST

A new method for the preparation of symmetric organo-mercury compounds. FR. HEIN AND K. WAGLER. *Ber.* 58B, 1499–509(1925).—In attempts to prep. organo-

Cu compds. from Hg dialkyls (e. g., HgPh_2) by treatment in $\text{C}_6\text{H}_5\text{N}$ with metallic Cu, an intense yellow-green color appeared even in the cold in 15–30 min. and the Cu became visibly amalgamated. The soln. was found, however, to contain but a fraction of a mg. of dissolved Cu per cc. and the phenomenon was traced to the presence of PhHgCl as an impurity in the HgPh_2 ; PhHgBr with Cu in $\text{C}_6\text{H}_5\text{N}$ gives the same yellow-green color and pptn. of Hg in a few min. and the resulting soln. yields halogen-free HgPh_2 . The reaction can therefore be used for the purification of the HgR_2 which, after 1 or more such treatments, no longer react at all with Cu in $\text{C}_6\text{H}_5\text{N}$, and also as a practical method for the prepn. of HgR_2 from RHgX (in the case of MeHgI and EtHgCl , the products, HgMe_2 and HgEt_2 , being liquid and volatile, cannot be well sep'd. from the $\text{C}_6\text{H}_5\text{N}$, but detns. of the amt. of dissolved Cu or pptd. Hg indicate that the reaction proceeds practically quant.). This new method of synthesis proceeds smoothly even in a no. of cases where all the earlier methods are largely unsuccessful. After the reaction is over the $\text{C}_6\text{H}_5\text{N}$ is removed *in vacuo* below 40° and the Cu compds. are dissolved away with cold NH_4OH . The following compds. were prepd. by the new method (yield in parentheses): $\text{Hg}(\text{CH}_2\text{Ph})_2$ (I), m. 111° (75%); $(1-\text{C}_{10}\text{H}_7)_2\text{Hg}$, m. $243-5^\circ$; (*p*- MeNC_6H_4) $_2\text{Hg}$, m. $167-8^\circ$ (81%); *bis*-[*o*-nitrophenyl]mercury, faintly yellow, m. $206-7^\circ$ (92%); *bis*-[*p*-chlorophenyl]mercury, m. $242-3^\circ$ (81%); *bis*-[*p*-bromophenyl]mercury, m. $244-5^\circ$ (92%). I in boiling alc. showed a mol. wt. of 466 (calcd. 382.8) and after addn. of 1 equiv. HgCl_2 395 (calcd. for PhCH_2HgCl , 327.2); preformed PhCH_2HgCl showed 346–8. C. A. R.

Benzenesulfonyl chloride. ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses I*, 21–3 (1921).—Prepn. of PhSO_2Cl from PhSO_3Na and PCl_5 or POCl_3 . C. J. WEST
***p*-Acetaminobenzenesulfonic acid.** S. SMILES AND C. M. BERE. *Organic Syntheses V*, 1–2 (1925).—Crude *p*- $\text{AcNHC}_6\text{H}_4\text{SO}_2\text{Cl}$, shaken with Na_2SO_3 , gives 43–7% of $\text{AcNHC}_6\text{H}_4\text{SO}_2\text{H}$, m. 155° (decompn.). C. J. WEST

***p*-Acetaminobenzenesulfonyl chloride.** S. SMILES AND JESSIE STEWART. *Organic Syntheses V*, 3–4 (1925).— PhNHAc added to HOSO_2Cl at 15° and then heated 2 hrs. at 60° gives 75% of *p*- $\text{AcNHC}_6\text{H}_4\text{SO}_2\text{Cl}$. C. J. WEST

Sodium *p*-toluenesulfinate. F. C. WHITMORE AND F. H. HAMILTON. *Organic Syntheses II*, 89–91 (1922).—Reduction of $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ by Zn and transformation of the Zn salt into the Na salt by Na_2CO_3 gives 64% of $\text{MeC}_6\text{H}_4\text{SO}_2\text{Na}$. C. J. WEST

Alcoholysis of trinitroanisole and trinitrophenetole. O. L. BRADY AND H. V. HORTON. *J. Chem. Soc.* 127, 2230–3 (1925).—The f. p. curve of mixts. of 2,4,6-(O_2N) $_3$ - $\text{C}_6\text{H}_2\text{OMe}$ (I) and 2,4,6-(O_2N) $_3$ - $\text{C}_6\text{H}_2\text{OEt}$ (II) was detd. from time-cooling curves: % of I and f. p.: 0, 77.6° ; 10, 72.6° ; 20, 67.9° ; 30, 62.9° ; 40, 56.4° ; 50, 48.1° ; 55, 43.0° ; 56, 42.0° ; 57.5, 40.1° ; 60, 41.0° ; 62.5, 40.3° ; 65, 39.4° ; 67.5, 39.2° ; 70, 41.7° ; 80, 53.0° ; 90, 59.3° ; 100, 67.0° . In mixts. of EtOH and I in the mol. proportions of 11 to 1 and 16 to 1 conversion occurred to the extent of 16 and 22% resp.; with larger amts. of EtOH, the results were irregular but even with 68 mols. not more than 35% of I was converted into II. C. J. WEST

Thiophenol. ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses I*, 71–4 (1921).—Reduction of PhSO_2Cl with Zn and H_2SO_4 gives 91% of PhSH . C. J. WEST

Reaction between organic peroxides and organomagnesium halides. HENRY GILMAN AND C. E. ADAMS. *J. Am. Chem. Soc.* 47, 2816–21 (1925).—The following reaction takes place: $\text{ROOR} + \text{R}'\text{MgX} = \text{ROR}' + \text{ROMgX}$. Reaction does not take place with every peroxide and the rate of reaction varies appreciably with different peroxides. Bz_2O_2 (I) (0.416 mol.) and 0.41 mol. PhMgBr gave 28% BzOPh and BzOH ; 0.82 mol. PhMgBr gave 3.6% BzOPh and 23% PhCOH . I (0.2 mol.) and 0.25 mol. EtMgBr gave 10% BzOEt . I (0.083 mol.) and 0.43 mol. BuMgBr gave 72% BuPhCOH . I (0.04 mol.) and 0.2 mol. PhCH_2MgCl gave 73% $(\text{PhCH}_2)_2\text{PhCOH}$. Triacetone peroxide (0.09 mol.) and 0.8 mol. PhMgBr gave 25% Me_3PhCOH and 66% PhOH (in PhOMe soln.; no reaction in Et_2O). Et_2O_2 (0.5 mol.) and 0.63 mol. PhMgBr gave 34% PhOEt and 30% Ph_2 ; this suggests a correspondence in structure between this peroxide and azo compounds. $(\text{Ph}_3\text{C})_2\text{O}_2$ and succinic peroxide do not react with PhMgBr . C. J. WEST

***p*-Bromophenol.** ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses I*, 39–43 (1921).—Prepn. of *p*- $\text{BrC}_6\text{H}_4\text{OH}$ from PhOH and Br_2 . C. J. WEST

***o*-Iodophenol.** F. C. WHITMORE AND E. R. HANSON. *Organic Syntheses IV*, 37–8 (1925).—A suspension of *o*- $\text{HOC}_6\text{H}_4\text{HgCl}$ and I_2 in CHCl_3 give 63% of *o*- $\text{IC}_6\text{H}_4\text{OH}$. C. J. WEST

***m*-Nitrophenol.** ROGER ADAMS AND W. C. WILSON. *Organic Syntheses III*, 87–90 (1923).—The diazo soln. from $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ is decompd. by heating with dil. H_2SO_4 , giving 80–5% of $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$. C. J. WEST

p-Cresol. W. W. HARTMAN. *Organic Syntheses* III, 37-9(1923).—*p*-MeC₆H₄-H₂SO₃Na and KOH (fusion) give 60-70% of MeC₆H₄OH. C. J. WEST

Pyrocatechol. H. D. DAKIN. *Organic Syntheses* III, 27-32(1923).—*o*-C₆H₄-(OH)₂ is obtained in 69-74% yields from NaOC₆H₄CHO and H₂O₂ or in 77-80% from MeOC₆H₄OH and HBr. C. J. WEST

Hydroxyhydroquinol triacetate. E. B. VLIET. *Organic Syntheses* IV, 35-6(1925).—*O*. C₆H₄ O, heated with Ac₂O and H₂SO₄ at 40-50°, gives 85-7% of 1,2,4-C₆H₃(OAc)₃. C. J. WEST

Quinone. E. B. VLIET. *Organic Syntheses* II, 85-8(1922).—*O*:C₆H₄:O results in 85-90% yields by oxidation of *p*-C₆H₄(OH)₂ by Na₂Cr₂O₇ and H₂SO₄. C. J. W.

The reduction of nitrosophenols with alkali sulfides. A. PORAT-KOSHITZ. *Chem.-Ztg.* 49, 595-6(1925).—NH₄OH (d. 0.94), was satd. with *p*-ONC₆H₄OH (I) at 45-50°, and H₂S led in with cooling until satn. was reached. *p*-Aminophenol (II) began to sep. at once and was filtered off at the end. Yield, 80% of crystals, m. 182-3°, and nearly free from S. At 70° the yield dropped to 70%, while at 20° the reaction was too slow and the product impure. The same mother-liquor could be used 3-4 times but the yield gradually dropped and the product became less pure. With Na₂S, 11 parts of Na₂S in 20 parts of H₂O were held at 50° and stirred under a reflux with 8 parts of I and the alkali neutralized with 11 parts of (NH₄)₂SO₄ in 16.5 parts of H₂O, thus pptg. II due to hydrolysis of the NH₄ salt. Neutralization with acid caused losses due to tar formation. As before, lower temps. caused slow reaction and impure products, and higher temps. or boiling reduced the yield. The NH₃ liberated was collected in H₂SO₄ and used again. Also NH₃ was recovered from the mother-liquor. Yield of II, 90-3%, m. 178-80°. M. A. YOUTZ

Nitrosation of phenols. II. Nitrosation of 3-bromo-, 2-bromo-, 3-iodo- and 2-iodophenol. Evidence for the nitroso formula of 4-nitrosophenol. HERBERT HENRY HODGSON and FRANCIS HARRY MOORE. *J. Chem. Soc.* 127, 2260-4(1925); cf. C. A. 18, 235.—3-Bromo-4-nitrosophenol (I), yellow, m. 139° (decompn.); crystd. from C₆H₆, dil. HCl or dil. EtOH, it yields 3-bromo-*p*-benzoquinone 4-oxime (II), orange, m. 188° (decompn.), mol. wt. in freezing PhOH, 189; all solvents tried except cold Et₂O effect the conversion. I dissolves in 10% aq. NaOH to a red soln. which froths after a few sec.; if acidified immediately, the soln. deposits a pale yellow substance, m. 189-90°; if allowed to stand, a dark colored substance of indefinite m. p. is formed. The orange form of II in NaOH, on acidification, deposits the colorless form; crystn. from dil. HCl gives the colored form. Oxidation of I gives 3,4-Br(O.N)₂C₆H₃OH. 2-Bromo-4-nitrosophenol, red from dil. HCl, light brown from C₆H₆, m. 150°; it is not transformed into a quinone oxime by hot dil. mineral acids. Liebermann's NO reaction gives a deep green color, changing to wine-red on diln. 3-Iodo-*p*-benzoquinone 4-oxime, deep yellow, m. 185-95°, mol. wt. in freezing PhOH, 254; this is assumed to be the *syn*-form. Soln. in 10% NaOH and acidification give the *anti*-form, pale straw-colored, decomp. about 185°, mol. wt. in PhOH, 160. The Liebermann reaction gives a yellowish brown color. Oxidation gives 3-iodo-4-nitrophenol, m. 123°. The main product of the action of Am-NO₂ and glacial AcOH on 2-IC₆H₄OH is the 6-NO₂ deriv. In H₂O with NaNO₂ there results 2-iodo-4-nitrosophenol, yellow, decomp. 152°, mol. wt. in freezing PhOH, 255. No conversion into a quinone oxime could be effected. The color produced by the Liebermann reaction was deep green, changing to crimson on diln. and to blue when made alk. C. J. WEST

Benzyl benzoate. O. KAMM and W. F. KAMM. *Organic Syntheses* II, 5-8(1922).—BzOCH₂Ph is obtained in 90-3% yields from BzH and PhCH₂ONa. C. J. WEST

Substitution in derivatives of quinol ethers. LEON RUBENSTEIN. *J. Chem. Soc.* 127, 1998-2001(1925).—Nitration of 2,5-HO(MeO)₂C₆H₃CHO (I) in glacial AcOH at 10-20° gives 88% of the 3-nitro deriv. (II), bright yellow, m. 132°; it does not yield an indigotin deriv.; FeCl₃ gives a red color; *p*-nitrophenylhydrazone, scarlet, decomp. 250°. With MeI and Ag₂O I gives quant. 3-nitro-2,5-dimethoxybenzaldehyde (III), pale yellow, m. 113°. Boiling 10% NaOH gives I. Bromination of I in glacial AcOH contg. AcONa gives 80% of the 3-Br deriv., light brown, m. 107°; *p*-nitrophenylhydrazone, scarlet, decomp. above 250°. 3-Bromo-2,5-dimethoxybenzaldehyde, m. 63°. Nitration of 2,5-(MeO)₂C₆H₃CHO at room temp. gives 20% III and 80% of the 6-nitro deriv., pale yellow, m. 159°; *p*-nitrophenylhydrazone, scarlet, m. 245-50° (decompn.). Aq. KOH gives 4,4',7,7'-tetramethoxyindigotin, deep purple, sublimes at 350°. Bromination of 2,5-(MeO)₂C₆H₃CHO gives only the 6-Br deriv., pale gray, m. 125-8°; *p*-nitrophenylhydrazone, scarlet, m. 204-6°. 3-Amino-2,5-dimethoxybenzoic acid, turns black 170°, decomp. 210-5°. 4-Bromo-2,5-dimethoxyacetanilide, pale pink, m. 122° (80% yield); hydrolysis with 20% EtOH-HCl gives 4-bromo-2,5-dimethoxyaniline, pale pink,

m. 106°. **4-Nitro-2,5-dimethoxyacetanilide**, yellow, m. 165°; 90% yield. Hydrolysis gives **4-nitro-2,5-dimethoxyaniline-HCl**, yellow, m. 160° (decompn.). C. J. WEST


Substitution in vicinal trisubstituted benzene derivatives. III. LEON RUBENSTEIN. *J. Chem. Soc.* **127**, 2268-9 (1925); cf. *C. A.* **18**, 386.—The nitration product of $3,2\text{-MeO}(\text{EtO})\text{C}_6\text{H}_3\text{CHO}$ is sepd. by condensation with $p\text{-H}_2\text{NC}_6\text{H}_4\text{Me}$ and careful fractional crystn.; it contains 60% of the 5- NO_2 and 40% of the 6- NO_2 deriv. **5-Nitro-3-methoxy-2-ethoxybenzylidene-*p*-toluidine**, pale yellow, m. 148°. The **6-nitro deriv.**, golden prisms, m. 88°; hydrolysis gives **6-nitro-3-methoxy-2-ethoxybenzaldehyde**, m. 57° (*p*-nitrophenylhydrazone, brown, m. 188-9°), oxidized by KMnO_4 to the corresponding acid, m. 119-20°. **5-Nitro-2,3-diethoxybenzaldehyde**, m. 71°; the *p*-toluidine deriv., cream needles, m. 105-6°; the **6-nitro deriv.**, m. 75-6°, turns green on exposure to the air, gives a *p*-nitrophenylhydrazone, bright yellow, m. 268-70°, and a *p*-toluidine deriv., m. 100°. The sepn. of these 2 compds. was incomplete. There is evidence that in both nitrations some 4- NO_2 deriv. is formed. C. J. WEST

Isomerism of the oximes. XXIII. Acyl derivatives. O. L. BRADY AND G. P. McHUGH. *J. Chem. Soc.* **127**, 2414-27 (1925); cf. *C. A.* **19**, 2650.—The present status of this study is shown by a table, which gives the products formed by the action of various reagents on various oximes. The following **Bz derivs.** were prepd. from the α -oxime in 2 *N* NaOH and BzCl ; the orientation of the product was detd. by hydrolysis with warm 2 *N* NaOH: *o*-Nitro- α -benzaldoxime, pale greenish white, m. 112°; *p*-deriv., pale greenish white, m. 196°; **3,4-methylenedioxy- α -benzaldoxime**, m. 168°; *o*-methoxy- α -benzaldoxime, m. 96°; *p*-dimethylamino- α -benzaldoxime, greenish white, m. 138°. In all cases studied, BzCl and β -oximes gave the *Bz* deriv. of the α -oxime, whether 2 *N* NaOH or $\text{C}_6\text{H}_5\text{N}$ was used as the solvent. Ketene and **3,4-methylenedioxy- α -benzaldoxime** gave the *Ac* deriv., m. 105°, identical with the product obtained from Ac_2O ; similar derivs. were obtained from *m*- and *p*-nitro- α -benzaldoxime. β -Aldoximes and ketene give nitriles. Diphenyl ketoxime gives the *Ac* deriv., m. 74°. The following *Ac* derivs. of β -aldoximes were prepd. with Ac_2O at -20° in a room free from acid fumes and illuminated by deep orange light only: *o*-nitro- β -benzaldoxime, m. 73°; *m*-deriv., m. 96-8°; *p*-deriv., m. 96°; **3,4-methylenedioxy- β -benzaldoxime**, m. 86°. $\text{N}_2\text{CHCO}_2\text{Et}$ and α -aldoximes gave unchanged α -aldoximes, while the β -derivs. gave a mixt. of the α - and β -forms, owing to isomeric change of the former into the latter. **Carbanilino-3,4-methylenedioxy- α -benzaldoxime**, m. 101°; the corresponding β -deriv., greenish white, m. 84°; attempts to cryst. the compd. led to isomeric change. The crude product is probably a mixt. of these 2 products. *p*-Nitro- α -benzaldoxime likewise gives a mixt. of the α - and β -derivs. The *o*-deriv. gives only the α -form. **Carbanilino-*o*-methoxy- α -benzaldoxime**, m. 107° (decompn.). *m*-Nitro- and *p*-methoxy- α -benzaldoxime and phenylcarbamyl chloride give the carbanilino- α -derivs. The Na salt of $o\text{-MeOC}_6\text{H}_4\text{CH:NOH}$ gives diphenylcarbamyl- α -methoxy- β -benzaldoxime, m. 124°. **Carbethoxy- α -cinnamaldoxime**, pale yellow, m. 64°. The β -oxime gives the nitrile. **α -Naphthylcarbamyl- α -cinnamaldoxime**, pale yellow, m. 152° (decompn.); the corresponding β -cinnamaldoxime, deep yellow, m. 125° (decompn.), ppts. from Me_2CO on addn. of H_2O in a colorless form, m. 125° (decompn.); a mixt. of the 2 forms also m. 125°. **XXIV. 4-Methoxy-3-methyl-, 3-nitro-4-methyl- and some *o*-substituted benzaloximes.** O. L. BRADY, ANTOINETTE N. COSSON AND ARTHUR J. ROPER. *Ibid* 2427-32.—***o*-Chloro- α -benzaldoxime-HCl**, m. 108° (decompn.). In the prepn. of the *o*-Br deriv., there is first formed *o*-bromobenzylidene diacetate, m. 84-6°, which is hydrolyzed to the aldehyde and then oxidated. **Acetyl-*o*-bromo- α -benzaldoxime**, m. 66°. Satd. with HCl , the α -deriv. gives *o*-bromo- β -benzaldoxime, m. 126°. The α -oxime *HCl* salt, m. 115° (decompn.). No β -deriv. could be obtained from the *o*-I or *o*-EtO derivs. The *o*-I deriv. with 30% NaOH gives *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$; the other *o*-derivs. showed little or no reaction. **Acetyl-4-methoxy-3-methyl- α -benzaldoxime**, m. 70°. The α -oxime, boiled 90 min. with excess Ac_2O , gives **4-methoxy-3-methylbenzonitrile**, m. 51-2°, hydrolyzed to the corresponding acid, m. 192°. **4-Methoxy-3-methyl- β -benzaldoxime**, m. 121°. **3-Nitro-4-methyl- α -benzaldoxime**, pale yellow, m. 118-20°; *Ac* deriv., m. 104°. The β -oxime, m. 135°; *HCl* salt, m. 140°; with Ac_2O , it gives the nitrile. C. J. WEST

***p*-Dimethylaminobenzaldehyde.** ROGER ADAMS AND G. H. COLEMAN. *Organic Syntheses II*, 17-21 (1922).—Prepn. of $\text{Me}_2\text{NC}_6\text{H}_4\text{CHO}$ from $\text{Me}_2\text{NC}_6\text{H}_4\text{NO}$, HCHO and PhNMe_2 and its purification. C. J. WEST

Structural formulas of anthranil and of anthroxanic acid. HERMANN LEUCHS. *Ber* **58B**, 1452-4 (1925).—Anthroxanic acid (I) forms with alkaloids salts sepg. from ales and especially from H_2O in well-formed crystals, which are always homogeneous in appearance, even when their amt. is considerably more than 0.5 of the total possible quantity, and on recrystn. from H_2O until they are diminished in amt. to 0.5 or less,

neither does their form change nor does the soln. of the NH_4 salt obtained from them show the slightest optical activity. L. concludes that I (and hence anthranil also) contains

no asym. C atom and has the structure $\text{HO}_2\text{CC}:\text{C}_6\text{H}_4:\text{N}:\text{O}$ rather than C_6H_4  CO_2H

Bromine salt, $\text{C}_{11}\text{H}_9\text{O}_2\text{N}_2$, H_2O , sinters 200° , m. $210\text{--}2^\circ$ (gas evolution). *Quinine salt*, sinters 190° , m. $198\text{--}202^\circ$ (foaming). *Strychnine salt*, prisms with $1\text{H}_2\text{O}$, sinters 200° , m. about $210\text{--}12^\circ$ (gas evolution). C. A. R.

Action of aldehydes on the Grignard reagent. III. JOSEPH MARSHALL. *J. Chem. Soc.* **127**, 2184-8(1925); cf. C. A. **9**, 2224. — $\text{PhCH}:\text{CHCHO}$ (2 mols., 264 g.) and 1 mol. MeMgI gave about 10 g. recovered aldehyde, 4 g. $\text{PhCH}:\text{CHCO}_2\text{H}$, a fraction b_{16} $220\text{--}60^\circ$ (20 g.), which was not examd., and a fraction (165 g.) b_{16} $150\text{--}80^\circ$; from the latter were isolated 100 g. $\text{PhCH}:\text{CHAc}$ (as the phenylhydrazone, m. 158°) and $\text{PhCH}:\text{CHCH}_2\text{OH}$, isolated as the *p*-nitrobenzoate, m. 76° . There was no indication of $\text{PhCH}:\text{CHCHMeOH}$. Similarly from EtMgI there were obtained $\text{PhCH}:\text{CHCOEt}$, $\text{PhCH}:\text{CHCH}_2\text{OH}$, and a bright yellow product, m. 158° , which has not been identified. $(\text{HCHO})_2$ (2 mols.) and 1 mol. PhMgBr gave a considerable quantity of BzH , although the chief product of the reaction was PhCH_2Br ; Ph_2 was also formed. C. J. W.

***p*-Bromoacetophenone.** ROGER ADAMS AND C. R. NOLLER. *Organic Syntheses V*, 17-9(1925). — PhBr , Ac_2O and AlCl_3 give 69-79% of *p*- $\text{BrC}_6\text{H}_4\text{Ac}$. C. J. WEST

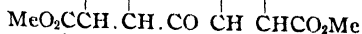
Benzalacetone. N. L. DRAKE AND P. ALLEN, JR. *Organic Syntheses III*, 17-9(1923). — BzH and Me_2CO give 65-78% $\text{PhCH}:\text{CHAc}$. C. J. WEST

Benzalacetophenone. I. P. KOHLER AND H. M. CHADWELL. *Organic Syntheses II*, 1-3(1922). — Prepn. of $\text{PhCH}:\text{CHBz}$ from BzH , PhAc and NaOH ; 85% yields. C. J. WEST

Photodimers of some γ -ketopentadiene derivatives. HANS STORBE AND EDUARD FÄRBER. *Ber.* **58B**, 1548-53(1925). — The yellow dibenzalacetone (I) tends to resinify on heating (Herzog and Kreidl, C. A. **17**, 1339) and also on exposure to sunlight in alc. (Ciamician and Silber, C. A. **3**, 2294) but in the presence of UO_2 salts in sunlight it very easily and rapidly gives up to 90% of the colorless bisdibenzalacetone (II), $\text{PhCH}:\text{CHCOCH}:\text{CHPh}$ (Praetorius and Korn, C. A. **5**, 484). S. and F. have



now found that II is likewise obtained (although in much smaller yield on account of tarry by-products) from the orange-yellow compd. 2I. SnCl_4 , C_6H_6 in C_6H_6 suspension exposed to sunlight. The formation of II is so accelerated by the purely catalytic action of the UO_2 or Sn salts or by their increased absorption of the longer wave lengths that the other, slower (resin-forming) reaction is more or less repressed. The absorption curves show that II as compared with I absorbs on an average 200 units further towards the shorter ultra-violet wave lengths and that the deep band of I reappears in broadened and flattened form in II; in 0.0001 to 0.01 *N* CHCl_3 solns., II is more transparent than I. II can very easily be depolymerized: by heating slightly above its m. p. (248°), by concd. H_2SO_4 at room temp., by $\text{Cl}_3\text{CCO}_2\text{H}$, liquefied with a little H_2O , at 25° , and by illumination with a quartz Hg lamp; the equil. in the photo-reaction $\text{I} \rightleftharpoons \text{II}$ therefore depends on the wave length of the light. On the other hand, while di-*p*-anisalacetone (III) likewise resinifies on heating or exposure to light in alc., its UO_2Cl_2 compd. and violet-red SnCl_4 compd., 2III. SnCl_4 , m. 173° , are rather stable towards light, merely undergoing a slight resinification. This photochem. difference between I and III is not due to marked differences in light absorption (III absorbs somewhat more strongly than, but otherwise very much like, I) but to the greater sluggishness of III in certain addn. reactions ($\text{AcCH}_2\text{CO}_2\text{Et}$, Br, etc.). The colorless, satd., "evidently polymeric" compd., m. $240\text{--}1^\circ$, obtained by Straus by exposing the yellow di- γ -ketopentadienedicarboxylate, m. $169\text{--}9.5^\circ$, to sunlight (*Ber.* **37**, 3294(1904)), is bimol. in boiling $(\text{CH}_2\text{Br})_2$ (found mol. wt. 401-20), is only slowly oxidized by KMnO_4 in AcOH and does not add Br but evolves HBr with it; it must therefore have the structure $\text{MeO}_2\text{CCH}:\text{CH}:\text{CO}:\text{CH}:\text{CHCO}_2\text{Me}$. While the monomer in dil. CHCl_3 solu



shows continuous absorption but in 0.1 *N* soln. has a very characteristic flat band with a max. at $1/\lambda$ 2500, the absorption of the dimer is so little greater than that of CHCl_3 that it cannot be detd. even in the most concd. soln. which can be prepd. The yellow di-*Et* ester, m. $49.5\text{--}50^\circ$, is not so stable towards light as might be concluded from S.'s paper. It melts in sunlight to a green-yellow oil and gradually changes, even in pe

troleum ether, into a yellow-brown resin of peculiar odor and strong acid reaction which in H_2O reduces moist Ag_2O and with $PhNHNH_2 \cdot HCl$ gives a yellow ppt. turning brown 220° and black 280° . In spite of their different behavior towards light, the yellow di-Me and di-Et esters show almost identical absorptions. C. A. R.

Oxidation with ozone. III. Preparation of methylvanillin, piperonal, and anisaldehyde. E. BRINER, H. v. TSCHARNER AND H. PAILLARD. *Helvetica Chim. Acta* 8, 406-12(1925); cf. C. A. 18, 1824.—The yield of methylvanillin (I) from methyl-isoeugenol (II) is much better than that of vanillin (III) from isoeugenol (IV), similar to the observation of Fichter that in electrolytic oxidation of phenols, protection of the OH group by methylation improves the yield. From 3 g. of IV in 50 cc. of CCl_4 at -15° , a concn. of 7% O_3 in O_2 , and a rate of 6 l./min., the yield of III was 0.52-0.63 g. in 90 min. but the yield of I from II was 0.94-1.35 g. Isosafrole (V) is oxidized to piperonal (VI) at 20° with a yield of 46% in 30-35 min., with 58% utilization of the O_3 (for the principal reaction). The yields are diminished by shorter or longer treatment, and are not much different at -15° . A 9.8% concn. of O_3 at -15° gives a poorer utilization of O_3 than a 3.2% concn. at 20° , while the yield of VI reaches the same max. value. Piperonylic acid is formed also and largely accounts for the low yields. Anethole (VII) gives a 49-50% max. yield of anisaldehyde (VIII) and 54-7% utilization of O_3 both at 20° and -15° using a 7% concn. of O_3 . A concn. of 9.8% of O_3 at -15° gives a 56% max. yield of VIII with a 57% utilization of O_3 while a 3.1% concn. at 20° gives 43.4% and 40.6% resp. *p*-Cresol Me ether is not oxidized by O_3 under any conditions tried. M. A. YOUTZ

The electrolytic reduction of benzoic acid in boiling solution. V. DECAÏS AND J. DUFOUR. *Bull. soc. chim.* 37, 1167-74(1925).—An app. is described for carrying out the reduction of BzOH in boiling aq. H_2SO_4 (no alc.). The following conditions were found to give the best yields: (1) $R = 1/1.6$ (where $R = \frac{\text{cathode surface in cm.}^2}{\text{vol. of cathode soln. in cc.}}$); (2) concn. of $H_2SO_4 = 60\%$; (3) cathode density = 12-13 amp. per dm.² BzII is not detected but the production of isohydrobenzoin is evidence that the aldehyde is an intermediate product in the reduction. Yield: $PhCH_2OH$, 75-80%; benzyl ether 20-16%; isohydrobenzoin 2-1%, tar 3%. REYNOLD C. FUSON

Benzoic anhydride. H. T. CLARKE AND E. J. RAHRS. *Organic Syntheses* III, 21-4(1923).—BzOH and Ac_2O give 72-4% of Bz₂O. C. J. WEST

2-Chloro-3,5-dinitrobenzamide. E. DEB. BARNETT. *Ber.* 58B, 1610-1(1925).—2-Chloro-3,5-dinitrobenzoyl chloride, from the acid with boiling $SOCl_2$, gives with NH_4Cl in CCl_4 the amide, m. 180° , with $PhNH_2$ the anilide, S-yellow, m. 177° , and with 1- and 2- $C_6H_4(CO)_2C_6H_4NH_2$ in $(CHCl_3)_2$ 1- and 2-[2'-chloro-3',5'-dinitrobenzoylamino]-anthraquinone, golden yellow, m. 278° , and yellow, m. 302° , resp. C. A. R.

Imino-aryl ethers. III. The molecular rearrangement of *N*-phenylbenziminophenyl ether. A. W. CHAPMAN. *J. Chem. Soc.* 127, 1992-8(1925); cf. C. A. 17, 2561.— $PhOCPh:NPh$ was heated in a thermostat maintained at temps. between 220° and 300° and the product submitted to thermal analysis; the f. p. curve of the mixt. of $PhOCPh:NPh$ and $O \cdot CPhNPh_2$ (I) was drawn from the following observations: (the values give the % I and the f. p.) 20, 107.8° ; 30, 123.8° ; 40, 134.8° ; 50, 144.8° ; 60, 152.7° ; 70, 159.7° ; 80, 165.6° ; 90, 171.6° ; 95, 174.6° ; 100, 176.7° . The progress of the transformation agreed closely with that of a unimol. reaction; the velocity coeffs. at different temps. are: (temp. and $k \cdot 10^3$ are given) 228° , 0.1-0.2; $246-7^\circ$, 1.6; 262° , 5.5; 272° , 11; 278° , 18; 282° , 23; $287-8^\circ$, 34; $292-3^\circ$, 45; the mean temp. coeff. between $246-292^\circ$ is 2.06 per 10° . The sp. cond. of the imino ether between $250-80^\circ$ was of the order 10^{-8} to 10^{-9} ; that of I was of the order of 10^{-6} to 10^{-7} at $250-80^\circ$. *N*-Phenylbenziminophenyl ether, m. 88° ; heated at $270-80^\circ$ for 1 hr., it yields *o*- ClC_6H_4NPhBz , m. $95-6^\circ$. The corresponding *p*- Cl deriv., pale yellow, m. $92-3^\circ$, undergoes transformation at $280-90^\circ$. *N*-*p*-Tolylbenziminophenyl ether, pale yellow, m. $65-6^\circ$; at $270-300^\circ$ this gives benzoyldi-*p*-tolylamine, m. $124-5^\circ$. From these results it is probable that the isomeric change of an imino ether into a substituted amide is not ionic in character. C. J. WEST

***o*-Tolunitrile and *p*-tolunitrile.** H. T. CLARKE AND R. R. READ. *Organic Syntheses* IV, 69-72(1925).—Diazotized *o*- $MeC_6H_4NH_2$, treated with NaOH and $NaCu(CN)_2$, gives 64-70% *o*- MeC_6H_4CN . Approx. the same yield is obtained in the prepn. of *p*- MeC_6H_4CN . C. J. WEST

***m*-Nitrobenzoic acid.** OLIVER KAMM AND J. B. SEGUR. *Organic Syntheses* III, 1(1923).—Crude *m*- $O_3NC_6H_4CO_2Me$, sapond. with NaOH, gives 87-93% of the acid. C. J. WEST

Methyl *m*-nitrobenzoate. OLIVER KAMM AND J. B. SEGUR. *Organic Syntheses* III, 71-2(1923).—Nitration of BzOMe gives 82-5% of the *m*- NO_2 ester. C. J. WEST

p-Nitrobenzoic acid. O. KAMM AND A. O. MATTHEWS. *Organic Syntheses* II, 53-5(1922).—*p*-O₂NC₆H₄Me is oxidized by Na₂Cr₂O₇ and H₂SO₄, giving 80-5% of *p*-O₂NC₆H₄CO₂H. C. J. WEST

p-Nitrobenzoyl chloride. ROGER ADAMS AND R. I. JENKINS. *Organic Syntheses* III, 75-7(1923).—O₂NC₆H₄CO₂H and PCl₅ give 90-6% of the chloride. C. J. W.

2,4,6-Trinitrobenzoic acid. H. T. CLARKE AND W. W. HARTMAN. *Organic Syntheses* II, 95-7(1922).—Oxidation of MeC₆H₂(NO₂)₃ with Na₂Cr₂O₇ and H₂SO₄ gives 57-69% of 2,4,6-(O₂N)₃C₆H₂CO₂H. C. J. WEST

Phenylacetic acid. ROGER ADAMS AND A. F. THAL. *Organic Syntheses* II, 63-5(1922).—PhCH₂CN is hydrolyzed by H₂SO₄, giving 80% of PhCH₂CO₂H. C. J. WEST

Ethyl phenylacetate. ROGER ADAMS AND A. F. THAL. *Organic Syntheses* II, 27-8(1922).—PhCH₂CO₂Et is obtained in 84-7% yields by boiling PhCH₂CN, EtOH and H₂SO₄. C. J. WEST

Benzyl cyanide. ROGER ADAMS AND A. F. THAL. *Organic Syntheses* II, 9-11(1922).—PhCH₂CN is obtained in 80-90% yields from PhCH₂Cl and NaCN. C. J. W.

p-Nitrobenzyl cyanide. G. R. ROBERTSON. *Organic Syntheses* II, 57-8(1922).—PhCH₂CN is nitrated at 10-20°, giving 50-4% of *p*-O₂NC₆H₄CH₂CN. C. J. W.

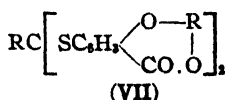
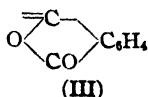
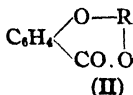
p-Nitrophenylacetic acid. G. R. ROBERTSON. *Organic Syntheses* II, 585, 615, 598-60(1922).—*p*-O₂NC₆H₄CH₂CN is hydrolyzed by H₂SO₄, giving 92-3% of *p*-O₂NC₆H₄CH₂CO₂H. C. J. WEST

p-Aminophenylacetic acid. G. R. ROBERTSON. *Organic Syntheses* III, 11-2(1923).—O₂NC₆H₄CH₂CO₂H is reduced by (NH₄)₂S and the product acidified with AcOH, giving 83-4% of H₂NC₆H₄CH₂CO₂H. C. J. WEST

m-Nitrocinnamic acid. F. K. THAYER. *Organic Syntheses* V, 83-4(1925).—*m*-O₂NC₆H₄CHO, AcONa and Ac₂O give 74-7% *m*-O₂NC₆H₄CH:CHCO₂H. C. J. W.

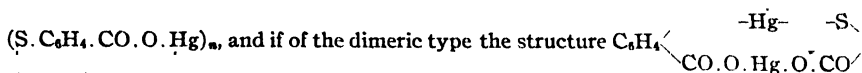
Constitution of Indian kamala. I. SIKHIBHUSHAN DUTT. *J. Chem. Soc.* 127, 2044-52(1925).—Rottlerin (I), m. 206-7°, mol. wt. in boiling PhMe, 585, 615, 598, is obtained in about 9 g. yield by extg. 150 g. com. kamala with C₆H₆. It dissolves to the extent of about 12% in boiling PhMe and C₆H₁₁OH. *Hepta-Ac deriv.* (II), m. 165°; the pale yellow *dibromide*, m. 115°; *hexa-Bz deriv.*, light yellow powder, does not m. below 300°; *hexa-MeO deriv.* (III), pale yellow, m. 135-7°, which yields an *Ac deriv.*, m. 215-7°, whose pale yellow *dibromide* decomps. on melting. Fuming HNO₃ oxidizes I to *p*-O₂NC₆H₄CH:CHCO₂H, (CH₂CO₂H)₂ and AcOH if the temp. is kept below 0°; if the reaction is allowed to warm up, *p*-O₂NC₆H₄CHO and *p*-O₂NC₆H₄CO₂H also are formed. Dil. HNO₃ (72 hrs. on the H₂O bath) gives AcOH, BzOH, *p*-O₂NC₆H₄CO₂H, small amts. of *o*-C₆H₄(CO₂H)₂ and *p*-C₆H₄(CO₂H)₂. Alk. KMnO₄ gives AcOH, BzOH, *o*- and *p*-C₆H₄(CO₂H)₂, (CO₂H)₂ and a dibasic acid, C₁₄H₁₀O₄, m. 192°. Alk. H₂O₂ gives the same products. Fusion with KOH gives AcOH, BzOH and 1,3,5-C₆H₃(OH)₃. Reducing agents (Zn and NaOH, Sn and HCl) give AcOH, (CH₂CO₂H)₂, PhCH₂CH₂CO₂H and a tarry residue yielding 1,3,5-C₆H₃(OH)₃ on fusion with KOH. HI and red P gave a hydrocarbon fraction, probably PhPr. Distg. with Zn dust gave β-C₁₄H₁₁Me and a liquid product, b. 230-40°. Oxidation of II with KMnO₄ gives AcOH, BzOH, (CO₂H)₂ and 1,3,5-(AcO)₃C₆H(CO₂H)₂, m. 260-70°. Oxidation of III with KMnO₄ gives the corresponding 1,3,5-(MeO)₃C₆H(CO₂H)₂, m. 248-50°. C. J. WEST

Substituted salicylic acids. V. Substituted salicylic phthalidene ether esters. H. P. KAUFMANN AND E. ROSSBACH. *Ber.* 58B, 1556-60(1925); cf. C. A. 18, 3051.—HOC₆H₄CO₂H and *o*-C₆H₄(COCl)₂ (I) in PhNMe₂ give 80% of salicylic phthalidene ether ester (II, R = III), m. 158.5°, identical with the product obtained from HOC₆H₄CO₂Na and I in C₆H₆. *Thiosalicylic phthalidene ether ester*, similarly obtained from HSC₆H₄CO₂H or its Na salt, m. 230°, is decompd. by boiling alc. NaOH but not by aq. Na₂CO₃ or NaOH. 2,5-HO(NCS)C₆H₃CO₂H (IV), m. 167-8°, is obtained in 73% yield from the 5-NH₂ acid (V) by the Sandmeyer method; with Zn dust in Na₂CO₃ 5 g. gives 4 g. 5-mercaptosalicylic acid (VI), m. 148°. *Bissalicylic acid 5,5'-disulfide*, m. 245°, is obtained in 85% yield from VI boiled in Na₂CO₃ in the air, 50% yield from diazotized V with S and Na₂S in NaOH, and 12 g. yield from 2 g. IV in NaOH at room temp. *Phthalidene ether ester* of IV (2.1 g. from 1.9 g. IV), orange-yellow, m. 199°. VI (3.4 g.) with 1.5 mols. I in PhNMe₂ gives 2.9 g. of *phthalidene-bis-4-[salicylic phthalidene ether ester] dithioether* (VII), amorphous, decomp. above 200°.



C. A. R.

Mercury compounds of thiosalicylic acid. GEORG SACHS AND HEINRICH BLESSL. *Ber.* 58B, 1493-9(1925); cf. C. A. 18, 3154; Smith and Semon, C. A. 18, 2115; and earlier workers.—Mol. wt. detns. do not permit of detg. with certainty whether the compds. formed by Hg mercaptides with Hg salts have the monomol. structure, RSHgX , or the dimeric form, and S. and B. have therefore undertaken to det. if possible what is their "reaction formula," i. e., whether at the moment of reacting they behave like a monomeric or dimeric substance. $\alpha\text{-HSC}_6\text{H}_4\text{CO}_2\text{H}$ (I) should form a Hg compd. which, if of the monomeric type, would probably have the structure $\text{S.C}_6\text{H}_4\text{CO.O.Hg}$ or



C_6H_4 . The 1st expts. with HgO and $\text{Hg}(\text{OAc})_2$ gave ill-defined or non-homogeneous products. The course of pptn. reactions with various Hg salts was then followed by detg. accurately the amt. of acid set free and of Hg not used up; the results showed that HgCl_2 , $\text{Hg}(\text{CN})_2$ and $\text{Hg}(\text{OAc})_2$ react in only 1 way and practically completely according to the equations $\text{I} + \text{HgCl}_2 = \text{ClHgSC}_6\text{H}_4\text{CO}_2\text{H}$ (II) + HCl ; $2\text{I} + \text{Hg}(\text{CN})_2 = \text{Hg}(\text{SC}_6\text{H}_4\text{CO}_2\text{H})_2$ (III) + 2HCN ; and $\text{I} + \text{Hg}(\text{OAc})_2 = \text{S.C}_6\text{H}_4\text{CO.O.Hg}$ (IV). The

K salt of III does not visibly react with $\text{Hg}(\text{CN})_2$ but with $\text{Hg}(\text{OAc})_2$ gives $2\text{IV} + 2\text{AcOH}$. Unlike the above salts, HgO dissolves in alc. or aq. alc. I with formation of a mixt. of III and IV. All these compds. contain the Hg attached to the S and not to a C atom of the nucleus, for IV with I gives $(\text{SC}_6\text{H}_4\text{CO}_2\text{H})_2$. These facts do not establish, however, whether IV really has the structure given above or the dimeric structure, i. e., that of a Hg salt of III. It is sol. in alkalies, to be sure, although in dissolving many samples show a transient yellow color; in the solns. thus obtained the excess of alkali can be titrated back with phenolphthalein. It dissolves in NaCl and NaOAc and on cooling a part seps unchanged, the rest being pptd. by AcOH as II, which is also formed when the IV, immediately after its pptn. in the reaction between the K salt of III and $\text{Hg}(\text{OAc})_2$, is treated with HCl . From the soln. of IV in KCN , III can be liberated. Steinkopf and his co-workers have made it very probable, from a large amt. of exptl. material, that there is no fundamental difference between org. and other residues attached to Hg, yet, according to them, the purely org. and the mercaptide compds., in spite of their formal analogy, cannot be compared directly with each other. Thus, the complex mercaptides, when decompd. with NH_3 , behave abnormally; II gives, besides the NH_4 salt of III, the *mercuri-amine salt* (V), $\text{Hg}(\text{SC}_6\text{H}_4\text{CO}_2\text{HgNH}_2)_2 \cdot 2\text{H}_2\text{O}$. Possibly these compds. have the anhydride-like structure IV but at the same time valence forces between the Hg and S atoms of different mols. make their appearance with preformation of the skeleton of III and in passing from the solid state into an aq. soln. or a H_2O -sol. form, whether reaction will occur in the 1 or the other direction will depend upon which of the 2 forms persists. Extension of this view to EtSHgAc (VI) will explain its association in aq. soln., although the possibility is not excluded that the mols., insofar as they are present in the dimeric form, have the structure assigned to them by Smith and Semon. The mol. wt. of VI was found to increase from 435.4 for 0.2651 g. in 19.886 g. freezing H_2O to 763.3 for 4.1197 g. (calcd. for the dimeric form, 641.5). *Mercuribisthiosalicylic acid* (III), m. 256° . *Di-K and di-NH₄ salts*. *Cu salt*, amorphous, yellow, turned blue-green by alkalis. *Hydroxymercurithiosalicylic anhydride* (IV), amorphous, sensitive to light, sometimes crysts. when allowed to stand a long time under the alc. mother liquors; it can be obtained in pure form in yellowish microrodlets in 50% yield from I in alc. treated to incipient turbidity with H_2O , then slowly with 1.5 mols. $\text{Hg}(\text{OAc})_2$ in H_2O ; the resulting ppt. is boiled out with alc., then treated with $\text{NH}_4\text{OH} \cdot (\text{NH}_4)_2\text{CO}_3$ until the ppt. which sometimes forms redissolves, filtered and treated hot with AcOH to incipient turbidity. V decomps. 206° . C. A. R.

Action of halogens on 2,4-dimethylbenzoyl chlorides. WM. H. PERKIN, JR. AND J. F. S. STONE. *J. Chem. Soc.* 127, 2275-97(1925).—2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{Ac}$ is best prepd. by warming a mixt. of 100 g. FeCl_3 , 100 g. $m\text{-C}_6\text{H}_4\text{Me}_3$ and 84 g. AcCl until evolution of HCl ceases. Oxidation of this at 0° with NaOBr gives a good yield of 2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$; if the temp. is allowed to rise, some 6-Br deriv. is formed. *Me ester*, m. -2 to -1° , b_{760} $232-3^\circ$. The chloride b_{15} $113-5^\circ$, b_{760} $234-6^\circ$, m. 25.5° ; bromination in the sunlight or in ultra-violet light gives about 50% of 2-bromomethyl-4-methylbenzoyl bromide (I), b_{15} $169-71^\circ$ (this probably contains some 4- BrCH_2 deriv.); it decomps. rapidly in moist air. Anhyd. HCO_2H and I at 15° give the free acid, m. $143-5^\circ$ (decompn.); *Me ester*, m. $62-3^\circ$, from I and MeOH ; its vapor is very irritating and causes prolonged

sneezing. Upon boiling the ester, it loses MeBr, giving 4-methyl-1,2-phthalide, m. 117-8°; soln. in NaOH followed by acidification gives 2-hydroxymethyl-4-methylbenzoic acid, m. 132-3°, with regeneration of the phthalide. If the crude I is converted into the Me esters and boiled, the pure I seps. as the phthalide, and the filtrate yields the isomeric 4-Br ester, m. 55-6°. This is hydrolyzed by boiling KOH, giving 4-hydroxymethyl-2-methylbenzoic acid, m. 141-2°; there is also formed a small amt. of 4,4'-dicarboxy-3,3'-dimethyldibenzyl ether, m. 221-2° (loss of 11H₂O from 2 mols. acid); mol. wt., 317 (Rast's method). Bromination of 2,4-Me₂C₆H₃COBr at 150-90° in the light of a Hg lamp, gives 40-50% of 2,4-di[bromomethyl]benzoyl bromide, viscid, green sirup, b₁₆ 223-8°; the acid (II), m. 158°; the Me ester, m. 83-4°; its vapors are very pungent, cause sneezing and burn the skin. Upon boiling, the Me ester gives 4-bromomethyl-1,2-phthalide, m. 159°; boiled with CaCO₃ and H₂O, it yields 4-hydroxymethyl-1,2-phthalide (III), m. 124-5°, which, warmed with NaOH, gives 2,4-di[hydroxymethyl]benzoic acid, m. 145-6°. III, (CO₂H)₂ and EtOK give Et 4-hydroxymethyl-1,2-phthalideoxalate, m. 169-70°; in MeOH, FeCl₃ gives a deep violet color. II and KCN in dil. EtOH give 4-cyanomethyl-1,2-phthalide, m. 123-4°, which is transformed by H₂O₂ and NaOH into 1,2-phthalide-4-acetamide, m. 218-9° (slight decompn.), and is hydrolyzed by concd. H₂SO₄ to 1,2-phthalide-4-acetic acid, m. 161-2°. On adding PhNHNH₂ to the mother liquor of III, there results a yellow compd., m. 179-80°, probably the phenylhydrazone of CHOC₆H₃MeCO₂H. Chlorination of 2,4-Me₂C₆H₃COCl at 180-210° in ultra-violet light gives a const. b. mixt. (b₁₆ 184-6°) of the di- and tetra-Cl derivs., from which the following derivs. were prepd.: 4-Chloromethyl-1,2-phthalide, m. 143-4°. 2,4-Dialdehydobenzoyl acid (IV), m. 138-9°, by boiling with chalk and H₂O; there also is formed (10%) 4-aldehydo-1,2-phthalide, m. 159-60° (phenylhydrazone, lemon-yellow, m. 171-2°). Alkali gives 2-hydroxymethylterephthalic acid, which, heated at 100° for 1 hr., gives 4-carboxy-1,2-phthalide, m. 279-80°. Chlorination at 200-20° gives 60-70% of 2,4-di[dichloromethyl]benzoyl chloride (V), b₁₀ 192-3°; the free acid (VI), m. 159-60°; anilide, m. 159°; Me ester, b₁₂ 186-8°; on boiling it gradually loses MeCl, yielding 4-dichloromethyl-1,2-chlorophthalide, b₁₃ 297°. Boiling V with chalk and H₂O gives IV, m. 140-1° (70% yields); dianilino deriv., m. 208°; condensation of VI with PhNH₂ gives anhydro-2,4-dialdehydobenzoic acid diphenylhydrazone, canary-yellow, m. 264-6°. VI and p-O₂N-C₆H₄NHNH₂ in EtOH give 4-aldehydo-1,2-hydroxyphthalide p-nitrophenylhydrazone(?), m. 221-3°, then 236-7° and, after solidifying, at 180°. In AcOH, there appears to be formed an Ac deriv. of the above, orange, m. 235°. In hot PhNO₂ there appears to be formed the orange dinitro deriv. of the anhydrodiphenylhydrazone, O₂NC₆H₄N₂H:CHC₆H₃:CH:N.N(C₆H₄NO₂) N CO, m. 295° (decompn.). The forma-

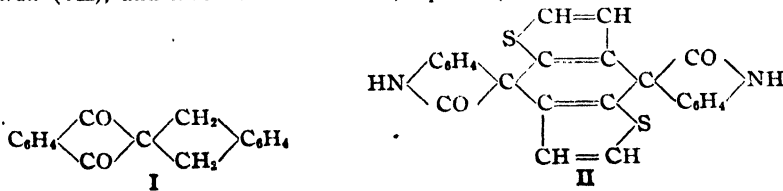
tion of 65-70% of pentachloro-2,4-dimethylbenzoyl chloride, b₁₄ 191-2°, is complete after 3.25 hrs. at 220°. Boiled with chalk, this gives 2-aldehydoterephthalic acid (VII), m. 242°, which is converted by boiling 25% NaOH into 4-carboxy-1,2-phthalide. Anhydro-2-aldehydoterephthalic acid phenylhydrazone, m. 326-7°. NH₂OH gives with VII the oxime, decomp. 136° and gives the imide of trimellitic acid. The filtrate from VII contained 2,4-(CHO)₂C₆H₃CO₂H, trimellitic acid and 4-aldehydo-1,2-phthalic acid, isolated as the phenylhydrazone, m. 174°, whose hydrate, yellow, m. 118°; heating to 115° converts this into the anhydride, orange-red, m. 216-7°. 2,4-Di[trichloromethyl]benzoyl chloride (VIII), b₁₅ 192-6°, does not fume in moist air, and reacts slowly with HCO₂H to give the acid, m. 170-1°; anilide, m. 202-3° (decompn.); amide, m. 175-6° (evolution of HCl). Me ester, b₁₅ 210°, pungent and lachrymatory on warming. 4-Trichloromethyl-1,2-phthalyl chloride, b₁₂ 186-7°. Dianilide, m. 220°. While VIII is very resistant to HCO₂H, it is readily hydrolyzed by boiling with chalk and H₂O, giving almost quant. trimellitic acid, whose Ca salt crysts. in feathery needles, sparingly sol in boiling and almost insol. in cold H₂O.

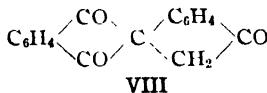
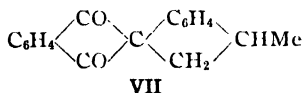
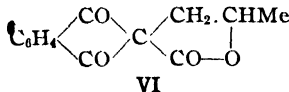
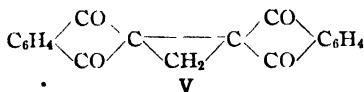
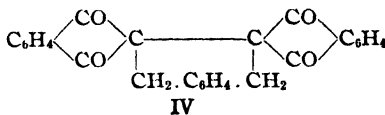
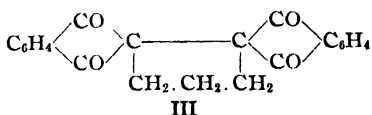
Acetylmandelyl chloride. F. K. THAYER. *Organic Syntheses* IV, 1-2 (1925).—PhCH(OH)CO₂H is treated with AcCl and then with SOCl₂, giving 79-83% of PhCH(OAc)COCl.

β-Methylesculetin (6,7-dihydroxy-4-methyl-1,2-benzopyrone). E. B. VLIET. *Organic Syntheses* IV, 45-6 (1925).—AcCH₂CO₂Et and 1,2,4-C₆H₃(OAc)₃, heated with 75% H₂SO₄ at 80°, give 92% of β-methylesculetin.

Phthalimide. W. A. NOYES and P. K. PORTER. *Organic Syntheses* II, 75-7 (1922).—C₆H₄(CO)₂O and NH₄OH or (NH₄)₂CO₃ give 94-5% of C₆H₄(CO)₂NH.

The constitution of phthalhydrazide. DAN RADULESCU and VICTOR GEORGESCU. *Bull. soc. chim.* 37, 881-90 (1925).—By the action of N₂H₄·H₂O (I) on phthalimide (II) in EtOH, Rothenburg (*Ber.* 29, 694 (1894)) obtained a substance, m. 250-6°, to which he assigned the formula III. Forsterling (*J. prakt. Chem.* [2] 51, 371 (1895)) obtained





M. A. YOUTZ

Nitration of phthal- and succin-*p*-tolil. O. L. BRADY, WM. G. E. QUICK AND W. F. WELLING. *J. Chem. Soc.* 127, 2264-7 (1925).—The system 2- and 3-nitro-*p*-toluidine shows the following f. ps., % of the 3-isomer being given: 0, 74.8°; 10.5, 69.0°; 18, 64.1°; 23.5, 60.3°; 29, 56.3°; 49.7, 74°; 55, 78.4°; 100, 116.7°; eutectic, 33.1, 56.1°; 38.7, 56.2°. Nitration of phthal-*p*-tolil by adding it to 10 times its wt. of HNO₃ (d. 1.5) at 0° and hydrolysis give a product contg. 76% 2,4-O₂N(H-N)C₆H₃Me. Since the eutectic was at 55.1°, there may be present small amts of di-NO₂ derivs. The main constituents were sepd. as the Ac derivs. The yield of mixed amines from succin-*p*-tolil was poor; it contains 84% of the 2-NO₂ deriv. Soln. of phthal-2-nitro-*p*-tolil in warm NaOH gives *phthal-2-nitro-p-toluidic acid*, decomp. about 160°. The corresponding *succin* deriv., m. 163°, if warmed above 50° with alkali, this undergoes further hydrolysis. 3-Nitrophthal-*p*-tolil, yellow, m. 149°; nitration gives a small yield of a mixt. of toluidines, contg. 83.5% of the 2-NO₂ deriv. *Tetrachlorophthal-p-tolil*, pale yellow, m. 145°, on nitration and hydrolysis, gives a product contg. 81.5% of the 2-NO₂ deriv. Nitration of succin- and phthalanil gives only *p*-O₂NC₆H₄NH₂. C. J. W.

Constituents of *Myoporum laetum*, Forst (the "ngaio"). I. P. H. McDOWALL. *J. Chem. Soc.* 127, 2200-7 (1925). Mannitol is present in the leaves of *Myoporum laetum*, Forst, to the extent of 0.2% (calcd. on the wt. of the green leaves), in the berries, which also contain HCO₂H, and in the wood to the extent of 0.25%. The leaves and terminal branchlets, distd. with superheated steam, give 0.12-0.30% of a volatile oil (varying with season and sample), from which, at -20°, there seps. C₃₂H₆₆ or C₃₄H₇₀, m. 62-3°, mol. wt. in C₆H₆, 470 (yield, 0.01% of the crude oil). The clear oil was reddish brown, with a sweet malt-like odor, d₂₀²⁰ 1.0203, [α]_D -26.54°, n_D²⁰ 1.4823, sapon. value, 17.9°. Repeated distn. gave *ngaione* (I) ("ny-one"), C₁₆H₃₄O₃ (analyses of derivs. agree closely with C₁₅H₃₂O₃), b₂₇ 182-3°, d₂₀²⁰ 1.0276, [α]_D -26.2°, n_D²⁰ 1.4804, mol. wt. in C₆H₆ and C₇H₄Br₂, 250. *p*-Nitrophenylhydrazones, bright yellow, m. 103°; the *thiosemicarbazone* is a thick reddish brown oil, which gives a yellow Ag salt. The I recovered from the salt analyzes for C₁₅H₃₂O₃, b₂₉ (cor.), d₂₀²⁰ 1.0273, n_D²⁰ 1.4794, [R]_L_D 69.10. I slowly reduces NH₄OH-AgNO₃ and Fehling soln., does not affect Schiff's reagent, gives a bright green fluorescence with *m*-C₆H₄(NH₂)₂ 2HCl in EtOH, but does not give a solid NaHSO₃ compd. *Oxime*, lemon-yellow, viscous oil, b₂₇ 201°, d₂₀²⁰ 1.0640, [α]_D -13.51° (10% in CHCl₃), n_D²⁰ 1.5008, [R]_L_D 73.37. *Semicarbazone*, m. 120-2° (decompn.). The phenylhydrazones and *p*-bromophenylhydrazones are liquid. I is probably a ketone, since it does not react with the usual aldehyde reagents. Na and EtOH reduce I to *ngaio* (II), C₁₅H₃₄O₃, b₂₉ 195-6° (cor.), d₂₉²⁰ 1.0163, [α]_D -25.00°, n_D²⁰ 1.4784, [R]_L_D 70.28, mol. wt. in C₆H₆, 260. CrO₃ does not regenerate I. II gives a mobile, light yellow liquid *Me xanthate*. The *acetate* b₂₉ 190-2°, d₂₀²⁰ 1.0337, n_D²⁰ 1.4720, [R]_L_D 79.60. *Me ether*, light yellow oil, b₂₉ 182° d₂₀²⁰ 0.9913, n_D²⁰ 1.4701, [α] -16.82°. MeI does not react with the K salt of this ether. C. J. WEST

Action of metals on dipentene dihydrohalide. Preparation of a synthetic diterpene. K. C. ROBERTS. *J. Chem. Soc.* 127, 2451 (1925). -EtOH solns. of *cis*- and *trans*-dipentene di-HBr and of *trans*-dipentene di-HCl were shaken with mol. Ag and finely divided Cu at room temp. until reaction was complete. In no case was metal halide formed. The dipentene formed polymerized to a *diterpene*, highly viscous liquid with a faint terpene-like odor, b₁₃ 173-83°, n_D²⁰ 1.5170, d₂₀²⁰ 0.9361, I value 103. C. J. W.

Borneol in spruce turpentine. A. S. WHEELER AND C. R. HARRIS. *J. Am. Chem. Soc.* **47**, 2836-8(1925); cf. *C. A.* **19**, 3087.—The residue of spruce turpentine after distg. the *p*-cymene fraction contains about 2% of borneol, isolated by cooling the fraction b_3 70–80° to –10°; from its $[\alpha]_D^{20}$ of –13.64° it is calcd. to contain about 36% of *l*-borneol; since the value is const. in different solvents, the product is free of isoborneol. Borneol obtained from a similar source in northern Europe contained 14–22% *l*-borneol.

C. J. WEST

Action of formic acid on certain sesquiterpenes. J. M. ROBERTSON, C. A. KERR AND G. G. HENDERSON. *J. Chem. Soc.* **127**, 1914-6(1925).— β -Caryophyllene, $b_{9.7}$ 118–9°, n_D^{17} 1.5009, d_4^{17} 0.9052, heated with an equal amt. of HCO₂H for several days, gives about 35% of *caryophyllene formate*, C₁₅H₂₆O₂, b_{110} 141–5°, d_4^{17} 1.22, n_D^{20} 1.4967, $[\alpha]_D^{17}$ –10.46°; the other fractions, b_{110} 115–30°, consisted mainly of hydrocarbons. Cadinene and HCO₂H give an unsatd. *hydrocarbon* (or a mixt.), C₁₅H₂₄, b_9 118–24°, d_4^{17} 0.9086, n_D^{14} 1.5010, which does not form a stable HCl salt, and unchanged cadinene. Cedrene gives an unsatd. *hydrocarbon*, C₁₅H₂₄, b_9 114–8°, d_4^{20} 0.9333, n_D^{21} 1.4988, some unchanged cedrene and a small fraction of higher b. p., in which the presence of alc. compds. is suspected.

C. J. WEST

Carboxycamphoronic acids. MAHIN SINGH AND RAM SINGH. *J. Chem. Soc.* **127**, 1966-8(1925).—Camphoric anhydride and the H₂NC₆H₄CO₂H (equal amts.) are heated with fused AcONa. *2'-Carboxycamphoronic acid*, (125–30° for 3 hrs.), crystals with 3H₂O, m. 75–80°, solidifies and then m. 199–200°, $[M]_D$ MeOH, c 0.0798, 18°, –584°; EtOH, c 0.0974, 17°, –574°; Me₂CO, c 0.1624, 17°, –551°; MeEtCO, c 0.1294, 17°, –390°. The *3'-deriv.* (160°, 3 hrs., quant. yield), is an amorphous powder, m. 249°; $[M]_D$ MeOH, c 0.1309, 19°, 466°; EtOH, c 0.0962, 17°, 431°; Me₂CO, c 0.1084, 412°; MeEtCO, c 0.0714, 17°, 313°. The *4'-deriv.* (140–5°, 4 hrs., 95% yield), amorphous mass with 11H₂O, m. 149–50°, then 212°; $[M]_D$ MeOH, c 0.0744, 19°, 860°; EtOH, c 0.1155, 17°, 722°; Me₂CO, c 0.1016, 17°, 709°; MeEtCO, 0.0820, 17°, 555°. The rotatory power is lowest in the solvent which has the lowest dielec. const.

C. J. W.

Derivatives of *m*- and *o*-dicresols. WILHELM STEINKOPF, ERICH ZEMISCH, HILDEGARD WINKLER AND GERHARD POHL. *J. prakt. Chem.* **110**, 354-8(1925).—Diazotized *m*-tolidine, heated with concd. HNO₃, gives 97% of *3,5,3',5'-tetranitro-4,4'-dihydroxy-2,2'-diolyl(?)*, yellow, m. 299°; NH₄ salt, dark yellow; Na salt, reddish yellow. Reduction by HCl and Sn gives the *tetraamino deriv.*, isolated as the *chlorostannate*, C₂₈H₃₀N₈ 8HCl SnCl₄, yellowish white, which gives with AcO the *tetraacetylamino deriv.*, crystals with 2H₂O. Di[nitro-*o*-cresol], reduced by HCl and Sn, gives *3,5'-diamino-4,4'-dihydroxy-3,3'-diolyl-HCl*, decomps 230°. PhNH₂ HCl SnCl₄ and α -C₁₀H₁₇NH₂ HCl SnCl₄ may be diazotized; the diazo compds. behave normally.

C. J. WEST

Di-*p*-tolylethane (unsym.). J. S. REICHERT AND J. A. NIEBUWLAND. *Organic Syntheses* **IV**, 23-5(1925).—A soln. of 700 cc PhMe, 70 cc. concd. H₂SO₄ and 7 g. HgSO₄, treated with C₂H₂, gives 60–4% of (MeC₆H₄)₂CHMe.

C. J. WEST

Benzilic acid. ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses* **I**, 29-32 (1921).—Prepn. of Ph₂C(OH)CO₂K from Bz₂ and KOH.

C. J. WEST

Diphenylacetic acid. C. S. MARVEL, F. D. HAGER AND E. C. CAUDLE. *Organic Syntheses* **III**, 45-6(1923).—Ph₂C(OH)CO₂H is reduced by red P and I in glacial AcOH, giving 94–7% Ph₂CHCO₂H.

C. J. WEST

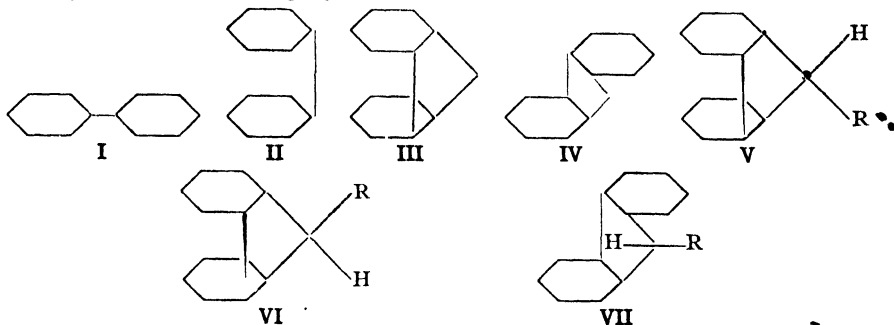
***p*-Dimethylaminodiphenylacetic acid.** DALIP SINGH. *J. Chem. Soc.* **127**, 2445-9 (1925).—Vorlander and Siebert (*Ber.* **39**, 1024(1906)) found that on distn. of (PhCHCO₂)₂Ba there resulted, among other products, Ph₂C:C:CPh₂; Me₂NC₆H₄CHPhCO₂H (I) was therefore prepd. since this might give rise to Me₂NC₆H₄CHPh:C:C(C₆H₅NMe₂)Ph, which would be a suitable material for testing van't Hoff's view of the mol. asymmetry of compds. of the substituted allene type. Me₂NC₆H₄COCO₂Et (2.5 mols.) and PhMgBr, if the product is worked up immediately, give the *Et ester*, m. 96–7°, of *p*-dimethylaminobenzilic acid (II), m. 50–5°, which is unstable and changes to yellow and then green on standing. A by-product of the ester, especially if a large excess of PhMgBr is used, is *p*-dimethylaminotetraphenylethyleneglycol, m. 193–4°. Reduction of II with HI and red P gives *p*-dimethylaminodiphenylacetic acid (I), m. 104–5°. Dry distn. of its Ba salt in a high vacuum gives *di-p*-dimethylaminobenzohydril ketone, m. 190°, and Me₂NC₆H₄CH₂Ph. No allene deriv. was found. (CO₂Et)₂. 4-C₆H₄NCH₂Ph and EtOK give about 33% of *Et phenyl-4-pyridylpyruvate* (III), yellow, m. 123–4°. The free acid is unstable and difficult to purify; the product obtained turned green at 100° and m. indefinitely at 110°; its *oxime HCl salt*, m. 52–3°. The Na salt is oxidized by H₂O₂ to Na phenylpyridylacetate; the free acid immediately decomps. into C₆H₄N-

CH_2Ph and CO_2 . **III** and $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ give *2- α -pyridylbenzyl-3-quinoxalone*, m. 294-5°. C. J. WEST

p-Toluy-*o*-benzoic acid. L. F. FIESER. *Organic Syntheses* **IV**, 73-5(1925).— $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ and PhMe are condensed by AlCl_3 , giving 96% of *p*- $\text{MeC}_6\text{H}_4\text{COC}_6\text{H}_4\text{CO}_2\text{H}$ (*o*). C. J. WEST

Stereochemistry of aromatic compounds; isomerism of the 9-aminofluorenes. RICHARD KUHN AND PAUL JACOB. *Ber.* **58B**, 1432-40(1925).—Cotton and Mouton have shown that certain isotropic liquids (especially C_6H_6 and its derivs.) are doubly refractive in a magnetic field, while aliphatic and hydroaromatic compds. show such a phenomenon either not at all or only very weakly; this peculiarity of aromatic compds. is probably to be explained by the existence of a magnetic moment and by a property of the mols. of easily arranging themselves in certain directions. It is as yet not possible to formulate definite conceptions as to the nature of the forces which, in the absence of powerful external fields, will lead to the arrangement in certain directions of the mols. of C_6H_6 derivs. but it may be assumed that the tendency to assume such directions with respect to each other is not limited to C_6H_6 nuclei of different mols. but is also present when the 2 nuclei are in one and the same mol. As regards the existence of geometrical isomers in the aromatic series there are then 2 possibilities: (1) The C_6H_6 nuclei repel each other, i. e., the axes perpendicular to the plane of the ring stand as far apart as possible from each other; the plane arrangement of the mols., as represented in our classical formulas (**I**), is retained and there are no isomers. (2) The C_6H_6 nuclei attract each other, i. e., the axes perpendicular to the plane of the ring approach each other, which is possible only if the mol. is deformed and the coplanar arrangement of the nuclei is abandoned. Formula **II** shows the closest possible approach of the 2 nuclei to each other; the axes perpendicular to the ring plane coincide. This holds on the assumption that the diphenyl union, corresponding to the ethane union, can rotate freely either about an axis in the plane of one of the nuclei or about an axis perpendicular to it. If this rotation is for any reason impeded or prevented the final configuration will depend on the resistance which the mol. **I** will have to overcome in its effort to pass into **II**. Just as the diphenyl may be compared with the ethane union, so a double union between C_6H_6 nuclei, as in diphenylene, fluorene, dihydroanthracene, etc., may be compared with the ethylene union, i. e., *cis-trans* isomers of fluorene, e. g. (**III** and **IV**), may be expected. All C_6H_6 -nucleus monosubstitution products of **III** or **IV** may exist in optically active antipodal forms, while disubstitution products with the same substituent in the 1,8-, 2,7-, 3,6- or 4,5-positions are identical with their mirror images, and the same is true of tetra-, hexa- and octasubstitution products with the same substituents in the above positions, but if the substituents in these positions are different the mirror images will again not be identical. Of the 9-substitution products, however, 2 non-resolvable forms (**V** and **VI**) can be derived from **III** and one resolvable form (**VII**) from **IV**. There are, therefore, 5 theoretically possible stereoisomeric 9-derivs., 2 *cis*- and 1 racemic and 2 optically active *trans*-forms. These views also hold when the C_6H_6 nuclei are not parallel to each other; if the angles between the planes of the 2 nuclei and the plane of the union between them are both greater or smaller than 90° the compd. will not be resolvable, but if 1 angle is greater, the other smaller than 90°, the compd. will be resolvable. The resolvability of the *trans*- and non-resolvability of the *cis*-forms is, moreover, independent of whether or not the 5-ring is plane, and 9 derivs. which also have a substituent in one C_6H_6 nucleus are likewise resolvable even when the 2 C_6H_6 nuclei lie in the same plane, as the 9-C atom is then asym. To test the above views, K. and J. have undertaken a study of 9-aminofluorene (**VIII**), which should exist in 3 inactive forms (**V-VII**). Reduction of fluorenone oxime according to Schmidt and Stutzel (*C. A.* **2**, 2232) gives a 9-aminofluorene (**IX**), m. 64°, probably identical with their α -compd. for which they give 53-5° as the m. p.; when pure, it dissolves in cold concd. H_2SO_4 without the slightest green color and melts colorless. A pure β -compd., m. 123°, could not be obtained by the S. and S. method; the 120-6° fraction of the crude bases contains CO_2 and gives with HCl and Me_3NCOCl derivs. identical with those obtained from **IX**. Kerp's compd. (**X**), m. 161° (*Ber.* **29**, 231 (1896)), was obtained in a single instance by extg. the crude bases with AcOEt and is apparently a *carbamnic acid*, $(\text{C}_6\text{H}_5)_2\text{CHNHCO}_2\text{H}$, corresponding to γ -9-aminofluorene (**XI**); with HCl it evolves CO_2 and gives a HCl salt entirely different from that of **IX** and having the m. p., 216°, of Wieland's **VIII**. HCl (*C. A.* **5**, 3414); with $\text{C}_6\text{H}_5\text{N}$ and Ac_2O , **X** likewise loses CO_2 and gives the *Ac deriv.*, m. 245.5-6.0°, of **XI**; with concd. NH_4OH , **X** gives **XI**, m. 60°, prisms which absorb CO_2 with exceeding rapidity and which have, therefore, not yet been obtained pure. **XI** reacts with AcOH considerably more easily than **IX** and is therefore obtained in considerable amts. as its *Ac deriv.* when the fluore-

none oxime or ketazine is reduced in boiling AcOH with Zn; in the reduction of the oxime with Na-Hg it is not formed. Its Ac deriv. gives fluorene on distn. with Zn dust, and with HNO_3 (d. 1.35) yields the same 1,8-dinitrofluorene, m. 196–7°, as S. and S. obtained from IX. IX and XI both give the same color reaction with triketohydrindene hydrate and a blue color with hot concd. H_2SO_4 but differ characteristically from each other in their behavior towards CO_2 and AcOH. IX. HCl, m. 255°; Ac deriv., m. 262° (cor.); α -N,N-dimethyl-N'-9-fluorenylurea, from IX and Me_2NCOCl in Et_2O , m. 158–9°, colored blue by even cold concd. H_2SO_4 .



Triphenylmethane. J. F. NORRIS. *Organic Syntheses* IV, 81–3(1925).— C_6H_6 , CCl_4 and AlCl_3 give the complex $\text{Ph}_3\text{CCl} \cdot \text{AlCl}_3$, which is decompd. by Et_2O to give 68–84% Ph_3CH C. A. R.

“Triphenylcarbinol hydrochloride.” BURCKHARDT HELFERICH AND HANS DEHE *Ber.* 58B, 1605(1925).—The substance $\text{C}_{19}\text{H}_{17}\text{OCl}$, m. 174°, obtained by the action of H_2O on Ph_3CCl in $\text{C}_6\text{H}_5\text{N}$ (C. A. 19, 2479) is also formed when HCl gas is passed into Ph_3COH in $\text{C}_6\text{H}_5\text{N}$; yield, 5 g. from 5 g. Ph_3COH . The “basic” properties of the O in the carbinol must therefore be quite pronounced. C. J. WEST

Reactions of compounds of triphenylmethyl and triphenylsilyl in liquid ammonia. C. A. KRAUS AND RAPHAEL ROSEN *J. Am. Chem. Soc.* 47, 2739–48(1925).—Na and K derivs of Ph_3C are salts; for 0.05 and 0.08 N, the equiv. cond. in liquid NH_3 is 64 and 32, resp. Ph_3CH does not conduct appreciably in liquid NH_3 . $(\text{Ph}_3\text{C})_2\text{O}$ and Na_2O or K_2O are obtained as final products after oxidation of the corresponding salts in liquid NH_3 . There is evidence of the existence of intermediate products. $\text{Na}(\text{K})\text{-CPh}_3$ are formed by the action of the corresponding amide on Ph_3CH in liquid NH_3 . The reaction is reversible and hydrolysis of the salts is obtained under suitable conditions. The K salt crysts. free from NH_3 and the Na salt with 1 mol. NH_3 . Ph_3CH is a sensitive indicator in liquid NH_3 , being red in alk. and colorless in acid soln. Ph_3CCl is slightly hydrolyzed in liquid NH_3 . The reaction is reversible and Ph_3CCl is formed by the action of NH_4Cl on Ph_3CNH_2 . Ph_3CCl is hydrolyzed to the amine and NH_4Cl on evap. an NH_3 soln. of the compd. and on treating the compd. with NH_3 vapors at higher temps. Ph_3CCl forms an addn. compd. with 1 mol. $\text{C}_6\text{H}_5\text{N}$, m. 173–4°, and with PhNH_2 , m. 189–90°. Ph_3CNH_2 does not react with KNH_2 . With K it yields Ph_3CK and KNH_2 . The Ph linkage is broken down when Ph_3SiCl is reduced with metallic Na in liquid NH_3 ; definite compds. could not be isolated. Ph_3SiCl hydrolyzes in liquid NH_3 with the formation of Ph_3SiNH_2 and NH_4Cl . The sp. cond. of Ph_3SiCl in the fused condition is 2.2×10^{-6} reciprocal ohms. C. J. WEST

Absorption spectra of benaurin. W. R. ORNDORFF, R. C. GIBBS AND S. ALICE McNULTY. *J. Am. Chem. Soc.* 47, 2767–77(1925).—The exptl. method used in measuring absorption spectra and the precautions taken to insure accurate and reliable data are outlined. Curves showing the absorption spectra of solns. of benaurin in neutral EtOH , EtOH-HCl , 93% H_2SO_4 , EtOH-alkali and 33% aq. alkali and of $(p\text{-HOCH}_2)_2\text{-CHPh}$ in neutral EtOH are recorded and discussed. It is suggested that the absorption spectra of benaurin in neutral alc. are due to the presence of a quinonoid hydrate form of benaurin, in acid soln. to a benaurin salt of the acid, in the alk. (KOH) soln. to the quinonoid K salt and in the strongly alk. (33% KOH) soln. to the di-K salt of the carbinol. A table showing the position of max. absorption, expressed in frequency nos., for all the bands in each of the solns. studied, is given. C. J. WEST

Benzoïn. ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses* I, 33–4(1921).—Prepn. of $\text{PhCH}(\text{OH})\text{Bz}$ from BzH and NaCN . C. J. WEST

Benzil. ROGER ADAMS AND C. S. MARVEL. *Organic Syntheses I*, 25-7(1921).—Prepn of Bz₂ from PhCH(OH)Bz and HNO₃. C. J. WEST

Cleavage of ring systems. JAKOB MEISENHEIMER. *Ber.* 58B, 1491-2(1925).—Reply to Kuhn and Ebel (*C. A.* 19, 2477). C. A. R.

Novel inversion phenomena. J. BÖRSEKEN. *Ber.* 58B, 1470-3(1925).—Remarks on the paper of Kuhn and Ebel, *C. A.* 19, 2477. C. A. R.

Stability of hexasubstituted ethanes. A. P. GRAY AND C. S. MARVEL. *J. Am. Chem. Soc.* 47, 2796-802(1925).—Dicyclohexylphenylchloromethane, m. 122° in 67-70% yields from the carbinol and AcCl. Shaken with mol. Ag in PhMe for 35 hrs., it gives 75% of sym-tetracyclohexyldiphenylethane (I), b_{1.75} 170-1°, n_D²⁵ 1.6710, mol. wt. in boiling C₆H₆, 506, 470; it forms a faintly yellow, viscous liquid, stable in the air and showing no oxidation at 330° for 30 min. It does not solidify at 0° and does not absorb H in the presence of Pt. An excess of cyclohexyl-MgBr and Et hexahydrobenzoate gave dicyclohexylcarbinol and cyclohexene. Tri-tert-butylethynylchloromethane, m. 170-1°, in 28-44% yields from the carbinol and PCl₃ in PhMe; it is unstable and turns yellow or red on standing a few days, even in the dark; EtOH or H₂O accelerates the change. Heating in PhMe gives a yellow solid, m. 210-20°. With mol. Ag, Hg, Na-K, Zn or Mg in C₆H₆ or Et₂O, no reaction occurs, but in PhMe at 100°, Ag gives a product which absorbs about 50% of the calcd. amt. of O to form a peroxide, thus indicating the existence of a purely aliphatic free radical. The stability of I and the existence of tri-tert-butylethynylmethyl are in accord with Lewis' explanation of the existence of free radicals. C. J. WEST

Infra-red absorption spectra of molten naphthalene. F. K. BELLE. *J. Am. Chem. Soc.* 47, 2811-6(1925).—A simple elec. heating device for the examn. of the infra-red absorption of solids in the molten state is described. The infra-red absorption spectrum of C₁₀H₈ at 95° and of C₆H₆ have been examd. as far as 12.0μ. A comparison of these spectra reveals a pronounced similarity in the region of the shorter wave lengths as far as 5.5μ and beyond this point shows increasing dissimilarity as the longer wave lengths are approached. C. J. WEST

The stereoisomeric forms of decahydronaphthalene. WALTER HÜCKEL. *Ber.* 58B, 1449-52(1925).—In view of the large differences in the phys. consts. of the prepn. of trans-decalin (I) of Eisenlohr and Polenske (*C. A.* 19, 498) and those of H. (*C. A.* 19, 1269), H. has prepd. I like E. and P. by the Wolff method, starting with about 3 times as much trans-β-decalone semicarbazone and thoroughly purifying the I with concd. H₂SO₄. His product (about 4 g from 21 g semicarbazone) shows d₄²⁰ 0.8685, n_D²⁰ 1.4691, M_D 44.28, heat of combustion 10824 cal./g., in good agreement with his other prepn. and with that obtained by Zelinskii (*C. A.* 19, 1262) from com. decalin. The exply. detd. consts. are: b. 185°, d₄²⁰ 0.8703, n 1.46728, 1.46994, 1.47572, 1.48060 for α, D, β and γ at 18.2°. The extreme values of the consts. of H.'s numerous prepn. of cis-octalin, all prepd. by longer or shorter heating of cis-β-decalol with KHSO₄, are. d₄²⁰ 0.917 and 0.913, n_D²⁰ 1.4986 and 1.4911, M_D 43.55 and 43.32, EM_D 0.04 and -0.19. His homogeneous trans-Δ²-octalin m. -24°, d₄¹⁹ 0.8936, n_D¹⁹ 1.48429, M_D 43.64, EM_D 0.13. The discrepancies between the results of E. and P. and those of H. are ascribed to the fact that the Wolff, like the Clemmensen, method gives products contaminated with O-contg. substances, which must be purified with concd. H₂SO₄, moreover, in the trans-series E. and P. used too small amts. of material. C. A. R.

α-Bromonaphthalene. H. T. CLARKE AND ETHEL SCHRAM. *Organic Syntheses I*, 35-7(1921).—Prepn. of α-C₁₀H₇Br from C₁₀H₈ and Br₂. C. J. WEST

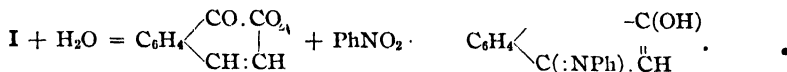
Nitroso-β-naphthol. C. S. MARVEL AND P. K. PORTER. *Organic Syntheses II*, 61-2(1922).—Technical β-C₁₀H₇OH with HNO₂(NaNO₂ and H₂SO₄) give 99% of 1,2-C₁₀H₆(OH)NO. C. J. WEST

1,4-Aminonaphthol hydrochloride. J. B. CONANT, R. E. LUTZ AND B. B. CORSON. *Organic Syntheses III*, 7-10(1923).—α-C₁₀H₇OH is combined with PhN₂Cl and then reduced, giving 65-74% of 1,4-C₁₀H₆(OH)NH₂·HCl. C. J. WEST

1,4-Naphthoquinone. J. B. CONANT AND S. A. FREEMAN. *Organic Syntheses V*, 79-82(1925).—1,4-C₁₀H₆(OH)NH₂·HCl, oxidized by Na₂Cr₂O₇ and H₂SO₄, gives 50-81% of 1,4-C₁₀H₆O₂. C. J. WEST

The preparation and properties of the arylaminonaphthoquinones. R. LANTZ AND A. WAHL. *Bull. soc. chim.* 37, 890-901(1925); cf. *C. A.* 19, 2487. —α-Halo-β-naphthols react readily with PhNH₂ to give phenylimino-1-hydroxy-2-naphthalene (I), which in Me₂CO is readily oxidized by the air and by oxidizing agents. In alk. alc. it is oxidized by dil. NaOCl at 5° to green crystals of 1-phenylimino-2-naphthoquinone (II), m. about 100° (yield, nearly 100%), identical with the reaction product of PhNO

on β -C₁₀H₇OH. It is reduced by Al-Hg to I. Similarly was obtained 1-*o*-methoxy-phenylimino-2-naphthoquinone and 1-*p*-acetylaminophenylimino-2-naphthoquinone. In soln. the blue-green colors of these substances fade, especially in presence of acid or alkali. If HCl is added to a soln. in Me₂CO and then AcONa, there is formed a red ppt. of 2-hydroxy-4-phenylimino-4-naphthoquinone:



PhNH₂ and II in Me₂CO give 1-phenylimino-4-phenylamino-2-naphthoquinone (III), brown crystals, and simultaneously more of II is reduced to 1-phenylimino- β -naphthol. III, also represented by its tautomeric form, 2-hydroxy-1,4-diphenylimino-1,4-naphthoquinone (IIIa), is changed by boiling in excess AcOH for 0.5 hr. to anilidonaphthoquinone-anilide (IV). III can be obtained directly from I without isolating II and in better yield by treating I with excess PhNH₂, adding Cu(OH)₂, and stirring with a current of air. This gives the Cu salt of the IIIa form, which is purified by recrystn. from PhNO₂. By treating II (40 g.) with 50–60 cc. of NaHSO₃ soln. (36° B \acute{e} .), finally with Na₂CO₃, filtering and acidifying, is produced 1-phenylamino-2-hydroxynaphthalenesulfonic acid (V). 1-*p*-Tolylamino-2-naphthoquinone behaves similarly but the acid formed (VI) is less stable and the salts are more sol. By sulfonating I is obtained an isomer of V. Similarly the 1-*p*-tolylamino-2-hydroxynaphthalene was sulfonated to give an acid isomeric with VI.

M. A. Youtz

Reaction of 2-benzylhydrindone phenylhydrazine with phenylhydrazine. HERMANN LEUCHS and KURT WINZER. *Ber.* 58B, 1520–7 (1925).—It was found (C. A. 7, 3329) that 2-benzyl-1-hydrindone (I) with excess of PhNHNH₂ at 130° gives a compd. C₂₈H₂₅N₃ (II). On treatment with Ac₂O, II loses a PhNHNH residue and yields a di-Ac compd. C₂₆H₂₃O₂N (III), in which one Ac group is firmly held while the other is so loosely bound that it is split off as AcOH by boiling with alics., forming the MeO and EtO derivs., C₂₆H₂₅O₂N (IV) and C₂₆H₂₅O₂N (V), of a mono-Ac compd.; reacylation of these compds. cannot be effected, but HCl, AcOH or even PhNHNH₂ hydrolyzes them to the same hydroxymonoacetyl compd., C₂₄H₂₁O₂N (VI), in which the HO group reacts with neither alics. nor Ac₂O and which contains no group reacting with PhNHNH₂; the Ac group remaining is, therefore, probably not attached to a C atom in ketone combination but to the N and the labile AcO group in III is part of an enolized C:O group in which it has replaced a PhNHNH residue, i. e., the following non-reversible reactions take place: C₂₁H₁₇(:NH)(:CNHNHPh) (II) (+ Ac₂O) \longrightarrow C₂₁H₁₇(:NAC)(COAc) (III) (+ MeOH) \longrightarrow C₂₁H₁₇(:NAC)(COMe) (IV) (+ HCl) \longrightarrow C₂₁H₁₇(:NAC)(COH) (VI). VI easily forms monohalogen derivs. in which the halogen is bound aromatically. II behaves with Bz₂O in the same way as with Ac₂O, but with C₆H₄(CO)₂O gives a monomol. compd. C₃₀H₂₁O₂N (VII) in which a new ring must have been formed; in order not to make it necessary to assume too large a ring, the \equiv C:O— and =N— residues in VII must be adjacent. This cyclic structure is probably the cause of the stability of VII towards HCl-AcOH and towards boiling MeOH, by which it is not attacked at all. With hot concd. HCl, II gives in good yield the HCl salt of a base C₂₂H₁₇N (VIII),

in whose formation it must be assumed that intramol. alkylation has occurred: Cl.C.

NH \longrightarrow C:N.HCl. VIII and its salt seem to have a tendency to add H₂O or HCl loosely at the double bond, which certainly can bind other mols. firmly. Thus, VIII with Ac₂O forms III, with C₆H₄(CO)₂O it gives VII in small part and with PhNHNH₂ at 130° it smoothly yields II. Boiling HCl smoothly converts the phenylhydrazone (IX) of I into VIII. HCl, and there can, therefore, be no doubt that when IX is heated with PhNHNH₂ at 130° there occurs a kind of indole synthesis and that the primary product immediately adds PhNHNH₂ to form II. It has not been possible up to the present to effect similar reactions with other than benzyl derivs. of hydrindone and it is, therefore, assumed that the ring formation occurs not through the tertiary α -C atom in IX but through the CH₂ group of the PhCH₂ residue, VIII being α,β -[*o*-benzylene]- γ -phenyl- β,γ -dihydroquinoline. II, m. 190–2°, from I and 4 parts PhNHNH₂ heated 8 hrs. at 130°, gives



an emerald-green soln. with $\text{H}_2\text{SO}_4\text{-FeCl}_3$, is unchanged by NH_3 in boiling MeOH, while boiling alc. NaOH converts it into products m. 190–206°. **III** (2.3–2.5 g. from 3 g. **II**), m. 155–7°, gives no color with alc. FeCl_3 . **IV**, m. 164–6°, dissolves in H_2SO_4 with a faint green-yellow color discharged by AcOH, gives no color with alc. FeCl_3 . **V**, m. 125–7°. **VI**, m. 196–8°. *Br deriv.* of **VI** (obtained from **III**, **IV** or **VI** with Br in AcOH through a reddish *perbromide*, m. about 170° (decompn.)), sinters 246°, m. 251–3°, insol. in alkalis. With Cl in AcOH, **III** gives, depending on the length of treatment, a *mono-* or a *di-Cl deriv.*, m. 238° and 265°, resp. *Di-Bz compd.*, $\text{C}_{26}\text{H}_{27}\text{O}_2\text{N}$, from **II** with Bz_2O and NaOBz at 100°, m. 191–3°, insol. in hot 2 N NaOH, sol. in H_2SO_4 with a yellow color turned faintly green by FeCl_3 (yield, 2.1 g. (together with 2.1 g. $(\text{PhNBz})_2$) from 3 g. **II**), converted by boiling MeOH into the *monobenzoylmethoxy compd.*, m. 163–4°. *Monobenzoyl compd.*, $\text{C}_{29}\text{H}_{23}\text{O}_2\text{N}$, m. 160–1°; *Br deriv.*, m. 208–9°, unchanged by boiling NaOEt. *Monophthalyl compd.* (**VII**) (0.23 g. from 2 g. **II** with $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ and NaOAc at 130°), m. 256–8°, sol. in H_2SO_4 with yellow color turned greenish by FeCl_3 . **VIII**, HCl (4 g. from 5 g. **II**), m. 206–8° (gas evolution); free **VIII**, prisms with H_2O from petroleum ether, m. 110–5° and, anhyd., 123–4°.

C. A. R.

Mesothianthracene derivatives. **II. Dianthranyl disulfide and dianthranyl tetrasulfide.** WM. H. COOKE, I. M. HEILBRON AND G. H. WALKER. *J. Chem. Soc.* 127, 2250–5(1925); cf. *C. A.* 17, 1465–9, 10- $\text{C}_{14}\text{H}_8\text{Br}_2$ and excess of NaHS (9 g. Na in 1000 cc. AmOH, sated with H_2S), boiled 12 hrs., give 40% of dianthranyl disulfide (**I**); if the stream of H_2S is continued during the boiling, the yield is less. The mother liquors contain *dianthranyl oxide*, straw-colored, m. 213°, which on reduction yields $\text{C}_{14}\text{H}_{10}$ and anthranol. The conditions for its formation are not sharply defined. If less than 1 equiv. of NaSH is used, there results 80–90% of dithioheptacyclene (**II**). Heating with a considerable excess of Na_2S gave only a little **I**, but on heating in an autoclave for 2 hrs. at 150°, there results a quant. transformation into **II**. Na_2S_2 in BuOH gives about 60% of **I**; with AmOH resin formation decreases the yield. Heating in an autoclave at 200° for 4 hrs. gives *ms-dibromodheptacyclene disulfide*, yellow amorphous product, which is resistant to EtOH-KOH. Na_2S_2 in AmOH, heated 2 days, gives 33% of *dianthranyl tetrasulfide*, m. 190° (previously termed dithiodianthrone disulfide); boiling with EtOH-NaOH for 3 hrs. converts it into **I**, 9-anthranyl mercaptan being an intermediate product.

C. J. WEST

Action of nitrogen dioxide on anthracene derivatives. E. DE B. BARNETT. *J. Chem. Soc.* 127, 2040–4(1925)—1- $\text{C}_{14}\text{H}_9\text{Cl}$ and NO_2 give an addn. product which, with cold $\text{C}_6\text{H}_5\text{N-EtOH}$, gives 1-chloro-9(or 10)-nitroanthracene, Au-yellow, m. 155°. 2- $\text{C}_{14}\text{H}_9\text{Cl}$ gives a viscous oil which yields a mixt. of NO_2 derivs. with $\text{C}_6\text{H}_5\text{N}$. 1,5-Dichloro-9,10-dinitro-9,10-dihydroanthracene, turns yellow on heating and m. 156° (evolution of gas); cold $\text{C}_6\text{H}_5\text{N-EtOH}$ give 1,5,9- $\text{C}_{14}\text{H}_7\text{Cl}_2\text{NO}_2$. The addn. compd. from 1,8- $\text{C}_{14}\text{H}_9\text{Cl}_2$ contains 1.5 CHCl_3 , m. 215° (evolution of gas). 9-Bromo-9,10-dinitro-9,10-dihydroanthracene, turns yellow and sinters at about 115°; $\text{C}_6\text{H}_5\text{N}$ and EtOH give 9,10- $\text{C}_{14}\text{H}_8(\text{NO}_2)_2$. 9,10- $\text{C}_{14}\text{H}_8\text{Br}_2$ and NO_2 give 9-bromo-9-nitroanthrone, sinters 116°. 9,10-Dichloro-9,10-dinitro-9,10-dihydroanthracene, extremely unstable and decomps. on boiling with CHCl_3 , giving $\text{C}_{14}\text{H}_8\text{O}_2$. The 1,5,9-tri-Cl deriv., yellow, decomps. 156° and yields with $\text{C}_6\text{H}_5\text{N}$ and EtOH 1,5-dichloro-9,10-dinitroanthracene, pale yellow, m. 277°. 2,3,9-Tribromo-9-nitroanthrone, evolves brown fumes on heating with PhMe and gives 2,3- $\text{C}_{14}\text{H}_6\text{Br}_2\text{O}_2$. Neither *meso-* nor *bz-*substituents have any appreciable influence on the ease with which addn. to the "bridge" takes place; *bz-*substituents do not increase the stability of the compds. formed by the addn. of NO_2 groups to the "bridge," whereas in the case of addn. of halogen atoms, the presence of Cl atoms in α -positions results in an enormous increase in stability; *ms-*substituents appear to decrease the stability of the addn. products.

C. J. WEST

9,10-Dibromoanthracene. I. M. HEILBRON AND J. S. HEATON. *Organic Syntheses* **III**, 41–3(1923).—Bromination of $\text{C}_{14}\text{H}_{10}$ in CCl_4 gives 83–8% 9,10- $\text{C}_{14}\text{H}_8\text{Br}_2$. C. J. W. **β -Methylanthraquinone.** L. F. FIESER. *Organic Syntheses* **IV**, 43–4(1925).—*p*- $\text{MeC}_6\text{H}_4\text{COC}_6\text{H}_4\text{CO}_2\text{H}$ (o), heated with fuming H_2SO_4 (20% SO_3), gives 86–95% of β - $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3\text{Me}$.

C. J. WEST

Furfural. ROGER ADAMS AND V. VOORHEES. *Organic Syntheses* **I**, 49–52(1921).—Prepn. of furfural from corn cobs, 10% H_2SO_4 and NaCl.

C. J. WEST

4-Ethylcyclopentane-3,5-dione. G. T. MORGAN AND A. E. RAWSON. *J. Soc. Chem. Ind.* 44, 462–3T(1925).—*Na acetylacetonone* (**I**) was prepd. in a 93% yield by adding CH_2Ac_2 to EtONa, cooling, washing and drying. 3-Ethylacetylacetonone (**II**) was prepd. in 60% yield by heating **I** with 6 times its wt. of EtI in an autoclave at 140–50° for 3 hrs. **II** was then refluxed with TeCl_4 in CHCl_3 ; on evapn. an 88% yield

of the 4-ethylcycloelluropentane-3,5-dione 1,1-dichloride (III) was obtained, blackening 185–90°. III was reduced at 0° with KHSO_5 in H_2O , yielding 96% of crude 4-ethylcycloelluropentane-3,5-dione, m. 141–2° after recrystn. from C_6H_6 . T. S. CARSWELL

Isatin. C. S. MARVEL AND G. S. HERS. *Organic Syntheses* V, 71–4 (1925).— PhNH_2 , NH_2OH and $\text{Cl}_3\text{CH}(\text{OH})_2$ with Na_2SO_4 give 80–91% of PhNHCOCH:NOH which, with concd. H_2SO_4 , yields about 70% isatin. C. J. WEST

4- and 6-Methylisatin. FRITZ MAYER AND RUDOLF SCHULZE. *Ber.* 58B, 1465–9 (1925).—As stated by Sandmeyer (*C. A.* 13, 1840), *m*- $\text{MeC}_6\text{H}_4\text{NHCOCH:NOH}$ (I) heated with concd. H_2SO_4 gives a mixt., m. about 143°, of 4- and 6-methylisatin (II and III, resp.), which M. and S. have now succeeded in sepg. into its components. On pouring it into H_2O without cooling, impure II first seps. and, later, impure III. Their degree of purity and their constitution can be detd. by degradation to the corresponding 6,2- and 4,2-Me(H_2N) $\text{C}_6\text{H}_3\text{CO}_2\text{H}$ (IV and V). True to rule, IV cannot be esterified with alc. and HCl while V can. Moreover, in their prepn from II and III with alk. H_2O_2 the 2 acids behave quite differently; V seps. on acidification of the soln. and is completely pptd. on further addn. of NaOAc , while IV can be isolated only as its Cu salt. The highest melting prepn. of II obtained m. 189° and on oxidation gave only pure IV, while no prepn. of III melting higher than 147° (softening 140°) could be obtained; this on oxidation gave a V contg. approx 10% IV. There seems to be no doubt, therefore, that Fincklee's product, m. 169° (*Ber.* 38, 3551 (1905)), was pure III. Bauer claims that his compd., m. 182°, gives *m*-homoisatoic acid on oxidation and is therefore III (*C. A.* 3, 2450), but M. and S. find that their method of oxidation yields both IV and V, so that B.'s substance is really impure II. C. A. R.

The (non-catalytic) hydrogenation of thionaphthene. R. FRICKE AND G. SPILKER. *Ber.* 58B, 1589–601 (1925); cf. *C. A.* 19, 1412.—The cor. const. for the new compds. obtained in the reduction of thionaphthene (I) with Na and alc., as described in the earlier paper, are: *o*- $\text{EtC}_6\text{H}_4\text{SH}$ (II), b_{768} 210.1–0.9°, d_4^{20} 1.0349; *o*- $\text{EtC}_6\text{H}_4\text{SMe}$ (III), b_{777} 228.2–8.6°, d_4^{20} 1.0253. Further study of the dark brown substance obtained from the Et_2O ext. of the reaction product has shown that it is a mixt. of unchanged I and 2,3-dihydrothionaphthene (IV), b_{768} 233.3–4.5° (cor.), d_4^{20} 1.1125, mol. wt. in freezing C_6H_6 125–9. They are sepd. from each other by removing the I as the picrate or by isolating the IV as the HgCl_2 compd., yellow, m. 128–9°. On further reduction IV gives II; it was also identified by conversion in AcOH with H_2O_2 into the sulfone, $\text{C}_8\text{H}_8\text{O}_2\text{S}$, m. 91.5–2.0°. II in AcOH with Cl gives *o*- $\text{EtC}_6\text{H}_4\text{SO}_2\text{Cl}$, converted by concd. NH_4OH into the amide (V), m. 126–6.5° (given in the literature as 97–100°); sulfonation of PhEt, followed by chlorination and treatment with NH_4OH , gave a mixt., sepd. by fractional crystn. of V, likewise m. 126°, and the *p*-isomer, m. 109°. The II was still further identified by prepg. it from *o*- $\text{EtC}_6\text{H}_4\text{SO}_2\text{Cl}$ with Sn and HCl . Reduction of I with Na in MeOH and (fermentation) AmOH gave practically the same results, as regards IV, as in EtOH , in MeOH 70 g. I yielded 8 g. IV and 10 g. II, in AmOH 12 and 22 g., resp. Two expts. were made on the reduction of solid I with H under pressure (in an autoclave which is described); in the 1st the initial pressure at room temp. was 50 atm. and reached 111 atm. at the max. temp. (438°), and in the 2nd the initial pressure was 70 atm. and reached 159 atm. at the max. temp. (425°). The results in the 2 expts. were almost the same; the products were H_2S , CH_4 and its homologs, C_6H_6 , PhMe, PhEt, II, I, IV and anthracene, the yield of IV being so small (about 10 g. from 200 g. I) as to make this method impracticable for the prepn. of IV; 12–5 g. II was obtained and about 40 g. I was recovered unchanged. C. A. R.

2-Amino-4,5-dimethylglyoxaline. RICHARD BURTLES AND F. L. PYMAN. *J. Chem. Soc.* 127, 2012–8 (1925).—2-*p*-Bromobenzenazo-4,5-dimethylglyoxaline, light brown, m. 213–4° (all m. ps. are cor.); it seems to cause irritation of the skin and swelling of the eyelids; HCl salt, orange-yellow, decomp. 135°. Reduction by Sn and HCl gives 69% of 2-amino-4,5-dimethylglyoxaline- HCl , m. 289°; carbonate, with H_2O , m. 114°; picrate, yellow, m. 245°. The amine reacts sluggishly with HNO_2 in dil. or concd. HCl or 25% AcOH , giving no cryst. products, but the solns. give deep colors on treatment with NaOH . It gives deeply colored solns. with $\text{Na}_2\text{Fe}(\text{CN})_6$ and aq. NaOH or with AmNO_2 and EtONa in EtOH . *Ac* deriv., m. 270°; after treating with HCl and NaNO_2 , it gives no color with $\beta\text{-C}_{10}\text{H}_7\text{ONa}$; it instantly decolorizes aq. KMnO_4 . The NH_2 deriv. does not give a benzylidene deriv. 2-*p*-Bromobenzenazo-4(5)-methylglyoxaline (I), yellow, m. 225–6°. 5(4)-*p*-Bromobenzenazo deriv., brown, m. 238°; HCl salt, yellow needles or yellow-red prisms, m. 188°. The yield of these 2 compds. is about 47 and 12%. The constitution of I was established by its reduction by Zn and AcOH to alacreatinine; this is also obtained with SnCl_4 and HCl , together with about 10% of the 2-amino deriv., analyzed as the picrate, brownish yellow, m. 186–7° C. J. WEST

Heterocyclic derivatives of substituted *o*-aminophenols. A. KORCZYNSKI AND ST. OBARSKI. *Bull. soc. chim.* **33**, 1823-32(1923).—All halogenated *o*-aminophenols (I) studied are oxidized by chloranil (II) to the corresponding substituted aminophenoxazone. For characterization of I certain Ac derivs. were prepd., corresponding benzoxazoles were prepd. using AcNH_2 at 220–50°, and mercaptobenzoxazoles with CSCl_2 , and the aminophenoxazones by refluxing with 0.5 mol. II in alc. 4,2-Cl(H_2N) $\text{C}_6\text{H}_3\text{OH}$, prepd. in 70% yield by electrolytic reduction of the NO_2 compd.; Ac deriv., m. 185°; di-Ac deriv., m. 201°; from it were prepd. as above 2-methyl-5-chlorobenzoxazole, m. 63°; 2-mercapto-5-chlorobenzoxazole, m. 275°. 4,2-Br(H_2N) $\text{C}_6\text{H}_3\text{OH}$, similarly prepd., gives 2-methyl-5-bromobenzoxazole, m. 70°; 2-mercapto-5-bromobenzoxazole, m. 283°; and 3-amino-6-bromophenoxazone, m. above 300°, difficultly sol., blue in concd. H_2SO_4 and becoming red on diln. 4,6,2-ClBr(H_2N) $\text{C}_6\text{H}_3\text{OH}$ gives 2-methyl-5-chloro-7-bromobenzoxazole, m. 117°; 2-mercapto-5-chloro-7-bromobenzoxazole, m. 228°; and 2-amino-3-chloro-1,8-dibromophenoxazone, m. above 300°, violet in concd. H_2SO_4 and pptd. on diln. 4,6,2-Br $_2$ (H_2N) $\text{C}_6\text{H}_3\text{OH}$ gives 2-methyl-6,7-dibromobenzoxazole, m. 127°; 2-mercapto-5,7-dibromobenzoxazole, m. 235° (ABSTRACTOR'S NOTE. Apparently an error in numbering of 1 of the 2 foregoing compds.); and 3-amino-1,6,8-tribromophenoxazone, m. above 300°. 4,6,2-I(H_2N) $\text{C}_6\text{H}_3\text{OH}$ gives 3-amino-1,6,8-triodophenoxazone, m. above 300°, blue in concd. H_2SO_4 and showing neither color change nor pptn. on diln.

WM. B. PLUMMER

The simplest *O*-alkyl ethers of benzoylacetone, and methylphenylisoxazole. C. WEYGAND. *Ber* **58B**, 1473-82(1925) — PhCHBrCHBrCOMe and alk. KOH give $\text{PhC}(\text{OEt})\text{:CHCOMe}$ (I), the *b*-ether of BzCl_2Ac (II), i. e. the *O*-ether of the benzoyl-enol form of II (Ruhemann and Watson. *J. Chem. Soc.* **85**, 1180(1904)). Claisen from II with $\text{HC}(\text{OEt})_3$ and FeCl_3 obtained an ether (III) (C. A. **2**, 94) to which he assigned the *a*- or acetyl enol structure, $\text{PhCOCH C}(\text{OEt})\text{Me}$, because, according to him, it gives with NH_2OH an isoxazole (IV), m. 12°, different from the methylphenylisoxazole (V), PhC:CH CMe N O , m. 68°, obtained from II or PhC CCOMe with NH_2OH .

Repetition of C.'s work has shown, however, that the product is really I; with $\text{NH}_2\text{OH} \cdot \text{HCl}$ it always gives chiefly V, and although the mother liquors from V contain lower melting products (about 50°), no substance m. 42° could ever be isolated. I behaves in exactly the same way with $\text{NH}_2\text{OH} \cdot \text{HCl}$. Further to confirm these observations, and furthermore to obtain, if possible, a true *a*-ether, W. prepd. Me ethers of II by 5 methods: (1) from PhCHBrCHBrCOMe and NaOMe ; (2) from PhC CCOMe and MeOH ; (3) from II and CH_2N_2 ; (4) from II and $\text{HC}(\text{OMe})_3$; and (5) from the Na salt of II and Me_2SO_4 . In every case the product was the *b*-ether $\text{PhC}(\text{OMe})\text{:CHCOMe}$ (VI). All these ethers (both Me and Et) are lemon-yellow oils of a faint characteristic odor hydrolyzed to II slowly in the air, almost instantly by mineral acids; only the very first preps. by the C. method were colorless oils which, however, agreed in all their other properties with the remaining preps. and could never again be obtained. If instead of $\text{NH}_2\text{OH} \cdot \text{HCl}$ a neutral or faintly alk. soln. of NH_2OH is used the reaction proceeds differently; from the aq. alc. reaction mixt. can be isolated a very viscous yellowish oil smelling intensely of V and giving with FeCl_3 an unstable emerald-green color (which V alone does not do), but treatment with acids again gives V. After standing for months over CaCl_2 the oil suddenly deposits crystals which, after crystn. from petroleum ether, yield a substance, m. 79–80°, smelling exactly like V, giving no color with FeCl_3 and distg. apparently without decompn.; the distillate completely solidifies after several days and then m. 81–2°, but on again crystg. from MeOH the m. p. suddenly falls to 50° and a homogeneous material can no longer be obtained. After this expt. had been carried out several times it could no longer be successfully repeated, the oil (which, however, always gave the green FeCl_3 reaction) now yielded crystals of V after some weeks. The ether obtained from II and CH_2N_2 gave with O_3 in CCl_4 an ozonide which on decompn. with H_2O yielded BzOMe , further confirming the *b*-structure VI. C.'s IV was finally obtained by treating PhC CCOMe with NH_2OH in faintly alk. soln.; it m. 42°, b. 234° and has the compn. $\text{C}_{10}\text{H}_9\text{ON}$ but whether it has the structure MeC:CH.CPh:N.O cannot be stated with certainty. The yellowish com II

is easily purified by fractionation *in vacuo*; it then b_1 135°, b_2 161°, solidifies 55.5° (thermometer in the liquid, which is undercooled 1–2°), m. 56° on slow, 61° on rapid heating.

C. A. R.

Aminobenzothiazoles. I. 1-Anilinobenzothiazole and its tolyl homologs. R. F. HUNTER. *J. Chem. Soc.* **127**, 2023-8(1925).—1-Anilinobenzothiazole, m. 159° (Ac deriv., m. 158°) gives a tetra-Br deriv., m. 117° (Hugershoff, *Ber.* **36**, 3121, gives 136°)

which, exposed to the air for 2–3 days, loses Br, giving a yellow *tribromide*, sinters 120°, m. 125° to red liquid. 1-*o*-Toluidino-3-methylbenzothiazole, m. 135° (Ac deriv., m. 77°); the *hexabromide*, red, loses Br at 60° and m. 76–8°; the *tribromide*, yellow, turns orange at 205°, red-brown at 240° and m. 250° (decompn.). Either deriv., boiled with EtOH, gives the *HBr salt*, m. 280° (decompn.), of the *di-Br deriv.*, m. 205°. 1-*p*-Toluidino-5-methylbenzothiazole, m. 162° (Ac deriv., m. 158°), gives a *tetrabromide*, sinters 130°, m. 145°, and a *tribromide*, orange, m. 148° (decompn.). Boiling EtOH gives the *HBr salt*, turns yellow 240°, pale brown 240°, and m. 256–8°, of the *di-Br deriv.*, pale cream, m. 159–60°. 1-*m*-Toluidino-*m*-toluthiazole, m. 184–6°; the *hexabromide HBr salt*, red, crumbles to a semi-cryst. mass at 110°, becomes orange and crystals at 187°, pale yellow at 197° but does not m. 200°. Exposure to the atm. gives the *tribromide HBr salt*, yellow, softens 136°, sinters 190°. It is uncertain whether this is the 4- or 6-Me deriv. II. **Naphthylaminonaphthothiazole derivatives.** *Ibid* 2270–4. —Di- α -naphthylthiocarbamide (I) (2 g.) and 2 cc. Br in 20 cc. CHCl₃ give 2- α -naphthylamino- β -naphthothiazole *tetrabromide*, brilliant vermilion, becomes yellow at 200° and colorless at 260°; on exposure to the air, it loses 1 Br, giving the yellow *tribromide*, which becomes colorless at 280°. Using 1 g. I and 1 cc. Br in CHCl₃, there is formed a heptabromide, bright red, which becomes yellow at 160°. These bromides, boiled with EtOH and then treated with warm 2 *N* NaOH, give *dibromo-2- α -naphthylamino- β -naphthothiazole*, sinters 180°, becomes yellow at 240° and m. 270–2°. I (1 g.) and 1 cc. Br in 6 cc. warm CHCl₃ yield a red *tribromide* of II, becomes orange at 180°, yellow at 190°, pale ocher-yellow at 215°, softens at 260° but does not m. 280°. Reduced with H₂SO₃, any of these bromides yields 2- α -naphthylamino- β -naphthothiazole (II), m. 221°; bromination in CHCl₃ gives a *hexabromide*, bright red, showing color changes at 238°; 2- β -Naphthylamino- α -naphthothiazole *hexabromide*, dark red, softens 210°, decomp. 216°; if the soln. is shaken to induce sudden crystn., a purplish red form, m. 196°, results. The *tribromide*, vermilion, m. 245°. 2- β -Naphthylamino- α -naphthothiazole, m. 223°; bromination gives the purple-red *hexabromide*, m. 198°. C. J. WEST

Action of sulfurous acid upon aromatic amino and hydroxyl compounds. XI. Action of phenylhydrazine-bisulfite mixtures upon azo dyestuffs. HANS TH. BUCHERER AND FRITZ STICKEL. *J. prakt. Chem.* 110, 309–53 (1925); cf. *C. A.* 16, 1950.—Orange II heated with NaHSO₃, gives the addn. product 1,2-HOC₁₀H₆N(SO₂Na)NHC₆H₄SO₂Na (I), yellow-orange needles; on continued heating with NaHSO₃ or PhNH₂ and NaHSO₃, there results a good yield of 1,2,4-C₁₀H₃(NH₂)(OH)SO₃H. PhNHNH₂-NaHSO₃ and Orange II give the yellow dye 1,2-PhNHNHC₁₀H₆N(SO₂Na)NHC₆H₄SO₂Na (II), also obtained from I and PhNHNH₂. II is stable towards NaHSO₃ but on heating with alkalis there results a red *hydrazinoazo compd.*, PhNHNHC₁₀H₆N:NC₆H₄SO₂Na (III). Acids decomp. II, yielding *p*-H₂NC₆H₄SO₃H, and a brown product, partly sol. in H₂O. III, with NaNO₂ and excess HCl, gives phenylpseudo-azimidisulfonic acid, C₆H₅N₃-SO₃Na, needles, easily sol. in H₂O but pptd. by acid, and PhN₂Cl. NaNO₂ and excess AcOH give HO₂CC₆H₄N₂X and phenylpseudoazimide. III is oxidized by HNO₃ in the presence of an excess of NaNO₂ to an *o*-disazo dye or *osotetrazone* (IV), light brown needles; this dye is also formed by oxidation by the air in alk. soln., by H₂O₂ and similar oxidizing agents. HCl, even in the cold, yields a violet dye (brown Na salt), which may be a semidine compd., and a small amt. of 8-aminophenonaphthazine, red-brown. Its diazo soln. gives a red dye with R-salt. Heating III with NaHSO₃ gives a yellow addn. product, which resembles but is not identical with II. IV is easily reduced to III; heating with HCl decomp. it, forming principally PhNH₂ and phenylpseudoazimidisulfonic acid. NaNO₂ and excess AcOH or mineral acid, at ordinary temp., give pseudoazimide and its SO₃H acid. NaHSO₃ gives *p*-H₂NC₆H₄SO₃H and an isomeric *pseudoazimide-4-sulfonic acid*. C. J. WEST

Synthesis of datiscetin. JAN KALFF AND ROBERT ROBINSON. *J. Chem. Soc.* 127, 1968–73 (1925).—2-*o*-Methoxybenzylidene-4,6-diacetoxycoumaranone, yellow, m. 174°, results in 55% yields from *o*-MeOC₆H₄CHO, 4,6-dihydroxycoumaranone and Ac₂O. The *dibromide*, m. 163°, gave no trace of a flavonol upon treatment with alkali. With MeOH, HBr is eliminated, giving the compd., C₁₉H₁₂O₆Br(OMe), yellow, m. 192–3°. *o*-Methoxyphloracetophenone, *o*-MeOC₆H₄CO₂Na and (*o*-MeOC₆H₄CO)₂O give 3,2'-dimethoxy-5,7-dihydroxyflavone (datiscetin di-Me ether), m. 218–9°; the yellow concd. H₂SO₄ soln. gradually acquires a weak green fluorescence; alc. FeCl₃ gives a blackish green color; *di-Ac deriv.*, m. 141.5–2.5°. With HI this yields datiscetin, pale yellow, m. 276°, identical with the natural product. The tetra-Ac deriv., m. 141°, the Bz deriv. 191–2°. 3,7,2'-Trimethoxy-5-hydroxyflavone, m. 111–2.5°; FeCl₃ gives a dull brownish green color. 3-Methoxy-5,7-dihydroxy-2-methylchromone, pale yellow, m. 223–4°, results from *o*-methoxyphloracetophenone, (*o*-AcOC₆H₄CO)₂O and *o*-AcOC₆H₄CO₂Na.

$\text{H}_2\text{CO}_2\text{Na}$ or from the ketone, Ac_2O and AcONa . The datiscetin isolated by Schunck and Marchlewski (*Ann.* 277, 266) contains some galangin. C. J. WEST

Synthesis of certain 2-styrylchromonol derivatives. ROBERT ROBINSON AND JUNZO SHINODA. *J. Chem. Soc.* 127, 1973-80(1925).—These products have been prepd. because of the possibility that they may be found in nature. 7-Hydroxy-3-methoxy-2-styrylchromone (I), pale yellow, m. 250° , gives no color with FeCl_3 , a deep yellow soln. with vivid green fluorescence in concd. H_2SO_4 , results in 4.5 g. yield from 4 g. α -methoxyresacetophenone (II), 7.5 g. $\text{PhCH}:\text{CHCO}_2\text{Na}$ and 16 g. $(\text{PhCH}:\text{CHCO})_2\text{O}$. Boiling H_2O gives 3,7-dihydroxy-2-styrylchromone, bright yellow, m. 257° ; the yellow concd. H_2SO_4 soln. has a green fluorescence. $\text{EtOH}-\text{FeCl}_3$ gives a dark brownish green color. The dyeing properties with various mordants are compared with those of 3,7-dihydroxyflavone, which crysts. with H_2O , pale yellow, m. 258° (cf. Kostanecki and Stoppani, *Ber.* 37, 1180(1904)). β -Phenylpropionic anhydride (III), b₄ $216-7^\circ$. Reduction of I by H and Pd or condensation of II and III with $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{Na}$ gives 7-hydroxy-3-methoxy-2- β -phenylethylchromone (IV), m. $186-7^\circ$; the yellow concd. H_2SO_4 soln. has a blue fluorescence. Demethylation of IV gives 3,7-dihydroxy-2- β -phenylethylchromone, m. 169° ; the yellow H_2SO_4 soln. has a blue fluorescence; $\text{EtOH}-\text{FeCl}_3$ gives a dark violet color; it has no mordant dyeing properties. 3-Methoxy-5,7-dihydroxy-2-styrylchromone, yellow, m. 241° ; the orange-yellow EtOH soln. is colored brown by FeCl_3 ; the yellow H_2SO_4 soln. has a green fluorescence. Demethylation gives 3,5,7-trihydroxy-2-styrylchromone, yellow, m. 249° (tri-Ac deriv., m. $215-6^\circ$); its dyeing properties are recorded. 4-Methoxycinnamic anhydride, m. $119-20^\circ$. With II this gives 3,4'-dimethoxy-5,7-dihydroxy-2-styrylchromone, deep yellow, m. 228° ; the orange H_2SO_4 soln. gives a greenish yellow fluorescence; $\text{EtOH}-\text{FeCl}_3$ gives a brown color. The 3,7,4'-tri-HO deriv., bright yellow, m. 156° ; it is quite insol. even in boiling aq. NaOH . The EtOH soln. gives a yellowish brown color with FeCl_3 . 3,4-Dimethoxycinnamic anhydride, m. $174-5^\circ$. With II it yields 3,3',4'-trimethoxy-5,7-dihydroxy-2-styrylchromone, orange, with H_2O , becoming yellow on drying and m. $233-4^\circ$; the orange H_2SO_4 soln. exhibits a weak green fluorescence; the FeCl_3 color is brown; alk. solns. are orange-yellow. 3,7,3',4'-Tetramethoxy deriv., yellow, m. $203-4^\circ$. 3,4'-Dimethoxy-5,7-dihydroxyflavone, pale yellow, m. 234° . FeCl_3 gives a violet color. The yellow H_2SO_4 soln. exhibits a bright bluish green fluorescence. Demethylation gives kaempferol, m. $276-7^\circ$. C. J. WEST

Synthetical experiments in the isoflavone series. I. WILSON BAKER AND ROBERT ROBINSON. *J. Chem. Soc.* 127, 1981-6(1925).—While derivs. of 2-phenylchromone (flavone) are widespread in nature, the occurrence of derivs. of 3-phenylchromone (isoflavone) has not been definitely proved in any single instance, though it has been suggested that prunetin is the Me ether of a trihydroxyisoflavone. The synthesis of this compd. has been undertaken. Isoflavones substituted in position 2 are easy to prep. but the contrary is the case when it is desired to leave this position unsubstituted. 2,4-(HO)₂C₆H₃COCH₂Ph (or its di-Ac deriv.), Ac_2O and AcONa give 90% of the Ac deriv., m. 162° , of 7-hydroxy-2-methylisoflavone, pale brownish yellow, m. 240° ; the aq. NaOH and concd. H_2SO_4 solns. exhibit weak blue and bluish violet fluorescence, resp. Me ether, m. 135.5° . $\text{PhCH}_2\text{COCH}_2\text{CO}_2\text{Et}$ and $m\text{-C}_6\text{H}_4(\text{OH})_2$ with concd. H_2SO_4 give 7-hydroxy-4-benzylcoumarin, faintly brown, m. $225-6^\circ$; the yellow NaOH soln. has a blue, and the colorless H_2SO_4 soln. a bluish violet fluorescence. 5,7-Dihydroxy-2-methylisoflavone, faintly yellowish brown, m. 228° ; di-Ac deriv., m. 169° ; 7-Me ether, m. $186-7^\circ$, and gives a bluish green color with FeCl_3 . 7-Hydroxy-3-phenylflavone (7-hydroxy-2-phenylisoflavone), pale yellow, m. $270-1^\circ$; the pale yellow H_2SO_4 soln. exhibits a bluish green fluorescence. On heating with aq. KOH is obtained a greenish yellow soln. which sets to a clear gel on cooling; a 1% soln. sets to a stiff gel, while even a 0.1% soln. gives a weak gel. Ac deriv., pale yellow, m. $208-9^\circ$. 7-Cinnamylxy-2-styrylisoflavone, pale yellowish brown, m. $213-4^\circ$; the deep yellow H_2SO_4 soln. exhibits green fluorescence. Heated with KOH and then methylated, there results 7-methoxy-2-styrylisoflavone, pale yellow, m. $203-4^\circ$, which is oxidized by KMnO_4 and then heated until CO_2 is no longer evolved, giving 7-methoxyisoflavone, m. 155° ; the H_2SO_4 soln. shows a blue fluorescence. C. J. WEST

Formation of chromones. A criticism. WILSON BAKER. *J. Chem. Soc.* 127, 2349-58(1925); cf. preceding abstr.—B. and R. state that the products described by Jacobson and Ghosh (*C. A.* 9, 2222, 2762; 10, 1031) as γ -benzopyrones or chromones are really the isomeric α -pyrones or coumarins; of the 24 fundamental compds. concerned, 13 of the true chromones have been prepd. The only safe criterion of the production of a chromone and not the coumarin is the formation on hydrolysis of a HO ketone. The correct names of the compds. prepd. by J. and G. are given with their properties. Ben-

zylresacetophenone, Bz_2O and $BzONa$ at $170-80^\circ$ for 6 hrs. give 7-hydroxy-3-benzyl-2-phenylbenzo- γ -pyrone, m. $272-4^\circ$; the aq. $NaOH$ soln. shows a slight bluish green fluorescence; Bz deriv., m. 167° ; Ac deriv., m. 150° ; in concd. H_2SO_4 they show a weak blue fluorescence. $PhCH_2CH_2CN$ and $1,3,5-C_6H_3(OH)_3$ in Et_2O , satd. with HCl , give benzylphloracetophenone, crystg. with $1H_2O$, m. $139-40^\circ$. With Ac_2O and $AcONa$ this gives 5,7-dihydroxy-3-benzyl-2-methylbenzo- γ -pyrone, m. $200-1^\circ$, the intermediate *di-Ac* deriv., m. 112° ; the concd. H_2SCl solns. show a weak blue-green fluorescence. With Bz_2O and $BzONa$ there results the 2-*Ph* deriv., pale yellow, m. $202-3^\circ$; *di-Ac* deriv., pale yellow, m. 126° . The pale yellow solns. in concd. H_2SO_4 show a weak blue-green fluorescence. Benzyloracetophenone, m. 118.5° , from β - $PhCH_2CH_2CN$. With Ac_2O there results 7-hydroxy-3-benzyl-2,5-dimethylbenzo- γ -pyrone, m. $294-5^\circ$, through the intermediate *Ac* deriv., m. $138-9^\circ$; Me_2SO_4 gives a *Me* deriv., m. 109° . These compds. in concd. H_2SO_4 show a blue fluorescence. 7,8-Dihydroxy-3-phenyl-2-methylbenzo- γ -pyrone, m. $219-20^\circ$; *Ac* deriv., m. 111.5° . The corresponding 2,3-*di-Ph* deriv., m. 297° ; its *di-Ac* deriv., m. $177-8^\circ$. 7,8-Dihydroxy-3-benzyl-2-methylbenzo- γ -pyrone, m. $203-5^\circ$; *di-Ac* deriv., m. 126° . 7,8-Dihydroxy-3-benzyl-2-phenylbenzo- γ -pyrone, pale yellow, m. $275-6^\circ$; *di-Ac* deriv., m. $175-6^\circ$. C. J. WEST

Experiments in the chromone and 1-thiochromone series. F. ARNDT WITH W. FLEMMING, E. SCHOLZ, V. LÖWENSOHN, G. KALLNER, B. MISTERT. *Ber.* **58B**, 1612-32 (1925); cf. C. A. **18**, 2167.—Br substitution in the thiochromanones (I) occurs stepwise, so that any degree of substitution can be effected at will by varying the amt. of Br, but further substitution of an already brominated deriv. is much more difficult than the introduction in 1 operation of the same total amt. of Br into the unsubstituted I. The 1st Br atom always enters position 3 and the resulting mono-Br derivs. all show the typical burning action on the skin characteristic of α -haloketones. 6-Methylthiochromanone (II) gives only a 3-*Br* (III) and a 3,3-*Br_2* deriv. (IV); IV is S-yellow and considerably more difficultly sol. than II or III. Thiochromanone (V), on the other hand, yields colorless 3-*Br* (VI) and 3,3-*Br_2* derivs. (VII), not materially different from each other, and an intensely yellow and difficultly sol. 3,3,6-*Br_3* deriv. (VIII). 6-Bromothiochromanone (IX) (prepd. from p - BrC_6H_4SH) forms a 3,6-*Br_2* deriv. (X) and, on further bromination, VIII. Color and difficult soly. therefore appear in the 3,3-*Br_2* compds. only when position 6 is also occupied by Me or Br. Similar relationships are found in the thioflavanones (XI); these, if the 3- and 6-positions are all occupied, can also still add 4 Br atoms (on the S). Dil. alc. alkalies or, better, C_6H_5N , easily eliminate HBr from the 3-*Br* derivs. of I and XI, with formation of the corresponding thiochromones (XII) and thioflavones (XIII); the XII and XIII not brominated in the pyrone ring can also be obtained directly from the corresponding I and XI with PCl_5 (Löwenbein, C. A. **19**, 288). The Br in the brominated XII and XIII is held very firmly. The action of Br on the XII and XIII does not result in substitution but in addn. of Br at the double bond; the resulting dibromides of the XIII are brown-red while those of the XII show a peculiar yellow-red color dimorphism and are very difficultly sol. in HO -free mediums. Chromone (XIV) itself with Br gives, insofar as it does not form the yellow bischromone hydrotribromide (XV), a colorless dibromide (XVI) (undoubtedly 2,3-dibromochromanone) easily sol. in HO -free solvents; whether the dibromides of the XII are analogous 2,3-*Br_2* derivs. of the I is left an open question for the present. With alc., etc. the dibromides of the XII give 3-*Br* derivs. of the XII, identical with those obtained from the 3,3-*Br_2* derivs. of the I. The dibromides of the XIII with alc., etc. regenerate the XIII, their 3-*Br* derivs. being formed only when an excess of Br is present at the same time. The 3-*Br* deriv. (XVII) of 6-methylthioflavone (XVIII) thus obtained from the dibromide (XIX) is a labile form of that obtained from the 3,3-*Br_2* deriv. (XX) of 6-methylthioflavanone (XXI) and changes into its stable isomer (XXII) only after seeding. The same isomerism is found in the sulfone of XVII but in this case it is the compd. obtained from the flavanone which is the labile form. The S of the I and XI is easily oxidized by H_2O_2 - $AcOH$ even in the cold. Little H_2O_2 , acting a short time, gives a mixt. of sulfoxides and sulfones; the sulfoxides cannot be obtained alone with the calcd. amt. of H_2O_2 nor has it been possible to effect their sepn. from the sulfones. Their presence can be detected by the intense red-violet color which they give with hot dil. (best alc.) alkali; this color soon disappears, the end result of the reaction being the elimination of H_2O and the formation of the corresponding XII or XIII. On longer action in the cold or shorter action in hot soln., H_2O_2 gives sulfones exclusively (except with the 3-*Br* derivs. of the I, where the oxidation stops at the sulfoxide stage). With alkalies, these undergo deep-seated decompn. without color changes; the sulfones of the XI yield BzH (but in far smaller amt. than that corresponding to the Ph present originally), and in all cases the alk. soln. contains an amorphous, strongly acid, S-contg.,

non-homogeneous substance (apparently a mixt. of SO_3H or SO_2H acids). In concd. H_2SO_4 the sulfones dissolve entirely without color. Oxidation of the **XII** and **XIII** is much more difficult, the **XIII** not being attacked at all in the cold and the **XII** only very slowly. The sulfones of the **XII** and of **XVIII** are colorless, that of thioflavone (**XXIII**) is light yellow. Towards alkalis they are much more stable than those of the **I** and **XI**. The sulfones of the **XII** dissolve in concd. H_2SO_4 with yellow, those of the **XIII** with strong orange-red color. Those of the **XII** add Br at the double bond rapidly, those of the **XIII** more slowly. The dibromide (**XXIV**) of 6-methylthiochromonesulfone (**XXV**) with boiling alc. loses HBr and forms a 3-Br deriv. (**XXVI**) of **XXV**. Bromination of 6-methylthiochromonesulfone (**XXVII**) gives a 3-Br deriv. (**XXVIII**) which with $\text{C}_6\text{H}_5\text{N}$ yields **XXV**, and condensation of the **XXVII** with BzH gives the same (colorless) 3-benzal deriv. (**XXIX**) as is obtained by oxidation of the (intensely yellow) 3-benzal deriv. (**XXX**) of **II**. Furthermore, bromination of 6-methylthioflavanonesulfone (**XXXI**) gives a 3-Br deriv. (**XXXII**) which with alkalis splits off BzH. Further bromination of **XXXII** gives a 3,3-Br₂ deriv. (**XXXIII**). **XXVI** is also obtained by oxidation of 3-bromo-6-methylthiochromone (**XXXIV**), which is prepd. from **IV** with $\text{C}_6\text{H}_5\text{N}$. **III**, from **II** and 2 atoms Br in AcOH, m. $60-1^\circ$, sol. in concd. H_2SO_4 with deep violet-red color; **IV**, obtained with 4 or more atoms Br, m. 155° (decompn.), sol. in H_2SO_4 with violet color. **VI**, from **V** and 2 atoms Br in CHCl_3 , m. 76° ; **VII**, obtained with 4 atoms Br, m. 97° , sol. in concd. H_2SO_4 with violet color. β -[*p*-Bromophenylmercapto]propionic acid, from *p*-Br $\text{C}_6\text{H}_4\text{SH}$ and $\text{ClCH}_2\text{CO}_2\text{H}$, m. 119° , converted by concd. H_2SO_4 into **IX**, m. 70° , sol. in H_2SO_4 with crimson color, gives with 2 atoms Br in CHCl_3 **X**, m. $109-10^\circ$, sol. in H_2SO_4 with crimson-violet color. **VIII**, m. 171° , insol. in H_2SO_4 . 3-Bromo-6-methylthioflavanone, m. 120° , sol. in H_2SO_4 with deep red color and violet dichroism; 3,3-Br₂ deriv. (**XX**), yellow, m. 138° , sol. in H_2SO_4 with violet color. 3-Bromothioflavanone, m. 135° ; 3,3-Br₂ deriv., oily; 3,3,6-Br₃ deriv., yellow, m. 157° (decompn.). 2-Bromothiochromonol, from thiochromonol and 2 or more atoms Br in AcOH, light yellow, m. 195° , forms an intensely yellow, difficultly sol., stable Na salt with dil. NaOH. 2-Bromo-6-methylthiochromonol, light yellow, m. 179° ; 2-Cl analog, from 6-methylthiochromonol (**XXXV**) in CHCl_3 with Cl in CCl_4 , brownish yellow, m. $175-6^\circ$; 2,2-Cl₂ deriv., from **XXXV** in CHCl_3 treated with Cl until the evolution of HCl ceases or from **XXXV** and SOCl_2 on the H_2O bath, yellow, m. $138-9^\circ$. 3-Benzalthiochromanone, from **V** in BzH satd. with HCl, faintly yellow, m. $105-6^\circ$, sol. in H_2SO_4 with dark brown-red color and only faint green dichroism. 6-Methyl-1-thiochromone, from **III** and boiling $\text{C}_6\text{H}_5\text{N}$ or NaOH in hot alc. or (in 70% yield) from **II** with PCl_5 in boiling C_6H_6 , m. $61-2^\circ$, easily becomes pink or light brownish, sol. in H_2SO_4 without color but with strong blue fluorescence; 3-Br deriv. (**XXXIV**), m. $117-8^\circ$. 1-Thiochromone, m. 78° ; 3-Br deriv., m. $142-3^\circ$; 6-Br deriv., m. 157° ; 3,6-Br₂ deriv., m. 178° . **XXII**, m. $117-8^\circ$. 3-Bromo-1-thioflavone, m. 136° ; 3,6-Br₂ deriv., m. $195-6^\circ$. **XIV**, m. 59° , which has hitherto been difficultly accessible, is obtained in 50% yield from chromanone with PCl_5 in boiling C_6H_6 . 6-Methylthiochromone dibromide, brown-red cryst. ppt. becoming yellow on standing; from AcOH the red ppt. generally seps. first in a yellow form which then changes to the red and back again to the yellow form which m. sharply $142-3^\circ$ to a red liquid and forms a red-yellow soln. in AcOH; the red form (from AcOH contg. an excess of Br) sinters 120° , m. 142° , changes into the yellow form on cautious heating. 3-Br deriv., unstable red crystals. 1-Thiochromone dibromide, seps. first as the yellow form, m. 141° ; the red form m. $130-5^\circ$. **XIX**, m. $121-3^\circ$ (decompn.). **XVII**, m. $98-9^\circ$. 1-Thioflavone dibromide, m. $111-2^\circ$; 3-bromo-6-methyl deriv. (**XXXVI**), m. $97-9^\circ$, from **XVII** or **XXII**, regenerates **XXII** on standing in the air or heating with alc. 3,3-Dibromo-6-methylthioflavanone tetrabromide, from **XX** in CS_2 with 4 or more atoms of Br, orange yellow, begins to sinter 120° , m. $127-9^\circ$, decomps. $137-40^\circ$; in the air or more quickly in hot C_6H_6 it loses HBr and Br with formation first of **XXXVI** and then of **XXII**. Bromination of **XIV** in concd. CS_2 soln. gives **XVI** almost exclusively, in more dil. CS_2 soln. or in CHCl_3 considerable **XV** also, in AcOH almost only **XV**. **XVI**, m. $104-5^\circ$ to a red liquid, converted by boiling its solns. (e. g. in alc.) into 3-bromochromone, m. $65-6^\circ$. **XV**, $(\text{C}_6\text{H}_5\text{O}_2)_2$. HBr Br₂, m. 127° to a red liquid, easily sol. in cold alc. with yellow color, decompd. by heating above its m. p. or with solvents. β -[*p*-Tolylsulfonyl]propionic acid, from $\text{MeC}_6\text{H}_4\text{SCH}_2\text{CH}_2\text{CO}_2\text{H}$ and 1 mol. H_2O_2 in cold AcOH, m. $147-8^\circ$; its H_2SO_4 soln. becomes red to blue-violet on heating. In boiling AcOH is obtained the sulfonyl compd., m. $112-3^\circ$, sol. without color in concd. H_2SO_4 . [*p*-Tolylsulfonyl]hydrocinamic acid, m. $200-1^\circ$, unchanged by hot POCl_3 or H_2SO_4 . 6-Methylthiochromanonesulfoxide, could not be sepd. from the sulfone (**XXVII**) which, obtained almost quant. by long action of H_2O_2 in cold AcOH or short boiling, m. 163° and dissolves in H_2SO_4 with no or only faintly yellowish color. Thiochromanonesulfone, m. $131-2^\circ$, sol. in H_2SO_4 without

color. 6-Methylthioflavanonesulfoxide (contg. some of the sulfone (XXXI)), m. 177–8° to a red liquid. XXXI, m. 177–8° (only partially on slow heating, then resolidifying and finally m. 191–2°), sol. in H_2SO_4 without color, slowly sol. in cold alc. alkalies with faint yellow color and reprecipitated by acids, insol. in cold aq. alkalies and decomposed on heating. XXVIII, m. 165°; sulfoxide, from III and $\text{H}_2\text{O}_2\text{-AcOH}$, m. 158°. 3-Bromothiochromanonesulfone, m. 199–200°. XXXIII, m. 198°, sol. in H_2SO_4 without color; sulfoxide, from IV and $\text{H}_2\text{O}_2\text{-AcOH}$, m. 166°. XXXII, decomps. 238–9°, difficultly sol. in H_2SO_4 with faint yellowish color; 3,3- Br_2 deriv., decomps. 232–9°. 3-Bromothioflavanonesulfone (given as chromanone in the original.—ABSTR.), m. 175–6° to a red liquid. XXIX, colorless to faintly yellowish, m. 204–5°, sol. in H_2SO_4 with light orange color. XXV, m. 146°, sol. in H_2SO_4 with greenish yellow color. Thiochromanonesulfone, m. 144°, sol. in H_2SO_4 with yellow color. XXIV, m. 192° (decomps.), sol. in H_2SO_4 without color. XXVI, from XXIV and $\text{C}_6\text{H}_5\text{N}$, XXXIII and boiling alc. or XXXIV and $\text{H}_2\text{O}_2\text{-AcOH}$, m. 216–7°. 6-Methylthioflavanonesulfone (XXXVII), m. 156–7°, quite stable towards boiling alkalies. Thioflavanonesulfone, light yellow, m. 132–3°. Dibromide of XXXVII, faintly yellowish, m. 221°. 3-Br deriv. of XXXVII, from the 3,3- Br_2 deriv. of XXXI with boiling $\text{C}_6\text{H}_5\text{N}$, faintly yellowish, m. 175–6° on rapid heating; on slow heating it sinters and changes, after repeated melting and resolidification (180–95°) into a stable form, m. 206–7°, which is obtained directly by oxidation of XVII or XXII. O-Me ether of XXXV, obtained with Me_2SO_4 , m. 108–9°, insol. in alkalies. Benzoate of XXXV, m. 181°. The 2,2- Cl_2 deriv. of XXXV is decomposed by boiling H_2O into 5-methylthiouraphthenequinone, m. 145°, and 3-methyl-6-mercaptobenzoic acid, m. 221°, easily sol. in Na_2CO_3 with yellowish color; S-Me ether of the acid, m. 134°. C. A. R.

Pyrone problem. 1-Thiopyranes and 1-thiopyranones. F. ARNDT, P. NACHTWEY AND J. PUSCH. *Ber.* 58B, 1633–44 (1925); cf. preceding abstr.—The term *pyranones* is suggested, in analogy with chromanones, for tetrahydropyrans. Thiopyranones (I) can be obtained by simple addn. of H_2S to α,α' -diolefinketones in very faintly alk. soln. Under such conditions $\text{CO}(\text{CH}:\text{CHPh})_2$ (II) smoothly yields the colorless 2,6-diphenylthiopyranone (III), also obtained from $\text{CO}(\text{CHBrCHBrPh})_2$ (IV) with alc. Na_2S or NaSH . III seps. sometimes in rhombic, sometimes in lower melting triclinic crystals of the same compn. and mol. wt. The former are formed predominantly in solns. of lower, the latter in solns. of higher alkalinity. The difference in m. p. persists in all derivs. which still contain the hydrogenated ring but disappears as soon as the ring is ruptured or dehydrogenated. Thus the 2 sulfoxides or sulfones of III give III with dil. alkalies; dehydrogenation of the two III yields the same 2,6-diphenyl-1-thiopyrone (V); the two 3,5-Br₂ sulfones form, on elimination of HBr, the same diphenylthiopyranonesulfone (VI). There can be no doubt, therefore, that the 2 isomeric series differ from each other in the *cis*- or *trans*-position of the Ph groups to the plane of the ring. A direct conversion of the 1 stereoisomeric series into the other was never observed. The ring system in the I is quite stable towards alkalies and acids but sensitive to oxidizing agents. The I show a distinct tendency to condense with BzH and $p\text{-ONC}_6\text{H}_4\text{NMe}_2$ but form amorphous products of high mol. wt.; in general, loading of the 3- and 5-positions so increases the unsaturation of the whole system that it becomes "resiniferous." $\text{H}_2\text{O}_2\text{-AcOH}$ in the cold gives directly the sulfones, which sep. first as H_2O_2 addn. products. Oxidation in hot soln. ruptures the ring. The sulfoxides are obtained with Br in Et_2O in the presence of H_2O or in $\text{AcOH-C}_6\text{H}_5\text{N}$ and are converted into the sulfones by H_2O_2 . The sulfoxides and sulfones are very sensitive to alkalies, smoothly giving II while the S is changed partially into sulfide and partially into sulfite or sulfate. The action of Br on the I is difficult to control; HBr is always evolved, to be sure, indicating substitution in positions 3 and 5, but the above mentioned tendency to resinification when these positions are loaded manifests itself, and moreover the Br simultaneously attacks the ring S and ruptures the ring. With more than 4 atoms of Br, IV and S₂Br₂ are smoothly formed; with 4 atoms, IV is also often obtained in part; otherwise amorphous masses of high mol. wt. are formed. In 3 of many trials, with the high melting form of III and in 1 with its isomer there was obtained a small amt. of a hydrotribromide-like substance sepg. from alc. in yellow, halogen-free needles, which with Br at first instantly add it but then evolve HBr; the yellow substance is believed to be 2,6-diphenyldihydro-1-thiopyrone (VII); "mild" bromination methods have no definite products. The sulfones of III, on the other hand, are smoothly converted into V with 4 mols. PCl_5 in C_6H_6 , but at the same time is formed a 3-Cl deriv. (VIII) of V (sometimes VIII is the chief product). The colorless V with Br in CHCl_3 , AcOH or CS_2 gives a red dibromide (IX) which can be crystd. from abs. alc. but with hot aq. alc. regenerates V. V does not react with NH_4OH . CH_3Ac , with P_2S_5 in boiling C_6H_6 gives 40% of triiodiacetylacetone

cyclodisulfide (?), S. CMe:CH. CS. CH: CMe. S, orange m. 183-4°, mol. wt. in camphor

176 80 **III**: A-form, m. 113-4°, mol. wt. in camphor 268-74; B-form, m. 87-8°, mol. wt. in camphor 264-8. Both immediately become intensely crimson in contact with concd H_2SO_4 and slowly dissolve with intense dark red color. *Phenylhydrazones*: A, m. turbid 155-6°, decomp. 190°; B, m. 142-5° (decompn.). *Semicarbazones*: A, m. 206-7° (decompn.); B, crystals with difficulty. *Sulfones*: A, m. 235°, seps. first as the H_2O_2 addn. product, m. 134-5° (decompn.); B, m. 196° (H_2O_2 compd., m. 123°). *Sulfoxides*: A, m. 196-8°, mol. wt. in camphor 283 1-6.7, sol. in H_2SO_4 with light orange color; B, m. 136-7°. *3,5-Br₂ sulfones*: A, m. 247°; B, m. 231-5°. **V**, m. 132-3°, sol. in H_2SO_4 with faint yellowish color and faint greenish fluorescence (yield, 15-25%); *HCl salt* **VIII**, m. 119 20°; *HCl salt* **IX**, m. 171°, sol. in alc. with light yellow color. **VI**, also obtained from **V** with $AcOH-H_2O_2$, yellow, m. 141-5°, sol. in H_2SO_4 with red-violet color. *2,6-Diphenyl-3-chloro-1-thiopyrone-sulfone*, from **VIII** with H_2O_2 - $AcOH$ or from **VI** in $CHCl_3$ or CCl_4 , light yellow, m. 163°, sol. in H_2SO_4 with intense red color. The results of Hellthaler on the action of Cl on **II** (C. A. 9, 56) could not be reproduced; no tetrachloride was obtained but only a dichloride, m. 128-9°, sol. in H_2SO_4 with light orange-red color and converted by boiling alc. KOAc into the light yellow PhCH₂-CHCOCl CHPh, m. 78-9°. *Oxime* of **VI**, light yellow, begins to decomp. 165°, m. 186-7°; of **VIII**, faintly yellowish, begins to decomp. 180°, m. 211°. **VII**, m. 142°, sol. in H_2SO_4 with orange-red color. Condensation of $CO(CH_2CO_2H)_2$ with BzH and HCl and pptn. of the product from Na_2CO_3 with acids gave not only Petrenko-Kritschenko's 2,6-diphenylpyranone, needles, m. 130° (*J. prakt. Chem.* 60, 150(1899)), but also in 1 expt a stereoisomeric form, plates, m. 174-5°, both smoothly give **II** with dil. alc. HCl. *2,6-Diphenylpyrone dibromide*, from the pyrone and less than 2 atoms Br in $CHCl_3$ or from the yellow tetrabromide (which is obtained with more than 2 atoms Br) gently warmed under its mother liquor, brown-red, m. 165-6°, slowly dissolves in boiling abs. alc., the orange bispyrone hydrotribromide, m. 174-5°, sepg. on cooling. C. A. R.

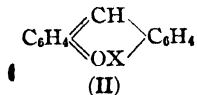
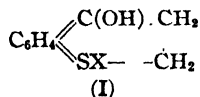
Conversion of 4-thiopyrones into dipyrlylenes. Dithiopyrylenes. F. ARNDT, P. NACHTWEY AND J. PUSCH. *Ber.* 58B, 1644-6(1925), cf. Schonberg, C. A. 19, 1424. *Dithioflavone* (**I**), like xanthione, is not altered by heating alone, but neither can any definite product be obtained with Cu. The "dipyrlylene reaction," if it occurs at all, seems to give definite products only when the original substance is sym. with respect to the C:S group. Thus, while 2,6-diphenyl- (**II**) and 2,6-diphenyl-3-chlorodithiopyrone (**III**) both undergo spontaneous transformation on heating, only **II** gives a well-defined product which can be isolated, viz., tetraphenyldithiopyrylene (**IV**). **I**, from 1-thioflavone and 2 parts P_2S_5 in boiling C_6H_6 , dark brown, m. 112-3°, sol. in alc. with brown, in C_6H_6 and Et_2O with deep green color. **II**, from diphenyl-1-thiopyrone (**V**) (preceding abstr.) as already described for 4-thiodiphenylpyrone (C. A. 19, 515), dark brown leaflets with strong green dichroism, m. 129 30°, sol. in alc. with brown color, in C_6H_6 (concd. soln.) with red color by transmitted light and green color by incident light; the dil. soln. in C_6H_6 is green and the soln. in concd. H_2SO_4 yellow-red with green fluorescence. **III**, brown-red needles with bluish luster, m. 155°, sol. in C_6H_6 with red-green dichroism, when it is heated at 165-70°, the melt soon becomes deep brown-red but does not solidify and the deep brown-red solns. in hot C_6H_6 or $C_6H_4Me_2$ yield no crystals on cooling. **II**, boiled a long time in alc. with aq. $NH_2OH \cdot HCl$ and Na_2CO_3 gives H_2S and 83% of diphenyl-1-thiopyrone oxime, $C_{17}H_{13}ONS$, light brown-yellow, m. 197-8°, sol. in H_2SO_4 with light lemon-yellow color; **V** similarly treated is recovered unchanged. **IV**, from **II** heated at 145° (only 1 min. elapses between the melting and resolidification), dark brown-red, almost black needles with strong green surface luster, m. 312-3°. C. A. R.

Question of the existence of indigoid dyes with a hydrogenated six-ring. F. ARNDT AND J. PUSCH. *Ber.* 58B, 1646-7(1925) - Herzog and Kreidl (C. A. 17, 1463) obtained from α -tetralone with α -isatin anil and α -thionaphthenequinone anil (**I**) indigoid dyes which they considered to be 2-dihydronaphthalene-2'-indole-indigo and -2'-thionaphthene-indigo, resp., formed by simple condensation. Later Friedländer and Sander concluded, from the absorption of the former dye, that it is really 2-naphthalene-2'-indole-indigo, i. e., that dehydrogenation accompanies the condensation. To throw possible light on the question, A. and P. tested the ability to condense of thiochromanones, which are analogous to the tetralones in many respects but in which a dehydrogenation corresponding to the above cannot come into play; the results of their expts indicate in their totality that the question at the head of their paper is to be answered in the negative. Alk. 6-methylthiochromonol (**II**) does not react at all with

cold $K_2Fe(CN)_6$ but on boiling slowly deposits dark red flocks of 5,5'-dimethylthioindigo and the filtrate evolves CO_2 in abundance on acidification. Mol. amts. of II or 6-methylthiochromanone (III) and I in boiling Ac_2O deposit no dye, the soln. merely gradually becoming a dirty dark brown. Mol. amts. of III and 2,2-dibromohydroxythionaphthene (V) in boiling $AcOH$ evolve HBr and soon deposit ordinary thioindigo (also obtained from 6-bromothiochromanone and V); i. e., the III is not a component of the dye. II and V likewise evolve HBr and yield thioindigo almost quant., but, on cooling, the soln. further deposits 3-bromo-6-methylthiochromonol (cf. 3rd abstr. preceding); i. e., the II and V mutually interchange a H for a Br atom and the resulting bromohydroxythionaphthene, by spontaneous loss of HBr , gives thioindigo. The reverse interchange occurs when the 2,2- Cl_2 deriv. of II is boiled in $AcOH$ with hydroxythionaphthene; HCl , thioindigo and the 2- Cl deriv. of II are formed. A. and P. believe that the dyes obtained by H. and K. are not derived from α tetralone but from α -naphthol.

Halochromism of hydrogenated pyrone and thiopyrone systems. F. ARNDT AND J. PUSCH. *Ber.* 58B, 1648-54 (1925); cf. preceding abstrs.—All 1-thiobenzopyrone derivs. contg. the hydrogenated hetero-ring (thiochromanones, thioflavanones and their substitution products) dissolve in concd. H_2SO_4 with intense color while their sulfones dissolve without color. In the dehydrogenated systems (thiochromones and thioflavones), on the other hand, it is the sulfones which form colored solns. That these color reactions of the hydrogenated compds. are really due to halochromism has now been shown definitely, for the thiochromanones, by the isolation of definite colored salts regenerating the org. component unchanged on hydrolysis. These salts are undoubtedly sulfonium salts to which might be assigned a structure (I) corresponding to that (II) given by Werner to the salts of xanthidrol and thioxanthidrol. If the chromophore resides in the *o*-quinonoid C_6H_4 ring, completely hydrogenated pyrone and thiopyrone rings not condensed with a C_6H_4 ring should not show halochromism, but as a matter of fact 2,6-diphenylthiopyranone (III) dissolves in H_2SO_4 with deep red color and di-Me 2,6-diphenylthiopyranone 3,5-dicarboxylate (IV) with strong yellow color. In these non-condensed systems, however, it has not been possible to obtain the decisive proof that they are the org. components of colored salts; in fact, their behavior, especially that of 2-phenyl-6,6-dimethylthiopyranone (V), is more in harmony with the view that these systems as such form colorless, unstable salts and that the color is due to the halochromism of a transformation product which is formed to a very small extent from the original substance by the action of the acid and is contained also in the decolorized product of hydrolysis. What the nature of this transformation is it has not yet been possible to establish. Since it can by no manner of means effect a ring condensation, the chromophore in the benzo series cannot be sought for in the C_6H_4 ring. A. and P. believe that in all these color reactions the hetero-ring atom itself plays a much greater role in the light absorption than has hitherto been ascribed to it. The chroman- and thiochroman-4-ols obtained by the action of $MeMgI$ on chromanones, thiochromanones and thioflavanones dissolve in H_2SO_4 at first with a blue color which, however, is quickly replaced by a dirty brown, probably as the result of a change into the chromenes. 6-Methylthiochromanone (VI) heated with 70% $HClO_4$ until it has dissolved clear with intense red color yields on cooling the perchlorate, VI. $HClO_4$, orange-red leaves, stable in the air for some time, longer if protected from moisture, deflagrates violently on heating, decolorized and converted into VI by shaking with H_2O . Thiochromanone dissolves in $HClO_4$ even in the cold with red color but the salt is very sol. and could not be obtained in cryst. form. Chromanone dissolves with a dark yellow color. The yellow soln. of VI in dry C_6H_6 satd. with HCl , treated in the absence of moisture with $SnCl_4$ in C_6H_6 , becomes intensely red and soon deposits deep red crystals, 2VI. H_2SnCl_6 , rapidly decompd. by moisture, and even in dry air losing HCl and changing into the yellow cryst. compd. 2VI. $SnCl_4$, which is also obtained from VI and $SnCl_2$ in C_6H_6 and yields the preceding red compd. on treatment with HCl in C_6H_6 . Chromanone likewise forms a faintly yellowish compd. ($C_6H_5O_3$), $SnCl_4$ and a dark yellow hexachlorostannate, which, however, changes very easily into the $SnCl_4$ compd. With Me_2SO VI does not yield a H_2O -sol. addn. compd. but the mixt. dissolves in H_2SO_4 with considerably fainter color than the VI alone. III does not dissolve in cold 70% $HClO_4$ and on warming decomp. into a brown oil; on shaking in cold $CHCl_3$ with the $HClO_4$, however, it yields crystals which are at first colorless and, after drying *in vacuo*, contain 20-30% $HClO_4$. If the III is shaken in C_6H_6 at about 60° with the $HClO_4$, the C_6H_6 layer quickly becomes deep violet and on cooling deposits deep violet crystals stable in a dry atm. but decolorized and dissolved by hot alc., H_2O pptg. III. V, obtained in 80% yield from benzalmesityl oxide, $NaOAc$ and H_2S in 90% alc., m. 42°, b_p 175-6°, dissolves

in cold concd. H_2SO_4 at first almost without color, but within 1–2 min. the soln. becomes crimson and with H_2O gives a yellow oil. *4-Methyl-4-chromanol*, m. 107° . *4,6-Dimethyl-4-thioflavanol*, m. $115-6^\circ$, gives with hot HClO_4 yellow crystals.



C. A. R.

Thiochromanones and transformation products. II. F. KROLLPFEIFFER, WITH H. SCHULTZE, E. SCHLUMBOHM AND E. SOMMERMEYER. *Ber.* **58B**, 1654–76 (1925); cf. C. A. **18**, 230 and preceding abstrs.—A report on the development of methods for detg. the constitution of the thiochromanones obtained from $\text{RSCH}_2\text{CH}_2\text{CO}_2\text{H}$ ($\text{R} = \text{aryl}$) and concd. H_2SO_4 . β -[Arylmercapto]propionic acids: *p*-Chlorophenyl (58 g. from 45 g. *p*- $\text{ClC}_6\text{H}_4\text{SH}$), m. $90-1^\circ$; *p*-methoxyphenyl, m. $81-2^\circ$; 1-tetralyl, m. 95° . β -[Arylmercapto]butyric acids: *Ph*, thick oil, b_{10} 185° (yield, about 60%); *p*-tolyl, b_{10} 193° , m. $44-5^\circ$ (yield, about 75%). Thiochromanones: 6-*Cl*, m. $67-9^\circ$ (yield, quant.); 6-*MeO*, obtained in 40% yield from $\text{MeOC}_6\text{H}_4\text{SCH}_2\text{CH}_2\text{CO}_2\text{H}$ with H_2SO_4 and in 65% yield by distn. of the acid *in vacuo* over P_2O_5 (POCl_3 gave the thiochromone), b_{12} $185-6^\circ$, m. $29-30^\circ$ (semicarbazone, m. 212° (decompn.) on slow heating, 221° when plunged into a bath at 205° and then rapidly heated); 7,8-tetrahydrobenzo, m. $60-1^\circ$, sol. in H_2SO_4 with pure red color, (semicarbazone, m. 232°); tetrahydrobenzo, from β -[tetralyl-2-mercapto]propionic acid, m. $60-1^\circ$ (semicarbazone, m. 255° ; the semicarbazone m. 224° described in the earlier paper proved to be a mixt. of the above, m. 255° , and an isomer, m. $238-40^\circ$, which when decompd. gave an almost colorless, very viscous oil, b_{14} 223°). 2-*Me* (yield, about 60%), viscous oil, b_{13} 152° , m. $18-9^\circ$ (semicarbazone, m. $167-8^\circ$); 2,6-*Me_2* (yield, about 65%), b_{20} 179° , m. $64-5^\circ$ (semicarbazone, m. $205-6^\circ$). 6-Methylthiochromanone perbromide, $\text{MeC}_6\text{H}_4\text{COCH}_2\text{CH}_2\text{SBr}_2$, from

6-methylthiochromanone (I) and 1 mol. Br_2 in cold CS_2 , CHCl_3 or AcOH , dark red crystals similar to red P, quickly loses HBr in the air or in a desiccator with formation of the 3-*Br* deriv. (II) of I, regenerates I with boiling PhNI_2 , gives with cold NaOEt an orange product sol. in alc. aq. NaOH with KMnO_4 -like color, the soln. dyeing cotton a violet-red which changes to yellow on moistening with AcOH . Sulfoxide of I, from the perbromide shaken with H_2O , m. 110° (yield, 3 g. from 5 g. I), also obtained from I and H_2O_2 - AcOH , gives II when evapd. with HBr , regenerates I with $\text{Zn-H}_2\text{SO}_4$ and gives with cold NaOEt 2 compds. m. 195° and 243° , resp. 2,6-Dimethylthiochromanone sulfoxide (from the scarlet perbromide with H_2O), m. $97-8^\circ$; yield, 60%. The following 3-bromothiochromanones, obtained with the calcd. amt. of Br in CS_2 , are faintly yellow, produce violent burning on the skin and dissolve in H_2SO_4 with violet-red color: *unsubstituted*, m. $76-7^\circ$; 6-*Me* (II), m. $60-1^\circ$; 2,6-*Me_2*, m. $101-2^\circ$; 6-*Cl*, m. $111-2^\circ$; 6-*MeO*, semi-solid. 3,3-Dibromothiochromanones, prepd with the calcd. amt. of Br in AcOH , are pale yellow: 6-*Me*, m. 156° (decompn.); 2,6-*Me_2*, m. $111-2^\circ$; 5,6-benzo, m. $115-6^\circ$. Boiling PhNMe_2 converts the above 3-*Br* derivs. into the thiochromones (and their 3-*Br* derivs.), sol. in H_2SO_4 with strong blue or green fluorescence: 6-*Me* (III), b_{12} 194° , m. $69-70^\circ$ (3-*Br* deriv., m. 117° , sol. in H_2SO_4 with pale yellow color); 6-*Cl*, b_{12} $205-10^\circ$, m. $143-4^\circ$; 6-*MeO* (also obtained from $\text{MeOC}_6\text{H}_4\text{SCH}_2\text{CH}_2\text{CO}_2\text{H}$ boiled with POCl_3), m. $110-1^\circ$; 2,6-*Me_2*, m. $120-1^\circ$ (3-*Br* deriv., obtained in 78% yield, m. $134-5^\circ$); 3-bromo 5,6-benzo (2 g. from 4 g. of the 2,3- Br_2 compd.), m. $168-9^\circ$. When boiled in alc. with concd. aq. NH_4OH , II loses HBr and forms III, but with NH_3 in abs. alc., best in the cold, it gives 80% of 3-amino-6-methylthiochromanone, greenish yellow, m. $67-8^\circ$ with loss of NH_3 , insol. in alkalies, sol. in H_2SO_4 at first with a yellow color which is replaced by a strong blue fluorescence, gives with hot HCl III. HCl , always forms III, with loss of NH_3 , in acetylation expts. (even in $\text{C}_6\text{H}_5\text{N}$). II refluxed in aq. alc. NaOH gives 70–5% 4,2-MeAcC₆H₃SH, b_{12} $144-6^\circ$, whose alkali-sol. semicarbazone, m. $199-200^\circ$ and corresponding disulfide, $\text{C}_{18}\text{H}_{18}\text{O}_2\text{S}_2$, m. $173-4^\circ$. The decompn. of the II proceeds quite smoothly and the reaction affords a convenient means of prepg. *o*-acetothiophenols, hitherto only difficultly available. No 2-mercapto-5-methylbenzoic acid could ever be detected among the products of the reaction of NaOH on II but it is obtained in 54% yield from 2,6-dimethyl-3-bromothiochromanone; it m. $155-7^\circ$ and gives with FeCl_3 a transient blue color; *Me ether*, m. $140-1^\circ$; disulfide, from the HS acid and $\text{K}_3\text{Fe}(\text{CN})_6$, m. 291° . With NaOEt at room temp., 2 g. III gives 1 g. 5-methyl-3-hydroxythionaphthene-2-aldehyde (IV), faintly yellowish green, m. $126-7^\circ$, sol. in alkalies with yellow color. $\text{K}_3\text{Fe}(\text{CN})_6$ pptg. the corresponding thioindigo from concd. solns.; alc. solns. are turned

olive-green by FeCl_3 ; boiling acids partially split off the aldehyde group with formation of 3-hydroxy-5-methylthionaphthene-2-aldehyde-5'-methylthioindogen. *Phenylhydrazones* of IV, golden yellow, m. 143° , easily sol. in alkalis. IV is also obtained by NaOEt cleavage of 2-indole-2'-thionaphthene-indigo. 4,5-Benzo-3-hydroxythionaphthene-2-aldehyde (0.7 g. from 1.5 g. 3-bromo-5,6-benzothiochromone and NaOEt , or 3 g. from 5 g. 4,5-benzo-3-hydroxythionaphthene (V) in dry CHCl_3 with HCN and HCl at room temp. and subsequent hydrolysis with boiling NaOH), yellow, m. 147° , forms with hot acids a red condensation product sol. in alc. alkalis with blue-green color; in aq. alkalis with $\text{K}_3\text{Fe}(\text{CN})_6$ it gives the red-brown bis-2,1-naphthothioephene-indigo. The V is obtained in 0.5 g. yield from 5 g. 2- $\text{C}_{10}\text{H}_7\text{SMe}$ with ClCH_2COCl and AlCl_3 . II (5 g.) refluxed 1 hr. in 50 cc. alc. with 10 g. crystd. NaOAc , gave 80% III, while 45 min. refluxing in 10 parts AcOH with 8 g. anhyd. NaOAc yielded 17.5% 6,6'-dimethyl-3,3'-dithiochromanolene, $(\text{CH}_2.\text{S}.\text{C}_6\text{H}_3\text{Me}.\text{CO}.\text{C}=\text{C})_2$, (VI), m. $151-2^\circ$, mol. wt. in C_6H_6 ,

349-80; attempts to prep. it by condensation of I with 6-methylthiochromonol *p*-dimethylaminoanil in the presence of Ac_2O gave 91% of the Ac deriv. of the tautomeric form of the anil, viz. 3-[*N*-dimethylaminophenyl-*N*-acetylamino]-6-methylthiochromone (VII), almost colorless, m. 193° , mol. wt. in CHCl_3 370-405, does not react with $\text{H}_2\text{NCO}.\text{NHNH}_2$, hydrolyzed by boiling 50% H_2SO_4 to 6-methylthiochromonol and *p*- $\text{H}_2\text{NC}.\text{H}_2\text{NMe}_2$ whose *picrate*, yellow, m. 139° ; *N*-propionylamino homolog of VII, obtained in 93% yield with $(\text{EtCO})_2\text{O}$ as the condensing agent, almost colorless, m. $157-8^\circ$. 3,3'-Dithiochromanolene, from 3-bromothiochromanone and $\text{Ac}_2\text{O}.\text{AcOH}$ (yield, 7%), faintly yellowish, m. $170-1^\circ$. 6,6-(MeO)₂ deriv. (yield, 23.5%), yellow, m. $168-9^\circ$. 3-Bromo-6-chlorothiochromanone gave no dimol. compd., but only 6-chlorothiochromone; likewise, 3-bromo-6-methylchromanone yielded only 6-methylchromone, and β -bromo- α -tetralone, m. $40-1^\circ$ (described by Strauss, C. A. 15, 1896, as an oil), yielded α -tetralone and α - and β -naphthol. Dibromide of VI (0.8 g. from 0.6 g. VI in AcOH with the calcd. amt. of Br), yellow, darkens about 130° , m. $290-5^\circ$ (carbonization), reddens on standing and, with loss of HBr , on boiling a short time with AcOH or high boiling solvents (PhNO_2). These dibromides boiled a short time with $\text{C}_6\text{H}_5\text{N}$ or quinoline yield the corresponding 3,3'-dithiochromones (also obtained, although less pure, from the dithiochromanolenes with concd. H_2SO_4): unsubstituted, brown-red; 6,6'- Me_2 , brown-red needles, traces of which impart a blue-red fluorescence to CS_2 or CHCl_3 and which dissolve in H_2SO_4 with yellow color changed to green by absorption of H_2O , while the NaOH suspension forms with $\text{Na}_2\text{S}_2\text{O}_4$ a yellow vat dyeing cotton in faint blue-red shades; 6,6'-(MeO)₂, blue-red. 3-Benzylidene-6-methylthiochromanone (VII), best obtained from I and 1.5 mols. BzH treated hot with a few drops of concd. $\text{AcOH}.\text{HBr}$, gives in CS_2 with 1 mol. Br_2 a dibromide, light yellow, m. 167° (loss of HBr), regenerates VII when boiled with PhNMe_2 ; the monobromide (phenyl-[6-methylthiochromonyl-3]-bromomethane), which is obtained when the dibromide is heated at its m. p. and the resulting resin is crystd. from Et_2O (3.7 g. from 9 g. of the dibromide), m. $115-6^\circ$. If the resin is recrystd. from MeOH there is obtained phenyl-[6-methylchromonyl-3]carbinyl *Me ether*, m. $118-9^\circ$; *Et ether*, m. $124-5^\circ$; *acetate*, from the bromide with boiling $\text{AcOH}.\text{NaOAc}$, m. $120-1^\circ$. The bromide with $\text{C}_6\text{H}_5\text{N}$ in C_6H_6 forms a pyridinium salt, $\text{C}_{22}\text{H}_{18}\text{ONBrS}$, m. $137-8^\circ$, and with PhSH a thiophenol ether, m. $129-30^\circ$. The above *Et ether*, cautiously added to concd. H_2SO_4 , produces a blue-red soln. which becomes colorless on standing and H_2O ppts. a substance, possibly a di-ether of the carbinol, insol. in all the usual solvents except CHCl_3 , does not m. 290° . The thiochromanones are reduced by the Clemmensen method to the thiochromans which with the calcd. amt. of KMnO_4 give the corresponding sulfones: Thiochroman, b_{10} $124-5^\circ$ (sulfone, m. $87-8^\circ$); 6-*Me deriv.*, b_{12} 137° (sulfone, m. 81°); 6,8-*Me*₂ deriv., b_{12} $146-7^\circ$ (sulfone, m. 101.2°). The thiochromanolens were prepd. from the thiochromanones with organo-Mg compds. and converted into the α -chromenes by vacuum distn. over P_2O_5 ; both dissolve in H_2SO_4 with deep blue color; the latter are oils of characteristic odor which resinify on standing, especially in the air. Thio- α -chromanols (% yields in parentheses): 4-*Me*, m. $109-10^\circ$ (65); 4,6-*Me*₂, m. $119-20^\circ$ (80); 4,6,8-*Me*₃, m. $46-9^\circ$; 4-ethyl-6-methyl, m. $52-3^\circ$, b_{11} $159-60^\circ$; 4-phenyl-6-methyl, m. $112-3^\circ$. α -Thiochromenes: 4-*Me*, b_{12} 138° (85%); 4,6-*Me*₂, b_{12} $145-6^\circ$ (80); 4,6,8-*Me*₃, b_{12} $155-7^\circ$; 4-ethyl-6-methyl, b_{12} $158-60^\circ$; 4-phenyl-6-methyl, b_{12} 211° , m. $47-8^\circ$. C. A. R.

Spectrochemistry of the thiochromans, α -thiochromenes and thiochromanones. F. KROLLPFER. Ber. 58B, 1677-80 (1925).—The values given below are, resp., t° (temp. at which the measurements were made), d_n , n for α , He, β and γ , and $E\lambda$ for α , D, β - α and γ - α (the last 2 expressed in %). Thiochromans: unsubstituted, 17.3° , 1.1267, 1.60943, 1.61610, 1.63289, 1.64835, 0.40, 0.41, 30, 32; 6-*Me*, 15.4° , 1.0907,

Quinoline derivatives. I. Synthesis of [2-phenyl-4-quinolylmethyl]amine. HANNS JOHN. *Ber.* 58B, 1489-91 (1925).—*N*-Phthalyl-[2-phenyl-4-quinolylmethyl]amine, from 14 g. o -H₂NC₆H₄COCH₂N(CO)₂C₆H₅ and 6 g. PhCOMe refluxed 8 hrs. in aq. alc. NaOH, seps. from H₂O or EtOH with solvent of crystn., m. 261°, converted by refluxing in concd. HCl into the *di-HCl* salt, m. 232-5° (decompn.), of [2-phenyl-4-quinolylmethyl]amine, which sometimes seps. in long needles soon changing in the air or in a desiccator to a reddish thick oil; usually, however, it seps. directly as an oil which cannot be made to solidify. *Mono-HCl* salt, gives with HgCl₂ a voluminous ppt. chang-

ing to druses of needles, with K_2CrO_4 , indistinct leafy crystals, with $K_3Fe(CN)_6$, rhombic platelets. In H_2SO_4 with I-KI the base yields a brown oil solidifying to needles. *Chloroplatinate*, orange, becomes gray 205°, black 220°, does not m. 287°. C. A. R.

2-Phenyl-3-methoxyquinoline-4-carboxylic acid [3-methoxyatophan]. W. DILTHEY and CL. THELEN. *Ber.* 58B, 1588-9 (1925).— $PhCOCH_2OMe$ boiled in aq. or alc. NaOH with isatin gives almost quant. *2-phenyl-3-methoxyquinoline-4-carboxylic acid*, almost colorless, m. 225°, easily sol. in alkalis and alkali carbonates and also in mineral acids, converted quant. by boiling in C_6H_6 with $AlCl_3$ into the 3-HO acid (I), m. 204-5°, which is amorphous when dry and very difficultly sol. in most solvents, but is easily sol. in hot $PhNO_2$ and seps. in a deep yellow amorphous form becoming lighter in color on standing (if the soln. is not quickly cooled, the I loses CO_2). Although I is a weak acid whose alkali salts have an alk. reaction, it dissolves quite readily in alkalis with light greenish fluorescence and mineral acids give after some days a light yellow ppt. of microneedles with $3H_2O$; both the color and the cryst. structure depend on this H_2O of crystn. *Base salt* of I, very faintly yellowish needles with $6H_2O$, loses $3H_2O$ easily, the next 2 less easily and the 6th mol. only with simultaneous loss of CO_2 . I on long boiling in $PhNO_2$, the 3-MeO acid with HCl at 160°, give 2-phenyl-1-hydroxyquinoline, m. 218-20°; HCl salt, m. 261° (Barginelli and Berlingozzi, C. A. 17, 2287, give 210-2° for the base, 243-5° for the HCl salt), insol. in carbonates but sol. in caustic alkalis with strong green fluorescence. C. A. R.

Homologs of 2,2'-diquinolyl. E. J. V. CONOLLY. *J. Chem. Soc.* 127, 2083-5 (1925).—6-Methylquinoline (70 g.) and 7 g. Na, heated 2 hrs. at 100° and 7-8 hrs. at 150-60°, give about 37 g. *6,6'-dimethyl-2,2'-diquinolyl* (I), m. 202.5-3°, mol. wt., 279 (Rast's method); *HCl salt*, minute needles; *picrate*, yellow, m. 282-3° (decompn.); *ethiodide*, m. 277-8° (decompn.). *7,7'-Dimethyl-2,2'-diquinolyl*, m. 208-9°; *picrate*, yellow, m. 285-6° (decompn.); *ethiodide*, Au-yellow, m. 274-5° (decompn.). The yield of *8,8'-dimethyl-2,2'-diquinolyl*, m. 147-7.5°, is very small; *picrate*, yellow, m. 264-5°; the ethiodide could not be obtained. 2-Bromo-6-methylquinoline, m. 117-8°, yields a yellow *picrate*, m. 140.5°, and an *ethiodide*, yellow, m. 110.1°. Attempts to prep. I from this by the Fittig-Wurtz or the Grignard reactions were unsuccessful. C. J. W.

Synthesis of substituted 4-keto-1,2,3,4-tetrahydroquinolines and an attempt to synthesize 4-keto-1,2,3,4-tetrahydroisoquinoline. G. R. CLEMO and WM. H. PERKIN, JR. *J. Chem. Soc.* 127, 2297-307 (1925); cf. C. A. 18, 3382.—*Toluene-p-sulfonyl-β-o-toluidinopropionic acid*, m. 127-8°, results in 28.5 g. yield from 52.2 g. $MeC_6H_4NHSO_3C_6H_4Me$ and 22 g. $ClCH_2CH_2CO_2H$ in 8% NaOH. Heated with $POCl_3$ at 100° for 15 min., there results *4-keto-8-methyl-1,2,3,4-tetrahydroquinoline*, yellow, m. 92°, gives solns. in H_2O or C_6H_6 with a green fluorescence and its *toluene-p-sulfonyl deriv.* m. 147-8°. The latter, allowed to stand overnight with H_2SO_4 , gives *β-o-toluidinopropionio-o-toluide*, m. 126°. *Toluene-p-sulfonyl-β-m-toluidinopropionic acid*, m. 103° (yield, 19 g.). $POCl_3$ gives a mixt. of *toluene-p-sulfonyl-3-chloro-4-keto-7-methyl-1,2,3,4-tetrahydroquinoline*, m. 138°, gives a deep violet soln. in concd. H_2SO_4 , and the corresponding *5-Me deriv.*, m. 98-100°. Hydrolysis with $AcOH-HCl$ gives *4-keto-7-methyl-1,2,3,4-tetrahydroquinoline*, bright yellow, m. 109° (*toluene-p-sulfonyl deriv.*, m. 98°), and the *5-Me deriv.*, yellow, m. 104-5° (*toluene-p-sulfonyl deriv.*, m. 136°). *Toluene-p-sulfonyl-β-p-toluidinopropionic acid*, m. 116-7°; treated with P_2O_5 and $C_6H_5Me_2$, it yields *toluene-p-sulfonyl-4-keto-6-methyl-1,2,3,4-tetrahydroquinoline*, m. 136-7°; $POCl_3$ gives the *3-Cl deriv.*, m. 176-7°. Either compd., on hydrolysis with acids, yields *4-keto-6-methyl-1,2,3,4-tetrahydroquinoline*, yellow, m. 85-6°. *3-Benzylidene deriv.*, yellow, m. 221-5°; this combines with 2 atoms of Br, and the dibromide boiled with $MeOH-KOH$, gives a *mono-Br deriv.*, m. 194-5°. The Cl deriv., refluxed with 20% $MeOH-KOH$, gives *4-methoxy-6-methylquinoline*, b₁₈ 195°, m. 51°. *Toluene-p-sulfonyl-β-p-anisidinopropionic acid*, m. 81-2°. P_2O_5 in $C_6H_5Me_2$ gives *toluene-p-sulfonyl-6-methoxy-4-keto-1,2,3,4-tetrahydroquinoline*, m. 124-5°; $POCl_3$ gives about 90% of this deriv. with 10% of the 3-Cl deriv.; hydrolysis gives *6-methoxy-4-keto-1,2,3,4-tetrahydroquinoline*, bright yellow, m. 112°. There is also formed by the action of $POCl_3$ a small amt. of a compd., $C_{17}H_{14}O_3NClS$, m. 235°, which may be *toluene-p-sulfonyl-3-chloro-6-methoxydihydroquinoline*; the concd. H_2SO_4 soln. shows an intense pale blue fluorescence. *Toluene-p-sulfonyl-β-p-phenetidinopropionic acid*, m. 97°. P_2O_5 gives a small amt. of *toluene-p-sulfonyl-6-ethoxy-4-keto-1,2,3,4-tetrahydroquinoline*, m. 114-5°; $POCl_3$ gives a mixt. of this deriv. with the 3-Cl deriv., yielding on hydrolysis the free quinoline, canary-yellow, m. 60°; the yellow solns. in org. solvents show a green fluorescence. *6-Hydroxy-4-keto-1,2,3,4-tetrahydroquinoline*, deep yellow, m. 163-4°, from the MeO deriv. and concd. HCl. *Toluene-p-sulfonylbenzylaminoacetic acid*, m. 137-8°; *ester*, m. 51°. C. J. WEST

Synthesis of *dl*-dicentrine. R. D. HAWORTH, WM. H. PERKIN, JR., AND JOHN RANKIN. *J. Chem. Soc.* **127**, 2018-23(1925).—*1-Veratryl-6,7-methylenedioxydihydroisoquinoline methiodide* (I), straw-yellow, m. 239-40°; the crude product probably contains some *6,7-methylenedioxy-3',4'-dimethoxy-1-benzoyl-3,4-dihydroisoquinoline methiodide*, amber-colored, m. 232-3° (decompn.). Crude I is transformed into the more sol. methochloride by AgCl, then reduced with Zn and dil. H₂SO₄ and finally electrolytically (5 amps. for 12 hrs.), giving *1-veratrylhydrohydrastinine* (II), oily; *HCl salt*, m. 215-6°; *III salt*, m. 180-2°; *picrate*, orange-yellow, m. 188-9°. HNO₃ in AcOH gives the *6'-nitro deriv.* of II, buff, m. 118°; *III salt*, pale yellow, m. 213°; *picrate*, lemon-yellow, m. 192°. The *6'-amino deriv.* is an oil, whose *di-HCl salt*, m. 250° (decompn.); FeCl₃ gives a deep blue color. The diazo soln. in 10% H₂SO₄, treated with Cu powder, gives *dl-centrine*, cream-colored, m. 178-9°; the colorless concd. H₂SO₄ soln. soon becomes reddish violet. The *HCl salt* darkens at 250° and m. 263-5° (decompn.); *methiodide*, m. 228-9°; *picrate*, orange, m. 188-9°. The synthetic base exhibits all those color reactions which are characteristic of the naturally occurring dicentrine. C. J. W.

Pyrimidines. CIII. The discovery of 5-methylcytosine in tuberculinic acid, the nucleic acid of the tubercle bacillus. T. B. JOHNSON AND R. D. COGHILL. *J. Am. Chem. Soc.* **47**, 2838-44(1925).—The base fraction of the hydrolytic products of tuberculinic acid pptd. by phosphotungstic acid contains, in addn. to cytosine, 5-methylcytosine, which is sepd. as the picrate; the orthorhombic Au-yellow crystals show parallel extinction between crossed nicols; they show a high birefringence, the 2 indices detd. being 1.44 and greater than 1.80. The crystallographic data for the monoclinic cytosine picrate are also given, the indices of this being 1.50 and greater than 1.80.

C. J. WEST

Condensation of amidines with ethoxymethylene derivatives of β -ketonic esters, β -diketones and cyanoacetic ester. P. C. MITTER AND NIRMALANANDA PALIT. *Quart. J. Indian Chem. Soc.* **2**, 61-70(1925); cf. *C. A.* **18**, 86.—The following derivs. of 4-*keto-5-cyano-1,4-dihydropyrimidine* were prepd: *2-Ph*, m. 295°, in a very poor yield from benzamidine-HCl and EtOCH₂:C(CN)CO₂Et; the corresponding acid, m. 271° (decompn.). *2-Tolyl deriv.*, m. 303-4°; the acid, m. 282°. *2-Anisyl deriv.*, m. 286°; the acid, m. 271°. *2- β -Naphthyl deriv.*, yellow, m. 305.6°; the acid, m. 291°. *Et 4-methyl 2-aminopyrimidine-5-carboxylate*, m. 222°, from guanidine and EtOCH₂:C(CN)CO₂Et; hydrolysis gives the free acid, m. 256-8° (decompn.). *Et 2-anisyl-4-methylpyrimidine-5-carboxylate*, m. 80°; the free acid, m. 232-3°. The *2- β -naphthyl deriv.*, m. 118° and gives an acid, m. 245-6°. *5-Acetyl-2-anisyl-4-methylpyrimidine*, m. 113-5°, from anisamidine and Ac₂C:CHOEt; *2- β -naphthyl deriv.*, m. 151-3°. *Et 4-keto-2-amino-1,4-dihydropyrimidine-5-carboxylate*, m. 285°, from guanidine and EtOCH₂:C(CN)CO₂Et; the free acid, m. 238° (decompn.); the intermediate product in the reaction is *Et ethoxymethylenemalonoguanidic acid*, m. 295°, which gives, with 50% HCl, *malonoguanidic acid*, m. 254° (decompn.). *Et 4-keto-2-anisyl-1,4-dihydropyrimidine-5-carboxylate*, m. 222-4°; the *2-naphthyl deriv.*, m. 213-5°.

C. J. WEST

Quinazolines from acetylated *o*-aminobenzohydrazides. GUSTAV HELLER, ERNST GÖRING, JOHANNES KLOSS AND WILLI KOHLER. *J. prakt. Chem.* **111**, 36-53(1925).—AcNH.C₆H₄.CO₂Et and N₂H₄ give 66% of 2-methyl-3-amino-4-quinazoline, m. 150°. *o*-Aminobenzacetylhydrazide (I), m. 181°; NaNO₂ and HCl give 3-acetaminobenzazimide, m. 206° (decompn.). Ac₂O transforms this into 2-methyl-3-acetamino-4-quinazoline, m. 174°. *o*-Benzoylaminobenzoic acid acetylhydrazide, m. 236° (decompn.), in 80% yield from I and BzCl; heated at 250° it gives 2-phenyl-3-acetamino-4-quinazoline, m. 122°. *o*-Aminobenzobenzoylhydrazide, m. 178° (70% yield); heated at 210-20°, it gives 2-phenyl-3-amino-4-quinazoline. 3-Benzoylaminobenzazimide, m. 205-6° (decompn.). *o*-Acetylaminobenzoic acid benzoylhydrazide, sinters 108°, m. 115° (decompn.); at 180° it yields 2-methyl-3-benzoylamino-4-quinazoline, m. 182°. The corresponding *o*-Bz deriv., m. 239° (decompn.), heated to 250°, gives 2-phenyl-3-benzoylamino-4-quinazoline, m. 202°. *o*-[*m*-Nitrobenzoyl]aminobenzoic acid acetylhydrazide, m. 205° (decompn.). 2-[*m*-Nitrophenyl]-3-acetamino-4-quinazoline, crysts. with 1H₂O, m. 183°. HCl splits off the Ac group, giving 2-*m*-nitrophenyl-3-amino-4-quinazoline, m. 222°. *o*-Aminobenzoic acid [*m*-nitrophenyl]hydrazide, m. 192°. [*m*-Nitrobenzoyl]aminobenzoic acid [*m*-nitrophenyl]hydrazide, pale yellow, m. 217°. 3-[*m*-Nitrobenzoyl]aminobenzazimide, m. 185° (decompn.). *o*-Acetylaminobenzoic acid [*m*-nitrophenyl]hydrazide, m. 167° (decompn.), giving 2-methyl-3-[*m*-nitrobenzoyl]amino-4-quinazoline, m. 231°. [*m*-Nitrobenzoyl]amino[benzoic acid benzoylhydrazide, decomp. 217°, forming 2-[*m*-nitrophenyl]-3-benzoylamino-4-quinazoline, m. 221°. Benzoylaminobenzoic acid [*m*-nitrophenyl]hydrazide, m. 236°; at 260° it gives 2-phenyl-3-[*m*-nitrobenzoyl]aminoquinazoline, m. 198°. Propionylaminobenzoic acid acetylhydrazide, m. 160° (decompn.), giving

2-ethyl-3-acetylaminquinazolone, m. 135°. *o*-Aminobenzoic acid propionylhydrazide, m. 137°; the triazine deriv., m. 181°. *o*-Acetylaminobenzoic acid propionylhydrazide, m. 167° (decompn.); 2-methyl-3-propionylaminquinazolone, m. 170°. Methylanthranilic acid hydrazide, m. 141–2°; yield, 70%. The Bz deriv., m. 192°. The Ac deriv., m. 152°. Methylacetylthranilic acid hydrazide, m. 234–5°; the HCl soln. with NaNO₂ gives an emerald-green compd., C₁₁H₁₂O₃N₄, decomp. at 250–60°. 3-Acetylphenoneaminobenzazimide, pale yellow, m. 168.5°. 1-Acetylaminobenzoic acid hydrazide, m. 202–3° (decompn.). 2-Methyl-3-acetylphenonamino-4-quinazolone, m. 195°. 3-Aminobenzazimide, gray, m. 152–3° (decompn.). Zn dust in AcOH gives benzazimide. C. J. WEST

Chemical reactivity and conjugation. II. The reactivity of the 2-methyl group in the 4-quinazoline series. I. M. HEILBRON, F. N. KITCHEN, R. B. PARKES AND G. D. SUTTON. *J. Chem. Soc.* 127, 2167–75 (1925); cf. C. A. 18, 267.—2,3-Dimethyl-4-quinazolone (I) contains a reactive Me group, the following condensation products being prepd.: 2-styryl-3-methyl-4-quinazolone, pale yellow, m. 167°; 4'-methoxy-2-styryl, bright yellow, m. 146°, giving an orange soln. in dil. HCl; 3',4'-dimethoxy-2-styryl, yellow, m. 208°; 3',4'-methylenedioxy-2-styryl, bright yellow, m. 185°; 4'-dimethylamino-2-styryl, orange-red, m. 175°. *o*-MeNHC₆H₄CO₂H gives a carboxy deriv., m. 108°. The acid in ClCO₂Et and AcCl gives quant. methylisatoic anhydride, m. 180°, which, with 0.88% NH₄OH, gives quant. *o*-MeNHC₆H₄CONH₂, m. 162°, from which Ac₂O gives an excellent yield of 1,2-dimethyl-4-quinazolone (II), m. 203°. 2-Styryl-1-methyl-4-quinazolone, cream-colored, m. 245°; 4'-MeO deriv., bright yellow, m. 94° (contains 2H₂O); anhyd., m. 156°; 3',4'-methylenedioxy deriv., yellow, m. 264°; 4'-dimethylamino deriv., orange, m. 274°. 5-Methoxyacetylthranil, m. 124°, in quant. yield from the acid and Ac₂O; with excess NH₄OH (0.88) there results 6-methoxy-2-methyl-4-quinazolone, m. 270°, and with MeNH₂ the corresponding 2,3-di-Me deriv., m. (with 1H₂O), 87°; anhyd., 133°; the latter does not condense with aromatic aldehydes. 5-Methoxymethylanthranilic acid, yellow, m. 163°; the amide, m. 145°, results by the action of NH₄OH upon 6-methoxymethylisatoic anhydride, m. 233°. 6-Methoxy-1,2-dimethyl-4-quinazolone, m. 220°; piperonal gives the 3',4'-methylenedioxy-2-styryl deriv., yellow, m. 284°. 7-Methoxy-1,2-dimethyl-4-quinazolone, m. 193° or with 1H₂O, m. 135°; 3',4'-methylenedioxy-2-styryl deriv., yellow, m. 280°; 4'-dimethylamino deriv., bright red, m. 266°. 7-Methoxy-2-methyl-4-quinazolone, m. 272°; Me₂SO₄ gives the 2,3-di-Me deriv., m. 149° or with 1H₂O, m. 80°; 3',4'-methylenedioxy-2-styryl deriv., yellow, m. 193°. 5-Chloro-2-amino-4-methoxytoluene, m. 112°; Ac deriv., m. 183–4°. The II appear to be more re-

active than the I, probably because of the presence of the conjugated system O:CN:CMe; a certain retardation of activity is found in the case of the 7-MeO deriv. of II, thus showing that neutralization effects, although not sufficient to prevent reaction, do nevertheless come into play. C. J. WEST

Dyes derived from oxalyldibenzyl ketone. I. Azine and azonium derivatives. G. C. CHAKRAVARTI. *Quart. J. Indian Chem. Soc.* 2, 71–6 (1925).—The following condensation products of oxalyldibenzyl ketone were prepd.: *o*-phenylenediamine, bright pink, m. 251°; concd. H₂SO₄ soln., deep pink, turning brown on diln.; dyes wool yellow from a neutral bath. 1,3,4-*o*-Tolylenediamine, yellow, m. 285°; dyes wool brown. 1,3,4,5-Bromotolylenediamine, ochre-colored, m. 300°; concd. H₂SO₄ soln., deep red; dyes wool pink. 1,2-Naphthylenediamine, deep yellow, m. 288°; concd. H₂SO₄ soln., violet; dyes wool gamboge shades. 1,2,3-*o*-Phenylenediaminesulfonic acid, yellow. 1,2-Diamino-8-naphthol-6-sulfonic acid, sparingly sol. in hot H₂O. 1,2,4-Naphthylenediaminesulfonic acid, yellow, amorphous ppt. 1,6,3,4-Chlorotolylenediamine, m. above 300°. 1-Amino-2-phenylaminonaphthalene, isolated as the HCl salt, brown, m. 195°; and the HNO₃ salt, scarlet-red, m. above 300°; H₂SO₄ soln., dark brown; dyes wool light brown.

Supposed formation of 1,2,4-oxadi-imine rings from nitroso compounds and methylene-arylamines. G. N. BURKHARDT, ARTHUR LAPWORTH AND E. B. ROBINSON. *J. Chem. Soc.* 127, 2234–6 (1925).—Polemical with Farrow and Ingold (C. A. 19, 978). C. J. WEST

The influence of chemical constitution on the thermal properties of binary mixtures. VI. Triazine and benzene derivatives. PAUL PASCAL. *Bull. soc. chim.* 37, 836–40 (1925).—The 5 binary systems:—(1) C₆H₅Ph₃-triphenyltriazine; (2) Et trimesate-Et triazinetricarboxylate; (3) methylidiphenyltriazine-triphenyltriazine; (4) methylidiphenyltriazine-C₆H₅Ph₃; (5) triphenyltriazine-Et triazinetricarboxylate were investigated. All the systems form solid solns. (complete diagrams given). M. A. YOUTZ

Lupine studies. IV. Isolation of *d*-lupanine from *Lupinus kingli* (S. Watson).

J. F. COUCH. *J. Am. Chem. Soc.* **47**, 2584-7(1925).—The abstract in *C. A.* **19**, 3271, should be corrected by eliminating the sentence: "Two other alkaloids were isolated and analyzed as the Au salts." These alkaloids are identical with *d*-lupanine.

C. J. WEST

The resins of lead. ROGER UZAC. *Bull. soc. chim.* **37**, 1194-6(1925).—The resins of Pb may be prepd. (1) by heating rosin with litharge, minium or white lead, or, (2) by double decompn. between an aq. soln. of a resinous soap and of a Pb salt; (1) gives an acid resin which is a liquid; (2) gives a neutral resin which appears as a gel or in the form of white flakes. By detn. of the *index of neutrality* the normal resin of Pb is shown to be alk. and the neutral or acid resins are probably contaminated with free resin which is acidic.

REYNOLD C. FUSON

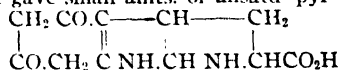
Cyamarin and strophanthidin. A. WINDAUS, G. REVEREY AND A. SCHWIEGER. *Ber.* **58B**, 1509-14(1925), cf. *C. A.* **9**, 2378; Jacobs and Collus, *C. A.* **19**, 1142.—In an investigation undertaken to det. whether the various plant glucosides with a digitalis action are closely related chemically and have structures similar to those of cholesterol and the bile acids, W. with Bandte (*C. A.* **17**, 3746) obtained from digitaligenin a hydroxylactone $C_{24}H_{38}O_3$ and a lactone $C_{24}H_{36}O_3$ and to Reverey was assigned the task of prep. from strophanthidin (cymarigenin) (I) the next lower homolog of hexahydro-digitaligenin, the hydroxylactone $C_{23}H_{36}O_3$ (II), which he succeeded in doing (*Diss. Göttingen*). Since then, Jacobs and his coworkers (cf. also Thoms and Unger, *C. A.* **19**, 379) have shown that the formula of I is $C_{23}H_{36}O_6$, not $C_{23}H_{30}O_6 \cdot H_2O$, and that the "anhydrostrophanthidin" (III) of W. and Hermanns, obtained by treating I in $CHCl_3$ with PCl_5 gas, shaking with H_2O to remove the HCl and crystg. the product from MeOH, is really dianhydrostrophanthidin Me hemiacetal, $C_{24}H_{36}O_4$ (IV). Schwieger has now found that the true dianhydrostrophanthidin (V) gives the same II as the III used by R. in the mistaken belief that it was V, as in the hydrogenation with AcOH and Pt sponge the hemiacetal is hydrolyzed. In the catalytic hydrogenation of V the compn. of the resulting mixt. depends greatly on the nature of the catalyst; with Pt previously treated with H there is obtained chiefly the *hexahydro deriv.* $C_{23}H_{34}O_4$ (VI), while Pt laden with O gives also the *octahydro* (VII) and the *desoxy deriv.* $C_{23}H_{36}O_3$ (VIII). VI, formed by satn. of the 3 double bonds, is a satd. hydroxyketolactone, and VIII, formed by the further addn. of 1 mol. H_2 at the C O group, is a satd. dihydroxylactone; on cautious oxidation with CrO_3 it smoothly regenerates VI, in which the C O group is reduced by the Clemmensen method to CH_2 ; the resulting alc. (VIII), from its resistance to oxidizing agents, is probably tertiary, i. e., is a satd. monohydroxylactone; it distills *in vacuo* without decompn. The above results show that I contains like cholesterol a tetracyclic system, is an unsatd. hydroxylactone like the genus of the digitalis glucosides but differs from them in contg., besides three HO groups, a C O group in addn., and also in having 1 atom less of C. VI, m. 208° , does not give the Liebermann-Burchard reaction. VII, m. $265-6^\circ$, also does not give the L.-B. reaction, *acetate*, m. 185° . VIII, m. 224° , gives no color with $Ac_2O \cdot H_2SO_4$.

C. A. R.

A chloroform-insoluble glucoside from digitalis leaves, gitoxin. A. WINDAUS AND G. SCHWARTE. *Ber.* **58B**, 1515-9(1925).—Kiliani (*C. A.* **9**, 1336) studied a glucoside, obtained in the Merck factory as a by-product in the prepn. of digitoxin, which, although originally sol. in $CHCl_3$, became insol. in the course of manuf. Although it showed the same slight soly. in alc., $CHCl_3$ and H_2O as Kraft's anhydrodigitalin (*C. A.* **6**, 1653) and gave the same very characteristic color reaction with Fe^{+++} salts and H_2SO_4 , Kiliani concluded, from differences in the compn. of the 2 substances, that they are not identical. These differences, however, were probably due only to his previous treatment of the material analyzed; he pptd. the Merck glucoside from MeOH- $CHCl_3$ with Et_2O , and as the 1st fractions were still contaminated with coloring matter, he analyzed only the last, colorless fraction which contains only the most sol. constituents and is relatively poor in the difficultly sol. main component. W. and S. have now carefully recrystd. both substances and obtained from each in good yield substances, m. 266° , almost insol. in most solvents and having the same compn.; no difference whatever could be detected between them and on hydrolytic cleavage both gave the same products, so that there is no doubt that they are identical; the name *gitoxin* (I) is suggested for the compd. Its compn. is C 62.22, H 8.15%; its mol. wt. could not be detd. on account of its insoly. but it titrates as a lactone with hot 0.1 N alkali, giving an equiv. wt. of about 770. The formula best agreeing with these results is $C_{42}H_{68}O_{13}$ or $C_{42}H_{66}O_{14} \cdot H_2O$, which is also rendered probable by a study of its decompn. products, *gitoxigenin* (II) and *digitoxose* (III). II, $C_{24}H_{36}O_6$, is obtained in 48% yield and III, $C_6H_{12}O_4$, in the proportion of about 3 mols. to 1 of II. II contains a lactone and three HO groups and a double bond; with cold concd. acids it loses 2 mols. H_2O and forms a triply unsatd. monohy-

droxylactone, *dianhydrodigitoxigenin*, $C_{24}H_{32}O_8$ (IV), identical with the digitaligenin (V) obtained from *Digitalinum verum*. The latter glucoside and I are therefore very closely related; both contain an aglycon, $C_{24}H_{36}O_8$, combined in the 1 case with glucose and digitalose, in the other with III; as with cymarín and strophanthin Kombé, the only difference between the 2 glucosides is probably in the sugar component. III m. 108–9°. II, m. 224–5° (decompn.), dissolves in about 500 parts AcOEt at 18°, gives with $FeCl_3 \cdot H_2SO_4$ a golden yellow, then violet-red color, does not react with NH_2OH , yields with $BzCl$ in C_6H_5N a *di-Bz deriv.*, m. 262°, mol. wt. in camphor 589–93. In AcOH with Pt sponge, II absorbs 1 mol. H_2 , giving a substance, m. 226°. IV, m. 209–10°, does not depress the m. p. of V; acetate, m. 208° (also when mixed with the acetate of V), mol. wt. in camphor 429. With H and Pt sponge in AcOH, IV gives hexahydrodigitaligenin, m. 186–7°; acetate, m. 156°. C. A. R.

The constitution of proteins. N. TROENSEGAARD. *Z. angew. Chem.* **38**, 623–6 (1925).—A paper giving various partly developed lines of evidence that proteins are probably not built up of amino acids as formerly supposed but largely of pyrrole, pyrrolidine and pyridine rings condensed into systems of 2, 3, or more, and contg. O as OH. Such substances would probably be easily split into amino acids. Against the older theory of their compn are several facts: (1) Hydrolysis of proteins often gives only a relatively small amt. of the N as amino acids. (2) While all proteins have nearly the same elementary compn., that of the amino acids varies greatly. (3) The proportions of the various acids are not such as to lead to any classification of the proteins from which they are derived or to any possible scheme of combination in the manner characteristic of polypeptides ($RNHCOR'$, etc.). (4) Ring compds. have been found among the amino acids, *i. e.* the glyoxaline ring in histidine, the pyrrolidine ring in pyrrolidinecarboxylic acid, and the indole group in tryptophan. Exptl. work was done using gliadin recrystd. from 60% EtOH, gelatin, casein and blood protein. Free NH_2 and NH groups in the products were detd. by the method of Van Slyke, using HNO_3 , followed by Sørensen's formol titration method. The difference gave the imino N. It was found possible to acetylate the proteins and obtain products which could be hydrolyzed to volatile bases with KOH in anhyd. MeOH. The hydrolysis products were sepd. into various basic and acid substances or fractions by distn., and by soly. differences in CS_2 , Et_2O and C_6H_6 . Some of the basic fractions from acetylgladin gave good yields of pyrrole upon distn. with 50% KOH. Reduction with Zn and HI or Mg and AcOH was too violent but Na and AmOH gave small amts. of unsatd pyrroles. An acid was sepd. to which the constitution



was tentatively assigned. It contained no aliphatic amino groups, was stable to acids, but was easily split up by alkalis. It reacted readily with MeI, adding to the N atoms and also some MeO compd being formed. No details are given but the original should be consulted for interesting descriptions of the above and other results M. A. Y.

Derivatives of *p*-cymene (SARGENT, HIBBARD) **25**. Catalytic splitting of acetoacetic acid by strong acids and bases (EULER, ÖLANDER) **2**. Study of the physical properties of nitromethane (WILLIAMS) **2**.

Tetraalkyl lead. W. S. CALCOTTE. U. S. 1,559,405, Oct. 27. Pb-Na alloy is treated with EtBr or other alkyl halide in the presence of triethylamine or dimethylaniline or other catalyst of the type used for the Grignard synthesis and the mixt. is subjected to the action of a sufficient quantity of a reducing agent such as nascent H formed by adding H_2O to effect reduction to a Pb dialkyl. The quantity of reducing agent used is substantially less than the equiv. of 4 atoms of nascent H for each mol. of Pb used. The Pb dialkyl thus formed is heated to produce tetraalkyl lead.

Lead tetraalkyls. K. WILLIAMS and H. W. DAUDT. U. S. 1,550,940, Aug. 25. Pb in the form of an alloy with Na is caused to react with an alkyl bromide, *e. g.*, EtBr, in the presence of a small quantity of H_2O , EtCN and pyridine at 83–85° for 8 hrs., and the reaction mass is mixed with a strong base, *e. g.*, a large quantity of NaOH soln.

Methanol, etc. A. MITTASCH, M. PIER and K. WINKLER. U. S. 1,558,559, Oct. 27. A mixt. of C oxides with at least about an equal vol. of H at a temp. of 200–600° and under a pressure of 50 atm. or higher is passed over a catalyst contg. an intimate mixt. of at least 2 oxides (non-reducible to metals under the conditions of the process) of metals belonging to different periodic groups such as Zn and Cr, Zn and U, Zn and V,

Zn and W, Mg and Mo, or Ce and Mn. The more basic oxide is used in larger proportion and Fe and Ni should be absent.

Methanol and other oxygenated organic compounds. M. PIER, W. RUMPF, F. LAPPE and G. STERN. Can. 254,987, Oct. 27, 1925. In the manuf. of MeOH by the catalytic reduction of CO at elevated temp. and pressure the app. used is lined with a metal or alloy resistant to CO at the temp. of working. Cu, Ag, Al and their alloys or special steel contg. Cr, Mn, W, Mo or V are specified.

Aldehyde-ammonia. F. W. SKIRROW and G. O. MORRISON. U. S. 1,551,176, Aug. 25. AcH or other "fatty aldehyde" and NH_3 , in approx. equimol. proportions, are passed into a satd. aq. soln. of aldehyde-ammonia at a temp. below 50° .

Alkali metal xanthates. R. B. CROWELL and G. F. BRECKENRIDGE. U. S. 1,559,504, Oct. 27. NaOH or other alkali metal hydroxide is caused to react with alc. and CS_2 in kerosene, gasoline, toluene or other liquid hydrocarbon medium which is chem. inert to the other ingredients.

Butyraldehyde composition containing iodine. C. BOGIN. U. S. 1,550,869, Aug. 25. Normal butyraldehyde is stabilized against oxidation by adding 0.01–0.25% of I, Cl, Br, hydroquinone, resorcinol or pyrogallol.

Styrolene and its homologs. NAUGATUCK CHEMICAL CO., I. OSTROMISLENSKY and M. G. SHEPARD. Brit. 232,909, April 24, 1924. Ethylbenzene and its homologs such as xylene, *o*-methylstyrene, *p*-methylstyrene, 1,3,5-dimethylstyrene or diethylbenzene are heated to 450 – 700° to split off H and form compds. of the type $\text{Ar}-\text{CH}=\text{CH}_2$. An app. for this purpose is described. Styrolene may be polymerized by heating for several hrs. at 180 – 200° with the optional addn. of an accelerator such as benzoyl peroxide. Homologs of benzene which have more than 2 C atoms in the side chain are heated to 500 – 700° . In treating cymene, CH_4 is split off and styrolene formed. Cinnamic acid and its homologs such as *o*- or *p*-methylcinnamic acids are heated to temps. of 250 – 650° (excluding, however, the temp. range of 300 – 500° within which anhydride of the acid and other products are formed). Styrolene obtained by these processes may be purified by shaking with alkali, distg. with steam and treating with CaCl_2 and finally with Na. Polymerization of styrolene or its homologs may be prevented by addn. of trinitrobenzene, quinone, mononitronaphthalene, TNT, PhNO_2 , dinitrobenzene, picramide "or other substances which act like mild oxidizing agents such as selenium." The nitro compds. retard polymerization at temps. below 170° but accelerate it above this temp.

Mono-alkylation of *m*-tolylenediamine. L. M. SHAFER. U. S. 1,550,749, Aug. 25. *m*-Tolylenediamine is warmed with dialkyl sulfate, without the addn. of an acid-binding material.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Observations on the mechanism of the tyrosine-tyrosinase reaction. R. A. GORTNER. *Proc. Soc. Exptl. Biol. Med.* **21**, 543–5 (1924).—Tyrosine oxidizes in the presence of tyrosinase and produces a change of colors from a deep rose-red to violet and finally a deposit of black pigment. Tyrosol, which has no amino group, did not oxidize beyond the rose-red color. An insol. tyrosinase was prepd. from the meal worm, *Tenebrio molitor*. Removal of the tyrosinase by filtration stopped the reaction. The red-black oxidation colors require the amino group and constitute a sep. reaction. C. V. B.

The non-uniformity of barley diastase. W. SYNIEWSKI. *Biochem. Z.* **158**, 87–120 (1925).—The non-uniformity in diastase action of enzyme preps. from different lots of barley is ascribable to differences in α -diastase and β -diastase, both of which contribute to the hydrolysis of starch. The products of the action of α -diastase on starch give a blue color with I. The products that give violet, red, brown or no color with I result from the action of β -diastase. Both the α - and β -diastases hydrolyze starch at the carbonyl or ether linkages of the starch mol. (cf. *Ann.* **324**, 212). F. A. CAJORI

Auxobody action. M. JACOBY and L. ROSENFELD. *Biochem. Z.* **158**, 334–6 (1925); cf. *C. A.* **19**, 1431.—Urease action in suitable concn. of EtOH (80%), though increased by such auxobodies as glycolcol, is diminished by KCN. F. A. CAJORI

The heat of combustion of pyrroacetic acid and its physiological significance.

H. BLASCHKO. *Biochem. Z.* **158**, 428-34(1925).—The heat of combustion of pyroracemic acid, detd. in a Berthelot bomb, was 279,140 cal. per mol., the heat of soln. 4566 cal. per mol., the heat of neutralization 11,400 cal. per mol. The heat of soln. of CH_3CHO was detd. as 4482 cal. The heat of reaction when pyroracemic acid is split by yeast carboxylase was detd.

F. A. CAJORI

The colloidal behavior of muscle proteins. I. The isoelectric point and conditions of stability of myogen. H. II. WEJER. *Biochem. Z.* **158**, 443-72(1925).—The isoelec. point of myogen of rabbit muscle is p_H 6.3, independently of the kind or concn. of the buffer present. Above a definite salt concn. the colloidal stability of myogen diminishes and pptn. occurs on the acid side of the isoelec. point, p_H 5.0. Anions cause a change in the elec. charge carried by the colloidal myogen as well as in its stability. The changes caused by anions are reversible and the myogen assumes its original condition when the anions are removed by washing. II. The isoelectric point and solubility of myosin. *Ibid* 473-90.—The point of max. pptn. of myosin by salts is at p_H 5.0. The isoelec. point of the muscle residue of rabbit muscle after removal of the press juice is p_H 5.1 to 5.2, indicating that there are different proteins in the residue from those in the press juice

F. A. CAJORI

Laccase. V. Action of hydrocyanic acid, and its relation to the reaction of the medium. P. FLEURY. *Bull. soc. chim. biol.* **7**, 797-805(1925).—See *C. A.* **19**, 1904.

A. T. CAMERON

Protein structure and proteolysis in some of their recent aspects. A. HUNTER. *Trans. Roy. Soc. Can.* **19**, Sec. V, 1-23(1925).—The various theories dealing with the general structure of the protein mol. are reviewed, its decompn. by enzymic hydrolysis is dealt with, and it is emphasized that 70% at least of the amino N of the av. protein is in simple polypeptide combination, the facts of protein digestion negative Troensegaard's cyclic theory, and render the extensive occurrence of anhydride rings improbable. Evidence is adduced that arginine radicals in casein, gelatin and edestin are in 2 forms of combination, one of which is more resistant to digestion, and there is some evidence that amide radicals may exist in proteins.

A. T. CAMERON

Silica and living matter. P. LEMAY AND L. JALOUSTRE. *La nature* **53**, ii, 180-2(1925).—A descriptive review of the occurrence of Si in the earth, plants and animals and its physiol. role.

C. C. DAVIS

Variations in phosphoric acid during glucolysis in the blood. GAETANO PIAZZA. *Arch. farm. sper.* **40**, 49-57(1925).—When freshly drawn blood is immersed in a water bath at 40° for 1 hr. the decrease in glucose is accompanied by an increase in inorg. P, which may amt. to as much as 0.94 mg. per 100 cc. This is attributed to hydrolysis of phosphatides. No relation was observed between the intensity of glucolysis and the amt. of inorg. P liberated. The importance of lactacidogen synthesis in the metabolism of carbohydrate is believed to have been overestimated.

A. W. DOX

Cozymase. VII. HANS V. EULER AND RAGNAR NILSSON. *Z. physiol. Chem.* **148**, 23-40(1925); cf. *C. A.* **19**, 81.—When glucose in the presence of phosphate is fermented at optimum acidity (p_H 6.0-6.5) the first 3rd of the total reaction occurs with const. velocity, then the fermentation curve flattens and the reaction proceeds at a considerably slower rate. Cozymase is put out of action in a reversible manner, presumably by combining reversibly with constituents of the dry yeast. In fresh yeast cozymase is bound entirely or for the most part to the protoplasm. Cozymase cannot be washed out from dried top yeasts but can be washed out completely or nearly so from dried bottom yeasts. Similar differences appear to exist with respect to the phosphate. Combined cozymase and free cozymase show different chem. behavior.

A. W. DOX

The kinetics of peptic action on fibrin. I. A. SMORODINTZEV AND A. N. ADOVA. *Z. physiol. Chem.* **149**, 179-83(1925).—With const. amts. of pepsin and fibrin the digestion of the substrate shows a linear relation, and in only 1 expt. with concd. artificial gastric juice does it follow the Schütz-Borissow law.

A. W. DOX

The maltase of barley and the specificity of the disaccharases. JESAJA LEIBOWITZ. *Z. physiol. Chem.* **149**, 184-94(1925).—The non-identity of barley maltase and yeast maltase is established by the fact that the former is inactive toward α -methylglucoside, does not catalyze the synthesis of α -ethylglucoside and does not hydrolyze β -methylmaltoside, while yeast ext. is active in all 3 instances. It must be assumed that yeast maltase attacks the glucoside portion and barley maltase the glucose portion of the maltose mol. Hence the 1st enzyme also hydrolyzes α -methylglucoside but the 2nd is unable to from the intermediate enzyme-substrate compd. and thus no cleavage can be effected. β -Methylmaltoside, although it contains the same 1,6- α -linkage as the free disaccharide, cannot be attacked by barley maltase because the glucose portion is essentially modified by the entrance of the Me group. This theory of localization of the

binding of disaccharases to definite parts of the substrate mol. is advanced in explanation of other instances of enzyme specificity and its modification by the introduction of substituent groupings. The stability optimum of barley maltase does not coincide with the activity optimum, the greatest stability being observed with citrate buffer at p_H 6.0.

A. W. DOX

The specificity of animal proteases. III. The specific actions of pancreatic trypsin and pancreatic erepsin. ERNST WALDSCHMIDT-LEITZ AND ANNA HARTENECK. *Z. physiol. Chem.* **149**, 203-20 (1925); cf. *C. A.* **19**, 3496.—Animal proteases may be classified into 4 groups: (1) peptidases, such as erepsin, which are sp. for simple di- and tripeptides, (2) enzymes of the type of non-activated trypsin, the action of which is demonstrated but has not yet been characterized by a strictly sp. substrate; (3) the activated trypsin type, e. g., trypsin + enterokinase, and (4) the pepsin type, the action of which is distinguishable from the others but cannot yet be definitely described. Among plant proteases, papain and its HCN compd. correspond to the 3rd and 2nd groups, resp. Numerous statements in the literature regarding the cleavage of protamines, histone and casein by erepsin are incorrect, and where such cleavage has been observed it must be attributed to contamination of the enzyme by trypsin. All of the dipeptides studied were hydrolyzed by erepsin but none of them was hydrolyzed by trypsin. The action of erepsin is limited to the simple peptides; peptic peptone, protamine, histone and proteins were not attacked by erepsin but were hydrolyzed by trypsin. Histone, protamine and peptone are hydrolyzed by non-activated trypsin, but for the cleavage of the high mol. proteins trypsin requires activation by enterokinase. Trypsin cannot, therefore, be considered as occurring in the pancreatic gland as an inactive zymogen. The activator functions merely as an accessory substance. The contention of Fischer and Aberhalden that the erepsin of the gland tissue and that of the secretion behave differently toward individual peptides could not be corroborated. Furthermore, the erepsin of the pancreas and that of the intestinal mucosa were found to be identical both qual. and quant. **IV. The spontaneous activation of trypsin.** *Ibid* 221-30.—By adsorption on $Al(OH)_3$ the activator can be removed from spontaneously activated trypsin and recovered in the elution. The exact detn. of activation performance of the substance formed by the gland is rendered difficult by the fact that the proportion of this substance to the tryptic enzyme cannot be controlled without a quant. sepn. and that its liberation from the gland material is accompanied by the formation of inhibitory substances. Its quant. characterization is possible only when it is sepd. in the form of its prokinase from the tryptic enzyme. After such sepn. by means of $Al(OH)_3$ adsorption the spontaneous activation of the trypsin in the mother liquor no longer occurs. The non-activated trypsin may then be activated by adding the elution. The formation of activator from its prokinase stage occurs spontaneously and is independent of the presence of trypsin. This activator functions under the same optimum conditions as the intestinal enterokinase and is identical with the latter. Whether its gradual formation from the prokinase stage is dependent on the erepsin which accompanies it in the sepn. from trypsin has not been detd. The identity of the pancreatic activator with enterokinase, as well as the presence of erepsin in both secretions, harmonizes with the view that the pancreatic gland is an evolutionary development from the intestinal mucosa.

A. W. DOX

The pectinase of *Sclerotinia cinerea*. G. W. MUHLEMAN. *Bot. Gaz.* **80**, 325-30 (1925).—*Sclerotinia cinerea* (the brown rot fungus) does not excrete pectinase in the culture media. The color of the felts of *Sclerotinia cinerea* is a good index of the activity of the pectinase solution which may be prepd.

B. H.

The cozymases of various fermentations. A. I. VIRTANEN. *Ber.* **58B**, 2441-5 (1925); cf. *C. A.* **18**, 3389; **19**, 2060.—Euler and Myrbäck's finding that insulin can replace the cozymase of lactic acid bacteria but not that of yeast has led to an investigation which has established the identity of muscle, yeast, lactic and propionic acid cozymases. Cozymase-free *Bacterium casei* ϵ was activated by yeast, muscle and propionic acid bacteria ext. and by insulin Wellcome in a 0.5 N phosphate soln. of p_H = 6.2 at 42°. The same insulin did not activate yeast. Since cozymase also catalyzes the zymophosphate formation it appears probable that the first stage of lactic and alc. fermentation is the same. There are, however, fermentation processes which do not require cozymase: the coli-aerogenes fermentation, the main end products of which are CO_2 , AcOH and succinic acid, and the succinic acid fermentation, which takes place concurrently with the propionic acid fermentation. The latter is catalyzed by cozymase and forms zymophosphate as may be observed from the amt. of free phosphate during the fermentation.

MARY JACOBSEN

Labile albumin compounds. OSKAR LOEW. *Biol. Zentr.* **45**, 373-80(1925).—A discussion regarding the change from chemically labile compds. into relatively stable ones.

FRANCES KRASNOW

The regularity of the osmotic pressure effect of physiologically indifferent substances on unicellular animals. HANS FORTNER. *Biol. Zentr.* **45**, 417-45(1925).—The osmotic pressure effect of physiologically indifferent substances is dependent principally on the relative surface. The death of the cells is brought about by the withdrawal of water, and by the inhibition of the oxidative metabolism, together with the resulting autointoxication. The osmo-narcotic condition is a sequel to this autointoxication called forth by the insufficient oxidative metabolism. The oxidative metabolic end products cannot be excreted in sufficient quantity because of the withdrawal of water, hence paralysis sets in.

FRANCES KRASNOW

Radium influence on the colloidal state of protozoan cell contents. MARGARETE ZUELZER AND ERNST PHILIPP. *Biol. Zentr.* **45**, 557-72(1925).—Radium treatment brings about accelerated plasma flow. This effect is due to hydration of the protoplasmic colloids.

FRANCES KRASNOW

Further studies on the sinus hormone from frog hearts. L. HABERLANDT. *Z. Biol.* **83**, 53-8(1925); cf. *C. A.* **19**, 2522.—The frog sinus elaborates a substance which accelerates and strengthens the beat of the isolated sinus even after 24-48 hrs. It also stimulates the action of the heart which has ceased beating.

F. K.

The question of iron transformation. I. WOLFGANG LINTZEL. *Z. Biol.* **83**, 289-96(1925).—A colorimetric method for the detn. of small amts. of Fe in the presence of hemoglobin is described. Through artificial digestion of hemoglobin with pepsin and pancreatin, 10% Fe is split off.

FRANCES KRASNOW

The biological relation between arginine and agmatine. HELMUT MULLER. *Z. Biol.* **83**, 320-4(1925).—Agmatine could not be obtained from arginine either through putrefaction or through subcutaneous injection of arginine.

FRANCES KRASNOW

Observations on the communication of O. Warburg: Iron, the oxygen-carrying constituent of the respiratory enzyme. P. ELLINGER. *Ber.* **58B**, 1547(1925); cf. *C. A.* **19**, 3277.—A discussion of Warburg's criticism and of unpublished criticism of Meyerhof of the author's earlier work (*C. A.* **18**, 2753).

H. B. LEWIS

Studies on enzyme action. XXXIII. Lipase actions of extracts of the whole rat at different ages. K. G. FALK, H. M. NOYES AND K. SUGIURA. *J. Gen. Physiol.* **8**, 75-88(1925); cf. *C. A.* **19**, 1433.—The exts. were incubated 22 hrs. at 37-38° and the lipase activity was detd. by titration with 0.1 N NaOH soln. and phenolphthalein. The relative lipase actions were plotted on a scale on which Ph acetate or Me butyrate equaled 100 and the other esters as percentages of this action. Ten simple esters were used. Exts. of the embryos and young estrats gave curves resembling those given by Flexner-Jobling rat carcinoma (*C. A.* **18**, 1301); these curves changed with increasing age to a type characteristic of the adult rat and in the oldest rats appeared to revert to the embryonic type. The greatest increases in action with age were shown by the Me and Et butyrates; the smallest increase was shown by glyceryl triacetate. Expts. on protease activity, detd. by placing the exts. of whole rats of different ages with peptone, casein and gelatin at 38° for 22 hrs. and measuring the extent of the action by the formol titration method, did not parallel those for the lipase actions. This is because in the protease expts. the amt. but not the type of action is measured.

CHAS. H. RICHARDSON

Is living protoplasm permeable to ions? W. J. V. OSTERHOUT. *J. Gen. Physiol.* **8**, 131-46(1925).—Expts. on the marine alga, *Valonia macrophysa*, show that almost no H₂S enters the cell sap except as undissociated mols.

C. H. R.

Theory of fermentation of amino acids. KANROKU KURONO. *J. Chem. Soc. Japan* **45**, 244-6(1925).—If the theory of alc. fermentation of amino acids of Neubauer and Fromherz (*C. A.* **5**, 1789) holds for all the amino acids, then the tertiary amino acids cannot be fermented by the yeast. Ehrlich (*Z. physiol. Chem.* **8**, 438(1908); cf. *C. A.* **2**, 1839) found, however, that *D*-isovaline is decompd. by the yeast, although no optically active BuOH could be isolated by fermentation of *DL*-isovaline. K. prepd. another tertiary α -amino acid, and tested N. and F.'s theory. Ten g. of *DL*-methyl-*n*-propyl- α -amino acetic acid, 300 g. cane sugar, 2250 cc. H₂O, and 150 g. yeast (No. 12) were incubated at 20-5° for 2 days. At the end of the incubation, K. isolated 2 g. of *DL*-methyl-*n*-propyl- α -aminoacetic acid, 0.5 g. of *L*-form ($[\alpha]_D^{20} = -8.37^\circ$), and the corresponding secondary alc., methylpropylcarbinol. The conclusion is that N. and F.'s scheme in assuming α -ketonic acid as an intermediate product of the amino acid fermentation does not hold for all the amino acids. The fermentation of this new leucine by

the yeast must probably go according to $\text{MePrC}(\text{NH}_2)\text{CO}_2\text{H} \xrightarrow{\text{NH}_2} \text{MePrCO} + \text{NH}_3 + \text{CO}_2 \xrightarrow{\text{H}_2} \text{MePrCHOH}$. The detailed method of identification of the various products of the fermentation and their chem. and phys. chem. characteristics are given. S. T.

The affinity of saccharase for different sugars. IV. KARL JOSEPHSON. *Arkiv. Kemi Mineral. Geol.* 9, No. 20, 1-5(1925) (in German); cf. C. A. 18, 2717.—No new work is reported (cf. C. A. 18, 2528). M. A. YOUTZ

The constitution of proteins (TROENSEGAARD) 10. Influence of alkali in hemolysis experiments on drug extracts (KARSMARK, KOFLER) 17.

B--METHODS AND APPARATUS

STANLEY R. BENEDICT

Chamber with thermostatic control and rotating table for plant cultures. S. F. TRELEASE. *Bull. Torrey Bot. Club* 52, 389-95(1925).—The chamber is $57 \times 34 \times 40$ inches, and can be kept at any temp. between 10° and 35° with a variation of 0.5° . It is equipped with a rotating table and thermostatic control made up from standard commercial appliances. JOSEPH S. CALDWELL

The groups responsible for the nucleal reaction and nucleal staining. II. Also remarks on the preparation of hydroxymethylfurfural. R. FEULGEN AND K. IMHÄUSER. *Z. physiol. Chem.* 148, 1-16(1925); cf. C. A. 18, 3069.—The contention of Steudel and Peiser (C. A. 19, 80) that the nucleal reaction is due to hydroxymethylfurfural (I) is refuted on the following grounds: (1) The color produced by I and fuchsin- SO_2 has a reddish tint resembling fuchsin soln. while that obtained in the nucleal reaction is bluish and resembles crystal violet soln. The 2 cannot be matched in a colorimeter. (2) The color produced by hydrolyzed thymonucleic acid and fuchsin- SO_2 is stable while the color from I and fuchsin- SO_2 rapidly fades and disappears completely. (3) The substance responsible for the nucleal reaction is extremely sensitive to heat while I is much more stable. (4) $\text{PhNH}_2 \cdot \text{AcOH}$ gives an orange color with I and a reddish color with furfural. At a diln. of 0.5% I reacts intensely with $\text{PhNH}_2 \cdot \text{AcOH}$ but not with fuchsin- SO_2 while the reverse is true of partially hydrolyzed thymonucleic acid. (5) I is sol. in EtOAc while the substance responsible for the nucleal reaction is insol. (6) The odor of bread noted by Steudel and Peiser in the hydrolysis of thymonucleic acid indicates that their hydrolysis was carried too far. When the reaction is properly performed no such odor can be detected. (7) An intense nucleal reaction is obtained with 0.5 mg of thymonucleic acid while the color from the same amt of I is subliminal. Sucrose, which yields 10% of I, is 10,000 times less sensitive to the nucleal reaction than thymonucleic acid under the same conditions. The prepn of I by Middendorp's method (C. A. 13, 2344) can be facilitated by collecting separately the few crystals which form in the beginning of the distn. and using these to seed the remainder of the distillate. A. W. DOX

Preparation of standards for the colorimetric determination of pepsin. I. A. SMORODINTZEV AND A. N. ADOVA. *Z. physiol. Chem.* 149, 173-8(1925).—For the colorimetric detn. of pepsin by the fibrin-diphenylrosaniline method it is important that the stained fibrin and the colorimetric standard be prepd. from the same fibrin and the same dye. The addn. of an equal vol. of glycerol prevents the development of turbidity and a standard thus prepd. undergoes no change when kept 8 months. At an acidity of 0.1% HCl the fibrin swells rapidly and is readily digested by very dil. enzyme. It is recommended that enzyme dilns. of 200-1000 be used and that color comparisons be made every 5 min. A. W. DOX

Improved micromethods. I. FRIEDRICH HOLTZ. *Klin. Wochschr.* 4, 1685-7(1925).—Essentially a detailed description of an ultra balance manufactured by the Paul Bunge Precision Balance Co., Hamburg. It is sensitive to 0.0000001 g. and has a capacity of 50 g. MILTON HANKE

Exact dosage of inhaled substances by means of an electro filter. HARRY SCHAFER. *Klin. Wochschr.* 4, 1765-7(1925). MILTON HANKE

Titration, estimation of the hydrogen-ion concentration and "titration of the indicator" in gastric juice. HEINZ KALK AND BERNHARD KUGELMANN. *Klin. Wochschr.* 4, 1806-10(1925).—"Titration of the indicator" (Sahli, cf. C. A. 19, 2680) and the old method of titration with dimethylaminoazobenzene give identical results with a test meal free from protein such as the alc. test meal and the Ewald-Boas meal. The old method is not an accurate index of the acidity when the gastric contents contain protein or lactic acid. In such cases the method of Sahli or actual p_H detns. by the indicator method will have to be resorted to. MILTON HANKE

A microchemical histological method for the differentiation of tissue by iron salt formation. ERWIN CHRISTELLER AND KARL KAISER. *Klin. Wochschr.* 4, 2193-4 (1925).—The freshly isolated tissue is immersed in an aq. soln. of an iron salt for 24 hrs. A number of ferric and ferrous salts were tried. The tissue is then either frozen and sectioned, or fixed in formalin and then frozen and sectioned. The sections are washed with water, immersed in a soln. of $K_4Fe(CN)_6$, washed and mounted. Connective tissue does not bind iron; it is almost colorless. The nuclei of all cells are pale blue, blood cells are dull green and serum is light green. The protoplasm of all epithelial cells is dark blue. Carcinoma cells are most intensely colored. Muscle fibers, both smooth and striated, are colored brilliantly blue. The differentiation can be sharpened by counterstaining with eosin, orange G, alum carmin or phenosafranin. MILTON HANKE

Delicate color reaction for the presence of vitamin A. OTTO ROSENHEIM AND J. C. DRUMMOND. *Biochem. J.* 19, 753-6 (1925).— $AsCl_3$ gives with cod-liver oil a brilliant ultramarine-blue color reaction. Like the H_2SO_4 test (*C. A.* 14, 2208; 16, 3550) it is characteristic for vitamin A. It has the advantage that the color persists sufficiently to allow a colorimetric comparison with a suitable standard. The reaction is carried out by adding 1 cc. of pure $AsCl_3$ to one drop of cod-liver oil, and shaking the test-tube at once. The oil dissolves immediately, forming a clear blue soln., and in the course of a few seconds assumes a purple tint and gradually fades. The reaction is characterized by a well-defined absorption band extending from λ 550 to 590. Under the above conditions, the band persists for about 5 mins. A 1% soln. (in light petroleum) of a highly growth-promoting Newfoundland cod-liver oil reacted intensely with 1 cc. $AsCl_3$ in amts. of 0.05 cc. (= 0.5 mg.) oil. The oil was saponified and the unsaponifiable portion freed from cholesterol by means of digitonin. The cholesterol-free fraction now gave the reaction in a diln. of 1:2,000,000. Like vitamin A, the chromogenic substance resists saponification and is coned. in the cholesterol-free unsaponifiable fraction of cod-liver oil; like vitamin A, the chromogenic substance can be destroyed when a current of air is passed through the oil at 100° (after 30 minutes' aeration the reaction is diminished and is no longer given after 60 min.). Tests on more than 30 oils and fats show complete agreement between color intensity and growth-promoting activity. The color reaction makes it possible to differentiate vitamin A from the antirachitic substance, since cholesterol, which was made highly antirachitic by irradiation with ultra-violet light, does not give the $AsCl_3$ test. Both vitamin A and the antirachitic substance diffuse through a rubber membrane. A number of substances which share with $AsCl_3$ the property of imparting a red color to cholesterol (such as Me_2SO_4 , Cl_3CO_2H , $AcCl$ and $BzCl$ —the last two only in the presence of $ZnCl_2$) also give the blue color with substances contg. vitamin A. Is vitamin A, therefore, related to the sterols? Vitamin A is also linked to the lipochromes in that these substances, particularly carotin (dissolved in light petroleum or chloroform), give a slate-blue color with $AsCl_3$, which is distinguished from cod-liver oil by being permanent. "In view of the possible relationship between sterols and lipochromes in their general association with vitamin A in plant tissues (Coward, *C. A.* 17, 2304), it is suggested that the $AsCl_3$ reaction is concerned with a substance derived from these types of synthetic plant products under the influence of sunlight." A suitable color standard for the $AsCl_3$ reaction is a mixt. of 100-cc. crystal violet soln. (1:10,000) with 50 cc. methylene blue soln. of the same strength (both in alcohol). Under the conditions chosen, the color produced by 20 mg. of a highly active Newfoundland oil (= 1 drop from a pointed glass rod of 3 mm. diameter) with 1 cc. $AsCl_3$ matches the standard dye soln. dild. in the proportion of 3:2. After prepg. a set of suitably dild. standard solns. in a test-tube of uniform diam., we found, after a little experience, no difficulty in ranging all the oils so far examd. in a series which agreed with their growth-promoting activity." BENJAMIN HARROW

Method for the estimation of iodine in the thyroid gland. F. A. PICKWORTH. *Biochem. J.* 19, 768-72 (1925). The method depends upon the destruction of org. matter by fusion with alkali and oxidation of the resulting iodide to iodate with permanganate soln.; excess of the latter is removed with animal charcoal, and after adding iodide, the liberated I is titrated with thiosulfate. *Method*—Weigh 0.2 g. finely powd. dry thyroid and introduce into a Ni crucible of 150 cc. capacity. Add 10 cc. 50% NaOH and mix by rotating the crucible; cover with a lid having a hole $1/8$ " in the center and heat slowly till the water is evapd. Next heat the crucible in an oven considerably below red heat but hot enough to give a clear fusion product in about 1 hr. Then heat over a large free flame protected so that the crucible and the lid can be rapidly raised to a dull red heat, which is maintained $1/2$ -1 min. Allow the crucible to cool, add 70 cc. water and place on warm plate for about 1 hr., when gentle stirring will bring the whole into soln., transfer to a 250 cc. Erlenmeyer flask and add 3 drops of 10% Na_2SO_3 soln.; acidify

with 50% H_2SO_4 from a buret; add 3 cc. in excess, cool and add 5 cc. approx. 0.1 N permanganate. After 3 min. add a suspension of charcoal; when decolorization is complete, filter and wash with a little water. Add a crystal of KI and titrate immediately with freshly prepd. 0.01 N thiosulfate. One cc. thiosulfate $\times 85$ gives the mg. of I in 100 g. of dried gland when 0.25 g. is taken for analysis. BENJAMIN HARROW

The differential estimation of fat in feces. G. A. HARRISON. *Brit. J. Exptl. Path.* **6**, 139-461 (1925).—Gross errors in the percentage of split fat in dried feces may result from hydrolysis of the soaps by acid alc. The mean mol. wt. of the fatty acids from 50 to 100 samples of pathological feces was 268. The factor 1 cc. of 0.1 N soda corresponds to 0.0268 g.; fatty acids are, therefore, suggested for calcg. the quantity of split fat. By using continuous extn. in a Soxhlet app. or the method of Holt, Courtney and Fales (*C. A.* **13**, 965), in duplicate estns. of the total fat, the av. variation from the means was $\pm 2\%$ and of the split fat $\pm 3\%$. HARRIET F. HOLMES

A useful preservative for whole blood. A. H. BAKER. *Brit. J. Exptl. Path.* **6**, 201-2 (1925).—Fowl blood will travel safely for several days through the post, and permit a satisfactory agglutination test on its arrival if the boric acid content of the tube be between $\frac{1}{100}$ and $\frac{1}{500}$. HARRIET F. HOLMES

A buffered solution for perfusion of isolated organs. R. N. CHOPRA AND SUDHAMOY. *Indian J. Med. Research* **13**, 7-10 (1925).—Proof is given to show that Fleisch's soln. is better for perfusion than either the Ringer or Tyrode soln. F. K.

Studies of acidosis. XXI. The colorimetric determination of the p_{H} of urine. A. BAIRD HASTINGS, JULIUS SENDROY, JR. AND WM. ROBSON. *J. Biol. Chem.* **65**, 381-92 (1925), cf. *C. A.* **19**, 86.—The method employs bicolor standards of bromocresol green, bromocresol purple and phenol red, covering a p_{H} range of 4.0 to 8.2, based on the assumption that the color of an indicator soln. is due to a mixt. of the acid and alk. forms of the indicator. The accuracy with all precautions employed is only 0.1 p_{H} as compared with 0.02 p_{H} of blood detns. (Hastings and Sendroy, *C. A.* **19**, 86). The accuracy of the colorimetric method has been increased by preventing loss of CO_2 and by allowing for the error introduced by the diln. of the urine. A. P. LOTHROP

A more specific reagent for the determination of sugar in urine. J. B. SUMNER. *J. Biol. Chem.* **65**, 393-5 (1925); cf. *C. A.* **19**, 1146.—A new reagent is described which appears to be almost completely specific for reducing sugars and figures obtained by its use are over 40% lower than those given by the previously described reagent and lower than those given by the Benedict-Osterberg method even after charcoal is used. *Method* Pipet 1 cc. of urine (dild. if necessary) into a Folin-Wu sugar tube and add 3 cc. of reagent. Mix and heat 5 min. in boiling water. Cool 3 min. in running water, dil. to 25 cc., mix, and compare in a colorimeter (within 30 min.) with a standard prepd. with 1, 0.5, or 0.25 mg. of glucose, according to the concn. of sugar in the urine. Concd. urines contg. over 0.18% or dil. urines contg. over 0.12% of sugar can be considered abnormal. The method is entirely satisfactory for the estn. of sugar both in normal and in diabetic urine. *Reagent*.—Add 22 cc. of 10% NaOH to 10 g. of crystd. PhOH, dissolve in a little H_2O and dil. to 100 cc. Add 6.9 g. of NaHSO_3 to 69 cc. of the alk. PhOH soln. Now add a soln. contg. 300 cc. of 4.5% NaOH, 255 g. of Rochelle salt, and 880 cc. of 1% dinitrosalicylic acid. Mix and keep tightly stoppered in well-filled bottles; the reagent will keep at least a month. A. P. LOTHROP

The sugar content of blood. B. K. HARNED. *J. Biol. Chem.* **65**, 555-60 (1925). When the proteins of blood are pptd. by acid $\text{Hg}(\text{NO}_3)_2$ the filtrate contains N only in the form of nitrate and is thus free from many, if not all, of the non-sugar blood components which interfere with the methods of detg. blood sugar. This method of pptn. has been employed in an endeavor to det. the absolute concn. of glucose in the blood. When the Folin-Wu method is applied to such filtrates the values obtained averaged 17-25% lower than those usually obtained and are in accord with those given by the new Benedict method (*C. A.* **19**, 2352) for blood sugar. The procedure is not recommended as a routine method because of the laborious and exacting technic involved. A. P. LOTHROP

A method for the determination of total sulfates in tissues. W. DENIS AND STELLA LECHE. *J. Biol. Chem.* **65**, 561-3 (1925).—Place 10 g. of finely divided tissue in a 25 \times 200 mm. Pyrex test-tube and add 50 cc. of N HCl. Cover the tube with a small watch glass held in place by a square of tin foil and heat in a chem. autoclave at 200° for 1 hr. or in a bacteriological autoclave at 150° for 2 hrs. Transfer quant. to a 100 cc. volumetric flask and fill to the mark. Mix thoroughly, transfer to two 50 cc. centrifuge tubes and centrifuge for 5 min. Filter by suction through a Gooch crucible provided with a thin asbestos mat. Transfer 40 cc. of the filtrate to a 250 cc. beaker and ppt. the sulfates by the addn. of 10 cc. of 5% BaCl_2 soln., added drop by drop from a buret. Heat

to boiling, allow to stand overnight and filter through a tared Gooch crucible. Wash, dry and ignite the BaSO_4 in the usual manner. No cystine S is transformed into SO_4 by this procedure and the results apparently represent only the preformed sulfates present in the tissue. The total sulfate contents of certain dog and beef tissues are as follows in mg. per 10 g. of tissue: dog: lung 1.0, liver 20.7 (av.), muscle 0.87, kidney 4.39, heart 1.58; beef: liver 2.3, muscle trace, kidney 3.8, brain, 11.1. A. P. L.

The colorimetric p_H test of water and unbuffered solutions. H. T. STERN. *J. Biol. Chem.* 65, 677-81(1925).—A bromothymol soln. for testing unbuffered solns may be satisfactorily prepd. by adding alkali until a pure dark green color is obtained but the soln. is not stable and shows a red translucence after about 2 months even though kept in paraffined Nonsol flasks. p -Nitrophenol is a more reliable indicator and the soln. that will show a neutral reaction in pure H_2O is prepd. as follows: Titrate 5.0 cc. of a 0.3% soln. in pure H_2O with 0.1 N KOH with Biilmann's quinhydrone electrode as an indicator of the C_H . 0.33 to 0.34 cc. is usually necessary to bring the soln. to p_H 7, the beginning p. d. corresponding to p_H 4.9. The amt. of alkali necessary for the whole vol. of soln. is calcd. from the figures obtained. The amt. of alkali used corresponds to approx. $\frac{1}{3}$ mol. of the indicator soln. the dye powder (being assumed to be 100% pure). CO_2 from the atm. does not seem to affect the colorimetric p_H test. A. P. LOTHROP

A micro-method for the determination of base in blood and serum and other biological materials. WM. C. STADIE AND EFFIE C. ROSS. *J. Biol. Chem.* 65, 735-54 (1925). —A micro-method for the detn. of total base, reliable to 1%, in whole blood, cells, serum and other biological materials is described in which the bases are converted into sulfate, pptd. by standard benzidine-HCl, and the benzidine sulfate is detd. by titration of the excess of benzidine-HCl. The advantage of indirect titration instead of direct titration of the benzidine ppt. lies in the elimination of quant. transfer of a small ppt., of washing the ppt. with Me_2CO , of the transfer of the washed ppt. back into a titrating vessel, of hot titration of the ppt., and of a variable titration blank of filter paper. The method reduces considerably the time and labor necessary for analysis. It is necessary to remove phosphates from biological materials, such as urine, gastric contents, feces, etc., which contain excessive amts. and this may easily be done by pptg. the phosphate as FePO_4 . The original must be consulted for the analytical details. A. P. L.

Method for detecting and estimating bile acids in the urine. E. C. MEYER. *Deut. Arch. klin. Med.* 147, 274-82(1925).—The method involves a detn. of the amt. of NaCl required to produce a certain surface tension of the soln. under examn. An acid soln. has a lower surface tension than a neutral one. The presence of bile acids in the urine. *Ibid* 282-6.—Bile acids are found in almost every urine contg. urobilin, but not always where there is bilirubin. F. B. SEIBERT

C—BACTERIOLOGY

A. K. BALLS

The source of energy of the sulfur bacteria. I. B. BECKING. *Proc. Soc. Exptl. Biol. Med.* 22, 127-9(1924).—Bacteria which deposit S inside or outside the cell are supposed to derive this substance and also their energy from oxidation of H_2S . The organisms occur in waters of p_H 7.6-8.6; this medium has 50-100 times more HS ions than undissociated H_2S . H_2S has a lower energy level than S and is unfit as a source of energy unless a compensating oxidation of H_2 would occur; this is improbable in the low O_2 tension of the black mud in which the bacteria live. Probably the HS or the S ion is the source of energy. C. V. B.

Changes in the virulence and growth characteristics of *Bacterium leprosepticum* following alterations in oxygen tension. L. T. WEBSTER. *Proc. Soc. Exptl. Biol. Med.* 22, 139-41(1924); cf. *C. A.* 19, 1583.—*Bacterium leprosepticum* is so delicately adjusted in its O_2 requirements that it fails to multiply freely or to maintain certain characteristics associated with its virulence unless available O_2 is mech. limited, or the O_2 effect is minimized by the presence of peroxidase. C. V. B.

The influence of the hydrogen-ion concentration on bacteriological processes. F. C. GERRETSEN. *Verslag. Onderzoek. Rijkslandbouwproufst. 30*, 1-44(1925).—G developed a colorimeter, known as the "bioclorimeter" on the same principal as that given by Gillespie (*C. A.* 15, 3650). Centrifuged soil exts. gave results which were comparable with the electrometric detns., while filtering the soil exts. or percolating according to Parker gave unreliable results. Nitrite formation in soln. took place between the p_H range 5.75 and 9.65 with a sharp optimum between 7.5 and 8.2. The equilibria of the nutrient salts at varying H-ion concns. also influenced the nitrite formation.

Nitrate formation took place between p_H 5.4 and p_H 10 with an optimum between 8.1 and 9.2. Formation of nitrite and nitrate was carried out in the same culture medium so long as the p_H remained low even if $(NH_4)_2SO_4$ was present in the solns. Soil suspensions adjusted to various H-ion concns. with definite mixts. of Na_2HPO_4 and HPO_4 and contg. $(NH_4)_2SO_4$ showed that at p_H values 3.7 and 4.0 there was no nitrite or nitrate formation—at p_H values from 5.7 to 7.0 nitrate only was present—indicating the rapid oxidation of nitrite. At p_H values around 8.9 and 9.0 the processes seemed to stand still. It is suggested that the max. quantity of $(NH_4)_2SO_4$ which a soil is able to tolerate at a given time is of practical significance. Soil suspensions, inoculated with active cultures of nitrifying organisms and contg. calcd. quantities of $(NH_4)_2SO_4$, gave results which showed a satisfactory agreement between the buffering power as calcd. from the resulting nitrification and that from titration curves. The buffering power of the soil was found to be a limiting factor in nitrate formation. Bacterial nos. were found to exert little or no influence; however, the moisture content of the soil influenced the rate of nitrite formation and the rate of nitrite disappearance. The soln. of phosphates by the nitrification process depends on the buffer content of the soil. R. M. BARNETTE

Bacterial fermentation, particularly in the coli-typhosus group. W. C. DE GRAAFF AND A. J. LE FÈVRE. *Biochem. Z.* 155, 313–32(1925).—Neuberg's method of fixation with Na sulfite has been extensively employed in an investigation of the production of AcH during the fermentation of a large no. of sugars and polyhydric alcs. by various members of this group of bacteria. AcH is invariably found wherever gas or acid formation takes place. Many of the simpler sugars and related compds., *e. g.*, glyceraldehyde, glycerol, glyceric acid, dihydroxyacetone, pyruvic acid, ethylene glycol, are fermented by certain of the colon organisms with intermediate production of AcH. Support is given to Neuberg's view as to the importance of pyruvic acid as an intermediate substance during bacterial fermentation. The basal medium employed was peptone water contg. Na sulfite, with $CaCO_3$ in suspension. The fermentation of glycol, pyruvic acid, and glycerol by *Bacillus coli* was followed quantitatively and a C balance sheet prep'd. CO_2 , AcOH and H were the main products; only with glycerol were appreciable quantities of succinic and lactic acids formed. The succinic acid is probably formed from pyruvic acid. B. C. A.

Antiseptic action of α -hop-bitter acid and its decomposition products on micro-organisms. W. WINDISCH, P. KOLBACH AND E. RATHKE. *Wochschr. Brau.* 41, 175–220 (1924).—The α -acid (humulone) was ext'd. from lupulin (hop meal) with ether, the soln. evap'd., and the residue dissolved in 80% MeOH to free it from resins. The acid was det'd. by pptn. as Pb salt, which was decomposed with K_2S , and the PbS was collected and weighed. The α - and γ -resins were obtained by decompn. of the α -acid. A series of expts. was made on the influence of H-ion concn. on the decompn. With p_H about 8, the α -acid was completely destroyed after boiling for 8 hrs.; with p_H 5 only half the amt. was destroyed in the same time, the amt. being influenced to a small extent by the nature of the buffer substance employed. The proportion of α - to γ -resin so produced varied from 9:1 under conditions of rapid decompn., to about 5:1 when the decompn. proceeded more slowly. The mixts. of α -acid and α - and γ -resins obtained in these expts. were used for the toxicity tests. 190 cc. of malt ext. were inoculated with 10 cc. of a soln. contg. a culture of *B. delbrücki*, and a known weight of hop ext. dissolved in 2 cc. of 95% alc. was added. After incubating for 4 hrs. at 38–42°, 20 cc. were withdrawn, sterilized, filtered and titrated with 0.1 N NaOH. Further samples were taken at intervals and the increase of acidity was measured. The antiseptic powers of the acid and resins were expressed as percentage increase of acidity of the soln. The results obtained show that the toxic action is proportional to the amt. of substance present up to 6 mg. of hop ext. per 200 cc. A break, however, is shown at about 1.5 mg. which is probably due to colloidal influences. The α -acid showed the max. antiseptic power, an increase of 4% acidity being obtained with 6 mg. per 200 cc., compared with an increase of 40% in the control expt. The toxic power of the α -acid was $1\frac{1}{2}$ –2 times greater than that of the α -resin, while the γ -resin had a toxic power only $\frac{2}{3}$ that of the α -acid. Mixts. of acid and resins had a toxic power equal to the sum of the toxic powers of the constituents. B. C. A.

Fermentation and oxidation of zymohexose in yeast. I. HANS V. EULER AND RAGNAR NILSSON. *Chem. Zelle u. Gewebe* 12, 238–42(1925).—The rate of fermentation of glucose by brewer's yeast measured by the glucose concn. of the fermenting mixt. was not influenced by bubbling air or N through the soln. even in the presence of $FeSO_4$. The addn. of H_2O_2 diminished the rate of glucose destruction, probably due to the poisoning action. A count of the yeast cells showed that the number remained const. in each case. H. J. DEUEL, JR.

The significance of p_H in bacteriology. I. M. KOLTHOFF. *Tijdschr. vergel. Geneeskunde* 11, 268-77(1925); cf. *C. A.* 12, 2343; 13, 1481, 2895; 16, 946.—Results of various investigators show that the growth of bacteria in cultures is brought to a standstill not by the H^+ but by the undissociated acids formed by the growing bacteria. A titrimetric detn. would therefore be of the same value as the p_H detn. The problem is complicated by the simultaneous formation of several acids by the same bacteria and the dependence of this formation on the growth conditions. An investigation, of the influence of undissociated acids is indispensable.

MARY JACOBSEN

Solubility of tubercle bacilli in cod-liver oil. M. D. HORST. *Tijdschr. vergel. Geneeskunde* 11, 320-7(1925).—Landsberg's expts. were repeated. The tubercle bacillus is not easily sol. either in the common yellow, or in the purified oil. The changes observed in the oil are probably due mainly to the influence of air and heat. Mutual action between bacilli and oil is evidenced by the shrinking of the former and a decrease in I value and increase in acid value of oil heated with bacilli in an H atmosphere. Heating with H alone also seems to affect the constants of the oil. The crude oil is less affected.

MARY JACOBSEN

Insulin and microorganisms. L. B. WINTER AND W. SMITH. *Proc. Physiol. Soc., J. Physiol.* 60, v. (1925).—Microorganisms (*B. coli* or yeast) that were shown to contain an insulin-like substance, lost this property after cultivation for several months in pure culture. With *B. coli* activity was regained after lactose replaced glucose in the nutrient soln.

J. F. LYMAN

A new agar-splitting bacterium. K. Aoi. *Centr. Bakt. Parasitenk., II Abt.* 63, 30-2(1925).—The organism was isolated from stable manure and its cultural characteristics are described.

JOHN T. MYERS

The optimum for growth and diastase production of *Aspergillus oryzae*. Y. NISHIWAKI. *Centr. Bakt. Parasitenk., II Abt.* 63, 102-6(1925).—The optimum temp. is 35.5° to 34.5°, the min. 7° to 9°, and the max. 45° to 47°.

JOHN T. MYERS

A thermophilic sulfate-reducing bacterium. L. ELION. *Centr. Bakt. Parasitenk., II Abt.* 63, 58-67(1925).—*Vibrio thermodesulfuricans* is Gram negative, grows in an inorg. medium at 55°, and forms considerable amts. of H_2S .

JOHN T. MYERS

A spirillum which can bind free nitrogen. M. W. BEIJERINCK. *Centr. Bakt. Parasitenk., II Abt.* 63, 353-9(1925).—*Sp. lipoferrum* seems able to bind free N but more work is promised.

JOHN T. MYERS

Hydrogen sulfide production by anaerobic spore-bearing bacteria. M. C. KAHN. *J. Bact.* 10, 439-47(1925).—No essential correlation is observed between the native protein-digesting ability and the H_2S -producing properties of the organisms.

JOHN T. MYERS

Indole studies. W. I. KULP. *J. Bact.* 10, 459-71(1925).—The Böhme-Ehrlich, Goré and Gnezda tests for indole are apparently satisfactory. A good medium for indole production by bacteria should contain free tryptophan. Indole negative organisms do not use indole, nor can they be induced to produce it by continued subculture in a tryptophan medium. Satisfactory p_H for growth of a bacterial species is also favorable for indole production by that species. Indole production is delayed in proportion to the amt. of carbohydrate present, but media contg. small quantities can be used if sufficient buffer is added.

JOHN T. MYERS

The conditions governing the appearance of taches vierges in bacteriophage activity. F. M. BURNET. *J. Path. Bact.* 28, 419-27(1925).—The fundamental differences between the activities of phages seem to lie in the readiness and directness with which the phage can be adsorbed to the specific entity in the bacillus which it is designed to stimulate. Any bacillus in which a direct adsorption of lytic particles occurs becomes a center for lysis. When a lytic particle remains unattached to a sensitive bacillus in a colloid-contg. medium it is progressively weakened, probably by accretion of colloid mols. around it. A strong phage can retain stimulating powers along with a considerable accretion of colloid mols.

JOHN T. MYERS

Acquired tolerance of gonococci in culture to mercurochrome-220 sol. C. C. SÆLHOF. *J. Am. Med. Assoc.* 84, 1267-8(1925).—The lethal dose of mercurochrome-220 sol. for the strains of gonococcus used increased after cultivation of the gonococcus on a medium contg. mercurochrome. Consequently, acquired tolerance of the gonococcus for mercurochrome was demonstrated in the test tube.

L. W. RIGGS

Viability of typhoid bacilli in shell oysters. E. O. JORDAN. *J. Am. Med. Assoc.* 84, 1402-3(1925).—Shell oysters artificially contaminated with typhoid bacilli (by floating for 1 hr. in sea water to which typhoid bacilli had been added) were then placed at ice box temp. (5 to 8°) and found to contain living typhoid bacilli for as long as 24 days. There was no evidence of multiplication, but after the first few days a diminu-

tion in the no. of bacilli was apparent. Of the 3 strains used, the survival period was 21, 22 and 24 days, resp. **Viability of *Bacillus typhosus* in oysters during storage.** F. O. TONNEY AND J. L. WHIRRE. *Ibid* 1403-6.--Shucked oysters were contaminated with typhoid bacilli and stored at 37°, 21° and 7.2°. In the oyster fluid, *B. typhosus* survived in considerable nos. for 1, 4 and 22 days, resp. Living shell oysters were contaminated with large nos. of typhoid bacilli and stored at 21° and at 7.2°. At the former temp., *B. typhosus* survived in the fluid within the shells for 8 days; at the latter temp., which is the ordinary icing temp. of the trade, the organisms survived for 60 days. The exterior of the shells of oysters exposed for 48 hrs. to a 4% soln. of sea salt, contg. large nos. of *B. typhosus*, showed the presence of typhoid bacilli on the 23rd day after storage at 7.2°. Shell oysters with the valves open, moisture evapd. and meat rotten contained typhoid bacilli. In general the temp. best suited for the preservation of oysters tends to prolong the life of the typhoid bacilli in them. L. W. R.

The biogens, inactive mother-substances of the two bioses. EDNA V. EASTCOTT. *Trans. Roy. Soc. Can., Sec. III* [3] 19, 21-4(1925); cf. C. A. 18, 1689.--The increased production of bios I and bios II from infusions of white baking flour and malt combings, resp., when permitted to stand for a time at 25° and 55° is attributed to the presence of inactive substaces called "biogens" from which the corresponding bios is formed. Warming with alkalis converts the biogens into bioses while acids, alcs. or heating dry converts bios II into biogen II. Both biogens are pptd. by lime or baryta in alc. After sepg. of the biogens, bios II was found to be very stable, resisting the action of Fehling soln., neutral KMnO₄, I, H₂O₂, warm concd. H₂SO₄, Ac₂O and AcCl. The biogens have not yet been isolated. Postulating the existence of biogenases explains the irregular behavior of the bioses observed in the production of yeast under controlled exptl. conditions. J. W. SHIPLEY

The reproduction of yeast in solutions in which no bios has been added. DOROTHY WHITEMAN. *Trans. Roy. Soc. Can., Sec. III* [3] 19, 24-5(1926); cf. C. A. 17, 1495.--Reproduction of yeast to a limited extent takes place without bios and also without salts and even without sugar. It is assumed that a certain quantity of bios exists in the yeast cell itself. J. W. SHIPLEY

5-Methylcytosine in tuberculinic acid (JOHNSON, COGILL) 10. Correlation of the sulfite reduction test with other tests in the bacterial examination of water (WILSON, BLAIR) 14.

D--BOTANY

B. M. DUGGAR

Absorption of salts by vegetable cells; epictesis and selection. L. LAPICQUE. *Bull. soc. chim. biol.* 7, 621-37(1925).--A theoretical discussion. A. T. CAMERON

The selective absorption of potassium by plants. G. ANDRÉ AND E. DEMOUSSY. *Bull. soc. chim. biol.* 7, 806-10(1925).--See C. A. 19, 2360. A. T. CAMERON

Rhamnucoside, new glucoside, generator of Chinese green, obtained from the bark and stem of the purging buckthorn (*Rhamnus cathartica* L.). The products of enzymic hydrolysis of rhamnucoside: primeverose and rhamnicogenol. The distribution of rhamnucoside in the genus *Rhamnus*. M. BRIDEL AND C. CHARAUX. *Bull. soc. chim. biol.* 7, 811-21; 822-30(1925).--See C. A. 19, 2107. A. T. CAMERON

Plant reproductive cells. II. The chemical constituents of the spores of *Aspidium filix mas*. ALEXANDER KIESEL. *Z. physiol. Chem.* 149, 231-58(1925).--Successive extrns. of the spores of the fern with Et₂O and EtOH gave 3.95% cerotic acid and 17.06% of oil. Another lot of spores collected in warm summer weather yielded 24.7% of oil. The cerotic acid, which was identical with that from beeswax, seems to occur as a protein complex, since a complete extrn. cannot be effected unless the material is boiled with EtOH. The oil gave the following const.: acid no. 48, ester no. 187.3, sapon. no. 192.1, I no. 104, Ac no. 6.8, insol. fatty acids 88%. The acids consisted mainly of oleic with a small amt. of linoleic. Sapon. of the oil gave 0.87% volatile fatty acid, 8.95% glycerol, 4.92% cholesterol, 0.61% choline, 1.58% H₃PO₄, 0.54% sugar. Less than half of the oil was in the form of triglycerides. The spores contained 1.51% total N, 1.39 protein N (8.69% protein) and 3.69% ash on the basis of dry wt. Direct detn. of sucrose showed 1.77%. Hydrolysis of the extd. residue with 33% H₂SO₄ gave azalaic acid, tyrosine and leucine, which were obtained in cryst. form, and qual. tests for proline. Basic cleavage products were not found in appreciable amt. The insol. residue from the hydrolysis was extd. with 2% NaOH, leaving a residue contg. 13.9% of the N of the original spores. A. W. DOX

Practical method for the determination of the chloride content of plant tissue fluids.

J. V. LAWRENCE AND J. A. HARRIS. *Ecology* 6, 391-6(1925).—A practical method for use in the field is given in detail.

The accumulation of dye in *Nitella*. M. IRWIN. *J. Gen. Physiol.* 8, 147-82 (1925).—When living cells of *Nitella* are placed in aq. solns. of cresyl blue of different concn. at p_H 6.9, the dye enters the cell sap. The greater the concn. of dye in the external soln., the greater is its speed of accumulation in the cell sap and the higher its concn. in the sap at equil. The process is a pseudounimol. reaction in which there is a chem. combination of the dye with a constituent of the cell. It is probably not an adsorption phenomenon because the temp. coeff. is high (about 4.9). Also when the log. of the dye concn. in the cell vacuole is plotted against that in the external soln. the slope of the straight line is 45° , which is not to be expected on the assumption that adsorption has taken place. The following explanations for the accumulation of dye in the cell sap are offered and discussed: (1) That it is a Donnan equil. phenomenon. (2) That the dye combines with cell protein. (3) That the undissociated dye hydroxide enters the cell whereas the dye salt and dye ions cannot enter. Further studies are in progress.

CHAS. H. RICHARDSON

Physiological and biochemical studies on cereals. IV. The presence of amino acids and polypeptides in the ungerminated rye kernel. S. L. JODIDI AND J. G. WANGLER. *J. Agr. Research* 30, 989-94(1925).—Polypeptides and amino acids occur in the ungerminated rye kernel as well as in the ungerminated kernel of wheat (*C. A.* 17, 3524), oats (*C. A.* 18, 2909) and maize (*C. A.* 19, 2361). The amino N in 3 varieties of ungerminated rye averaged 4.82% as calcd. on the basis of the total N, and 0.092% on the basis of the oven-dried kernel. The corresponding values for the peptide N in the same varieties were 6.40% and 0.129%, resp., and for the acid amide N, 4.27% and 0.084%.

W. H. ROSS

Some effects of seasonal conditions upon the chemical composition of American grape juices. J. S. CALDWELL. *J. Agr. Research* 30, 1133-76(1925).—Chem. analysis of the juices of a collection of 66 varieties of grapes grown together under control conditions at Vineland, N. J. were made annually from 1919 to 1923. The range of variation in compn. of the juice of any variety grown under const. conditions in one locality during a series of years is much narrower than the variation encountered on a large number of samples of a given variety grown over a wide area and under a variety of cultural conditions. Differences of soil and cultural conditions appear to affect varietal compn. more profoundly than do variations in environmental conditions encountered over a series of years in one location. There is a very definite and clearly marked effect of climatic conditions during the growing season upon the total sugar content, total astringency and titratable acidity of the fruit produced during that year. Under the environmental conditions in which this work was carried out the amount of sunshine received during the period of growth is subject to the greatest annual variation of the various climatic factors entering into the compn. of the seasonal conditions at Vineland and is the dominant factor in determining the chem. character of the fruit of a large number of grape varieties. Thus the year of max. sunshine for the period of March to Sept. was found to be the year of max. sugar content for a majority of the varieties and also the year of min. acid content and total astringency. Conditions which produce a max. accumulation of sugar in the fruit thus also favor a reduction of titratable acidity and astringent content to a low or min. value. A bibliography of 62 references is appended.

W. H. ROSS

Distribution of lignin in wood. GEO. J. RITTER. *Ind. Eng. Chem.* 17, 1194-7 (1925).—Microscopic and quant. studies of the changes taking place when wood is subjected to the standard procedures used in isolating cellulose and lignin indicate that about 75% of the total lignin is present in the middle lamella which apparently contains no pectins. Another type of lignin is found in the secondary layer of the wood ("cell-wall lignin"). "Middle lamella lignin" retains the general structure of the wood, may be mechanically sepd. from the other lignin, and has a MeO content of 10.8% (in western white pine) and 13.6% (in red alder). The amorphous lignin of the secondary layer contains 4.3-4.8% MeO. Excellent photomicrographs illustrate the article.

LOUIS E. WISE

Constituents of *Myoporum laetum* (McDOWALL) 10.

E—NUTRITION

PHILIP B. HAWK

The development of antirachitic potency in phytosterol and cholesterol following irradiation. A. F. HESS, M. WEINSTOCK AND F. D. HELMAN. *Proc. Soc. Exptl. Biol.*

Med. 22, 227-8(1925).—Phytosterol, obtained from vegetable oils acquired antirachitic properties when irradiated with the Hg vapor quartz lamp. Cholesterol also became antirachitic and spectrograms showed the transmission of a greater intensity and wider range of the short ultra-violet radiations. C. V. B.

A diabetic diet; the line ration scheme. R. D. LAWRENCE. *Brit. Med. J.* 1925, I, 261-2.—Details of an elastic diet scheme for diabetics A. T. CAMERON

Irradiation of milk and the healing of rickets. S. J. COWELL. *Brit. Med. J.* 1925, I, 594-5.—Of 3 children with active rickets 2 received activated milk with marked benefit, the 3rd untreated milk, and remained in a stationary condition. A. T. C.

The causation and prevention of rickets. A WEBSTER AND L. HILL. *Brit. Med. J.* 1925, I, 956-60.—Further exptl work with rats indicating that certain rickets-producing foodstuffs can be made antirachitic by irradiation with ultra-violet light. Cholesterol and vegetable sterols are especially effective. A. T. CAMERON

The action of ultra-violet light upon the growth of rats. MISS M. E. HUME. *Brit. Med. J.* 1925, II, 341-2.—Light cannot be substituted for vitamin A indefinitely for the growth and well-being of the rat (which gradually under such substitution develops much increased tendency to respiratory disease) though it is not yet certain how far A is completely independent of light. Three rats kept in darkness on a diet deficient in fat-sol. vitamins for 4 months (and subsequently for 2 months on the same diet plus 0.4 g. spinach a day) grew slowly and were in fair condition. A. T. CAMERON

Foodstuffs irradiated with ultra-violet light; their effect on the bone lesions of rachitic children. HELEN M. M. MACKAY AND H. F. SHAW. *Brit. Med. J.* 1925, II, 344-5.—Rapid healing of bone lesions in children can be brought about by dried milk irradiated with ultra-violet light from the Hg arc. This antirachitic potency withstands 10 min. boiling. White flour similarly irradiated had little or no effect, and cottonseed oil probably slight effect. A. T. CAMERON

Vitamins. III. The water-soluble factor B. H. SIMONNET AND MISS L. RANDOIN. *Bull. soc. chim. biol.* 7, 678 749(1925)—A review. A. T. CAMERON

Discussion on non-specific disturbances of health due to vitamin deficiency. W. HUNTER, et al. *Proc. Roy. Soc. Med.* 18, 15-24(1925). A. T. CAMERON

Discussion: Is the modification of cow milk necessary in infant feeding? L. FINDLAY, E. PRITCHARD, H. THURSFIELD, R. C. JEWESBURY, H. C. CAMERON, B. MYERS, AND L. PARSONS. *Proc. Roy. Soc. Med.* 18, Sect. Dis. Children, 73-83(1925).—Arguments against and in favor are presented. A. T. CAMERON

The influence of *Ayuga chamaepitis* on the elimination of nitrogen in the normal individual. GIOVANNI MANGIANTE. *Arch. farm. sper.* 40, 58-70(1925).—Dietary expts., of which the author was the subject, showed that a daily addn. of 2.5-5.0 g of *Ayuga* to a fixed diet resulted in a marked retention of N, either by increasing the absorption of alimentary N or by retarding cellular metabolism. No impairment of health was observed during or after the expts. A. W. DOX

Growth factors. VI. HANS V. EULER AND SVEN STEFFENBURG. *Z. physiol. Chem.* 149, 195-202(1925).—The content of fat-sol. growth factor 1D and of antirachitic vitamin A1 in bone marrow and blood far exceeds that of most of the other organs and body fluids. It appears that the fat-sol. growth factor participates in blood formation and that the formed elements of the blood as well as the bone marrow are centers of activity of this factor. An expt. with parathyroid seems to indicate a high growth-promoting action and antirachitic action of constituents of this organ. The growth-promoting action of ultra-violet radiation shows an optimum after a certain period of irradiation or after the absorption of a certain amt. of energy. When this is exceeded an inhibition from unexplained causes is observed which finally exceeds the activation A. W. DOX

Hyperglucemia produced by glycerol. CARL VOEGTLIN, J. W. THOMPSON AND EDITH R. DUNN. *J. Biol. Chem.* 64, 639-42(1925).—"Glycerol given to fasting rabbits produces a hyperglucemia of considerable extent and duration, indicating a conversion of glycerol into glucose." I GREENWALD

Animal calorimetry. XXIX. Fat production in a young hog. M. WIERZUCHOWSKI AND S. M. LANG. *J. Biol. Chem.* 64, 697-707(1925)—"The basal metabolism of a growing hog from the 70th to the 117th day of its life, during which time it increased in wt from 8.5 to 18.1 kg., averaged 1085 cal. per day per sq. m. of body surface, within a \pm variation of 3%. The hog showed a continued capacity for retaining the N of milk protein in large amts. when milk and starch formed the basis of the diet. When starch and glucose were given together on the morning of a day following a large ingestion of starch, the metabolism rose 100% above the basal and the production of fat from carbohydrate amounted to a storage of energy in the form of fat equal to 260% of the basal

metabolism. Estd. on a 24-hr. basis, the hog has a capacity of using ingested carbohydrate so that more than 0.5 of the material is employed for fat construction. After giving starch to a hog the respiratory quotients were maintained at about 1.40 during at least 20 hrs. The highest quotient obtained was 1.58. During 12 hourly periods, the heat calcd. by the indirect method was 417.6 cal., and the "heat eliminated" by the hog (body temp. changes disregarded) was 426.8 cal. . . . Though the production of fat from carbohydrate did not exceed 2 mg. per second, yet in 24 hrs. the rate of production reached at times 125 g. per day or 0.9% of the hog's wt." I. G.

The relation of thyroid secretion to specific dynamic action. L. J. BAUMANN AND LOUISE HUNT. *J. Biol. Chem.* 64, 709-26(1925).—"Complete thyroidectomy (in rabbits) caused a gradual decrease and final disappearance of specific dynamic action after about 65 days. Restoration of specific dynamic action. . . was accomplished by feeding thyroid gland. Incomplete thyroidectomy caused a decrease of specific dynamic action, which would be increased again by feeding thyroid and in some cases by feeding a small amount of KI." I. GREENWALD

Quantitative aspects of the function of vitamin B in several species. G. R. COWGILL, A. H. SMITH AND H. H. BEARD. *Proc. Am. Soc. Biol. Chem., J. Biol. Chem.* 63, xxiii-xxiv(1925).—Data obtained from 3 widely different species of animals (mouse, rat and dog) indicate that the vitamin B requirement is closely related to metabolism. In the adult animal the vitamin B requirement is very closely proportional to the product of: (1) the two-thirds power of the wt., which may indicate surface or "active protoplasmic mass" or whatever the metabolism depends on, (2) the quantity of energy handled as indicated by the total calories utilized from the food, and (3) the body wt. The following formula embracing these factors has been constructed. By it a number called provisionally the "vitamin B constant" may be calcd.

$$\frac{\text{Vitamin B per day}}{\text{Weight}^{2/3}} = K_{\text{vitamin}} \times \text{calories per day} \times \text{weight}, \quad (a)$$

whence

$$K_{\text{vitamin}} = \frac{\text{vitamin per day}}{\text{calories per day} \cdot \text{weight}^{2/3} \cdot \text{weight}} \quad (b)$$

$$K_{\text{vitamin}} = \frac{\text{vitamin}}{\text{calories} \cdot \text{weight}^{4/3}} \quad (c)$$

This formula gives good agreement with exptl. data for adult rats, dogs and mice. During growth some other factor, as yet undefined, appears to affect the vitamin requirement, K_{vitamin} during this period, having a higher value. I. G.

Carbohydrate-phosphate metabolism. J. ABELIN. *Klin. Wochschr.* 4, 1732 (1925).—The respiratory quotient is raised when carbohydrate (glucose, maltose, sucrose or starch) is fed. The respiratory quotient is scarcely elevated and the CO_2 production is increased very little when phosphate is fed with the carbohydrate. From this one would conclude that the carbohydrate is not burned; hence it might be stored as glycogen. Expt. has shown that it is not stored as glycogen. A satisfactory explanation is not given. MILTON HANKE

The influence of hunger, and of diets rich or deficient in sodium chloride, on the gastric secretion. CHRISTINE JAKLE. *Klin. Wochschr.* 4, 2059-61(1925).—The salt content of the diet has no influence upon the acid content of the gastric juice collected either shortly after awakening or after partaking of a test meal. The acidity of the gastric juice is increased by starvation. MILTON HANKE

An improved technique for use with synthetic diets. G. A. HARTWELL. *Biochem. J.* 19, 729-32(1925).—To improve synthetic diets, so that the compn. and texture approximate more closely to those of ordinary foods, mix 22 g. of a sythetic mixt. consisting of 20 g. caseinogen, 64 g. starch, 4 g. salt mixt.) to a smooth paste with warm distd. water at 40°, add 10 cc. of marmite soln. and 3 g. butter (melted) and mix the whole well. Place mixt. in the inner saucepan of a double boiler, the outer pan of which contains boiling water, and stir rapidly until it thickens. BENJAMIN HARROW

Note on the effect of high temperatures on the accessory food factor content of cod-liver oil. H. W. SOUTHGATE. *Biochem. J.* 19, 733-6(1925).—Even when oxygen is excluded, heating cod-liver oil to 300° destroys the antirachitic and growth-promoting factors. BENJAMIN HARROW

Effect of alcohol, under varying conditions of diet, on man and animals, with some observations of the fate of alcohol in the body. H. W. SOUTHGATE. *Biochem. J.* 19, 437-45(1925).—Once the max. concn. of alcohol in the blood has been reached, provided

the subject be at rest, the subsequent rate of disappearance of alc. from the blood is independent of concn. The effect of a previous meal of a foodstuff such as bread and milk in depressing the concn. curve is demonstrated. This is shown to be due not to delayed absorption, but to the fact that a considerable fraction of the alcohol ingested is never manifested in the blood stream. The concn. of alc. in the urine exceeds that of the blood over a period of 1-6 hrs. after ingestion by about 40-50%; the passage of alc. through the kidney into the urine cannot, therefore, be merely a diffusion process.

BENJAMIN HARROW

Biochemical study of by-product yeast. J. S. HEPBURN. *J. Franklin Inst.* 200, 767-70(1925).—Dried by-product yeast was used as the sole source of water-sol. B vitamin in the otherwise complete ration of albino rats for a period of 400 days. Yeast from an industrial alc. plant was given for 11 days, beer yeast for 89 days, alc yeast for 300 days. The rats grew, remained healthy, and reproduced to the third generation. The com. utilization of this trade waste as a source of vitamin B is suggested.

JOSEPH S. HEPBURN

The elaboration of antirachitic vitamin D in germinating seeds. WILHELM STEPP. *Z. Biol.* 83, 99-101(1925).—Vitamin D is not elaborated during generation. F. K.

The action of the parenteral supply of vitamin A and vitamin D in experimental avitaminosis. WILHELM STEPP. *Z. Biol.* 83, 102-6(1925).—Parenteral administration of vitamin A relieves entirely the eye affection caused by the lack of it. Intraperitoneal injection of 2 cc. cod-liver oil every 3 or 4 days showed distinct improvement in rachitic animals.

FRANCES KRASNOW

Vitamin B in the excreta of rats on a diet low in this factor. W. D. SALMON. *J. Biol. Chem.* 65, 457-62(1925).—The consumption of feces by rats on diets low in vitamin B may result in significant error. Addn. of 20% of extd. velvet beans caused resumption of growth in rats when they had access to their excreta although the beans contained no demonstrable amt. of vitamin B. This result may have been due to increased undigested food residues in the intestinal tract which made conditions more favorable for bacterial activity. Rats given 10% of dried feces from this diet grew at a rate comparable with that of Steenbock's rats that received 40% of corn or oats as the source of vitamin B. Efforts should be made, therefore, to reduce fecal consumption to a min in vitamin B diets. Cf. McCollum, *et al.*, *C. A.* 19, 2066.

A. P. LOTHROP

The concentration of vitamin B. II. P. A. LEVENE AND B. J. C. VAN DER HOEVEN. *J. Biol. Chem.* 65, 483-9(1925); cf. *C. A.* 18, 1851, 3638.—The Osborne and Wakeman concentrate of yeast may be further concd. by successive pptn., first by basic Pb acetate and second by Ba(OH)₂. The product obtained contained 5.2% N (calcd. on the ash-free basis) and was potent in daily doses of from 2.0 to 4.0 mg. The mineral impurities can be removed by dissolving in the min. amt. of HCl of 1.19 sp. gr. and adding enough 98% alc. to make the alc. concn. 70%; this product has an elementary compn. approaching carbohydrates, yields reducing sugars on hydrolysis, contains about 4% of N and is potent in daily doses of 1.25 mg.; from it can be obtained by treatment with SiO₂ gel and extrn. at *p*_H 9 a product potent in doses of 0.6 mg. per day contg. 4% of N. The original Pb-Ba ppt. has a P-contg. impurity which is apparently essential for good selective adsorption by SiO₂ gel, for from it the most active material was obtained; it was potent in daily doses of 0.1 mg. contg. 0.015 mg. of N.

A. P. LOTHROP

Is the antirachitic factor of cod-liver oil, when mixed with ground grains, destroyed through storage? E. B. HART, H. STEENBOCK AND S. LEFKOVSKY. *J. Biol. Chem.* 65, 571-8(1925).—"Appreciation of the fact that cod-liver oil has potent antirachitic properties has led to its direct mixing with foods designed for human consumption, particularly infant foods, and also with feeds intended for animal nutrition, especially poultry feeds. Such practice has raised the question of the permanency of the antirachitic properties of this mixt. after several months of storage." Expts. conducted with baby chicks indicate that cod-liver oil mixed with ground grains and stored in covered galvanized iron cans at room temp. retains its calcifying power for at least 6 months.

A. P. LOTHROP

The nutritional requirement of the chicken. V. The influence of ultra-violet light on the production, hatchability and fertility of the egg. E. B. HART, H. STEENBOCK, S. LEFKOVSKY, S. W. F. KLETZIEN, J. G. HALPIN AND O. N. JOHNSON. *J. Biol. Chem.* 65, 579-95(1925).—"The egg production of hens is greatly influenced by the supply in the diet or environment of the antirachitic factor, even when there is plenty of lime in the ration. Groups of hens continued to lay abundantly when given in addition to their ration an exposure to ultra-violet light of 10 min. daily; those not receiving the ultra-violet light decreased their egg production practically to the zero point. Feeding cod-liver oil or irradiating hens after a long confinement to a rachitic ration with

resultant decrease in egg production again stimulates and increases egg production. Irradiation of hens greatly improves the hatchability of the eggs. Under the influence of ultra-violet light hatchability was sustained at 60–70% while in its absence the hatchability receded to zero. Irradiation increased markedly the amt. of lime in the shell as compared with eggs from non-irradiated hens. This fact is of significance in the marketability of the egg. The Ca and P content of the whites and yolks of the two groups was not distinctly different. The developing embryo from the eggs of irradiated hens contained, after 21 days of incubation, nearly twice as much lime as the embryo from non-irradiated hens' eggs. The low hatchability on the rachitic ration is probably related to the low power of the developing embryo to transfer lime from the shell. The antirachitic potency of egg yolks from irradiated hens was approx. about 10 times that of the egg yolks from non-irradiated hens. Fertility of the eggs was not consistently influenced by a paucity or abundance of the antirachitic factor." A. P. LOTHROP

The influence of sunlight on bone development in swine. L. A. MAYNARD, S. A. GOLDBERG AND R. C. MILLER. *J. Biol. Chem.* 65, 643–55 (1925).—Sunlight has a markedly favorable influence on the mineral nutrition of growing pigs fed a ration low in Ca and in the factor aiding Ca assimilation. All the pigs fed on the ration without access to direct sunlight developed characteristic stiffness within 4 months. Sunlight in general also caused an increase in the ash content of the bones and histological studies showed the production of more nearly normal bone. Normal bone is produced only when the diet contains sufficient amts. of Ca. "From a practical standpoint the results indicate that the common observation, that both growing pigs and brood sows keep in better condition and are less likely to develop stiffness on pasture than when they are housed inside, may be explained on the basis of sunlight as well as of feed. It is also indicated that it is good practice to let the pigs spend a part of each day outdoors, in winter as well as summer, whenever the weather is not too severe, and that healthier and better nourished animals may result therefrom." A. P. LOTHROP

Fat-soluble vitamins. XXV. The antirachitic action of irradiated animals on the non-irradiated when placed in the same cage. E. M. NELSON AND H. STEENBOCK. *Am. J. Physiol.* 73, 341–5 (1925); cf. *C. A.* 19, 2691.—The protection from rickets of white rats fed rickets-producing diets by the presence of other rats similarly fed but radiated with ultra-violet light is not due to radiations given off by the treated animals but rather to the presence of antirachitic substances in the excreta. Minute amts. of the excreta from radiated animals seem to protect the non-radiated rats. J. F. L.

The utilization of minerals by ewes during the period of gestation. A. R. WINTER. *Am. J. Physiol.* 73, 379–86 (1925).—Five ewes in the early period of pregnancy showed positive balances for N, S, Mg, P, Na and K in all cases on rations contg. timothy hay or alfalfa as roughage supplemented or not by bone meal. The Cl balances were variable. Of 22 Ca balances, covering nearly all stages of the gestation period, 15 were negative, indicating a poor assimilation of the Ca of timothy and alfalfa hay. J. F. L.

The basal metabolism of some orientals. GRACE MACLEOD, ELIZABETH E. CROFTS AND F. G. BENEDICT. *Am. J. Physiol.* 73, 449–62 (1925).—The basal metabolism of oriental women (7 Chinese and 2 Japanese, college students, living under American conditions) was strikingly low, 10.4% below the Harris and Benedict prediction standard. This is thought to be due to the sp. low cell metabolism characteristic of Orientals and that American and English physiol. standards cannot be applied to Orientals.

J. F. LYMAN

The apparent digestibility of low protein rations by dairy cows. A. E. PERKINS AND C. P. MONROE. *J. Dairy Sci.* 8, 405–14 (1925); cf. *C. A.* 19, 2365, 2971.—All cows were on a ration with a nutritive ratio 1:11, receiving 70% as much protein and 158% as much net energy as called for by the Armsby standard. The observed digestibility of each nutrient in the ration was less than the commonly accepted average digestibility. Et₂O ext. was less than half. Changing cows from distd. to tap H₂O did not affect the results. Cows which had been on a low protein ration previous to the expt. gave results similar to those previously on a liberal ration. There was some indication that molasses in the ration was one factor causing lowered digestibility. FRANK E. RICE

The influence of diet upon the production of mouse carcinoma. W. EBER, FR. KLINGE AND L. WACKER. *Z. Krebsforschung* 22, 359–64 (1925).—Diets rich in cholesterol and scarlet red hasten the formation and metastasizing of exptl. mouse carcinoma. The growth-exciting activity is attributed to the cholesterol, because very often in rabbits fed on a similar cholesterol-rich diet there appears on the bottom of a cirrhosis-like liver injury, a proliferation of the liver sinus walls resembling bile ducts. F. B. S.

The vitamin content of cortex limonis, Brit. Pharm.; preliminary note. S. G. WILLIMOTT AND F. WOKES. *Pharm. J.* 115, 164–8; *Chemist & Druggist* 103, 187–8

(1925).—Feeding expts. on rats showed that lemon peel contains considerable quantities of vitamin, although not sufficient to insure growth at the max. rate. Expts. are under way to clear up the wide divergence in growth and well-being between the male and the female rats receiving lemon peel, as the latter failed to respond to a subsequent doubling of the supply of lemon peel, or to adding the known fat-sol. A requirement for the rat. The vitamins A, B and C are all readily sol. in alc. of 75–90%. Fat-sol. A becomes less sol. as the alc. strength decreases. Vitamin C is the most easily affected by heat in even weak alk. soln. (C. A. 14, 192); the presence of the org. acid is a protective in heating (C. A. 14, 2016) and in drying (C. A. 12, 2612). A bibliography of 22 references* is given.

S. WALDBOTT

Tissue changes following deprivation of fat-soluble A vitamin. S. B. WOLBACH AND P. R. HOWE. *J. Exptl. Med.* 42, 753–77(1925).—The sp. tissue changes which follow the deprivation of fat-sol. vitamin A in albino white rats and in the human concerns epithelial tissues. These pathol. changes are described in detail. C. J. W.

Influence of high-protein diet on the kidneys. A. J. MILLER. *J. Exptl. Med.* 42, 897–904(1925).—No evidence of kidney damage (blood uric acid and urea detns. and microscopic examns. of the tissues) was found in rats fed on diets contg. protein varying in amt. from 1.36 to 40.13% (derived mainly from grain, casein, meat and milk with carbohydrate, fat and vitamins). There was evidence of kidney hypertrophy consisting of increased wt. of the kidney, large diams. of the capillary tufts, convoluted tubules and kidneys in the animals receiving high-protein diet. C. J. WEST

F— PHYSIOLOGY

ANDREW HUNTER

A study of the occurrence of peptide nitrogen in the blood. W. W. SWANSON. *Proc. Soc. Exptl. Biol. Med.* 22, 193–4(1924).—Tungstic acid blood filtrate was boiled with satd. Ba(OH)₂ soln. for 20–24 hrs. The Ba was pptd. with H₂SO₄ and the Folin method was used to det. free and hydrolyzed amino acids. The difference between free and total amino acid N was considered as peptide N and this constituted 72–93% of the undetd. N of human blood. C. V. B.

Blood calcium in relation to sex in pigeons. O. RIDDLE AND H. E. HONEYWELL. *Proc. Soc. Exptl. Biol. Med.* 22, 222–5(1925).—The detns. were made by the method of Kramer and Tisdall and include appreciable but unknown amts. of Mg. The results fall into sex groups; the females had notably higher amts. of Ca in the blood. No classification could be made on the basis of health, age or body wt. The females included those actively producing eggs. C. V. B.

Intermediary carbohydrate changes in the muscles under identical conditions of gas metabolism (normal, starvation, insulin action). IX. T. BRUGSCH, H. HORSTERS AND J. VORSCHÜTZ. *Biochem. Z.* 158, 144–66(1925).—CO₂ production, O₂ utilization and changes in sugar, lactic acid, H₃PO₄ concn. of muscle tissue suspended in Ringer soln. in closed flasks was followed under various conditions, and indicated the importance of δ -fructosediphosphoric acid as a factor in intermediary carbohydrate metabolism in muscles. Cf. C. A. 19, 3302.

F. A. CAJORI

A red pigment prepared in a pure condition from human urine by treatment with *p*-dimethylaminobenzaldehyde. G. SCHEFF. *Biochem. Z.* 158, 167–9(1925).—Crystals of a red pigment, similar to those described by Hari (C. A. 15, 2446), were obtained by boiling normal urine with animal charcoal, extg. the charcoal with EtOH and treating with the aldehyde reagent. **Determination of a red pigment produced from human urine by treatment with *p*-dimethylaminobenzaldehyde.** *Ibid.* 170–5.—Measurements in the spectrophotometer of the extinction coeff. of alk. solns. of the red pigment prepd. from urine permits detn. of the concn. of this pigment in urine samples. It was found that on meat diets the pigment was excreted in greater amts. and its origin is probably in the food proteins.

F. A. CAJORI

The chlorination of fluids in its relation with the velocity of mineral exchanges and the selective character of cellular permeability. W. MESTREZAT AND MISS Y. GARREAU. *Bull. soc. chim. biol.* 7, 860–7(1925); cf. C. A. 19, 1807, 2292, 2346.—The presence of NaCl in fluids allows exchanges (anions of waste products or for anabolism) with the tissues to be effected with the rapidity necessary for life. Cations are generally integral parts of the tissues. While other factors (variable polarization, solubility in membranes, etc.) may play a part, the presence of NaCl in tissue fluids seems to be the primordial cause of the phenomena of selectivity. The approx. 0.1 N concn. of NaCl in the blood is that which is found experimentally to be most efficacious in augmenting

the velocity of diffusion of univalent and divalent ions, those most abundant in the organism.

Basal metabolic determinations in 250 Winnipeg school children. A. T. CAMERON. *Can. Med. Assoc. J.* 15, 1022-5(1925).—As detd. with clinical app., distinctly higher values have been found for normal children than Benedict's and Talbot's predicted figures. The differences are attributed chiefly to climatic effects. Of 163 goitrous children examd. probably not more than 2.5% were definitely above max. normal limits, and none was definitely below.

Action of carbon dioxide on organic oxidations. A. OZORIO DE ALMEIDA. *J. physiol. path. gén.* 23, 525-31(1925).—In frogs intact or with the cord sectioned increase of CO_2 tension produces an exaggeration of the respiratory exchanges, while in frogs with the nervous system destroyed it produces a marked reduction. CO_2 has therefore an inhibiting action on tissues, which is masked in the normal animal.

The humoral transmission of the excitation of cardiac nerves. M. POPPER AND G. RUSSO. *J. physiol. path. gén.* 23, 562-71(1925).—Stimulation of the autonomic nerves of the frog heart produces sp. substances whose action seems to be similar to that of the nerves themselves. Their nature is not known, but they do not appear to be sp. to species, since, obtained through stimulation of the vagus nerve of the rabbit, they are active to the frog heart.

Renal perfusion. P. CARNOT AND P. RATHERY. *J. physiol. path. gén.* 23, 625-37(1925).—Dogs in a condition approaching anesthesia caused by removal of half their blood had their kidneys perfused *in situ* with 0.4% citrated blood from other dogs, the kidneys functioning normally during the expt. and the urine being free from blood and albumin. The blood used for perfusion was modified as desired. Urea is always coned. in kidney secretion, but NaCl may show increased or decreased concn. The concn. of urine glucose is always less than that of blood for normal blood, but concn. appears to take place when there is considerable hyperglucemia.

The regeneration of carbohydrate in the muscle of warm-blooded animals. S. JANSSEN AND H. JOST. *Z. physiol. Chem.* 148, 41-61(1925).—During rest the blood-perfused muscle of warm-blooded animals takes up small amts. of glucose and returns similar amts. of lactic acid to the circulation. After raising the lactic acid picture by infusion, the resting muscle takes up large quantities of this substance from the blood. Directly after discontinuance of the infusion the extn. of lactic acid ceases and the lactic acid is then gradually given back. In this period of liberation the arterial picture drops very rapidly to nearly normal. Hence it is not the musculature, for which no definite basis for an oxidative carbohydrate synthesis can be recognized, but other organs which remove the greater part of the lactic acid from the body. Since only an insignificant portion of the infused lactic acid is excreted by the kidneys, the inference is that the liver takes up the lactic acid and utilizes it for carbohydrate synthesis. The disintegration of carbohydrate whereby energy is supplied occurs in the muscle, while the regeneration of the source of energy takes place in the liver at the expense of all nutrients.

The chemism of rigor mortis. HANS-JOACHIM DEUTICKE. *Z. physiol. Chem.* 149, 259-97(1925).—In rigor mortis a considerable increase in lactic acid and H_3PO_4 occurs. This acid formation is not the direct cause of rigor, since a reduction in amt. of acid by treatment of the stimulated muscle with O does not prevent the onset of rigor. Other factors are of greater importance, such as alterations in the muscle colloids which bring about a loss of ability to esterify H_3PO_4 with carbohydrate under the favorable influence of F ions. These colloid changes are probably a sequence of the acid formation during previous stimulation, along with other deleterious influences, in such manner that the acid shocks of stimulation result in an irreversible change in the colloids which continues after the acid action has ceased. In advanced rigor the muscle loses its ability to esterify H_3PO_4 but still retains the power of splitting added hexosediphosphoric acid into lactic acid and H_3PO_4 . Hexosediphosphoric acid was the only substance the addn. of which resulted in lactic acid formation. Addn. of glycogen had no effect. This behavior corresponds to earlier observations on press juice and supports the view that the intramuscular degradation of carbohydrate to lactic acid requires an intermediary synthesis with phosphate, especially since the capacity of the musculature to synthesize hexosediphosphoric acid under the strongly favoring influence of F ions is completely lost in rigor mortis.

The normal bilirubin content of blood. GYULA FÖRSTER. *Klin. Wochschr.* 4, 1689-90(1925).—Treat 2 cc. of serum with 3-4 cc. of colorless acetone, filter and exam. the clear filtrate colorimetrically, for bilirubin. The color is entirely due to bilirubin because lipochromes are not present in normal serum. A 1:6000 soln. of $\text{K}_2\text{Cr}_2\text{O}_7$

is used for comparison. The minimum amt. determinable is 0.2 mg. %. The normal bilirubin value may vary from 0.2 to 1.0 mg. %; hence a value in excess of 0.5 mg. %, the former upper limit of normality, does not necessarily indicate disease. M. H.

The specific dynamic action of protein in children before and during the period of puberty. OSKAR GÖTTCHÉ. *Klin. Wochschr.* 4, 2062-4(1925).—The sexual hormone and the thyroid hormone increase the basal metabolic rate and decrease the specific dynamic action of protein. The action of the hypophyseal hormone is the reverse of the above. In short, the hypophysis is antagonistic to the thyroid and to the sex glands. Ingestion of protein by adults increases the oxidation process by 30%. In young children (pre-puberty period) protein calls forth only a 20% increase in the oxidation rate. In such children the hypophysis and thyroid are active; but the sexual hormone is absent. The action of the hypophysis is predominant. The early stages of puberty are characterized by a 10-35% increase in the basal metabolic rate and a marked decrease in the specific dynamic action of protein, the mean value being about 5% as compared to 30% in adults. The influx of the new hormone has destroyed the previously existing balance between hypophysis and thyroid with a temporary suppression of the hypophyseal activity. The period of puberty is associated with a tendency to establish a new balance between the endocrine organs so that the basal metabolic rate steadily decreases to normal and the specific dynamic action of protein steadily rises to the adult value of 30%. MILTON HANKE

Distribution of phosphorus compounds in the blood. R. V. STANFORD AND A. H. M. WHEATLEY. *Biochem. J.* 19, 706-9(1925).—The av. figures are (representing per cent of total P): in plasma, inorg. 5, lipin 10, "unknown" 0; in corpuscles, inorg. 3, lipin 17, "unknown" 65. BENJAMIN HARROW

Excretion of purine derivatives. FINAR LANGFELDT AND JÖRGEN HOLMSEN. *Biochem. J.* 19, 717-23(1925).—In dogs on a meat diet purine derivs. are excreted in amts. which largely exceed the purine content of the meat; also, dogs on a purine-free diet excrete such large amts. of purine derivs., that a synthesis is most plausible. The expts do not permit conclusions as to which amino acids may be the raw materials for the synthesis of purines. The amt. of the synthesized allantoin and uric acid varies in the different dogs on the same diet. BENJAMIN HARROW

The presence of glutathione in the corpuscles of mammalian blood. H. F. HOLDEN. *Biochem. J.* 19, 727-8(1925).—Four liters of sheep blood was freed from protein with tungstic acid (see C. A. 13, 2541) and the ppt. was well washed with cold water. To the united filtrate and washings was added 35 cc. of 10% HgSO_4 in 5% H_2SO_4 for each liter of fluid. The ppt. was filtered off, washed with cold water, decomposed with H_2S , and the H_2SO_4 exactly removed with baryta. The filtrate was concd. under diminished pressure to 50 cc and enough H_2SO_4 added to make the soln. semi-normal. Phosphotungstic acid dissolved in 0.5N H_2SO_4 was added till the max. ppt. was obtained. The ppt. was filtered off, washed, decomposed with baryta, the Ba tungstate removed by filtration and the excess baryta removed with H_2SO_4 . The soln. was concd. to a sirup and on the addition of alc. a white powder was pptd. The product proved to contain "neutral" S and amino N. After reduction it yielded the nitroprusside reaction. It had the same m. p. as glutathione from other sources, and when mixed with a specimen of pure glutathione from yeast the m. p. was unchanged. After acid hydrolysis characteristic crystals of glutamic acid hydrochloride were obtained. No trace of the glutathione could be found in sheep plasma, but it is present in the corpuscles of sheep, goats, rabbits and rats in the reduced form. The glutathione is apparently the chief optically active constituent of deproteinized blood other than glucose; and as such is responsible for the effects recorded by Wintgr and Smith (C. A. 17, 2736) and others, and quoted as evidence in favor of the presence of an unstable modification of glucose. The glutathione probably accounts for the "neutral" S in blood. B. H.

Relation between the pancreas and the carbohydrate metabolism of muscle. II. Antiglyoxalase and glyoxalase. D. L. FOSTER. *Biochem. J.* 19, 757-67(1925); cf. C. A. 18, 3210.—The factor in the pancreas able to inhibit the production of lactic acid by chopped muscle *in vitro* is not antiglyoxalase. The "antiglyoxalase" is probably due to the action of some factor in the pancreas on phenyl-glyoxal rather than on glyoxalase. Rabbit muscle does not contain glyoxalase and here lactic acid is produced without the action of glyoxalase; presumably, therefore, the lactic acid does not arise from methylglyoxal. The glyoxalase used in these expts. was obtained from minced chicken muscle. BENJAMIN HARROW

Some observations on the normal sugar content of blood and the sugar tolerance test. S. L. BHATIA AND G. CORLHO. *Indian J. Med. Research* 13, 41-51(1925).—In

non-vegetarians the av. blood sugar was lower, tolerance for carbohydrates greater and glycosuria less common than in vegetarians. The significance is discussed. F. K.

The transition of plasmalogens into plasmal with special reference to gastric conditions during digestion. K. VOIT. *Z. Biol.* 83, 223-30(1925).—The action of acids in changing plasmalogen into plasmal (*i. e.*, to make manifest the aldehyde groups) is a function of the H ion, time and temp. When gastric acidity is sufficient for peptic digestion, the greater portion of plasmalogen is changed to plasmal. F. K.

The isoelectric point of muscle proteins. EDGAR WÖHLISCH AND HANS SCHRIEVER. *Z. Biol.* 83, 265-82(1925).—The isoelec. point values for the various substances studied are: "ammonium sulfate myosin" $p_H = 5.4$; "dialysis myosin" $p_H = 4.8$; myogen $p_H = 4.4 \pm 0.2$; myoprotein $p_H = 3.3$. The hypothesis of Hill and Meyerhof, that the contraction of muscle is dependent on protein ionization, may be applied. Myosin may act as the contraction protein while myogen may play the role in buffering the acid formed.

FRANCES KRASNOW

The reciprocal transformation of creatine and creatinine. AMANDUS HAHN AND HUGO FASOLD. *Z. Biol.* 83, 283-8(1925).—After many subcutaneous injections of creatine, creatinine excretion did not increase. Moreover, the injected creatine was not recovered. In being utilized by the body, it is transformed into a substance yet unknown.

FRANCES KRASNOW

Elimination of carbon monoxide from the blood. A theoretical and experimental study. W. C. STADIE AND K. A. MARTIN. *J. Clin. Invest.* 2, 77-91(1925).—An equation is derived for the relation between hemoglobin, O_2 , CO and p_H at equil. Expts. *in vitro* substantiate it. Increased H-ion concn. hastens the elimination of CO in dogs regardless of the rate of ventilation, thus explaining the chief beneficial effect of CO_2 inhalation. Hyperventilation with air has little effect upon CO elimination. CO alters the O_2 dissociation curve, which results in marked lowering of partial pressure of O_2 in the capillaries, giving the basis for anoxemia.

LOUIS LEITER

The isolation from blood of a hitherto unknown substance, and its bearing on present methods for the estimation of uric acid. GEORGE HUNTER AND BLYTHE A. EAGLES. *J. Biol. Chem.* 65, 623-41(1925).—A new substance, believed to be a simple pyrimidine nucleoside and having the empirical formula $C_6H_{11}N_2O_3$, has been isolated from pig blood. It is also present in human whole blood to the extent of 10 to 12 mg. per 100 cc. and is confined entirely to the corpuscles. The amt. varies over a wide range even in the same individual. The substance gives a blue color with phosphotungstic and arsenophosphotungstic acid uric acid reagents in the presence of either Na_2CO_3 or NaCN. Its presence in human blood is made more conspicuous by using Na_2CO_3 , as with this alkali the reagent is less sensitive towards uric acid. "The behavior of the new substance has been quant. studied with the old and new uric acid reagents and the conclusion has been reached that the discrepancies between the direct method of Benedict and the pptn. method of Folin and Wu for the estn. of uric acid in human blood are due to the fact that this new substance adds to the values obtained for uric acid by the direct method. The substance which has now been isolated is that mainly responsible for the direct 'uric acid' values recently obtained in animal bloods by Bulmer, Eagles and Hunter (*C. A.* 19, 1437), and is separable from uric acid in blood filtrates by the pptn. method of Folin and Wu." The substance is also present in dog, rabbit and other animal bloods.

A. P. LOTHROP

Energy expenditure of women during horizontal walking at different speeds. H. M. SMITH AND DOROTHY B. DOOLITTLE. *J. Biol. Chem.* 65, 665-76(1925).—"The energy expenditure of women during horizontal walking is of the same degree as that of men when walking at moderate speeds, (60 and 90 m. per min.); this value is from 0.45 to 0.55 g. cal. per horizontal kilogrammeter. The energy expenditure is greater at an abnormally slow speed (30 m. per min.) than at moderate speeds. The menstrual period appears to be without definite influence on the standing metabolism." A. P. L.

Studies of gas and electrolyte equilibria in blood. VIII. The distribution of hydrogen, chloride and bicarbonate ions in oxygenated and reduced blood. D. D. VAN SLYKE, A. BAIRD HASTINGS, C. D. MURRAY AND JULIUS SENDROY, JR. *J. Biol. Chem.* 65, 701-28(1925).—"The distribution of the diffusible ions, H^+ , Cl^- , and HCO_3^- , between serum and cells of horse blood has been studied over the p_H range 7.0 to 7.6, and in oxygenated and reduced blood. The exptly. detd. distribution ratios are related as follows: $[\alpha_{H^+}]_s/[\alpha_{H^+}]_c = 0.77$ $[Cl]_s/[Cl]_c = 0.62$ $[HCO_3]_s/[HCO_3]_c$; α_{H^+} represents hydron activity electrometrically detd. and $[Cl]$ and $[HCO_3]$ represent molalities, in terms of moles of chloride and bicarbonate per kg. of H_2O . The activity coeff. of HCO_3 in serum estd. from detd. $[H_2CO_3]$, $[BHCO_3]$, and p_H values was found to be related to the ionic strength in the manner predicted for salt solns. by the theory of Debye and

Hückel. For cells, however, the ionic strength as calcd. by us indicated a much greater activity coeff. than that found. It appears that in cells unknown factors influence either the activity coeffs. or the potential readings obtained with the H electrode. The changes in the distribution of α_{H}^+ , Cl, and HCO_3 between serum and cells with change in serum p_{H} and in degree of oxygenation of the hemoglobin approximate those predicted by Van Slyke, Wu, and McLean (*C. A.* 17, 3046), from changes in base-binding power of the cells and serum proteins caused by varying p_{H} and oxygenation." A. P. L.

The influence of protein concentration on the conductivity of human serum. D. W. ATCHLEY AND EMILY G. NICHOLS. *J. Biol. Chem.* 65, 729-34 (1925).—When human serum proteins which have been prepd. so they suffer few, if any, phys. changes during their prepn. are added at p_{H} 7.4 to a pure salt soln. of sp. cond., about 136×10^{-4} at 25°, each additional g. of protein per 100 cc. was found to decrease the cond. of the salt soln. 1.58%. This produces a cond. of about 120×10^{-4} for 7.5% protein. A. P. L.

Changes in the composition of the urine after muscular exercise. D. W. WILSON, W. L. LONG, H. C. THOMPSON AND SYLVIA THURLOW. *J. Biol. Chem.* 65, 755-71 (1925); cf. *C. A.* 19, 1730.—The strenuous exercise consisted of running up and down a flight of stairs as rapidly as possible while swinging the arms vigorously during short periods of from 1 to 3 min. The urine was collected in 10-min. periods. There was a diminution in the urine vol. which could not be overcome by drinking even large amts. of H_2O but there was no evidence of perspiration so that there was no excessive losses by way of the skin and lungs. The urinary acidity increased to p_{H} 5.5 to 5.0 irrespective of the reaction during the fore period. The titratable acidity was nearly doubled and the NH_3 increased 2-5 times. The excretion of inorg. phosphates increased and that of chlorides decreased. There was no significant change in creatinine. These changes reached a max. within 20 to 30 min. and normal values were again found within 40 to 90 min. after 1 to 2 min. of exercise. **The excretion of lactic acid in the urine after muscular exercise.** S. H. LILJESTRAND AND D. W. WILSON. *Ibid.* 773-82; cf. *C. A.* 19, 1730.—The excretion of lactic acid in the urine after 2-3 min. of strenuous exercise (stair running) was studied in 10 and 15 min. periods. The excretion reached max. values varying from 86 to 630 mg. during the 2nd 10 min. period and the elimination thereafter diminished and reached normal values in 30-50 min. The total amt. excreted after one period of exercise varied from 140 to 1370 mg. and similar amts. were excreted after a 2nd period of exercise following shortly after the 1st. The acid excreted was *d*-lactic acid; Zn sarcosylate was isolated. A. P. LOTHROP

The influence of orally administered calcium salts on the serum calcium of normal and thyreoparathyroid dogs. A. M. HJORT. *J. Biol. Chem.* 65, 783-95 (1925).—The absorption of Ca salts such as the lactate, chloride, and glycerophosphate is rapid enough definitely to increase the amt. of serum Ca when these salts are administered orally in amts. equiv. to 0.2727 g. of CaO per kg. of body wt. Results with the relatively insol. salts such as CaCO_3 are inconst. The sol. salts simulate the insol. ones if given in amts. equiv. to less than 0.2727 g. of CaO. Ca lactate is preferable to CaCl_2 even though it must be given in greater bulk as it is less irritating to the gastric mucosa. Orally administered Ca salts control tetany by increasing the blood Ca level of parathyroid dogs. A. P. LOTHROP

Physiological effect of hot air baths. CORNELIA G. BENEDICT, F. G. BENEDICT AND E. F. DUBOIS. *Am. J. Physiol.* 73, 429-48 (1925).—The effects of exposing the nude human body to dry hot (85°) air on body wt., rate of metabolism, pulse, respiration and body temp. are noted. The large loss in body wt. is practically all H_2O rather than org. matter. J. F. LYMAN

The excretion of carbon dioxide by frog nerve. C. H. PARKER. *J. Gen. Physiol.* 8, 21-31 (1925).—Quiescent sciatic nerve of the frog discharges CO_2 at the av. rate of 0.00876 mg. per g. nerve per min. When steeped 1 min. in boiling H_2O , it discharges first at a low rate and in $1\frac{1}{2}$ hr. not at all. Degenerated sciatic nerve discharges at a slightly higher rate than normal nerve. Connective tissue discharges at a rate of 0.0097 mg. per g. per min. av. It is estd. that the strictly nervous components of a nerve have a rate of 0.008 mg. CO_2 per g. per min. The CO_2 production for stimulated sciatic nerve is 14% over quiescent nerve; corrected for the strictly nervous components the increase is 16%. This increase was not observed on stimulation of normal nerves after boiling, blocking or degeneration nor in stimulated strands of connective tissue. Cf. *C. A.* 19, 2523, 2986. CHAS. H. RICHARDSON

Metabolism under reduced atmospheric pressure. A. JAQUET. *Schweiz. med. Wochschr.* 55, 755 (1925); *J. Am. Med. Assoc.* 85, 1096.—On the basis of Ehrlich's theory that arsenicals are toxic only when the As is in the trivalent state, J. employed the min. lethal dose of quinquivalent arsenicals (atoxyl and Na cacodylate) as a means

to measure the reduction processes in the rabbit under various atm. pressures. Under a pressure corresponding to an altitude of 1800 m., the lethal dose of these arsenicals is reduced by 22 to 23%, as compared to the lethal dose at sea level. This proves that at an altitude which usually does not produce any subjective symptoms, the metabolic processes are altered.

Physiological action of ovarian fluid. W. J. BERESIN, W. W. PETROWSKY AND G. A. MALOFF. *Arch. ges. Physiol.* (Pflüger's) **209**, 170-6(1925).—Upon the frog heart ovarian fluid exerts a strong and protracted stimulating action, expressed by an increased amplitude, both systolic and diastolic. With the rabbit heart there is also, as a rule, an increased amplitude but in some instances, particularly when the heart first comes in contact with high concns. of the fluid, the amplitude is diminished. Upon the vessels of the frog liver the fluid is without obvious effect although it causes a constriction of the vessels of the rabbit ear. The fluid has a sensitizing effect in that it intensifies the action of minimal doses of adrenaline.

Physiology of intestinal motility. FRITZ SCHNELLER. *Arch. ges. Physiol.* (Pflüger's) **209**, 177-217(1925).—An analysis of the relationships between peristalsis and tonus under different conditions.

A preliminary study of the chemistry of post-mortem blood and spinal fluid. G. W. PUCHER AND LILLIAN A. BURD. *Buffalo General Hospital Bull.* **3**, 11-3(1925).—A comparative analysis of post-mortem blood and spinal fluid is presented. The greatest differences are found in the uric acid, amino acids and CO_2 . The quantities in the spinal fluid are always smaller than those in the blood. The detn. of urea N, sugar and creatinine in post-mortem spinal fluids may be of value in confirming pre-mortal blood chemistry.

Relationship of the chemical constituents of blood and cerebrospinal fluid. L. S. KUBIE AND GERTRUDE M. SHULTS. *J. Exptl. Med.* **42**, 565-91(1925).—If due allowance is made for the slow rate of elaboration of cerebrospinal fluid and for the time that it takes for newly formed fluid to emerge from a needle in the cisterna, the amt. of sugar, chloride and non-protein N in the fluid seems to follow in a general way their concns. in the blood serum. It is equally evident, however, that for any substance other factors besides its concn. in the blood stream play a part in its distribution between blood and cerebrospinal fluid. Many analytical data are given for samples from humans and dogs.

Urobilin physiology and pathology. V. The relation between urobilin and conditions involving increased red cell destruction. ROBERT ILMAN AND P. D. McMASTER. *J. Exptl. Med.* **42**, 619-40(1925); cf. *C. A.* **19**, 2530.—Animals rendered urobilin-free by the collection of all the bile from the intubated, uninfected common duct remain urobilin-free during and after extensive blood destruction caused by intravenous injections of distd. H_2O , as also after reinjections of the animal's own blood, hemolyzed *in vitro*. No urobilin appears in the bile, urine or feces of animals so intubated when blood destruction has been caused by Na oleate, or by an agent, toluylenediamine, which damages the liver as well as the blood. On the other hand, when bile flow into the intestine is uninterrupted, urobilinuria occurs during blood destruction caused in any of the ways mentioned and it parallels, both in severity and duration, the destructive process. Merely increasing the amt. of bilirubin within the intestines of healthy dogs by feeding urobilin free bile will lead to marked urobilinuria. The effects of other physiol. and pathol. conditions are discussed. The results indicate that urobilinuria, occurring during blood destruction, is primarily the result of an increased excretion of bilirubin from which, in turn, an unusually large quantity of urobilin is formed within the intestine. The liver fails to remove from the portal blood all of the latter pigment which is reabsorbed and consequently some of it reaches the kidneys and urine.

Study of the metabolism of salicylic acid. E. G. HOLMES. *J. Pharmacol.* **26**, 297-314(1925).—After the ingestion of salicylates by a normal individual on a mixed diet, salicylic acid was isolated from the urine, and identified (soly., NH_2 and total N content and m. p.). For doses of Na salicylate of from 2 to 5 g., the salicylic/salicyluric ratio is constant at the value of 40/60. This ratio, after the ingestion of 1.5 synthetic salicyluric acid, reaches the value of 8/92. The distn. method for the detn. of total salicyl in urine, as described by Hanzlik, is not satisfactory when solns. of pure salicyluric acid in urine are employed. No evidence has been found for the destruction of salicylic acid in the body. No salicylglucuronic compds. were excreted in these expts.

C. J. WEST

G—PATHOLOGY

H. GIDEON WELLS

Diphtheria toxin-antitoxin titration by Ramon method for practical application. O. R. POVITZKY and E. J. BANZHAF. *Proc. Soc. Exptl. Biol. Med.* **22**, 11-3(1924).—The Ramon method depends upon a flocculation which occurs in toxin-antitoxin mixts. of certain proportions, and is absent in an excess or deficiency of either ingredient. 2.5 cc. of a potent stable toxin, titrated for its L+ and flocculation values, were placed in each tube, and varying amts. of undil. serum were added. The tubes were incubated at 50°. The first tube to flocculate indicated a nearly neutral mixt. and from this the antitoxin value was calculated. The results agreed closely with guinea pig tests.

C. V. B.

A chemical study of tuberculin. J. H. MUELLER. *Proc. Soc. Exptl. Biol. Med.* **22**, 209-11(1925).—Old tuberculin prepd. from glycerol infusion broth gives a pptn. reaction with good immune sera in a diln. of 1-1000, and a skin test in tuberculous guinea pigs in a diln. of 1-50 to 1-100. After several pptns. with alc., AcOH pptd. a substance which gave a powerful skin reaction in high diln. but a weak pptn. reaction. A tannic acid pptn. gave no skin reaction at the ordinary diln. but gave a pptn. reaction at a diln. of 1-40,000. By the use of synthetic media and fractional alc. pptn. followed by dialysis, a substance was obtained which gave a pptn. reaction in a diln. of 1-1,000,000. This material in a diln. of 1-100 gave a doubtful or negative skin test.

C. V. B.

A spasm-inciting substance in the sputum during asthmatic attacks. J. HARKAVY. *Proc. Soc. Exptl. Biol. Med.* **22**, 225-6(1925).—Sputa were obtained from 8 cases of bronchial asthma during the height of the attack. An alc. ppt. was dissolved in Tyrode soln. and tested on strips of smooth muscle from cat intestine suspended in Tyrode soln. The ext. contained a substance which stimulated unstriated muscle to sustained contraction. Negative results were obtained from cases of pulmonary tuberculosis, bronchiectasis, normal individuals and from asthmatic patients in the interval of attacks.

C. V. B.

The condition of enzymes during recurrent typhus. A. A. GUERQUÉ. *J. physiol. path. gén.* **23**, 617-24(1925).—Blood enzymes show great variations, protease and catalase each showing a sp. type curve. Between the 2 there is often an antagonism, the value for each depending on the gravity of the infection. With the complication of lobar pneumonia a different type of curve is developed for catalase.

A. T. CAMERON

The cerebrospinal fluid in lead poisoning. C. V. WELLER and AILEEN D. CHRISTENSEN. *Arch. Neurol. Psychiatry* **14**, 327-45(1925).—The cerebrospinal fluid in Pb-meningo-encephalopathy is clear, sterile and shows increased pressure, cells, globulin content, and probably sugar. Fairhall's improved hexanitrite test apparently has demonstrated passage of Pb in the cerebrospinal fluid of Pb-poisoned rabbits.

A. T. C.

Cerebrospinal fluid sugar. F. FREMONT-SMITH and MARY E. DAILEY. *Arch. Neurol. Psychiatry* **14**, 390-5(1925).—Spinal fluid, as well as blood plasma, contains reducing substances other than glucose, which disappear on hydrolysis, and may amt. to more than 10% of the total "sugar." The hyperglucemia following sugar-tolerance tests is reflected in the lumbar spinal fluid only after a latent period following the administration of glucose, by which time the blood sugar may have fallen below the cerebrospinal fluid value. Hence no statement can be made at present as to the normal ratio of spinal fluid sugar to blood sugar, nor can the normal limits of the former be stated. Values for it above 80 mg. occur in many conditions, and are usually associated with hyperglucemia, which is not uncommon in cerebral conditions. In absence of hypoglycemia values below 50 mg. nearly always indicate an acute infection of the meninges. Values should be detd. after an over-night fast, and compared with coincident blood sugar.

A. T. CAMERON

The human cerebrospinal fluid in the general system and metabolic diseases as in nephritis, diabetes, etc. B. J. ALPERS. *J. Nervous Mental Dis.* **62**, 265-78(1925).—A review, chiefly from the literature.

A. T. CAMERON

Cerebrospinal fluid chlorides. F. FREMONT-SMITH and MARY E. DAILEY. *Arch. Neurol. Psychiatry* **14**, 509-12(1925).—A general paper of variations in disease, giving no statement of actual results.

A. T. CAMERON

Transient glucosuria following scorpion sting. H. E. KING FREITZ. *Brit. Med. J.* **1925**, II, 294.—Three cases following (Trinidad) scorpion stings showed glucosuria (0.2 to 0.6% glucose) for 2 or more days, although the acute symptoms subsided after KMnO₄ treatment.

A. T. CAMERON

Tubercle formation from the injection of toxic substances. RUDOLF JAFFE. *Z. Tuberk.* **40**, 284-5(1924).—By injecting CHCl₃ exts. of tubercle bacilli, identical results

were obtained to those of Guillery (*Z. Tuberk.* 38, 1(1923)), indicating the toxic origin of tuberculous changes. Ray and Shipman were able to obtain tuberculous changes from defatted tubercle bacilli which Jaffe could not corroborate. Morse and Schott found typical tubercles with giant cells after the injection of alc. exts. of tubercle bacilli, but not from ether exts.

H. J. CORPER

Reply to remarks of Jaffe on tubercle formation after the injection of toxic substances. H. GUILLERY. *Z. Tuberk.* 40, 286(1924).—G.'s expts. were misunderstood by Jaffe. Proof is lacking for toxic substances from tuberculous structures acting upon the tuberculous focus. The remote action of the living bacillary focus is not related to Jaffe's expts.

H. J. CORPER

The significance of serum lipase in pulmonary tuberculosis. E. HENSCHKE AND H. ZWERG. *Beitr. klin. Tuberk.* 58, 324-8(1924).—The investigation for serum lipase in tuberculosis and other infectious diseases revealed diminished values, and there is no parallel between the lipolytic power (dtd. by means of the tributyrin method) of the serum and immunity. The findings of Kellert and Frisch (*Beitr. klin. Tuberk.* Vols. 43, 47 and 48) that all cases of cachexia with pulmonary tuberculosis revealed low lipase titers were corroborated, while cases in good general condition revealed a normal or only slightly reduced value. There seems to be a close relationship between the lipolytic power of the serum and the cachexia. This was borne out by the low values found in other cachectic conditions.

H. J. CORPER

Auto serum reaction in tuberculosis. A. V. v. FRISCH. *Beitr. klin. Tuberk.* 58, 280-92(1924).—A satisfactory explanation of the nature of the substances occurring in the blood which after intracutaneous injection caused papule formation could not be given. Since especially in those cases with most marked toxic symptoms there occur no reactions, it is believed that neither the toxins nor endotoxins occasion the toxic symptoms in severe phthisis, but it is due to the decomposition products of the tuberculous tissues.

H. J. CORPER

The diagnostic significance of the alizarin test for protein in the sputum. GEORG ZÜHLSDORFF. *Z. Tuberk.* 40, 449-52(1924).—The alizarin test for protein in the sputum is not specific for tuberculosis; the number of positive reactions increase with the severity of the disease. The reaction is negative in 30% of advanced cases of pulmonary tuberculosis. It has no differential diagnostic significance.

H. J. CORPER

The presence of heterogeneous antigens in denucleated erythrocytes. K. A. FRIEDE AND F. T. GRUNBAUM. *Klin. Wochschr.* 4, 1778-9(1925).—Rabbits, when injected with either sheep or cat erythrocytes, engender hemolysins against both cat and sheep erythrocytes. Rabbits, when injected with sheep erythrocytes, engender hemoagglutinins against cat erythrocytes. Cat erythrocytes, injected, do not engender heterogeneous hemoagglutinins.

MILTON HANKE

Hyperglucemia after ingesting levulose or carbohydrate-phosphate. J. ABELIN AND E. GOLDENER. *Klin. Wochschr.* 4, 1733(1925).—Ingestion of levulose does not lead to a significant hyperglucemia in normal individuals. A hyperglucemia is produced in diabetics; but not when insulin is given simultaneously. Levulose does not reduce the hypoglucemia that results from insulin poisoning. If a thyroid prepn. is fed for some time before the levulose is ingested, hyperglucemia is obtained. Phosphate, when ingested with glucose or levulose, enhances the rate of occurrence of hyperglucemia (no thyroid). Cf. following abstr.

MILTON HANKE

Insulin hypoglucemia. J. ABELIN AND E. GOLDENER. *Klin. Wochschr.* 4, 1777-8(1925).—Ingested Na_2HPO_4 prevents hypoglucemia when small amts. of insulin are injected and markedly reduces the hypoglucemia that normally follows large doses of insulin. The symptoms of malaise also are absent in the latter case.

M. H.

The potassium content of blood and the potassium-calcium ratio in essential hypertonia. E. KYLIN AND G. MYHRMAN. *Klin. Wochschr.* 4, 1870(1925).—The normal K/Ca ratio is 1.7-2.15. In cases of essential hypertonia this ratio is 2.08-2.97. The absolute K values are slightly increased, the Ca is decreased. The adrenaline reaction is intimately associated with the Ca and K content of the blood. When the Ca content is high, the rise in blood pressure, induced by adrenaline, is augmented; when the K content is high, the blood pressure effect of adrenaline is decreased.

M. H.

Significance of acids, formed by fermentation, for the pathogenesis of the digestive disturbances of infants. WERNER CATEL. *Klin. Wochschr.* 4, 1867-8(1925).—The ratio of lactic acid to volatile fatty acid production on a milk medium is 10-1 (enterococcus), 1-10 (*B. coli*) and 1-3 (*B. bifidus*). Lactic acid and its Na salt do not irritate the intestinal mucosa. Acetic acid and the other volatile fatty acids and their Na salts irritate the mucosa cells. The large intestine is less irritable than the small intestine.

Intestinal disturbances, in infants, may be due to an abnormally large production of volatile fatty acids by the intestinal microorganisms. MILTON HANKE

Is an incubation period, after preparation, necessary for the production of passive anaphylaxis? R. FRIEDBERGER AND S. SEIDENBERG. *Klin. Wochschr.* 4, 1823-4 (1925).—A slightly pptg. active antiserum can be prepd. by injecting guinea pigs with egg albumin. When this antiserum is injected into a normal guinea pig, passive sensitization occurs immediately, and a typical anaphylactic reaction is obtained when the antigen is injected within 5 min. This would indicate that fixation of the antibody to the cells is not necessary for an anaphylactic reaction. The foreign protein introduced in large quantity when rabbit antiserum is injected into guinea pigs may be responsible for the incubation period that is necessary before the passive sensitization can be demonstrated. MILTON HANKE

The hexosephosphoric acid content of blood in the normal and diabetic organism and the effect of adrenaline and insulin on its concentration. HEINZ LAWACZECK. *Klin. Wochschr.* 4, 1858-61 (1925).—The Ba salt of hexosephosphoric acid (H. P. A.) is insol. in water; hence H. P. A. can be sepd. from glucose, in a blood filtrate, with $\text{Ba}(\text{OH})_2$. The hexose content of the ppt. is then estd by reduction. The normal H. P. A. content of blood is about 1 mg. %; but it may vary from 0.66 to 2.0 mg. %. Administration of adrenaline gives a marked rise in blood sugar and a simultaneous decrease in H. P. A. Fifteen min. after the injection the H. P. A. begins to rise rapidly. Its concn. soon exceeds its pre-insulin value. Administration of insulin lowers the blood sugar and elevates the H. P. A. Glucose, as such, cannot be fixed to the body cells. Fixation occurs as hexosephosphoric acid. Adrenaline leads to the conversion of glycogen and of H. P. A. into glucose. The concn. of blood sugar rises in consequence. Insulin is involved in the conversion of glucose into H. P. A. The latter becomes fixed to the body cells and the blood sugar decreases. From this it is clear that adrenaline and insulin are really antagonistic; each tends to undo the work of the other. A balance normally exists, in the body, between these two substances and their opposing forces. The subcutaneous application of adrenaline leads to a hyperadrenalinemia and upsets the balance that exists between adrenaline and insulin. The organism reacts against this upset by inhibiting the suprarenal glands and stimulating the pancreatic glands. After the adrenaline depot has been exhausted, the organism continues its reaction for a short time which leads to an *insulin* effect, namely, an elevation of H. P. A. above normal. The effect of an insulin injection is the reverse of the above. There are two kinds of diabetics; those that react normally toward insulin (with an elevated H. P. A. and a reduced blood sugar) and those that react paradoxically (with a reduced H. P. A.). The first type represents cases in which the activity of the pancreatic cells is deficient; they can be successfully treated with insulin. In the second group a pathological balance exists between insulin and adrenaline in favor of the adrenaline. The organism depresses the pancreatic glands excessively and reacts rapidly and powerfully to keep the balance in favor of the adrenaline. An injection of insulin leads, therefore, almost immediately to a marked stimulation of the suprarenal glands with a consequent *adrenaline* effect in place of an *insulin* effect. The prognosis in these cases is always bad. MILTON HANKE

Use of the Rabl precipitation method with bones from children afflicted with rickets. RICHARD BÖHMIG. *Klin. Wochschr.* 4, 2010-2 (1925).—Immerse the bones in a neutral, satd. soln. of $(\text{NH}_4)_2\text{C}_2\text{O}_4$ for 48 hrs. This ppt. the sol. Ca as crystals of CaC_2O_4 . Soak in H_2O for 24-48 hrs. Dissolve out the Ca that had been pptd. *in vivo* by immersing the bones in formic acid. Exam. the washed prepn. histologically. A detailed histological description is given (no pictures). MILTON HANKE

Clinical evaluation of the trypanocidal function of the liver. FRIEDRICH MÜNTER. *Klin. Wochschr.* 4, 1967 (1925).—Normal serum—0.2 cc. per 20 g. body wt.—is fully protective against a trypanosome infection in mice. The protective action of the serum of hepatopathics, with a diffuse destruction of the parenchyma of the liver, is inversely proportional to the degree of the destruction. Icterus may or may not influence the trypanocidal action of the serum. MILTON HANKE

Alimentary leucocytosis and leucopenia. ERNST WOLLHEIM. *Klin. Wochschr.* 4, 1960-2 (1925).—A local increase in the concn. of Ca or H ions leads to a local leucocytosis. An increase in K or OH ions leads to a local leucopenia. MILTON HANKE

Ossification. FRITZ EICHMOLTZ. *Klin. Wochschr.* 4, 1959-60 (1925).—A bibliographical review of the recent work following the discovery, by Robison, of an enzyme, in bone, that can convert org. phosphates into inorg. phosphates. M. H.

Maximal hypoglycemia without the use of insulin. E. GEIGER AND L. SZIKTES. *Klin. Wochschr.* 4, 1912-4 (1925).—Splanchnicotomy, in rabbits, leads to hypothermia.

Injection of coli toxin or atropine produces a pronounced hypoglucemia; the blood sugar is reduced to 0.03–0.01%. Cramps may not occur for hours. When they do occur, the animals die unless treated. Adrenaline or glucose removes the cramps promptly. Adrenaline still further decreases the blood sugar to 0.007%; but the animals do not die. Glucose raises the body temp.

MILTON HANKE

The chemistry of the production of an epileptic attack by forced respiration. F. MAINZER. *Klin. Wochschr.* 4, 1918(1925).—Injection of NaCl promptly initiated an epileptic attack in one patient. Voluntary forced respiration, which also called forth an attack, led to a 4% increase in plasma chlorides; the total Cl content of the blood remained unchanged. The possible connection is obvious. An injection of glucose does not lead to an attack. NaOAc, when injected, does elicit an attack. In this case the acetate ion is considered to be the irritating substance

MILTON HANKE

Improvements in blood investigations. HUGO SELHEIM in collaboration with LÜTTGE, v. MERTZ AND BERGER. *Klin. Wochschr.* 4, 2049–53(1925).—Two new refinements for the methods of C. A. 19, 2079, are described. The serum to be tested is mixed, and allowed to react for 30 min. with a specially prepd. ninhydrin-negative organ extract (details of prepn. not given) supplied by the firm of A. Wolff. The liquid is boiled to coagulate the proteins, filtered and the filtrate tested with ninhydrin. Not only can pregnancy be diagnosed with an accuracy of 98% but the sex of the fetus can also be detd. with similar accuracy. The method should also be suitable for the diagnosis of malignancy, with properly prepd. organ exts. and may prove suitable for the diagnosis of infectious diseases. The detn. can be completed in 45 min. *Second process.*—Evap. to dryness 1 cc. of the specially prepd. organ ext. Dissolve the residue in 1 cc. of the serum to be tested. After 30 min. add 10 cc. of 95% alc., filter, and to 4 cc. of the filtrate add 0.025 N HCl until a cloud appears. Less acid is required to produce a cloud in positive than in normal serums. This method has not been very thoroughly tested for specificity.

MILTON HANKE

Influence of protein on the ketone body elimination in severe diabetes. S. J. THANNHAUSER AND W. MARKOWICZ. *Klin. Wochschr.* 4, 2093–9(1925).—Severe diabetics with a low sugar tolerance catabolize tyrosine, leucine and phenylalanine with production of ketone bodies. The output of ketone bodies is never greater than, but may be equal to, the amt. that could be theoretically produced from the quantity of amino acid ingested. Ketone bodies could not, theoretically, be produced from glycine or alanine and these amino acids, when ingested, have no effect upon the existing ketonuria. From this it is clear that the specific dynamic action of protein, which is shared by the amino acids, is not responsible for the ketonuria. Diabetics with an improving sugar tolerance catabolize all of the amino acids completely. Ketone bodies are not formed

MILTON HANKE

Influence of insulin on tar carcinoma. H. D. v. WITZLEBEN. *Klin. Wochschr.* 4, 2115(1925).—Daily injections of insulin protect rabbits against tar carcinoma.

MILTON HANKE

Acetone body concentration in blood in cases of toxicosis of pregnancy. O. BOKELMANN AND A. BOCK. *Klin. Wochschr.* 4, 2158(1925).—Blood normally contains about 30 mg. of acetone bodies (calcd. as acetoacetic acid) per 1000 cc. The av. figure during normal pregnancy is 40 mg. In pregnancy with albuminuria the value is 54 mg. Severely intoxicated patients average 65–75 mg. In pre-eclampsia and in eclampsia the av. figure is 65 mg.

MILTON HANKE

Two different types of phenomena by the specific antigen-antibody reaction that occur in vitro between a monogenic anti (protein) serum and its homologous antigen. E. FRIEDBERGER AND T. IKEDA? *Klin. Wochschr.* 4, 2140–51(1925).—When a dil. soln. of an antigen is carefully superimposed upon an antiserum in a small test tube, two distinct rings are formed, sepd. by a clear band. The lower ring consists of coarse, heavy, protein flocculi, insol. in ether, that settle gradually to the bottom of the tube. The upper ring is composed of a very fine, light ppt., sol. in ether, that stains intensely red with sudan III and reduces osmic acid, and that gradually diffuses upward through the antigen layer until the entire upper layer has become uniformly cloudy. If the antigen and the antiserum are extd. with ether before performing the ring test, or if just the antigen is extd. with ether, a double ring is not formed; only the heavy protein ppt. is obtained. The upper, "lipoid" ring is the one that is obtained when a foreign antigen is superimposed upon an antiserum. Double ring formation occurs best at 0°. Sera that have been preserved for some time with phenol still show the double ring phenomena. Rabbit antisera against protein from man, sheep, steer, horse, pig, dog, chicken and cat were used in the above expts. Guinea pig antisera behave similarly. Heterogeneous antigens give only one ring, namely, the lipoid ring. MILTON HANKE

Lactic acid excretion in carcinoma. K. GLAESSNER. *Klin. Wochschr.* **4**, 1868-9 (1925); cf. *C. A.* **19**, 3534.—The artificial production of carcinoma and enchondroma in rats is followed by a metabolic disturbance. The intravenous injection of glucose is followed by an excretion of lactic acid in amts. up to 1% of the animals' body wt. The animals have lost the faculty of oxidizing lactic acid. MILTON HANKE

Studies on the nature of the immunity reaction. I. An experimental study of pneumococcal immunity. R. R. ARMSTRONG. *Proc. Roy. Soc. (London)* **98B**, 525-44 (1925).—Measurement may be made, with a high degree of accuracy, of the protective power of sera, prepd. by immunization of rabbits with pneumococcal vaccine, against measured doses of living pneumococcal cultures, with mice as test animals. Immunity is produced in a characteristic manner after exptl. inoculation in the rabbit, or the natural stimulus of lobar pneumonia in man. An inductive phase of 3 to 5 days is followed by a rapid outpouring of protective antibodies into the blood serum at an increasing rate corresponding to a geometric progression, the max. concn. of antibodies being attained on the 8th day after inoculation. During the resulting phase of const. high immunity, the serum probably is satd. with immunizing substances. The resistance of an immunized animal to the homologous living pneumococcus coincides with the appearance of the antibodies in the blood serum. Provided neither excessively large nor excessively small doses of vaccine be used, the following rules hold true: The smaller the dose, the less complete and shorter the phase of induction; the earlier the appearance of immunity, the sooner the attainment of max. immunity, and the shorter the period of active immunity. The max. immunity attained is proportional to the size of the dose. Small doses (less than 5000 organisms) have no antigenic effect on the rabbit, being destroyed by the natural nonspecific mechanisms of the body. Excessive doses cause prolonged postponement of immunity, although antibodies finally appear in the serum. II. *Ibid.* 545-56.—Administration of protective antibodies after administration of their antigen causes postponement of the active immunity without any conspicuous decrease in its intensity. Administration of antigen to an animal previously passively immunized by intravenous administration of the corresponding immune serum gives rise to a marked decrease in, but no postponement of, the active immunity. On administration of a sensitized vaccine (equiv. doses of antigen and its antibodies) the greater portion of the latter are liberated and rapidly impart a slight degree of immunity; the antigen then gives rise to the development of active immunity in the same manner as a raw vaccine. However, this immunity is delayed, and is less intense than that produced by an equal dose of raw vaccine. JOSEPH S. HEPBURN

The role of the ether-soluble constituents of serum in certain serological reactions. P. HARTLEY. *Brit. J. Exptl. Pathol.* **6**, 180-96(1925).—The ether-sol. constituents were removed from various sera by the method of Hary and Gardiner (*J. Physiol.* **40**, lxviii(1920)). Specific pptn. does not occur when both antigen and antiserum, which have been freed from the ether-sol. constituents which they normally contain, are mixed together. The union of diphtheria toxin and diphtheria antitoxin is independent of the ether-sol. constituents occurring in antitoxic serum. Flocculation of neutral or nearly neutral mixts. of toxin and antitoxin (Ramon's reaction), however, is dependent upon these constituents. The agglutination of bacteria by a specific serum, and the hemolysis of red cells by a specific serum, are independent of the ether-sol. constituents of the serum. The complement-fixing property of syphilitic serum is associated with the ether-sol. constituents of the serum, since such sera after extn. react negatively in the Wassermann reaction. HARRIET F. HOLMES

Pathogenesis of edema. KL. GOLLWITZER-MEIER. *Z. ges. exptl. Med.* **46**, 15-39 (1925).—In edema fluid the concns. of HCO_3 and Cl are higher than in the blood serum and the concns. of K and Ca are lower. The Na content is usually but not always higher in edema, while the phosphate content seems evenly divided. The distribution of H, Cl, HCO_3 and perhaps Na ions between edema fluid and serum takes place according to the equil. law for membranes of Donnan (*C. A.* **6**, 1559). During an increase of edema there is a decrease of HCO_3 and Cl in the serum and an increase of Na and K, and during disappearance of the edema an increase of anions and decrease of cations. In normal persons the equiv. sum of the cations in the blood serum is always greater than the sum of the anions, because of the presence of negatively charged proteins and perhaps of other unknown anions. In an edematous patient this deficit of anions frequently varies from normal values on account of changes in the total proteins or in the protein fractions. From the concn. of H and Cl ions in the serum and edema fluid the potential of the membrane can be calcd. The serum is negatively charged in relation to the edema fluid. The potential becomes smaller as the difference of concn. of the ions

in serum and edema becomes less. Addition of NaCl or decrease of total protein in the plasma causes the potential to become smaller. Probably these changes are of importance for the colloidal condition and for the permeability of the capillary wall. It is probable that reversible changes of permeability may occur, permitting the passage of protein. The same conditions that lead to a difference in potential also reduce the osmotic pressure of the serum, that is, a lessening of the protein content and such changes in the protein fractions as lead to a deficit of anions and which in many cases are caused by the administration of NaCl.

HARRIET F. HOLMES.

The meaning of alterations in the calcium of the serum in fever. F. GLASER. *Z. ges. expl. Med.* 46, 65-72(1925).—Excluding pneumonia, in 33 febrile conditions alteration of Ca content of the serum was noted in over half of the cases when the Ca content of the serum was compared during and after fever. The hypocalcemia in pneumonia is due to the retention of Ca in the formation of the extensive fibrin masses of the pneumonic exudate and the release of this Ca on resolution of the pneumonia. In the other cases it is probable that the changes of Ca content brought about by fever are due to changes in tone of the vegetative nervous system and are similar to the changes in Ca content in functional neurosis which may be greatly altered by hypnosis. H. F. H.

Ammonium chloride acidosis. R. HOPMANN. *Z. ges. expl. Med.* 46, 73-93(1925).—Administration of NH_4Cl in 10 g. doses in normal persons sets free in the body, through breaking down of the salt, acid valences to an equivalent of 50-100% of the salt introduced. There is a marked increased excretion in the urine of Ca, but not of other cations. This loss of Ca through the urine is made up in part by an increased utilization of Ca from the intestinal tract and in only one case was there a slight Ca loss from the body as a whole. N metabolism and H_2O balance of the body were not altered by NH_4Cl acidosis. Oxidation was at first reduced but in the end in spite of repeated doses of NH_4Cl the intensity of O metabolism was not altered. H. F. H.

The importance of the cations, sodium, potassium and calcium, for the occurrence and treatment of nephritic edema. W. KEMPMANN AND H. MENSCHEL. *Z. ges. expl. Med.* 46, 111-20(1925).—Administration of Na as NaHCO_3 in nephritis with edema causes a retention of H_2O in the tissues with an increase in concentration of blood and urine. Only after large doses of alkali does the acid urine become alk. The K ion acts in a manner antagonistic to the Na ion and may be of therapeutic value. Administration of KHCO_3 leads to a hydremia and increased diuresis. The results with Ca are not decisive but CaCl_2 even in large doses seems to have no definite effect on the H-ion concn. of the urine. The Ca ion had no definite effect on albuminuria nor diuresis. H. F. H.

Kidney function in severe cases of diabetes. O. KLEIN. *Wiener Arch. inn. Med.* 10, 507-42(1925).—In severe diabetes the concn. power of the kidney is not affected and there may be polyuria with even a restricted intake of fluid. The diln. power of the kidney is also not affected. The water test often shows a delay of H_2O excretion or a retention of H_2O . The extrarenal excretion of H_2O is probably dependent on changes in the colloidal binding of H_2O in the tissues, brought about by changes in carbohydrate metabolism. Urea is excreted promptly when given. NaCl may be excreted but is often retained, and without simultaneous retention of H_2O . In severe diabetes there seems to be a reciprocal relation in the excretion of glucose, urea and NaCl. The kidney does not seem able to secrete large amts. of these substances at one time and this relative insufficiency may account for the raised threshold value for glucose in cases of long standing.

HARRIET F. HOLMES

The specific viscosity of the blood serum in joint diseases. L. KAUFTHIL AND A. SIMÓ. *Wiener Arch. inn. Med.* 11, 191-200(1925).—The specific viscosity of the blood serum is 0.96 to 0.99 in normal persons. In joint disease it increases in proportion to the extent of tissue waste and the severity of the inflammatory processes. It is of normal value in arthritis urica, slightly higher in arthritis deformans and secondary chronic polyarthritis and highest in primary chronic polyarthritis and tuberculous joint lesions.

HARRIET F. HOLMES

A specific precipitating substance from tubercle bacilli. P. P. LAIDLAW AND H. W. DUDLEY. *Brit. J. Exptl. Pathol.* 6, 197-201(1925).—Glycogen has been isolated from tubercle bacilli, also a carbohydrate complex of the nature of a gum. This gum gives specific pptn. with immune serum. The gum from tubercle bacilli has no relation to tuberculin and is not a true antigen, since it fails to induce the formation of antibodies. It is probable that for the production of this particular antibody, giving specific ppts. with tubercle gum, stimulation by a protein carbohydrate complex is required, and that when this antibody is formed pptn. can occur with the whole mol. or with either part separately.

HARRIET F. HOLMES

Variations in the blood and urine diastase contents in relation to measles. I.

COHEN. *Brit. J. Exptl. Pathol.* **6**, 173-9(1925).—The output of diastase in the urine varies greatly, with an immediate rise after a meal. The blood diastase remains at a constantly low level, despite marked changes in urinary diastase content. It is probable that diastase is irregularly absorbed from the gut and then is excreted as completely as possible from the blood. Examin. of isolated specimens of urine for clinical purposes would seem to yield very unreliable information. On the other hand the relative constancy of the blood diastase content renders any special precautions with regard to meals unnecessary.

HARRIET F. HOLMES

The chemical composition of gallstones in Dutch India and their diagnosis by means of Röntgen rays. C. D. DE LANGEN. *Geneeskundig Tijdschr. Nederl. Indie* **65**, 90-102 (1925).—Cholelithiasis is rare in Dutch India. Cholesterol and cholesterol-bilirubin stones occur very rarely, bilirubin-CaO stones (I) and Ca bilirubinate stones (II) frequently, bilirubin (III) stones most frequently. Unlike cholesterol stones I, II and III and particularly II give distinct Röntgen shadows. The cholesterol content of the blood serum of the natives, especially the poor population, is 25-50% lower than that of Europeans and the wealthy natives. Natives kept 1 week on a diet rich in cholesterol show a 50% increase of the blood cholesterol. The prevalence of pigment stones demonstrates the role of infection in the etiology of gallstones in contrast to Naunyn's theory. Although it is admitted that the cholesterol content of the diet is not the only factor controlling cholesterol metabolism, yet the importance of diet is evident. It may be emphasized in this connection, that diabetes and chronic nephritis are also rare among the natives, who live mainly on rice and vegetables.

MARY JACOBSEN

The carbohydrate metabolism of tumors. II. Changes in the sugar, lactic acid and carbon dioxide-combining power of blood passing through a tumor. C. F. CORI AND GERTY T. CORI. *J. Biol. Chem.* **65**, 397-405(1925); cf. *C. A.* **19**, 2850.—Blood drawn from the right and left wing vein of normal chickens contains the same amts. of sugar and lactic acid and has the same CO₂-combining power. Blood which has passed through a tumor growing on one wing contains an av. of 23 mg. less of sugar and 16.2 mg. more of lactic acid than blood which has passed through the tissues of the normal wing, indicating active glucolysis. Upon satn with alveolar air the plasma from the tumor blood showed 3.7 vols. % less CO₂ than that from the normal side but when collected under oil it contained an av. of only 0.7 vol. % less CO₂ than the normal plasma.

A. P. LOTHROP

Urea tests of renal efficiency. I. I. M. RABINOWITCH. *J. Biol. Chem.* **65**, 617-22(1925).—"When urea was administered by mouth to normal individuals, previously restricted from fluids for at least 12 hrs., and tests showing polyuric responses, above the rate equal to the min. value of the 'augmentation limit' (2.5 l. per 24 hrs., the max. urine vol. output necessary to produce the max. rate of urea excretion) were discarded, the coeff. of variation in case of the factor, U/B , was practically identical with that of the const., $D/B\sqrt{VW}$. Under the same set of conditions a parallelism was also noted in 40 cases of albuminuria. Since urine vol. output is essential in calcg. the const. and is not taken into consideration in the calcn. of the factor, and in view of the above observations, its effect on urea excretion is practically negligible under the conditions described. Excretory ability of the kidneys thus appears to be the predominating factor influencing the value of the ratio U/B . The ratio has, therefore, a sound basis as a test of renal efficiency.

A. P. LOTHROP

Variations in blood sugar in relation to operation on the thyroid gland. C. C. LUND AND E. P. RICHARDSON. *Arch. Surg.* **11**, 171-9(1925).—There is a rise in blood sugar after hyperthyroid operations similar to that in other patients. No case of hypoglycemia occurred. There was no emotional hyperglucemia before operation. Treatment should maintain the supply of glucose.

JOHN T. MYERS

The excretion of water, urea and chlorides in experimental oxalate nephritis. J. S. DUNN AND N. A. JONES. *J. Path. Bact.* **28**, 483-506(1925).—When urea retention has been established in the tubular nephritis produced by oxalates it is possible to secure a decrease in urea retention by inducing a water diuresis. Extra chloride is excreted with the urea, suggesting that urea like chloride is excreted in the glomerular filtrate. Urea retention in this nephritis is explained on the theory that the damaged tubule cells are unable to prevent the indiscriminate reabsorption of glomerular filtrate with urea from the tubules into the connective tissue and vessels of the kidney.

J. T. M.

Cholesterol in health and disease. A critical review. J. M. H. CAMPBELL. *Quart. J. Med.* **18**, 393-422(1925).—There is a bibliography of 164 titles.

J. T. M.

The action of sensitized antigen in the production of specific and isophile hemolytic immune body. TSUNENORI IJIMA. *J. Path. Bact.* **28**, 397-406(1925).—Sensitization of antigen leads to a neutralization of antigenic power, since the amt. of immune body

produced is infinitesimal compared to that in controls with unsensitized antigen. A slight temporary increase of immune body soon after the injection of sensitized antigen is accounted for by the dissociation of injected antigen and antibody. J. T. M.

The classification of (common) salt by its iodine content, and the use of iodine in combating goiter. MICHAEL RÓZSA. *Kali* 19, 313-5(1925).—Statistics covering the distribution of goiter in Austria and Hungary, and of corresponding (local) concns. of I in the water supply, salt used and milk supply, are given. Legal requirement of 3 mg. KI per kg. salt for domestic consumption is recommended. WM. B. PLUMMER.

The blood glucose curve in head injuries. E. C. DAVIDSON AND C. I. ALLEN. *Bull. Johns Hopkins Hosp.* 37, 217-23(1925).—Such head injuries as fracture of the skull and concussion of the brain are followed by a profound but temporary derangement of carbohydrate metabolism; this seems to be similar to the sugar puncture reaction of Claude Bernard. The av. fasting blood sugar in fractures and concussion was within normal limits. The av. blood sugar at the end of 15 min. was higher in persons with concussion of the brain than in normal individuals, and this curve fell to fasting level more slowly. The curve was higher in fractured skulls than in concussion of the brain, and the fall to fasting level slower. The curve was more striking according to the seriousness of the injury G. F. REDDISH

Role of epithelium in experimental immunization. HENRY SEWALL. *Science* 62, 293-9(1925); cf. *C. A.* 9, 3288; 10, 2471.—When a small quantity of blood serum is dropped into the nose of a guinea pig the serum is adsorbed by the mucous membrane and, after a definite period of incubation, the animal can be shown to have become profoundly changed. Depending upon the no. of instillations, the interval between them and, especially, the quantity of serum instilled, the animal becomes either highly hypersensitive or strongly resistant, to a toxic injection given by the vein. This resistance withstands a considerable series of increasing toxic injections and is strengthened with the lapse of time, contrary to the state of tolerance produced by traumatic methods. It is inferred that the absorption of foreign protein by the nose causes the formation of 2 different antibodies. One of these is allergic and excites to anaphylaxis; the other is protective and leads to true immunity. The relative amt. of either antibody can be regulated by modifying the amt. of the serum instilled. Added to a state of general allergy it is easy to produce, in the guinea pig, a special sensitization of the respiratory app. which leads, under appropriate stimulation, to attacks resembling bronchial asthma in man. The evidence indicates that the living epithelium mediates between foreign protein and the organism in a way to favor specifically the elaboration of true immunity. L. W. RIGGS

Vital staining of inoculated tumors with acid dyes. D. ENGEL. *Z. Krebsforschung* 22, 365-72(1925).—Many inoculated tumors take as vital stains several acid dyes of the triphenylmethane group (fuchsin S, red violet, light green and isamine blue). This is true for the Jensen-tumor and mouse sarcoma, but not for the rat carcinoma. The coloring occurs in the living tumor cell and not in the necrotic cells as claimed by Karczag, Tischler and Barok. F. B. SEIBERT

Influence of alkali in hemolysis experiments on drug extracts (KARSMARK, KOFLER) 17.

H—PHARMACOLOGY

ALFRED N. RICHARDS

The action of ammonia upon the lungs. A. A. HORVATH. *Proc. Soc. Exptl. Biol. Med.* 22, 199-200(1924).—Rabbits and guinea pigs were exposed for long periods in atms. contg. 1.5, 0.5, 0.25 and 0.15 cc. of NH_3 per l. Guinea pigs tolerated 0.15% of NH_3 without apparent ill effects, but 0.25% caused catarrhal bronchopneumonia and its complications. Rabbits were more resistant. Intravenously, NH_4OH caused changes in the lungs similar to anaphylactic shock. C. V. B.

The treatment of malaria by novarsenobillon. H. E. WHITTINGHAM. *Proc. Roy. Soc. Med.* 18, War Sect., 23-32(1925).—Novarsenobillon compares very favorably with quinine in the treatment of benign tertian malaria. (Discussion, included, was adverse.) A. T. CAMERON

The therapeutic effect of light. W. E. DIXON, C. E. M. JONES AND G. H. LANCASHIRE. *Brit. Med. J.* 1925, II, 499-504.—A series of papers followed by a discussion and dealing especially with local action, general action, sp. action, heliotherapy, artificial light treatment and phototherapy in dermatology. A. T. CAMERON

Researches on the peripheral circulation of man. VI. Vascular action of adrenaline, atropine and amyl nitrite in normal man. D. DANIÉLOPOLU AND A. ASLAN.

J. physiol. path. gén. **23**, 572-81(1925).—Adrenaline produces on the peripheral circulation, in av. doses, a short phase of vasoconstriction (sometimes absent), then vasodilatation, followed by constriction, and finally by dilatation. The results can all be explained by interrelations between the abdominal and peripheral action, and the changing concn of adrenaline in the circulation. The action of atropine on blood vessels is similar to its action on other tissue with autonomic innervation. Amyl nitrite causes first vasoconstriction (passive) followed by vasodilatation. **VII. Action of atropine, adrenaline and amyl nitrite on the oculo-vascular reflex.** D. DANIELOPOLU AND A. ASLAN. *Ibid* 606-16.—A physiological study. A. T. CAMERON

Diabetes in surgical patients with especial reference to insulin. L. BAUMAN. *Surgery, Gynecol., Obstetrics* **41**, 272-83(1925).—Prophylactic use of glucose and insulin has given good results with both diabetic and non-diabetic cases requiring surgical treatment and in which acidosis was present. A. T. CAMERON

Diabetic and non-diabetic glucosuria in the surgical patient. W. C. MENNINGER. *Surgery, Gynecol., Obstetrics* **41**, 454-9(1925).—Of 47 cases treated before the use of insulin there were 20 deaths and of 22 cases treated with insulin there was one death. Traumatic glucosuria may be effectively treated, when necessary, with insulin. A. T. CAMERON

Carbolic acid in malaria. J. E. M. BOYD. *J. Roy. Army Med. Corps* **45**, 138-9(1925).—Administration of dil. phenol and tincture of I has given good results in several cases of the crescent stage of malignant tertian malaria in which patients did not respond to quinine. A. T. CAMERON

Gentian violet intravenously in chorea and encephalitis. J. W. VISHNER. *J. Nerv. Mental Dis.* **62**, 376-80(1925).—Three cases of encephalitis following typhoid fever and one case of chorea with endocarditis showed prompt recovery following intravenous injection of gentian violet. A. T. CAMERON

The borocaines: A new class of local anesthetics. A. J. COPELAND AND H. E. F. NOTTON. *Brit. Med. J.* **1925**, II, 547-51(1925).—The action of a local anesthetic depends on the sp. selective affinity of its base for nerve fibrils. The action of different salts of such a base varies greatly according to the acid with which they are combined, and is optimal if combined with a weak acid so that the p_H of the soln. is high. In this case absorption into the general circulation is slow (low toxicity), and the local effect is correspondingly greater (sp. anesthetic effect high). The borocaines—borates of ethocaine and similar compds.—fulfil this condition. They are less toxic than the corresponding hydrochlorides, but have often more than 10 times the anesthetic action. A. T. CAMERON

Introduction of germanium in therapy. J. MESSNER. *Pharm. Zentralhalle* **66**, 632-3(1925).—An address. W. O. F.

The concentration of quinine in the circulating blood. H. W. ACTON AND R. N. CHOPRA. *Indian J. Med. Research* **13**, 197-204(1925).—The absorption of quinine increases when an excess of OH ions is present and diminishes with an excess of H ions. The concn. of quinine is greater in the mesenteric blood than in the systemic blood. FRANCES KRASNOW

The effect of formalin on snake venom. II. Diminution of toxicity of daboia venom. C. DE C. MARTIN. *Indian J. Med. Research* **13**, 109-10(1925); cf. C. A. **19**, 2708.—Formalin diminishes the toxicity of daboia venom but not to the same extent as cobra venom. FRANCES KRASNOW

Note on the anesthesia produced by intra-arterial injection of apothesine. J. P. ARLAND. *Indian J. Med. Research* **13**, 95-6(1925).—"The anesthesia was perfect and profound." FRANCES KRASNOW

The distribution of injected sulfates in tissues.* W. DENIS AND STELLA LECHE. *J. Biol. Chem.* **65**, 565-70(1925).—"In a series of expts. in which hypertonic solns. of Na_2SO_4 were administered to dogs by intravenous injections it was found by analysis of the blood, muscles and viscera that there is little absorption of the SO_4 ion by the tissues, although even 2 hrs. after injection the sulfate content of the blood may still be 10 times its initial value." A. P. LOTHROP

Synergism of magnesium sulfate and morphine and magnesium sulfate and ether. J. T. GWATHMEY. *J. Am. Med. Assoc.* **85**, 1482-5(1925).—Synergism between MgSO_4 and morphine occurs in man. With lab. animals this synergism is life-saving when Et_2O vapor is used as the anesthetic. When properly applied the dose of Et_2O to produce and maintain satisfactory anesthesia is reduced by one-half or more. L. W. R.

"Fitochinina," a substance that activates carbohydrate metabolism. CONDORELLI. *Riforma Medica* **41**, 745(1925); *J. Am. Med. Assoc.* **85**, 1338.—This substance, which was obtained by alc. extn. of leaves of grains, rapidly reduces the sugar content of the

blood, and usually of the urine of pancreatectomized dogs, and of diabetic patients. The tolerance for carbohydrates is augmented for some time after the administration of the substance. It is not pptd. by picric acid, thus differing from insulin and glyco-phytin. "Fitochinina" does not show any appreciable action in the normal person; in this respect it resembles the vitamins. It appears to be harmless and is not pptd. by the usual reagents that act on albumin. L. W. RIGGS

Distribution and excretion of bismuth with different administration methods. I. BIRÓ. *Magyar Orvosi Archivum* 26, 335-45(1925).—The resorption and distribution of Bi in the animal organism are rather independent of administration methods. The largest part of the Bi is deposited in the kidneys and is excreted with the urine. Considerable Bi will be excreted with the feces. Bi is also deposited in the liver, spleen, bone marrow, brain and spinal cord. L. W. RIGGS

Behavior of blood sugar and liver glycogen under the influence of morphine. M. FRANK AND G. FÖRSTER. *Magyar Orvosi Archivum* 26, 296-300(1925).—The hyperglucemia arising after doses of morphine reaches its max. in 2.5 hrs., then sinks to its normal value. Morphine mobilizes the liver glycogen, the expts. with rabbits showing a gradual lowering of the liver glycogen and corresponding rise in the blood sugar. The glycogen mobilization and the hyperglucemia are between certain limits independent of the quantity of morphine administered. L. W. RIGGS

Local irritation caused by the infusion of digitalis. MASAKAZU NAKAMURA. *Tohoku J. Exptl. Med.* 6, 278-84(1925).—Rabbits were given subcutaneous injections of the drug and the following local irritation was estd. by the degree of severity of the resulting symptoms. Digitalis infusions of 1 to 100, also these dild. 50 times, were thus tested. The local action persisted for 3 days after the injection, but disappeared almost completely when the infusion contg. 0.2% HCl was allowed to stand 6 hrs. at 27°, or was heated before injection. Digitoxin, digitalein, digitalin and digitonin each showed a local action which was hardly influenced by the presence of 0.2% HCl; consequently the local action of the digitalis infusion is not to be referred to these substances. The heart action of the infusion is not affected by the presence of 0.2% HCl. This fact may be utilized in the administration of the infusion by the alimentary canal. L. W. R.

Gas metabolism and minute volume. I. The relation of gas metabolism and minute volume to the internal secretion. TSUTOMU ODARIA. *Tohoku J. Exptl. Med.* 6, 325-63(1925).—Tests were made with rabbits in which the O consumption per min. and the minute vol. (m. v.) were measured. By m. v. is meant the ratio of the O consumption per unit of time (O_2) to the difference between the O in 1 cc. of arterial blood (O_A) and the O in 1 cc. of venous blood (O_V), or $m. v. = O_2 / (O_A - O_V)$. Intravenous injections of adrenaline in doses of 0.015 to 0.03 mg. per kg. increase the O consumption and m. v.; the greatest increase in each factor was noted with a dose of 0.025. Larger doses caused a decrease in both factors. Pituitary ext. had slight or no influence on the O consumption until the dose reached 0.17 cc. or more per kg. when a decrease was observed. At the same time a decrease up to 38% in the m. v. was observed, with a still greater decrease following doses above 0.17 cc. Feeding thyroidin (Parke-Davis) to rabbits caused the O consumption to increase from 45 to 144% and the m. v. to increase 70 to 221%. After thyroidectomy in rabbits the decrease in O consumption ranged from 10 to 52% and the m. v. decrease ranged from 18 to 69%. Rabbits fed thyroidin 4 to 8 days, or long enough to produce a state of hyperthyroidism, were given an intravenous injection of adrenaline in doses ranging from 0.015 to 0.5 mg. per kg. one to 4 days after the last feeding of thyroidin. Doses of 0.015 and 0.025 mg. produced no change in the O consumption, but 61 and 15% increase, resp., in the m. v. Doses of adrenaline above 0.03 mg. caused a decrease up to 46 and 53%, resp., in O consumption and m. v. Thyroidectomized rabbits were given injections of adrenaline 25 to 42 days after the operation. There was a small increase of O consumption after doses of 0.03 to 0.15 mg., but larger doses caused a decrease. The m. v. was increased by doses up to 0.25 mg. It was decreased by a dose of 0.5 mg. Pituitrin injected intravenously caused a decrease of O consumption and m. v. in both hyperthyroidism and athyroidism. Normal rabbits given 1.5 units of insulin per kg. showed a decrease in O consumption and m. v., but doses of 0.2 unit per kg. showed an approx. parallel increase in each of these figures. L. W. RIGGS

The pharmacological action of amines on organs containing involuntary muscles. MASAKAZU NAKAMURA. *Tohoku J. Exptl. Med.* 6, 367-88(1925).—The amines used in this study were of known purity or were purified when necessary. Just before use the amines were dissolved in Ringer soln. and made neutral. The tissues and organs used were isolated from frogs, rabbits or cats. The action of amines on the surviving tissues and organs consisting of the involuntary muscles differs in character with the variety

of the compds. though they may in some cases cause the same effect. Each of the 11 aliphatic amines examd. has a stimulating action on the contractile elements, the activity of which increases from methyl- to hexylamine, the iso-forms being less active than the corresponding normal ones. Of these compds. only isoamylamine possesses a sympathetic action in addn. to a muscular action. The others are without action; among these is included ethanolmethylamine, which may be regarded as the side chain of the adrenaline mol. Of 8 aromatic amines studied, phenylamine paralyzes the muscular substances, aminoacetophenone and *p*-aminophenol, like many aliphatic amines, stimulate the same elements, and methylaminoacetocatechol stimulates the sympathetic mechanism, just as does adrenaline. The other members such as phenylmethylamine, phenylethylamine, *p*-hydroxyphenylethylamine and aminoacetocatechol have 2 defined actions, the muscular and the sympathetic, which interfere with each other so that the motor effect is more powerful than the inhibitory effect. L. W. RIGGS

Adrenaline hyperglucemia. III. Reducing substances in adrenaline hyperglucemia. TOSHIO OIHARA. *Tohoku J. Exptl. Med.* 6, 191-211 (1925); cf. C. A. 19, 3120.—Expts with rabbits showed that carbohydrates other than dextrose are contained in the blood. The precise nature of these substances has not been detd. As the difference of the results obtained by Bang's method and Epstein's method is more pronounced in adrenaline hyperglucemia, especially in well fed animals, and is scarcely found in alimentary hyperglucemia, this difference may be inferred to result from some carbohydrate driven into the systemic circulation by adrenaline. The difference was greatest in blood of the inferior vena cava. In hyperglucemia caused by either adrenaline or sugar puncture the glycogen content of the inferior vena cava increases. At least a part of liver glycogen goes into the circulation as such and gradually is converted to glucose. IV. Antagonism between the pancreas hormone and the adrenaline. *Ibid* 213-46.—The pancreatic ext. suppresses the adrenaline hyperglucemia when the dose of the latter is not too large. This effect of the pancreatic ext. is seen also in normal animals and in hyperglucemias caused by other means. The pancreatic ext. acts more powerfully after subcutaneous injection than in the intravenous application; it has no influence upon the normal blood pressure and cannot lower the pressure raised previously with adrenaline. The artificial perfusion of the ext. through the peripheral blood vessels by the Laewen-Trendelenburg's method causes no change in the rate of the outflow of Ringer's soln. The ext. produces no change in the enucleated frog's eye-pupil both in normal state and in adrenaline mydriasis. It has no effect on the pupils of dogs either normal or depancreatized. The rectal temp. scarcely changes until collapse occurs. The rise of blood sugar caused by puncture is powerfully reduced by the subcutaneous injection of the ext. The pancreatic ext. in acid reaction inhibits the movements of the intestine but this phenomenon is probably to be attributed to acid reaction of the ext. The substance itself which causes the fall of blood pressure has no effect upon the intestinal movements. Pituitrin has no obvious inhibiting influence upon the fall of blood sugar caused by the pancreatic ext. The ext. has no effect upon the contraction of the surviving uterus-strip of the cat either in normal condition or in condition when contracted with adrenaline. L. W. RIGGS

Physiological action of furan. ELIZABETH M. KOCH AND M. H. CAHAN. *J. Pharmacol.* 26, 281-5 (1925).—While furan has some anesthetic and analgesic properties, its toxicity is so great as to eliminate it from consideration for practical use. It seems to be a general protoplasm poison, completely inhibiting the growth of yeast. When given by inhalation it causes convulsions, followed by paralysis of the respiratory center and asphyxia. When administered in small doses by mouth it has a corrosive, solvent effect on the mucosa, causing a copious watery secretion. There is an increased permeability of the blood vessels, frequently producing extensive hemorrhages. Injection of 1.5 cc. into a 10 kg. dog caused immediate death with symptoms and post mortem changes similar to those seen in acute HCN poisoning. C. J. WEST

Inactivation of atropine sulfate by rabbit serum. JEAN LA BARRE. *J. Pharmacol.* 26, 259-79 (1925).—The inactivation of atropine by rabbit serum, observed previously by various authors, was confirmed by both chem. and physiol. methods, the 1st expts showing that rabbit serum at 38° could inactivate about 30% of the alkaloid added to it in 2 hrs. The figures obtained did not show any great individual variations in inactivating power of the sera of different rabbits. Ultrafiltration was employed to ext. the atropine without having recourse to heating or to the addn. of any substance that might modify it. 60-65% of the alkaloid was found in the ultrafiltrate of the serum-atropine mixt. which had been left for 2 hrs. at 38° and in the residue 6%. Prolongation of the time of contact of the atropine and serum up to 6 hrs. and increase in temp. from 18° to 42° favor the inactivation of the atropine by the rabbit serum. Thus, the

inactivation can be attributed only in the slightest degree to adsorption, the chem. destruction of the alkaloid being the most important factor involved. An amt. of tropine was recovered sufficient to account for the atropine lost through exposure to the serum.

C. J. WEST

I—ZOÖLOGY

R. A. GORTNER

Poison production by animals from the zoölogical-physiological viewpoint. J. STROHL. *Biol. Zentr.* 45, 513-36(1925).—A discussion. FRANCES KRASNOW

The biological factors involved in the destruction of river-fisheries by pollution due to lead mining. K. E. CARPENTER. *J. Appl. Biol.* 12, 1-13(1925).—A continuation of studies previously reported (cf. *C. A.* 18, 3233). The present article includes expts. on the toxicity of Pb compds. to various fresh-water fishes and analyses of river waters which have been polluted due to lead mining. C. H. R.

The control of biaxial development in the reconstitution of pieces of *Planaria*. C. P. RUSTIA. *J. Exptl. Zool.* 42, 111-42(1925).—Increase of biaxial head frequency has been obtained with compds. possessing very different phys. and chem. properties and is regarded as detd. by quant. changes in the physiol. condition of the pieces. The exptl. data are interpreted in terms of physiol. gradients; they offer no support to conceptions of polarity in terms of stratification or flow of substances or of mol. structure and orientation. Other physiol. data are given. C. H. R.

Regeneration after dissociation (an experimental study on sponges). I. Behavior of dissociated cells of *Microciona prolifera* under normal and altered conditions. P. S. GALTISOFF. *J. Exptl. Zool.* 42, 183-220(1925).—A suspension of cells of *Microciona* forms aggregates due to contact during ameboid movement. Coalescence is the result of accident, and increases with the temp. between 9° and 19°, following van't Hoff's rule. In hypertonic sea water, movement and coalescence of the cells stop when the salinity reaches 55.8%; at 43.4% coalescence is incomplete. In hypotonic sea water the min. concn. for coalescence is between 9.3 and 12.4%. Ameboid movement ceases and aggregates do not form in isotonic NaCl and KCl solns. The inhibitory action of the Na and K ions may be counteracted by the addn. of Ca and Mg ions. Ameboid movement and coalescence take place in isotonic MgCl₂ soln., but isotonic CaCl₂ soln. is toxic. Cations may be placed in the following descending order of effectiveness on ameboid movement and coalescence: Ca>NH₄>Li>K>Mg>Na. Low concns. of HCl cause a loss of motility; low concns. of NaOH increase the adhesiveness of the cells. In mixts. of cells of *M. prolifera* and *Cliona sulphurea* in normal sea water coalescence occurs only between the cells of a species. Foreign cells mutually inhibit the movement of each other. In alk. sea water *Cliona* cells surround *Microciona* aggregates. CHAS. H. RICHARDSON

The combined toxic action of light and eosin. J. R. PEREIRA. *J. Exptl. Zool.* 42, 257-62(1925).—Neither light nor eosin is toxic to the eggs, sperm or larvae of *Arbacia* for the exposures used. The observed toxicity depends upon the concn. of eosin and length of exposure. Death is due to the transformation of eosin into a secondary toxic product by the action of the light. Eggs and sperm are much more sensitive to the action of eosin and light than the larvae. The injurious influence of light may last after the cells have been removed from sun light. The cells are not stained till death occurs. The toxic action appears to take place at the surface of the cells. C. H. R.

Physical-chemical and chemical investigations on larval and pupal blood (*Pieris brassicae*, *Vanessa urticae*). L. BRECHER. *Z. wiss. Biol., Abt. C* 2, 691-713(1925).—The blood of larvae and pupae of *Pieris* has a p_H value of 6.50-6.77, av. 6.6, as detd. electrometrically with the U-electrode of Michaelis and the microelectrode of Winterstein. Color changes in the pupae under the influence of various light waves cannot be attributed to changes in the reaction of the blood since its H-ion concn. is very const. under differing life conditions. The sp. cond. at 20° is 0.005 av., the same as that of a 0.05 M NaCl soln. The concn. of Cl in the blood is M/35. Unlike vertebrate blood, the blood of these larvae and pupae contains an insignificant quantity of CO₂, approx. 0.001 M, but relatively large quantities of PO₄, about M/45. Its buffer value is due to the latter, but is not so good as that of vertebrate blood. CHAS. H. RICHARDSON

The embryonal metabolism of Teleostei. The amino acids derived from the degradation of the capsule and their relation to the embryo. E. REMOTTI. *Atti Acad. Lincei* [6], 2, 68-74(1925).—These expts. constitute part of an investigation of the biology of teleost eggs. The perivitelline liquid of these eggs was studied to det. the nature of the products of hydrolysis of the capsule and these were detd. by Abderhalden's

ninhydrin reaction. When the liquid obtained by breaking the capsule was tested the presence of amino groups was proved. The reaction was also positive when the liquid was first dialyzed. When the capsule itself was used as a dialyzing membrane the dialyzate failed to show the presence of amino groups. This is another case of strong physiological retention such as has been previously observed in marine animals.

E. J. W.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Debatable questions in food chemistry. A. BREYTHIEN. *Z. Nahr. Genussm.* **50**, 42-53(1925).—An address. WILLIAM J. HUSA

The meaning of limiting figures in food chemistry. A. BÖMER. *Z. Nahr. Genussm.* **50**, 75-87(1925).—A discussion of (1) physical and chemical, (2) physiological and (3) legal standards for foods and beverages. WILLIAM J. HUSA

Report on (the examination of) canned foods. A. L. SULLIVAN. *J. Assoc. Official Agr. Chem.* **8**, 641-6(1925).—Collaborative work on the examn. of canned stringless beans showed that all collaborators were able to pick out "flat sours," and that sour beans were found to have a relatively high acidity, large quantities of rod-shaped bacteria, and little or no vacuum in the cans. A. PAPINEAU-COUTURE

Further experiences with hydrocyanic acid fumigation. P. BUTTENBERG, W. DECKERT, AND G. GARTZ. *Z. Nahr. Genussm.* **50**, 92-103(1925); cf *C. A.* **18**, 3657.—Analytical data are given on the HCN content of various foods stored in ships and warehouses during fumigation with HCN. WILLIAM J. HUSA

Milk supply from the standpoint of science, economics and administration. A. JUCKENACK. *Z. Nahr. Genussm.* **50**, 21-37(1925).—An address. W. J. HUSA

Contribution to the study of poisonous milks and their products. FELIX DAELS. *J. pharm. Belg.* **7**, 737-9(1925).—D. has isolated from a sample of milk and from a sample of cheese, which produced death in one case and severe symptoms of poisoning in another, a base which possesses the general properties of hydrocollidine and collidine. It is probably an isomer or a polymer of one of these. A sufficient quantity of the material was not obtained to make an elementary analysis. 0.01 g. administered by mouth to a dog weighing 5 kg. produced vomiting immediately, followed by convulsions. There was copious salivation, accelerated respiration and diarrhea. The animal recovered slowly. The same dose administered subcutaneously produced death in 3 hrs. A. G. DUMÉZ

A review of the chemical and physical methods for testing milk and their value in judging adulterated milk. A. GRONOVER. *Z. Nahr. Genussm.* **50**, 111-9(1925). The f. p. depression of milk shows much less variation for individual cows, both healthy and diseased, than sp. cond., refraction, etc., and is, therefore, of particular value in detecting diln. of milk. WILLIAM J. HUSA

A new method for the detection of neutralized milk. J. TILLMANS AND WERNER LUCKENBACH. *Z. Nahr. Genussm.* **50**, 103-11(1925).—In 50 cc. of milk det. the degree of acidity (Soxhlet and Henkel). Add 38 cc. of a colloidal iron soln. (Liquor ferri oxydati dialysat. D. A. B. 5), mix well, let stand 15 min. Pour on to a folded filter and let as much serum as possible run through. Place 20 cc. of the serum in a 50-cc. cylinder and neutralize to phenolphthalein (p_H 8.1) with 0.1 N NaOH. Titrate with 0.1 N HCl to p_H 3.2, the indicator being 0.3 cc. of a 0.01 soln. of dimethylaminoazo benzene in 90% alc. The end point is judged by comparison with a similar cylinder contg. the indicator with 20 cc. of a buffer soln. of p_H 3.2. (The buffer soln. is made by dissolving 21.008 g. of citric acid in 200 cc. of N NaOH, dilg. to 1 l., then mixing 43 cc. of this soln. with 57 cc. 0.1 N HCl.) The titration is calcd. for 100 cc. of milk and the corresponding acidity is read off from a curve or table showing the relation between the degree of acidity and the no. of cc. of 0.1 N HCl required to titrate 100 cc. of milk from p_H 8.4 to p_H 3.2. If the degree of acidity actually found is less than the value indicated by the table, the milk in question has been neutralized from the value indicated in the table to the value detd. Differences of 1 to 2 degrees (Soxhlet and Henkel) arouse suspicion, while larger differences indicate definitely that the milk has been neutralized. W. J. H.

The estimation of citric acid in milk. B. BLEYER AND J. SCHWAIBOLD. *Milch-wirtschaft. Forsch.* **2**, 260-311.—B. varies the method of Kunz (*C. A.* **9**, 687) by using KBr and H_2SO_4 instead of Br water in oxidizing citric acid to pentabromoacetone. He centrifuges in a graduated tube instead of using a Gooch crucible. This method

checks the theoretical results of Soldner (Handbuch der Milchkunde, Weisbaden, 1909), more closely than does the method of Kunz.

GEORGE R. GRENBANK

Determination of cane sugar in condensed milk. K. SCHERINGA. *Pharm. Weekblad* 62, 1034-5(1925).—A formula is given for calcg. % of sucrose in the presence of lactose in condensed milk, from detns. of optical rotation and reducing power.

A. W. DOX

Variations in the percentage of butter fat in milk. V. Summary of the investigations. W. N. PATON. *New Zealand J. Agr.* 31, 110-4(1925); cf. *C. A.* 19, 2379, 2713.

K. D. JACOB

The bacterial content of ice cream. A report of experiments in bacterial control in six commercial plants. N. E. OLSON AND A. C. FAY. *J. Dairy Sci.* 8, 415-44(1925); cf. *C. A.* 18, 3651.—The finished ice cream from the supervised batches averaged $1/10$ as high in bacterial counts as that from the regular manuf. Important sources of bacterial contamination were found to be the following: cream and milk (most important of all); careless washing of coolers; failure to take apart conveying pipes, pumps and homogenizers in cleaning; use of pasteurizing equipment in successive batches without washing; leaving mix for aging without previous proper cooling; failure to cool immediately after homogenizing. Other recommendations are: use alk. washing powders, hypochlorite solus. and live steam in cleaning all equipment; pasteurize at 145° F. for 30 min. and homogenize at that temp. If ice cream contains more than 100,000 bacteria per g. (plate method), carelessness in the manuf. is indicated. FRANK S. RICE

Gelatin as a source of bacteria in ice cream. J. M. BRANNON AND P. H. TRACY. *J. Dairy Sci.* 8, 115(1925).—Addn. of gelatin results in very slight increase in number of bacteria.

JACK J. HINMAN, JR.

The salt content of butter and its influence on quality. E. HAGLUND AND E. WALLER. *Kgl. Landtbr. Akad. Handl. och Tidskr.* 64, 483-98(1925).—Samples of butter from 368 creameries were analyzed. The av. salt content was 1.15% and varied from less than 0.5% to over 2.25. Nearly half had a salt content between 0.75% and 1.25. Evenness in salting was as common with creameries using large amounts of salt as with those using small amounts. The quality rating of butter was higher with the creameries using the smaller amounts of salt.

C. O. SWANSON

The colorimetric determination of the acidity of cheese and whey. B. J. HOLWERDA. *Verslag. Landw. Onderzoek. Rijkslandbouwraproefsta.* No. 30, 220-3(1925).—The colorimetric detn. of the H-ion concn. of whey may be carried out by using suitable indicators. Methyl red and neutral red were found to be satisfactory indicators, while bromothymol blue, bromocresol purple and *p*-nitrophenol gave incorrect results. Well-washed neutral infusorial earth may be used for clarifying cloudy whey without affecting the H-ion concn. The H ion of cheese can be detd. by shaking 10 g. of cheese with 30 cc. of lactic acid-NaOH mixts. of different H-ion concns. The supernatant liquid is decanted after not less than 3 min., indicator (0.2 cc. of a 0.2% soln.) is added to 15 cc. aliquots and the resulting colors are compared with that of the same concn. of indicator in the original mixts. The mixt giving the same H-ion concn. before and after contact with the cheese is taken to indicate the H-ion concn. of the cheese. Methyl red was found to be a satisfactory indicator—giving results comparable to the electrometric method.

R. M. BARNETTE

Determination of coconut oil in edible fats by means of the ethyl ester number. JAN LUKAS. *Chem. Listy* 19, 307-12(1925); cf. *C. A.* 6, 690.—The Et ester number is more suitable for analysis of edible fats than the Polensky number, which yields low values on artificial mixts. of known compn.

F. C. KRACEK

A proposal for expansion or modification of rules for valuation of cacao and cacao products. F. HARTEL. *Z. Nahr. Genussm.* 50, 122-35(1925).—A discussion of proposed specifications for cacao products.

WILLIAM J. HUSA

The bacterial flora in preserved eggs. HANS POPP. *Z. Nahr. Genussm.* 50, 139-11(1925).—The bacteria found in dried egg powders and preserved yolks were such as normally occur in many raw materials and would generally be rendered harmless by the heat used in prepn. of foods, except in mayonnaise, etc.

W. J. H.

Report on the determinations of the acidity of the fat and of the acid-insoluble phosphoric acid in (dried and liquid) eggs. H. I. MACOMBER. *J. Assoc. Official Agr. Chem.* 8, 604-10(1925).—The neutral extn. method for lipoids (Hertwig, *C. A.* 17, 3386)

measures more accurately the quantity of fat present than the direct extn. method. *S. Dept. Agr. Bull.* 846, p. 90; but the final soln. is too highly colored for satisfactory acidimetric titration. To det. acidity of the fat, dry the sample to const. wt. 55° under a vacuum of not less than 25 in., ext. with anhyd. Et_2O in a Knorr app. in a Johnson extractor, evap. the Et_2O , weigh the fat, dissolve in 50 cc. of neutral

C_6H_6 (prepd. by refluxing for 6 hrs. with 0.1 vol. of N EtONa, distg., and finally washing 3-4 times with water if necessary), and titrate with 0.05 N EtONa (prepd. by dissolving about 1 cc. of metallic Na in 800 cc. abs. EtOH, titrating with 0.1 N HCl, and dilg. to proper strength with abs. EtOH) in presence of phenolphthalein till the yellow of the H_2O ext. turns orange. Collaborative results were satisfactory for dried eggs, but those for liquid eggs differed very considerably in some instances. Detn. of acid-sol. P_2O_5 by the method described by Pine (*C. A.* 18, 3235) was simplified (1) by reducing the time of extn. by placing in a shaking machine for 30 min., (2) by sepn. of the insol egg material from the ext. by centrifuging and decanting instead of filtering, and (3) by pptg. P_2O_5 as $MgNH_4PO_4$ directly in the H_2SO_4 soln. without preliminary phosphomolybdate pptn. Collaborative results by the modified method were not considered sufficiently satisfactory; this is attributed to insufficient mixing of the samples (especially the yolks) with the HCl soln. before addn. of the picric acid. (Cf. following abstracts)

A. PAPINEAU-COUTURE

Report on methods of analysis of liquid and frozen egg products. M. L. HITCHCOCK. *J. Assoc. Official Agr. Chem.* 8, 610-4(1925); cf. preceding and following abstracts.—Collaborative results on the detn. of H_2O (drying to const. wt. at 98° at a pressure of not over 5 in. abs.), fat by acid hydrolysis (Hertwig, *C. A.* 17, 2621), lipoids and lipid P_2O_5 (Hertwig, *C. A.* 17, 3386), H_2O -sol. protein-N precipitable by 40% EtOH (Hertwig, *C. A.* 17, 3549-50), and total N showed that the methods are quite accurate and that different analysts are able to secure concordant results. The various methods are described in detail. L. H. Bailey reports that drying 1 hr. at 130° at atm. pressure gives results practically identical with those obtained in 5 hrs. at 98° and 5 in. abs.

A. PAPINEAU-COUTURE

Report on methods for the analysis of (powdered) dried (whole) eggs. J. C. PALMER. *J. Assoc. Official Agr. Chem.* 8, 615-21(1925); cf. preceding and following abstracts.—Comparison of results obtained by drying to const. wt. at 98° and 6 in. pressure (abs.), 98° and 2.5 in. and 55° and 2.5 in. showed that max. H_2O content is obtained by heating at 98° for 5 hrs. at a pressure not over 2.5 in. abs. In the detn. of fat by acid hydrolysis (Hertwig, *C. A.* 17, 2621) max. fat content was obtained by hydrolyzing at $75-80^\circ$ instead of 70° . In the detn. of lipoids and lipid P_2O_5 most of the H_2O -sol. material must be removed before proceeding with the neutral extn., and the extd. sample should be pulverized with $CaCO_3$ (results about 0.5% lower without $CaCO_3$ than with it). Max. results were obtained with a 1-2 g. sample. Best results for total N were obtained by the Kjeldahl-Gunning-Arnold method with a 2-hr. digestion period after clearing. In the detn. of H_2O -sol. protein-N precipitable by 40% EtOH (Hertwig, *C. A.* 17, 3549-50) trouble was encountered in filtering the pptd. albumin, and in obtaining concordant results for the H_2O -sol. N content. The first was overcome by detg. the pptd. albumin by difference between N contents of the albumin soln. before and after pptn. with 40% alc., and the second by extg. the albumin with 1.2% NaCl soln. instead of H_2O . The various methods are described in detail.

A. PAPINEAU-COUTURE

Report on (the determination of) zinc in eggs. W. E. KIRBY. *J. Assoc. Official Agr. Chem.* 8, 621(1925); cf. preceding and following abstracts.—Gravimetric detn. of Zn as $HgZn(CNS)_4$ (Lundell and Bee, *C. A.* 8, 3404) gives satisfactory results on pure solns. of Zn. Efforts are being made to adapt it to the ash obtained from dried eggs or to the acid digestion product of dried eggs.

A. PAPINEAU-COUTURE

Report on (methods of analysis of) eggs and egg products. RAYMOND HERTWIG. *J. Assoc. Official Agr. Chem.* 8, 594-604(1925); cf. preceding abstracts and *C. A.* 19, 547.—A discussion of the results reported, with recommendations for adoption of the methods as tentative and for continuation of the work. The technics of the methods recommended are described in detail.

A. PAPINEAU-COUTURE

Determination of egg-yolk oil. HANS POPP. *Z. Nahr. Genussm.* 50, 135-8 (1925).—The results of detns. of fat in dried or preserved egg yolk vary with different solvents, depending on the soly. of lecithin. P. applies the method of Grossfeld (*C. A.* 19, 3548), in which the diglyceride formed by splitting off the phosphoric acid choline group from lecithin is included in the total fat. The free fatty acids in egg powder are detd. by extg. 5 g. of egg powder with neutral ether-alc. mixt. for 1 hr. at room temp., filtering, washing and titrating the filtrate with 0.1 N alkali. W. J. H.

Sugar and saccharin. A. TRÄGEL. *Deut. Zuckerind.* 50, 1175-6(1925).—Saccharin was boiled with dil. solns. of oxalic, acetic, tartaric and malic acids. The taste of the fresh solns. was satisfactory; after 3 hrs. boiling the taste was somewhat unpleasant; and after 5 hrs. boiling the sweet taste had disappeared, the taste was very unpleasant, and there was a very bitter aftertaste. Similar results were obtained

in cooking apples with saccharin. Ten % of the sugar needed ~~could be replaced with~~ saccharin, but if more than that amt. of saccharin was used, the ~~taste was unpleasant~~ after boiling 30 min.

Report of Committee on Baking Tests (American Association of Cereal Chemists). S. A. FITZ. *Cereal Chem.* 2, 232-5(1925).—The following recommendations for a tentative standard formula for baking tests for hard wheat flour were made. Flour 325 g., sugar 10 g., salt (high-grade) 5 g., yeast (compressed) 10 g., pure lard 7 g., distd. water, q. s. It is recommended that 1 lb. of yeast be obtained as fresh as possible, directly from the manufacturer, and that all outside surfaces be trimmed off and discarded. No definite recommendations are given for scoring or for handling dough. R. B.

Science in experimental baking. C. A. KRESS. *Cereal Chem.* 2, 228-32(1925).—Attention is called to the necessity of scientific methods for baking and the important tests are discussed. RUTH BUCHANAN

The gluten quality of flour and its iso-electric point. E. L. TAGUE. *Cereal Chem.* 2, 202-8(1925).—The point of min. transference or neutral point (corresponding to the isoelectric point in a pure substance) is proposed as a logical basis for the study and correlation of the different factors influencing gluten quality of flours. A method is given by which this point as well as the acidic and basic strength of a given flour can be accurately detd. Curves given show the behavior of different grades of flour as well as the different constituents of the given flour within the zone (p_H 4.5 to 7) important in gluten formation. No relation is apparent between the H-ion concn. of a flour and the point of minimum transference. RUTH BUCHANAN

Report on meats and meat products. (Determination of nitrites in cured meats.) R. H. KERR. *J. Assoc. Official Agr. Chem.* 8, 696-7(1925).—Adoption of the following method is recommended: to 5 g. of comminuted sample in a 50-cc. beaker add 40 cc. of HNO_3 -free water at 80°, mix thoroughly, wash into a 500-cc. volumetric flask to a vol. of approx. 300 cc., heat on a steam bath for 2 hrs. with occasional shaking, add 5 cc. satd. $HgCl_2$ soln., mix, cool to room temp., dil. to 500 cc. mix, filter, and det. HNO_2 -N in a suitable aliquot by the official method for nitrites in water. A. P.-C.

Report on methods of analysis for meats and meat products. (Determination of reducing sugars.) W. C. POWICK. *J. Assoc. Official Agr. Chem.* 8, 697-8(1925).—In using phosphotungstic acid to remove non-coagulable proteins, creatinine, etc., in the detn. of reducing sugars, trouble was experienced in some cases in the final reduction. Attempts to locate the source of the difficulty were unsuccessful, but indicated that the trouble is not due to incomplete removal of creatinine, to the presence of 1:18 phosphotungstic acid in the specimens of 1:24 phosphotungstic acid employed, nor to variations in the exptl. conditions, length of standing, etc., obtained at different stages of the investigation. Fermentation methods would be preferable to reduction methods for this detn. owing to the possible presence of reducing non-sugars. A. P.-C.

Report on (the analysis of) flavors and non-alcoholic beverages. J. W. SALE. *J. Assoc. Official Agr. Chem.* 8, 686-96(1925).—Comparison of the Folin and Denis (*C. A.* 7, 1769) and official A. O. A. C. methods for *vanillin detn.* showed excellent agreement between the 2. The Wichmann method for detn. of *Pb no. in vanilla exts.* (*C. A.* 15, 2518) and the detn. of the *Pb* as chromate instead of sulfate (cf. Clemens, *C. A.* 18, 3235) are recommended for adoption as official. Comparative results for the *detn. of oil in lemon, orange, peppermint, anise and nutmeg exts.* of known compn. by the official polarization method, official pptn. method, Peniman-Randall method (*C. A.* 8, 3837), and a modification of the latter using 1 cc. of HCl (1+1) and water instead of the acidulated $CaCl_2$ soln. were not sufficiently conclusive to warrant adoption of the new methods. Variations in individual results were greater by the new methods than by the official ones. In detg. oil by pptn., the same correction (0.4%) for soly. of the non-terpene constituents should be made with orange exts. as with lemon exts. Results obtained by Horvet and West's method (*C. A.* 3, 1189) for the *caln. of alc. in lemons, orange, peppermint, anise and nutmeg exts.* of known compn. showed the method is accurate, and it is recommended for adoption as official. A. PAPINEAU-COUTURE

Composition of sugar beet pulp and tops and of silage therefrom. S. F. SHERWOOD. U. S. Dept. Agri., *Circ.* 319, 1-11(1924).—Analyses are given of a number of samples of beet pulp, beet tops and silage prepd. from beet tops grown in a number of Western states. The ash content on a water-free basis of clean beet tops was found to vary from 12 to 15%, but when the dirt was not removed one-half the samples had a crude ash content of 25% with a max. of 29%. The crude ash content on a water-free basis of beet top silage varied from 20.8 to 58.5%. W. H. ROSS

Significance of occurrence of copper, manganese and zinc in forage crops and foods. J. S. MCHARGUE, *J. Am. Soc. Agron.* 17, 368-72(1925).—Fertile soils contain small

amts. of Cu, Mn and Zn and plants absorb small amts. which are stored in leaves and in pericarp and germ of seeds. When wheat and corn are highly milled they are deprived of the greater part of Cu, Fe, Mn and Zn which appear to be important in animal nutrition. Some depleted soils require small amts of Cu, Mn and Zn. J. J. H., Jr.

Some effects of seasonal conditions upon the chemical composition of American grape juices (CALDWELL) 11D. Nitrogenous fertilizer or stock feed (U. S. pat. 1,561,667) 15.

Chlorine gas control for flour bleaching. W. STEIN. U. S. 1,562,380, Nov. 17. Cl is passed through a body of liquid (e. g., H₂O) in a graduated transparent tubular vessel which serves as a sight gage of the Cl supply and is then passed through a transparent moisture-sepp. vessel.

Nitrogen trichloride in bleaching flour. WALLACE & TIERMAN CO. AND J. C. BAKER. Brit. 232,607, April 21, 1924. Cl and an NH₄ compd. are brought together as described in Brit. 159,166 (C. A. 15, 2134) in soln. and the NCl₃ is removed in a stream of inert gas, after the reaction is complete. Several examples are given.

Apparatus for testing the "bread-making qualities" of flour. L. BAUMANN. Brit. 232,585, April 16, 1924. Flour is made into a dough and the tenacity and extensibility of the dough (in the form of a disk) are tested by pressing it against a round-ended die and noting the pressure required to rupture the disk.

Pasteurizing milk. D. F. WISEMAN. U. S. 1,550,860, Aug. 25. The temp. of the milk is rapidly raised to about 50° by maintaining H₂O or other circulating medium at a temp. to maintain the contact surfaces with the milk at a temp. below 75° and the milk temp. below 63°.

Apparatus for pasteurizing milk in bulk. M. BLOCK. U. S. 1,550,668, Aug. 25. **Cheese.** W. FAHNDRICH. U. S. 1,561,781, Nov. 17. Small pieces of cheese are heated to form a dough-like mass, a Ca salt and milk sugar are added, and the mass, while hot, is inoculated with a pure culture of *Bacillus bulgaricus* or a similar culture and sealed in packages.

"Butter substitutes." MILK OIL CORPORATION AND C. F. NORTH. Brit. 232,916, April 23, 1924. Fatty substances such as beef fat or tallow or a mixt. of these with milk fat or oil are homogenized in melted condition and emulsified with skim milk powder and H₂O. The emulsion is cooled to about 13°, worked into a butter-like mass, flavored and salted.

Conserved fruits. P. NAVARRE. U. S. 1,560,396, Nov. 3. Fruits are bleached in a strong soln. of SO₂ which is maintained at the b. p. and are then subjected to the action of a sugar sirup at const. temp. and pressure throughout the process. The sirup may have a temp. of about 60° and is circulated under pressure continuously in contact with the fruit and through a reconcentrating app.

Concentrating and drying fruit juices. W. H. DICKERSON. U. S. 1,562,309, Nov. 17. Fruit juices are concd. by freezing, so as to preserve the aromatic ethers, and then dried to a powder by spraying the concentrate into a hot gas.

Flavoring extracts, etc. F. FORAY. Brit. 232,552, April 19, 1924. Ether in liquid or vapor form is used to ext. essential principles of plants, vegetables, fruits, flowers, etc., and the resulting exts. may be mixed with sugar, flour, sago, alc., etc.

Stock food. W. P. M. GRELCK. U. S. 1,561,158, Nov. 10. The starchy part of barley or other grain (or the whole grain) is treated with H₂O and heated. Malt grain is then added and the materials are steeped to produce maltose. The latter is converted into lactic acid in sufficient amt. to have a preservative effect on the product and additional grain is then incorporated in the mixt.

Food for animals and poultry. C. E. CHANNER. Brit. 232,667, Jan. 21, 1924. Sour milk is maintained at about 40° to complete souring and effect partial evapn. and cooking. The temp. is then raised to about 93° until the milk dries to a brown granular mass which is crushed. A current of heated air may be used for drying.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The complexity of the industrial chemist. H. K. MOORE. *Chemistry & Industry* 44, 1070-2, 1085-92 (1925). E. H.

Drying rate efficiency. Introducing a new method of efficiency comparison in drying rates. A. E. STACEY, JR. *Trans. Am. Inst. Chem. Eng.* June, 1925, (advance

copy) pp. 3-15.—A graphical evaporative-efficiency curve based on the max. rate of evapn. from the particular material being investigated consists of plotting the percentage rate of moisture removal relative to the max. rate of evapn. vs. the percentage moisture removed. Such curves are detd. and exhibited for pulp lead, a color pigment, blue toner pulp, a dye pigment, copper carbonate, niter cake fines, barium nitrate crystals, gelatin and white lead. The depth of the material and temp. were varied.

W. L. MCC.

Materials-handling problems and their solution. F. D. CAMPBELL. *Mech. Eng.* 47, 793-8(1925).

E. H.

What the chemical industry of the country means to the Chemical Warfare Service. A. A. FRIES. *Am. Dyestuff Rept.* 14, 719-23(1925).—Gas warfare is treated in this address.

L. W. RIGGS

Some possible new war gases. D. C. WALTON. *Am. Med.* 31, 525-8(1925).—Review and discussion.

FRANCES KRASNOW

Dielectric absorption in fibrous insulating materials. R. E. MARBURY AND E. R. L. GHATT. *Elec. J.* 22, 605-10(1925).

C. G. F.

The Dorr Company. WM. RUSSELL. *Ind. Eng. Chem.* 17, 1293-5(1925).

E. J. C.

Accident records and how to keep them. C. B. AUDEL. *Ind. Eng. Chem.* 17, 1254-5(1925).

E. J. C.

Carbon tetrachloride vs. carbon disulfide. E. R. HAYHURST. *Rubber Age* 18, 88-91, 102(1925).—A review and discussion of the industrial uses of CCl_4 and CS_2 and their physiol. effects. Of the two, CCl_4 is much the less poisonous on an industrial scale.

C. C. DAVIS

Coöperation of the medical and safety departments. O. F. W. CROMWELL. *Ind. Eng. Chem.* 17, 1286(1925).

E. J. C.

Is cadmium an industrial poison? L. SCHWARZ AND A. OTTO. *Z. Hyg.* 104, 364(1925); *Bul. mens. office internat. d'hyg. publique*, 17, 1036(1925).—Although Cd poisoning is rarely reported Cd should be classed among the toxic industrial metals.

JACK J. HINMAN, JR.

Dermatosis industrialis in blue print worker due to chromium compounds. H. J. PARKHURST. *Arch. Dermatol. Syphilol.* 12, 253(1925); *J. Am. Med. Assoc.* 85, 850.—Three cases reported show that a dermatitis may follow contact of $\text{K}_2\text{Cr}_2\text{O}_7$ with the skin in susceptible persons. This dermatitis may be avoided by frequently rinsing the exposed skin with a satd. soln. of NaHSO_3 , and then with water.

L. W. RIGGS

Flow meters in the accounting of process steam (TYLER) 1.

Mixing liquids and solid particles. T. M. CHANCE. U. S. 1,561,909, Nov. 17. Mech. features of mixing sand and H_2O (for use in gravity sepn. of coal and slate) or other solids and liquids in similar processes.

Rectification system for separating argon and other constituents of air or similar mixtures. C. C. VAN NUYS. U. S. 1,557,907, Oct. 20.

Preheating and spray desiccation of distillers' slop, waste sulfite liquor or other liquids by combustion gases. A. W. LISSAUER. U. S. 1,558,022, Oct. 20.

Insulating cement or mortar. L. CALDWELL. U. S. 1,556,488, Oct. 6. A cement or mortar adapted for use in heat insulation consists principally of powd. diatomaceous earth and an org. adhesive such as glue, casein, or waste sulfite pitch, together with not more than 7% of NaCl , borax, K_2SO_4 or other salt which serves as a distending agent for the adhesive.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Water and water supplies. H. S. HANCOCK, JR. *Pub. Health J. (Can.)* 16, 36-42(1925).—Early history of public water supplies is outlined, and the supply of Fort William, Ont., derived from Loch Lomond, 6 miles from the city, is described.

R. E. THOMPSON

Lucknow water supply. ANON. *Water & Water Eng.* 27, 263(1925).—Purification equipment consists of 3 m. g. d. Patterson rapid sand filters and old (slow sand) filters. Max. daily capacity is about 9 m. g. d.

JACK J. HINMAN, JR.

Phenol tastes in the water supply of Marquette, Michigan. PAUL HANSEN. *Eng. News Rec.* 95, 469(1925).—The presence of pyroligneous acid and crude wood alc. still

wastes in the water supply of Marquette, derived from Marquette Bay, Lake Superior, has given rise to tastes and odors which are intensified by chlorination. On the basis of the Milwaukee expts. it is proposed that troublesome wastes be partially treated at works of origin and then discharged with city sewage into a reaction tank (designed for possible conversion into an activated-sludge plant) with a retention period of approx. 8 hrs. The ratio of waste to sewage is approx. 1:15. R. E. THOMPSON

The distribution of water in Gloucestershire. L. RICHARDSON AND R. C. S. WALTERS. *Surveyor* **67**, 13-4(1925).—Quantity and quality of water available in Gloucestershire are given. R. E. THOMPSON

The water supply of Gloucestershire. L. RICHARDSON. *Water and Water Eng.* **27**, 264-70(1925).—A geological paper. R. E. GREENFIELD

New London, Conn. ANON. *Eng. News Rec.* **95**, 305-6(1925).—The water supply of New London is derived from Lake Konomoe, a 600-m. g. storage supply about 6 miles from the city. Chlorination is the only treatment employed. R. E. THOMPSON

Brookline, Mass. ANON. *Eng. News Rec.* **95**, 259-60(1925).—Water supply (5 m. g. d.) is obtained from driven wells and underground collecting galleries located on banks of Charles River. The purification works consist of 6 tricklers, a sedimentation basin, and 6 slow sand filters. R. E. THOMPSON

Cincinnati water supply and the U. S. P. H. S. standard. CLARENCE BAHLMAN. *J. Am. Water Works Assoc.* **14**, 260-6(1925).—At present with a chlorine dosage of from 1.5 to 2.5 lbs. per million gallons, the Cincinnati supply at the tap will easily conform to the suggested new U. S. P. H. S. standard. D. K. FRENCH

Water supply in Holland. F. A. LIEFRINCK. *Water and Water Eng.* **27**, 356-61(1925).—The oldest public system is that of Amsterdam, constructed in 1853. 108 undertakings supply 325 communities. 4.6 million out of 7 million inhabitants are supplied from public supplies. Peculiarities of ground water in sand dunes close to the sea are discussed. JACK J. HINMAN, JR.

The water supply of the English army during the European war. D. FEDERICO BEIGHEDER. *Memorial de Ingenieros del Ejército*, Jan. 5-32; Feb. 33-61; *Water and Water Eng.* **27**, 165(1925). JACK J. HINMAN, JR.

The purification of water supplies on field service: a retrospect. WM. HORROCKS. *J. Roy. Army Med. Corps* **45**, 167-89(1925).—A historical account of the development of Horrock's and similar tests and of the various methods of chlorination used in the field during the war, and the results obtained with them. A. T. CAMERON

System of sanitary grading of water supplies. E. S. CHASE. *Eng. News Rec.* **95**, 469-70(1925).—A system of scoring sanitary condition of water supplies is described which consists of a scale of values from 0 to 100 divided into 3 parts of 50, 20 and 30 which are assigned to factors for pollution hazards, protective measures and quality condition, respectively. Max. value indicates perfect or nearly perfect conditions. R. E. THOMPSON

Bibliography on the detection of phenols in water supplies. C. F. SCHURCH. *J. Am. Water Works Assoc.* **14**, 348-51(1925). E. H.

Iodine and water supplies. H. W. CLARK. *Eng. News Rec.* **95**, 470(1925).—The av. I content of 80 Massachusetts water supplies examd. was 2.14 parts per billion, individual supplies having content as high as 6.3 parts per billion. These results are being studied in relation to prevalence of goiter. Use of iodized salt is considered the ideal method of overcoming I deficiency, application of I to water being considered more or less wasteful. R. E. THOMPSON

Use of iodides in water supplies to prevent simple goiter. A. F. MELLEN. *Eng. News Rec.* **95**, 352-4(1925).—Adverse criticisms of iodization are reviewed and commented on. The Minneapolis supply, filtered Mississippi River water, contains only approx. 0.8 parts per billion of I, compared with min. content of 5 parts found in waters in non-goitrous regions. M. has recommended that the deficiency be corrected by addn. of 10 parts per billion of NaI, a proposal which has been favorably considered. The cost of such treatment is estd. at 1½¢. per capita per annum. R. E. THOMPSON

The mineral waters of Saint-Gervais-Les Bains le Fayet (Haute-Savoie). D'ARSONVAL, F. BORDAS AND F. TOUPLAIN. *Ann. fals.* **18**, 454-60(1925).—A description of the 2 springs, the surrounding geological formation and the chem. compn. of the water. The more important constituents of the "Gontard-de-Mey" and "Torrent" springs are: Ca 0.317, 0.2408; K 0.1064, 0.1038; Na 1.2703, 0.8186; Li 0.0104, 0.0063; Cl 1.064, 0.730; SO₄ 2.087, 1.456; total solids (at 180°) 5.075, 3.515; cond. 5.9 × 10⁻³, 4.3 × 10⁻³, resp. A. PAPINEAU-COUTURE

Chicago water works. M. B. REYNOLDS. *Proc. Ills. Eng. Soc.* **40**, 47-57(1925).

JACK J. HINMAN, JR.

Chesterfield (England) new water works. CHAS. BOLDRY. *Water and Water Eng.* 27, 257-63(1925).—Engineering description of ground water project to supplement existing gravity surface supply. JACK J. HINMAN, JR.

The transparency of natural waters to ultra-violet rays. J. DUCLAUX AND P. JEANTET. *Compt rend.* 181, 630-1(1925).—Salts in the amts commonly found do not diminish the transparency of natural waters to ultra-violet rays. Three mg. NH_3 per l. will diminish the transparency to rays above 2000 A. U. Turbid waters are almost opaque to such rays. One mg. per l. nitrates or nitrites gives a characteristic absorption at 2300 A. U. BEN H. PETERSON

A contribution to water analysis. JULIUS ZINK AND FRIEDRICH HOLLANDT. *Z. angew. Chem.* 38, 445-7(1925); cf. *C. A.* 18, 3662.—To det. the hypothetical combinations of the cations and anions, the quantity of each anion is proportioned among all of the cations in the same ratio in which they exist. This method is based on the equil. const. K. C. BEESON

New medium for the differentiation of B. coli in water analysis. J. L. PAWAN. *Annals of Tropical Med. and Parasitology*, 19, 319-26(1925); *Pub. Health Eng. Abst.*, Sept. 26, 1925, Water Supplies, p. 56.—Brief summary of British and American methods is given. After applying various tests, the medium of Koser (*C. A.* 18, 1512) is credited with being best. The author considers it much superior to the methyl red and Voges-Proskauer tests. JACK J. HINMAN, JR.

Investigations of ice. ÖRS V. HUBAY. *Z. Nahr. Genussm.* 49, 370-3(1925).—Analyses were made of the turbid portions and clear portions of 19 samples of artificial ice and 1 sample of natural ice. The turbid portions contained more impurities than the clear portions, the ratios of the averages for the 20 samples being: residue on evapn. 3.08 : 1; chlorides 2.54 : 1; oxidizability 1.23 : 1; bacteria 1.43 : 1. W. J. H.

Report on measures for the protection of underground waters. A. R. ATKEY, A. B. E. BLACKBURN, A. E. CORNEWELL-WALKER, F. W. MACAULAY AND WM. TERRY. *Water and Water Eng.* 27, 175-80(1925).—Reports of a sub-committee to the Advisory Committee to the Ministry of Health of Great Britain concerning legal rights of property holders in underground waters. JACK J. HINMAN, JR.

Protection of underground water. PERCY GRIFFITH. *Water and Water Eng.* 27, 196-8(1925).—A discussion of the above report. JACK J. HINMAN, JR.

Analyses of rainfall from a protected and an exposed gage for sulfur, nitrates and ammonia. E. M. JOHNSON. *J. Am. Soc. Agron.* 17, 589(1925).—This work was undertaken in order to evaluate the influence of bird droppings on the analysis of rain waters collected from gages. Bird droppings from an old loft showed 0.78% S on dry basis of which 0.58% was water-sol. Less S was found in the water from the exposed gage than in protected gage due to biological action of bird droppings. More ammonia was found in the exposed gage. JACK J. HINMAN, JR.

The purification of waste waters from small and medium-sized communities. ALEX GIRARD. *La technique sanitaire* 20, 215-18(1925).—The capacity of septic tanks for isolated houses and small communities should be 400 to 500 l. per capita, allowing a detention period of 20 to 22 hrs. A capacity of 125 to 200 l. is too small. If the larger capacity is used the effluent will generally be colorless, odorless and contain 50-100 p.p.m. NH_3 , all or nearly all of which disappears in 7 days at 30-32°, being transformed into NO_2 and NO_3 . A contact bed is recommended for the effluent from the tank. JACK J. HINMAN, JR.

Report on the water softening and purification works for the year 1924. C. P. HOOVER. *Supplement to the City Bulletin, Columbus, Ohio* 1924, 29.—Hardness of of the water of the Scioto river was reduced from an av. of 299 p.p.m. to 99 p.p.m. by the plant. Lime, soda ash, alum and Cl were the chemicals employed in treatment. A pumpage of 8700 million gallons was treated at a cost for chemicals of \$20.81 per million gal. JACK J. HINMAN, JR.

Preparation and comparative performance of base-exchange water-softening materials. E. B. HIGGINS AND J. P. O'CALLAGHAN. *Chemistry & Industry* 44, 882-5(1925).—Artificial zeolites show larger percentage of replaceable sodium, but less resistance to disintegration, dissolved carbonic acid and impurities than natural minerals. Also in *Water & Water Eng.* 27, 392-4(1925). HOPE HEFFNER

Recent experience with doucil as a water-softening material. T. P. HILDITCH AND H. J. WHEATON. *Chemistry & Industry* 44, 885-7(1925); cf. *C. A.* 18, 1539.—This complex synthetic aluminosilicate is unaffected by free carbonic acid of natural waters and has a loss by disintegration of less than 5% per annum. H. H.

Correlation of sulfite reduction test with other tests in the bacterial examination of water. W. J. WILSON AND E. M. BLAIR. *J. Hyg.* 24, 111-9(1925).—A special medium

is made of glucose agar (3% agar) to each 100 cc. of which is added 1 cc. FeCl_3 8% soln., 0.6 cc. NaOH 10% soln., 20 cc. Na_2SO_3 20% soln. Forty cc. of water is mixed with 100 cc. media and poured into a large Petri dish. A layer of melted sulfite agar is then poured over the hardened mixt to keep out air. Certain bacteria such as *B. typhosus*, and *B. enteriditis* Gaertner give deep black colonies. Most *B. coli* are unable to discolor media. *B. welchii* and some other forms give dark colored colonies. Bacteria responsible for vegetable decay are in general not sulfite reducers. J. J. H. JR.

Purification of waste waters by fish ponds and particularly waste waters from cellulose factories. H. SELTER AND E. W. HILGERS. *Arch. Hyg.* **94**, 264(1924); *Bul. mens. office internat. d'hyg. publ.* **17**, 792-3(1925).—Exptl. results show that the process is feasible if wastes make up $\frac{1}{4}$ or less of the water. JACK J. HINMAN, JR.

Bacteriological purification of drinking water with alkaline hypochlorites and liquid chlorine. D. F. RICART. *Memorial de Ingenieros del Ejercito*, Nov., 1924; *Water and Water Eng.* **27**, 79(1925).—A general and comprehensive paper dealing with permanent and military installations. JACK J. HINMAN, JR.

Use of potassium permanganate in drinking water for poultry. SIVERT ERICKSEN. *J. Am. Vet. Med. Assoc.* **67**, 496(1925).—Added to pink color. Recommended as very effective. JACK J. HINMAN, JR.

Irritant poisons in water from shell holes. WILH. HARTMANN. *Chem.-Ztg.* **49**, 473(1925).—Waters were found to be poisoned from shell gas. It is believed that the Cl and Br split from the acetyl halides and reacted with the organic compds. in the water forming poisons which caused vomiting and intestinal disorders. K. C. B.

Treatment of alkali and other waters for domestic use. G. A. CUMMINGS. *Colorado Agr. Expt. Sta. Rept.*, p. 40(1924); *Expt. Sta. Rec.* **53**, 185(1925); *Pub. Health Eng. Abst.*, Sept. 26, 1925, Water Supplies, p. 57.—Distillation is the only suitable method. JACK J. HINMAN, JR.

The more unusual gases occurring in Imhoff tanks. F. L. CAMPBELL AND WILLEM RUDOLFS. *Eng. News-Rec.* **95**, 552-3(1925).—Fifty analyses of gases from Imhoff tanks at Plainfield, employing both combustion and absorption methods, have failed to reveal presence of H_2 , confirming the results of Imhoff, who attributes absence of H_2 to its combination with CO_2 to form CH_4 . This is considered improbable by C. and R. By expt. it was found that H_2 in contact with sludge disappears, but that this phenomenon does not occur if sludge is first sterilized. Studies are being undertaken to determine whether H_2 disappearance is due to chem. combination, absorption, or to catalytic action of living organisms. Hydrogen sulfide has been detected in one tank which had been cleaned for alterations and put in operation again. The sp. gr. of tank gases calcd. from analyses has been found to be significantly higher than values obtained by direct detn. with Schilling's app., indicating presence of other light gas or gases. R. E. THOMPSON

The Fort Worth Imhoff tank accident. H. L. THACKWELL AND F. A. JONES. *Eng. News-Rec.* **95**, 278(1925).—Discussion of the Fort Worth explosion (cf. following abstracts) which is considered a good illustration of the effect of accumulated scum in Imhoff tanks of the open gas vent type. A method of exhausting and utilizing the gas for heating the sludge, thus promoting digestion, is described briefly. In existing tanks having scum trouble the CO_2 can be removed by injecting NaOH soln. into floating scum, thereby allowing the escape of lighter gases. R. E. THOMPSON

Fort Worth Imhoff tank accident. T. R. CAMP AND C. F. LEWIS. *Eng. News-Rec.* **95**, 482(1925).—Discussion. (Cf. following abstr.) R. E. THOMPSON

Fort Worth Imhoff tank explosion recalls one in South Carolina. MCKEAN MAF FITT. *Eng. News-Rec.* **95**, 278(1925); cf. preceding abstr.—Description of explosion, due to firing of gas accumulation, in small plant operating as a septic tank. R. E. T.

Boiler feed water purification. A. S. BEHRMAN. *Mech. Eng.* **47**, 909-10(1925).—Boiler feed water purification is classed as external and internal treatment. Lime-soda ash pptfr. is the oldest of the external treatments. Temporary hardness is thus removed by sedimentation or filtration and the sulfates and chlorides of Ca and Mg are converted into the Na salts. In the zeolite process the temporary hardness is replaced by an equiv. quantity of soda, increasing the tendency to foam and prime. There seems to be a relation between excess soda and embrittlement. Excess soda ash treatment within the boiler to prevent the formation of CaSO_4 scale is used but cases are known where scale has formed with such treatment. The hot process of soda lime treatment is more effective in removing CaCO_3 than the cold because of the formation of colloidal CaCO_3 in the cold process. Attention is called to the necessity of consideration of local conditions for the best results. BEN H. PETERSON

The "Filtrator" apparatus for the prevention of scaling of boilers. ANON. *Le*

Génie civil 84, 410(1924).—This is not a filter, but an apparatus by means of which steam extracts a mucilaginous material from flaxseed and returns with it to the boiler. The emulsion formed is claimed to coat the particles of the precipitate and prevent formation of adherent scale.

JACK J. HINMAN, JR.

East Durham water for boiler and other purposes. W. G. CAREY. *J. Soc. Chem. Ind.* 44, 286-90T; *Water and Water Eng.* 27, 229-33(1925).—A general paper on the softening of a hard magnesian water by various methods and including discussion of the removal of oil and dissolved gases. The source is wells 140 to 500 feet deep from which 10 m.g.d. is obtained. Sanitary quality is good.

JACK J. HINMAN, JR.

The chemical purification of the boiler feed water of locomotives on the Paris, Lyons-Marseilles system. VIGNAL. *Rev. gen. de chemins de fer*, May, 1925; *Le Génie civil* 87, 67-8(1925).—The lime-soda process is used.

JACK J. HINMAN, JR.

What is the present trend in water works design and operation? WELLINGTON DONALDSON. *Cont. Rec.* 39, 854-7(1925).—Review and discussion of trend of water works practice with regard to aeration, sedimentation, coagulation, chem. application, filter sand bed, filter auxiliaries and chlorination.

R. E. THOMPSON

A modern water-softening and filtration plant. ANON. *Fire and Water Eng.* 78, 399(1925); *Pub. Health Eng. Abst.*, Sept. 5, 1925, Water Supplies, p. 50.—The Miami, Florida, supply is derived from 9 wells. It is treated with lime and alum, carbonated and filtered.

JACK J. HINMAN, JR.

Some features of filter design. J. W. ARMSTRONG. *Eng. News-Rec.* 95, 470-1(1925).—Since construction of Loch Raven Reservoir (Baltimore) max. 20° count has been reduced from 800,000 to 13,000 per cc. and max turbidity from 5000 to 200 p.p.m. Max. temp. has been reduced 6° F. To obtain max. efficiency with coagulation the water should be violently agitated immediately after addition of coagulant. Later agitation is ineffective. Expts. carried out at Baltimore with mixing basins of around-the-end type with 13-180° turns showed a distinct gain in subsiding value of the water at each successive turn. Reinforced concrete in contact with water has been found to have a tendency to disintegrate, particularly in cold climates, two important factors being quality of sand and imperviousness of concrete. Seepage of water through concrete, particularly where subject to frost action, will lead to ultimate disintegration. Water of p_H value less than 7.5 and alk. less than 100 dissolves CaCO_3 from concrete, and Al compds. also slowly go into soln., resulting in loss of strength; rapidity of destruction depends largely on porosity.

R. E. THOMPSON

Keeping the filter plant up to the mark. A. O. TRUE. *Fire and Water Eng.* 78, 791-2 and 820(1925).—Practical plant details.

JACK J. HINMAN, JR.

Rapid filters of the Stuttgart, Wurtemberg, water works. BAER. *Z. des Vereins deut. Ingenieure*, June 6, 1925; *Génie civil* 87, 339(1925).—Water from the Neckar is submitted to prefiltration, put through sand filters and chlorinated.

J. J. H., JR.

Electrically operated gages devised for filters. H. N. JENKS. *Eng. News-Rec.* 95, 346-8(1925).—Loss-of-head gages and valve-opening indicators consisting of voltmeters actuated by current varied through reactance coils, developed at Sacramento filtration plant, are described and illustrated.

R. E. THOMPSON

Economical use of alum in mechanical filters. A. D. STEWART and V. G. RAJU. *Water and Water Eng.* 27, 273-4(1925); cf. *C. A.* 19, 2717.

JACK J. HINMAN, JR.

Progress report of Committee No. 18, on Filter Sand Testing and Recording. ANON. *J. Am. Water Works Assoc.* 14, 235-52(1925).—In this report, special attention is given to the standardization and manipulation of sieves, the acid test and methods of expressing results obtained.

D. K. FRENCH

Chlorinator has daily capacity of 750 pounds. ANON. *Eng. News-Rec.* 95, 365(1925).—An injector type chlorinator with capacity of 750 lb. per 24 hrs., for use with 1000 containers, is described briefly and illustrated. App. has range of capacity of 1 to 1 and is equipped with automatic Cl shut-off device operated by water pressure.

R. E. THOMPSON

Economies resulting from the rational use of conduits in cast iron, steel, and in reinforced concrete for transporting water and gas. J. GILBERT. *La technique sanitaire* 20, 187-95 and 209-14(1925).—The dangers of leakage into and from water mains and the collection of escaped gas under pavements are discussed. Considerable space is given to various classes of joints, especially one designed by the author.

JACK J. HINMAN, JR.

Seventeenth Annual Report of the Division of Sewage Disposal. C. D. MCGUIRE. *Supplement to City Bulletin, Columbus, Ohio* 1924, 39-43.—Details of operation are reported.

JACK J. HINMAN, JR.

Sewage disposal—Retrospective and prospective. T. SALKFIELD. *Surveyor* 67, 29-30(1925).

Sewage disposal. ANON. *Surveyor* 67, 92-6(1925).—Review of progress 1924. R. E. GREENFIELD

Newark (England) sewage disposal. W. H. RADFORD. *Water and Water Eng.* 27, 234-6(1925).—Sewage is first settled and the sludge removed and dried on beds. The sewage is then mixed with 2½% activated sludge and stirred for one hr. After mixing the sludge is removed by settling and pumped to a reconditioning (aeration) tank and the liquid is run to the river. The sewage is 20% brewery waste and it is hard to get an activated sludge. The plant is run 16 hrs. per day. J. J. H., JR.

● Sewage disposal in the Rhenish-Westphalian industrial district. SIERP. *Z. Nahr. Genusssm.* 50, 53-69(1925).—A report, illustrated with photographs and diagrams. WILLIAM J. HUSA

Summary of the subject of the purification of sewage (in France). F. NAVE. *La technique sanitaire* 20, 157-64, 183-7(1925).

Activated-sludge process of sewage purification. G. P. HEAD. *Pub. Health J. (Can.)* 16, 82-5(1925).—The activated-sludge process is described and discussed and its advantages are outlined. R. E. THOMPSON

Report of Committee on Sewerage (in Wisconsin). F. R. KING, *et al.* *Proc. Eng. Soc. Wisc.* 17, 156-60(1925).—New sewer systems and treatment plants in the state since the 1924 report. Cf. C. A. 19, 2992. JACK J. HINMAN, JR.

Sewage works for small districts. J. D. WATSON. *Munic. Eng.* 76, 8(1925).—Sewage treatment methods suitable for small communities are outlined and discussed. R. E. THOMPSON

New sewage purification works for Epson. ANON. *Surveyor* 68, 315-6(1925).—Consists of detritus tanks, sedimentation tanks and aerating tanks using simplex aerators. Sedimentation takes place in quiet zones thus automatically returning the sludge. The power required is 725 h. p. for a 500,000 gallon flow. R. E. G.

Sewage treatment plant operation. G. H. RADEBAUGH. *Proc. Ills. Soc. Engrs.* 40, 63-7(1925).—Design and operation data on plant of Urbana-Champaign district consisting of coarse screens, Imhoff tanks, sprinkling filters, sludge-drying beds and lagoon. JACK J. HINMAN, JR.

Sewage pollution of drinking water for cattle and its effect on them. A. LEVIE. *Veterinary Record* 5, 692-3(1925).—Drinking sewage-polluted water causes loss of appetite, unthriftiness, drowsiness, weariness, scouring and sometimes vomiting. Septic swellings of the throat are occasional. Cattle kept solely on water contg. a high proportion of crude sewage will die in about six months. Recovery on clean water requires about 3 to 6 months. Toxins of sewage are important. Cattle drinking sewage-laden water are more susceptible to tuberculosis, Johnne's disease, and contagious abortion. JACK J. HINMAN, JR.

Measuring sewage flow by pitometer. A. L. SHAW. *Eng. News-Rec.* 95, 518(1925).—A device is described by means of which pitometer orifices may be flushed to remove adhering solids. R. E. THOMPSON

Recent additions to the sewerage system and disposal works of Framingham, Mass. F. W. HALEY. *J. Boston Soc. Civil Eng.* 12, 253-75(1925); *Pub. Health Eng. Abst.* Aug. 15, 1925, Sewage and Industrial Wastes, p. 48.—An installation of 12 acres for "intermittent filtration" and 57 acres for "broad irrigation" is supplemented by 2 Imhoff tanks with sludge beds and 16 sand filters of ½ acre area each. The Imhoff tanks are designed for 5000 people each and when operating at capacity will have a sedimentation period of 2 hrs. 10 min., and a sludge capacity of 2 cu. ft. per capita. Gas vents occupy 21% of the superficial area of the tanks. The sludge-beds have an area of 1 sq. ft. per capita. JACK J. HINMAN, JR.

Report on the installation of sewers and the propagation of worm infestations in British Guinea. H. KHALIL. *J. Helminthology* 2, 175-90(1924); *Sanitation Supplement, Tropical Disease Bulletin* No. 1, 45(Mar., 1925); *Bul. mens. office internat. d'hyg. publique* 17, 1014-6(1925).—In England and Europe most thought is given to bacterial content of sewage and waters. Worms, including hookworm, and protozoa are very important in the tropics. Hookworm larvae can pass through filter paper and through the human skin. Filtration is probably not effective against them. Septic tank action does not always kill hookworm larvae. JACK J. HINMAN, JR.

Activated-sludge works in East York. ANON. *Cont. Rec.* 39, 690-5(1925).—The new Don Valley sewage-disposal works of East York Township, adjoining Toronto, Ont., are described and illustrated. The plant, which is of the diffuser aeration activated-sludge type, consists of bar screens, detritus tanks, re-aeration and mixing tanks.

for intermixture of returned sludge and inflowing sewage, aeration tanks and Dorr clarifier, the effluent being discharged into the Don River. The excess sludge will pass to digestion tanks, and, after digestion, will be dried on beds consisting of 12 in. of gravel and 12 in. of screened ashes underlaid with agricultural tile. R. E. T.

The pressing of precipitated sludge. J. T. THOMPSON. *Surveyor* 67, 269-70 (1925); cf. C. A. 19, 2251—Method used at Leeds (Eng.). R. E. GREENFIELD

Reading new activated-sludge plant. ANON. *Surveyor* 67, 249-50 (1925).—Brief engineering description. R. E. GREENFIELD

The subject of septic tanks in the Department of the Seine. VAILLARD. *Comptes rendus Conseil d'hyg. publ. et salubrite du Dept. de la Seine* 31, 66 (1925); *Bul. mens. office internat. d'hyg. publ.* 17, 928-9 (1925). JACK J. HINMAN, JR.

Remodeling an old septic tank and constructing a separate sludge-digestion and sprinkling filter system for the city of Rochelle, Illinois. R. I. RANDOLPH. *Proc. Ills. Eng. Soc.* 40, 68-71 (1925). JACK J. HINMAN, JR.

Wandle Valley joint sewerage board. *Munic. Eng.* 76, 380 (1925).—The Wandle Valley works, treating dry weather flow of 3,900,000 gallons per day from population of 80,000, consists of primary and secondary sedimentation tanks, percolating filters and humus tanks, the effluent being discharged into the River Wandle. The sludge is mixed with ground lime, pressed at 80 lbs. pressure, and disposed of for fertilizer. R. E. THOMPSON

The correlation of federal health agencies. L. R. WILLIAMS. *J. Am. Med. Assoc.* 85, 1479-80 (1925).—The present federal bureaus have overlapping agencies and lack of correlation. Under the present conditions many improvements are possible, but so far no comprehensive plan has been worked out. L. W. RIGGS

The Sanitary Inspectors' Association of Canada. L. L. ANTHES. *Pub. Health J. (Can.)* 16, 135-42 (1925).—The fundamentals of sewage treatment in septic tanks are outlined and discussed. R. E. THOMPSON

Continuous carbon monoxide recorder in the Liberty Tunnels. A. C. FIELDNER, S. H. KATZ AND E. G. MEITER. *Eng. News-Rec.* 95, 423-4 (1925).—A CO recorder which has been successfully employed in controlling ventilation in the Liberty Tunnels, Pittsburgh, for 10 months is described and illustrated. The principle involved is the measurement by thermocouples of the increased temp. of gas when CO and O₂ react in the presence of a catalyst, the thermoelec. effects being recorded by means of a potentiometer which is sensitive to 1-2 parts per million. Four parts of CO per 10,000 parts of air has been detd. to be the max. concn. to which human beings may be exposed continuously for 1 hr. without noticeable effect, or, if concn. is increased from zero uniformly for 1 hr., max. tolerable concn. is 6 parts per 10,000, averaging 3 parts for the hr. R. E. THOMPSON

How to make a sanitary survey of your plant. C. L. FERGUSON. *Ind. Eng. Chem.* 17, 1275-7. —One should become acquainted with the standards for cleanliness, drinking water, ventilation, lighting, toilets, cuspidors, wash rooms, dressing and rest rooms and restaurant, as they pertain to the plant. Expert advice should be sought whenever necessary. EDWARD BARTOW

Public swimming pools in the city of Edmonton. ANON. *Cont. Rec.* 39, 654-5 (1925). —The water is circulated every 18-24 hrs. and is purified by filtration and chlorination with bleach, the latter being controlled by the o-tolidine test. CuSO₄ is used in small quantities to control algal growths. R. E. THOMPSON

The purification of swimming bath water. ANON. *Munic. Eng.* 76, 217 (1925). —The water of the municipal pools of St. Helens, of which there are 2 of aggregate capacity of 112,000 gallons, is filtered through Paterson pressure filters after addition of coagulant, aerated with compressed air, and chlorinated with Chloronome app. at the rate of approx. 0.5 p.p.m. The water is circulated at a rate equiv. to complete replacement every 10 hrs., and is heated to 72° F. in summer and 78° F. in winter. After 19 weeks' continuous use, examn. showed *B. coli* and *B. enteritidis sporogenes* to be entirely absent; the total no. of bacteria per cc. on gelatin, 3 days' incubation, was only 112. There was no trace of free Cl₂ or nitrites, and the free and albuminoid ammonia and $\frac{1}{2}$ absorbed in 3 hrs. at 37° were 0.0046, 0.0058 and 0.045 part per 100,000, resp. R. E. T.

A water-borne typhoid epidemic at Aegion, Greece. GEORGE SP. JOANNIDES. *La Grèce medicale* 27, 10 (1925); *Bul. mens. office internat. d'hyg. pub.* 17, 907-8 (1925). —An epidemic of 128 cases and 2 deaths in Nov., 1924. Water of the aqueduct was polluted at the point of entrance to the reservoirs. The distribution of water was stopped, repairs were made and the reservoirs treated with lime. JACK J. HINMAN, JR.

Algal growths in tank waters. V. G. RAJU. *Water and Water Eng.* 27, 57 (1925). —

Algae seem to prefer a temp. of about 75° F. and die off as reservoirs get low and the water goes above that value in temp. They then decompose and give off bad odors. Copper sulfate and lime have not been very effective under Indian conditions. H_2SO_4 in amt. necessary to neutralize the bicarbonates has been very successful. It is not necessary to add the dose all at once. Most important algae have been *Oscillaria*, *Anabaena*, *Cylindrospermum*, *Navicula*. A *Euglena* forms a thick red coating at times on the water. *Spirogyra* is the most important layer form of alga. J. J. H., JR.

Soil acidity and survival of hookworm larvae. A. C. CHANDLER. *Indian Med. Gazette* 60, 462-4 (1925).—The acidity likely to be in agricultural soil, up to a p_H of 5.5, does not interfere with the survival of the hookworm larvae. L. W. RIGGS

● **Decomposition of "cobolt" or "metalloid arsenic" by atmospheric oxygen in presence of water.** MAURICE FRANÇOIS AND (MISS) LAURE SÉGUIN. *Ann. fals.* 18, 460-4 (1925).—The action of "cobolt" as a fly destroyer is due to the formation of sol. H_3AsO_3 by action of atm. O in presence of H_2O under ordinary conditions of use. In 34 days 30% of the As was obtained in sol. form, and it is concluded that it would ultimately be all solubilized. A. PAPINEAU-COUTURE

Air pollution. The tenth report of the London Advisory Committee on Air Pollution. J. B. C. KERSHAW. *Combustion* 13, 218-20 (1925).—Although the amt. of soot and solid combustion products suspended in the atm. seldom amounts to 1% of the weight of the coal burned, its presence is a sign of bad conditions of combustion, and considerably more than 1% of the calorific value of the coal is lost under these conditions. Impurities in the atm. also contaminate the rainfall. Data on the impurities in rainfall and the total fall of solid matter in towns in the United Kingdom are given. J. F. BYRNE

Cemeteries and cremation. FR. MESSERLI. *La Technique sanitaire* 20, 65-71 (1925).—Discusses decomposition of cadavers and relation to nature of soil of burying ground, ground water height and hygiene. Cremation is favored on ground of economy as well as on that of hygiene. JACK J. HINMAN, JR.

The classification of common salt by its iodine content and the use of iodine in combating goiter (RÓZSA) 11G. Corrosion (TRAX) 9.

ADAMS, H. C.: **Domestic Sanitation and House Drainage.** 227 pp. Henry Froude and Hodder and Stoughton: London. Reviewed in *Expt. Sta. Rec.* 53, 188 (1925); *Public Health Eng. Abst.*, Sept. 26, 1925, Sewage and Industrial Wastes, p. 51.

Electrolytic protection of surfaces of steam boilers or other metals against incrustation. W. THALHOFFER. U. S. 1,558,646-7, Oct. 27.

Fumigating with hydrocyanic acid. W. S. LANDIS AND G. H. BUCHANAN. U. S. 1,559,892, Nov. 3. After introducing HCN gas into a space to be fumigated, NH_3 and AcH are introduced (in the proportions of substantially more than 1 mol. NH_3 to $1\frac{1}{4}$ mols. of the AcH) to destroy the HCN.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

A bibliography of soil alkalies. F. V. KING, GUY ERVIN AND O. LOUISE EVANS. U. S. Dept. Agr., *Bull.* 1314, 1-40 (1925).—A bibliography compiled with special reference to the deleterious action of soil alkalies and various other chemical agents on cement and concrete. W. H. ROSS

The nature of soil acidity. D. J. HISSINK AND JACOB VAN DER SPEK. *Chem. Weekblad* 22, 500-1 (1925).—Soil particles are negatively charged in aq. suspension. It is assumed that they carry a double elec. layer, the positive inner, consisting of aluminosilicate or humic acid anions, the negative outer layer of H, K, Na, Ca and Mg ions. The H ion of the double layer and that of the molecularly dispersed acids determine the acidity of the soil. Clay acids are weak, humic acids mostly weak, sometimes moderately strong. The decrease of acidity with diln. is explained by a smaller no. of colloidal particles with double layer. The interpretation is supported by the lower acidity of centrifugates or filtrates as compared with the original suspensions and the increase of p_H from 4.2 to 4.6 in soil suspensions as soon as the rotation of the electrode ceases. The origin of the negative charge of the particles is sought not in the stronger adsorption of H ion but in the splitting off of cations by the boundary layer. M. J.

The nitrifying power of pozzolanas. I. CESARE SERONO AND LAURA GUERCI.

Ann. chim. applicata 15, 309–16(1925).—Systematic analyses of various waters originating in volcanic ground, particularly in the subsoil of Rome where pozzolana is present, showed the presence of nitrates but no nitrites or NH_3 . Four samples from the region of Rome contained 0.1320, 0.0988, 0.0844 and 0.0302 g. of N_2O_5 per l., the amts. remaining approx. const. for months. Bacteria and org. substances were absent and the nitrates were of *inorg. origin*. Since pozzolana is a transformation product of volcanic rock and since NH_4 salts dissociable at low temps. are present in such eruptions, it is probable that the nitrates were formed from these NH_4 salts and air by the catalytic action of pozzolana. To verify this supposition, expts. were made to det. whether NH_3 can be oxidized by air with pozzolana as catalyst. When a current, hot or cold, of a mixt. of NH_3 and air was passed through pulverized pozzolana and H_2O , a small amt. of NH_3 was oxidized to N_2O_5 , the latter being formed whether or not the pozzolana had been sterilized with CHCl_3 . On the other hand there was no N_2O_5 formed with pozzolana which had been calcined, nor with that which had been heated at 250° for 2 hrs., these last tests being to det. whether the colloids present in pozzolana were the active catalytic agent. Nor was any N_2O_5 formed with pulverized pumice, indicating as did the expts. with calcined pozzolana, that the formation of N_2O_5 is independent of the extent of the surface of contact. The formation of *Chile nitrate*, which occurs in a volcanic region, may have originated in the same manner as the nitrates in the H_2O of the volcanic ground described. The presence of nitrates in the H_2O of volcanic regions explains why the addn. of N fertilizers to the Roman campagna does not increase the yield of crops, for nitrates are supplied in adequate quantity in the H_2O . C. C. DAVIS

Humophosphates. E. BORTINI. *Ann. chim. applicata* 15, 358–62(1925).—The work of Berthelot, Grandeau (*Ann. station agronom. de l'est* 1878), Dumont (*Les matières humiques du sol*, Paris 1905, 117) and Petit (*C. A.* 5, 2684) left in doubt the nature of the absorption of P_2O_5 by humus and whether it even involves a chem. reaction. Repeating the expts. of Dumont, but using peat, a humate was obtained which contained 5.98% P_2O_5 and 3.19% N, a result similar to that of Dumont. A study was then made to det. what component of humus absorbs P_2O_5 , i. e., whether it is the true humic acids, aliphatic or aromatic acids (crotonic, dihydrostearic, agroceric, cinnamic, etc.), org. bases (purine, xanthine, guanine, etc.) or inorg. bases. **Humic acids.**—Two artificial humic acids were prepd from hydroquinol and from pyrocatechol, resp. (cf. Eller and Koch, *C. A.* 15, 83). The preps. were then repeated, except that previous to the oxidation by $\text{K}_2\text{S}_2\text{O}_8$, $\text{Ca}(\text{H}_2\text{PO}_4)_2$ soln. was added. Analysis of the 4 humic acid products showed the absence of P_2O_5 in all. **Org. acids.**—Crotonic and cinnamic acids were chosen as typical. Even after a month neither reacted with H_3PO_4 , the latter being used rather than $\text{Ca}(\text{H}_2\text{PO}_4)_2$ to avoid Ca ppts. **Org. bases.**—Guanine and hypoxanthine when treated in alk. soln. with $\text{Ca}(\text{H}_2\text{PO}_4)_2$ gave white ppts. contg. P_2O_5 in each case. When treated with dil. H_3PO_4 , however, the ppts. contained no P_2O_5 . **Inorg. bases.**—Expts. proved that the KOH used to dissolve the humic acids was the active agent in the absorption of P_2O_5 ; in fact dil. KOH and $\text{Ca}(\text{H}_2\text{PO}_4)_2$ soln. formed a ppt. contg. P_2O_5 , which calens. showed accounted for practically all the P_2O_5 absorbed by the humic acids. It is concluded that the so-called "humophosphate" is not a definite chem. compd. but is a *Ca humate accompanied by more or less CaHPO_4 and $\text{Ca}_3(\text{PO}_4)_2$* formed by the action of the alkali used as a solvent of the humic substance. C. C. DAVIS

Influence of easily soluble nitrogenous compounds on the decomposition of cellulose in the soil. J. A. ANDERSON. *Kgl. Landtbr. Akad. Handl. och Tidskr.* 64, 199–509(1925).—The rate of decompn. of cellulose in soil increases in proportion to the assimilable N present until this exceeds the quantity necessary for the max. development of the microorganisms. Under the conditions of the expts. this point was reached when the ratio between assimilable N and cellulose was 1:35. N in excess of this was without influence on the decompn. The quantity of cellulose decomposed per mg. N decreases with increased quantities of N. Nitrification takes place in the soil in the presence of cellulose, but unless more N is present than needed by the microorganisms, the nitrate N is consumed as soon as formed. Ammonification also takes place in the presence of cellulose. It appears that none of the bacteriol. processes in soil is stopped by the addition of carbohydrates. When cellulose is added to soil, conditions are created for the development of cellulose-decomp. organisms and these in turn use for their growth the assimilable N. The growing plant is not able to compete with the microorganisms for the N and hence are hindered in their development or fail entirely. C. O. SWANSON

The nitrogen compounds in rain and snow. F. T. SHUTT AND B. HEDLEY. *Trans. Roy. Soc. Can. Sec. III* [3], 19, 1–10(1925); cf. *C. A.* 11, 1242.—This investigation ascertained the fertilizing value of rain and snow in nitrogenous plant food over the period

1907-1924. The rain was collected in a lead-lined tray, the snow off a stone ledge on the chemical building, Experimental Farm, Ottawa. Samples were collected twice daily during precipitation. During the 17 years, 1214 samples of rain and 495 of snow were analyzed for NH_3 , albuminoid NH_3 , nitrates and nitrites. The av. annual rainfall was 24.15 inches and snowfall 95.7 inches. There was no direct proportionality between the vol. of rainfall or snowfall and the quantity of N furnished annually per acre. Bush fires in 1908-09 gave an abnormally high NH_3 content. The av. annual contributions of N in lb. per acre, for rain and snow, resp., was: as free NH_3 3.322, 0.568; as albuminoid NH_3 0.654, 0.194; as nitrates and nitrites 1.762, 0.412. The investigation is being discontinued because of the increasingly large amount of ammonia found and attributed to the use of bituminous coal in the neighboring city of Ottawa. J. W. SHIPLEY

Manufacture and analysis of the new ureic fertilizers obtained from cyanamide.

A. COCHET. *Ann. fals.* **18**, 396-412, 468-76(1925); cf. *C. A.* **18**, 3246—The manuf. of urea, "phospho-N" and other ureic fertilizers as carried out at the Martigny plant of the Société des Produits Azotés is briefly outlined. In the *detn. of urea* via Fosse (*C. A.* **8**, 1972, 3181, 3450): (1) an excess of at least 2.8 times the theoretical quantity of xanthidol is required; (2) a 50% reduction in the indicated concn. of AcOH still gives quant. pptn. of $\text{CO}(\text{NH}_2)_2$, while increase in the concn. gives incomplete pptn.; (3) by adding the 5 cc. of xanthidol soln. at one time, the duration of pptn. can be reduced to 1 hr. 15 min.; (4) counterpoised filters can be used instead of a Gooch crucible, and drying is much quicker; (5) drying is incomplete at 110° , all the AcOH is driven off in 50 min. at 150° . In the presence of guanilylurea sulfate, $(\text{NH}_4)_2\text{SO}_4$ and superphosphate, shake 30 min. with water, make slightly alk. with NaOH with phenolphthalein indicator, make to vol., filter and det. urea in an aliquot. On account of the small amt. of sample which must be taken (not over 20 mg. $\text{CO}(\text{NH}_2)_2$) the results are usually somewhat low as a result of errors in measuring; but practically theoretical results are obtained by weighing the aliquot taken and calcg. its vol. from the d. of the soln. taken with a picnometer. For the *detn. of guanilylurea*: to 10-15 cc. of soln. contg. not over 0.125 g. of guanilylurea-N add successively 0.1 g. of mannitol per cc. of soln., about 20 cc. of Ni reagent ($\text{Ni}(\text{NO}_3)_2$ 10 g., NH_4NO_3 5 g., H_2O 50 cc., concd. NH_3 aq. 20 cc., 10% NaOH 20 cc.) and 4 cc. 10% NaOH , let stand 4 hrs., filter on a Gooch crucible, wash with 2% NH_3 till free from Ni , dry to const. wt. and weigh. The standing beakers should be covered to prevent loss of NH_3 with consequent pptn. of $\text{Ni}(\text{OH})_2$; but if the latter occurs, redissolve with a little NH_3 . The compn. of the ppt. is $\text{Ni}(\text{C}_2\text{H}_5\text{ON})_2 \cdot 2\text{H}_2\text{O}$, and not $\text{Ni}(\text{C}_2\text{H}_5\text{ON})_2 \cdot \text{H}_2\text{O}$ as claimed by Grammont; on drying at 100° it loses $2\text{H}_2\text{O}$, so that the factor is 0.42968, and not 0.4019 as claimed by Grammont. With small guanilylurea contents, the ppt. is merely weighed after drying, but with high contents N is detd. in the ppt. *via* Kjeldahl. In the presence of urea, $(\text{NH}_4)_2\text{SO}_4$ and superphosphate, shake 30 min. with H_2O , make slightly alk. to phenolphthalein with NaOH , make to vol., filter, take an aliquot and make slightly acid to Me orange, evap. to about 15 cc. (adding H_2SO_4 if necessary during evapn. to keep acid), add 2 g. of mannitol, and ppt. with Ni as above. For the *detn. of NH_3 -N* the Ronchèse method (conversion to $(\text{CH}_2)_6\text{N}_4$ by means of CH_2O) and Auger's method (*C. A.* **18**, 1798) are inapplicable because of partial electrolytic dissociation of the guanilylurea sulfate. It is detd. by treating a soln. of the sample with 30 cc. of 36° Bé. NaOH in the cold, and drawing off the liberated NH_3 into standard H_2SO_4 by means of a current of air. All the NH_3 is removed in 2.5-4 hrs. In the *detn. of dicyanodiamide* *via* Harger (*C. A.* **15**, 286) optimum conditions are: not over 0.05 g. of dicyanodiamide-N in 100 cc., 0.150 g. AgNO_3 (as 5% soln.), 100 cc. of picric acid (7.5 g. per l.). Addn. of more than 0.150 g. of AgNO_3 is liable to cause partial pptn. of Ag picrate or of Ag-NH_3 picrate (when NH_3 is present). In cyanamide, $\text{C}_2\text{N}_4\text{H}_4$ is first extd. with Me_2CO in a Soxhlet app. for 1 hr., the ext. evapd. almost to dryness, taken up with H_2O and treated *via* Harger. If the cyanamide is extd. with alc. instead of Me_2CO , the H_2O in the alc. dissolves free CaO from the cyanamide and polymerizes part of the latter to $\text{C}_2\text{N}_4\text{H}_4$, giving high results. The method was applied to com. "phospho-N" and showed it to be free from $\text{C}_2\text{N}_4\text{H}_4$. When applied to a sample contg. a known added amt. of $\text{C}_2\text{N}_4\text{H}_4$, the whole of the latter was recovered. $\text{C}_2\text{N}_4\text{H}_4$ should not be calcd. by difference.

A. PAPINEAU-COUTURE

May Chile saltpeter be replaced by other nitrogenous fertilizers? JULIUS STOKLASA. *Z. Zuckerind. cecoslov. Rep.* **50**, 17-21, 25-9(1925).—Pot expts. with sugar beets gave results as follows: wt. roots (a), wt. leaves (b), % sugar (c), wt. sugar per 10 pots (d)—no fertilizer, (a) 2364, (b) 894, (c) 16.2, (d) 383 g.; base fertilizer (monocalcium phosphate and kainite), (a) 2407, (b) 958, (c) 18.6, (d) 448; base + NaNO_3 , (a) 4070, (b) 1960, (c) 18.0, (d) 733; base + KNO_3 + NH_4NO_3 , (a) 3825, (b) 2060, (c) 17.9, (d) 685; base + "ammonium sulfate-nitrate," (a) 3572, (b) 1820, (c) 17.2, (d) 614; base +

(NH₄)₂SO₄, (a) 3603, (b) 1547, (c) 17.3, (d) 623. Similar results were obtained with oats. Comparative pot expts. with and without 21 mg. KI per pot showed largely increased yields with KI. This is held to be the reason for the superiority of Chile saltpeter over all other nitrogenous fertilizers.

The maturation of horse manure. E. BOTTINI. *Ann. chim. applicata* 15, 346-57 (1925).—Because of its agricultural importance, analyses of horse manure were made each 2 months as it reached more advanced states of decompn. The material was kept in a moist condition by replenishing the H₂O lost, thus insuring normal microbic action. Cellulose is very resistant during the early stages of maturation but then decomps. rapidly and after 4 months it is reduced to 40% and after 8 months to 26% of the original amt. The proteins are likewise very resistant, but exact data are difficult to obtain because of the action of bacteria which fix N and compensate the loss, and which become active after about 2 months. The fatty substances decrease noticeably during the first 2 months, this decrease becoming more rapid in the succeeding 2 months. The loss is thereafter gradually more than compensated by the formation of fats from the decompn. of cellulose and of proteins, which occurs after about 6 months. The penosans decomp. gradually from the beginning, and after 8 months only about 16% remain. The methyl-pentosans also decomp. from the beginning, but this decompn. ceases after 6 months, at which time about 40% remain. The mineral substances change but slightly or not at all. Other unidentified substances take part in the maturation, their decompn. contributing to a further progressive loss of wt. A review of the compn. of manure and the chem. reactions involved in its decompn. is included. C. C. D.

Some effects of sodium arsenite when used to kill the common barberry. P. R. SCHULZ AND N. F. THOMPSON. U. S. Dept. Agr., *Bull.* 1316, 1-18 (1925).—Na₃AsO₃ in proper diln. is an effective killing soln. for most plants and is found in nearly all tissues of treated plants while controls contain no As. The soln. is most effective in killing plants when applied to the roots; spraying or dipping is not always effective. When rainfall was abundant the soils used showed rapid leaching of Na₃AsO₃ but its sweet taste attracts animals and its use in pastures without precautions or repellents is therefore unsafe. A modified volumetric method was developed for the detn. of small quantities of As in plant tissue. A bibliography of 8 references is appended. W. H. ROSS

Preliminary studies on the control of cereal rusts by dusting. C. V. KIGHTLINGER. *Phytopathology* 15, 611-3 (1925).—A sulfur dust contg. 10% Pb arsenate was used in greenhouse and plot expts. for controlling *Puccinia coronata* on oats artificially inoculated by spraying with spore suspensions or interplanting with infected plants. Four applications gave almost absolute control, untreated checks having 74% infection. The work is being continued and extended to other cereals. JOSEPH S. CALDWELL

Influence of temperature and humidity upon the volatilization of nicotine from tobacco dust-lime hydrate mixtures. L. R. STREETER. *J. Econ. Entomol.* 18, 590-3 (1925).—Moisture is more important than temp. in the volatilization of nicotine. The addn. of a little water to the mixt. insures a rapid evolution of nicotine. C. H. R.

Observations on insects developing immunity to insecticides. R. S. WOGLUM. *J. Econ. Entomol.* 18, 593-7 (1925).—In certain districts of Calif., the red and black scale have developed immunity to HCN to such an extent that present dosages are unreliable. C. H. R.

Determination of nitrate N (LAGERS) 7.

Nitrogenous fertilizer or stock feed. L. F. SCHMELZER. U. S. 1,561,667, Nov. 17. Materials such as garbage or slaughter house materials are digested in a heated closed steam-tight container, in steam derived at least mainly from the moisture in the material itself.

Product from sulfur and alkaline protein compounds. W. C. PIVER. U. S. 1,559,984, Nov. 3. Pulverized S is dispersed in an alk. protein compd. such as that of NaOH and casein to prep. a finely comminuted product suitable for use as a fungicide.

"Pickling" seeds. CHEMISCHE FABRIK L. MEYER. Brit. 232,563, April 19, 1924. Seeds are protected against fungoid diseases, etc., by a mixt. of HgCl₂ or other Hg compd. with phenol, with or without kaolin, fossil meal or alcs. Brit. 232,564 specifies the use, for the same purpose, of formalin with glycerol, HCl, glycollic acid nitrite, phenol, MgCl₂ or HgCl₂, with or without inert substances.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Preliminary investigation on the ultimate possible commercial uses of the leaves of *Opuntia vulgaris* (India fig-tree). HURDISAN. *Bull. assoc. inst. sup. ferm. Gand* 26; *Ann. soc. brasseurs* 34, 284-99 (1925).—Analysis of the pulped leaves gave: H_2O 82.79, total solids 17.21, ash 3.67, org. matter 13.54. The compn. of the org. solids calcd. to the dry basis was found to be: hexoses (calcd. as glucose) 3.62, crude protein ($N \times 6.25$) 9.63, sol. uncoagulable proteins (albumin II) 1.04, albumin I 4.48, propeptones 1.28, denucleins 0.83, peptones 1.99, Et_2O ext. 0.26, petr. ether ext. 0.12, gums and dextrins 44.67, crude fiber 37.43%. The ash contained (on the wet basis) SiO_2 0.27, P_2O_5 0.45, MgO 0.18, CaO 0.72%. Extn. in the cold (about 15°) and hot (about 80°) of 50 g. of the pulp with 450 g. H_2O dissolved 2.89 and 4.96%, resp.; with 445 g. H_2O and 5 g. H_2SO_4 dissolved 6.05 and 7.65%, resp.; with 445 g. H_2O and 5 g. $NaOH$ dissolved 3.89 and 7.00%, resp. The juice had p_H 4.3. The pulp contains a proteolytic diastase active at about $45-50^\circ$, a dextrin-saccharifying diastase, oxidizing diastases (laccase, tyrosinase, or perhaps a peroxidase), but no liquefying diastase. The sugars consist of glucose, or xylose, or a mixt. of both. The juice contains the glucoside of an acid, possibly an allotropic form of primeverin. On placing a small piece of the bark of the leaves in unhopped beer worts having p_H of (1) 4, (2) 6, (3) 7.4, resp., there developed mainly: (1) and (2) a yeast with small ovoid, *Torula*-like cells, and small motile rods; (3) large cells with rounded corners, forming zoögleas, apparently identical with Lindner's *Sachsis suaveolens*. Boiled, filtered and sterilized wort at 8.4° . Balling was inoculated with pure strains from the 3 above cultures: (1) gave a slow fermentation with aromatic odor, and the distillate had the characteristic odor and b. p. of $PrOH$; (2) gave rapid fermentation with decided butyric odor; the distillate was practically odorless and the residue had a strong butyric odor; (3) gave a slow fermentation with odor of white wine, and the fermented liquor had an acid and strongly aromatic flavor.

A. PAPINEAU-COUTURE

The conversion of wood cellulose into sugar and alcohol. FOULON. *Wochbl. Papierfabr.* 56, 1149-51 (1925).—Wood, for conversion to sugar and $EtOH$, is best used in a disintegrated form which has been previously leached with water to remove sol. substances. HCl , in a closed system under pressure, is preferable to H_2SO_4 for the hydrolyzing agent. The various steps in the conversion process are described. The method of Classen, using H_2SO_4 , $50-60^\circ$ Baumé, is also given. Other patents of C. involve the use of Cl and hypochlorites, and H_2SO_4 contg. SO_3 . J. L. PARSONS

Evaporation losses in quick-vinegar producers. A. STEINMETZ. *Chem.-Ztg.* 49, 613-5, 635-6 (1925).—A discussion of advances in the manuf. of vinegar by the quick-vinegar process from $EtOH$. Large amts. of both $EtOH$ and $AcOH$ are often lost in the effluent air. The air used need not exceed about 3 times that required for the oxidation though it is usually not controlled and may reach ten times the theoretical. Analysis of the effluent air is often useful in indicating by too high an O content that a unit is not functioning properly. Over-oxidation, shown by the presence of too much CO_2 , is usually more quickly revealed by the cloudy appearance of the product. In recent times the effluent air is treated to recover $EtOH$ and various methods are discussed. The humidity and temp. of the air are shown to be factors in cooling and in evapn. losses, high humidities and temps. ($25-35^\circ$) causing smaller losses. M. A. Y.

Frings' capacity generators. HEINRICH FRINGS. *Deut. Essigind.* 29, 391-4, 396-7 (1925).—This type of generator is described and illustrated. W. O. E.

Antiseptic action of α -hop-bitter acid and its decomposition products on micro-organisms (WINDISCH, *et al.*) 11C. Preheating and spray desiccation of distillers' slop by combustion gases (U. S. pat. 1,558,022) 13. Rectification of alcoholic liquids (U. S. pat. 1,559,218) 22.

VENTRE, JULES: **Du rôle de l'acidité réelle dans la preparation et la conservation des vins.** Montpellier: Goulet et fils. 158 pp. Reviewed in *Ann. fals.* 18, 482-6 (1925).

FABRE, J. H.: **Procédés modernes de vinification en Algérie et dans les pays chauds.** Paris: Dujardin; Alger: J. H. Fabre. Reviewed in *Ann. fals.* 18, 486 (1925).

Acetone and butyl alcohol by fermentation. E. RICARD. U. S. 1,550,746, Aug. 25. In fermenting carbohydrate materials such as a cereal wort or saccharine soln. for

producing acetone and BuOH, successive relatively small quantities of a non-aseptic wort are added to an aseptic fermenting wort.

Alcohols and acetone by fermentation. E. H. STRANGE. U. S. 1,550,928, Aug. 25. Both yeast and bacteria capable of producing BuOH and acetone are used for the fermentation of a mash from cereals or other amylaceous materials or saccharine solns.

Enzymic beverage. J. TAKAMINE, JR. U. S. 1,561,955, Nov. 17. Beverages having diastatic and proteolytic properties are prepd. by isolating a H₂O-sol. enzymic compn. of vegetable fungus origin, *e. g.*, from *Aspergillus oryzae*, and mixing this enzymic material with dissolved cane sugar to produce a thick sirup suitable for diln. with H₂O.

Yeast. A. POLLAK. U. S. 1,558,627, Oct. 27. Materials such as leguminous flour, soja flour, oil cake, cereal seeds, bran, grains, dry yeast or any vegetable protein materials, or casein, fibroin, collagen, meat meal, etc., may be used for prepg. nitrogenous yeast-nutrient substances; *e. g.*, a part of the raw material may be made into a thick mash with H₂O, and then enough H₂SO₄ added to equal 5–15% of the total mixt. and the mixt. is heated to 100–110° for 3–12 hrs. to effect soln. of the protein substances. The action of the H₂SO₄ is then checked, *e. g.*, by adding an equiv. amt. of Ca phosphate, and is further heated at about 100° for about 12–24 hrs. or until tests show that the higher "albumen complexes" are converted into amino acids, peptones and albumoses. The soln. is treated with NH₃ to neutralize nearly all the acid then present and, after sepn. from insol. substances, is suitable for use. Other details are specified.

Yeast mixture. M. E. NEIL. U. S. 1,557,764, Oct. 20. A mixt. stated to possess good durability comprises moist compressed yeast 2, milk powder 2 and cooked arrow-root powder 0.125 part, with sufficient H₂O to facilitate admixture.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Future research in the field of organic arsenicals. W. G. CHRISTIANSEN. *Ind. Eng. Chem.* 17, 1270–1 (1925). E. J. C.

A new method for the determination of phenols in essential oils. L. RETI. *Ann. chim. applicata* 15, 317–20 (1925).—For a description of the method see *C. A.* 19, 1928. Typical results with oils included the following: thyme, 36% thymol; marjoram, 65% carvacrol; *Satureia montana*, 49% carvacrol; clove, 82% eugenol; pimento, 63% eugenol; Ceylon cinnamon, 14% eugenol. When an oil contains such a mixt. as eugenol and acetyleneugenol, *e. g.*, clove, which should both be detd. as phenols, the dil. NaOH should be added at 70–80°, under which conditions sapon. of the acetyl deriv. to eugenol is complete. The method may be extended to the detn. of basic compds. in neutral mixts., *e. g.*, pyridine and quinoline, by the use of 20% HCl as absorbent. C. C. DAVIS

New ampules. G. E. DANN. *Pharm. Ztg.* 70, 1520–2 (1925).—Five different types of the more recent multiple-chambered ampules are illustrated and described in detail. W. O. E.

Impregnated gauzes. P. SCHÜTZ. *Pharm. Ztg.* 70, 1522 (1925); cf. *C. A.* 19, 2861.—The analytical findings of a series of gauzes medicated with dermatol, Bi subgallate and xeroform are presented in tabulated form showing the declared and actual drug content of the fabric, the variations being such as to warrant more stringent control. W. O. E.

Strontiuran as solvent and reagent for arsphenamine and neoarsphenamine. ALFRED HIRSCH. *Pharm. Ztg.* 70, 1577–8 (1925).—Expts. are described showing how with the aid of "strontiuran" (a prepn. of SrCl₂ and urea, proportions not given) arsphenamine and neoarsphenamine may be applied in medical practice without fear of intoxication. 0.2 g. samples are dissolved in 100 cc. of H₂O, acidified with 25 cc. of 1:20 HCl, and treated with 50 cc. of 0.1 N I soln. After 3 min. the mixt. is titrated with 0.1 N Na₂S₂O₃ in the presence of starch. The no. of cc. of I soln. expended $\times 5$ = the total reduction capacity of 1 g. of the sample. This value should range between 152 and 160; the use of a product with a value of 149 to 150 is permissible, while those having lower values should be regarded with suspicion, and preferably discarded. W. O. E.

Strontiuran as reagent for neoarsphenamine and arsphenamine. W. KOLLE, H. BAUER AND F. LEUPOLD. *Pharm. Ztg.* 70, 1614–5 (1925).—The utility of strontiuran as a reagent in judging the quality of neoarsphenamine and arsphenamine, as advocated in the preceding abstr., is seriously questioned; in fact the results obtained and conclusions arrived at by Hirsch are shown to be illusory and based on false assumption. A more detailed publication of the authors' findings is shortly promised. W. O. E.

Examination of some Rhodesian eucalyptus oils. P. G. CARTER AND JOHN READ. *J. Soc. Chem. Ind.* **44**, 525-6T.—In the great majority of instances the material heretofore examd. was obtained from trees growing in their natural environment, comparatively little information of the kind now reported being available for material derived from cultivated trees. In the present instance small quantities of the 1st specimens of eucalyptus oils were distd. from 2 to 3 year old seedlings grown in the central region of Africa. In all cases the crude oils were dried with anhyd. Na_2SO_4 and filtered before examn. The values in parentheses represent findings for similar Australian products. *Eucalyptus macarthurii*.—Yield 0.32% (0.21), n_D^{15} 1.4821 (1.476 to 1.4718), α_D^{15} 4.1° (1.2 to 3.6), d_4^{15} 0.9329 (0.9214 to 0.9245); *E. citriodora*.—Yield 1.6% (0.8), n_D^{15} 1.4595 (1.4515 to 1.4596), α_D^{15} 3.5° (—1.0 to +1.7), d_4^{15} 0.8787 (0.8657 to 0.8697); *E. globulus*.—Yield 1.25% (0.92), n_D^{15} 1.4695 (1.4663), α_D^{15} 3.56° (8.4), d_4^{15} 0.9389 (0.913). The first named oil was almost colorless, contg. 57.1% of ester calcd. as geranyl acetate, as compared with 60 to 70% for Australian specimens. The free alc. calcd. as geraniol amounted to 5%. On keeping the crude oil deposited a large quantity of eudesmol, becoming ultimately almost solid. The *citriodora* product was almost colorless and contained 95% aldehyde, thus corresponding closely to Australian values. The oil from *E. globulus* was practically colorless, contg. *via* the H_3PO_4 method 65% of cineole, a value very like that for the Australian product. The results obtained indicate that although the Rhodesian and Australian oils exhibit appreciable difference in phys. consts., they nevertheless contain sensibly identical amts. of the main components of com. value, with the exception that the ester content of *E. macarthurii* oil is distinctly low.

W. O. E.

Veronal-pyramidone and "Veramone." HEINRICH RHEINBOLDT AND MARIETTE KIRCHSEIN. *Arch. Pharm.* **263**, 513-8(1925).—Examn. of varying mixts. of veronal with pyramidone by the "thawing and melting" method shows that veramone, alleged to consist of 2 mols of pyramidone and 1 mol. of veronal, is in reality a mixt. of the compd. $\text{C}_{21}\text{H}_{23}\text{O}_4\text{N}_2$ (veronal and pyramidone in equimol. proportion) with pyramidone, colored more or less yellow by decompn. (oxidation) products.

W. O. E.

Influence of alkali in hemolysis experiments on drug extracts. K. A. KARSMARK AND L. KOFLER. *Pharm. Zentralhalle* **66**, 717-23(1925).—In a study of this question 2 points were considered: (1) influence of alkali addn. on the extn. of saponins and other drug components; (2) influence of alkali on the final outcome of the hemolysis. For the proper clarification of the 1st point a great no. of expts. will be required involving a variety of saponin drugs in varying degrees of fineness. In this connection also some consideration must be given the influence of H-ion concn. To this end expts. are still in progress. In the present paper numerous expts. are described involving rat blood and various preps. of *Polygala* and Senega, while saponinum pur. albiss. Merck served as test object. It is shown that addn. of Na_2CO_3 in moderate amt. to the finished decoction of Senega depresses the hemolytic index, while larger amts. of alkali inhibit hemolytic action completely. That this is not due to hydrolysis is shown by electro-dialyzing the liquid thus treated, whereupon the hemolytic action of the dialyzate is regenerated. A decoction of *Polygala amara* prepd. without Na_2CO_3 reacting strongly acid was, by subsequent addn. of alkali, made to show any desired index from 1:260 to 0. Very min. quantities of Na_2CO_3 , insufficient to neutralize the decoction, depressed the hemolytic index. The explanation for the exptl. findings is believed to be found less in the chem. influence of alkali addn. on the saponins than in the influence of such addn. on the nature of hemolysis itself, since in expts. of this character the action of a pure saponin alone on the red blood corpuscles is not involved. On the contrary, the magnitude of the hemolytic index may be influenced by the reaction of the soln. as also by the presence of substances other than saponins in the decoction.

W. O. E.

Aspirin tablets. L. ROSENTHALER. *Pharm. Zentralhalle* **66**, 629-31(1925).—A case of substitution for the true Bayer product (including both container and label) of a competitive acetylsalicylic acid. The tablets in question were compounded with potato starch, whereas the Bayer product carries wheat starch.

W. O. E.

Tests for diethyl phthalate. HENRY LEFFMANN AND MAX TRUMPER. *Am. J. Pharm.* **97**, 507-10(1925); cf. *C. A.* **17**, 853, 1202, 2845; **19**, 152.—The procedure which calls for the addn. of a phenolic compd. and subsequent addn. of H_2SO_4 has been modified by producing sulfonic acid beforehand by addn. to 10 g. phenol 5 cc. H_2SO_4 and diluting with an equal vol. of H_2O . This soln. was used with about 15 cc. of a soln. of 2 drops of diethyl phthalate in 100 cc. alc., following the recommendation of Breithut and Apfelbaum (*C. A.* **19**, 1753) in heating for a short time at 160°. A positive reaction by production of phenolphthalein was obtained. Much stronger solns. of the ester,

such as one of the com. "rubbing alcs." gave positive results when the mixt. was simply heated in the evapg. dish. The resorcinol test as perfected by Andrew (*C. A.* 17, 2845) seems to be entirely satisfactory. Hydroquinol, pyrocatechol and pyrogallol are useless as they promptly oxidize and become dark in alk. soln. and no characteristic reactions were produced in H_2SO_4 soln. Acetone did not under any of the conditions employed give a fluorescence, but a very distinct temporary effect was obtained when small amts. of acetaldehyde were added and the higher temps. used. No effect was obtained at the low temp. prescribed by Andrews.

W. G. GAESSLER

Question of soap in dentifrices. HERMAN BRODY. *Dental Cosmos* 67, 948-52 (1925).—The sole purpose of a dentifrice is to aid in the mechanical cleansing of the teeth. Soap should be a constituent since it is a cleanser, antacid, antiseptic and emulsifier. Pure soap, used in the proper amt., does not injure the teeth, mucous membrane, or general health, and does not depress the flow of saliva. Use of an acid dentifrice does not produce a marked increase in oral alkalinity. Harsh abrasives, such as Ca phosphate, should not be present. Strongly antiseptic or alk. dentifrices are of practically no value in the prevention of dental caries. A bibliography is appended.

JOSEPH S. HEPBURN

Capillary analysis in pharmacy. GIULIO CONCI. *Boll. chim. farm.* 64, 353-7 (1925).

MARY JACOBSEN

The determination of silver and arsenic in silver arsenobenzenes. UGO CAZZANI. *Boll. chim. farm.* 64, 513-5 (1925).—The slightly modified method of Lehmann for the detn. of As in neoarsphenamine was used for the detn. of As and Ag in one sample. In an aliquot part of the oxidized soln. As was detd. iodometrically, in another Ag was titrated with 0.01 N NH_4CNS . The results are accurate for As, slightly too high for Ag. In presence of chlorides Ag is detd. as $AgCl$.

MARY JACOBSEN

The chemical assay of arsenobenzenes, with especial reference to the D. M. index. ALDO PATA. *Boll. chim. farm.* 64, 417-24 (1925); cf. *C. A.* 19, 1756.—Valeur and Launoy's results are confirmed. The reason for the inconsistent results obtained in the detn. of D. M. is probably to be sought in the too long heating with $AcOH$, which seems to cause decompn. of the arsenobenzene. Five to 6 mins. heating is sufficient for the pptn. of the latter.

MARY JACOBSEN

A clinical method for the estimation of the amount of quinine in medicinal solution. J. A. SINTON. *Indian J. Med. Research* 13, 25-8 (1925).—The quinine soln. is tested for albumin (heat coagulation). Four cc. of the soln. is dild. to 250 cc. with water. One vol. of the latter is treated with 1 volume of Tanret-Mayer reagent. (This reagent is made as follows: Add with shaking 1.35 g. mercuric perchloride in 75 cc. water to 5 g. KI in 20 cc. water and make up to 100 cc.) The opacity produced is compared with Brown's $BaSO_4$ standards or quinine standards.

FRANCES KRASNOW

An oil from Tonquin rich in cedrol. ÉTABLISSEMENTS A. CHIRIS. *Parfums de France* No. 32, 285 (Oct., 1925).—Oil obtained from the leaves of an unidentified conifer (probably a *Cunninghamia*) consisted of a light yellow semi-solid mass, contg. cryst. needles, which became completely fluid at 50° . It had d_{15} (calcd. from its soln. in xylene) 0.972, $[\alpha]_D^{18}$ $-17^\circ 10'$ (from a 51.66% soln. in xylene), acid no. 0, total alcs. as $C_{15}H_{26}O$ via acetylation in xylene soln. 30.60%, total alcs. as $C_{15}H_{26}O$ via cold formylation 73.91%, showing that the alcs. are tertiary. The cryst. portion after repeated recrystn. from alc. m. $85-6^\circ$, and has $[\alpha]_D^{20}$ $+8^\circ 33'$ (from a 17.647% soln. in xylene). A mixt. of the crystals with pure cedrol had the same m. p. With phenyl isocyanate in the cold it gives a phenylurethan m. $106-106.5^\circ$, identical with that of cedrol. The liquid portion must be strongly l-rotatory, and presumably contains cedrene.

A. P.-C.

(South) American oil of petitgrain. ÉTABLISSEMENTS A. CHIRIS. *Parfums de France* No. 32, 286-90 (Oct., 1925).—Brief description of its production and properties.

A. PAPINEAU-COUTURE

Artificial musks. L. V. DOUAU. *Rev. parfumerie* 5, 288-92 (1925).—Brief review of the com. manuf. of the more important artificial musks, $C_6(NO_2)_3Me_2CMe_3$, $C_6(NO_2)_3MeOMeCMe_3$, and $C_6(NO_2)_3Me_2COMeCMe_3$.

A. PAPINEAU-COUTURE

Formation of natural perfumes in plants: Algerian oil of geranium. ANDRÉ DUBOSC. *Parfumerie moderne* 18, 98-9, 196-200 (1925); *Bull. soc. ind. Rouen* 53, 306-21 (1925).—Review of the mechanism of the formation of perfumes in plants and of the constitution and properties of citronellol, rhodinol, geraniol and linalool.

A. P.-C.

Adulterations of saffron. G. PIERLOT. *Ann. fals.* 18, 464-8 (1925); cf. *C. A.* 10, 1490; 17, 2767.—The following forms of adulteration have been observed recently: incorporation of up to 35-40% stamens of *Crocus sativus* (normal content in pure saffron, 3-5%); petals of *Cynara cardunculus* loaded with Na glyceroborate and KNO_3 and

colored with a red dye, contained no saffron; saffron loaded (by osmosis) with up to 40-60% of borax, KNO_3 and glycerol; addn. of about 25% of invert sugar; addn. of 40% of sugar and Na_2SO_4 ; introduction of up to 50% of pollen. A. P.-C.

Note on the stability of Dakin's solution. G. W. PUCHER AND LILLIAN A. BURD. *Buffalo General Hospital Bull.* 3, 20-1 (1925).—The bleaching powder used in the prepn. of Dakin's soln. must contain at least 25% available Cl and the boric acid and NaHCO_3 employed for p_{H} adjustment must be free from organic impurities. Dakin's soln. with an initial NaOCl content of 0.500% is satisfactory for use over a period of six weeks if preserved in clean dark bottles and maintained at 10-24°. N. v. P.

Accuracy of the standardization of hypophysis preparations by means of the isolated uterus. H. SAWASAKI. *Arch. ges. Physiol.* (Pflüger's) 209, 137-69 (1925).—By the Dale-Ruidlaw method the probable error in detns. amounts to something less than 10% in 88% of the measurements, but it can be materially reduced by making sufficient detns. By the method of Kochmann the probable error is about 8%. G. H. S.

West Australian sandalwood oil. H. FINNEMORE. *Pharm. J.* 115, 168-9, 178-9; *Chemist & Druggist* 103, 178-9 (1925); P. MAY. *Ibid.* 179.—West Australian differs from the East Indian sandalwood oil in its botanical source, chem. compn. and phys. properties; hence it fails to meet the Brit. Pharm. requirements for this oil (*Bull. Imp. Inst.* 18, 163 (1920); cf. *C. A.* 17, 2472). However, in discussion, P. May found no chem. or phys. differences in recent, authentic Australian oils; agreement exists even in optical rotation. He recommends an impartial pharmacol. and clinical examn. of the Australian oil (cf. *C. A.* 13, 2415, 2730; 19, 418, 3349). S. WALDBOTT

True and false santonicas. T. E. WALLIS AND ELLINOR J. MOWAT. *Pharm. J.* 115, 149-56; *Chemist & Druggist* 103, 182-5 (1925).—A detailed botanical description, with line drawings, is given of many species of *Artemisia*, section *Seriphidium*, enabling the formulation of botanical characteristics by which the flower heads of genuine santonica of commerce may be identified with certainty. The botanical source of true com. wormseed is *Artemisia cina* (Berg) Willkomm, differing from *A. maritima*, var. *α -Stechmanniana*, Besser, of the Brit. Pharm., (Flückiger and Hanbury) and from *A. pauciflora*, Weber (*A. lercheana*, Karel. et Kiril.) of the U. S. P. (Bentley and Trimen). Com. specimens of santonica devoid of santonin (cf. *C. A.* 16, 4296) can all be distinguished from the true drug botanically. The plant cultivated in Holland (*C. A.* 18, 1364) is not *A. cina*, Berg, but is a distinct species differing from all those examd. S. WALDBOTT

The structure of Coscinium. G. R. A. SHORT. *Pharm. J.* 115, 156-62; *Chemist & Druggist* 103, 185-6 (1925).—A detailed histological and general description of the stem of *Coscinium fenestratum*, Colebrooke, native of Ceylon, (false calumba root) is given, with drawings and 11 references. Several com. samples of "*Berberis aristata*" consisted entirely of *Coscinium* stem. Definite histological differences exist also between the stems of *C. fenestratum* and *C. wallichianum*, Miers. S. WALDBOTT

Sulfur content of arspenamine (CHRISTIANSEN, *et al.*) 10. Assaying HgI_2 , HgCl_2 , and some other Hg compounds (ELLMAN) 7.

Organic antimony compounds for pharmaceutical use. H. HAHN. U. S. 1,561,535, Nov. 17. In making alkali metal salts of complex Sb compds. of mercapto-carboxylic acids, the mercapto-carboxylic acid, e. g., thiosalicylic acid, or thioglycolic acid, is treated with Sb_2O_3 , $\text{Sb}(\text{OH})_3$ or other O deriv. of tervalent Sb, and the resulting product is neutralized with Na_2CO_3 or other suitable alkali metal compd.

Synthetic drugs. F. LEHNHOFF-WYLD. *Brit.* 232,612, April 17, 1924. Metallic derivs. of 3,3'-diamino-4,4'-dihydroxyarsenobenzene-*N*-methylenesulfonic acid are prepd. by reaction of a sol. metallic salt such as ZnCl_2 or compds. of Mg, Cd, Cu or Ag with 3,3'-diamino-4,4'-dihydroxyarsenobenzene before or after its conversion into the methylenesulfonate.

Medicines. INSTITUT SERO-THERAPIQUE ET VACCINAL SUISSE. *Brit.* 232,906, April 28, 1924. Substances for use in dentistry or medicinal, antiseptic or cauterizing substances (e. g., As_2O_3 , Co oxide or arsenites formed within the jellies by reaction between As_2O_3 and oxides, hydroxides or salts of alk. earths or noble or heavy metals) are suspended uniformly in gelatin, agar agar, cellulose or other gelatinous substance which is caused to set, dried and formed into tablets, balls, etc., contg. a known amt. of the active ingredient.

Medicinal irritant from the Rhus plant. P. MASUCCI. U. S. 1,559,340, Oct. 27. A soln. is formed comprising a fixed vegetable oil such as cottonseed or olive oil and the

irritant or vesicant principle of the *Rhus*. This compn. is adapted for use as a therapeutic agent.

Deodorant mixture. A. G. SMITH. U. S. 1,558,405, Oct. 20. A mixt. adapted for use on the skin comprises NaHCO_3 50, Zn stearate 10, CaSO_4 20 and talc 20%.

Massage cream or paste. C. M. GEARHART. U. S. 1,558,160, Oct. 20. S and an astringent such as alum are used with glycerol, starch and H_2O .

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Synthesis of ammonia by the Casale process. J. DUBOURG. *Technique moderne* 17, 714-6(1925).—Brief description of the process. A. PAPINEAU-COUTURE

The industrial uses of zirconium ores. M. F. BERTRAND. *Rev. universelle mines* [7], 7, 218-34(1925).—The occurrence, properties and analysis of Zr ores, the prepn., phys. and chem. properties and uses of Zr, the value and use of ZrO_2 and Zr silicate as refractories, the manuf. of porcelain and enamels with ZrO_2 and various other uses of ZrO_2 are described. C. C. DAVIS

Pyrites containing selenium. I. WOLKOFF. *Bumashnaja Promuschlennostj* (Russia), No. 2 (1925); *Zellstoff u. Papier* 5, 355-6(1925).—The removal of Se from SO_2 , resulting from the burning of pyrites, by suitable washing operations is discussed. Se acts catalytically to form SO_3 . Pyrites from the Ural mountain region contain 20 g. Se per ton. J. L. PARSONS

The stability of solid calcium hypochlorite. H. H. KING. *Indian J. Med. Research* 13, 191-4(1925).—Ca hypochlorite is stable if dry and air-tight. F. K.

The salt industry of Poland. P. H. SERAPHIM. *Kali* 19, 354-6(1925).

WM. B. PLUMMER

The cast basalt industry. ANON. *Le Génie civil* 87, 57(1925).—The cast material has great physical strength and chemical resistance. It is used for insulators and for chemical apparatus. JACK J. HINMAN, Jr.

Removing water from oils and solvents. C. F. GREEN. *Textile Colorist* 47, 644(1925).— H_2O may be removed from oils and solvents before lab. distn. by mixing them with very finely powd. gum tragacanth. This absorbs the H_2O , swells and settles on standing. CHAS. E. MULLIN

Ebony and its substitutes. E. J. FISCHER. *Kunststoffe* 14, 113-6, 164-5, 181-3(1924).—The general properties of ebony wood are discussed. Substitutes consist of various woods dyed to match the color of ebony; artificial products consisting largely of cellulose fibers and a binder, such as albumin, casein or blood; products free of cellulose contg. glue, glycerol, waxes or resins, casein or rubber; and cellulose esters or artificial plastics (phenol resins, etc.). A list of 24 patents relating to the manuf. of these substitutes is given. C. J. WEST

Manufacture of artificial cork. OTTO LINCKE. *Kunststoffe* 14, 116(1924).—Very general discussion of the manuf. of "Subertit," made from cork waste and a suitable binder. C. J. WEST

New impregnating and binding agents. M. BOTTLER. *Kunststoffe* 15, 4-6(1925).—Discussion of various trade products. C. J. WEST

Advances in the field of adhesives and binding agents. MAX BOTTLER. *Kunststoffe* 15, 89-91, 114-7(1925).—Patent review. C. J. WEST

Artificial products from blood. K. J. BREUER. *Kunststoffe* 15, 1-2(1925).—The blood is dried by spraying into a stream of warm air or heated with superheated steam, pressed and finally dried. 100 l. blood gives 14 kg. dry material, deep black in color. This is finely ground and then pressed or molded into the desired shapes. C. J. W.

Animal size. E. O. RASSER. *Kunststoffe* 15, 23-4, 38-41, 55-6(1925).—Review of methods of prepn. and tests. C. J. WEST

Sealing waxes. LEIT. *Kunststoffe* 15, 109-11(1925).—In part a review of Andes' book on this subject; in part, of recent German patents. C. J. WEST

Old and new about polishes and polishing varnishes. FRITZ ZIMMER. *Farben-Ztg.* 31, 390-400(1925).—Review. F. A. WERTZ

Organic glasses. J. FRERES. *Rev. prod. chim.* 28, 113; *Kunststoffe* 15, 92-4(1925).—Discussion of the history of the condensation of $\text{CO}(\text{NH}_2)_2$ and HCHO . C. J. WEST

Recent advances in the preparation of plastic masses. S. HALEN. *Kunststoffe* 15, 19-23, 70-82, 134-5(1925).—Patent review. C. J. WEST

Modern plastic masses. A. HUTIN. *Rev. gen. mat.-plastiques* 1, 57-63, 105-11,

163-7(1925); *Kunststoffe* 15, 116-7, 196-9(1925).—A large number of the trade names of various artificial plastics are given; the method of prepn. is indicated in most instances; in some cases patent references are given.

C. J. WEST
Condensation of formaldehyde with phenols. H. BARTHÉLÉMY. *Kunststoffe* 15, 150-1(1925).—See C. A. 19, 2552.

C. J. WEST
The manufacture of chewing gum as a problem in dispersion. RUDOLF DITMAR. *Gummi-Ztg.* 40, 156-8(1925).—A review of various patented processes, with special reference to the Pratt process of dispersing rubber in H_2O (cf. Brit. pat. 233,370).

C. C. DAVIS
Impregnation of waterproof materials. KARL MICKSCH. *Kunststoffe* 14, 133-4 (1924).—Various methods are discussed, alum and lead acetate, Cu salts, linseed oil, etc., being used.
C. J. WEST

The classification of common salt by its iodine content (RÓZSA) 11G. The gasification of molasses residues and the recovery of potash, NaCN and $(NH_4)_2SO_4$ (MÜHLERT) 2B. Effect of X-rays on the Pt catalyst in the contact H_2SO_4 reaction (CLARK, *et al.*) 2.

LANGTON, H. M.: **Blacks and Pitches.** Ernest Benn, Ltd. 178 pp. 15s., by post 15s. 6d. Reviewed in *Munic. Eng.* 76, 116; *Chemistry and Industry* 44, 999 (1925).

Sulfuric acid. H. KLENCKE. U. S. 1,561,985, Nov. 17. Gases contg. SO_2 are brought into contact with nitrosyl sulfuric acid of a sp. gr. of about 58° Bé. and of the highest possible concn. with respect to N-O compds. and the resulting gas mixt. is then brought into contact with nitrosyl sulfuric acid of a sp. gr. of about 66° Bé. and of about the highest concn. attainable in N-O compds.

Sulfuric acid. C. B. CLARK. Can. 251,618, Oct. 13, 1925. In the contact process of producing H_2SO_4 , SO_2 gases of a temp. above the one used for the contact reaction are produced and these are cooled before the first contact stage by causing them to give up heat to the gases which are on their way from the absorption stage to the next contact stage after such gases have abstracted heat on the way from the first contact stage to the absorption stage. App. is also specified.

Purifying waste waters containing sulfuric acid. J. A. NEWLANDS. U. S. 1,557,188, Oct. 13. Waste waters from pickling brass or other waste waters contg. H_2SO_4 are freed from Cu and H_2SO_4 (e. g., by use of Zn) or other impurities which would impair the quality of the product to be produced or contaminate streams and are then treated with Zn to form $ZnSO_4$. Ba sulfides are then added and the pptd. ZnS and $BaSO_4$ are sepd. from the liquor for use as a pigment.

Hydrocyanic acid. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT (VORM. ROESSLER) and O. LIEBKNECHT. Brit. 232,834, Aug. 1, 1924. HCN is sepd. from gaseous mixts. by use of absorbents such as activated charcoal or silica gel, in the presence of H_2O , steam, or acids or other liquids which themselves are capable of absorbing HCN.

p-Hydroxy-m-nitrophenylarsenious acid. IWAN OSTROMISLENSKY. Can. 255,009, Oct. 27, 1925. Arsanilic acid is diazotized in the presence of water at 70°, the diazotized product is nitrated at a temp. below the b. p. of the mixt., an alkali is added and the alk salt of p-hydroxy-m-nitrophenylarsenious acid is recovered.

Apparatus for ammonia synthesis. I. W. CEDERBERG. Can. 250,080, May 26, 1925.

Combining alkaline earth metals with other refractory metals. H. BOVING. U. S. 1,562,202, Nov. 17. In combining an alk. earth metal, e. g., Ba, with a refractory metal of higher volatilizing temp., such as Ni, W or Pt, the refractory metal is formed into thin strips, a spongy mass, filaments or other configuration having a large ratio of surface to vol. and it is then exposed to vapor of the alk. earth metal at a temp. lower than the m. p. of the combined metals.

Arsenical salts. S. J. LLOYD and A. M. KENNEDY. Can. 253,583, Sept. 15, 1925. As_2O_3 is dissolved in NaOH, the arsenite is converted into arsenate by electrolytic oxidation, and to the soln. is added a soln. or suspension of a salt of a base producing an insol. arsenate which is sepd. and the soln. reused in the process.

Drying calcium hypochlorite. CHEMISCHE FABRIK GRIESHEIM-ELEKTRON. Brit. 232,560, April 15, 1924. $Ca(OCl)_2$ or basic hypochlorite is partially dried by heating and then mixed with CaO to combine with residual H_2O .

Zinc oxide. A. FORGEUR and L. GRANGE. Brit. 232,610, April 16, 1924. Roasted blende or other crude material contg. ZnO , which may be first treated with H_2O to remove sol. sulfates, is treated with NH_4Cl soln. in an autoclave to dissolve the Zn

The soln. is treated with metallic Zn to remove Cu and is then poured into H_2O to ppt. $Zn(OH)_2$. NH_3 liberated in the autoclave is led to the hydrolysis vessel and the NH_4Cl soln. is concd. and used repeatedly.

Iron oxide and sulfur trioxide from ferrous sulfate. AUSTRAL PIGMENTS, LTD. Brit. 232,581, April 16, 1924. Hydrated $FeSO_4$ crystals are directly heated by a gas flame or otherwise so as to liberate the H_2O of crystn. at a temp. above 64° to avoid caking. Monohydrated sulfate thus produced is ground, oxidized with air to form a basic ferric sulfate and then calcined in a roasting furnace to produce Fe_2O_3 and SO_3 . Details of heating app., etc., are described.

Recovery of hydrated oxides of iron and calcium sulfate. J. B. DUFAUR. Can. 254,503, Oct. 13, 1925. $CaCl_2$ is added to Fe sulfate solus., the $CaSO_4$ pptd. is removed and $CaCO_3$ is added to the soln. which is agitated with air under pressure to ppt. Fe in the ferric state.

Titanium oxide. METAL AND THERMIT CORPORATION. Brit. 232,680, Jan. 23, 1924. A black form of TiO_2 which is a conductor of heat and electricity is obtained by heating TiO_2 or rutile to 800 – 1000° in a covered crucible in a gas- or oil-fired furnace or in H . The material may be first molded into electrodes, conductors or containers for elec. or chem. purposes.

Titanium oxide. S. J. LUBOWSKY. Can. 253,964, Sept. 22, 1925. An electrically and thermally conductive oxide of Ti is formed by heating TiO_2 in a non-oxidizing atm. at 800 – 1000° .

Hydrogen. J. ROCHET. Can. 254,162, Sept. 29, 1925. In the production of H by the reduction of water vapor with metallic Fe and then reducing the FeO formed with a reducing gas, the reaction mass is maintained at a uniform reacting temp. by arranging the mass in small thicknesses in narrow chambers which are heated by circulating a double current of gas along their walls.

Nitrogen and hydrogen mixtures. J. ROCHET. Can. 254,163, Sept. 29, 1925. A mixt. of CO , H and hydrocarbon gases is burned in an excess of air and the products of combustion are subjected to the action of H in excess at a temp. suitable for the combination of the H and of the free O contained in the gases, then absorbing the CO_2 by means of NH_3 soln.

Sulfur burner. H. F. MERRIAM. Can. 254,659, Oct. 13, 1925.

Moldable mixture of sulfur and lime. C. E. HITE. U. S. 1,551,307, Aug. 25. A powd. mixt. comprising S 1 and hydrated lime 3 parts is adapted, on addn. of H_2O , for use as a mortar, plaster, etc.

Casein. A. MESSMER. U. S. 1,557,181, Oct. 13. Curd, sepd. from whey, is discharged from its container in a stream into which a stream of cold H_2O is directed. H_2O is drained from the curd and the latter is centrifuged and washed.

Modified casein. H. V. DUNHAM. U. S. 1,551,471, Aug. 25. H_2O and an excess of caustic alkali are added to casein and sufficiently heated to form NH_3 . Excess $NaOH$ is neutralized with NH_4Cl by heating. The product thus formed is adapted for sizing paper, leather, cloth, etc.

Dental cement. P. W. KRUGER. U. S. 1,556,696, Oct. 13. Guaiacol is used as a setting agent with a powder contg. kaolin and MgO or with other dental cement-forming ingredients.

Bleaching solutions. D. A. PRITCHARD. Can. 254,155, Sept. 29, 1925. A predetd. quantity of liquid Cl from a storage tank is heated to form gas, the pressure exerted by the gas is used to feed liquid Cl into a chlorinated chamber where it is thoroughly mixed with a base.

Plastic molding composition. R. W. SEABURY. U. S. 1,561,525, Nov. 17. A compn. for manuf. of battery jars or other molded articles comprises a phenolic condensation product, and a filler, e. g., SiO_2 and wood-flour, in intimate mixt. with particles contg. a vulcanizable rubber compn. and a filler.

Colored plastic composition comprising phenolic formaldehyde condensation products or similar substances. C. T. FULLER. U. S. 1,560,346, Nov. 3. Cements (for uniting glass to metals) or other products are formed from material such as "bakelite" or similar compns. which are capable of being hardened or cured without change in color by heating to a crit. temp., admixed with malachite green or other coloring material which changes color or fades out permanently only when heated to the temp. of curing or hardening, e. g., at 150 – 220° .

Composition of fibrous material and phenol resin. L. V. REDMAN and H. C. BERTHAM. U. S. 1,551,428, Aug. 25. Cotton, paper pulp or other fibrous material is compounded with a non-reactive phenol resin and a hardening agent such as CH_2O .

or $(\text{CH}_2)_6\text{N}_4$, with or without furfural, in the presence of H_2O contg. PhOH or other free phenolic substance. The product is adapted for making laminated sheets.

Fibrous material impregnated with phenolic condensation products. K. BROWN. U. S. 1,559,846, Nov. 3. Fibrous material such as laminated paper or cloth sheets for making gears, etc., is impregnated in its inner portion with substances such as PhOH and CH_2O which are capable of reacting to produce a H_2O -resistant phenolic condensation product; less of the CH_2O or other hardening reagent is used than would be required to produce a condensation product of max. hardness and infusibility. The outer portion of the fibrous material is similarly impregnated, with the use, however, of a larger proportion of the hardening reagent and the materials are then heated to effect reaction and different degrees of condensation and hardening in different portions of the material.

Impregnating strings of fibrous material with phenolic condensation product. F. S. SMITH. U. S. 1,557,730, Oct. 20. A string formed of jute, cotton or other similar org. material is impregnated with "Bakelite A" dissolved in a mixt. of EtOH or MeOH and C_6H_6 or other solvent and is then subjected to the action of a high-tension elec. current for removing the solvent and thereafter converting the "bakelite A" into the "B" form.

Condensation products. K. RIPPER. Can. 254,238, Sept. 29, 1925. A mixt. of urea and formaldehyde is heated, the product is preferably concd. by evapn. and basic substances and salt-like electrolytes are added just before the final insol. products are formed.

Sealing composition. S. FREEDMAN. U. S. 1,558,008, Oct. 20. A sealing liquid for compressed air containers is formed of glue, sawdust, Na_2CO_3 , rubber shavings and resin, cooked together in H_2O .

Acidproof composition. CONSOLIDATED MINING AND SMELTING CO. OF CANADA, LTD., F. S. WILLIS and B. A. STIMMEL. Brit. 232,742, March 12, 1924. An acidproof mixt. for use as a lining, etc., is prepd. by mixing sand 70-60 with melted S 30-40% and heating the mixt. to about 150° , after which it may be cast or used as a plaster.

Friction material for brake linings, etc. I. J. NOVAK. U. S. 1,561,740, Nov. 17. Mech. features of molding and heat-treating products such as those formed from asbestos, phenolic resin and gum sandarac. Cf. C. A. 20, 98.

Friction-resisting material for facing or lining clutches or brakes, etc. P. A. ANDREWS. U. S. 1,559,146, Oct. 27. Mech. features of forming molded products from materials such as reinforced mixts. of asbestos and cement.

Revivifying fuller's earth. F. W. HALL. U. S. 1,558,162, Oct. 20. Decolorizing clay which has been used for oil refining is treated with a solvent comprising acetone and gasoline. U. S. 1,558,163 specifies the use of a mixt. of acetone and C_6H_6 .

"Dustless" crayons. J. A. HAUFF. U. S. 1,561,075, Nov. 10. Hydrated Al silicate and magnesia are mixed with a binder such as gum arabic and moistened to produce a putty-like mixt. This is allowed to season, molded and subjected to spontaneous air drying. The product is suitable both for use dry as a crayon and for use with H_2O as a water color and also may be used in plastic form as a painting medium. Kaolin, steatite and talc may be used.

Purifying graphite. E. J. E. DUMOND. Brit. 232,936, April 23, 1924. To remove siliceous and other impurities, crushed crude graphite is triturated in moist condition, sieved in the presence of H_2O and subjected to a flotation sepn. Further purification may be effected by heating the material in a kiln with Na_2CO_3 , treating with dil. HCl , washing and further sieving.

Lithographic printing plate. W. GRASS. U. S. 1,562,324, Nov. 17. Exposed portions of metal plates such as those of Zn are subjected to an etching bath contg. "a neutralized acid," e. g., FeCl_3 soln. treated with NaHCO_3 and also contg. HNO_3 and HCl or other etching acid.

Composition for preventing obscuration of glass panes by moisture. R. V. RIDGELY. U. S. 1,556,714, Oct. 13. A mixt. of soap, glycerol, waterglass and H_2O .

"Antitarnish" composition. T. H. LASHAR. U. S. 1,561,650, Nov. 17. A compn. adapted for use by jewelers on silverware, etc., to prevent tarnishing comprises a soln. of Pb acetate or other metal salt capable of absorbing H_2S , in a hygroscopic non-volatile solvent such as glycerol.

Composition for cleaning and polishing silverware, etc. E. M. BURKET. U. S. 1,560,659, Nov. 10. A mixt. of rouge, CaCO_3 , floated pumice, H_2O and whiting.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Ceramics at the Bureau of Standards. ANON. *Chem. Met. Eng.* **32**, 867-9(1925).

E. J. C.

The relation between the chemical composition of clays and their fusibility. I. BERTRAND. *Céramique* **28**, 155-64(1925).—The relation is shown by charts.

H. G. SCHURECHT

The adsorptive power of clays. M. P. BREMOND. *Céramique* **28**, 153(1925).

H. G. SCHURECHT

Drying ceramic products. A. BIGOT. *Céramique* **28**, 165-80(1925). H. G. S.

Synthesis and industrial manufacture of sillimanite. O. REBUFFAT. *Trans. Ceram. Soc. (Eng.)* **23**, 312-3(1925). Sillimanite can be made by mixing hydrated Al_2O_3 with kaolinite and gradually heating the mixt. to 1400° .

H. F. S.

The renumbering of Seger cones. KNUTH, MICHR AND STEPHAN. *Tonind. Ztg.* **49**, 1234-6(1925).—The present method of numbering Seger cones is too complex because it requires a table to convert the cone numbers into temps. It is suggested that the cones be numbered so as to correspond to the temp. at which they soften, as below:

Cone no.	Temp., °C.	New cone no.	Cone no.	Temp., °C.	New cone no.	Cone no.	Temp., °C.	New cone no.
022	600	60	1a	1100	110	28	1630	163
021	650	65	2a	1120	112	29	1650	165
020	670	67	3a	1140	114	30	1670	167
019	690	68	4a	1160	116	31	1690	168
018	710	71	5a	1180	118	32	1710	169
017	730	73	6a	1200	120	33	1730	173
016	750	75	7	1230	123	34	1750	175
015a	790	79	8	1250	125	35	1770	177
014a	815	81	9	1280	128	36	1790	179
013a	835	83	10	1300	130	37	1825	182
012a	855	85	11	1320	132	38	1850	185
011a	880	88	12	1350	135	39	1880	188
010a	900	90	13	1380	138	40	1920	192
09a	920	92	14	1410	141	41	1960	196
08a	940	94	15	1435	143	42	2000	200
07a	960	96	16	1460	146			
06a	980	98	17	1480	148			
05a	1000	100	18	1500	150			
04a	1020	102	19	1520	152			
03a	1040	104	20	1530	153			
02a	1060	106	26	1580	158			
01a	1080	108	27	1610	161			

R. RIEKE in answer to this article opposes this change. The numbering has been the standard for the past 40 years and the change would necessitate changing all references for the past to the new numbers when referring to them. It would also cause considerable confusion among the practical men who have learned to use the cones according to their old numbers.

H. G. SCHURECHT

The Swedish feldspar industry. A. S. W. ODELBURG. *Trans. Ceram. Soc. (Eng.)* **24**, 275-7(1924-25).

H. F. S.

Observations on the elimination of carbonaceous matter from fireclay bricks. L. S. THEOBALD AND A. T. GREEN. *Trans. Ceram. Soc. (Eng.)* **24**, 159-69(1924-25).—The material used was Stourbridge fireclay, as this seemed to show the elimination of the carbonaceous matter to the greatest advantage. Under the particular conditions of the heat treatment, no change is apparent in the test specimen at temps. below 500° , but at 600° oxidation has, undoubtedly, commenced. With full-sized bricks drawn from actual burns, the cores become distinctly darker and blacker as the time at 600° is increased, indicating that as heating continues further changes are taking place in the carbonaceous matter in the center of the piece. As soon as the temp. approaches 650° , a white ring, which develops into a yellow area follows the removal of the carbonaceous matter. Above 600° some chem. action takes place in a deficiency of air in the

interior of the piece, which is manifested as a yellowish area replacing the C. On heating to 750°, there is a darkening in the shade of the interior as if a diffusion of C had taken place. Reduction of the Fe to the ferrous state may also contribute to this change. The black cores at this temp. are definitely replaced by persistent yellow areas and a more prolonged soaking at 750° would not remove them. H. F. S.

The action of carbon monoxide on fire brick. GILARD. *Rev. universelle des mines de Liège*, December 1, 1923; *Le Genie civil* **84**, 457-8(1924).—The CO penetrates the fire brick and if the brick contains Fe_2O_3 it reacts setting free C. Disintegration results. American work is noted. JACK J. HINMAN, JR.

The electrical conductivity of magnesia refractories at high temperatures. J. T. BURT-GERRANS AND R. S. KERR. *Trans. Roy. Soc. Can.* **19**, 27(1925).—The sp. cond. of new magnesia bricks increases from 2×10^{-6} reciprocal ohms per cc. at 870° to 5×10^{-6} at 1020° then falls to 2×10^{-6} again at 1080° and finally increases with the temp. to 0.27 reciprocal ohms at 1550°. Bricks after heating above 1400° and then cooling showed decreased cond. between 1200° and 1300° but behaved as new bricks at higher temps. J. W. SHIPLEY

Laboratory production of pure magnesia ware. R. F. MEHL, J. L. WHITTEN AND D. P. SMITH. *Ind. Eng. Chem.* **17**, 1171-2(1925).—Pure MgO crucibles and tubes are made by (1) heating pure MgO for 1 hr. at 1800°, (2) mixing with shellac (12 g. orange shellac in 80 cc. EtOH or MeOH, mixed with 120 g. of the previously heated MgO), (3) pressing into mold, (4) drying at room temp. for 1 hr., (5) drying at 150° for 2 hrs. or more, (6) firing at 1800° for 1 hr. The resulting ware is excellent. C. H. KERR

Apparatus for drying "ceramic and chemical products" (Brit. pat. 232,851) 1. Refractory oxides and alloys (Brit. pat. 232,549) 9.

Polishing and glazing glassware. A. B. KNIGHT. U. S. 1,562,341, Nov. 17. The ware is subjected to the action of a polishing burner, and then, after lowering its temp., to the action of a glazing burner. U. S. 1,562,342 relates to a glass-working burner construction.

"Plastic fire brick." W. A. L. SCHAEFER. U. S. 1,561,571, Nov. 17. Fire bricks are formed of a clay rich in Al_2O_3 (apportioned into raw and calcined portions in the ratio of 9:2 parts, mixed together) mixed with ground burner fire brick in the proportion of 11 and 18 parts, resp.

Chamotte bricks. S. E. SIEURIN. U. S. 1,561,492, Nov. 17. There is added to the main mass from which the bricks are formed a binder consisting of a mixt. of finely divided SiO_2 and fireclay, the mixt. being so proportioned that after heating to glowing it contains 73-90% SiO_2 .

Bricks, pottery, etc. V. M. GOLDSCHMIDT and J. C. W. VAN KROGH. Brit 232,943, April 25, 1924. In the manuf. of burnt or sintered clay products, the base material is mixed, before burning, with a substance which is richer in Fe, in such quantity as to effect an increase in the % of FeO compds in the final product of 3-15%. About 1% of borax also may be added. A rapid burning of the material produces a relatively porous product and a slower burning a product of greater solidity.

Refractory composition. W. A. FARISH. U. S. 1,561,641, Nov. 17. A non-crystd. refractory compn. adapted for making crucibles, retorts, pyrometer tubes, etc. comprises a refractory elec. furnace product such as SiC_2 , Al_2O_3 or SiO_2 , 65, a carbonizing binder, e. g., tar 32, and borax 3%.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

A native national wealth, the cement of Vassy. G. BIDAUT DE L'ISLE. *La nature* **53**, ii, 182-7(1925).—An illustrated description of the geological, phys. and chem. characteristics of the deposit of argillaceous limestone at Vassy. It produces an excellent hydraulic cement, forming with H_2O a double Ca-Al silicate of unusual hardness. It contains no Mg and gives a product which in strength and adherence is in a few days the equal of most hydraulic limes and portland cements after several yrs. Like *ciment fondu* it is not decompd. by sea or selenitic waters and does not slowly expand under such conditions. It is of extreme value where *rapid setting* is necessary, such as emergency work, particularly under H_2O . C. C. DAVIS

Close water control important in alumina cement concrete. P. H. BATES. *Eng.*

News-Rec. 95, 462-3(1925).—Expts. showed that marked decrease in strength accompanies use of excess water with high-alumina cement, as little as 0.5% (of wt. of dry mix) causing distinct reduction. Grading of aggregate, by influencing amt. of water required to secure workability, is also a factor. R. E. THOMPSON

The properties of aluminate cement. R. L. MORRISON. *Cont. Rec.* 39, 417-8 (1925).—Tests of properties of American aluminate cement (Atlas Lumnite Cement Co.) indicated that max. strength is reached in 3-5 days, strength of 1:2:4 aluminate cement concrete at 5 days being almost twice that of the best 1:2:4 portland cement concrete at 29 days. At 29 days a 1:4:8 aluminate cement concrete has approx. the same strength as 1:3:6 portland cement concrete, while 1:3:6 aluminate is approx. as strong as 1:2:4 portland. In practically all the cases, the strength of aluminate concrete was inversely proportional to the amt. of water used. The amt. of water required to produce a given slump with aluminate cement was practically the same as with portland cement. In almost every case cylinders cured in dry air were stronger than those cured in moist air, the av. difference in strength being 7%. An av. of 209 lbs. per sq. in. was required to break at the end of 24 hrs. 6 cylinders made by replacing in molds half-briquets of portland cement and filling the rest of the space with aluminate cement mortar. Results of setting time tests made upon mixts. of aluminate and portland cements showed that flash set does not occur unless the proportion of portland cement falls between 33 and 90%. R. E. T.

The influence of the quantity of water in the mixture on the heat of setting of aluminous cements. J. BERTET. *Genie civil* 84, 542-4(1925).—Two distinct reactions are indicated. J. J. HINMAN, JR.

Slag in wet process cement manufacture. SOZO KANO. *Concrete* (Mill Section) 27, 93-7(1925).—Data are given on setting time of clay-limestone and slag-limestone slurries. Because of hydraulic properties of granulated slag, continuous agitation of slag-limestone slurry is necessary. RAYMOND WILSON

Method for testing fine aggregate. G. W. HUTCHINSON. *Eng. News Rec.* 95, 395(1925).—As standard test methods are of questionable economic value, an attempt was made to devise a method more consistent with the use of fine aggregate under field conditions. The test adopted consists in proportioning materials as follows—dry vol.: cement 23%, fine aggregate 46%, coarse aggregate 76%, with a standard consistency analogous to that required in field concrete. The specimens, 3 × 6 in. cylinders, were stored in a moist closet until compared with similar specimens made with standard Ottawa sand. Prepared coarse aggregate (Mascot Chats), grade $\frac{3}{8}$ to $\frac{3}{4}$ in., was employed. R. E. THOMPSON

Preservation of wood. SEDLACZEK. *Kunststoffe* 14, 49-52, 103-5, 134-6(1924).—Discussion of patented processes. C. J. WEST

Experimental study on the transmission of heat by some building materials made at the University of Lausanne. DUMAS. *Bul. technique de la Suisse romande* Nov. 10 and 24, 1923; *Genie civil* 84, 43-4(1925).—Expts. made with walls electrically heated from within showed that a considerable role is played by moisture. Porous materials when dry give much better insulation than more dense substances, but a wet porous wall conducts heat more strongly than a less porous wall does when dry. JACK J. HINMAN, JR.

The effect on the principal building materials of carbonated and iron-bearing mineral waters. P. LIEGEAIS. *Ann. soc. geol. Belg.* 48B, 30-2(1925).—Marble is diminished $\frac{1}{8}$ the original weight after 10 months immersion. Siliceous-aluminous substances are not appreciably affected, although artificial substances of like character, such as brick, are easily corroded. A mixt. of 50% sand and 50% port. cement is completely disintegrated 4 hours after setting. Siliceous substances such as quartzite, and sandstone, and eruptive rocks with a siliceous base are not affected. O. F. P.

Cement production (Brit. pat. 232,930) 9.

BARTON, WM. H. and DOANE, LOUIS H.: **Sampling and Testing of Highway Materials.** New York and London: McGraw-Hill Book Co., Inc. Cloth: 355 pp. \$3.50. Reviewed in *Eng. News Rec.* 95, 480(1925).

BLAKE, ERNEST G.: **The Seasoning and Preservation of Timber: Being a Treatise on the Various Methods Employed for Drying and Preserving Timber Against Decay; With a Chapter on the Origin and Spread of Dry Rot, and the Best Method to be adopted for Its Eradication.** New York: D. Van Nostrand Co. Cloth: 132 pp. \$2.50. Reviewed in *Eng. News Rec.* 95, 480(1925).

Deterioration of Structures in Sea Water. Fifth (Interim) Report of the Com-

mittee of the Institution of Civil Engineers. H. M. Stationery Office. 65 pp. 3s. 6d. by post 3s. 8d. Reviewed in *Munic. Eng.* 76, 285(1925).

Portland cement. A. G. CROLL. U. S. 1,562,207, Nov. 17. A cement of high strength is produced by burning the ingredients at a clinkering temp., quenching the clinker at white heat, and grinding.

Cement. E. C. ECKEL. Can. 253,811, Sep. 22, 1925. A cement contains calcareous material, TiO_2 , FeO and Al_2O_3 . Cf. C. A. 19, 3579.

Cements. L. G. PATROUILLEAU AND ALUMINE ET DERIVES. Brit. 232,898, Dec. 19, 1924. In making aluminous cements the raw materials are treated with SO_2 or a substance capable of supplying SO_2 in order to prevent formation of silicates. H_2S , S , sulfides such as Fe pyrites, sulfites, hyposulfites, or sulfates such as those of Fe , Al or Ca may be used.

Articles of concrete impregnated with sulfur. R. F. BACON, W. H. KOBBE and P. H. BASCOM. U. S. 1,561,767, Nov. 17. The interstices of building blocks, conduits or other articles formed of concrete are filled with S , e. g., by immersion in molten S at 125° , so as to produce a material having at least 10 times the tensile strength of the concrete itself.

Artificial stone. H. S. LUKENS. U. S. 1,561,473, Nov. 17. A wet mixt. is formed from soapstone in small fragments or other aggregate (other than ores of metals), with a binder mainly consisting of MgO and sufficient H_2O to confer plasticity, and, while wet, the mixt. is carbonated to convert the MgO into MgCO_3 .

Preserving stone. A. P. LAURIE. U. S. 1,561,988, Nov. 17. Sandstone or other stone is soaked in a soln. of an undecomposed silicic ester, e. g., a soln. formed from SiCl_4 and HCl in alc. and CaH_2 or other volatile solvent (the HCl being volatilized) and the moisture of the air is allowed to hydrolyze the soln. so that a continuous film of hydrated silica is formed in the stone and holds it together.

Road construction. R. W. COBURN. U. S. 1,561,139, Nov. 10. Crushed stone and dry mortar are deposited upon a base and an overlying layer of bituminous material is then applied before the mortar has set, so that good bonding is effected.

Roofing felt of asbestos and other fibrous material in united layers. F. C. OVERBURY. U. S. 1,558,495, Oct. 27.

Mixing asphalt with fibrous and abrasive materials. A. R. LUKENS. U. S. 1,556,703, Oct. 13. Sep. batches of asphalt or the like are mixed, resp., with fibrous and abrasive materials such as paper waste and kieselguhr and the 2 batches are then mixed to obtain a product for making roofing or other purposes. The sep. mixing minimizes the action of the abrasive on the fiber.

Floor covering. C. M. TAYLOR. U. S. 1,562,382, Nov. 17. The tensile strength of a dry felt flooring material is increased by satg. it with a mixt. of a cellulose ester and a vegetable drying oil, e. g., a mixt. of nitrocellulose, linseed oil and solvent. U. S. 1,562,383 specifies satg. a felt base with asphalt or similar material and coating it with a compn. formed from nitrocellulose 12, a solvent such as "acetone oil" and naphtha 88, resin 12 and linseed oil or a similar vegetable oil, 12 parts.

Floor covering. C. M. TAYLOR. U. S. 1,562,384, Nov. 17. A floor covering is prepd. as described in U. S. pat. 1,562,383 (cf. above) and then, after drying, is given a coating of paint. U. S. 1,562,385 specifies applying, over the paint coating, an additional coat of compn. formed of nitrocellulose 10, a solvent such as "acetone oil" and C_6H_6 90 and linseed oil or other softening agent 10 parts. U. S. 1,562,386 specifies impregnating felt or a similar porous base with asphalt or the like and then successively coating it with paint and with a film of pyroxylin or other cellulose ester. U. S. 1,562,387 specifies satg. felt with a nitrocellulose compn. and then coating it with a film of pyroxylin or similar material on both sides.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Progress in fuels engineering. O. P. HOOD, et al. *Mech. Eng.* 47, 1124-6(1925).

E. J. C.

Pulverized fuel for boilers and furnaces. W. R. CHAPMAN. *Fuel in Science & Practice* 4, 396-400, 420-4(1925); cf. C. A. 19, 3361.—A discussion of the proper lining of the combustion chamber, the disposal of the ash, the suitability of different types of fuels, the efficiency of pulverized coal and a comparison with other methods of firing. *Ibid* 486-92.—A general discussion of the value of pulverized fuel under various conditions and the results obtainable in comparison with those with gas. C. C. DAVIS

Pulverized fuel and low temperature carbonization in relation to the mining industries. DAVID BROWNLIE. *Combustion* 13, 101-4(1925). J. F. BYRNE

Boiler-furnace design for pulverized fuel. J. G. COUTANT. *Combustion* 13, 278-9 (1925).—Changes in boiler furnace design to meet the conditions imposed by the use of pulverized fuel are discussed. J. F. BYRNE

Furnace heating. VIII. R. J. SARJANT. *Fuel in Science & Practice* 4, 383-95 (1925); cf. C. A. 19, 3362.—An illustrated review and discussion of the influence of the furnace atm. on the materials heated and the use of heat-resistant steels, the phys. and chem. properties of refractory materials and the influence of repeated heating and cooling, the proper selection of refractories, melting furnaces, open-hearth furnaces, hearth area, ports, regenerators, valves, the general construction of a furnace and the heat balance. C. C. DAVIS

Present status of the facts and theories of detonation. G. L. CLARK AND W. C. THREE. *Ind. Eng. Chem.* 17, 1219-26(1925).—A review with an extensive bibliography (61 references), certain of the more significant data covering the effect of various factors on gaseous detonation being tabulated. The various theories which have been advanced are discussed briefly and further suggested research is outlined. WM. B. PLUMMER

Faulty oil causes carbon? J. W. ORELUP AND O. I. LEE. *Petr. Age* 16, No. 2, 50-2(1925); cf. C. A. 19, 2398.—The reaction producing cylinder carbon, which consists of highly condensed hydrocarbons of a bituminous nature, is still an open question but probably runs: petroleum, naphthenic acids, asphaltogenic acids, asphaltenes, carbenes, carbides (cylinder carbon). Tests to det. the factors affecting the deposition of carbon in the engine indicate that conditions causing crank-case diln. must cause spraying of oil into the combustion chamber by the breaking of the oil seal of the piston rings, thus bringing about increased deposition of carbon. In general, the major factors of carbon deposition are: (1) amt. of lubricating oil projected into the combustion chamber, (2) kind of oil used, (3) temp. of the combustion chamber, (4) extent of time the preceding factors have been in effect. M. B. HART

Lead tetraethyl: its use in explosion engines as an anti-detonant. J. H. FRYDLENDER. *Rev. prod. chim.* 28, 685-8(1925).—A review. A. PAPINEAU-COUTURE

The hydrogenation and liquefaction of coal. III. The hydrogenation of brown coal, of Devonshire lignite and of low temperature coke obtained from Devonshire lignite. D. G. SKINNER AND J. I. GRAHAM. *Fuel in Science & Practice* 4, 474-85 (1925); cf. Shatwell and Bowen, C. A. 19, 2401.—Work was continued to det. the extent to which geologically more recent and more highly oxygenated coals could be converted into oil by hydrogenation at temps. and pressures similar to those of the earlier expts. A German brown coal and 2 English lignites, 1 much more recent than the other, were tested. Low-temp. coke was also hydrogenated at higher temps. to study the nature of the reaction. The yields of tar were much the same in brown coal and in the older ("normal") lignite, being in each case about 40% of the original dry, ash-free material. With the "recent" lignite the product sol. in CHCl_3 was only 0.75 that from the brown coal and "normal" lignite, but it consisted of more mobile tar yielding a greater proportion of volatile on distn. up to 300°. Hydrogenation of both the "normal" and "recent" lignite cokes gave smaller yields than the original lignites, and the amt. of CHCl_3 sol. material formed in the prepn. of the cokes did not account for these differing yields. Hydrogenation products sol. in PhOH but insol. in CHCl_3 were also obtained, the yield being very small with the "recent" lignite. A balance of the elements showed only very small losses with brown coal and the "normal" lignite, but with the "recent" lignite considerable loss of C, H and O occurred, probably because of the formation of phenols or acids, and possibly H_2O and low boiling oxygenated compds. Phenols were not formed in the hydrogenation of brown coal and the "normal" lignite. A comparison of the compn. of the products sol. in both PhOH and CHCl_3 with those from bituminous coals showed that the C/H ratio was greater in the products from brown coal and lignites. This was even more marked in the products of hydrogenation of the semi-cokes. The products sol. in PhOH but insol. in CHCl_3 and those sol. in CHCl_3 were formed by simultaneous hydrogenation and thermal decompn. of the original lignite. The hydrogenating action was probably due in part to the addn. of H at the moment of decompn. (depolymerization) of portions of the coal conglomerate as a result of heat treatment and in part to the direct action of H on certain mol. aggregates remaining in the residual coke. The influence of thermal decompn. on hydrogenation was more marked in the "recent" than in the "normal" lignite. In general the expts. indicated that under the particular conditions of temp. and pressure used the yield of tar oil was not appreciably greater with coals of recent geological age than with bituminous coals. C. C. DAVIS

Experiments on the combustion of pulverized coal. ÉTIENNE AUDIBERT. *Rev. Ind. minerale*, Jan. 1, 1924; *Genie civil* **84**, 231-4(1924). J. J. H., JR.

Thermodynamic and industrial bases of pulverized coal combustion. ROSIN. *Combustion* **13**, 94-5(1925); cf. *C. A.* **19**, 2735.—As with other forms of coal, the combustion of pulverized coal is a surface phenomenon. The ratio of the surface of the individual particle to its wt. is related to the combustion period by an hyperbolic curve. The disturbing influence of ash on combustion is not thermodynamic in nature but is due to the reduction in effective surface of the coal by the ash constituents. The combustion chamber must meet 2 fundamental specifications: (1) The fuel must burn completely in it. (2) The temp. of the inner refractory walls must be below their softening point, *i. e.*, there must be a transfer of heat to the body to be heated immediately after flame production. J. F. BYRNE

The length of visible flame and length of flame travel in combustion of powdered coal. HENRY KREISINGER. *Ind. Eng. Chem.* **17**, 1232-3(1925).—The length of the visible flame depends on the volatile matter of the coal, its compn., the amt. of primary air, and the method of mixing the coal and air. The combustion of the coke particles after the volatile matter has been driven off gives no visible flame, so that the length of the visible flame is no general guide to proper operation. The velocity of combustion of powd. coal is mainly dependent on the rate and manner of mixing of the gases and the fuel during combustion. WM. B. PLUMMER

The mechanism of combustion in the Bunsen cone. E. W. REMBERT AND R. T. HASLAM. *Ind. Eng. Chem.* **17**, 1233-6(1925).—Varying the temp. of the furnace walls surrounding a Bunsen flame from 110° to 1100° had no effect on the rate of combustion in the cone as detd. by analysis of the stack gases, which is in accord with the theory. Expts. made to det. the effect of port velocity, port diam., and air-gas ratio upon the height of the cone gave the following results. The rate of change of cone area decreases with increasing port velocity, becoming almost const. at high velocities; the rate of change of cone height decreases with the port diam., in some cases passing through a max.; the rate of combustion in the cone increases with increase in the primary air-gas ratio. These facts lead to the conclusion that heat transfer from the flame surface to the cold gas is the factor controlling the combustion of gas premixed with air. WM. B. PLUMMER

The development of a unit pulverizer (for coal). R. S. RILEY AND OLLISON CRAIG. *Mech. Eng.* **47**, 1045-52(1925). E. H.

The use of raw brown coal in the foundry drying chambers of the Krupp-Gruson works. W. TROLLIUS. *Braunkohle* **24**, 595-9(1925).—Shifting from coke to raw brown coal has reduced the B.t.u. requirements 43% and the fuel cost 73%. W. B. P.

Powdered coal transportation. WALTHER. *Braunkohle* **24**, 599-601(1925).—A brief discussion. WM. B. PLUMMER

The products of the distillation of coal: Installation of coke furnaces and recovery plant of the Société normande de metalurgie at Caen. A. GREBEL. *Genie civil* **84**, 585-93(1925).—Description with photographs, detail drawings and process diagrams. JACK J. HINMAN, JR.

Determination of heating value of coal in Monel metal bombs. J. C. GENIESSE AND E. J. SOOP. *Ind. Eng. Chem.* **17**, 1197-9(1925).—A study of the heat evolved through dissolution of the Monel metal in a combustion bomb has shown that if a suitable correction is applied, it is possible to reduce the error to less than 0.4%, even with coals contg. over 5.0% S. A bomb of Monel metal or a bomb with a Ni-lining will give corrected results well within the ordinary limits of accuracy of the method as a whole. The proper correction is obtained by titration of the liquid used for washing the bomb and comparison of the results with the total S of the coal. C. C. DAVIS

The Powell and Parr method for the determination of sulfur compounds in coal. T. G. WOOLMOUSE. *Fuel in Science & Practice* **4**, 454-6(1925).—The method of Powell and Parr (cf. *C. A.* **14**, 112) was used for the analysis of 12 coals of different types, as a result of which several conclusions are drawn. The dil. HNO₃ appears to be a complete solvent for the Fe compds. since the residues after extrn. with HNO₃ contained no Fe. With some coals the theoretical value for pyritic S is greater than the value detd. suggesting either that in these coals the difference between the Fe sol. in HNO₃ and that sol. in HCl is not true pyritic Fe, or that the formula for Fe pyrites in coal is not FeS but intermediate between FeS and FeS₂. With other coals the theoretical value for pyritic S is less than the detd. value, suggesting that the org. S in these coals is attacked by HNO₃. The method in general is fairly accurate, but it seems desirable always to est. Fe values together with S values so that some idea of the probable error involved may be obtained. The nature of the Fe compds. sol. in HCl varies from sample to

sample and includes ferrous compds., derivs. of hydrated ferric oxide and ferric compds. Complete analytical data are given. C. C. D.

Plant ash in relation to the inorganic constituents of coal. P. HAAS. *Fuel in Science & Practice* 4, 424-9(1925).—A survey of the quantity, distribution and nature of the ash of plants emphasizes the fact that too much reliance must not be placed on the value of an ash analysis as an indication of the nature of the plant material furnishing the ash. Accordingly caution must also be exercised in deducing from the ash analysis of a coal the nature of the plant from which it may have originated. Quant. data on the nature and compn. of the ash of numerous plants are included, with a description of the function of K, Ca, Mg, Fe, P, S and Mn. C. C. DAVIS

Washing coal by flotation: the treatment of dusts and slimes of high ash content. CH. BERTHELOT. *Genie civil* 84, 521-6(1924).—A promising scheme to treat material now wasted and recover the combustible material. Dutch national mines are now treating 100,000 metric tons per year. Also in *Chimie et industrie Special No.*, 154-62 (Sept., 1925). JACK J. HINMAN, JR.

Pulverized coal as applied to the steam boiler plant. W. E. EAST. *Proc. Illinois Eng. Soc.* 40, 75-80(1925).—Present specifications require 65% of coal to pass 200-mesh sieve. Formerly finer grinding was required. It was formerly thought necessary to dry coal to 1% moisture, but now it is considered necessary to dry it only to 5 to 8% moisture. Lignite contg. 24% moisture will be used at Denver. Advantages: (1) high boiler efficiency, (2) ability to burn high- and low-grade fuels with approx. the same efficiency, (3) ability to burn liquid, solid, or gaseous fuel in the same furnace, (4) low banking and stand-by losses, (5) ability to carry high over-loads for long periods, (6) ease of adapting to automatic control. JACK J. HINMAN, JR.

Moisture as a component of the volatile matter of coal. W. T. THOM. *Colliery Guardian* 130, 558-9(1925).—Moisture eliminated from air-dried low-grade coals below 100° is essentially the same as moisture liberated above 100° and is formed by analogous reactions. It is, therefore, essential to the formulation of a systematic classification of coals on a chem. basis to class all moisture forming a normal essential part of the coal as a sep. component and not as an extraneous impurity. The use of an air-dried sample in proximate analysis is the best method for distinguishing between accidental H₂O and that comprising a normal component. By plotting the % volatile (H₂O after air-drying included) against the calorific power for 800 samples the various types of coals could then be distinguished more clearly than by the usual dry basis. This was especially true with low-grade coals in which the H₂O in the air-dried coal increased the total volatile and decreased the calorific power much more than with high-grade coals and therefore allowed the various grades of coal to be distinguished more readily when plotted graphically. Low-grade coals such as lignites and sub-bituminous coals change rapidly on exposure to air, the volatile and the calorific power decreasing rapidly. This same degradation may take place geologically in coal seams over long periods of time. C. C. DAVIS

A routine apparatus for the determination of volatile matter in coal. A. E. BEET. *Fuel in Science & Practice* 4, 382(1925).—A set of SiO₂ crucibles (inside top diam. 24 mm., bottom 21 mm., height 39 mm., projections outside 27 mm. from bottom) with SiO₂ lids, resting in a SiO₂ rack and contg. 1 g. of sample in each crucible, is heated in an elec. muffle for 7 min. at 900°. The gases from the distn. are sufficient to maintain a reducing atm. Parallel expts. with Pt crucibles showed no appreciable differences in results. C. C. DAVIS

Fellner-Ziegler process of low-temperature carbonization. FR. SHÜTZ AND W. BUSCHMANN. *Iron Coal Trades Rev.* 111, 140, 182-3, 212-3(1925).—The economic factors in low-temp. carbonization are discussed. The value of lignite is greatly enhanced. The 20% yield of semi-coke contains 76.7% of the calorific value of the crude lignite and the tar—8.75% by wt.—has 12.8% of the calorific value. Small bituminous coal can be carbonized as cheaply as it can be briquetted, except the non-coking coals. These make better briquets after carbonization and, in addn., the by-products are recovered. Semi-coke has a calorific value of 6500-7500 cal. per kg., depending on the coal from which it was made, and can be used for coal dust firing, briquets, producer-gas furnace coke, mixed with strongly caking coals in coke ovens, as an intermediate product in the liquefaction of coal, i. e., to be converted to CO and H for high-pressure synthesis. The tar can be used as a source of motor fuels, chem. agents, impregnating oil, etc. Low-temp. tar fractions between 200° and 300° contain 40-50% phenols with the remainder mainly aromatic hydrocarbons of the benzene series, and 5% satd. hydrocarbons of the paraffin series. Coke-oven tar, between 200° and 300°, is mainly aromatic, with only 3-6% phenols. Lubricating oil extn. from low-temp. tars is impracticable,

the only present uses for the tar being liquid fuel, impregnating oils and disinfectants. The benzene obtained makes a very desirable motor fuel. Its chem. compn. is more complicated than coke-oven light oils or petroleum, and consists of paraffins 10-25%, diolefins 1-5%, aromatic hydrocarbons 25-60%, naphthenes 1-2%, ketones 1-2%, aldehydes, S and N compds., and phenols. Gasol, the liquid mixt. that boils below 30°, contains 10,000 cal. per kg., and is excellent for cutting and welding. The operation of the Fellner-Ziegler plant at Frankfurt, which uses the compression method for recovering benzene and gasol, is described. J. F. BYRNE

Recent progress in the peat problem. R. M. PERKIN. *Colliery Guardian* 130, 556-7(1925).—A review and discussion of present developments in the drying, briquetting and distn. of peat, with a description of a new method devised by P. The latter consists essentially of macerating the peat and extruding as much H₂O as possible, then heating it in an autoclave under pressure, suddenly discharging it by a sluice valve, filtering and finally pressing into briquets which are hard and contain only 18-20% H₂O. When carbonized these briquets give a charcoal which is superior to Swedish charcoal for the manuf. of steel. A typical analysis gave 83.5% fixed C and very low P and S and volatile. Analyses and yields of distn. products from peats are also given. C. C. DAVIS

Industrial importance of Rumanian natural gas. P. STACHELIN. *Mon. Petr. Roum.* 24, 971(1925).—The principal use of the natural gas is the production of mechanical and elec. energy. A plant was established in Sarmas for the production of nitrogen oxide according to the process of Bender by direct combustion of the natural gas with air. At a temp. of 2000°, 1% of nitrogen oxide is formed. This process was abandoned later because the furnace walls did not resist the high temp. By passing natural gas over heated quicklime, H was obtained besides Ca contg. 50% C, which can be preferably used in blast furnaces. Martin Bank has a Rumanian patent according to which 33.8% by vol. of acetylene can be obtained by passing methane through an elec. furnace at a temp. of 1400°. M. B. HART

The choice of properties for gas. KARL BUNTE. *Gas u. Wasserfach* 68, 587-90, 607-10, 623-5(1925).—Gas properties are discussed, in particular the mixing of coal and water gas to obtain the properties desired for various purposes. The operation of the Bergius process as a gas plant adjunct is also discussed. WM. B. PLUMMER

Use of oxygen in the manufacture of water gas. F. E. VANDAEVER WITH S. W. PARR. *Ind. Eng. Chem.* 17, 1123-7(1925).—It is estimated that O₂ at 25 cents/1000 cu. ft. will certainly, at 50 cents may possibly, compete with air in gasification processes. Tests on a small generator (approx. 5 × 10 in. section × 5 ft. high, inside) burning coke without steam used 0.417-0.512 cu. ft. O₂/cu. ft. gas made, the final gas being somewhat over 200 B.t.u./cu. ft. and contg. 60-70% CO and 10-15% CO₂. Similar tests with steam and the min. amt. O necessary to sustain the reaction gave results as follows: 920 lbs. steam with 20,562 cu. ft. O₂ gave 66,000 cu. ft. gas, all per ton coke; the gas was 254 B.t.u./cu. ft., contg. 10.4% CO₂, 57.6% CO, 20.7% H₂, 0.6% O₂, 10.7% N₂. In both producer and water gas tests suction was used on the generator; temps. were sufficient to slag the ash but caused no operating difficulties. WM. B. PLUMMER

The removal of benzene from gas: the present state of the matter in France. A. GREBEL. *Genie civil* 87, 37-43, 53-7(1925). JACK J. HINMAN, JR.

Factors influencing length of a gas flame burning in secondary air. F. W. REMBERT AND R. T. HASLAM. *Ind. Eng. Chem.* 17, 1236-8(1925).—Expts. on the effect of port velocity, port diam., and primary air-gas ratio on the length of a flame burning in free space show that the length is expressed by the equation $L = K \log u + B \log D + E$, where u is the port velocity and D the port diam., the consts. K and B being dependent upon the furnace construction, and also upon the primary air-gas ratio. These consts. are tabulated for various cases. WM. B. PLUMMER

Factors affecting the utility of secondary air in gaseous combustion. F. W. REMBERT AND R. T. HASLAM. *Ind. Eng. Chem.* 17, 1238-40(1925).—With increasing air supply the ratio of air utilized/supplied passes through a max., the actual values depending on port diam. and velocity. For a given air supply the ratio of air utilized/supplied increases with both port velocity and diam., probably because of increased rate of mixing. WM. B. PLUMMER

Relative rates of combustion of constituents of city gas burning in secondary air. F. W. REMBERT AND R. T. HASLAM. *Ind. Eng. Chem.* 17, 1240-2(1925).—Provided that over 80% of the gas has already been burned, the relative rates of combustion of the various constituents of city gas may be approx. expressed by the following ratios: C₂H₄/CH₄ = 1.1, H₂/CO = 4.9, CH₄/H₂ = 3.0, CH₄/CO = 14.9. These results were obtained by detn. of flue gas compn. for various controlled conditions. W. B. P.

Chemical equilibrium in gases exhausted by gasoline engines. W. G. LOVELL WITH T. A. BOYD. *Ind. Eng. Chem.* 17, 1216-9(1925).—Numerous data on the compn. of engine exhaust gases have been examd., it being found that the *water gas equil. const.* $K = (\text{CO})(\text{H}_2\text{O})/(\text{CO}_2)(\text{H}_2)$ calcd. from them lies, for practically all cases of load, carburetor adjustment, etc., between 3.0 and 4.0, which corresponds to an apparent equil. temp. of 1350-1550°.

WM. B. PLUMMER

Experiments on the flow of gas in long pipe lines between Saint-Quentin and Noyon. COMMISSION DE DISTRIBUTION, 48TH CONGRÈS DE LA SOCIÉTÉ TECHNIQUE. *J. usines gaz* 49, 260-8, 275-85(1925).—A detailed report of expts. on coal gas, water gas and city (mixed) gas at various rates of flow in various pipe lines. The results have been compared to those calcd. by the Girard, Unwin, Towl, Mommer, Arson, Weymouth-Towl and Chicago formulas. Of these the last is accurate to 1% for initial pressures of over 1 kg. This is much closer than with any of the other formulas. W. B. P.

Contribution to the study of the gas producer. G. HUSSON. *Rev. ind. minérale* 1925, 451-72.—A discussion of the *theoretical relations between the temp. gradient of a gas producer using coke and the compn. of the gas*, with their application to the practical operation of the producer. In effect the article is an amplification of a previous one (cf. *C. A.* 16, 4327). The determinant factors governing the operation of such a producer are the insulation of the equipment, the reactivity of the coke and the softening temp. of the ash, the first two of which have heretofore been too little appreciated. The insulation detcs. the temp. of the zone where the ratios CO/CO_2 and $\text{H}/\text{H}_2\text{O}$ are max. and the rate at which combustion should be carried on to obtain max. efficiency. It is shown to be of great advantage to have a very reactive coke and so a gas producer using coal should be so operated that the distn. in the upper region yields a coke of max. reactivity. Theoretically ideal conditions are modified in practice by the fact that the softening point of the ash limits the temp. of the hot zone, the efficiency becoming less above this temp. because of mech. troubles caused by fusion of the ash. Further considerations, such as the effects of steam injection, the max. temp. of combustion and the application of the theories derived for coke gas producers to producers using coal, are discussed in a way which does not admit of brief exposition.

C. C. DAVIS

Conditions governing the efficiency of gas burners. S. W. PARR. *Ind. Eng. Chem.* 17, 1215-6(1925).—A brief discussion of the inefficiency of ordinary gas burners, and of the advantages of increasing the primary air and the gas pressure in burners of the Bunsen type.

WM. B. PLUMMER

New apparatus for the determination of carbon dioxide in flue gases. CAILLOT. *Rev. ind. minérale*, Jan. 15, 1924; *Genie civil* 84, 415(1924).—As the CO_2 increases in the flue gases their heat cond. decreases. Two Pt wires, one in the air and one in the flue gases, are heated by the same elec. current. The wire in the flue gases gets hotter as the CO_2 increases and its resistance increases. The amt. of CO_2 and the resistance therefore vary similarly. A recording galvanometer is used.

J. J. H. JR.

Vapor composition relationships in the systems phenol-water and phenol-cresol. F. H. RHODES, J. H. WELLS AND G. W. MURRAY. *Ind. Eng. Chem.* 17, 1199-1201(1925).—PhOH and H_2O form azeotropic mixts. which have min. boiling points, the proportion of PhOH in the const.-boiling mixt. decreasing with the pressure. Thus at atm. pressure the mixt. contains 9.4% PhOH and at a pressure of 260 mm. 4.4% PhOH. The concn. of PhOH in the distillate remains approx. const. as long as its concn. in the liquid is over 85% or so. Comparison of exptl. and calcd. data (cf. *Z. physik. chem.* 26, 603(1898)) of the vapor compns. indicates that PhOH forms "ideal" liquid mixts. with *o*-, *m*- and *p*-cresol. The complete data allow the calcn. of the theoretical min. reflex ratio and the min. no. of sections required in the fractionating columns of stills for the sepn. of PhOH from H_2O and from cresols.

C. C. DAVIS

The testing of coke. G. E. FOXWELL AND R. V. WHEELER. *Fuel in Science & Practice* 4, 410-3(1925); cf. *C. A.* 19, 3368.—The CO_2 , O and air methods for detg. the combustibility and reactivity of coke and the general principles involved in methods for detg. its temp. of ignition are described and criticized. The CO_2 method prescribes 950°, so that cokes made below this temp. are superheated before the actual detn. Furthermore crushing destroys the macrostructure and exposes an undue amt. of the interior of the cells to CO_2 , which have a different reactivity from the surface, and therefore the mean reactivity differs from coke in bulk. When the finest material is discarded the reactivity is abnormally low. In the O method the order of the rates of reaction of different cokes is not the order of their rates at other temps. In the air method channeling is likely, difficulty is encountered in maintaining a const. height of bed and there is no temp. control, but in spite of these short comings the air method using a grate area of 1 sq. ft. appears to be the most satisfactory. The ignition temp.

method is of doubtful value in that the ignition temp. of coke is not necessarily a function of its combustibility.

C. C. DAVIS

New continuous vertical chamber ovens. O. PEISCHER. *Gas u. Wasserfach* **68**, 596-7(1925).—Results of several tests show no decrease in coke quality in continuous ovens as compared to intermittent ovens of the same dimensions.

W. B. P.

The gasification of molasses residues (MUEHLERT) **28**. $\text{CO}_2\text{-NH}_3$ compounds (MEZGER, PAYER) **2**. Air pollution (KERSHAW) **14**. Rational use of conduits for transporting water and gas (GILBERT) **14**. Kiln for drying and carbonizing coal (U. S. pat. 1,556,571) **1**. Apparatus for drying wet coal (U. S. pat. 1,558,119) **1**. Retort for distillation of coal (U. S. pat. 1,558,671) **22**. Mixing liquids and solid particles (U. S. pat. 1,561,909) **13**.

Hydrocarbon gases from coal, etc. N. G. LINDERBORG. U. S. 1,528,623, March 3, 1925. In producing gas from coal, gasoline and other products from kerosene, or in carrying out other similar reactions, the raw materials are passed successively through hotter zones of a furnace partially heated by elec. devices adjacent the extreme end of the furnace and volatilized products are subjected to high-tension elec. discharges from rapidly moving electrodes.

Gravity separation apparatus for testing coal and separating impurities from it. G. R. DELAMATER. Brit. 232,942, April 26, 1924.

Benzene, etc., from heavy oils. E. A. BARBET. U. S. 1,561,899, Nov. 17. A mixt. which may comprise a heavy non-volatile oil and substances absorbed from coke-oven gas is first heated by heat of out-going stripped oil and by vapors of C_{10}H_8 coming from a heating of the oil to a higher temp. at a later stage. The oil thus preheated is then run through a still and rectifying column and heated by indirect steam heat to about 160° while vapors are drawn off from the lower portion of the rectifying column, and is then further heated by superheated steam to a temp. which will vaporize C_{10}H_8 .

Apparatus for distilling benzene, etc., from wash oils. KOPPERS COKE OVEN CO., LTD. Brit. 232,724, Feb. 9, 1924. The app. is arranged so that circulation of the oil is not affected by the degree of reduced pressure in the app.

Apparatus for washing benzene and light oils from gas works, etc. K. PFISTERER. Brit. 232,730, Feb. 20, 1924.

Apparatus for testing the explosiveness and explosion pressure of motor oils and fuels. H. JENTZSCH. Brit. 232,633, April 20, 1924.

Liquid seal valve device for gas manufacturing plants. ASKANIWERKE AKT. GES. FORM. CENTRALWERKSTATT-DESSAU AND C. BAMBERG-FRIEDENAU. Brit. 232,937, April 26, 1924.

Gas scrubber. H. BAUER and G. TAUBE. Brit. 232,590, April 15, 1924.

Apparatus for separating tar from producer gases by scrubbing and baffling. B. MOSCOVITCH. U. S. 1,562,118, Nov. 17.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Progress in petroleum engineering. W. R. ECKART, et al. *Mech. Eng.* **47**, 1126 (1925).

E. J. C.

Chemistry of petroleum. II. Action of sodium hypochlorite on sulfur compounds of the types found in petroleum distillates. S. F. BIRCH AND W. S. G. P. NORRIS. *Chem. Soc.* **127**, 1934-44(1925); cf. *C. A.* **19**, 2407.—Solns. of Et_2S , dipropyl sulfide, diisobutyl sulfide and diisoamyl sulfide dissolved in naphtha ($100\text{--}175^\circ \text{ b. p.}$) were made to have S contents of approx. 1%. All were oxidized wholly or in part to the analogous sulfones when shaken (15 min.—2 hrs.) in equal vol. with a soln. of NaOCl (8.42% of available Cl). The % of free alkali (NaOH) influenced greatly the rate of the reaction, the most active solns. contg. relatively little excess of NaOH (0.22%). Solns. of org. sulfides give rise under similar conditions to sulfonic acids and sulfuric acid. The reaction of these products with NaOH must be considered in prepg. the soln. of hypochlorite, which in practice should remain alk. Mercaptans in fairly alk. solns. are oxidized largely to the disulfides. In less alk. solns., the products are the same as those of the analogous disulfides. The activity of the hypochlorite is increased by diln. and by decrease of concn. of OH . Elementary S is not attacked. H_2S is oxidized to

H₂O and S, and there is evidence that some H₂SO₄ is formed simultaneously. Thiophene is not oxidized. W. F. FARAGHER

Analysis of crude oils of Roumania. G. GANE AND A. MOSCHUNA. *Mon. Petr. Roum.* **24**, 950-60(1925).—Samples of all the Roumanian crudes were studied to det. (1) the d₁₅, (2) color, (3) point of liquefaction and (4) the paraffin content at -20°. M. B. HART

Absolute viscosity of the Roumanian petroleum. C. PREDESCO. *Mon. Petr. Roum.* **24**, 1248(1925).—The method used is described and a table contg. the exptl. results is given. The abs. viscosity with the b. p. of the fraction 100-110° is 0.004891 and 0.1703 for the fraction 340-350°. It increases much faster than the surface tension. Up to the fraction 200-210°, the absolute viscosity increases in straight line; from this fraction up to 300-310°, it increases faster; then up to 340-350°, it increases much faster. The surface tension increases in nearly a straight line. The variation of the absolute viscosity with the temp. for the heavy fractions is much greater than for the light fractions. M. B. HART

Chemical problems in the water-driving of petroleum from oil-sands. P. G. NUTTING. *Ind. Eng. Chem.* **17**, 1035-6(1925).—Exptl. results of displacing oil by water from spaced plates of glass and from sand are described and discussed theoretically. Na₂CO₃ is particularly effective in enabling H₂O to displace petroleum. Its use is being tested in the Bradford district (Pa.). W. F. FARAGHER

Developments in American refining methods and equipment. J. T. B. BOWLES. *Oil Trade* **16**, No. 8, 27-8(1925). M. B. HART

Petroleum motor fuel. K. G. MACKENZIE. *Ind. Eng. Chem.* **17**, 1105-14(1925).—A historical account of the production of motor fuel is presented statistically (domestic and foreign). Factors of conservation are discussed and emphasized. W. F. F.

Mazut. E. DAWKIN. *Chem. Tech.-Ztg.* **43**, 113-5(1925).—The physical properties of mazut (fuel oil) are given. Suitable methods of combustion are discussed. M. B. HART

Mazut (fuel oil). I. DAVIN. *Chem. Tech.-Ztg.* **43**, 113(1925).—Well-known methods of testing fuel oil are mentioned. Special attention is paid to its use in burners of different types as follows: (1) burning in a pan; (2) preheating and burning the gas; (3) atomizing by compressed air; (4) atomizing by superheated steam. Atomization is the most economical on boats. A rapidly rotating atomizer is used, the fuel being preheated. M. B. HART

Wastage and salvaging of oil at tanks in Salt Creek Field, Wyo. J. S. ROSS. *Nat. Petroleum News* **17**, No. 29, 58(1925).—Effective tank drainage and waste oil recovery systems in use include: wooden drain and sump boxes together with a steam pump to remove to 50-barrel tank, in which drain connections discharge downward into the boxes; drains around the bases of tanks, either ditches or concrete drains; the use of ponds, dams or earthen sumps to catch wastage is poor, for the oil is difficult to recover. Satisfactory collectors are small wooden or concrete sump boxes "Tank bottoms" and "burnt oil" may be treated effectively by steaming with care for 4¾ hrs. on one day and 2½ hrs. the next day, the temp. being raised from 50° to 160° F. After steaming the oil was allowed to stand for four days when but 2% bottom settlings and emulsion were present as compared to 5 to 12% before steaming. Conditions for proper steaming include: No live steam should come in contact with the oil; heat until all is at the desired temp., let steamed oil stand until all free water and bottom settlings have settled; keep tank tops tight to keep out moisture. M. B. HART

Extraction of gasoline by absorption. L. H. HILE. *Oil & Gas J.* **24**, No. 10, 186(1925).—The oil absorption method is described and commended because of its application to gases of any gasoline content under varied pressures, and its simplicity of operation. M. B. HART

Engineering increases the capacity of gasoline plant at minimum cost. J. C. CHATFIELD. *Nat. Petroleum News* **17**, No. 33, 36-38(1925).—It is recognized by natural gasoline engineers that 50% of the absorption oil circulated will ext. 80% of the gasoline, while the rest is necessary to absorb the remaining 20%. The Phillips Petroleum Company will double the gas flow through the absorbers, extg. about 80% of the available gasoline and pass the gas through three 7 × 30 foot horizontal charcoal absorbers to recover the remaining 20%. The gas will be passed from the oil absorber through two 7 × 30 foot horizontal scrubbing tanks to remove all absorber oil. M. B. H.

Gasoline manufactured from California crude has superior quality. ROY CROSS. *Oil Age* **22**, No. 8, 11, 12(1925).—The various types of anti-detonating gasolines are discussed with curves to show volatility gravity relations of various types. An app. and method for detn. of gasoline content are described. The relative value of fuels in

regard to anti-detonating properties for carboned cylinders or high-compression motor, is approx.: benzene-gasoline, synthetic gasoline from cracking coal tar gas oil, synthetic gasoline from cracking kerosene under high pressure, California natural gasoline, synthetic gasoline from cracking paraffin-base petroleum, Mid-Continent natural gasoline, pure paraffin base gasoline.

M. B. HART

Prevention of evaporation losses from gasoline storage tanks. R. E. WILSON, H. V. ATWELL, E. P. BROWN AND G. W. CHENICEK. *Ind. Eng. Chem.* **17**, 1030-5 (1925).—The process of "breathing" of tanks is discussed fully. Breather-bags of canvas, rendered impervious by a dope consisting of high-grade glue and glycerol and coated, after drying, with talc to prevent adhesion of surfaces in contact, are connected to breather-pipes of tanks. A bag 25 ft. in diam. and 45 ft. long (18,000 cu. ft.) will serve two 40 × 120 ft. gasoline tanks. The bags are housed in a sheet-metal building. Loading, seals, performance, durability and costs and savings are discussed. W. F. F.

Motor design and fuel economy. C. F. KETTERING. *Ind. Eng. Chem.* **17**, 1115-6 (1925).—A discussion of ideal requirements for a motor car, and the departures from them forced by the demands of the purchaser.

W. F. FARAGHER

The "cracking" of paraffins. A. WILLIAMS-GARDNER. *Fuel in Science & Practice* **4**, 430-40 (1925).—With the ultimate object of detg. the chem. changes involved in the cracking of oils, a study was made of the thermal decompn. of the simplest compd. capable of being cracked, viz., C_2H_6 . At pressures slightly below normal C_2H_6 begins to decomp. at 550°. Decompn. is very slow, and secondary changes do not occur at this temp., the chief products being CH_4 and C_2H_4 with traces of H. At slightly higher temps. the C_2H_4 has a tendency to be hydrogenated by the H present, forming CH_4 and at the same time undergoing slight decompn. into C and H. The intermediate formation of C_2H_2 is extremely doubtful and at no time during the thermal decompn. of C_2H_6 does C_2H_2 appear in appreciable quantity nor does it play an important part in the different reactions taking place at any temp. Up to 800° conditions favor the formation of liquid products, but above 800° there is a strong tendency for C_2H_6 and C_2H_4 to decomp. into their C and H and at the same time to be hydrogenated to CH_4 . At still higher temps. decompn. of CH_4 into C and H sets in. Contrary to the expts. of Bone and Coward (*C. A.* **2**, 3061) aromatic compds. were formed in considerable quantities and C_6H_6 was one of the chief liquid products. This formation of aromatic compds. is ascribed to the behavior of C_2H_4 in the region of 750°. At such temps. the predominant secondary change is apparently the polymerization of an unsatd. compd. with elimination of H. The mechanism of the changes can be explained on the assumption that there is a scission of the C-C bond in the C_2H_6 mol., giving rise to Me residues which are stable at temps. around 550°. With rise in temp., however, these residues are dissociated to the more unsatd. and perhaps less stable $:CH_2$ residues, which form equil. mixts. with C_2H_4 , H being at the same time eliminated. With rise in temp. Me groups are hydrogenated to CH_4 and H, while the reaction $:C_2H_4 \rightleftharpoons :CH_3 + :CH_2$ proceeds from left to right, the unstable $:CH_2$ residues undergoing either (1) decompn. into $:CH$ residues and H (the former polymerizing to liquid products or decompng. into C and H); (2) hydrogenation to CH_4 or (3) direct decompn. to C and H. The $:CH$ residues may be considered to have more than the "fugitive sep. existence" attributed to them by Bone and Coward (*loc. cit.*), for C_2H_2 is formed from C and H above 1000° (cf. *J. Chem. Soc.* **89**, 1591 (1906)) and it is probable that at such temps. C_2H_2 does not exist but that CH residues are stable. In general the thermal decompn. of C_2H_6 is typical of the decompn. of a paraffin to form a lower paraffin or an olefin in the manner suggested by Haber, Thorpe and Young and others. Subsequent changes are due to the secondary decompn. of the products. The app. and methods used in the expts. are described and illustrated, besides which a bibliography of 26 references is included. C. C. D.

N. T. U. Company building for eduction of shale in large quantity. L. E. SMITH. *Nat. Petroleum News* **17**, No. 33, 30 (1925).—The process is based upon the principle of a down draft within a vertical steel shell with a controlled zone of combustion. All fuel for the internal heating of the generator is supplied from the shale itself. Temp. control is effected by returning some of the gaseous products of combustion through the air feed pipe to the top of the generator. The oil produced is condensed in the cool shale below the zone of distn. or in the condensing and scrubbing app. 68 to 88.3% recovery of available oil and gasoline at a cost of 65-70 cents per ton of shale distd. is possible from a plant costing \$400,000. The shales used have not been true oil shales but a diatomaceous earth satd. with a bituminous substance similar to asphalt which is sol. in gasoline, but tests on kerogen shale showed a 96.0% recovery. The Cross cracking process produced an ultimate yield of 78% gasoline and 22% gas and coke from samples of the oil.

M. B. HART

A general survey of the economics of the oil-shale industry. R. B. DAY. *Pet. World Calif.* 10, No. 8, 30, 31, 114(1925). M. B. HART

Charcoal adsorption plant set up in eight days making money from gas of one well. J. C. CHATFIELD. *Nat. Petroleum News* 17, No. 32, 63, 64, 66(1925).—Charcoal adsorption has been used efficiently on rich gas by the Skelly Oil Co. by means of three 6 by 8 foot absorbers contg. 7000 lb. of activated charcoal running on 30-min. cycles. Gas enters the system at 5 lb. well pressure per sq. in. and is being handled at the rate of 950,000 to 1,000,000 cubic feet per day without the use of scrubbers. The charcoal is cooled to 135 to 145° by the residual gas before reabsorbing, leaving only 60 to 66 gallons of gasoline per million cu. ft. of gas. M. B. HART

Colorado oil shales. W. C. ALDERSON. *Petroleum Times* 14, 227(1925).—Oil shale is found in all periods of geological formation and can be classified as a natural deposit resulting from the deposition of org. matter from plants and animals of a former geological period. Oil shale contains ferns, leaves and fish scales, besides pollen, insects and other remnants of plant and animal life, but no oil as such. Since H and C are present a proper distn., in an air-tight retort at about 800° F., produces oil and gas. Tables are given which show the potential supply and approx. relative value of oil shales in the United States. M. B. HART

The present status of the oil-shale industry in Esthonia. P. N. KOGERMAN. *J. Inst. Petroleum Tech.* 11, 210(1925).—A short history of the development and method of operation of the oil-shale industry in Esthonia is given. Kukersite, the Esthonian oil shale, produces 20% of its wt. of oil. The gas produced by carbonization in old-type horizontal retorts contains H 37.6, methane 25.8, CO 19.1 and CO₂, etc., 13.3%. The oil yield is greater from unweathered shale and contains hydrocarbons 72.1, phenols 22.4, carboxylic acids 4, bases 0.2%. Shale oil is at present the cheapest crude oil in Esthonia. M. B. HART

Control of consistency in manufacture of cup-grease. D. R. MERRILL. *Ind. Eng. Chem.* 17, 1068-71(1925).—The general method of making cup-greases is discussed briefly. An *Abraham consistometer* was used to det. consistencies of commercial grades of lime-soap cup-greases. A control test during manuf. involves cooling in the air for 15 min. A sample (judged by quantities of oil, etc. used and "by feel" of an air-cooled sample to be slightly too hard) in a spice can (1 1/4" X 2 1/4" X 3 1/8") is cooled in the air during 15 min., and is then chilled for an hour in crushed ice and water. Two tests are made on each can. The quantity of oil to be added is known from previous tests for the particular grease. Temp. at which grease is finally drawn into the containers is important. W. F. FARAGHER

Density of a lubricating oil at temperatures from -40° to 20°. H. K. GRIFFIN. *Ind. Eng. Chem.* 17, 1157-8(1925).—A special pycnometer and the method of using it are described. Determinations of density are accurate to 1 part in 1000. W. F. F.

Decolorization of lubricating oils by the contact method. A. R. MOORMAN. *Nat. Petroleum News* 17, No. 29, 84(1925).—Contact filtration which produces oil of uniform color and eliminates grading allows clay to be used directly on sour oils from acid treat, thus eliminating neutralization. Action of clays is entirely selective, and is independent of temp. (up to 500° F.). The decolorizing power is ordinarily independent of the acidity of the oil, being greater in contacting a sour oil, and increases with rise in temperature. Steam should be present until the clay is removed from the oil, which makes a continuous process preferable. Natural clays are lower in efficiency and price than treated clays and are best adapted to use on gasoline and neutralizing lubricating oils while treated clays are better decolorizers. Clays are used either dry or in the form of a pulp, the latter being more efficient, after they have been treated with acid and washed. M. B. HART

Increasing viscosity of lubricants. E. C. ISOM. *Oil & Gas J.* 24, No. 13, 156 (1925).—"Voltol" is a lubricant manuf. by subjecting fatty and mineral oils to an elec. glow discharge of 4000 v. at 500 cycles. The process is covered by the German patents 234,543, 236,294, 185,931. It is carried out in a closed horizontal cylindrical steel vessel of 30 cu. m. content, under a reduced pressure of 24-26 inches of Hg with the addition of no other gas. Since the oil is held at 80°, vapors are formed and the "voltolizing" is carried on in a rarified atm. of oil vapors. None of the properties is affected except the viscosity, but the friction reduction often amounts to 30%. "Normal voltol" is a compounded oil with a viscosity of 1500 Saybolt at 212° F., consisting of a mixt. of fatty oil with mineral oil. Uses of the lubricant include lubrication of internal-combustion engines, high-pressure compressor, superheated steam cylinders, marine engines, heavily loaded ring-oiling bearings, etc. The process increases the viscosity of an oil 300% without affecting its original pour test. M. B. HART

Low-grade crude available for lubricants. J. W. WEIR. *Oil & Gas J.* **24**, No. 17, 24, 84-6(1925).—Mixed-base crude is reduced to asphaltum, the lubricating stock is reduced to viscosity and the wax sepd. by filtering through clay, usually clay that has already been used for decolorizing purposes. The wax is then removed from the clay by extn. with a solvent, the soln. filtered from the clay and the clay used over again together with a certain additional amt. of fresh clay. M. B. HART

Identification of Norit and other wood charcoals. H. G. TANNER. *Ind. Eng. Chem.* **17**, 1191-3(1925).—Charcoals prepd. by heating various types of wood in the presence of insufficient O all contain occasional particles having a perforated structure characteristic in size and pattern of the particular genus of wood used, varying somewhat in the various species within the genus, and independent of the exact conditions of prepn. Norit (a Dutch com. active C) has thus been identified as apparently made from birch wood, and a charcoal prepd. as above from birch (yield 7%) has been found to have the same decolorizing power as Norit. Photomicrographs are given of characteristic particles from a no. of woods. WM B. PLUMMER

The carbonization oven competition of the Sénart forest (France). ANON. *Recherches et inventions* **7**, 789-809(1925).—The Frey, Laurent, Camille Rochet, Delhommeau, Krug, Magnein and Trihan portable carbonization ovens and their method of operation are described. Their comparative performances during the competition are given. A. PAPINEAU-COUTURE

Hydrocarbon gases from coal (U. S. pat. 1,528,623) **21**. Bituminous liquid coating compositions (U. S. pat. 1,558,082) **26**. Tetraalkyl lead (U. S. pat. 1,559,405) (U. S. pat. 1,550,940) **10**.

Refining petroleum oils. J. F. FABER, H. C. HANNA and M. L. CHAPPELL. U. S. 1,562,156, Nov. 17. After treating oil with H_2SO_4 , the treated oil is sepd. from the acid sludge and neutralized in the presence of a "petroleum carboxylic salt" to prevent the formation of a persistent emulsion, this "petroleum carboxylic salt" being obtained by extg. "petroleum carboxylic acids" from crude petroleum oil by use of an aq. soln. of a metallic base so as to avoid the presence of sulfonated soaps.

Gases containing olefinic hydrocarbons. GOLDSCHMIDT AKT.-GES. Brit. 232,568, April 15, 1924. Pennsylvania gas oil or a similar oil is passed through a bath of molten Pb or the like maintained at about 600-650° and the resulting gases are freed from undecomposed oil, "benzines" and diolefins by cooling, compression or absorption. They consist of CH_4 , C_2H_4 , C_3H_6 and C_4H_8 . C seps. on the surface of the Pb bath.

Removing wax from hydrocarbon oils. A. GREENSPAN. U. S. 1,562,425, Nov. 17. Kerosene 15-20% is added to oil to effect the crystn. of cryst. wax at a temp. of about 27-32°. The oil is then sepd. from the wax crystals and amorphous wax and kerosene are distd. off from the sepd. oil until the residuum in the still is a high-grade cylinder stock.

Rectification of alcoholic or hydrocarbon liquids. E. A. BARBET. U. S. 1,559,218, Oct. 27. In rectifying mixed liquids such as petroleum oils or "benzols," heat is supplied to the mixt. to vaporize its lower b. p. constituents at atm. pressure. Vapors formed are condensed, and the heating of the residual liquid is interrupted and it is subjected to a reduction of pressure while still hot, the vapors thus formed are fractionated and the liquid residue from the fractionation is further subjected to multiple effect evapn. *in vacuo*.

Dephlegmator for hydrocarbon vapors. F. LAMPOUGH. U. S. 1,557,478, Oct. 13.

Cracking petroleum oil. G. EGLOFF. U. S. 1,561,779, Nov. 17. Oil is passed through a heating coil where it is subjected to cracking conditions of heat and pressure. A portion of the oil is then transferred to a primary expansion chamber and all of the oil constituents are transferred from this chamber into a secondary chamber. The remaining portion of the heated oil from the coil is directly introduced into liquid oil in the secondary chamber to increase the amt. of conversion.

Still for cracking petroleum oil. G. W. WALLACE. U. S. 1,561,758, Nov. 17. Vertical tubes through which the oil is circulated (and which are heated by combustion products to effect cracking of the oil) extend between upper and lower headers. From shaves in these headers, chains pass through the tubes and by their movement prevent collection of C deposits in the tubes.

Apparatus for fractional distillation of petroleum. H. P. STRAUS. U. S. 1,562,009, Nov. 17. The app. comprises a column with perforated plates.

Decolorizing oil. P. W. PRUTZMAN and C. J. VON BIBRA. U. S. 1,562,001, Nov. 17. An aq. mud is prepd. from pulverulent solid decolorizing material to exclude all

from the pores of the material. This mud is mixed with oil to be decolorized, *e. g.* petroleum lubricating oil, and the mixt. is heated until the H_2O is evapd., the spent decolorizing material being then sepd. from the oil.

Purifying and decolorizing oils. P. W. PRUTZMAN. U. S. 1,561,999, Nov. 17. A portion of petroleum oil of high b. p. or other similar oil to be decolorized is mixed with powd. porous adsorbent material such as fuller's earth, boneblack or acid-treated montmorillonite and the mixt. is allowed to stand until air has been displaced from the pores of the adsorbent by the oil. The remainder of the oil is heated to a temp. above 175° and mixed with the adsorbent and its associated adsorbed oil to effect a partial decolorization. The adsorbent is then sepd. Cf. C. A. 19, 3013.

Removing acids from oils. P. W. PRUTZMAN and P. D. BARTON. U. S. 1,562,000, Nov. 17. In removing acid-tar from acid-treated petroleum oil contg. tar, the oil is agitated with adsorbent clay or other powd. adsorbent which has been previously used for removing impurities from tar-free oils and is charged with tar-free oil.

Retort for distillation of shale, coal, etc. W. GUY-PELL. U. S. 1,558,671, Oct. 27. See Brit. 223,652 (C. A. 19, 1192).

Bituminous emulsions. H. A. MACKAY. Brit. 232,683, Jan. 23, 1924. The process of Brit. 202,021 and 202,235 (C. A. 18, 326) is modified by effecting the prep. of the emulsion at a lower temp., about 88° , in an agitating app.

Bituminous composition for use in block or sheet form, etc. G. J. MULLER. U. S. 1,559,731, Nov. 3. Bituminous material such as asphalt is mixed with finely divided slate contg. graphitic C, *e. g.* with Peach Bottom slate.

Metallic lubricant-carrier. A. E. BECKER. U. S. 1,562,138, Nov. 17. Metallic lubricant-carrier material such as steel, Cu, brass or Monel "wool" is heated in the presence of a S-contg. oil, *e. g.* heavy distillate from Mexican petroleum oil, to increase its holding capacity for lubricant.

Refining gum turpentine. A. R. AUTREY. U. S. 1,559,399, Oct. 27. Gum turpentine or similar substances to be refined and decolorized is agitated with dried fuller's earth, preferably at a temp. of about $57-68^\circ$, and then filtered and distd. with steam at a temp. not exceeding about 155° .

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Reactions relating to carbohydrates and polysaccharides. XI. Oxidation of cellulose. HAROLD HIBBERT and J. L. PARSONS. *J. Soc. Chem. Ind.* 44, 473-85T (1925).—From expts. on the oxidation of purified cotton cellulose, 22-26% over the oxidizing range 0.01-2.00 atomic portions O per $C_6H_{10}O_5$ unit using $KMnO_4$, $Mg(MnO_4)_2$ and $Ba(MnO_4)_2$ in neutral and slightly alk. solns. and with CrO_3 in 90% aq. $AcOH$ soln., there is evidence of a progressive degradation of the fibers and CO_2 is one of the chief products of oxidation. From ash, Cu no., alkali soly., furfural and Lefèvre CO_2 detns., the cotton oxidized in acid soln. contains a larger amt. of oxidized cellulose on the fiber than in neutral soln. Soly. of oxidized cellulose in alkali is regarded as due not only to salt formation and aldehydic reactions but also to soln. of a portion of the unattacked, though probably depolymerized, cellulose. The viscosity of $Cu-NH_4$ hydroxide solns. of oxidized cellulose is much lower than of the original cotton, even when the min. amt. of oxidant was used. Acetylation tests showed that the av. no. of OH groups decreased from 3 to nearly 2. Oxidation of cellulose, in general, is accelerated by alkalis and retarded by dil. acids, and also is dependent on other exptl. conditions. Oxidized cellulose is regarded as a mixt. of a large amt. of unattacked, but partly depolymerized, cellulose with small quantities of complex oxidation products, aldehydic and acidic in nature.

J. L. PARSONS

Determination of α -cellulose. C. G. SCHWALBE. *Papierfabr.* 23, Tech.-Wiss. Teil, 177-80 (1925); cf. C. A. 19, 170, 2127.—Report of a comparative investigation of the Jentgen, Waentig and Fiber Analysis Committee (German) methods for the detn. of α -cellulose in wood pulps. A recommended sampling procedure is to cut the pulp strips into small pieces. Disintegration of the sample in an Fe grinding mill increases the ash content in Fe by as much as 9.3%. Rased pulp contains fibrous particles which are strongly attacked by the alkali. Comparative α -cellulose detns. gave the following results: by the Jentgen method, 86.4-88.2%; by the Waentig method, 83.5-87.0%; and by the Committee procedure, 84.9-87.0%. The Waentig method was considered unsatisfactory. Time, temp. and the method of stirring are the most important factors in the detn.

J. L. PARSONS

Action of metallic hydroxides upon cellulose. VOSS. *Kunststoffe* 15, 192-6 (1925).—Review of recent work with 55 references. C. J. WEST

Nitro or acetate films. RICHARD BLOCHMANN. *Kunststoffe* 15, 149-50 (1925).—Comparison of the two films as to stability and practical use. C. J. WEST

Recent developments in the manufacture of celluloid and celluloid substitutes. SCHMIDT. *Kunststoffe* 14, 129-33, 167-70, 184-5 (1924).—Patent review. C. J. W.

Production of mother-of-pearl iridescence effects upon paper and artificial materials. O. W. PARKERT. *Kunststoffe* 15, 169-71 (1925).—Various processes are discussed. C. J. WEST

The manufacture of vulcanized fiber products. F. HUTH. *Papierfabr.* 23, Tech.-Wiss. Teil, 621-3 (1925).—A general discussion. J. L. PARSONS

Swelling and adsorption of cotton and wood pulp fibers. C. G. SCHWALBE AND G. A. FELDTMANN. *Papierfabr.* 23, Tech.-Wiss. Teil, 589-95 (1925).—A simple method for detg. the absorption quality of a pulp is to expose weighed strips of air-dry sample, 4 by 8 cm., to the action of a liquid for 4 hrs. at room temp. The pulp is then drained for 120 sec. and weighed. By this method there were practically no differences in the absorption of water and of a 1% AcOH soln. by various pulps. Water absorption of bleached pulp is less than that of unbleached pulp. Swelling and adsorption of fibers are closely related. The latter is easily detd. by ascertaining the quantity of Fe_2O_3 retained by the fibers after exposing the pulp to a $\text{Fe}(\text{OAc})_3$ soln. for 1 hr. with agitation. The no. g. Fe_2O_3 held by 100 g. ash- and moisture-free fibers is termed the Fe_2O_3 no. Detns. of water absorption and the Fe_2O_3 no., in addn. to the usual chem. analysis, are valuable quality tests for wood pulps. The researches of S. and Teschner (C. A. 19, 3017) are discussed. The amts. of Al_2O_3 and Fe_2O_3 retained by the fibers are proportionately the same. Unbleached Mitscherlich pulps show greater absorption than other pulps. J. L. PARSONS

The reducing power of waste sulfite liquor and its use in dyeing and bleaching. M. G. KOTIBHASIKER. *J. Soc. Dyers Colourists* 41, 361-2 (1925).—The reducing power of waste sulfite liquor was measured by Fehling soln.; it was found that 17.66 cc. of the liquor was equiv. to 1 g. of $\text{Na}_2\text{S}_2\text{O}_4$. Lab. expts. were made to test the action of the liquor as a reducer in indigo dyeing and indigo stripping. The work is in progress. L. W. RIGGS

Production of sulfite cellulose from *Pinus maritima* in France. ANON. *Papir-Journalen* 13, 153-4 (1925).—The usual sulfite cellulose app. was used. Fresh wood 4-6 in. and with 18-23% moisture was digested for 15 hrs. The yield of cellulose was 35.7%. W. SEGERBLÖM

Ventilation in paper and cellulose plants in connection with recovery of heat. H. ERIKSSON. *Svensk Pappers-Tid.* 28, 391-3, 450-5 (1925).—Tables, diagrams and graphs give further data similar to items mentioned in C. A. 19, 2745. W. SEGERBLÖM

Ionic reactions in the sulfite pulp cooking process. E. ØMAN. *Svensk Pappers-Tid.* 28, 81-4, 106-10 (1925); *Papierfabr.* 23, Tech.-Wiss. Teil, 445-8, 483-6, 510-3, cf. C. A. 19, 2743. J. L. PARSONS

The use of chlorine in the production of bleaching liquors. B. SMÄRT. *Svensk Pappers-Tid.* 27, 447 (1924).—Of the Cl used in bleaching pulp 80% is shipped as liquid Cl and not as CaOCl_2 . Prepn. of liquid Cl is described. Freshly burnt lime is slaked, strained and pumped into absorption chambers supplied with stirrers and special inlets for Cl. The temp. is regulated to prevent chlorate formation. The resulting Ca hypochlorite soln. contg. 20-30 g. Cl per l. is run into settling tanks. The clear soln. is dild. to hold 15 g. Cl per l. (cf. C. A. 19, 2129). W. SEGERBLÖM

Sizing with hard water. J. CHINTSCHIN. *Zellstoff u. Papier* 5, 299-300 (1925).—Polemical with Lorenz (C. A. 19, 2129). Coagulation of rosin size is possible with a hard water when the paper stock is sufficiently highly dild. Sizing expts. should be carried out under mill conditions to det. the best practice to follow with hard water. The size concn., in general, should be increased. RUDOLF LORENZ. *Ibid.* 300-3. —A reply to Chintschin's criticism. Pptn. of rosin size with hard water is independent of the size dild. but is influenced by the compds. in the water. Mg salts are more effective precipitants than Ca salts. The more concd. the rosin emulsion, the more rapid is the pptn. with hard waters. For the protection of size dispersions the use of protective colloids is recommended (cf. C. A. 19, 3017). J. L. PARSONS

Pulp from different parts of the tree. ERIK HÄGGLUND. *Paper Trade J.* 81, No. 2, 45-7 (1925).—See C. A. 19, 2130. A. PAPINEAU-COUTURE

Soluble sulfites and their bisulfites in the pulping of wood. J. D. RUR. *Paper Trade J.* 81, No. 16, 54-6 (1925).—A review of the literature and patents. A. P.-C.

Researches on the chemistry of sulfite pulp cooking. ERIK HÄGGLUND. *Pap-*

pers-och Trävarutidskrift för Finland, Nos. 23 and 24 (Dec. 31, 1924); *Pulp Paper Mag. Can.* **23**, 1175-7 (1925).—A review of the principal results of H.'s researches on the compn. of spruce wood and on the mechanism of sulfite cooking (*C. A.* **14**, 943; **18**, 327, 535, 1568, 3113; **19**, 473, 1054, 1495, 2130). A. PAPINEAU-COUTURE

The relation between cooking conditions and yield and quality of sulfite wood pulp. R. N. MILLER. *Paper Mill* **49**, No. 41, 4, 22-6 (1925).—A description of the effects of penetration of the chips by the acid, circulation in the digester, time and temp. of cooking and acid compn. from the standpoint of yield and quality of pulp.

A. PAPINEAU-COUTURE

Pulp produced from Bordeaux pine by the Chevalier-Girard process. A. RETTORI. *Papeterie* **47**, 798, 801 (1925).—Results of analysis of pulp produced by the Chevalier-Girard process, the details of which are not given (Fr. pat. 568,630—the chipped wood is treated for 2-6 hrs. at 90-100° with an alk. soln. to remove the resin, drained, washed and treated by one of the usual processes) show it to be equal to the best grades of wood pulp produced by the ordinary soda and sulfite processes. A. P.-C.

Semi-cellulose and semi-chemical pulping. J. D. RUE. *Paper Trade J.* **81**, No. 16, 57-9 (1925).—A review of the literature and patents on processes for the treatment of wood preliminary to grinding (or mech. disintegration by other means than the ordinary grinder), so as to increase at low cost the strength and quality of the product without serious loss of yield. Steaming apparently is the only process used commercially at present for the purpose.

A. PAPINEAU-COUTURE

New developments in refining and finishing of paper pulp. K. A. PELIKAN. *Paper Trade J.* **81**, No. 17, 52-4 (1925); *Pulp Paper Mag. Can.* **23**, 1387-9 (1925).—Waste paper can be cheaply and efficiently de-inked by passing through a Hurrell homogenizer together with a suitable "solving agent," the cost and efficiency of the treatment both being increased by increasing the diln. of the pulp or the amt. of solvent. By passing pulp through the mill under certain conditions (not described) the mill does not hurt the fibers appreciably, but thoroughly seps them from one another. Colloidal rosin suspensions can be made without the use of alkali by passing through the homogenizer together with a suitable filler to prevent subsequent coagulation of the rosin particles. The "filler" may consist of montan wax, fibers (pulp), clay, satin white, blanc fixe, etc., $Mg(OH)_2$, $Al(OH)_3$, glue, casein, viscose. The $Mg(OH)_2$ or $Al(OH)_3$ can be either left in the pulp as a filler, or removed by means of acid. Paper-making fillers or dyestuffs can be reduced to an impalpable state of fineness by putting through the homogenizer, and the resulting material gives a better yield and better and more homogeneous appearance to the paper.

A. PAPINEAU-COUTURE

The manufacture of coating stock. E. ARNOULD. *L'industrie papetière* **4**, 266, 268 (1925).—Practical hints on properties, furnishes and operating conditions.

A. PAPINEAU-COUTURE

Some properties of paper. P. M. HOFFMAN JACOBSEN. *Paper* **28**, 895-900 (1925); *Paper Trade J.* **81**, No. 21, 49-51 (1925).—Breaking length (tensile strength), "zero-breaking-length," fiber breaking length, adhesion and bulk are defined. The importance of testing conditions, and more particularly of tension in detg. folding resistance, is briefly discussed (cf. *C. A.* **19**, 174).

A. PAPINEAU-COUTURE

Woods from French West Africa ("Emien," *Alstonia congensis*, Engl.). F. HEIM, M. CERCELET, J. MAHEU, G. S. DAGAND AND R. HEIM DE BALSAC. *Bull. agence gén. colonies* **17**, 1377 (1924); *Bull. Imp. Inst.* **23**, 367-8 (1925).—A sample of "Emien" from Ivory Coast, contg. 8.25% H_2O , showed (on dry basis): ash 0.91, fats and waxes 0.63, cellulose 64.3, lignin 34.16%. Cooking 8 hrs. under a pressure of 3 kg. with a 5.5% NaOH soln. gave a brownish yellow pulp, which bleached white with av. facility, yielding 33% (on dry basis) of bleached pulp. The pulp consists almost entirely of narrow-ended, cylindrical fibers, with very thin walls and very wide lumen, 1.0-1.5 mm. long (av. 1.2 mm.), 0.025-0.035 mm. (av. 0.030 mm.) in diam., and with a felting power (diam.: length) of 0.025. The pulp gives paper of similar quality to ordinary wood pulp papers (cf. *C. A.* **19**, 1947).

A. PAPINEAU-COUTURE

Sorghum from Madagascar. R. HEIM DE BALSAC, J. MAHEU AND M. CERCELET. *Bull. agence gén. colonies* **18**, 360 (1925); *Bull. Imp. Inst.* **34**, 466 (1925).—Fragments of stalks received under the name of "Bakaka," a form of *Sorghum vulgare*, Pers., contg. 9.59% H_2O , showed (on dry basis): ash 6.22, cellulose 82.83, lignin 10.05%. Cooking 7 hrs. under pressure (not given) with a 5% NaOH soln. gave a yellowish brown, very easy-bleaching pulp. The yield of bleached pulp was 37%. It is composed of fibers, fragments of vessels, and a rather large proportion of cellular matter. The felting power was 0.005. Paper made from the bleached pulp was dull white, soft to the

touch, and had a fair rattle; in general it was of good quality but a little lacking in suppleness.

(Paper making qualities of) creepers from Indo-China. F. HEIM AND M. CÉRCELET *Bull. agence gén. colonies* **17**, 1609(1924) *Bull. Imp. Inst.* **23**, 366-7(1925).—Sixteen kinds of creepers, which have not been botanically identified and are referred to under their native names, can be converted into pulp by similar treatment. In each case the samples were cut into pieces 3-4 cm. long and 3-5 mm. thick, and were digested with a 3-4% NaOH soln. for 3.5-4 hrs. Bleaching was effected with av. facility and yielded 20-32% (37% in one case) of bleached pulp. The av. yield from the whole series was 28%. The paper made from the pulp was generally of fairly good quality. Some difficulty might be experienced in sepp. the different species of creepers, but there appears to be no doubt that good results would be obtained by treating them in admixt.

A new method for determining the strength of chemical pulp. P. M. HOFFMAN JACOBSEN. *Papier* **28**, 877-80(1925); *Paper Trade J.* **81**, No. 22, 52-3(1925).—J. shows that the tensile strength of paper can be found from that of the pulp from $r = R \cdot \gamma \cdot a$, in which r is the breaking length of the paper, R is the "zero-breaking-length" of the unbeaten pulp, γ is the increase in R obtained by beating for the given grade of paper (to be detd. exptly. under mill conditions), and a is the adhesion (ratio of ordinary to "zero" breaking length, approx. const. for a given grade under given mill conditions)(cf. *C. A.* **19**, 2129).

Determination of the acidity of paper. S. KOHLER AND G. HALL. *Paper Ind.* **7**, 1059-63(1925).—The acidity of engine-sized papers is mainly due to the rosin precipitant (usually $Al_2(SO_4)_3$) ("internal" acidity); that of tub-sized papers to the $Al_2(SO_4)_3$ added to preserve the glue ("external" acidity). The latter is almost harmless as regards the permanence or durability of the paper, while the former may affect durability seriously. To det. total (both "internal" and "external") acidity, grind the sample in a suitable app. (e. g., a Koerner leather grinder), to 5 g. in a 500-cc. Erlenmeyer flask add 250 cc. of boiling water in small portions with vigorous shaking between addns (see that the paper is properly soaked), heat 1 hr. on a steam bath with an air reflux condenser, drain off on a Buchner funnel (with a strong suction), rinse with 10 cc. cold water, transfer the fibers back to the flask and repeat the extn. twice. Cool the exts. to room temp. and titrate separately with 0.01N NaOH, using phenolphthalein as indicator. The "acidity no." is the total no. of cc. of 0.01 N NaOH required to neutralize the first 3 exts., calcd. per 10 g. of oven-dry paper. To det. "external" acidity, use the following modification of Vandeveld's method (*Revue des Bibliothèques et Archives de Belgique* 1906, Pt. 4, p. 77): cut 10 g. into small pieces, ext. by shaking continually for 2 min. with 100 cc. of cold distd. water, draw off on a Buchner funnel without washing, and titrate as before. "Internal" acidity is the difference between total and "external" acidities. Titration with iodeosin indicator (see Richter, *C. A.* **6**, 2524; Quist, *C. A.* **14**, 344) gave much lower results, but the ratio of the results obtained with the 2 indicators was practically const. Iodeosin titrations are much more tedious.

The technic of the use of rosin in paper making. A. THIRIET AND P. DELCROIX. *Chimie et Industrie, Special No.*, 508-12(Sept., 1925); cf. *C. A.* **18**, 3718. Free rosin is the active sizing agent, and the rosin is made into soap so as to obtain the required degree of subdivision. Use of an acid size contg. more or less free rosin is of advantage only insofar as it reduces alkali consumption, and it does not give any better results than neutral or alk. size, provided the stock has the right p_H when it reaches the paper machine. This should be 4.5-5.0. This is readily controlled by means of methyl red and of Na alizarinsulfonate, proper sizing conditions obtaining when the back water from the paper machine gives the same color with both indicators. A continuous and recording control method could be worked out by means of the cond. of the back water, the excess of alum being the main factor affecting the cond.; but details would have to be worked out in each mill according to local conditions. Graphs are given by means of which the amt. of H_2SO_4 required to replace a given proportion of alum can be calcd.

Demonstration of the use of glue in coated paper. ANON. *Paper Mill* **49**, No. 43, 16, 18, 37, 38(1925).—A demonstration of the use of glue in coated paper was given at the Paper Section, Bur. of Standards, and at the Govt. Printing Office, Washington. Results of practical coating and printing tests showed that: (1) with proper selection of the glue and adaptations to local conditions and product requirements, the use of glue in coating paper requires little change in equipment and involves little change in operating technic from procedure with casein; (2) the choice of various types of glue

offers a considerable latitude within which local conditions may be met; and (3) the use of glue-bound coated paper offers no new difficulties to the printer and engraver as regards printing processes other than lithographic color work and possibly offset processes.

A. PAPINEAU-COUTURE

Determination of the specific gravity of paper-making fillers. J. R. *Papeterie* 47, 905-9(1925).—The method uses Regnault's volumenometer and is based on Mariotte's law. It consists essentially in placing a weighed amt. of the material in a flask of known vol. connected to a Hg manometer. By addn. or withdrawal of Hg from the manometer the vol. is changed by a known amt.; and by reading the resultant change in pressure the actual vol. of gas in the app. contg. the filler can be calcd., thus giving the vol. actually occupied by the powder.

A. PAPINEAU-COUTURE

Manufacturing of pulp and paper in 1925. W. G. MACNAUGHTON. *Paper Trade J.* 81, No. 18, 35-41(1925).—Discussion of the present status and tendencies of pulp and paper mfg. along mech. and chem. engineering lines, mainly as regards the use of wood as the chief primary raw material.

A. PAPINEAU-COUTURE

Theory and practice of rosin sizing. RUDOLF LORENZ. *Wochbl. Papierfabr.* 56, 962-7, 1027-30, 1090 3, 1214-6(1925); cf. *C. A.* 19, 2129, 2564. —The concluding articles of a series in which recent developments in rosin sizing are discussed from a colloid-chem. standpoint. Concerning the pptn. of rosin size in the beater, the following conclusions are reached: (1) The Al ion exerts a coagulating effect over all ranges of concns.; (2) with a high concn. of rosin, especially with a large amt. of alkali, a portion of the former is carried down with the insol. $\text{Al}(\text{OH})_3$ formed in the beater; and (3) the colloidal coagulation of a rosin- $\text{Al}(\text{OH})_3$ adsorption compound depends upon the relative concns. of the rosin and $\text{Al}(\text{OH})_3$. There are yet many difficulties in sizing with rosin prepd. in a mech. way, as by means of the colloid mill. J. L. PARSONS

French colonial cellulosic fibers. A. THIRIET. *Chimie et industrie, Special No.*, 498-507(Sept., 1925).—A review of the paper making qualities of the more important French colonial fibers.

A. PAPINEAU-COUTURE

Bald-cypress (*Taxodium distichum*) pulp. I. VIDAL. *Papier* 28, 985-8(1925).—Results are given of a detailed micrographic examn. of the sample included in Surface's "Paper pulps from various forest woods" (*C. A.* 6, 3516). The sample in question was very noticeably undercooked and contained many shives and incompletely sepd. fiber bundles. A sample prepd. in the lab. from a tree grown at Grenoble (France) seemed to be of better quality and appeared noticeably stronger. V. concludes that, though not as good as spruce pulp, bald-cypress pulp is of some value and could doubtless be used instead of spruce in many cases.

A. PAPINEAU-COUTURE

Physico-chemical study of cellulosic fibers. ROGER BOUSSU. *Papyrus* 6, 495-7(1925).—The colloidal properties of cellulose and its chief derivs. (hydracellulose, hydrocellulose and oxycellulose) are briefly reviewed, and the phenomena of beating, sizing and loading are explained in the light of these properties.

A. P.-C.

Khanbaligh and other ancient Asiatic papers. R. BOUVIER AND L. VIDAL. *Mon papeterie française* 56, 467-70(1925).—A description of Khanbaligh paper, an exceptionally high-grade, ancient, Persian paper of Chinese manuf., of 2 samples of Chinese papers of the 15th and 17th centuries, resp., of 2 samples of Persian papers of the 10th and 12th centuries, resp., of a Syrian paper of the 12th century, and of a Turkestan paper of the 10th century, all of which are taken from old dated manuscripts.

A. PAPINEAU-COUTURE

The impregnation of pasteboard. J. SOUDIER. *Caoutchouc & gutta-percha* 22, 12862-3(1925).—A brief description of present developments in impregnating cardboard with viscose and drying oils.

C. C. DAVIS

Electric drive in a modern paper mill. O. C. CORDES AND B. L. KERNS. *Elect. World* 86, 1143-7(1925).

C. G. F.

The manufacture of pulp by the chlorination process. U. POMILJO. *Wochbl. Papierfabr.* 56, 1115-21(1925).—Description of the Pomilio Cl process for the manuf. of chem. pulp from straw, esparto, etc. In spite of the large no. of chem. and mech. operations (12 in all) the process is easily controlled and requires a comparatively small amt. of fuel. The treatment varies with the kind of fibrous raw material and the cellulose produced is of a very high quality. The pulp yield from esparto was 38.6-42.0%; from cereal straw, 38.5-42.0%; and from rice straw, 31.7-38.9%. J. L. PARSONS

The solubility of sulfur dioxide in calcium bisulfite solutions up to 100° and certain practical considerations. JARL ENCKELL. *Pappers och Trävarutidskrift för Finland* No. 4, 93-9(1925); *Papierfabr.* 23, Tech.-Wiss. Teil, 633-6. —The solubilities of SO_2 in water, in $\text{Ca}(\text{HSO}_3)_2$ solns. of different concns., in 6.8% H_2SO_4 soln., and in 7.5% Na_2SO_4 soln. are given over the range 40-90°, at 10° intervals and 1 atm. pressure.

Its soly. is somewhat less in an acid or salt soln. Graphs are shown indicating the relations between the concn. of free SO_2 in sulfite cooking acid and the gas pressure above the soln., and also between gaseous SO_2 , water vapor and air at different temps. and acid concns. at 1 atm. pressure. To diminish losses of SO_2 in waste gases, the latter should be introduced into the cooking liquor through an injector. Filling a pulp digester at the bottom with cooking acid contributes to SO_2 economy. Steaming the chips brings the SO_2 loss to a min.

Filter paper. ANON. *Papierfabr.* 23, Tech.-Wiss. Teil, 639-41(1925).—A general discussion.

Evaporation of waste sulfite liquor. F. KOENIG. *Papierfabr.* 23, Tech.-Wiss. Teil, 544-5(1925).—Waste sulfite liquor, before or after neutralization and after being heated by waste heat from the mill, is evapd. by exposing a large surface to the atm. and sun, as in a salt works.

Blotting paper and cardboard. H. POSTL. *Papierfabr.* 23, Tech.-Wiss. Teil, 578-80(1925).—A general discussion of the raw material for blotting-paper manuf. and its prepn. for the machine. Fine blotting paper is made from cotton cuttings, a good blotting paper is made from cotton rags and aspen wood pulp and a cheap paper has the following compn.: 30% coniferous wood pulp, 40% aspen wood pulp, and 30% clay. Its testing is briefly described.

New methods for the regeneration of alkali from black liquors. E. HAGGLUND. *Papierfabr.* 23, Tech.-Wiss. Teil, 493-9(1925).—Decarbonization of black liquors from alk. wood digestion processes is effected by heating the filtered liquor in an autoclave to 350°. The org. matter is converted to gases (mainly H_2 and CH_4), MeOH, tar, C and AcONa. Increase in alky. of the liquor decreases the pitch and MeOH yields, while the vol. of gases evolved is greater. The following by-products were obtained from a metric ton of kraft pulp from pine wood: 510 kg. tar and C, 130 cu. m. gas, 325 kg. AcONa crystals, and 55 kg. MeOH. From straw, calcd. on a ton of pulp, 375 kg. AcONa and 26 kg. MeOH were obtained, and from birch wood pulp, 500 kg. AcONa and 36 kg. MeOH. The calorific value of the tar, C and gases is sufficient to furnish heat and steam for the alkali regeneration, the cooking and drying of the pulp and other purposes. Black liquor from the sulfate process yields by-products contg. S.

Bag papers. W. ROTH. *Papierfabr.* 23, Tech.-Wiss. Teil, 529-31(1925).—An exptl. investigation of bag papers showed that paper made from soda pulp is preferable for filling with hot material, such as cement, etc., because of its ability to regain moisture and strength. The more viscous a pulp stock becomes, the less permeable is the resulting paper to air and the less suitable for bag paper. Paper having a tearing length over 5000 m. and a stretch over 3% is unsuitable for bag manuf. The air no. is defined as the time required for 1 l. air under a certain pressure to pass through a certain area of paper, and is a test used in evaluating papers made from soda and sulfite pulps for bag manuf.

Cymene. F. KOENIG. *Papierfabr.* 23, Tech.-Wiss. Teil, 501-2(1925).—Of the 8-12 kg. cymene formed in the manuf. of a ton of sulfite pulp, only 0.1 is obtained in the crude condition. SO_2 is removed from the cymene mixt. by shaking with NaHCO_3 soln. and after several hrs. the oil seps. from the water and can be siphoned off. The crude cymene was distd. and the distillate redistd. over Na to 200°. Fractionation was carried out under reduced pressure at 240° and 60 mm. The first fraction, yield 38.6% and distg. at 174-8° and 740 mm., consisted mostly of *p*-cymene. Six fractions were made in all; the residue was a brown resin, amounting to 25.9% of the cymene used. Crude cymene was also neutralized and distd. with steam, yielding 47.2% distillate (sp. gr. 0.867, 20°), and 52.8% residue (sp. gr. 0.99). Fractionation of the distillate gave a 76.6% yield cymene, b. 173-7.5°.

Strength tests on pulps. K. RIETH. *Papierfabr.* 23, Tech.-Wiss. Teil, 525-9(1925).—Strength tests on pulps showed that the max. tearing length was obtained when the stock was parchementized. The expts. are described in detail. The CI figure of the pulp decreases with an increase in strength.

Investigation on the strength of fine paper with special reference to paper of the Swedish government. II. S. KOHLER AND G. HALL. *Svensk Pappers-Tid.* 28, 333-9, 358-63, 421-5, 446-9(1925); cf. C. A. 19, 2745.—Surface-sized paper resists molds and bacteria better than rosin-sized paper. Addn. of $\text{Al}_2(\text{SO}_4)_3$ or NaF to animal size increases this resistance. Two percent NaF is equiv. to 10% $\text{Al}_2(\text{SO}_4)_3$, and obviates an acid condition in the paper. $\text{Al}_2(\text{SO}_4)_3$ in the usual amts. in surface-sized paper does not markedly affect the strength. Corresponding tests with NaF were not tried.

W. SEGERBLOM

The removal of printer's ink from old paper. E. BERL AND W. PFANNMÜLLER. *Z. angew. Chem.* **39**, 887-9(1925).—Removal of printer's ink from old papers was best accomplished by a short preliminary cooking at low temp. with $N/20-N/60$ NaOH, followed by agitation of the stock with tetralin, which dissolves the binding material in the ink and holds the lampblack in suspension. The org. solvent, carrying the removed ink, is sepd. from the stock by flotation from water, the fibers remaining in suspension in the water. W. H. SWANSON

Grease-proof and sulfite paper. ANON. *Svensk Pappers-Tid.* **28**, 386-7(1925).—An investigation made by the Government Testing Institute, Stockholm, to det. the difference in compn. and general character of grease-proof and sulfite paper. One grease-proof and 3 sulfite papers were tested. The different qualities of paper made from sulfite cellulose do not appreciably differ in regard to sizing. The grease-proof differs considerably from the sulfite paper in regard to the microscopic appearance of the fibers, transparency, water absorption, and grease-proofness. The grease-proof paper, being manufd. from a more drastically beaten and hydrated pulp, allows 25-50% more light to pass through it, absorbs less water and is considerably more grease-proof than the sulfite samples. Printed in English. W. SEGERBLÖM

Plant control. E. MATHESON. *Papir-Journalen* **13**, 205-15(1925).—Various aspects of modern plant control in the paper industry are collected. Their relations to each other are discussed on an economic basis. Tables compare the detailed items of raw material, fabrication and administration of paper, sulfite and pulp. Machine production and efficiency records also are given. Some of the tables are in English. W. SEGERBLÖM

Influence of moisture of air on determination of moisture in paper. R. KARLBERG. *Svensk Pappers-Tid* **28**, 306-7, 363-5, 388-91(1925).—Newspaper in single sheets having a lower moisture content than surrounding air rapidly takes up moisture. Absolutely dry paper in 8 min. took up 6% and 16% moisture with a relative air moisture of 40% and 90%, resp. Samples for moisture content must be taken with this in mind. Closely packed paper and paper in rolls do not take on moisture so rapidly. Absorption data are tabulated and absorption curves given. W. SEGERBLÖM

Insulation material from impregnated hard paper. K. J. BRIQUER. *Kunststoffe* **15**, 17-9, 31-5(1925).—Discusses the impregnation of paper with bakelite and the forming of tubes, etc., from it. C. J. WEST

Rendering paper impermeable to water. KARL MICKSCH. *Kunststoffe* **14**, 52-4(1924).—Review of methods. C. J. WEST

Paraffin paper. KARL MICKSCH. *Kunststoffe* **14**, 122-3(1924).—General discussion of its manufacture. C. J. WEST

Paper and cellulose investigations conducted in Laboratory D at the Technical High School in Norway. S. SCHMIDT-NIELSEN. *Papir-Journalen* **13**, 250(1925).—A lecture on the retention of paper fillers by pulp fiber. S. considers retention as a filtering process, modified by various adsorption processes. In unsized paper, the amt. of filler retained increases with the size of the granules within certain limits. On the other hand, the possibility of adsorption is increased with a decrease in the size of the granules. *Ibid* 267. A report on expts. showing that sulfite solns. of relatively low % of CaO and high % of SO₂ had the highest solvent effect on cellulose and in-crustants in wood shavings. The solvent action increased rapidly near 125°, but boiling above this temp. (125-140°) caused a darkening of the fiber mass. E. O. E.

Toxicity of solvents for rubber, resins and cellulose esters (KOHN-ABREST) **30**. The conversion of wood cellulose into sugar and alcohol (FOULON) **16**. Distribution of lignin in wood (RITTER) **11D**. Purification of waste waters from cellulose factories by fish ponds (SELTER, HILGERS) **14**. Modified casein [for sizing paper] (U. S. pat. 1,551,471) **18**. Preheating and spray desiccation of waste sulfite liquor by combustion gases (U. S. pat. 1,558,022) **13**.

Nitrating cellulose. G. JUER. U. S. 1,562,093, Nov. 17. Cellulose and nitrating acids are thoroughly mixed in a mixing pot so as to effect a partial nitration of the cellulose, and the mixed materials are then charged into a rotatable cylinder and tumbled in the latter to complete the nitration.

Nitrocellulose solvent from wood-tar oil. A. E. MAZE. U. S. 1,558,446, Oct. 20. A wood-tar distillate b. up to 130° is agitated with bleaching powder to obtain a product of improved odor and good solvent properties, adapted for use as a solvent for nitrocellulose, etc.

Molded articles from nitrocellulose and furfural. C. ELLIS. U. S. 1,558,442, Oct. 20. Nitrocellulose is dissolved in furfural and the acidulated mixt. is allowed to harden in molds or spread to form molded articles or films.

Water- and grease-proof paper. L. KIRSCHBRAUN. U. S. 1,561,728, Nov. 17. A fibrous web is treated with bituminous material and with a product formed from waste sulfite liquor and formaldehyde.

Stencil sheet. R. LANT. U. S. 1,561,865, Nov. 17. Sheets adapted for stencilization by pressure comprise a base of open porous material such as Japanese paper with a type-impressible coating including nitrocellulose or similar cellulose derivs., castor oil and tallow.

• **Stencil sheet.** J. D. GRANGE. U. S. 1,562,228, Nov. 17. A sheet of Japanese Yoshino paper or similar fibrous material is impregnated with gelatin or other protein, an Al salt such as $\text{Al}_2(\text{SO}_4)_3$ and HOAc or other material which retards the hardening effect of the Al salt, together with a "tempering agent" such as glycerol and sugar, a coloring agent and H_2O .

Evaporating waste sulfite liquor or other liquids. G. BOJNER. U. S. 1,561,636, Nov. 17. Combustion gases are passed through a rotating heater immersed in the liquid to be evapd. and the heater is rotated with sufficient speed substantially to avoid incrustation.

Control of bisulfite pulp cooking. J. E. FLEURY. U. S. 1,562,217, Nov. 17. A sample of liquor is drawn from the digester in operation, treated with NH_4OH or other alk. hydroxide and an alc., filtered, dild. and compared in a colorimeter with standard samples corresponding to certain percentages of strength and bleach of finished pulp.

Rosin from pulp mill black liquor. F. E. GREENWOOD. U. S. 1,560,420, Nov. 3. Resinous components of black liquor are treated with a solvent or emulsifying liquid e. g., gasoline or naphtha, and an acid such as H_2SO_4 is added which will liberate resinous substances so that they may be taken up by the solvent. A second solvent, immiscible with the first solvent e. g., EtOH or MeOH , is used for selective sepn. of the rosin from the soln. in which it is first obtained.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Richard Escales. ANON. *Kunststoffe* 14, 145-6(1924).—Obituary. A list of his publications is given.

Sugar-dust explosions. VOJTECH SANDTNER. *Z. Zuckerind. czechoslovak* Ref. 50, 33-8, 41-5(1925).—Mainly a review of the work of Beyersdorfer. Cf. C. A. 15, 1996; 16, 1021; 17, 1144, 1551, 2192, 2785, 3608.

Mine dust. Its sampling and treatment as carried out at the Cannock Chase colliery. M. J. FOGGO. *Colliery Guardian* 130, 1047(1925).—In wide experience with the sampling of mine dust, 1.2% needed treatment with non-combustible dust, viz. with gypsum. This ratio is based on the practice of treating with gypsum all roadways or zones having 40% or more of combustible in the dust. The latter amt. is chosen because it has been found with some dusts that it is possible to explode a 50/50 mixt. The methods of sampling and treating and the keeping of records are described in detail.

C. C. DAVIS

The ignition of gases. A. C. G. EGERTON. *Colliery Guardian* 130, 556(1925). The time for detonation of an explosive mixt. to occur varies with the particular gas present, being longest delayed with N, less so with A and occurring soonest with O.

C. C. DAVIS

The ignition of gases. H. B. DIXON. *Colliery Guardian* 130, 555-6(1925). A crit. discussion of the ignition of gases under various conditions, covering work from that of Bunsen and LeChatelier to the most recent developments.

C. C. DAVIS

The ignition of gases. O. C. DE C. ELLIS. *Colliery Guardian* 130, 556(1925). A discussion of the principles and characteristics of the propagation of flame in a closed vessel with and without an opening. When CO or other combustible gas is exploded in O the flame is followed by a glow beginning near the point of ignition. When the combustible mixt. is satd. with H_2O vapor at 45° the glow is still marked but is of far less intensity and duration, suggesting that burning takes place after the flame passes through the mixt. Certain radiations which are found after passage of the flame affect a photographic plate, and it is possible that they represent a residual combustion of gas which has escaped the flame.

C. C. DAVIS

The ignition of gases. W. T. DAVID. *Colliery Guardian* 130, 556.—Expts. are described in which *spontaneous ignition temps. of inflammable gaseous mixts.* were detd. by means of adiabatic compression produced by the flow of compressed air in a tube contg. the mixt. Under these conditions the spontaneous ignition temp. varies with the pressure, this temp. decreasing with increase of pressure in mixts. of CH_4 and O. Further expts. on the *rate of combustion of inflammable mixts.* in a closed system showed that the introduction of infra-red radiation increases the speed of combustion provided that N is present and that the radiation is of such a nature that it is absorbed by the gases. Thus the rate of combustion of CO and O with N present is increased by 4.4μ rays and that of CH_4 and O with N by 3.2μ rays. Since H has no absorption bands, radiation does not accelerate the combustion of H and air. No such increase in the rate of combustion occurs when the N is replaced by O, A or CO_2 . The expts. suggest a temporary association during explosion of N and the combustible gas which is inhibited by the radiation. The rate of combustion of CO and O with N is much greater when the interior of the container is polished (Ag-plated) than when it is black. C. C. D.

The ignition of gases. E. K. RIDEAL. *Colliery Guardian* 130, 556(1925).—The acceleration of combustion in the presence of N described by David (cf. preceding abstr.) may be due in part to the fact that N is activated by the absorption of radiation and acts as a reservoir of energy. C. C. DAVIS

Explosibility of coal and other dusts in a laboratory steel dust gallery. V. C. ALLISON. *Colliery Guardian* 130, 495-6(1925).—A lab. app. for the study of the explosibility of various combustible dusts is described. Data were obtained which show graphically the *length of flame of explosive mixts. as a function of the concn. of the dust in the air.* The limits of explosibility for mixts. of combustible and inert dust also were studied. With increasing concn. the explosibility of a dust passes through a max. and then decreases, but this is not true of a mixt. of coarse and fine mine dust where the coarse dust is less inflammable and there is only a partial initial combustion. Furthermore 1 dust may be more explosive than another at low concns., and yet the explosibility of the second increases so rapidly at higher concns. that the order of explosibility of the 2 dusts is reversed. A third dust may be more explosive than either at low concns. and less so at higher concns. Thus S dust, though more difficult to ignite at low concns. than starch, sugar, corn, wheat, coal or Al, ranked next to Al at higher concns. The explosibility comprises in general 3 factors: the *initial explosibility*, the *rate of increase of explosibility with increase in concn.* and the *max. explosibility.* There is no necessary relation between the explosibility and the rate of combustion. The explosibility may further be divided into 2 factors, the explosibility of the dust *per se* and the explosibility of that part of the dust rendered volatile by the explosion flame. Combustible volatile is not necessary in a dust to render the latter explosive, though it does increase the explosibility. Any dust not already in its most highly oxidized condition may explode if in sufficiently fine condition. Moisture is about 2.4 times as effective as ash in reducing the explosibility, a ratio which is close to that of their heat capacities. The limiting % of inert dust (*I*) to prevent explosion in a mixt. of inert dust and combustible dust can be expressed by the relation $I = 46 + 79 [\text{volatile}/(\text{volatile} + \text{fixed C})] - 1.7\text{H}_2\text{O} - 0.5 \text{ash} - 1.5\text{CO}_2 + 2\text{CH}_4$, where all components are expressed in %. This is accurate to ± 4 parts of rock dust. If *I* is below 60, subtract 5, if over 60, add 5. For coarse mixed mine dust in not too large amt., 17 parts of rock dust should be subtracted from *I*. The term CO_2 can be replaced by $7.5 \times \text{O deficiency}$ when an inert gas is used as the explosion preventive. C. C. D.

Fire hazards of static electricity. R. M. CLARK. *Ind. Eng. Chem.* 17, 1127-9 (1925).—Fire hazards in cleaning processes of various types, in cotton ginning, agitation of org. liquids, etc., are discussed with examples, and the necessity of properly interconnecting and grounding all parts is emphasized. Oil films in bearings may give sufficient insulation to permit accumulation of static in rotating parts despite thorough grounding of the body of the machine, and hence brushes should be used properly to ground agitators, etc. WM. B. PLUMMER

Heat stability tests of guncotton. MARCEL LEMIRE. *Bull. soc. ind. Rouen* 53, 292-6(1925).—Brief description of the Abel, "110" and Bergmann stability tests. The latter is the most severe. Guncotton washed with distd. H_2O gave satisfactory results with the "110" test, but almost invariably exploded in the Bergmann test, while guncotton boiled with hard water followed by washing with Na_2CO_3 soln. and finally by working in the presence of CaCO_3 gave a satisfactory Bergmann test (cf. Bréguet and Caille, C. A. 18, 3715). A. PAPINEAU-COUTURE

The liquid-oxygen plant of the Real del Monte Co. J. MARTINEZ. *Bol. minerio Mexico* 20, 105-19(1925).—Actual experience showed that 1 kg. of 40% dynamite =

2.1 kg. of liquid O or 0.87 kg. of liquid-O explosive. To obtain a useful kg. of liquid O it was necessary to produce 3.36 kg., the difference being evapn. losses. These are higher than in Germany because local labor is less efficient. Whenever the price of 40% dynamite is above 41.17 centimos per kg. it is economical to use liquid O. Its advantages of safety, absence of CO when properly shot and beneficial effect on mine air are reviewed. Only a large concern can manufacture it economically. E. M. SYMMES

The Fort Worth Imhoff tank accident (THACKWELL, JONES) (CAMP, LEWIS) 14.
Fort Worth Imhoff tank explosion recalls one in S. Carolina (MAFFITT) 14.

• **Blasting cartridge for use with liquid air.** SPRENGLUFT GES. AND L. LJSSE. Brit. 232,885, Feb. 19, 1925. A blasting cartridge adapted to be impregnated with liquid air is charged with a compn. contg. cork or wood 25% admixed with NaCl, sugar, soda, borax, alum, chalk, $(\text{NH}_4)_2\text{SO}_4$ or NH_4Cl .

Dropping and exploding blasting charges in hardpan or other refractory formations to be excavated. F. W. CAMP. U. S. 1,560,038, Nov. 3. Mech. features.

25— DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

• **Aniline black.** BONUS. *Farbe und Lack* No. 44, 517-8(1925).—Review.

Printing of aniline black. W. R. MCKENNON. *Textile Colorist* 47, 578(1925).
F. A. WERTZ
CHAS. E. MULLIN

Casein dye compounds. H. O. RASSER. *Kunststoffe* 15, 91-2(1925).—Formulas are given for various compositions contg. casein. C. J. WEST

Chrome colors on wool. L. J. MATOS. *Dyestuffs* 26, 133-4(1925). C. E. M.

Bleaching and dyeing of towelings. ISMAR GINSBERG. *Textile Colorist* 47, 701 2(1925) — Fast color towelings should be dyed only with vat dyes, about 33% excess of hyposulfite being used. Naphthol AS may be used for red. It is claimed that a previous treatment of the fabric with a 2 or 3% soln. of AcOH prevents the usual bleeding of reds on bleaching. S blacks are also used. Indanthrene blue and alizarin cyanol E or B are recommended for *bluing*. CHAS. E. MULLIN

Mordant reds for silk. H. W. WILSON. *Textile Colorist* 47, 734(1925).—The color obtained from alizarin red and alizarin bordeaux on silk mordanted with Al or Cr are considered as regards fastness. CHAS. E. MULLIN

The composition of some products used for the production of insoluble azo colors. F. M. ROWE AND ESTHER LEVIN. *J. Soc. Dyers Colorists* 41, 354-6(1925).—Naphthol AS-BR (GrE) is probably the dianisidide of β -hydroxynaphthoic acid. Naphtholate AS (GrE) is the Na salt of Naphthol AS to which sol. oil has been added to render the former more sol. Brenthol H Soluble 50% Paste (British Synthetics Ltd.) (S) is an aq paste of a readily sol. combination of Naphthol AS and pyridine. Baths prepd. with this paste may be kept almost indefinitely without oxidation or polymerization. The various bases in the following list were identified by diazotizing and coupling with β -naphthol and Naphthol AS, resp., followed by crystn. and detn. of m. p.: Fast Garnet base CL (JWL), Fast Garnet base L (JWL), Fast Garnet GB base (GrE), and Fast Garnet GC base (GrE) are *o*-aminoazotoluene. Fast Red base GL (JWL) and Fast Red GI base (GrE) are 5-nitro-2-aminotoluene. Fast Scarlet GL base special (JWL) and Fast Scarlet G base (GrE) are 4-nitro-2-aminotoluene. Fast Scarlet base GCL (JWL) and Fast Scarlet GG base (GrE) are the hydrochlorides of 4-nitro-2-aminotoluene. Fast Scarlet base 2GL (JWL) and Fast Scarlet GG base (GrE) are 2,5-dichloroaniline. Fast Yellow base GL (JWL) and Fast Yellow G base (GrE) are *o*-chloroaniline. Fast Yellow base GCL (JWL) and Fast Yellow GC base (GrE) are the hydrochlorides of *o*-chloroaniline. By other methods it was detd. that Fast Orange base (GrE) is *m*-chloroaniline. Fast Red KB base (GrE) is the hydrochloride of 4-chloro-2-aminotoluene. Fast Red Salt B (GrE) is stabilized diazotized 5-nitro-2-aminoanisole. Fast Red Salt GG (GrE) is stabilized diazotized 2,5-dichloroaniline. Fast Red Salt GI (GrE) is stabilized diazotized 3-nitro-4-aminotoluene. Fast Scarlet Salt R (GrE) is stabilized diazotized 4-nitro-2-aminoanisole. Permanent Red 2G (AGFA) and Monolite Red 2G (BCD) are identical and when crystd. from glacial AcOH m. 302°. This m. p. was not depressed by admixture with the azo compd. formed by coupling diazotized *m*-dinitroaniline with β -naphthol. L. W. RIGGS

Red and green shades of indanthrene blue RS and GCD. ADOLPH ZIMMERFELD. *Chemicals* 24, No. 15, 19-20(1925).—Z. gives expts. which support his theory that the redder shade of indanthrene RS and GCD is caused by the oxidation of the oxalic (carboxylic) H, while the greener shade is due to the oxidation of the imino H of the hydrazine group.

CHAS. E. MULLIN

Dyeing with Indanthrene Blue GCD. GUSTAV DURST AND HANS ROTH. *Textilber.* 6, 837-9(1925).—By analyzing some lab. and practical scale vats at intervals, it was found that reducing power of the liquor falls off rapidly during the first 30 min. working, but then reaches a min. The NaOH content falls off rapidly following introduction of the yarn, but very soon reaches a min.

E. R. CLARK

A study of certain derivatives of *p*-cymene, with special reference to possibilities of utilization (in dyestuffs). R. E. SARGENT AND F. W. HIBBARD. *Textile Colorist* 47, 561-5(1925).—The literature upon the chlorination, nitration and sulfonation of *p*-cymene is discussed. S. and H. were not successful in brominating it. They prepd. the benzidine homolog, dimethyldiisopropylbenzidine (I), which closely resembles benzidine, by suspending 1 vol. of nitrocymene in 4 vols of 25% alc., adding 2 vols. of alc. KOH while boiling and then Zn dust. The isomer, dimethyldiisopropylidiphenylene (II), which is very unstable, was formed simultaneously. Cymene was nitrated according to Wheeler and Smithy, reduced with Fe and HCl, diazotized and coupled with various (21) components to form monoazo dyes. I was tetrazotized and coupled as the first component of 11 combinations for direct dyes, while II was treated in the same manner with 6 combinations. Acid dyes also were prepd. In nearly every case the color tones of the dycings were darker than the corresponding dyes from benzidine or *o*-toluidine.

CHAS. E. MULLIN

Restraining dyes in dyeing. C. F. GREEN. *Textile Colorist* 47, 577(1925).—In order to obtain more even dyeings, it is suggested to work cotton yarn in a Na_2CO_3 soln before adding the direct dye or salt. Before dyeing tannin mordanted, or topping direct or S dyes cotton with basic dyes, the goods may be worked in an AcOH bath.

CHAS. E. MULLIN

Roughness of dyed silk hosiery. C. E. BICK. *Am. Dyestuff Rept.* 14, 717(1925).—Roughness in real silk is caused by excessive mech. action. Machines that will dye successfully with the least amt. of friction on the goods should be selected.

L. W. R.

Chats with the textile chemist. J. MERRITT MATTHEWS. *Textile World* 68, 2633-4, 2697(1925).—A discussion of the present status of the *adsorption theory of dyeing*, and *moisture in cotton*.

CHAS. E. MULLIN

Cleaning solution for the dye laboratory. C. F. GREEN. *Textile Colorist* 47, 614(1925).—A hot mixt of H_2SO_4 and HNO_3 is recommended as better than dichromate and H_2SO_4 . Sufficient HNO_3 should be used to keep the soln. nearly colorless.

CHAS. E. MULLIN

Proposed system of tests for the fastness of dyestuffs on wool. H. R. HIRST. *J. Soc. Dyers Colorists* 41, 347-54(1925).—The fastness requirements of the manufacturer and of the wearer are described, also the details of making the tests.

L. W. R.

Detection of oxycellulose in dyed cotton. E. RISTENPART. *Textilber.* 6, 830(1925).—The detn. of Cu numbers of dyed cotton is complicated by the fact that most dyestuff fix a certain amt. of Cu. Therefore a blank test on dyed material free from oxycellulose must be made, the test dyeing being dyed to match. The HNO_3 ext. may be evapd. to dryness, ignited and fused with KHSO_4 prior to detg. Cu colorimetrically or otherwise, to remove org. matter.

E. R. CLARK

Coloring and sizing ribbons. ISMAR GINSBERG. *Textile Colorist* 47, 571-3(1925).

CHAS. E. MULLIN

Some applications of logwood. EMIL LESSER. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 197-205; *Am. Dyestuff Rept.* 14, 755-63.—An address followed by a discussion.

L. W. RIGGS

Domestic rayon production sets new record. D. G. WOOLF. *Textile World* 68, 1748-50(1925). **Bird's-eye view of rayon industry.** *Ibid* 1750-1. **Lines of progress in the development of rayon.** J. M. MATTHEWS. *Ibid* 1752-3. **Mechanical development in rayon manufacture.** W. O. MITSCHERLING. *Ibid* 1754-6. **Further expansion for the Viscose Company.** ANON. *Ibid* 1757-8. **Chardonnet process basis of Tuzize production.** ANON. *Ibid* 1758-63. **Celanese development at Amcelle, Md.** ANON. *Ibid* 1763-5. **Du Pont Rayon Co. Old Hickory plant in operation.** ANON. *Ibid* 1765-6. **Important changes in Industrial Fiber Corp.** ANON. *Ibid* 1766-7. **Belamose Corporation reaches commercial production.** ANON. *Ibid* 1767-8. **Acme Artificial Silk Co. increases output.** ANON. *Ibid* 1768. **Bemberg to use cupro-ammonium process.** ANON. *Ibid* 1768. **Difficulties encountered by the rayon user.**

JAMES CHITTICK. *Ibid* 1776-8. **Dyeing of rayon hosiery.** H. C. ROBERTS. *Ibid* 1785-6. **Dyeing rayon in the skein.** E. F. JAMES. *Ibid* 1788-90. **Scouring and bleaching rayon.** ANON. *Ibid* 1790-1. **Standardized practical tests for rayon.** W. F. EDWARDS. *Ibid* 1791-4. CHAS. E. MULLIN

The fine structure of viscose rayon. H. C. DAHLENVORD. *Textilber.* 6, 739-42, 823-4(1925).—The velocity of coagulation, which is a function of ripeness, affects the crystal structure of rayon, and in turn the character of the dyeings. The more the viscose is ripened before spinning, the less is the extensibility of the threads. Hence it seemed that the more easily stretched types of viscose rayon should dye differently from those showing little stretch. Dyeing tests made parallel to stretch and strength tests, on a variety of com. viscose rayon products, seemed to confirm the conclusion.

E. R. CLARK

Bleaching rayon waste. WALTER KOSCHE. *Textilber.* 6, 827-8(1925).—Spinning wastes may be treated in a circulating kier with 1.5% perborate and 1.0% NaOH or 1½% water glass for 1.5 hrs. at 60° and 0.5 hrs. at 70°, then rinsed well, chemicked with NaOCl soln. contg. 2 to 6 g. active Cl per l., let stand 6 hrs., washed, soured with 4% HCl and rinsed out of monopol soap soln. If the waste contains S compds. a preliminary treatment with H₂SO₄ should be employed. A final treatment with olive oil, gelatin and HOAc adds luster and improves the feel. Textile-mill waste may be handled similarly if not dyed. Little can be done with dyed mill waste. Very dirty material of this type requires soap or tetrapol in the kier.

E. R. CLARK

Changes in the length of rayon and silk threads with variations in atmospheric humidity. ALFRED OPPÉ AND KURT GOTZE. *Textilber.* 6, 850-4(1925).—Single strands of the material being examd. were suspended with a fixed wt. attached in a glass tube provided with a means for circulating air of various degrees of humidity about them, and the amt. of extension was measured. Acetate rayon, contrary to what might be expected, stretched very similarly to viscose rayon at 83% relative humidity, and in fact there was in general a greater variation between the products of different makers, than between those of different chem. manufacturers. Degummed silk stretched less than raw silk.

E. R. CLARK

German patents (relating to rayons) made available. ANON. *Textile World* 68, 2313(1925).—A list of 73 U. S. patents in the hands of the Chemical Foundation, covering the production and use of rayons, cellulose products and esters, and wool substitutes.

CHAS. E. MULLIN

Preparation of water-impenetrable fabrics. SCHWARZ. *Kunststoffe* 15, 49-53, 74-7, 137-41(1925).—Patent review.

C. J. WEST

The fastness of dyed and printed cottons to washing agents. JAS. FERGUSON. *Textile Recorder* 43, No. 510, 61-3(1925).—Washing expts. were made to det. the fastness of 46 colors to soap, Na₂O₂, NaBO₃, Persil, Ca(OCl)₂ and NaOCl. Basic dyes are not as fast to hypochlorites as to the per-salts but their poor fastness is due to their alkali sensitiveness. The direct cotton colors are no more fugitive to Persil than to soap washing, but they are more fugitive to hypochlorites. Direct colors which have been after-treated with metallic salts are fugitive to Persil, possibly as a result of catalytic action, and in this case hypochlorites cause injury to the fiber. S colors are attacked by both peroxides and Persil, and more so by hypochlorites. Most other colors are as fast to Persil as to soap. The action of hypochlorite upon the various dyes, particularly vats, varies considerably. Turkey red, aniline black, naphthol red AS, and colors developed with hypochlorite are very fast to per-salts and Persil washing. Coupled and developed colors in general have a higher fastness to Persil than towards hypochlorite or soap. A fastness table is given.

CHAS. E. MULLIN

Faults in textiles and their causes. JOVANOVIĆ. *Textilber.* 6, 831-7(1925).—Faults in cotton and wool textiles and tests for detg. their nature and causes are presented in a compact tabular form, together with a considerable bibliography.

E. R. CLARK

Printing metallic powder (on fabrics). ALBERT SCHEURER. *Bull. soc. ind. Mulhouse* 91, 469-70(1925).—Scaled Notes 1788 of Nov. 26, 1907; 2127 of Nov. 22, 1911. 2134 and 2135 of Dec. 19, 1911. No. 1788: Cooking 20 kg. of a good grade of white glue with 80 l. of water for 1 hr. at 0.5 kg. pressure gives a gelatinous mass on cooling, which has a definite liquefying point lying between 27° and 35°. The paste-metal powder mixt. must be applied to the fabric at the critical temp. Waterproofness is obtained by the action of CH₃O vapors. No. 2135: As the metal powder has a tendency to settle out when mixed with the paste, this is overcome by cooking 600 kg. of gelatin with 400 l. of H₂O for 8 hrs. at a pressure of 2 kg. Nos. 2127 and 2134: The mixt. can be printed together with algal, helindone and indanthrene dyes on a bottom which can

be removed with hyposulfite. **Report.** PHILIPPE BRANDT. *Ibid* 471-2.—The process is cheap and gives good results. Care must be taken when the printed fabric must be subsequently washed, as the paste is not very resistant to rubbing when the fabric is wet. No anteriority was found. A. PAPINEAU-COUTURE

(Printing) alizarin rose and red (on fabrics). Method of eliminating iron. ALBERT SCHEURER. *Bull. soc. ind. Mulhouse* 91, 473(1925).—Scaled Note 1839 of May 20, 1906. Presence of basic Al chloride prevents alizarin rose and red from turning to violet on steaming, even in the presence of Fe; e. g., $Al_2Cl_3(OH)_4$ dissolved in AcOH, can be added to the mordanting soln. **Report.** PIERRE BINDER. *Ibid* 474.—S's claim was easily verified. No anteriority was found. A. PAPINEAU-COUTURE

Modern equipment (in the textile industry). ANON. *Textile Colorist* 47, 103-6, 171-4, 239-42, 307-10, 375-8, 443-6, 511-4, 579 82, 656 9(1925).—A description of various types of app., its uses and advantages. CHAS. E. MULLIN

Why new fabrics and fibers. H. G. BEEDE. *Textile World* 68, 2479, 2493-7, 2509(1925).—An address in which the prepn., uses and properties of *rhea* are described. CHAS. E. MULLIN

Transient decrease in the strength of cotton fabrics by dehydration at high temperatures. FÉLIX DRIESSEN. *Bull. soc. ind. Mulhouse* 91, 475-8(1925).—The strength of cotton fabrics is shown to be considerably reduced when they are very dry, but is restored when they reabsorb moisture. A. PAPINEAU-COUTURE

Purification of cotton linters. W. W. CHASE. *Textile World* 68, 1479-81(1925).—A discussion of the app., methods, materials, labor, records and costs of scouring linters. CHAS. E. MULLIN

Methods of drying wool. BROMPTON. *Textile World* 68, 2175, 2181(1925).—General. CHAS. E. MULLIN

The bleaching, dyeing and finishing of cotton fabrics containing rayon. R. W. ARRINGTON. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 192-4; *Am. Dyestuff Rept.* 14, 726-8. —Cotton threads will stretch and recover. Rayon threads have practically no resiliency. These facts govern the methods of handling fabrics contg. both cotton and rayon. L. W. RIGGS

Artificial silk industry. ANON. *Papir-Journalen* 13, 159-62(1925).—Various mfg. methods for artificial silk are compared. Tonnage and percentage produced in different countries are given. W. SEGERBLUM

The artificial silk industry. EUGENE GRANDMOUGIN. *Génie civil* 84, 33-6, 57-61(1925). JACK J. HINMAN, JR.

Artificial silk and the textile industry. G. J. ESSELEN. *Am. Dyestuff Rept.* 14, 713-7(1925).—The methods of manuf. and the properties of the 4 leading kinds of artificial silk are described. L. W. RIGGS

Silk and its testing. J. O. THOMPSON. *Textile Colorist* 47, 221-3, 293-5, 370-1, 374, 431-3(1925).—A discussion of the various tests and their applications. C. E. M.

Caustic soda discharges which do not affect printing rolls. WILHELM SIEBER. *Textilber.* 6, 829-30(1925).—Gum arabic or senegal soln. may be treated with successive small portions of the necessary amt. of NaOH in 36-40° BÉ. soln., along with const. stirring and removal of heat. E. R. CLARK

Caustic soda as a mercerizing agent for linen. ISMAR GINSBERG. *Textile Colorist* 47, 629-32(1925).—Mercerizing linen fabric, with or without tension, increases the luster and dyestuff affinity. The strength is decreased about 10% but the elasticity is increased. CHAS. E. MULLIN

Starch. JOSEPH WOODMAN. *Textile Colorist* 46, 717-9, 783-6(1924); 47, 232-4, 640-1(1925).—Starch is considered from the standpoint of its textile uses. C. E. M.

Jute fiber and its applications. W. VAUBEL. *Textilber.* 6, 805-6(1925).—Prior to the war the German jute industry had been increasing along with a decline in the flax and hemp industry. The war revived the latter and they are again growing, but the jute industry is also expanding rapidly. Efforts are being made to produce jute products of higher quality. Abstracts of patents, etc., are cited as suggestions for bleaching, improving fine spinning characteristics, cottonizing, dyeing and pulping wastes. E. R. CLARK

Sodium fluoride in cold-sizing materials. E. O. RASSER. *Kunststoffe* 15, 151-3(1925).—NaF in cold-sizing materials serves 2 purposes: as a preserving agent and as an adhesive. Various formulas are given for starch, dextrin or casein products contg. NaF. C. J. WEST

"Cold size." ANON. *Kunststoffe* 14, 54-6, 118-20(1924).—The name "cold size" is applied to products that are used at room temp. The dry cold sizes consist

of products from starch, dextrin or casein; these same products and waste sulfite liquor are also used in the liquid form. Various formulas and uses are given. C. J. WEST

Textile mill soaps (HAYES) 27. Dyes derived from oxalyldibenzyl ketone (CHAKRAVARTI) 10. The reducing power of waste sulfite liquor and its use in dyeing and bleaching (KOTIBHASHIKER) 23. Standardization of the analysis of sulforcinates (GALTIHERN, SUNDER) 27. Modified casein [for sizing cloth] (U. S. pat. 1,551,471) 18.

Dyes. BADISCHE ANILIN & SODA FABRIK. Brit. 232,799, May 24, 1924. Dyes producing gray to black shades on cotton from the vat are produced by treating nitrated dibenzanthrone with S or a S-yielding material, with or without a "transporter" such as Cu oxide or Sb₂S₃. A temp. of 240–250° may be used in forming the dyes.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Brit. 232,620, April 20, 1924. The process of Brit. 207,162 (C. A. 18, 1206), according to which azo dyes are obtained by coupling an *o*-diazonaphthol with 1-hydroxynaphthalene-8-sulfonamide, is extended to the coupling of any *o*-hydroxydiazo compd. with any hydroxynaphthalenemono (or poly-) sulfonamide. The products dye wool various shades which may be after-chromed or after-coppered. Numerous examples are given. Hydroxynaphthalene-sulfonamides are obtained from the corresponding naphtholsulfonic acids by acylating the -OH group, converting the sulfo group into the sulfochloride and then into the sulfonamide group, and finally eliminating the acylidyl group.

Dyes. FARBENFABRIKEN VORM. F. BAYER & Co. Brit. 232,740, March 11, 1924. An orthoformic ester or a salt of formic acid or β -alkyloxy-acroleinacetal is condensed with a cyclammonium salt contg. a reactive Me group in the α -position to the N. α -Methylindolenium salts, the μ -methylbenzoxazolium salts and the μ -methylbenzthiazolium salts may be used. Red, blue and violet dyes are produced with various starting materials. α , β , β -Trimethylindolenium compds. of the naphthalene series (which may be used to form blue dyes) are prepd. by condensing 1- or 2-naphthylhydrazine with acetone or other ketone, melting with ZnCl₂ and alkylating the indole obtained to introduce 3 alkyl groups.

***o*-Hydroxyazo dyes.** O. KALTWASSER, H. KIRCHHOFF and H. OEHRN. U. S. 1,556,329, Oct. 6. The diazo compd. of 2-amino-4-nitro-1-hydroxybenzene-6-sulfonic acid or other sulfonated *o*-hydroxydiazo compd. is combined with an unsulfonated 1-naphthyl-3-methyl-5-pyrazolone. The after-chromed tints and tints produced by dyeing with chrome mordants by the resulting dyes are orange to bluish red of good fastness to light and staining.

Monoazo dyes. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 232,629, April 19, 1924. Sulfonated *o*-hydroxydiazo compds. are coupled with unsulfonated 1-naphthyl-3-methyl-5-pyrazolones. The products yield fast orange, bluish red, etc., shades when dyed on wool with a chrome mordant or when after-chromed. Several examples are given.

Dyeing "acetyl silk," etc. FARBWERKE VORM. MEISTER, LUCIUS and BRÜNING. Brit. 232,599, April 15, 1924. A violet-black is obtained by treating "acetyl silk" with the glycine of α -naphthylamine, diazotizing, and developing with β -hydroxynaphthoic acid. A yellow color is produced by the glycine of aminoazobenzene, violet with the glycine of 1,4-diaminoanthraquinone, and blue and reddish violet, resp. by the glycines of 1,4,5,8-tetraaminoanthraquinone and of 1-amino-4-hydroxyanthraquinone. Acids, salts or protective colloids may be added to the dye bath.

Benzene derivatives for dyestuffs. H. G. STONE and B. H. JACOBSON. Can. 254,834, Oct. 20, 1925. A mixt. of phthalic anhydride and anhyd. AlCl₃ is ground, benzene is introduced during the grinding which is continued for several hrs., the excess benzene is evapd. and the resulting AlCl₃ compd. of *o*-benzoyl-benzoic acid is obtained in dry finely divided form.

Phenol-sulfur compounds for use as mordants. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 232,958, April 24, 1924. Colorless S-contg. compds. suitable for use as mordants for basic dyes are obtained by heating (suitably at about 170°) with a phenol-sulfonic acid the resinous substances produced by treatment of phenols with S chloride.

Artificial silk from nitrocellulose. E. BINDSCHEDLER. U. S. 1,562,076, Nov. 17. Nitrocellulose hydrate dissolved in a mixt. of alc. and ether is exuded through orifices and the formed product drawn away and coagulated in a bath contg. EtOH or other similar alc. and glycerol. The drawing is effected at a speed greater than that of exudation.

Artificial silk from viscose solutions. W. P. DREAPER. Can. 255,256, Nov. 10,

1925. The viscose soln. is extruded from the spinning jet into an acid salt pptg. bath contg. not less than 4 or more than 10% of a Zn salt and about 20% of Na_2SO_4 .

Fibers from flax and hemp. C. DUBOIS. Brit. 232,935, April 26, 1924. Flax or hemp, freed from shives by retting or scutching, are treated with hot alk. solus. or other solvents to remove gummy and resinous substances, washed and passed through opening and carding machines. The silky fibers thus obtained are treated with oil or varnish, pressed and smoothed.

Apparatus for treating cotton or other fibers with oil, etc. C. C. SELDEN and R. D. PEARSON. Brit. 232,947, April 28, 1924.

Mothproof felt, etc. B. A. STAGNER. U. S. 1,558,122, Oct. 20. A soln. contg. an arsenical compd. such as Na arsenite, soap, and glue or other adhesive is used for coating the fibers of a hair fabric.

Bacillus felsineus cultures. D. CARBONE. U. S. 1,556,489, Oct. 6. *Bacillus felsineus* cultures are prepd. by using recipients contg. hemp cut into pieces, placed in H_2O and sterilized and bringing these into contact with *Saccharomyces ellipsoidus*, cultivated separately, *e. g.*, in a malt decoction. Cultures thus prepd. are adapted for macerating hemp.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Painting technic and colloid chemistry. HUGO KÜHL. *Farben-Ztg.* 31, 154-5 (1925).—Some of the directions of the early artists, especially in fresco and tempera colors, for the prepn. of the surface and the application of the paints, were founded on principles which are now recognized as colloidal phenomena.

F. A. WERTZ

Tar as a paint. F. O. RASSER. *Kunststoffe* 15, 131-4 (1925).—Tar is of general use where resistance to weathering is important and the esthetic side is unimportant.

C. J. WEST

Lead salts and their use in color manufacture. ANON. *Farben-Ztg.* 31, 26-8 (1925).—Review.

F. A. WERTZ

Rust-proof paints—iron lacquers—asphalt lacquers. F. O. RASSER. *Asph. u. Teer Ind. Zeit.* 25, 506-7 (1925).—A review of the requirements of a rust-proof paint with a brief discussion of those in use.

M. B. HART

Determination of asbestine in lithopone paint. F. G. GERMUTH. *Ind. Eng. Chem.* 17, 1150 (1925).—The extd. paint pigment contg. only lithopone and asbestine, is treated with acid NH_4OAc . The insol. residue is fused with Na_2CO_3 and K_2CO_3 , and the resultant BaCO_3 and the unattacked asbestine are sepd. from the leached fusion. The BaCO_3 is dissolved in dil. HCl , the asbestine filtered on a Gooch crucible and weighed after drying at 105° , and the Ba detd. in the filtrate as sulfate. Accurate results are obtained.

F. A. WERTZ

Lead suboxide as a pigment. A. V. BLOM. *Farbe und Lacke* 1925, No. 43, 504-5.—Theoretically, Pb_2O can react with linseed oil in the presence of moisture and air to produce Pb soaps, metallic Pb, and eventually $\text{Pb}(\text{OH})_2$. The behavior of Pb_2O in certain reactions suggests that one of the Pb atoms is more closely attached to the O atom than the other; and the variable reactivity of Pb_2O from different sources, which cannot be explained by variations in degree of dispersion, suggests that the structure may lie between the extremes of Pb_2O as a chem. compd. and PbO plus Pb as a phys. mixt. When a Pb_2O -linseed oil mixt. is examd. in a thin layer under a polarizing microscope, anisotropic formations appear around each pigment particle after 1 day. These birefringent formations of Pb soaps grow until the inter-particle space is eventually bridged over. Similar soap formations can be observed when other basic pigments are mixed with free fatty acids. When Pb_2O in linseed fatty acids with access of air is observed in the polarizing microscope or by dark field illumination, characteristic threads of oleate surround each pigment particle in a short time; this does not occur in absence of O. With limited access of O, it is sometimes possible to observe the mass of oleate threads spangled with minute opaque spots which are perhaps highly dispersed metallic Pb. These spots disappear on further access of air through formation of oxide and subsequent soln. in the fatty acid. The same reactions that occur in the fatty acid, occur more slowly in the glyceride, and they finally produce a paint film of increased elasticity and impermeability. An indication of the existence of Pb suboxides of different structures and reactivities is afforded by expts. on 4 vulcanized rubber compds. of identical compn. except contg. different samples of Pb_2O of similar particle

size. These rubber compds. were graded according to their structure detd. by microchem reactions in the polarizing microscope, and the grading arrived at was the same as that shown by tensile-strength measurements. The best pigment structure gave nearly twice the tensile strength of the poorest. The polarizing microscope can be used advantageously for studying rubber structure, and shows analogies between the dispersoid-chem. structures of rubber compds. and paint films. Illus. F. A. W.

New rust-preventive paint. HANS REBS. *Farbe und Lacke* 1925, No. 11, 124.—R. disputes that Pb_2O used as a pigment with linseed oil, gives up its O to the oil and deposits a film of metallic Pb; and other claims made for this pigment. A reply (W. PFLUGER, *Ibid*) is appended. F. A. WERTZ

Grape-seed oil as a paint oil. ANON. *Farbe und Lacke* 1925, No. 11, 125.—A review of phys. consts. drying characteristics, compn., etc. F. A. WERTZ

Poisonous paints. ANON. *Farbe und Lacke* 1925, No. 11, 129-30.—A review of the German laws governing the use and manuf. of pigments injurious to the health. Observations suggest that the danger from the handling and use of white lead, and other poisonous pigments is not as great as is often assumed. F. A. WERTZ

Luminous pigments. ANON. *Farben-Ztg.* 31, 401-3(1925).—A review of the discovery of phosphorescent mineral substances, of the requirements and causes for their phosphorescence, and of the uses and properties of pigments made with them and with radioactive constituents. F. A. WERTZ

Titanium white. SCHEIBER. *Farbe und Lacke* 1925, No. 44, 515-6, 527.—A review of methods of manuf. and properties. F. A. WERTZ

The use of Prussian blue in painting. ANON. *Farben-Ztg.* 31, 218-20, 276-9 (1925).—A review of the manuf., properties and uses of Prussian blue. F. A. W.

The genesis of the earth color mill. P. W. RICHTER. *Farben-Ztg.* 31, 223(1925).—A brief historical review of grinding operations from primitive times. F. A. W.

Heavy spar. ERICH STOCK. *Farben-Ztg.* 31, 341-2(1925).—A review emphasizing the legitimate uses of barytes as an extending pigment in paints. F. A. WERTZ

The German lead pigment industry from the standpoint of hygiene. ANON. *Farben-Ztg.* 31, 346(1925).—A review of the brochure by K. B. Lehmann, 95 pp. (Julius Springer, Berlin). F. A. WERTZ

Black drawing ink. ANON. *Farben-Ztg.* 31, 37-8(1925).—A review of the manuf. of drawing and India ink in liquid and tablet form. F. A. WERTZ

Manufacture of linoleum. J. A. PALMER. *Kunststoffe* 14, 148-9(1924).—General review. C. J. WEST

Manufacture of linoleum, artificial leather, etc. SCHWARZ. *Kunststoffe* 14, 161-4, 177-81(1924), 15, 34-8(1925).—Patent review. C. J. WEST

The running of varnishes. A. FREY. *Farbe und Lacke* 1925, No. 44, 518.—The "running" of varnishes after application may be due to "slack melting" of the gum, too low an oil content with certain types of gum, an excess of Pb driers, unfavorable humidity conditions, the presence of combustion products in the air, etc. F. A. W.

Linseed-oil varnishes—wood-oil varnishes—cellulose lacquers—a cross section. H. RASQUIN. *Farben-Ztg.* 31, 91-2(1925).—A comparative review of the properties and uses of these different types of varnish coatings. F. A. WERTZ

Fire-protecting varnishes. E. O. RASSER. *Kunststoffe* 15, 171-3, 199-200 (1925).—Various preps. are discussed, with special reference to the use of water glass. C. J. WEST

Sediments in varnishes and lacquers. HANS WOLFF. *Farben-Ztg.* 31, 29-32 (1925).—Investigation of a wood oil-linseed oil-hardened rosin varnish that had become mushy after 6 mo. storage, showed that the sepg. material was a double Pb salt of abietic and stearic acids. The sediment in another dark-colored varnish was found to be a mixt. of Pb acid resinate and Pb stearate with small quantities of other fatty and hydroxy acid salts. A third sediment contained Pb, glycerol and abietic acid in proportion to suggest a Pb monoglyceryl abietate with another mol. of abietic acid as a loosely held addition product. Details of the identification tests and analyses are given (cf. C. A. 19, 3603). F. A. WERTZ

The color determination of varnishes, oils, etc. HANS WOLFF. *Farben-Ztg.* 31, 34(1925).—I solns. as recommended by Fonrobert (C. A. 20, 117) are preferred as color standards, but the designation is more conveniently expressed by the *N* factors of the I solns. than in mg. of I per 100 cc. F. A. WERTZ

The determination of color of varnishes, oils, etc. HERMANN VOLLMANN. *Farben-Ztg.* 31, 338(1925).—I solns. as color standards (cf. preceding abstract) are not absolutely permanent. For this reason they were displaced as color standards in the brewing industry by mixed solns. of $K_2Cr_2O_7$ and $CoSO_4$, which are much more permanent and

whose color is designated as the amt. of 0.1N I soln. which must be added to 100 cc. H₂O to obtain the same color. Such solns. do not undergo color changes in several years and are therefore better working standards, even though I solns. may serve for lab. use where the I may be readily titrated at the time color comparisons are made.

F. A. WERTZ

The standardization of driers. P. MÜLLER. *Farben-Ztg.* 31, 339-41(1925).—A plea for the standardization of com. prepd. driers as supplied to varnish manufs. They should consist of pptd. or fused linoleates and resinsates of Pb, Mn and Co with a defined content of the available metal. Suspended metallic oxides often present in fused resinsates are not in available form to be taken up at the low temp. at which driers are often incorporated into the varnish bases.

F. A. WERTZ

Decalin and hydroterpinol varnishes. E. O. RASSER. *Kunststoffe* 15, 53-4, 77-9 (1925).—The possible substitution of decalin for turpentine is discussed; its use and that of hydroterpinol in varnishes is indicated, formulas being given and the properties of such products reported.

C. J. WEST

The production of kauri copal. FELIX FRITZ. *Farben-Ztg.* 31, 156-8, 220-2 (1925).—Illus.

F. A. WERTZ

Melting copals with exclusion of air with carbon dioxide. E. GASKA. *Farben-Ztg.* 31, 158-9(1925).—A gum-melting kettle provided with CO₂ inlets at the top and at the bottom below the surface of the gum, and the method of operation are described. Better gum melts, lighter-colored varnishes, and more easily cleaned kettles result by the method than if conducted in the usual way with access of air.

F. A. WERTZ

Linseed oil diluent or substitute. E. O. RASSER. *Kunststoffe* 14, 146-8(1924).—Discussion of the product "Linil," which, mixed with linseed oil, permits it to be diluted with H₂O. The use of perilla oil is also discussed.

C. J. WEST

Wood oil (tung oil, Chinese wood oil, etc.). E. O. RASSER. *Kunststoffe* 15, 111-2(1925).—Brief discussion of wood oil and its substitutes

C. J. WEST

Oxidation of Chinese wood oil. F. H. RHODES AND T. T. LING. *Kunststoffe* 15, 157-8(1925); cf. *C. A.* 19, 1783

C. J. WEST

The unsaponifiable constituents of commercial rosins, with notes on rosin oil and on the polymerization of turpentine. EDMUND KNECHT AND N. B. MAURICE. *J. Soc. Dyers Colourists* 41, 356-61(1925).—From the unsaponifiable constituents of the com. rosins examd. were isolated pinene, 3 hydrocarbons of the compn. C₂₂H₃₂ and b 270-278°, 315-320° and 360-370°, resp., and a hydrocarbon C₁₉H₃₀, b. 335-340°, this being identical with colophene. No compds. contg. O were found. Resin as it comes from the tree contains a much larger proportion of turpentine than does com. rosin, and there is no colophene present. Only Varyan rosin contained C₂₀H₃₂, m. 360-370°. The 3 hydrocarbons of the compn. C₂₂H₃₂ were proved to be identical with diterpenes of the same b. p., formed by polymerization of turpentine by heat, or, in the first 2 cases, by treating turpentine with 85% H₂SO₄ at 0°. No colophene was found in gum thus, and the presence of this hydrocarbon in com. rosin suggests that it is formed during the distn. process by the decompn. of the rosin acid. The 3 diterpenes mentioned are unaffected by alk. permanganate but are oxidized completely by acid permanganate. They are not dehydrogenated by the usual methods and they form substitution products with Br. They do not form nitrosochlorides or nitrosites and do not combine with HCl gas.

L. W. RIGGS

Report on naval stores. (Determination of the softening and melting points of rosin.) F. P. VEITCH. *J. Assoc. Official Agr. Chem.* 8, 710-3(1925).—A "capillary-tube method" for softening and m. points and a "drip method" for m. p. of rosin are described in detail. Results of collaborative tests by the capillary tube method for softening point and by the drip method for m. p. were very satisfactory. The max. and min. figures for m. p. by the capillary-tube method were decidedly wide (possibly because of lack of familiarity of the operators with the method). The drip method gives results about 10° higher than the capillary-tube method for m. p., and is more a yielding- or softening-point method than a m.-p. method.

A. PAPINEAU-COUTURE

Two-type lacquer solvents. D. B. KEVES. *Ind. Eng. Chem.* 17, 1120-2(1925).—Mixts. of ethers and alcs., esters and alcs., etc., are better solvents for nitrocellulose than either solvent alone. A single compd. having the properties of both an alc. and an ether or an ester, such as the monoethyl ether of glycol, or Et lactate represents a two-type solvent which in general is a powerful solvent for nitrocellulose and for resins. A list of the simpler compds. that fall within the two-type group is given, with graphic formulas, b. ps., an indication of how they can be made, and any reference to their use in lacquers.

F. A. WERTZ

Evolution of hydrogen peroxide by oils on exposure to light. G. F. A. STUTZ,

H. A. NELSON AND F. C. SCHMUTZ. *Ind. Eng. Chem.* **17**, 1138-41 (1925).—The comparative quantities of H_2O_2 evolved by drying and semi-drying oils and by dry oil films, especially after exposure to light, were detd. by the relative opacity of the images they produce on a photographic plate. On varying the time of exposure to light, the drying oils reach a max. evolution of H_2O_2 in 2 hrs. exposure; the non-drying oils show a steadier increase with no max. The addn. of free fatty acids to linseed oil did not increase the evolution; this is not in accord with previous reports (C. A. **19**, 2172). The effects of humidity, addn. of pigments, metallic soaps, etc. were detd. The region of the spectrum which is most effective in causing evolution of H_2O_2 is restricted to the blue and ultra-violet with a decided max. at 4300 Å. U. to 3000 Å. U. Sensitivity curves, tabulations, spectrograms, etc. are given. F. A. WERTZ

The emulsions of coumarone resin. ANON. *Farbe und Lacke* **1925**, No. 13, 505. A very brief review of the mfg. processes, properties and uses of coumarone resins. Electrostatic or centrifugal forces, addn. of certain colloids, etc., avoid troublesome emulsions sometimes formed in the mfg. process. F. A. WERTZ

Some plant gums of the Southwestern United States. ERNEST ANDERSON, LILA SANDS AND NELSON STURGIS. *Am. J. Pharm.* **97**, 589-92 (1925).—*Cholla gum* from the white cholla cactus, *Opuntia fulgida*, is pale yellowish white to a dark red, has a faint characteristic odor and taste, d. 1.34-1.58. In 50 times its wt. of cold water approx. 40% dissolves after 48 hrs. On the boiling water bath after 10 hrs. 50% dissolves. Slightly more of the gum will dissolve in strong NaOH soln. and in strong ammonia soln. Org. solvents dissolve only traces of the gum. When mixed with 10 times its wt. of water it swells up to a gelatinous mass. As it came from the plants the gum contained moisture 8.65, ash 5, N 0.40, ether ext. 0.15, total reducing sugar after hydrolysis with 4% H_2SO_4 , detd. by Fehling soln. and calcd. as glucose 63, pentosans 67, galactose, calcd. from the mucic acid detn., 14%. The fresh soft gum lost 45% on drying to const. wt. *in vacuo* over H_2SO_4 . The ash contained SiO_2 3.59, unburned C 3.75, CO_2 27.57, SO_4 2.97, Cl 4.67, P_2O_5 0.94, CaO 36.71, MgO 8.7, Fe_2O_3 and Al_2O_3 0.40, Mn_2O_3 0.40%. The water and ammonia solns. of the gum are faintly levorotatory. The aq. soln. is faintly acid to litmus and to methyl red. The gum is partially pptd. from soln. by 95% alc. and by solid $(NH_4)_2SO_4$, but not by $FeCl_3$ or $Pb(OAc)_2$. A few starch grains were detected. In 4% H_2SO_4 on the boiling water bath approx. 11% remains insol.; this insol. material is chiefly cellulose. *l*-Arabinose is one of the products of hydrolysis. Solns. of the gum in water, ammonia or NaOH soln. do not reduce Fehling soln. *Mesquite gum* is found on the mesquite tree, *Prosopis juliflora*, and other species of mesquite. The gum varies from light amber through a pale yellow to a dark brown, d. approx. 1.5. It is completely sol. in cold water. When the clear soln. is heated in the boiling water bath it becomes cloudy. The pH of the aq. soln. is approx. 5. The gum is practically insol. in the ordinary org. solvents. Gum that had been collected and kept in the lab. for many months contained moisture 11, ash 2.13, N 0.70, pentosans 60, galactose 11%. The ash contained unburned C 6.23, SiO_2 4.52, CO_2 29, SO_4 1.42, P_2O_5 0.35, Cl 4.51, CaO 40.88, MgO 6.71, Fe_2O_3 and Al_2O_3 0.93%. A 6.38% aq. soln. of the gum had $[\alpha]_D^{20}$ 59. The aq. soln. of the gum is much less viscous than that of gum arabic. A 10.16% aq. soln. is 3.923 times as viscous as water at 29°. *Mesquite gum* in 10% water soln. gives a faint brownish red coloration with ferric chloride soln. but no ppt. with either ferric chloride soln. or lead acetate soln. The gum is pptd. by 95% alc. *l*-Arabinose in yield of 36.5% was obtained by hydrolysis of the gum. W. G. GAESSLER

Gum-melting kettles. H. KÖLLN. *Farben-Ztg* **31**, 280 (1925). F. A. W.

Toxicity of solvents for rubber, resins and cellulose esters (KOHN-ABREST) 30. Resinates of Pb (UZAC) 10. Polishes and polishing varnishes (ZIMMER) 18. Floor covering (U. S. pats. 1,562,382-7) 20. Purifying waste waters containing H_2SO_4 (U. S. pat. 1,557,188) 18.

SPROXTON, F.: **Cellulose Ester Varnishes.** ERNEST BENN, LTD. 158 pp. \$4.50. 15 s., by post, 15 s. 6 d. Reviewed in *Munic. Eng.* **76**, 116; *J. Franklin Inst.* **200**, 828. *Engineering* **120**, 589; *Chemistry and Industry* **44**, 916 (1925).

Pigments. J. BEDFORD. Brit. 232,653, Dec. 19, 1923. A readily sol. metallic salt, e. g., Pb acetate or $ZnSO_4$, in the solid state, is added to a hot (preferably boiling) aq. soln. of Na_2CO_3 , a sol. chromate or other metallic compd. the acid radical of which

will form an insol. compd. with the metal of the added salt. Insol. pigments contg. Cu, Co, Ba and Ti and basic salts may be similarly prepd.

Pigments containing zinc compounds. P. PIPEREAUT and A. BRONNER. Brit. 232,618, April 18, 1924. Dry $ZnSO_4$ mixed with ZnS or other metal sulfide is calcined to produce a pigment which may contain ZnO alone or associated with ZnS or the oxide or sulfate of the other metal, e. g., Ti, Sb, Ba or Pb.

Water paints. R. EDSER and J. S. MARCHALL. Brit. 232,723, Feb. 8, 1924. An opaque water paint comprises cholesterol or wool fat and a hardening agent such as a mixt of casein and formaldehyde, and preferably also deflocculated kaolin or other pigment.

Calcining crude lithopone. A. S. KREBS. U. S. 1,551,197, Aug. 25. Crude lithopone is fed longitudinally through an externally treated muffle in a substantially non-oxidizing atm. and the calcined product is cooled by passing it through an externally cooled muffle extension in which a non-oxidizing atm. is also maintained.

Cyclohexanol-aldehyde resin. C. ELLIS. U. S. 1,557,521, Oct. 13. A resinous compn. adapted for forming molded articles is prepd. from cyclohexanol and formaldehyde by heating in the presence of caustic alkali.

Keto-alcohol resin. C. ELLIS. U. S. 1,557,571, Oct. 20. Ketobutyl alc is reacted on with caustic alkali at a temp. which will cause "heat-setting" to form a product which may be used for manuf. of molded articles (which may also include various fillers).

Bituminous liquid coating compositions. D. GARDNER. U. S. 1,558,082, Oct. 20. In prepg. compns. adapted for use in paints or enamels from bitumens, asphaltites, etc., a temp. of 125–140° is maintained; local overheating is avoided and the operation is carried out in a nonoxidizing atm., to avoid oxidation.

Polishing woodwork. G. RENGEL and J. PERL. U. S. 1,550,456, Aug. 18. A celluloid-resin soln. is applied to the surface of wood (considerably more rosin than celluloid is used), followed by the application of solns. contg. a larger proportion of celluloid. The finishing coat may be a pure celluloid soln.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Oxidative splitting of unsaturated acids. A. GRÜN AND F. WITTKA. *Chem. Umschau Fette Öle Wachse u. Harze* 32, 257–9(1925).—Instead of oxidizing acids of the olefin series for the purpose of identification directly by $KMnO_4$ or $K_2Cr_2O_7$, G. and W. first convert them into their corresponding acids of the acetylene series by means of Br addition and subsequent treatment with alc. KOH, then oxidize by alk. $KMnO_4$ (the last 2 reactions are quant.), or they oxidize by $K_2Cr_2O_7$. Asahina and Ishida's method in which steam is passed through the reaction mixt. With oleic acid G. and W. obtained by $KMnO_4$ oxidation pure azelaic acid, m. 106.5°, neutralization no. 596.2 (calcd. 596.7) and by $K_2Cr_2O_7$ and steam distn. they obtained almost pure pelargonic acid, neutralization no. 350.8 (calcd. 355.1). The $KMnO_4$ method is preferable, but for the purpose of prepg. pure pelargonic acid the $K_2Cr_2O_7$ method is more convenient.

P. ESCHER

A new catalyzer apparatus. ANON. *Chem. Umschau Fette Öle Wachse u. Harze* 32, 261–2(1925).—A description of a horizontal hydrogenation cylinder for 20 atm. pressure with detachable front head and fitted below with 2 gas burners for temps up to 350°; it has a substantial agitator and 2 exchangeable gas inlet tubes of asbestos-covered metal, porcelain or asbestos fabric to suit requirement, one serving as gas inlet, the other as a filter for the liquid, under treatment; a thermometer, gage, safety valve and gas exit complete the outfit.

P. ESCHER

Reaction capacity of iodine toward fats. VI. Solutions of iodine in glacial acetic acid. B. M. MARGOSCHES, L. FRIEDMANN AND E. NEUFELD. *Chem. Umschau Fette Öle Wachse u. Harze* 32, 221–4(1924); cf. C. A. 18, 2436.—Violet I solns. (in C_6H_6 , CCl_4 , $CHCl_3$, etc.) are capable only of I addition in fats, while brown I solns. (in alc., glacial AcOH, aq. KI) form III and cause addition of IOH. The reaction in alc. solns. takes place according to the equations $I_2 + HOH \rightarrow IOH + III$ and $R'CH:CHR'' + IOH \rightarrow R'CHICH(OH)R''$; solns. in glacial AcOH behave in a similar way. When HI is added to I solns. in glacial AcOH or alc. I absorption diminishes in oleic acid while addition of IOH accelerates I absorption, even to slightly beyond the normal Hübl I value. Addition of 200 cc. H_2O likewise hastens absorption in solns. of glacial AcOH, so that normal I nos. are obtained after 10 min. These latter results were obtained with linseed oil, which shows a greater soly. in glacial AcOH than other oils; but by

using abs. alc. as a fat solvent and then adding 0.2N I soln. in glacial AcOH and 200 cc. H_2O the normal Hübl value was obtained after 20 min. also for sesame oil (108.2) and a super I no. of 134.2-135.6 after 24 hrs. for sesame oil and of 214.8-216.0 for linseed oil. These super-values may be expressed by the equation $R'CHICH(OH)R' + IOH \rightarrow$ oxidation product contg. I + HI. P. ESCHER

Affinity of iodine for ethylene compounds (in different solvents. Simple and rapid method for the determination of acetyl number.) EMILE ANDRÉ. *Chimie et industrie* *Special No., 435-6(Sept., 1925); cf. *C. A.* 15, 2556, 18, 816. —A. claims priority over Margosches and Hinner (*C. A.* 18, 3731) as regards the greatly reduced reactivity of I on fats in CCl_4 or CS_2 solns., as compared with $CHCl_3$ or AcOH solns. Traces of Cu salts catalyze the absorption of I by fats: with soln. of I in AcOH contg. 0.1% CuO non-drying oils give complete absorption in 3 hrs., and non-drying and semi-drying oils give up to 80% of theoretical absorption in 2-3 days, while without catalyst it is impossible to fix more than 50% the theoretical amt. The following method is proposed for the detn. of Ac no. (defined as the no. of mg. of AcOH fixed by 1 g. of oil by esterification of the free alc. groups): in each of 2 flat-bottomed 60-cc. flasks weigh 2 g. of fat, add 25 cc. of xylene (b. 135-8°) to both, and 5 cc. of freshly distd. Ac_2O to one flask, reflux for 1 hr. in the same oil bath, distil off the C_8H_{10} at not over 175°, add 25 cc. C_8H_{10} and distil, repeat the addn. and distn. (the 3rd distillate, on shaking with H_2O should not make it acid), and finally det. the sapon. no. of the contents of both flasks. The difference between the 2 sapon. nos. multiplied by 1.071 is the Ac no. The advantages of the method are: speed and simplicity, concurrent running of blank (oil distd. in presence of C_8H_{10} shows a decrease of up to 5-6 in sapon. no.), elimination of the trouble of prep. a certain quantity of acetylated oil, which had to be washed and dried. A. PAPINEAU-COUTURE

Bromine-acetic acid reagent for determining the iodine-bromine value. L. W. WINKLER. *Pharm. Zentralhalle* 66, 581-3(1925). —A cheap and titer-stable volumetric reagent is prep. as follows: Distil about 1200 cc. of com. AcOH (rejecting the first 20 cc. and the final 100 cc.), det. the d. and adjust to a strength of 96 to 97% by addn. of H_2O . To 1000 cc. of the distd. acid add 3 cc. of Br and distil over practically the entire soln. To det. the titer, weigh into a 50-cc. Erlenmeyer flask 0.1 to 0.15 g. of castor oil, dissolve in 2 cc. CCl_4 , add 0.1 g. $HgCl_2$ and a like amt. of cryst. $AcONa$, then run in from a buret the reagent drop by drop, with const. agitation, until a permanent yellow color persists after a lapse of 2 to 3 min. On the assumption that the I-Br no. of castor oil = 84, 8.4 cc. of the reagent will be required, if exactly 0.1 N, to yield the above result. Should the no. of cc. expended be greater than 8.4, then the Br-AcOH is too weak, and may be properly adjusted by the addn. of the necessary amt. of Br. W. O. F.

The usefulness of the iodine number determined according to Margosches in the examination of oils. ERICH STOCK. *Farben-Ztg.* 31, 403-4(1925). —I nos., detd. by Margosches' method (*C. A.* 18, 2436) and by the Hübl method, on a variety of oils are tabulated; they show very good agreement. The adaptability of the much shorter and simpler Margosches method to waxes and resins is still uncertain. F. A. WERTZ

The preparation and properties of sulfonated fish oil and neats-foot oil. E. STASNY AND C. RIESS. *Collegium* 1925, 498-521. —Methods of analysis of sulfonated oils are discussed. To det. the total SO_4 heat 5 g. of oil and 100 cc. of H_2O with 10 cc. concd. HCl , either under a reflex condenser for 15 min. or on a steam bath for about 2 hrs., and det. SO_4 in the aq. portion of a H_2O - Et_2O sepn. The sulfonated portion of the oil can be sepd. in alc. by shaking the oil with equal vols. of 80% alc. and petr. ether. Fish and neats-foot oils were sulfonated under varying conditions. The fish oil could be more highly sulfonated. The amt. of organically bound SO_4 reached a max. when the amt. of H_2SO_4 used reached 30 to 40%; the I_2 no. did not fall to zero but became const. There was no relation between I_2 no. and ability to take up H_2SO_4 . The petr. ether insol. was much greater than the calcd. amt. of sulfonated product. Chrome leather took up the unsulfonated part of the oil in greater amt. and the amt. taken up decreased as sulfonating increased. Sulfonated oil was extd. by acetone but not by petr. ether. Interfacial tension between oil and H_2O was a max. at p_H 7.7. Ease of formation and stability of emulsions depended on different factors. I. D. C.

The seed oils of *Salvia sclarea* and *Cosmos bipinnatus*. S. BERLINGOZZI AND P. BADOLATO. *Boll. chim. farm.* 63, 721-3(1924). —The phys. and chem. const. are given. Owing to the high content in linolenic acid the better grades can be used as drying oils.

MARY JACOBSEN
Observations on coconut and palm-kernel oil. "Leim" fats. K. L. WEBER. *Seifensieder Ztg.* 52, 792-3, 814-5(1925). —Cold-made soaps are an unrational product.

except for use in salt-water; 6% of coconut or palm-kernel oil suffices for quick lathering ability in a soap and 10–15% is enough to produce the mottled effect in Eschweiger soaps. A high amt. of coconut oil causes absorption of considerable NaCl in settling and thereby a tendency toward "sweating" in the finished product. In shaving soaps 10–15% is permissible.

P. ESCHER

Oxygen-containing washing compounds and their keeping quality. W. SCHAEFER. *Seifensieder Ztg.* 52, 793–4(1925); cf. C. A. 19, 707.—Loss of O_2 in a washing compd. is due to the presence of H_2O in the product. When dry its keeping quality is greatest. Na silicate, when present, represents a colloidal soln and surrounds catalysts like Fe with a protective coating, preventing chem. reactions.

P. ESCHER

The chemical constitution of the compounds of sulfuric acid with the higher unsaturated aliphatic acids. H. POMERANZ. *Chem. Umschau Fette Oele Wachse u. Harze* 32, 259–61(1925).—P. discusses the various positions possible for the HSO_3 radical when H_2SO_4 acts upon unsatd. acids. He favors the grouping $-CH(OH)CH(SO_3H)-$, which assumes that the oxidation, observed in sulfonated oils after splitting off H_2SO_4 , does not occur during splitting but takes place during sulfonation by regrouping of the atoms.

P. ESCHER

Theory and practice of the manufacture of soap bases. BERGELL-LASKARAY. *Seifensieder Ztg.* 52, 822, 839(1925).—An answer to criticisms by Weber and Grosser (C. A. 19, 2753).

P. ESCHER

Standardization of the analysis of sulforcinates. HENRIETTE GALIBERN AND HENRI SUNDER. *Chimie et industrie Special No.*, 370–2(Sept., 1925).—A criticism of the methods adopted as official by the German association of Turkey red oil mfrs. G. and S. consider that results should be expressed as % by wt. of hydrated fatty acids, and suggest the following technic for its detn.: tare a wide-necked Erlenmeyer flask contg. a glass rod and a few pieces of pumice (treated with HCl and dried to const. wt.), weigh in 10 g. of sample, add hot H_2O and 20 cc. 0.1N HCl, boil till the fatty acids sep. as a clear layer, filter through double tared filters (moistened before filtering is begun), wash with hot water till the wash water is neutral, place the filter and contents in the flask, and dry carefully at not over 60° (preferably about 50°). The method is accurate to 0.25%. If insol. solids are present, they can be detd. on a sep. portion of the sample, and correction made.

A. PAPINEAU-COUTURE

Interesterification of glycerides and their technical applications. A. GRÜN. *Chem. Umschau Fette Oele Wachse u. Harze* 32, 225(1925).—Esterifying glycerides by means of alc. in inorg. acids forms ethyl esters and glycerol. Esterifying fats by means of glycerol yields mono- and diglycerides, which are used technically as such or as raw material for producing mixed glycerides contg. acids of drying oils or rosin acids. Mono-glycerides at high temps. form di- and triglycerides and glycerol. The triglyceride of 12-hydroxystearic acid, a constituent of hardened castor oil, yields glycerol and the inner esters (estolides) by direct distns. These esters are satd. glycerides with a high mol. wt. (above 3000), liquid at room temp., salve-like in the cold and viscous at elevated temp., which properties give them technical value. By heating castor oil with alc. HCl the dichlorohydrins are obtained almost quantitatively together with ethyl esters or their estolides. Interesterification of triolein, tricaprylin, tristearin, etc., occurs by heating without catalysts, and with Sn as a catalyst the mixed glycerides stearo-dicaprylin and caprylodistearin could be isolated.

P. ESCHER

The glycerides of hardened whale oil. G. GREITEMANN. *Chem. Umschau Fette Oele Wachse u. Harze* 32, 226(1925).—The original whale oil had an I no. of 145, sapon no. 192 and 0.62% free acids; it contained approx. 5% each of myristic, palmitic and stearic acids. After hardening to I no. 1, it m. 55.5° and by means of Bomer's fractional soln. and Heinz's fractional pptn. the following glycerides were isolated: (1) myristopalmitoarachin, m. 49.5° ; (2) an impure glyceride with C_{32} in its fatty acid radical, m. 53.9° ; (3) palmitostearoarachin, m. 57.3° ; (4) distearoarachin, m. 62.3° ; (5) stearoarachobehenin or palmitodibehenin, m. 65.0° ; (6) very small amts. of diarachobehenin or arachodibehenin. The acid of highest m. p. was behenic acid, 79.0° . All of the above isolated compds. had been formed by hydrogenation; the original oil had therefore contained small amts. of an unsatd. C_{14} acid, some C_{16} , C_{18} , a large amt. of C_{20} and some C_{22} acid. Apparently all were present as mixed glycerides, each contg. an unsatd. acid radical of the C_{20} or C_{22} series.

P. ESCHER

Partial saponification of mixed glycerides. K. H. BAUER. *Chem. Umschau Fette Oele Wachse u. Harze* 32, 230–1(1925).—While P. Miller has found a step-wise sapon. for the triglycerides of benzoic and myristic acid, B. and his co-workers find no step-wise decompn. when partially saponifying the following mixed glycerides: diacetyl-

benzoylglycerol, mono-*p*-nitrobenzoyldibenzoylglycerol, di-*p*-nitrobenzoylmonobenzoylelglycerol and the same glycerides of *m*-nitrobenzoic acid. P. FESCHER

Pressing or extracting. F. W. ALBRECHT. *Seifensieder Ztg* 52, 839-40(1925).—A criticism of Löffl's article (*C. A.* 19, 3606). P. FESCHER

Hardened fats and leathering ability of curd soaps. R. G. SEITENSIEDER *Ztg* 52, 851-2(1925).—Well lathering curd soaps were obtained with 50% and 60% hardened fats by keeping their NaCl content low during the final washings. P. FESCHER

A survey of equipment used in modern soap manufacture. II. C. RICHTER. *Industria saponiera* 25, 175-6(1925); cf. *C. A.* 19, 3168. —An illustrated description of agitators, frames and filter presses. III. *Ibid* 213 5.—An illustrated description of presses, cutters and driers. C. C. DAVIS

Textile mill soaps. F. A. HAYES. *Textile World* 68, 1357-61(1925).—A general discussion on the manuf., analysis and use of textile soaps. CHAS. E. MULLIN

Savonade as an emulsifier. E. O. RASSER. *Kunststoffe* 15, 71-4(1925). Savonade is a compd. of methylhexalin with an alkali soap of oleic acid, which is a viscous liquid, sol. in H₂O, and is capable of forming transparent solns. with many H₂O insol. liquid hydrocarbons. Its use in the prepn of benzene and petroleum soaps, boring oils; drawing oils, spinning oils, etc., disinfecting agents and insecticides is discussed. It is not injurious to the skin or textiles, has a marked cleansing action, is a good solvent for many org. compds., mineral oils, fatty oils, etc., and is reasonably cheap. C. J. WEST

Flow meters in the accounting of process steam (TALER) 1. Apparatus for extracting oils from animal or vegetable materials (Brit. pat. 232,601) 1.

Mixed glycerides of lower and higher fatty acids. G. I. SCHWARTZ. U. S. 1,558,299, Oct. 20. Glycerides of fatty acids, *e. g.*, coconut oil, are heated with concd. HOAc in the presence of an esterification catalyst, *e. g.*, H₂SO₄, until a desired proportion of higher fatty acid radicals in the glycerides has been replaced by acetic radicals. Glycerol is then added and the mixt. is heated until a crude acetin mixt. is formed. Excess HOAc is distd. off and the mixt. is then heated further to a temp. above 150° but below that at which thermal decomn. of the glycerides occurs, N or other inert gas is passed through the mixt. to remove H₂O as formed, until esterification of the higher fatty acid by the acetin is practically complete. The product formed is adapted for softening pyroxylin compns.

Removing free sulfur from grease. H. CHRISTISON and C. L. NUTTING. U. S. 1,561,911, Nov. 17. Grease, *e. g.*, that from raw wool, is heated and agitated with an aq. soln. of a neutral alkali sulfite in sufficient quantity to convert the free S into thiosulfate and the aq. soln. contg. the thiosulfate is sepd.

Extracting oils from blubber. K. HOLTER and S. THUNE. Brit. 232,954, April 22, 1924. See Norw. 40,903 (*C. A.* 19, 1504).

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The campaign of 1924-25 in Moravia. ALEŠ LINSBAUER. *Z. Zuckerind. Cechoslow. Rep.*, 49, 495-502, 502-8(1925); *Listy Cukrovar.* 43, 531 ff (1924-5).—Av. figures from 30 factories are: kg. chips per hl. diffuser, 55.4; diffusing time for 16-cell battery, 101 min.; draft, 111.2%; pressed pulp, 64.4%; total CaO to carbonation, 2.3%; raw sugar produced, 17.02%; molasses produced, 1.24%; coal consumption, 7.02%. All percentages are on beets. Brix (a), polarization (b), purity (c), and alky. (d) were: Pulp, (b) 0.29; battery waste water, (b) 0.10; raw juice, (a) 17.10, (b) 15.48, (c) 90.5; thin juice, (a) 15.61, (b) 14.60, (c) 93.5, (d) 0.010; thick juice, (a) 60.25, (b) 57.20, (c) 94.9, (d) 0.045; 1st fillmass, (a) 93.58; (b) 86.9; (c) 92.8; 1st sugar, (b) 94.85; 1st green sirup, (c) 86.87; 2nd fillmass, (a) 92.96, (b) 71.94, (c) 77.3; 2nd sugar, (b) 93.25; molasses, (a) 82.0, (b) 53.4, (c) 65.1. Sixteen mills used triple satn.; the rest, double. Alky. of 1st carbonation juice was 0.06%. One mill, by only washing press cakes to 17.6% sugar, obtained a thin juice of 19.6° Bx. Only 5 mills had to clean evaporators during the campaign, and these cleaned only once. Av. losses were: known, 0.42%; unknown, 0.45%; total 0.87%. The av. no. of employees were 48 per 100 metric tons beets per day. W. L. BADGER

Proposals for decreasing steam consumption, in beet sugar factories, for heating, evaporating and boiling; with an appendix on the pressure evaporator station. GUSTAV GLASER *Z. Zuckerind. czechoslovak. Rep.* 50, 9-14, 21-4, 29 31(1925).—G. suggests a quintuple under pressure, with steam, to the 1st effect at 135° (3.2 atm. abs. or 30 lbs. gage), boiling points of 130°, 125°, 118°, 110°, followed by a pre-cooker boiling at 90°. Battery heating is to be accomplished by direct injection of vapors from the 2nd effect; raw juice is to be heated to 50° by vapors from the pans, and to 80° by hot evaporator condensate in heat interchangers. Thin juice is to be heated to 95° by vapors from the 4th effect, to 110° by vapors from the 3rd effect, to 125° with vapors from the 1st effect, and to 130° with exhaust steam. Raw sugar pans are to be heated by vapors from the 1st effect; 2nd product pans by vapors from the 4th. Full details of calcons. are given for this case (I) and one similar except for juice consens. at certain points (II). A 3rd calcn. (III) is made for a triple under pressure, heated by steam at 123° (17 lbs. gage), the 1st effect boiling at 118° and heating the 2nd thin juice heater, 2nd effect boiling at 112° and heating the 1st thin juice heater, carbonated juice heater, juice boiler and 1st pan; the 3rd effect boiling at 102° and heating the 3rd thin juice heater, the 2nd carbonation heater, the 1st and 2nd pans. This represents the best practice at present with pressure evapn. The final results for total steam consumed are: quadruple effect under vacuum, 47.8-43.1 kg. steam per 100 kg. beets; same with juice boiler, 47.2-43.4 kg.; case (III) 38.06 kg.; case (I), 26.46 kg.; case (II) 24.48 kg.

W. L. BADGER

Velocity of solution of refined sugar. K. J. SMOLENSKI. *Gazeta Chemiczna* 1924, 19 22; *Centr. Zuckerind.* 33, 1195(1925).—Samples of various kinds of pressed refined sugar were shaken with 50% EtOH. The soln. was removed every 5 min. and polarized, and fresh soln. added. The amt. dissolved per 5 min. increased at first (as pore spaces became larger), then decreased (as total surface decreased). Expts. on single large crystals whose surface was measured confirmed the expression $K = (1/t) \log_e [C/(C-X)]$, where t is time, s is surface of crystal, C = concn. of satd. soln., and X is concn. of soln. surrounding the crystal. Crystals running 1114 per g. dissolved at continuously decreasing rates, as pore space was ample and surface was the detg. factor. Crystals running 29,900 per g. dissolved at an increasing rate as pore space increased, then at a decreasing rate as surface decreased.

W. L. BADGER

Use of ultra-violet light for determining the quality of commercial sugar products. HARALD LUNDÉN. *Centr. Zuckerind.* 33, 1281-2(1925).—The colors present in sugar solns. absorb violet strongly, and are best compared in ultra-violet light. If blue has been used on the sugar, it is almost impossible to compare colors in daylight. If the absorption shown by the coloring matter of sugar be called 1.00 for light of 6450 Ångström Units, for wave length 6050 it is 1.5; for 5200, 3.0; and for 4300, 5.0. Sugar samples, compared in the light of a quartz Hg-vapor lamp screened by Uviol glass, could be evaluated very accurately. Refined sugar with an ash (a) of 0.0007% gave a relative color (b) of 0.1; refined sugar, (a) 0.003, (b) 1.0; loaf sugar, (a) 0.010, (b) 1.5; affined sugar, (a) 0.07, (b) 12.0.

W. L. BADGER

Spectrophotometric investigations of sugar colors in a refinery. HARALD LUNDÉN. *Centr. Zuckerind.* 33, 1311 2(1925).—The laws of Lambert (absorption proportional to thickness of layer of soln.) and of Beer (absorption proportional to concn.) were confirmed for sugar solns. Absorption spectra for different beet products gave the following av. results. (a) = wave length in Å. U., (b) = "extinction coeff." or reciprocal of thickness of layer necessary to cause the same relative absorption. (a) 7000, (b) 0.08; (a) 6000, (b) 0.28; (a) 5500, (b) 0.33; (a) 5000, (b) 0.55; (a) 4500, (b) 0.90; (a) 4300, (b) 1.0. There was no definite max. or min. in the absorption spectrum. Changes in alkyl. did not change the shape of the curve, affecting the absolute values only. Affined Java sugar in a 50° Bx soln. at $p_H = 10$ gave figures checking Zerbán (*Sugar* 27, 266(1925)) showing a min. absorption in the yellow.

W. L. BADGER

First results with (cane) varieties 2878 and 2883 POJ. J. KUYPER. *Arth. Suikerind.* 33, 901-5(1925). These new varieties have in many tests proven superior to the best present varieties and are worthy of further study.

F. W. ZERBAN

The borer pest (in Java). III. J. POLL. *Arch. Suikerind.* 33, 699-702(1925).—Reply to van Harreveld (*C.* 1, 19, 3169). IV. *Ibid* 857-66.

F. W. ZERBAN

Fruit sugar of Rouen, genuine and artificial. G. A. LEROY. *Bull. sci. pharmacol.* 32, 527-44(1925).—The paper is mainly historical. The points emphasized in distinguishing made up and adulterated sugars from the genuine are: the presence of dextrin and CaSO₄ from the com. glucose used in the artificial or adulterated product, and the ratio of glucose to levulose. At present the problem is not solved completely.

L. W. RIGGS

The behavior of raffinose in the crystallizing operations. RICHARD MEHRLE. *Deut. Zuckerind.* **50**, 1325-8, 1357-61(1925).—Careful analyses made during 2 campaigns have shown that the proportions between the different non-sucrose substances vary widely in different products, even between a fillmass and the crystals and runoff obtained from it. In crystals of high purity the non-sucrose consists of about 45-50% each of raffinose and org., and 5-10% ash. The relationships between the compn of a fillmass, and of the crystals and runoff resulting by purging are shown in a graph. From such a graph the quantity of runoff and crystals in a given raw sugar for a given rendement can be found or else the yield of crystals can be calcd. from the crystal content of a fillmass and the crystal content of the sugar. During crystal formation a certain proportion of raffinose and of ash is deposited in the crystal, while the org accumulates more on the outer surface of the crystal. By following the raffinose throughout the raw sugar process, it was found that with falling true purity of the product the ratio between raffinose and sucrose increases gradually, while that between raffinose and non-sucrose decreases, at first rapidly and then more slowly. These relationships are shown in a graph. The ratio between raffinose and sucrose in a sugar is generally about one-third of that in the fillmass from which it is obtained. During the 1st half of the campaign this ratio was 0.46, during the 2nd half 0.22. No such more or less const. ratios could be found for ash and org. On the basis of the regularity in the raffinose ratios the distribution of raffinose between sugar and runoff can be calcd. for a given fillmass. Four examples are cited and discussed in detail. In refinery operation the raffinose content of the raw sugar has a pronounced effect on the sugar yield, as is shown in 3 examples. G. SCHECKER. *Ibid* 1413.—Analyses of unwashed and washed sugar (high- and low-grade raw sugar, low-grade sugar from degumization plant at Dessau) have shown the washed crystals to be free from raffinose. Raffinose crystallizes together with sucrose only from high purity fillmasses. M.'s results are due to faulty methods of analysis. RICHARD MEHRLE. *Ibid* 1445.—The differences between S.'s and M.'s results are probably due to differences in raw material and mfg. conditions. F. W. ZERBAN

The absorption of lime from sugar solutions by boneblack. JAROSLAV DĚDEK AND O. LANGER. *Z. Zuckerind. czechoslovak. Rep.* **50**, 1-8(1925); *Listy Cukrovar.* **43**, 301 ff. (1924-5).—A no. of solns of affined sugar were made alk. with CaO and treated with varying amts. of boneblack. Full data are given. CaO is selectively adsorbed. This adsorption cannot go far enough to make the soln. neutral to methyl red; hence there can be no danger of inversion and liquors to be filtered through boneblack need not be limed. Omitting CaO treatment of the liquors makes regeneration of the black easier. W. L. BADGER

Alkalinity and color (of sugar solutions). BRUNOLF BRUKNER. *Centr. Zuckerind.* **33**, 1066(1925).—Graham has shown that caramel is flocculated by acids and peptized by alkalis. Hence Lundén's "new" color (C. A. **19**, 2278) is probably caramel. The differences in the p_H at which it is pptd. in beet and cane sirups are probably due to the presence or absence of protective colloids. LUNDÉN. *Ibid* 1117.—The curve obtained by varying the p_H of the soln. shows that a true indicator is present, not caramel. W. L. BADGER

Comparison of filterpresses with thin and thick cakes. A. GRILL. *Centr. Zuckerind.* **33**, 963-5(1925).—A press 815 × 815 mm. (approx. 30 × 30 in.) with 35 frames 25 mm. thick will filter the juice from 132,500 kg. beets per 24 hrs. This calls for a rate of filtration of 4.02 l. per min. per sq. m. (5.9 gal. per sq. ft. per hr.) and 16.2 cycles per 24 hrs. Each cycle consists of 49 min. filtering, 30 min. for washing, and 10 min. for opening and closing. Assuming that with a 50 mm. cake the rate of filtration will fall to 3.0 l. (4.4 gal.) it is calcd. that a press with 76 frames 50 mm. thick will correspond to 257,000 kg. beets. For a 1200-ton mill there will be needed 9 small presses or 5 large ones. The large presses will have 26% more filtering surface, but because of their longer cycle will have to be opened half as many times per day, will use only 50% of the labor, and, because of the fewer cycles, will be less hard on cloths. Hence larger presses are to be chosen in preference to small ones. W. L. BADGER

An unusual disturbance in the evaporator station. VIKTOR SPONDR AND ALEXANDER PLATZER. *Z. Zuckerind. czechoslovak. Rep.* **50**, 46-8(1925).—During the campaign the evaporator tubes became completely filled with a dark-brown ppt. which appeared very rapidly. It was finally found to be a mixt. of Ca and Mg soaps and oxalates. The limestone used carried 5% MgCO₃. The MgO combined with the fats used to prevent foam, and formed a bulky ppt. which occluded much sugar and all kinds of suspended material. A sample of the fat used, saponified with MgO and boiled with thick juice, gave no ppt.; but on adding a few crystals of oxalic acid, a ppt. formed

immediately, exactly like the one found in the evaporators. Hence an unusual concn. of oxalates was held to be the immediate cause. W. L. BADGER

Advantages of drum driers as compared to "wender" driers. KARL FÄHMEL. *Centr. Zuckerind.* 33, 1064-6(1925).—A 63-hour test on a Büttner drier 2.6 m. diam. \times 13 m. long showed a production of 290 metric tons dry chips of 16.3% H_2O from wet chips of 86.7% H_2O , with 135 tons coal of 6900 cal. per kg. (12,400 B. t. u. per lb.). A total of 55 elec. h. p. was used. W. L. BADGER

The blueing of crystals in the centrifuge. BERTHOLD BLOCK. *Deut. Zuckerind.* 50, 1301-3(1925).—Both ultramarine and indanthrene are used. Indanthrene is insol. in H_2O , is not decompd. by acids or alkali, is harmless to the human system, and contains neither Sn or As. Either may be added to the pan in boiling sugar, but both are best used by spraying into the centrifugal after washing. A no. of patented devices for spraying blue are described. W. L. BADGER

Some analyses of commercial corn sirups. C. P. LATHROP. *J. Assoc. Official Agr. Chem.* 8, 714 5(1925).—Analysis of 9 samples of com. corn sirups gave the following av. values: Baumé 43.30°, solids by refractometer 82.25%, solids by drying *in vacuo* at 70° 81.05%; sugars as glucose (by Cu), before inversion 35.65%, after inversion 36.38%, after boiling 2½ hrs with dil. HCl 81.40%; total ash 0.321%, alk. no. of ash 11.5, S in ash 3.31%, P_2O_5 in ash 23.4 mg. per 100 g., K_2O in ash 2.04%, Cl in ash 22.05%, acidity 6.1 cc. 0.1 N acid; polarization of N soln., before inversion 20° +171.4°, after inversion 20° +169.4°, after inversion 87° +159.0°; com. glucose (factor 163) 97.50%, com. glucose solids (factor 196.17) 81.05%. The refractometer method gave uniformly slightly higher results than drying *in vacuo* at 70°. A. P.-C.

Polarization results on molasses from the last campaign, clarified with alkaline lead nitrate and with basic lead acetate. R. OFNER. *Z. Zuckerind. czechoslov. Rep.* 50, 38-9(1925); cf. Weiss, *C. A.* 19, 3029, 3612.—Nineteen samples using half-normal wt. gave an av. reading 0.213% higher using basic Pb (OAc)₂, with a max. of 0.5%. Twenty samples using normal wt. gave an av. reading 0.165% higher, with a max. of 0.4%. Samples kept a long time seemed to show less difference. Out of the 39 samples, 7 showed no difference. W. L. BADGER

The gasification of molasses residues and the recovery of potash, sodium cyanide and ammonium sulfate. F. MUHLERT. *Chem. App.* 12, 156-7, 189-91, 211-3(1925); 9 cuts.—Descriptions of plant, directions for operating, and data on yields. J. H. MOORE

Saponification value of starches. L. ROSENTHALER. *Pharm. Zentralhalle* 66, 631(1925).—The following values were obtained by heating 1 g. of the sample for 1 hr. with 20 g. 1%OH and 5 cc. of 0.1 N alc. alkali in connection with a reflux, thereupon titrating the unexpended alkali with 0.1 N acid to a permanently colorless soln.: wheat starch 5.1, rice 4.9, maranta 3.3 potato 4.7, corn 3.2, sago 5.3. It is believed these figures are true sapon. values depending on the sapon. of amylopectin, an ester of H_3PO_4 . W. O. E.

Composition of sugar beet pulp and top and of silage therefrom (SHERWOOD) 12. **Sugar-dust explosions (SANDTNER)** 24.

Sugar from beets. I. DE VECCHIS. U. S. 1,562,151, Nov. 17. Cossets are heated to a temp. sufficient to dry and sterilize them and the dried cossets are lixivated to obtain a highly concd., almost neutral sugar juice. Lime is added to the juice to render it alk. and to ppt. the less complex dissolved albuminoids. Ca superphosphate is added to the juice to neutralize it and it is then filtered.

Glucose. CORN PRODUCTS REFINING CO. and W. B. NEWKIRK. *Brit.* 232,938, April 25, 1924. Details are specified for treating glucose solns. to obtain a cryst. product (cf. *C. A.* 19, 2756).

Drying dextrose. CORN PRODUCTS REFINING CO. and J. J. MERRILL. *Brit.* 232,584, April 18, 1924. Cryst. dextrose or similar pulverulent material is dried while being passed through inclined horizontal rotary cylinders, by hot air or gas.

29—LEATHER AND GLUE

ALLEN ROGERS

Leather work at the Bureau of Standards. R. C. BOWKER. *Leather Mfr.* 36, 231-6(1925).—Descriptions of the Bureau's research equipment, types of problems being investigated and some of the results. J. A. WILSON

The need and use of analyses of the raw and prepared materials of the leather industry. R. LAUFFMANN. *Ledertech. Rundschau* 17, 121-3(1925). I. D. C.

Testing the serviceability of leather. P. PAVLOVICH. *Collegium* 1925, 455-65.—The work of Hart and Bowker (*Bur. Standards, Tech. Paper, No. 147*) and others is reviewed. Bobarikoff and Malischeff used a cement tester in which the leather pieces were moved in a circle in a large body of sand of a definite size. P. devised an app. in which 2 samples on a wheel rotate against a steel rasp. He found that fats increase the wear of leather greatly, that the side is weaker than the back and that the wear per unit thickness is greater than that per unit weight. I. D. C.

Increasing the wear of sole leather. R. C. BOWKER. *Hide & Leather* 70, No. 18, 90-4; No. 20, 51; No. 21, 42-3(1925).—The wear of sole leather can be increased by raising its grease content and by rendering it more flexible. Chrome-tanned soles wear twice as long as vegetable-tanned soles, but have the disadvantage of poorer appearance and lack of firmness and of water resistance. J. A. WILSON

Spueing and dulling in shoe leathers. D. WOODROFFE. *Leather World* 17, 830-4 (1925).—The appearance of spue on the surface of leather after chilling may be due to excessive amounts of solid fatty acids, natural skin greases, chrome soaps, or salts. J. A. WILSON

The hydrolysis of vegetable-tanned leather. HEINRICH ROSE. *Collegium* 1925, 465-79.—A no. of leathers were leached with cold and with boiling H_2O until the ext. gave no test with Fe alum. in each case and then analyzed. Leaching at ordinary temp. removed mostly tannin and nontannin while boiling H_2O dissolved also considerable hide substance. The extd leathers had a nearly const. compn., averaging 78 parts of tannin per 100 parts of hide substance. The course of the hydrolysis at the beginning depends on the manner of tanning. I. D. C.

The use of fish oil in the leather industry. A. BRESSER. *Ledertech. Rundschau* 17, 155-6(1925).—A brief review. I. D. C.

White chrome leather. H. SALT. *Leather World* 17, 770-6(1925).—Details of expts. leading to the production of white leather by means of the 2-bath tanning. J. A. WILSON

Spots on glove leather. P. HUC. *Halle aux cuirs* 1925, 298-9.—Spots on glove leather were traced to emery particles deposited during shaving, which reacted with H_2SO_4 in the skin to form $FeSO_4$. H. B. MERRILL

Artificial leather. KARL MICKSCH. *Kunststoffe* 14, 120-2(1924).—General review. C. J. WEST

Technic of chamois manufacture. RIGOLLET. *Ganterie; Halle aux cuirs* 1925, 300-7.—A description. H. B. MERRILL

Report to the special meeting of the Union of Academic Chemists at Darmstadt, July, 1925. E. STIASNY. *Ledertech. Rundschau* 17, 113-6, 123-6(1925).—An address reviewing the use of $ZnCl_2$ to produce sterile soaks, Cr tanning with complex compds., oil analysis and recent developments in soaking, bating and vegetable tanning. I. D. CLARKE

New tanning materials and tannery sundries. LEOPOLD POLLAK. *Gerber* 51, 157(1925); cf. *C. A.* 20, 123.—Analytical data are given for certain com. brands of $HCOOH$, $CaCl_2$ and "Calcin." The latter is a 20% soln. of $Ca(SiH)_2$. H. B. M.

Sulfite cellulose extract for tanning. WALTER PETRIE. *Leather World* 17, 680-2 (1925).—Suggestions for the use of waste sulfite cellulose as a valuable tanning agent in conjunction with catechol tannins or with gum tragacanth. J. A. WILSON

South American quebracho extract. WILHELM VOGEL. *Ledertech. Rundschau* 17, 116-9(1925); cf. *C. A.* 19, 3034.—Production and prices are discussed. I. D. CLARKE

The reactions of pure, sulfited and cellulose extract-containing quebracho extracts. ANON. *Collegium* 1925, 438-55; cf. *C. A.* 18, 2822.—Mixts. of quebracho and 3 cellulose exts. were analyzed and tested qualitatively. The gelatin-salt test became somewhat less sensitive and the Br_2 test rapidly less sensitive as the amt. of cellulose ext. was increased. The ratio of tannin to nontannin was decreased from 9 or 10 to 3:4 by the addn. of 20% of cellulose ext. The increase in amt. of insolubles with increasing concn. was greater if cellulose ext. was present. I. D. C.

Analysis of used chrome liquors. F. KLINGER. *Collegium* 1925, 525-6.—Oxidation of used Cr liquors with Na_2O_2 gives reliable results if, after the first boiling, more Na_2O_2 is added to decompose CaO_2 . The method is described in detail. I. D. C.

The soak and white weight. J. E. WEISSBERG. *Collegium* 1925, 522-5.—After soaking and draining 2 hrs. raw skins had the same wt. as in the green condition. W. suggests taking the white wt. at the isoelec. point (p_H 5.5) after draining 2 hrs. I. D. C.

Recent progress in the glue and gelatin industries. HERMANN STADLINGER. *Kunststoffe* 14, 97-8(1924). C. J. WEST

Manufacture of linoleum, artificial leather, etc. (SCHWARZ) 26. Modified casein [for sizing leather] (U. S. pat. 1,551,471) 18. Apparatus for extracting gelatin from animal or vegetable materials (Brit. pat. 232,601) 1.

Tanning fish skins. A. EHRENREICH and K. BENDIXEN. Brit. 231,084, Dec. 18, 1923. Preparatory to tanning, fish skins are milled, at a temp. of about 30°, in a bath contg. about $\frac{1}{2}$ —1 part lactic or acetic acid or equiv. acid, about 3 parts NaHSO₄ and H₂O, with or without a mordant such as "oropon." This treatment expedites the subsequent tanning treatment.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Researches on the nature of matured rubber (slabs). G. BRUNI AND T. G. LEVI. *Giorn. chim. ind. applicata* 7, 447-51(1925).—Detn. of the acidity of several types of raw rubber by the method of Whitby (*C. A.* 17, 3808; 19, 907), except for the replacement of Me₂CO by abs. EtOH, gave results which agreed well with those of W. On the other hand matured rubber (coagulated with HOAc, pressed and dried to 20-5% H₂O) without preliminary washing and drying had an acidity approx. 3 times (dry wt.) that of smoked sheets. By washing this matured rubber with cold H₂O or by heating it *in vacuo* at 130° its acidity was reduced from its original extremely high value to that of other types. Washing or distn. *in vacuo* did not, however, influence materially the time to reach a given state of cure when vulcanized with S alone, but after extn. with Me₂CO or abs. EtOH the time of cure was increased nearly 5-fold, the extd. rubber curing at approx. the same rate as smoked sheet. From the distillate at 130° *in vacuo* were obtained NH₃, volatile satd. fatty acids among which HOAc predominated and also homologous acids such as valeric acid. A valeramide (probably *n*-C₄H₉CONH₂) was present in the highest fraction and the acids in the rubber were probably present in the form of amides or NH₄ salts. It was found that both *n*-C₄H₉CONH₂ and *iso*-C₄H₉CONH₂ are accelerators and when 3% of either is added to a rubber-S mixt. the time of vulcanization is reduced to approx. $\frac{1}{3}$ and $\frac{1}{2}$ its values, resp. The Me₂CO ext. of the matured rubber contained a mixt. of higher fatty acids which were obtained sep. from the composite ext. by extg. the undried rubber in thin sheets rolled with Pb foil. Under these conditions a mixt. of Pb stearate and palmitate was obtained, from which the free acids were isolated in almost equal amts. of 0.5-0.7% based on the crude rubber. Though the time of cure of matured rubber was increased about 5-fold by extn. with Me₂CO, by returning this ext. (after drying at 70°) to the rubber its normal rate of cure was practically restored. Furthermore addn. of this ext. to first latex crepe increased its rate of cure 4-fold, rendering it capable of curing in only twice the time of unextd. matured rubber. The Me₂CO ext. was completely sol. in a mixt. of H₂O and Et₂O, the Et₂O absorbing 90% of the total. The Et₂O fraction was composed chiefly of higher fatty acids which had only a very slight accelerating action, judged by their addn. to first latex crepe. The H₂O fraction contained 9.27% N and was a very active accelerator, indicating that the natural accelerators contain N and comprise the aq. portion of the Me₂CO ext., though they cannot be extd. directly from the crude rubber with H₂O. The work involved the detn. of the *m. p.* of *palmitanilide* and of *stearanilide*, which were 88-90.5° and 94°, resp., compared with 90.4° and 93.6° recorded in the literature. C. C. DAVIS

Chemical and physical methods and their importance in rubber research. F. KIRCHHOFF. *Gummi-Ztg.* 40, 93-4(1925).—A review of the role which physics and chemistry have played in the study of the properties of latex and raw rubber. Phys. and colloid-chem. methods now offer more promising means of studying the structure of rubber than the purely chem. methods relied upon to so great an extent in the past. C. C. DAVIS

The physical properties of rubber. Microscopic examination of rubber. L. B. SEBRELL, C. R. PARK AND S. M. MARTIN, JR. *Ind. Eng. Chem.* 17, 1173-6(1925).—A photomicrographic study, in some cases by motion pictures, of the changes taking place in latex when it is coagulated or dried and in the dispersion of the coagulum in org. solvents has confirmed the work of previous investigators relative to the shape of latex

particles and their persistence after coagulation. When latex is coagulated or dried, the globules do not lose their identity and the resulting rubber appears to be composed of a very closely packed mass of discrete globules. This structure will account for various phenomena before and after vulcanization, as examples of which it is suggested that the increase in plasticity of rubber when milled and the lower viscosity of cements made of masticated rubber are due to partial destruction of these intact globules.

C. C. DAVIS

The structure of rubber. I. PAUL BARY. *Rev. gén. caoutchouc* 3, 225-30(1925).—A survey and crit. discussion of the spheroidal and the isocolloidal hypotheses of the structure of rubber and recent work to explain calender grain. Twenty-two references are included.

C. C. DAVIS

Measurement of crude rubber consistency. D. F. CRANOR, *et al.* *Ind. Eng. Chem.* 17, 1202(1925); cf. *C. A.* 19, 2575.—The tentative method proposed by the Crude Rubber Comm. (Rubber Div., Am. Chem. Soc.) as a criterion of the consistency of raw rubber is described. The sample of rubber, with as little preliminary mastication as practicable, is tested in a Williams plastometer (cf. *C. A.* 18, 1763) with the whole system in equilibrium at 100°.

C. C. DAVIS

The plasticity of rubber. A. D. LUTTRINGER. *Caoutchouc & gutta-percha* 21, 12345-7, 12461-3(1924); 22, 12622-3, 12710, 12812-3(1925).—A review of the work of Williams, Krall, Beebe and Stringfield, Marzetti and de Vries.

C. C. DAVIS

Relation between dye adsorption of clays and their behavior in rubber compounds. H. R. THIES. *Ind. Eng. Chem.* 17, 1165-9(1925).—The great differences in the way that clays influence both the rate of vulcanization of a given rubber mixt. and its max. tensile strength cannot be correlated with the chem. compn. of the clays nor with impurities which they may contain. On the other hand where clays of similar chem. compn. behave differently in rubber this unlike behavior is accompanied by an unequal power of adsorbing dyes from soln. In general the more favorable the action of the clay in rubber, the less dye it adsorbs. To foretell the influence of a clay in a vulcanized rubber mixt. 2 g. of clay is agitated with 50 cc. of 0.1% malachite green soln. and the amt. of adsorption detd. in a Dubosc colorimeter by the color of the supernatant liquid. The parallelism between the capacity of a clay for adsorbing dyes and its behavior in rubber is most marked when org. accelerators are present in the rubber, and is in fact very little in unaccelerated rubber mixts., suggesting that possibly the influence is due to adsorption of the accelerator by the clay. Contrary to Arrhenius (cf. *C. A.* 16, 1350) there is among various dyes no relation between the quantity adsorbed by a given clay and the mol. wt. of the dye.

C. C. DAVIS

Synthetic preparation of rubber and the higher alcohols. A. DUBOSC. *Kunststoffe* 15, 33-4, 112-3; *Caoutchouc & gutta-percha* 22, 12585-6(1925).

C. J. WEST

Wearing qualities of tire treads as influenced by reclaimed rubber. W. L. HOLT AND P. L. WORMLEY. *Bur. Standards, Tech. Paper No. 294*, 579-88(1925).—Service tests to det. the comparative resistance to wear of tread compds. contg. reclaimed rubber and those with new rubber alone were made by constructing tires in sections, each of the latter representing a compd. under test. Comparative tests were made in turn between these service tests and lab. abrasion tests by various methods. The results indicate that the resistance to wear is a max. when no reclaimed rubber is present and that the substitution of reclaimed for new rubber reduces the resistance to wear roughly in proportion to the amt. of reclaimed rubber used. Even with 25% reclaimed rubber by wt., however, a tread can be made which will wear 70% as long as one contg. new rubber alone. Six lab. abrasion machines gave results which agreed closely in all but one case with the service tests.

C. C. DAVIS

Formulas of mixtures. RUDOLF DITMAR. *Caoutchouc & gutta-percha* 22, 12861-5(1925).—Formulas of rubber cable and conduit insulating compds. are given.

C. C. DAVIS

Fatty acids in the acetone extract of Hevea rubber. P. DEKKER. *India Rubber J.* 70, 815-8(1925).—The Me_2CO ext. of *Hevea* rubbers was analyzed systematically by extn. of the Me_2CO ext. with H_2O , sapon. of the part of the Me_2CO ext. insol. in H_2O with Barfoed's alc. Na_2CO_3 , sepn. of the resulting H_2O -sol. fatty acids and of the H_2O -insol. solid and liquid fatty acids by Twitchell's method, sapon. with alc. KOH of the part unsaponifiable by Na_2CO_3 and sepn. of the resulting H_2O -sol. fatty acid of the mixt. of solid and liquid fatty acids and of the unsaponifiable residue. The H_2O ext. of the original Me_2CO contained HCO_2H , H_2O -sol. acids of the caproic-caprylic series and what was probably butyric acid, but no sugars. After sapon. with Na_2CO_3 HCO_2H , butyric acid, an acid of the caproic-caprylic series, oleic, linolic, stearic and probably palmitic acids were identified. A free phytosterol was present in the un-

saponifiable part. On sapon. of the latter part with KOH, HCO_2H , an acid of the caproic-caprylic series, oleic, linolic and stearic acids were obtained. The Me_2CO ext. of rubber, therefore, contains free oleic, linolic and stearic acids and probably palmitic acid, besides esters of all these acids. HCO_2H , butyric acid and acids of the caproic-caprylic series are also present, though all these lower acids may be formed during the Me_2CO extn., or subsequent boiling with H_2O , by partial decompn. of the esters of higher fatty acids. Insofar as the work coincides with that of Whithy (cf. *C. A.* 17, 3808; 18, 1589; 19, 907, 1963) the results are in agreement. C. C. DAVIS

Sodium fluosilicate for coagulating latex. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 7, 555-60 (1925); cf. *C. A.* 19, 1638.—It is recommended to coagulate the latex, contg. NaHSO_3 if desired and dild. to 1.5 lb. rubber per gal., by running it into a tank contg. 1 lb. dry Na_2SiF_6 per 150 gals. of latex and stirring for 30-45 min. Manufacturers report that Na_2SiF_6 -rubber behaves normally on the machines and that the rate of cure and tensile strength are also normal in mixts. contg. org. or inorg. accelerators. It cures slowly in rubber-S mixts. F. H. YORSTON

Toxicity of solvents for rubber, resins and cellulose esters. A. KOHN-ABREST *Kunststoffe* 14, 101-2 (1924); *Chem. Age* 32, 199-201 (1924).—See *C. A.* 18, 1921.

C. J. WEST

A deviation from the law of Poiseuille. BRUNO MARZETTI. *Rend. accad. Lincei* 2, [6a], ii, No. 5-6 (Sept., 1925).—It has already been shown (*C. A.* 18, 3738) that rubber does not conform to the law of Poiseuille over a considerable range of pressures. Since this deviation may be due to disturbing influences similar to those in other plastics, the attempt was made to det. the possible transition at high pressures from the law of squares to that of Poiseuille. Up to 50 kg. per cm^2 . and a flow of several m. per min., however, no approach to the latter law was found. As evidence on the transition between the abnormal behavior of rubber and the normal behavior of other plastics, comparative expts. on 2 solns. of rubber in C_6H_6 (1:4 and 1:2.34, resp.) showed that in the first case the flow varied directly with the pressure, whereas with the more concd. soln. the flow varied with the square of the pressure or even more rapidly. Likewise expts. on castor oil and on a mixt. (of the same viscosity) of rubber in heavy mineral oil (1:2.15) showed that the former followed the law of Poiseuille, but that with rubber-oil the flow varied directly with the pressure only at very low pressures and that above this range the flow increased more rapidly so that at length it varied with the square of the pressure. With mixts. more concd. in rubber (1:1.43) the flow finally increased more rapidly than even the square of the pressure. The transition from the law of Poiseuille to that of the square of the pressure is such that the less the mobility the sooner it appears, this transition range of pressures with rubber being so small that it could not be detd. The peculiar behavior of rubber, whether pure or dild. with other substances, is probably not due to the same causes which make other plastics deviate from the law of Poiseuille, for with the latter materials the causes are active only at low pressures, whereas with rubber the opposite occurs. Telescopic flow occurs in all cases, rubber included, and to explain the phenomena it is assumed that rubber has a property unknown among other substances, viz., a variable mobility (cf. *C. A.* 18, 3738), which at first remains const., then increases and remains over a wide range proportional to the square root of the velocity of flow and eventually increases still more rapidly. It remains to be explained why the variations in mobility are not more nearly continuous so that both the law of Poiseuille and that of the square of the pressure are valid only approx. for the particular range of pressure. C. C. DAVIS

New rubber softeners. RUDOLF DITMAR. *Gummi-Ztg.* 40, 94 (1925).—Esters of polyhydric alcs., such as acetin, diacetin, triacetin, α -dibutyrim, tributyrin, α -diolein, triolein and benzoins such as benzoinanilide (cf. Metzeler, German patent 411,539, Class 22i and A 42,958, Class 22i) are very effective softeners. A typical mixt. is rubber 100, trichloroethylene 2400, diacetin or triacetin 0.5. The adhesive powers of the solns. are increased by such small addns. Addn. products of terpenes and S are also good softeners. Superior to both groups of substances, however, are "solvol," "hexalim" and "heptalin," which are powerful softeners and give permanent dispersions. They increase the adhesive power of rubber solns., and may be mixed with the rubber when the latter is plasticized or may be added to the finished soln. C. C. DAVIS

Determination of rubber and inorganic materials in soft rubber goods. R. T. MEASE AND N. P. HANNA. *Kunststoffe* 15, 177-8 (1925), cf. *C. A.* 19, 1209.

C. J. WEST

The concentration of latex with the aid of the ultrafilter of Bechhold-König. RUDOLF DITMAR. *Caoutchouc & gutta-percha* 22, 12857-8 (1925).—The Bechhold-König ultrafilter (cf. *C. A.* 18, 2981) is well suited for filtering and thus concg. latex.

Addn. of protective colloids as in the Hauser process (cf. German patent 412,060) is unnecessary and concns. of rubber in the paste higher than 88% set by Hauser can be obtained.

C. C. DAVIS

Latex drying in recent patent literature. F. KIRCHNER. *Kunststoffe* 15, 69-71 (1925).—Patent review.

C. J. WEST

Table of new methods for the precipitation of rubber latex. S. HALEN. *Kunststoffe* 14, 117-8(1924).—Thirty patents are listed(cf. *C. A.* 19, 1065).

C. J. WEST

The influence of moderate, prolonged heating on the trend of the stress-strain curve of vulcanizates which have been prepared with and without an accelerator. M. LE BLANC AND M. KRÖGER. *Gummi-Ztg.* 40, 25-6(1925).—When vulcanized rubber is heated at 80° its stress-strain curve shifts progressively in the same direction and in the same way that it does when the original vulcanization is prolonged a shorter but corresponding time. This is equally true whether the rubber is cured with S alone or with the aid of org. accelerators, though there is no invariable relation between the time of heating at a lower temp. and the extra time of vulcanization. Thus with a simple rubber-S mixt 24 hrs. at 80° is approx. equiv. to doubling the time of vulcanization at 135°, whereas with the same mixt. contg. an org. accelerator 24 hrs. at 80° gives an effect which resembles a much greater degree of over-vulcanization than does a two-fold time of cure. The latter fact emphasizes the danger in the use of excessive amts. of S in accelerated mixts. which are to undergo elevated temps in use.

C. C. DAVIS

Concavity factor of the stress-strain curve. T. R. DAWSON. *India Rubber J.* 70, 702(1925).—The formula of Wiegand for the concavity factor is incorrect in the form $C = [24 Ey/(TP)] \times 100$ as first published (cf. *C. A.* 19, 2423; *India Rubber J.* 70, 223(1925)), and should be $C = 24 Ey/(TP)$.

C. C. DAVIS

Formic acid as a coagulant for Hevea latex. O. DE VRIES, W. SPOON AND R. RIEBL. *Arch. Rubbercultuur* 9, 763-89(1925); (in English, *Ibid* 790-5).—A large no. of crepe and sheet samples prepd. with H_2CO_2 in the lab. and on estates had a slightly longer av. time of cure in rubber-S and $C_6H_{12}N_4$ mixts. (but not in a PbO mixt.), a lower viscosity and greater plasticity than controls prepd. with (usually) twice as much HOAc. The differences between the 2 types were, however, no greater than those found among HOAc samples. The properties of crude and vulcanized lots of each changed in the same way during storage for a yr. No slow-curing H_2CO_2 samples such as previously reported (*C. A.* 14, 3168), were found.

F. H. YORSTON

Formic acid as a coagulant. H. P. STEVENS. *Bull. Rubber Growers' Assn.* 7, 568-70(1925); cf. *C. A.* 19, 908.—Crepe and sheet samples prepd. with H_2CO_2 cured in most cases, a little more quickly than did HOAc-coagulated controls when tested in rubber-S and PbO mixts. and in a mixt. contg. ZnO and $(NHPh)_2C:NH$. Rubber coagulated with the min. amt. of H_2CO_2 cannot be distinguished from rubber coagulated with HOAc.

F. H. YORSTON

Theory of rubber vulcanization in hot air. B. V. BUTZOV. *J. Ind. Chem. (Russia)* 1, 14-7(Jan.-Feb., 1925).—The theory is held that vulcanization in hot air is due essentially to a chem. reaction which takes place between the acid resins of rubber and PbO . On heating resins, extd. from rubber by means of acetone, with PbO at 130°, chem. compds. were obtained which contained Pb and dissolved easily in cold $CHCl_3$. During the vulcanization of rubber the same Pb salts of resin acids are formed, which then react with rubber in some unknown way and become insol. in $CHCl_3$. PbS and $PbSO_4$ are formed in relatively small quantities and their formation plays a secondary role in vulcanization. The arguments in favor of this theory are as follows. (1) no rubber can be vulcanized in hot air without PbO , HgO or Ag_2O ; (2) rubbers which contain only small amts. of resins, or those which have been deprived of their resins by extn. do not vulcanize in hot air even in the presence of PbO ; (3) if the acid resins of rubbers are extd. and replaced by other suitable acids the rubbers can be vulcanized just as well as rubbers contg. resins, suitable acids being those which melt at the temp. of vulcanization and dissolve in rubber and (4) PbO can be replaced by basic salts of Pb , but not by acid salts, a fact which shows that the presence of the basic hydroxyl of Pb is necessary for the formation of salts with the organic acids present in rubber, though Pb salts of higher acids, such as Pb stearate, palmitate, oleate, have themselves a favorable influence on vulcanization. To confirm this theory, the acid nos. of various rubber resins and the abs. acidity of rubbers were detd., abs. acidity being the product of the % resins and the acid no. of the resins. The results were as follows, the data giving the % resin, the acid no. of the resin and the abs. acidity, resp.: Para 3, 98, 294; crepe 3-2, 45-93, 135-186; Ceara 4, 43, 172; Congo Kassai 4, 12, 48; guayule 20, 12, 240; Upper Congo 33.6, 12, 44; Benguela 6, 10, 60; Kassai 4, 8, 32; Peruvian 3, 6, 18;

Accva lumps 26, 2.9, 75.5. Of these rubbers, Para, crepe, Ceara, guayule and Accva lumps vulcanize in hot air without the addn. of resins or other acids, as they contain a high enough % of acids to effect a vulcanization by combining with PbO. The other rubbers do not vulcanize unless suitable acids are added. The min. abs. acidity necessary is between 75.5 and 60, since Accva lumps vulcanize and Benguella does not. All the expts. were carried out with mixes having the compn.: rubber 100, PbO 30, S 3, and the arguments above hold true only if these proportions are observed. With larger amts. of S even rubbers contg. very small amts. of resins can be vulcanized if PbO is present.

BERNARD NELSON

An attempt to explain the action of vulcanization accelerators. B. BYSOV. *India Rubber J.* 70, 859-60(1925).—Though accelerators always improve the phys. quality of rubber and increase the rate at which the rubber becomes insol in org. solvents, some do not increase the rate of addn. of S to rubber, and there is not necessarily any connection between the activity of an accelerator and its power of transferring S to rubber, as demanded by chem. theories of vulcanization. Vulcanization is the *formation of a colloidal system* where the dispersed phase is S in the form of supercooled droplets in a continuous phase of rubber (cf. *J. Russ. Chem. Soc.* 53, 1(1925)). *Chem. combination* is incidental, as proved by the Peachey cold process, where only the first phenomenon occurs, no S reacting chemically. Furthermore the 2 characteristics of vulcanization, *increased "elasticity"* and *decreased soly.*, can be brought about without S, e. g., with C black (cf. LeBlanc, Kroger and Klotz, *C. A.* 19, 3398). A similar change can be brought about by mixing AmOAc solns. of rubber and of FeCl₃ evapg. to a film, and treating with H₂S or NH₄OH. The ppt. of FeS or Fe(OH)₃ leads to the rubber properties simulating those of ordinary vulcanized rubber. Any substance in which rubber can swell is an accelerator and likewise any substance which is sol in rubber and in which S is sol. has an accelerating action, the latter being most favorable when rubber is more sol. in it than is the S. Furthermore any substance sol. in rubber and capable of forming a ppt. insol in rubber is an accelerator, and in general any *increase* (within certain limits) of the *internal surfaces sepg. the phases* involves acceleration of vulcanization. These criteria include *gaseous accelerators* such as H₂O vapor, NH₃, H₂S, HClHO, etc.

C. C. DAVIS

Oxidation products of aromatic thioureas as accelerators of vulcanization and the formation of "elastic sulfur." E. ROMANI AND C. PELIZZOLA. *Kunststoffe* 15, 156-7 (1925); cf. *C. A.* 19, 1966.

C. J. WEST

Modern compounding ingredients. I. Properties and use of a number of well-known rubber accelerators, softeners and pigments. J. M. BALL. *Rubber Age* 18, 92-4(1925).—A description of the *accelerating properties and uses of tetramethylthiuram disulfide and Pb dimethyldithiocarbamate*, which as com products are known as Tuads (I) and Super-sulfur No. 2(II). Besides the general accelerating properties of I which are already well known, expts. have shown that its accelerating activity is retarded by clay, C black and reclaimed rubber and is inhibited by MgO, Sb compds. and white factice. Unlike I, which requires ZnO as an activator, II is unique among org. accelerators in that it requires PbO for its max. activation. **Modern compounding ingredients. II.** *Ibid* 125-7.—A description of the manuf., properties and uses of "hard hydro carbon," "thermatomic C" and "Dixie clay."

C. C. DAVIS

Lead suboxide as a pigment (BLOM) 26. CCl₄ vs. CS₂ (HAYHURST) 13.

Rubber. A. BIDDLE. Can. 254,660, Oct. 13, 1925. Rubber latex is mixed with an alkali and a carbohydrate. Cascin and filling material may be added.

Rubber composition. A. BIDDLE. Can. 254,659, Oct. 13, 1925. Rubber latex is mixed with Na₂SiO₃, water and a filling material. Cascin may be added.

Rubberized fabrics. RUBBER LATEX RESEARCH CORPORATION. Brit. 232,763, April 7, 1924. A bat of smooth non-felting fibers such as cotton, flax, jute, woody fibers or asbestos is impregnated with rubber latex, coagulation being avoided, with or without H₂O as a diluent or filling or vulcanizing agents and products of different qualities may be then formed depending on the pressure under which vulcanization is effected.

Splicing uncured rubber. E. I. A. G. MEYER. U. S. 1,561,942, Nov. 17. The exposed surfaces of severed portions of tubed stocks or other articles of unvulcanized rubber are coated with an aq. dispersion of rubber (e. g., latex) and then joined together and vulcanized.

Rubber vulcanization. A. CAMBRON. U. S. 1,562,146, Nov. 17. A vulcanization

accelerator is used which is a steam-blown reaction product of an aldehyde and an aromatic amine, *e. g.*, AcH and PhNH_2 .

Vulcanizing rubber. L. B. SEBRELL and C. W. BEDFORD. Can. 250,074, May 26, 1925. A vulcanizing agent and benzothiazyl disulfide are mixed with rubber and heat is applied.

Vulcanization of rubber. L. B. SEBRELL and C. W. BEDFORD. Can. 254,175, Sept. 29, 1925. A Pb salt of mercaptobenzothiazole is used.

Vulcanization of rubber. R. V. HEUSER. Can. 255,036, Oct. 27, 1925. A di-substituted guanidine contg. both phenyl and tolyl radicals is used as an accelerator in vulcanizing rubber.

Impregnating fibrous materials with rubber solutions, etc. L. S. NEWELL. U. S. 1,558,271, Oct. 20. Mech. features

Preparing clay for use as a filler with rubber. J. G. COFFIN and A. W. KEEN. U. S. 1,561,971, Nov. 17. A suspension of clay in H_2O is projected in finely divided form into heated air mixed with combustion gases or other drying medium and dried in suspension to produce minute globular masses composed of lightly cohering particles of clay.

Treating "rubber hydrocarbons." O. H. SMITH. U. S. 1,562,262, Nov. 17. "A normal alk. base salt of a phosphorus acid," *e. g.*, Na_3PO_4 2-3.5%, is added to rubber latex or the like to serve as a preservative and facilitate subsequent vulcanization

CHEMICAL ABSTRACTS

Vol. 20.

FEBRUARY 10, 1926

No. 3

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Inexpensive autoclave for small laboratories. E. E. WOLFE. *J. Am. Water Works Assoc.* **14**, 357-8(1925).—Outlines the modification of a 25-qt. "Denver" pressure cooker to make it available for lab. service. D. K. FRENCH

A simple photometer attachment for ultra-violet absorption measurements. T. T. BAKER AND L. F. DAVIDSON. *J. Sci. Instruments* **3**, 13-5(1925). E. J. C.

A simple gas calorimeter. HARALD NIELSEN. *Gas J.* **171**, 107-9(1925).—The calorimeter body is a glass cylinder $2\frac{1}{4}$ to $2\frac{1}{2}$ in in diam by $11\frac{1}{2}$ to 12 in. long; the lower end is closed by a rubber stopper carrying a Cu tube $1\frac{1}{4} \times 7$ in. closed at one end in an inverted position as a combustion chamber. A wooden lid carries a thermometer graduated to $\frac{1}{20}^{\circ}$ and a stirrer. A small Bunsen burner with a sideall tube inserted inside to carry the gas to the top and a side tube at the bottom to form air passage in the outer compartment, and a spark gap at the top for gas ignition, burns the gas. Air is supplied to the burner by change of water level in two leveling bottles. The burner is connected to an inverted 1000-cc graduate for measuring the gas. The gas is drawn in and forced out of the graduate by means of liquid in two bottles connected to the graduate. The water charge of the calorimeter is 500 cc. Formulas and details are given A. E. GALLOWAY

A thermoregulator. H. J. WING AND T. J. THOMPSON. *Ind. Eng. Chem.* **17**, 1242 (1925).—The new app., like that of Davis and Pratt (*C. A.* **9**, 2470), utilizes Hg and PhMe, but has several advantages. C. C. DAVIS

Electric bath heater (immersion heater) for heating acid baths. ANON. *Apparatenbau* **37**, 314-5(1925).—One cut. J. H. MOORE

A heat flow meter and its use for measuring heat losses in steam lines. ARNOLD KORTING. *Gas u. Wasserfach.* **68**, 715(1925).—The meter consists of a thick strip of rubber into which are vulcanized a large no. of thermocouples. If this strip be wrapped around a pipe, the heat loss from which it is desired to det., the temp. difference between the inside and outside of the strip may be easily detd. and is proportional to the heat loss from the pipe. WM B. PLUMMER

A simple and efficient hydrogen electrode. C. P. SIDERIS. *Science* **62**, 331-2 (1925).—The cell consists of a flat-bottomed glass tube 7.5 cm. long and 2.5 cm. diam., fitted with a 3-holed rubber stopper. The H conducting tube is 15 cm. long and 0.5 cm. diam., the lower end being bent 180° and terminating in a pointed tip the opening of which should be between 0.5 and 0.75 mm. diam. and be placed exactly under the center of the conical spiral electrode described below. The upper end of the H conducting tube is attached to a H generator by means of a rubber tube. The Pt electrode is made by winding 15 to 25 cm. of 22 gage, or larger wire, around a conical object with the windings 1 to 1.5 mm. apart, forming, when in place, the outline of an inverted funnel. One free end of the wire is fused into a glass tube 10 cm. long and 0.5 cm. diam., where the wire comes in contact with Hg. This tube and the H conducting tube fit the rubber stopper tightly. The 3rd hole of the rubber stopper holds the salt bridge or tube contg. either concd. KCl soln. or agar-KCl. This tube fits the rubber stopper loosely to allow the escape of H. With this app. detns. of H-ion concn. may be made with 5 to 10 cc. of liquid. The entering H gas keeps the liquid agitated without the use of a mech. stirrer. This form of app. gives a larger surface area of Pt than other types. L. W. RIGGS

Hot-wire anemometer for measuring air flow through engine radiators. C. G. F. ZOBEL AND L. B. CARROLL. *Chem. News* **131**, 260(1925). E. J. C.

Silica to glass and to metal joints. L. J. BUTTOLPH. *J. Optical Soc. Am.* **11**, 519-57(1925). E. H.

Phosphor-bronze helical springs from the standpoint of precision instruments. W. G. BROMBACHER. *J. Optical Soc. Am.* **11**, 519-47(1925). E. H.

Glass pump plungers lessen replacements. D. S. CHAMBERLIN. *Chem. Met. Eng.* 32, 818-9(1925).—Glass offers certain advantages over porcelain for pump plungers. It is resistant, very smooth, and very hard, costs less, can be blown in an iron-split mold to exact dimensions, and the coeff. of expansion is very close to that of steel and neat cement. Development by pump manuf. is needed. W. H. BOYNTON

- Acetylene generator.** C. J. CLEFTON. U. S. 1,563,016, Nov. 24.
- Tubular compressible filter.** W. P. COTTRELL. U. S. 1,565,988, Dec. 15.
- Light filter.** A. R. ST. CLAIR. U. S. 1,566,703, Dec. 22. A filter for simulating daylight is formed from glass having a tint lying between the following analyses according to Lovibond's tintometer: blue 3.50, red 0.05 and blue 6.0, red 0.50.
- Filter for gasoline or other liquids.** H. BRUSO AND R. KRUM. U. S. 1,563,247, Nov. 24.
- Filter and trap for purifying gasoline or other liquids.** J. S. CRISLER. U. S. 1,563,250, Nov. 24.
- Filter for water or other liquids.** J. F. GRIFFIN. U. S. 1,564,666, Dec. 8.
- Filter for preparing sirups, etc.** F. B. LOMAX. U. S. 1,565,661, Dec. 15.
- Filter for milk or other liquids.** D. C. KERCKHOFF AND R. COPP. U. S. 1,563,904, Dec. 1.
- Inclined steam chest evaporator for milk or other liquids.** H. D. MILES. U. S. 1,562,713, Nov. 24.
- Apparatus for distilling methanol from wood, and for like purposes.** A. F. FRAME. U. S. 1,562,880, Nov. 24. The app. comprises a special arrangement of feed pipes and a rotary cylinder, with rotatable feed screws in the pipes and cylinder.
- Rotary apparatus for dry distillation of ligneous acetate material, etc.** N. STRATHAM. U. S. 1,566,778, Dec. 22.
- Apparatus for steeping grains, extracting sugar from beets and for other purposes.** P. A. SINGER. U. S. 1,564,980, Dec. 8. The app. comprises a treating chamber in which a partial vacuum may be maintained for steeping grain, extg. sugar, washing black ash in the soda industry, extg. oils from seeds and for various other processes.
- Apparatus for aerating or carbonating beverages or other liquids.** P. A. GARRETT. U. S. 1,562,628, Nov. 24.
- Apparatus and air circulation methods for drying and solvent recovery.** G. D. HARRIS. U. S. 1,564,782-3, Dec. 8.
- Feeding solids or semisolids to chemical apparatus.** G. A. BERRY. U. S. 1,563,066, Nov. 24. In app. such as that used for reducing PhNO_2 to PhNH_2 , vapor from a treating receptacle is condensed and refluxed to the receptacle and the refluxing condensate is utilized to carry Fe filings or other solid or semisolid substances into the receptacle.
- Feeding solids and semisolids to chemical apparatus.** G. A. BERRY. U. S. 1,565,249, Dec. 15. An app. is arranged for utilizing the condensate flowing back to a reaction vessel for carrying solid or semisolid reagents into the vessel. (See U. S. 1,563,066; above.) The app. may be used for feeding Fe filings to a reaction vessel in reducing PhNO_2 to form PhNH_2 .
- Closed jacketed kettle for digestion, extraction and filtration.** L. C. DANIELS. U. S. 1,562,870, Nov. 24. The app. is adapted for purifying crude benzanthrone with chlorobenzene as a solvent, etc.
- Apparatus for evaporating liquids by indirect heating.** K. I. E. THUNHOLM. U. S. 1,562,525, Nov. 24. The app. comprises superposed plates with annular channels for the heating medium.
- Apparatus for removing air from water or for removing other gases from liquids.** H. FOTHERGILL. U. S. 1,562,827, Nov. 24. A falling spray of the liquid is passed over heating surfaces.
- Apparatus for liquefaction and rectification of air or other gas mixtures.** C. E. RECORDON AND J. W. HILLE. U. S. 1,562,915, Nov. 24.
- Apparatus for impelling gases by heating.** C. G. SMITH. U. S. 1,546,287-8, Dec. 8.
- Apparatus for pressing paraffin, etc.** A. VITENKO. U. S. 1,560,443, Nov. 3.
- Device for automatic liquid-level control in evaporators or other apparatus.** H. P. MILKER. U. S. 1,563,097, Nov. 24.
- Penetrometer.** F. RODLER. U. S. 1,565,502, Dec. 15.
- Test blocks for determining temperatures in heat-treating furnaces, etc.** O. PEDERSEN. U. S. 1,563,104, Nov. 24.

Regenerative furnace adapted for heating metals or melting glass. N. I. IVANOVSKY. U. S. 1,565,370, Dec. 15.

Monolithic magnesite tubing for furnace tap-holes. H. G. FRIEDRICH. U. S. 1,565,084, Dec. 8.

Heat governor for gas-fired industrial ovens. H. W. PARTLOW. U. S. 1,532,340, April 7, 1925. A thermostatic device is adapted for use on annealing, tempering, enameling or core-baking ovens, etc.

Device for testing the compression strength of foundry sand, loam, or other materials in granular form. L. TREUHEIT. U. S. 1,559,921, Nov. 3.

Viscometer. P. J. THOMAS. U. S. 1,565,119, Dec. 8.

Hydrometer freezing-point tester for automobile radiator solutions, etc. W. F. ALBRECHT and J. SHEBOL. U. S. 1,550,412, Aug. 18.

Thermostatic gas governor. H. W. PARTLOW. U. S. 1,551,212, Aug. 25.

Thermostatic device for controlling flow of liquids through pipes. H. T. WOOLSON. U. S. 1,564,504, Dec. 8.

Thermostat for controlling water heaters, etc. E. A. SCHOLTZ. U. S. 1,566,699, Dec. 22.

Bomb calorimeter. G. E. SCHOLES. U. S. 1,563,662, Dec. 1.

X-ray apparatus. W. MEYER. U. S. 1,562,650, Nov. 24.

X-ray apparatus. H. P. PILON. U. S. 1,567,012, Dec. 22.

X-ray apparatus. C. N. MOORE. U. S. 1,567,024, Dec. 22.

Controlling gas pressure in X-ray tubes or similar devices. R. W. KING. U. S. 1,566,279, Dec. 22. A portion of the gas is ionized at a rate which is proportional to the pressure, and gas is supplied to the device at a rate controlled by the ionization.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

Services of the American Chemical Society to the nation. J. F. NORRIS. *Nucleus* 3, No. 2, 5-7(1925). E. J. C.

The organization of scientific research throughout the [British] Empire. T. H. HOLLAND. *J. Roy. Soc. Arts* 74, 3-27(1925). E. J. C.

Hindu chemistry. C. A. SILBERRAD. *Chemistry & Industry* 44, 1179-80(1925). E. H.

Ernst Erdmann. VORLANDER. *Z. angew. Chem.* 38, 980-1(1925). ANON. *Chem.-Ztg.* 49, 861(1925).—Obituaries. E. J. C.

The work of Celso Ulpiani in chemistry and in agriculture. The *Georgics* of Virgil and the political and agricultural ideals of Ulpiani. F. SCURTI. *Ann. chim. applicata* 15, 331-46(1925).—A detailed review of the work of Ulpiani, his contributions to org. chemistry and to the chemistry of agriculture and fermentation, and his development of the ideas set forth in the agricultural writings (*Georgics*) of Virgil. C. C. D.

Electronation. H. P. CADY AND ROBERT TAFT. *Science* 62, 403-4(1925).—The authors point out the objections to the use of the terms "reduction" and "oxidation" in the broad sense and propose instead, resp., *electronation* (the addn of an electron or electrons to an element) and *de-electronation*. A. M. PATTERSON

The allotropy of manganese. A. J. BRADLEY. *Phil. Mag.* 50, 1018-30(1925).—Three allotropes of Mn have been discovered. Two are normally present in commercial Mn and have been isolated and photographed by the X-ray method. They are called β and γ Mn. The β Mn is stable from 150° to 850° and γ Mn from 650° up. From 650° to 850° both forms are stable, and for each temp. there is a given equil. mixt. The third allotrope of Mn which has so far been obtained electrolytically only is apparently stable only at low temps. It is intermediate between a body-centered and a face-centered cube. By heat treatment α Mn (electrolytic variety) is converted into the β and γ forms but the process does not seem to be reversible. See also WESTGREN and PHRAGMEN (*C. A.* 19, 2910). S. C. L.

The crystal structures of the sulfides of mercury. H. E. BUCKLEY AND W. S. VERNON. *Mineralog. Mag.* 20, 382-92(1925).—The structures of the 2 modifications of HgS, cinnabar and metacinnabarite, were detd. The materials used were finely powdered massive cinnabar, and in the case of the cubic modification, a chem. pptd. sulfide, washed and dried. *Cubic mercuric sulfide*.—The structure is of the zinc-blende type, with 4 mols. of HgS to the unit cube; $a_0 = 5.854$ A. U. The distance between adjacent Hg and S atom centers = 2.54 A. U. *Cinnabar*.—The spacings correspond

with a hexagonal space-lattice with 3 mols. to the unit cell; $a_0 = 4.160$ A. U., $c_0 = 9.540$ A. U. The Hg atoms are arranged on a simple rhombohedral lattice, while S atoms are dispersed in the (0001) planes forming spirals running parallel to the vertical axis. The distance apart of the S atoms in the same spiral = 3.52 A. U.

W. F. HUNT

The crystal structures of sodium and potassium azides and potassium cyanate and the nature of the azide group. S. B. HENDRICKS AND L. PAULING. *J. Am. Chem. Soc.* **47**, 2904-20(1925).—The crystal structures of NaN_3 , KN_3 , and KCNO have been detd. The rhombohedral unit of structure of NaN_3 has $\alpha = 38^\circ 43'$ and $a = 5.481$ A. U., and contains 1 NaN_3 . The Na atom is at 000, the N atoms at $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, with u equal to 0.423. The tetragonal unit of KN_3 has $a = 6.094$ A. U. and $c = 7.056$ A. U., and contains 4 KN_3 . The K atoms are at $00\frac{1}{2}$, $00\frac{1}{2}$, $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, and the N atoms at $0\frac{1}{2}0$, $\frac{1}{2}00$, $\frac{1}{2}0\frac{1}{2}$, $0\frac{1}{2}\frac{1}{2}$; $u(\frac{1}{2} + u)0$, $(\frac{1}{2} - u)u0$, $\bar{u}(\frac{1}{2} - u)0$, $(\frac{1}{2} + u)u0$, $(\frac{1}{2} + u)\frac{1}{2}$, $u(\frac{1}{2} - u)\frac{1}{2}$, $(\frac{1}{2} - u)\bar{u}\frac{1}{2}$, $\bar{u}(\frac{1}{2} + u)\frac{1}{2}$, with u equal to 0.135. The structure of KCNO is shown to be closely similar to that of the azide; the unit of structure has $a = 6.070$ A. U., and $c = 7.030$ A. U. Neither K nor Na azides shows mol. segregation; the azide ion is, however, easily distinguished. This ion is shown to possess not a ring structure, but a linear arrangement of the three N atoms. Possible electronic configurations are discussed in light of these results. A consideration of the previously studied structures of sodium and potassium acid fluorides is shown to indicate that the acid fluoride ion is similar in structure to the azide ion and the cyanate ion.

GEORGE I. CLARK

The crystal structure of carbon dioxide. J. C. McLENNAN AND J. O. WILHELM. *Trans. Roy. Soc. Can., Sec. III* (3) **19**, 51-6(1925); cf. *C. A.* **19**, 1816, 2149.—The crystal structure of CO_2 was investigated by the use of X-rays. A modified Debye and Scherrer camera with a Shearer X-ray tube provided with a Cu anti-cathode was used. The low temp. was produced by using liquid air. A const. very low pressure was provided in the tube in order to obtain strong Cu X-rays. Plates showing the diffraction pattern are reproduced. The crystal form for CO_2 was found to be in the tetragonal system with an axial ratio of one, showing the structure to be cubic. The diffraction pattern did not show all the lines of a simple cube so the authors present a crystal structure exhibiting cubic symmetry of a special kind, the side of the unit cube being 5.76 A. U., the distance between the C and the O atoms 1.25 A. U., and the moment of inertia 8.2×10^{-39} g. sq. cm.

J. W. SHIPLEY

The crystal structure of lead dioxide examined with X-rays. A. FERRARI. *Atti accad. Lincei* [6], **2**, 186-91(1925).—Recently F. (C. A. **19**, 2890) found that MgF_2 has a tetragonal structure of the "rutile" type. Crystallographically PbO_2 resembles rutile and cassiterite and so the Debye photograph of pure PbO_2 was prepd. PbO was found in this way also to have the tetragonal structure of the "rutile" type. The elementary cell contains 2 mols. PbO_2 ; $a = 4.98$ A. U., $c = 3.40$ A. U. The axial ratio $c/a = 0.682$ is somewhat different from that detd. crystallographically. The d detd. from the dimensions of the cell is 9.42, which agrees well with direct detns. All prepns. obtained in various ways showed this same tetragonal form. The supposed hexagonal modification of Geuther and Lüdecke does not exist.

E. J. WITZEMANN

X-ray analysis of mixed crystals of silver halides. R. B. WILSEY. *J. Frank. Inst.* **200**, 739-46(1925).—Precision X-ray powder spectra are taken with the following results: AgCl , simple cubic, $a_0 = 2.770$; $\text{AgCl} + \text{AgBr}$, miscible in all proportions, simple cubic with a_0 following the linear law; AgBr , simple cubic, $a_0 = 2.884$; AgI , diamond cubic and hexagonal; $\text{AgI} + \text{AgBr}$, mixts. up to 70 mol. % AgI simple cubic with increasing a_0 to max. of 3.007 A. U., beyond which diamond cubic or hexagonal lattice predominates; CaWO_4 tetragonal. The enlargement of the AgBr lattice by incorporation of AgI may be connected with the increased speed obtainable in photographic emulsions of AgBr containing small amts. of AgI .

GEORGE I. CLARK

The preparation and crystal structure of ferrous oxide. R. W. G. WYCKOFF AND E. D. CRITTENDEN. *J. Am. Chem. Soc.* **47**, 2876-82(1925).—Pure FeO from Fe_2O_3 melted with Fe gives an X-ray pattern showing a "NaCl" structure, edge of unit cube = 4.29 A. U.; calcd. d. = 5.99.

G. CALINGBART

The structure of high- (or β)-quartz. R. W. G. WYCKOFF. *Science* **62**, 496-7(1925).—The hexagonal unit cell of α -quartz (temps. below 575°) has the dimensions $a_0 = 4.903$, $c_0 = 5.393$ A. U., and contains 3 mols. of SiO_2 . The only simple unit cell for β -quartz which can account for data now obtained from powder and 6 Laue photographs is a similar one with $a_0 = 5.01$, $c_0 = 5.47$ A. U., and contains 3 mols. as calcd. from the $d_{hkl} = 2.518$. The structure is that of the 2 enantiomorphic arrangements.

6D-4 (c) and (j) and 6D-5 (c) and (j) with Si atoms (c) at $\frac{1}{2}\frac{1}{2}\frac{1}{2}$, $0\frac{1}{2}0$, $\frac{1}{2}0\frac{1}{2}$, and O atoms (j) at $u\frac{1}{2}\frac{1}{2}$, $2\bar{u}\frac{1}{2}\frac{1}{2}$, $u\ 2u\frac{1}{2}$, $\bar{u}u\frac{1}{2}$, $2uu\ \frac{1}{2}$, $\bar{u}\ 2\bar{u}\frac{1}{2}$, where $u = 0.20$. GEORGE L. CLARK

The structure of alpha and beta quartz. W. BRAGG AND R. E. GIBBS. *Proc. Roy. Soc. (London)* **109A**, 405-27 (1925).—A partial structure of quartz (parameters of Si) was previously established (C. A. **8**, 1699). From the fact that trigonal α -quartz and hexagonal β -quartz must have a very similar structure, the missing parameters for the statement of the O atoms in the lattice are calcd. The arrangement of the O atoms round the Si atoms so found is very close to tetrahedral. Values of the changes in the position of the atoms when α -quartz is transformed into β -quartz will be given later. G. CALINGAERT

The isomorphism between quadrivalent uranium and zirconium. LORENZO FERNANDES. *Atti accad. Lincei* [6], **2**, 182-6 (1925).—Until recently little work on the isomorphism of the various quadrivalent rare earth elements had been done. By the X-ray methods Goldschmidt and Thomassen (C. A. **17**, 1609) found that CeO_2 , ThO_2 and UO_2 are isomorphous. Cuttica and Tocchi (C. A. **19**, 425) prepd. double nitrates of NH_4 and Ni with Ce^{IV} and Th. The case of Zr has not been examd. yet. Recently F. found by the X-ray method that ZrO_2 exists in only 1 form and that the variations observed in its d. are due to the inclusion of gases. In a previous paper F. (C. A. **19**, 2892) studied the isomorphism of $\text{Zr}(\text{SO}_4)_2$ and $\text{Ce}(\text{SO}_4)_2$ and found that they are completely miscible in the solid state. In this paper the compds. $\text{Zr}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ and $\text{U}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ which cryst. in the rhombic system like the corresponding Ce and Th salts were studied. These 4 salts of Zr, U, Ce and Th constitute an interesting isomorphous series capable of giving solid solns. in a relatively vast range and this isomorphism serves to explain the frequently relatively high U content of Zr minerals. Probably hafnium sulfate is also isomorphous with the 4 above compds. E. J. W.

Some theoretical calculations of the physical properties of certain crystals. J. E. LENNARD-JONES (formerly J. E. Jones) AND P. A. TAYLOR. *Proc. Roy. Soc. (London)* **109A**, 476-508 (1925); cf. C. A. **19**, 756, 1093, 1973.—Methods are given of obtaining the forces between certain Ne-like and Ar-like ions. They are used with success to account for the observed distances in certain NaCl-type crystals. They can also be used to make predictions of crystal consts. not yet measured. The values of compressibility, elasticity and other consts. of the same crystals are also calcd. and compared, when possible, with expt. The repulsive force of Ne-like ions in crystals can well be represented by an inverse 11th-power law and that of Ar-like ions by an inverse 9th-power law. In the latter case the inverse 15th power is a better approximation for large distances. G. CALINGAERT

Cristobalite. LOUIS LONGCHAMON. *Compt. rend.* **181**, 614-6 (1925).—Observations on the crystn. of tridymite from solns. in which cristobalite is dissolving, and the orientation of these tridymite crystals on the cristobalite residue. G. L. C.

Pseudo-symmetry of racemic potassium chlorosulfacetate. F. M. JAEGER. *Proc. Acad. Sci. Amsterdam* **28**, 423-5 (1925).—See C. A. **19**, 3044. E. J. C.

The chemistry of solids. C. H. DESCH. *Chemistry & Industry* **44**, 903-13, 924-9 (1925); *Bull. Brit. Non-Ferrous Metals Res. Assoc.* **1925**, No. 16, 10-5.—An interesting abridg., reviewing the various problems dealing with reactions in the solid state. H. S. v. K.

Flames of atomic hydrogen. IRVING LANGMUIR. *Science* **62**, 463-4.—Twenty-amp. arcs from a const. current transformer were passed between 2 W rods 6 mm. in diam. mounted transversely in an aluminum tube through which a stream of H flowed and burned at the open end. The at. H could be blown out of the arc and formed an intensely hot flame burning to mol. H_2 and liberating 90,000 cal. per g. mol. Mo, W and quartz could be melted, as also Fe without contamination by C, O, or N and, without fluxes, alloys contg. Cr, Al, Sr, or Mn could be welded without surface oxidation. GEORGE L. CLARK

New investigations on the melting and vaporization of carbon. H. ALTERTHUM. *Z. tech. Physik* **6**, 540-4 (1925).—A review of the methods used and the results obtained by past investigators. J. H. P.

The ignition of carbon disulfide vapor and its phosphorescent flame. HAROLD B. DIXON. *Fuel in Science & Practice* **4**, 401-10 (1925).—A version in English of a previous article (cf. C. A. **19**, 2893). C. C. DAVIS

Supersaturation of gases in liquids. N. D. CLARE. *Trans. Roy. Soc. Can., Sec. III* **3**, 19, 32-3 (1925); cf. Metschl, C. A. **18**, 2451.—Supersatd. solns. of O_2 up to about 250 atm. pressure on release of pressure sometimes formed clouds of bubbles in the liquid away from the walls. A metal hydraulic gage and a glass capillary of 0.3 mm. bore provided with a magnetic stirrer were used. J. W. SHIPLEY

The initiation of bubbles in supersaturated solutions of gases. F. J. FARNCOMB. *Trans. Roy. Soc., Can., Sec. III* (3) **19**, 32(1925); cf. *Trans. Roy. Soc.* **16**, 271(1922).—PbCl₂ crystals, phenol globules, freshly pptd. AgI, colloidal As₂S₃ and Fe(OH)₃, starch and Pt wire had no appreciable effect on the initiation of bubbles. Crystals of C₆H₅-COOH, salicylic acid and phthalide, Fe wire and paraffin wax globules had a small but decided effect. Pptd. AgI, CaSO₄ and boric acid crystals had a very strong effect. Many of the solids used were formed within the soln., thus eliminating preformed gas films. Bubbles are initiated chiefly by substances wetted with difficulty by the solvent.

J. W. SHIPLEY

Density and temperature. V. W. HERZ. *Z. Elektrochem.* **31**, 512-4(1925); cf. *G. A.* **18**, 3501.—For a large no. of tabulated substances the abs. temps. at which the quotient of the ds of the liquid (*D*) and of the satd. vapor (*S*) is a given chosen value, are approx the same fraction of the crit. temps. For any one substance the successive differences between the logarithms of the ratios *D/S* decrease as the temp. is lowered from the crit. value by equal intervals, pass through a min. and again increase.

GEORGE L. CLARK

Measurement of the vapor tension of gasoline and other volatile liquids. HAROLD S. DAVIS. *Ind. Eng. Chem.* **17**, 1136-8(1925).—An app. is described for detn. of vapor tension by detn. of the additional pressure required to compress a mixt. of air satd. with the given vapor, and in contact with a large excess of the liquid, to 0.5 of its original vol. Detns. made on standard liquids show remarkable accuracy. Errors inherent in the use of the U. S. Bur. of Explosives vapor pressure bomb method are discussed.

WM B. PLUMMER

Some phenomena in capillary chemistry. RENÉ DUBRISAY. *Bull. soc. chim.* **37**, 996-1008(1925).—See *C. A.* **18**, 490, 1074, 3131.

JAMES M. BELL

The adsorption of some vapors by alumina gel. J. H. PERRY. *J. Phys. Chem.* **29**, 1462-8(1925).—By a dynamic method, the adsorption of 10 vapors by alumina gel has been measured at 25°. The satn. values (g. vapor per 10 g. of gel) are: CS₂ 2.96; CCl₄ 3.6; CHCl₃ 3.8; C₂H₄Cl₂ 3.7; C₂H₅COOH 2.7; CH₃C₂H₅CO 2.46; hexane 2.47; CH₃Ac 2.56; CH₂Cl₂ 3.4; C₆H₅CH₃ 2.8

J. H. PERRY

A deviation from Poiseuille's law. B. MARZETTI. *Atti accad. Lincei* [6], **2**, 169-73 (1925).—M. found that nonvulcanized rubber made to flow slowly through a tube or a small hole shows a velocity of outflow that is not a linear function of the pressure as required by Poiseuille's law. The app. data and some discussion of this case are given.

E. J. WITZEMANN

Electro-ultrafiltration. II. BRECHOLD. *Z. Elektrochem.* **31**, 496-8(1925).—A balloon-shaped ultra-filter dips into the soln. compartment of an ordinary ultra-filter and electrodes are placed on the filtrate side of both. A potential gradient of 40 v./cm. is used and the process is completed in 1/175 of the time necessary for dialysis and 1/13 of the time necessary for ultra-filtration.

D. S. VILLARS

Colloid systems in nitrobenzene. F. S. BROWN AND C. R. BURY. *J. Phys. Chem.* **29**, 1312-6(1925).—When solns. of alcohols, phenols, or org. acids in dry C₆H₅NO₂ are agitated with dehydrating agents such as P₂O₅, CaCl₂, ZnCl₂, or SiO₂, colloidal solns. of the latter result, which pass through filters, show the Tyndall effect and exhibit brilliant Christianson colors. With CaCl₂ and P₂O₅ sols contg. several g. per 100 g. C₆H₅NO₂ may be obtained which set to gels on standing. Traces of H₂O cause rapid coagulation. AcOH and PrOH are adsorbed from C₆H₅NO₂ in accordance with Freundlich's adsorption isotherm. The amt. of CaCl₂ peptized varies with the concn. of peptizing agent in accordance with a similar equation.

F. L. BROWNE

Emulsion films. H. N. HOLMES. *J. Phys. Chem.* **29**, 1205-10(1925).—The theories of the stability of emulsions are briefly reviewed. Polar substances in true soln. sometimes act as emulsifying agents. Emulsions of C₆H₆ in H₂O are stabilized by MeOH, EtOH, allyl alc., phenol, resorcinol, fatty acids above caprylic, sulfonic acids, benzonitrile, rancid fats and neutral fats (less effectively). Higher alcs., glycol, glycerol, benzyl alc., sugars, aldehydes, ketones, nitro and amino compds. are not effective emulsifying agents. Emulsifying agents are believed to form oriented, monomol films at the interface. This seems to be the only explanation for the emulsification of Nujol in H₂O by EtOH. Gum dammar emulsifies H₂O in C₆H₆, yet it is in true soln. and does not lower the surface tension of C₆H₆. The use of gum dammar to emulsify H₂O in oils has com. possibilities for *printers' inks, medicated salves and ointments* and in *color photography*. The viscosity of emulsions is affected by the nature of the emulsion film as well as by the vol. concn. of the 2 phases.

F. L. BROWNE

Hydrophobe and hydrophile colloids. JACQUES LOEB. *J. chim. phys.* **21**, 169-87 (1924); cf. *C. A.* **18**, 928.—The principle of membrane equil. explains the sp. properties

of the two types of sols: hydrophilic, such as the proteins, and hydrophobic, such as mastic, graphite, collodion. The Donnan equil. depends in all cases on the charges of the colloidal particles, which arise in part from ionization and in part from an elec. double layer. The origin of the charge is the only point of difference between the 2 types of colloids. In the hydrophilic sols the charge is due to ionization and in the hydrophobic to the double layer that is set up between the particle and the water. A double layer exists also at the periphery of solid particles of electrolytes such as proteins and $\text{Fe}(\text{OH})_3$; in such cases ionization of the particles affects only the difference of potential of the double layer.

HARRY B. WEISER

Protein films on collodion membranes. D. I. HITCHCOCK. *J. Gen. Physiol.* **8**, 61-74(1925).—Highly permeable collodion membranes adsorb weighable amts. of gelatin and egg albumin from soln. at 37° . Langmuir's equation (*J. Am. Chem. Soc.* **40**, 1368, 1384; cf. *C. A.* **12**, 2152) expresses fairly well the effect of concn. on adsorption while Freundlich's equation (*Kapillarchemie* 3rd. ed. p. 151, 232(1923)) does not fit the exptl. results. Max. adsorption occurs in solns. of isoelec. protein. The effects of acids and salts on the amt. of gelatin adsorbed resemble their effects on viscosity (cf. Loeb, *Proteins and the Theory of Colloidal Behavior*, 2nd. ed. 1924), but are opposite in direction. The effects of pH on the amt. of adsorbed gelatin and fluidity of gelatin solns. are nearly parallel. Membranes made impermeable by long drying adsorb little gelatin from soln. In membranes of varying permeability, the max. amt. of gelatin adsorbed increases with the permeability and thickness of the membranes. Within limits the permeability seems to be a linear function of the relative pore surface of the membrane. The gelatin film decreases the permeability of the membranes to water. Since the relative cross-section of the pore openings is a linear function of the amt. of adherent gelatin, it is concluded that gelatin forms a film inside the pores.

CHAS. H. RICHARDSON

Contribution to the theory of permeability of membranes for electrolytes. L. MICHAELIS. *J. Gen. Physiol.* **8**, 33-59(1925).—Expts. with apple skin, parchment paper and dry collodion membranes show that they are less permeable for anions than for cations. Anions permeate parchment-paper membranes relatively much less than cations, whereas apple skin and dry collodion membranes are nearly impermeable to them. In membranes which are permeable for cations but not for anions, the permeability for these ions follows the same order as their mobilities in free aq. soln. But the differences are greatly magnified and whereas the mobility ratio of H^+ and Li^+ in aq. soln. is 1:10, in the collodion membrane it is 1:900. The cause of this retardation of ion mobility within the membrane is probably the friction of the water envelope dragged along by the ion in the capillary canals of the membrane. The difference in mobility between cations and anions is probably due to the elec. charge on the walls of the canals. These theoretical considerations are developed mathematically and the deductions are tested by expt.

CHAS. H. RICHARDSON

Soaps and the theory of colloids. J. W. MCBAIN. *Nature* **115**, 805-7(1925); cf. *C. A.* **19**, 3399.—A lecture. F. N. S.

A rational notion for the expression of the actual reaction of solutions. D. GIRIBALDO. *Bull. soc. chim. biol.* **7**, 652-64(1925).—See *C. A.* **19**, 1218. A. T. C.

Electrical dispersion of liquids. Phenomena accompanying the passage of an electric current through contiguous immiscible electrolytes. VICTOR COFMAN. *J. Phys. Chem.* **29**, 1289-302(1925).—Elec. current under a voltage varying from 0 to 220 was passed through a system of 2 conducting, immiscible liquids, such as a soln. of KI_x in $\text{C}_6\text{H}_5\text{NO}_2$ and a soln. of KI in H_2O . Phenomena of liquid dispersion, chem. reactions, endosmosis, and polarization occurring at the interface are described in detail. They show that the transfer of electricity from one electrolytic phase to another does not take place in every case by means of ions only, but that it is also effected by electrons and by larger complexes of ions and solvent. When ion A^+ in phase I and ion D^- in phase II meet at the interface one of three things may happen. (a) if compd. AD is insol. in both I and II, a ppt. forms as a membrane and gives rise to electro-endosmosis, polarization, and stenolysis, (b) if AD is sol. in both phases, the current is carried across the interface by the ions, the fraction of the current carried by each ion depending upon the soly. and the diffusion consts. of AD and the mobilities of the ions in I and II; (c) if AD is sol. in II but not in I, A^+ ions pass from I to II but no D^- ions cross in the opposite direction, i. e., the interface behaves as a semi-permeable membrane. Negatively charged droplets of II enter I as a very fine dispersion. These droplets move very rapidly at first, but then seem to lose their charge, slow up, become positively charged and move back toward the interface again. The charged droplets trying to move across the interface under the elec. potential are opposed by the interfacial tension.

This accounts for the observed fact that a certain min. voltage must be attained before dispersion takes place.

F. L. BROWNE

Solubility relations in isomeric organic compounds. V. The construction of the ideal ternary solubility diagram and its use in analysis. G. T. KOHMAN and D. H. ANDREWS. *J. Phys. Chem.* **29**, 1317-24(1925); cf. *C. A.* **18**, 3518.—Three simple graphical methods are described for constructing and interpreting soly. diagrams of ternary systems which yield ideal, or nearly ideal solns. Mixts. of *o*, *m* and *p* isomers afford examples of such systems. The first method employs a solid model, the second a projection of the solid model on a plane surface, and the third a plot of $\log N$ vs. $1/T$ (where N is the mol. fraction of the solute in the soln. in equil. with cryst. solute at temp. T). This is a straight line for the case of ideal soln. The same methods, with slight modifications, can be used where the solns. depart somewhat from ideality. The soly. diagram can be detd. from a small no. of observations, for instance from detns. of the primary f. p. of a known mixt. of 2 components, their eutectic temp., the m. p. of each, and the eutectic temp. of the 3rd component with either of the others. By means of the diagram, a mixt. of the components can be analyzed with an accuracy of the order of 1 or 2% by observation of the primary f. p. and the influence on the f. p. of small addns. of each of 2 of the components. The method can be used even when small amts. of an impurity such as H_2O are present.

F. L. BROWNE

Electrical conductivity in benzene solutions. SOPHIE JAKUBSOHN. *Z. physik. Chem.* **118**, 31-6(1925).—The sp. cond. of $AlBr_3 \cdot H_2S$ at 25° in C_6H_6 ($\kappa < 1 \times 10^{-13}$) is found to vary from 0 for solns. under 20% to 3.54×10^{-4} for a 53.99% soln. (which is a satd. soln.). The mol. cond. and mol. wt. (as detd. from cryoscopic measurements) increase with increasing concn. Association or solvation thus seems to favor the dissociation process. When electrolyzed, H_2 is evolved at the cathode and Br_2 at the anode (where secondary bromination compds. are formed). The decompn. p. d. of a 45% soln. is 0.74 v. at 25° .

D. S. VILLARS

Conductivity and electrolysis of iodine trichloride in acetic acid. B. P. BRUNS. *Z. physik. Chem.* **118**, 89-98(1925).—Pure ICl_3 dissolves in water-free $AcOH$ to form clear 33% solns. If there are traces of water present, the ICl_3 hydrolyzes and HIO_3 ppts. for concns. over 10%. The $AcOH$ used had a sp. cond. of 0.8×10^{-9} reciprocal ohms. The mol. cond. decreases from a value of about 0.5 (at 18°) at a diln. of 2 l. to a min. (0.1) at a diln. of 10 l. and then increases so as to reach the original value of 0.5 at a diln. of 1000 l. For concns. of 6.45 and 7.27% there is a break in the temp.-cond. curve at a temp. between 20° and 30° and for a concn. of 10.50% there is a min. at about 30° . On electrolyzing, an amt. of Cl is pptd. at the anode twice that required by Faraday's law and it is found that the whole ICl_3 mol. goes to the anode. (Cf. Brunner, *Z. physik. Chem.* **84**, 385.) There is little if any decompn. p. d. It is inferred that a complex, $ICl_3 \cdot nAcOH$, is formed which dissociates into the mols. when the temp. is raised above 30° (this accounts for the break in the temp.-cond. curve) and also into the ions ICl_2^{--} and $(AcOH)_n^{++}$ (this accounts for the electrolytic phenomena).

D. S. VILLARS

Ion antagonism. R. MINAKAMI. *Biochem. Z.* **158**, 306-18(1925).—The effect of the addn. of various salts and mixts. of salts of univalent and bivalent metals (Na, K, Li, Ca, Mg, Ba, etc.) on the surface tension of 0.1 and 0.2% soap solns., Na oleate, was measured. The curves of surface tension changes show the antagonism between univalent and bivalent ions such as Ca and Na or Li and Mg.

F. A. CAJORI

Cryoscopic measurements for verification of Debye-Hückel's theory on solutions of electrolytes in organic solvents. E. SCHREINER and O. E. FRIVOLD. *Naturwissenschaften* **13**, 859(1925).—Measurements are given of $1-\gamma$ (γ is osmotic coeff.) of $LiCl$ solns. in cyclohexanol (f. p. lowering 38.22° for 1 molal per l.; m. p. 23.6° ; $d_{20.6} = 0.9489$, dielec. const. at 25° 15.0). With an empirical value for the ion radius $a = 2.80 \times 10^{-8}$ cm. complete agreement is obtained between exptl. data and theory (concns. examined ranged from 0.00037 to 0.0142 molar).

B. J. C. VAN DER HOEVEN

Electrolytic solutions of low dielectric constant. PHILIP GROSS and OTTO HALPERN. *Physik. Z.* **26**, 636-42(1925).—The Debye-Hückel theory of electrolytic solns. yields a value of the osmotic coeff. $f_0 = 1 - (\epsilon^2 \kappa / 6DkT) \cdot (\sum \nu_i z_i^2 \sigma_i / \sum \nu_i)$ (Debye-Hückel notation, cf. *C. A.* **17**, 2665; **18**, 190). If the dielec. const. D is small, ionized solutes may exhibit very small values of f_0 . The exptl. detns. of f. p. lowering, etc., on such solns. in many cases yield results pointing towards considerable association of the solute mols., although cond. detns. show that some ions must be present. The $A-\gamma$ curves in general are abnormal, and cannot be interpreted on the classical theory of electrolytes. In the D.-H. theory of strong electrolytes, complete dissocn. into ions is assumed and the variation of the osmotic and activity coeffs. with concn. is explained

on the basis of change of the elec. potential between the charges on the ions. Thermodynamic considerations yield certain stability conditions which indicate the presence of both ions and undissociated mols. of the solute in solns. of low D , in view of the abnormally low osmotic effects yielded by these solns. Significant for this point of view is that solns. that do not conduct current show no abnormal osmotic effects. No numerical evidence is quoted; in order to apply D.-H. equations it is necessary to know the effect of solute concn. on the dielec. const. of the soln. A review of previous hypotheses used to explain the behavior of solns. of low D , and a bibliography are given.

F. C. KRACEK

The calculation of the equivalent conductivity of strong electrolytes at infinite dilution. I. Aqueous solutions. A. FERGUSON AND I. VOGEL. *Phil. Mag.* **50**, 971-85 (1925).—F. and V. recommend the Storch equation (*Z. physik. Chem.* **19**, 13 (1896)) for the formulation of the diln. law of electrolytes. They develop a more rigid method of evaluating the consts. involved in it and then apply it to existing cond. data. Comparison is made by applying other formulas to the same data. S. C. L.

Hydrogen peroxide as an oxidizing agent in acid solution. III. W. H. HATCHER. AND G. W. HOLDEN. *Trans. Roy. Soc. Can.*, Sec. III (3) **19**, 11-9 (1925); cf. C. A. **19**, 924.—Glyoxylic acid was prepd. by the electrolytic reduction of oxalic acid, purified through sepn. as Ba glyoxylate and then reformation of the acid by addn. of H_2SO_4 . After concn. over H_2SO_4 in a vacuum desiccator the crystals forming were sepd., dried and recrystd. from water. Glyoxylic acid forms colorless, anhyd. monoclinic crystals, m. (without decompn.) 98° , sparingly sol. in alc., Et_2O , and C_6H_6 , but very sol. in H_2O . Aq. solns. are yellowish. It reduces ammoniacal $AgNO_3$ slowly. Its metallic salts are largely hydrated and quite stable even on boiling. Silver glyoxylate dissolves in H_2O at 18° to the extent of 0.007 g. per 100 cc. Ba glyoxylate with exactly 2 mols. of water was sol. to the extent of 0.005 g. per 100 cc. at 18° and 0.08 g. at 68° . Aq. solns. of the acid were analyzed by titration with KOH and phenolphthalein or by $KMnO_4$ in H_2SO_4 at room temp. The reaction with H_2O_2 was of the second order, yielding only water, carbonic and formic acids. Mineral acids and rise in temp. and concn. increase the already rapid reaction. The Na salt is especially reactive towards H_2O_2 .

J. W. SHIPLEY

Benzidine researches. I. Passivity of zinc dust. B. A. IZMAILSKII AND B. I. KOLPENSKII. *J. Chem. Ind.* (Russia) **1**, 31-2 (May-June, 1925).—In the manuf. of benzidine considerable trouble is sometimes experienced in reducing nitrobenzene by means of com. Zn dust and alkalis. The operation is very irregular, its duration and yield are very variable, and above all it is dangerous, since it may occasion an explosion, even if Zn dust is added gradually in small portions. Zn dust may acquire temporary reducing passivity under the influence of nitrobenzene, either by occluding H on the surface, or by forming the unstable combination ZnH_2 . The H_2 may suddenly be liberated in large quantities and cause an explosion. The phenomenon of temporary passivity of Zn dust can be avoided by preliminary treatment of the dust with NaOH soln. and either cooling overnight or heating to $60-70^\circ$ and quickly cooling, during this treatment of Zn excessive formation of gas must be carefully avoided. By means of the Zn paste thus prepd. 123 g. nitrobenzene (1 mol.) at an inside temp. of $92-96^\circ$ and bath temp. of 80° , is reduced to azoxybenzene with a yield of about 95% in the course of 90-105 min.; whereas by means of untreated Zn dust 6-12 hrs. is required to attain the same result. Some brands of Zn dust which had been rejected on account of being dangerous reacted very quietly after being subjected to the above preliminary treatment with alkalis.

BERNARD NELSON

Thermal decomposition of ozone. R. O. GRIFFITH AND ANDREW McKEOWN. *J. Chem. Soc.* **127**, 2086-96 (1925); cf. C. A. **18**, 789.—The velocity of deoxygenation was measured at 100° in glass tubes in the presence and in the absence of H_2SO_4 by the difference in pressure between the reaction tube and a compensator contg. air maintained at the same temp. The reaction is approx. bimol. For ozonized O_2 mixts. at pressures between 300 and 1000 mm. the bimol. coeff., k , (in liters/moles-minutes) is given by $k = 11,500/(360 + P)$ where P is the pressure in mm. of gas mixt. The addn. of one of the gases He , CO_2 , N_2 , A causes an increase in the velocity of deoxygenation (in the order named) if the reaction velocity is compared with that obtaining for the same partial pressure of O_2 in ozonized O_2 . This positive "catalytic" effect increases with increasing partial pressure of the added gas. A mechanism is suggested which involves the ideas of Christiansen (cf. C. A. **19**, 2157) and Boru and Franck (cf. C. A. **19**, 1655).

D. S. VILLARS

Photochemical and thermal decomposition of ozone. R. O. GRIFFITH AND A. McKEOWN. *Trans. Faraday Soc.* (advance proof) Oct. 1, 1925; cf. preceding ab-

stract.—A review of the work done on this subject with references. G. and McK. propose the mechanism: $O_3 \longrightarrow O_3^*$ (1); $O_3^* + O_3 \rightleftharpoons$ complex (2); complex $\longrightarrow 3O_2$ (3), where O_3^* represents an activated mol. The complex mol. formed by (2) is assumed to be capable of decomp. on collision with any other mol. present, the collision resulting in either the reverse reaction of (2) or in reaction (3). D. S. V.

The velocity of the reaction between hydrogen peroxide and the iodide ion. J. A. CHRISTIANSEN. *Z. physik. Chem.* 117, 433-47(1925).—The reaction velocity const. for the reaction $2H_2O_2 + I^- \longrightarrow 2H_2O + O_2 + I^-$ was detd. at 15° by measuring the rate of O evolution from 30 cc. of 0.05 mol. KI soln. to which 5 cc. of commercial 3% H_2O_2 soln. had been added. The influence of various neutral salts on the rate of reaction was also detd. In the latter expts. the concn. of the neutral salt was 1 N. The rate of O evolution was measured by the increase in gas pressure over the soln. A shaking-app. like Brönsted's (cf. *C. A.* 16, 4113) was used. Uni-univalent salts of the type KCl caused a slight acceleration; uni-bivalent salts like K_2SO_4 caused a slight retardation; and bi-univalent salts like $BaCl_2$ caused a marked acceleration. These observations were qualitatively explained as being due to the action of the neutral salt in changing the elec. field in the immediate vicinity of the I^- ion. Further, the temp. coeff. of acceleration of the reaction $H_2O_2 + 2HI \longrightarrow 2H_2O + I_2$ by the H ion was measured, at 0° and 25°, by Harcourt and Essons' classical method (cf. *Phil. Trans.* 157, 117(1867)). The measured velocity const. k , of the equation $-(dC_{H_2O_2}/dt) = kC_{H_2O_2} \cdot C_I(1 + k_1C_H)$ showed a slight decrease with increasing temp. The results when examd. in the light of Herzfeld's concepts (cf. *C. A.* 15, 1440) indicate that the primary reaction is probably $I^- + H_2O_2 \longrightarrow I(O)^- + H_2O$ and that the $I(O)^-$ is stabilized by reaction with H^+ according to the equation $I(O)^- + H^+ \longrightarrow HIO$.

R. L. DODGE

The mechanism of the reaction between iodine, the iodide ion and hydrogen peroxide. J. A. CHRISTIANSEN. *Z. physik. Chem.* 117, 448-56(1925); cf. preceding abst.—An attempt is made to reconcile Brode's conception of the mechanism of the reaction between I, the I^- ion and H_2O_2 (cf. *Z. physik. Chem.* 37, 257(1901); 49, 208(1904)) with Abel's exptl. results (cf. *C. A.* 15, 199) by means of a somewhat involved reaction-scheme. Bray and Livingstone's measurements of the reaction between HBr and H_2O_2 are similarly treated. No new exptl. data are given. R. L. D.

Chemical reactions in powdered mixtures of two kinds of crystals. G. TAMMANN. *Z. anorg. allgem. Chem.* 149, 21-34(1925).—In the introduction to an extraordinarily comprehensive series of exptl. studies are considered the direction of the reaction (that only in which heat is evolved), the reaction kinetics and the dependence of the velocity of thickening of the layer formed from interaction between 2 kinds of crystals upon the orientation of the 2 crystals, the thickness of the layer, the temp. and the nature of the new layer, the atomistics of the linear velocity of reaction in the cryst. lattices, the isothermal transformation in powdered mixts. as it depends upon grain size, the temp. interval on the heating curve of the course of the reaction, the influence of small amts. of liquid in powdered mixts., the temp. of the observed beginning of the reaction and that of the change in position of the mols. **I. The reactions of WO_3 and MoO_3 on basic oxides and carbonates.** G. TAMMANN AND FR. WESTERHOLD. *Ibid.* 35-46.—The heating curves for 26 mixts. of WO_3 and MoO_3 with CuO, BeO, MgO, CaO, BaO, PbO, CeO_2 , $CaCO_3$, $SrCO_3$, $BaCO_3$, FeO, Fe_2O_3 , Al_2O_3 and $CeO_2 + SiO_2$ are reproduced. The relation (heat of formation per mol. \times transformation in mols.)/(sizes of surfaces between 2 heating curves) = const. holds within 5%. Similarly the thickness of the layer of the reaction products of a double pastille follows the law $l = a \log t + b$, and also the transformations in % a law of similar form. The grain size has a large effect; e. g., CuO + WO_3 , diam. of particles 0.007 mm., transformation 98.9%; 0.30 mm., 82.3%; 1.00 mm., 24.0%. **II. Double decomposition of basic oxides with sulfates and nitrates.** G. TAMMANN AND B. GARRE. *Ibid.* 46-58.—Curves and data as above are given for reactions of BaO, SrO, CaO and PbO with sulfates of Zn, Pb, Cu, Ag, and Mg, and $AgNO_3$; of Na and K carbonates with $BaSO_4$ and $PbSO_4$; of Ag_2CO_3 and Na halides; of CaO and PbO with SiO_2 as quartz and as glass. **III. Reactions between oxides and sulfides.** G. TAMMANN AND ERNST KORDES. *Ibid.* 58-68.—The reactions $ZnS + CdO$, $ZnS + PbO$, $ZnS + CuO$ and $PbS + CdS$ are studied with particular reference to the influence of speed of heating, and compression of the pastilles, both of which ordinarily have small effect on the yield. Similarly the reaction between powdered metals and oxides and salts permits a study of the relationship between the temp. of agglomeration and the m. p., the former being 0.57 of the latter when expressed as °abs. Hedvall's work, (*C. A.* 19, 768, 915) is verified. **IV. The behavior of V_2O_5 , SiO_2 , TiO_2 , ZrO_2 , Sb_2O_3 and As_2O_3 with basic oxides.** G. TAMMANN AND H. KALSING.

Ibid 68-89.—The reactions of 12 basic oxides with these anhydrides are summarized in an extensive table (p. 88). **V. Thermodynamics of the reactions in mixtures of two kinds of crystals.** G. TAMMANN. *Ibid* 89-98.—A mathematical discussion in terms of the thermodynamic potential ζ function. For addn reactions $\zeta = E - \eta T + vp$, where E is the molar energy const., η = mol entrop., and v = molar vol. Then $(m\zeta_A + n\zeta_B)/(m + n) \leq \zeta_D$ det's the direction of the reaction, where m and n are nos. of mols. of A and B uniting to form a third type D. Double decompns. are similarly considered.

GEORGE L. CLARK

The hydrolysis constant of sugar. MLE. H. COLIN AND MLE. A. CHAUDIN. *Bull. soc. chim.* 37, 1224-7 (1925).—See C. A. 19, 922.

H. G.

The determination of hydrogen- and hydroxyl-ion concentrations and their significance. WM. MANSFIELD CLARK. *J. Am. Leather Chem. Assoc.* 20, 544-64 (1925).—An address.

J. A. WILSON

Secondary kinetic salt effect in the case of hydroxyl-ion catalysis. J. N. BRÖNSTED AND C. V. KING. *J. Am. Chem. Soc.* 47, 2523-31 (1925).—The term "secondary kinetic salt effect" indicates a kinetic salt effect due to a change in concn. of the reacting mols. resulting from to a change in the inter ionic forces. The presence of salts influences OH-ion catalysis when this ion enters into a displaceable homogeneous equil. Data of Arrhenius (*Z. physik. Chem.* 2, 284 (1888)) on the sapon. of AcOEt by ammonia-ammonium buffers show a considerable secondary salt effect. By means of special app. for measuring velocities of reactions accompanied by evolution of gas, the decompn. of nitroso-triacetoneamine into phorone and N has been studied under different conditions. Catalyzed by a strong base the reaction shows a negative primary salt effect. The same reaction measured in a piperidine-piperidinium ion buffer and a phosphate buffer shows a considerable secondary salt effect, positive in the first and negative in the second case, effects which are in agreement with the theory of this effect. These results exemplify the inadequacy of stating an ion-equil. const. without reference to the sp. region of salt concn. to which it applies.

JAMES M. BELL

The promoter action of thoria on nickel catalysts. WM. W. RUSSELL AND H. S. TAYLOR. *J. Phys. Chem.* 29, 1325-41 (1925).—The reaction $\text{CO}_2 + 4 \text{H}_2 = \text{CH}_4 + 2\text{H}_2\text{O}$ is a surface reaction, strongly affected by the adsorbing power of the catalyst surface for the reactants. The activity of Ni alone as catalyst, either supported or unsupported, is greater the lower the temp. at which the Ni was reduced, presumably because the no. of highly unsatd. Ni atoms per vol. of catalyst is greater the lower the temp. of reduction. Heating a catalyst above the temp. at which it was reduced markedly reduces its activity because the increase in the mobility of the atoms with temps. brings about the coalescence of the unsatd. atoms with loss of effective adsorptive power. The primary function of ThO_2 as promoter with supported Ni catalysts is to make possible the existence of a greater no. of Ni atoms of a highly unsatd. character per unit of catalyst, through the creation of ThO_2 -Ni interfaces. With unsupported Ni catalysts, ThO_2 may function as promoter (a) by the creation of a more active surface through the above interface mechanism, (b) by an increase in the extent of surface inasmuch as the promoter acts as a support, (c) by a favorable alteration in the ratio in which the reacting substances and possibly the products are adsorbed. The conclusions are based on the results of both adsorption and reaction-velocity measurements on samples of promoted and unpromoted, supported and unsupported Ni catalysts.

F. L. BROWNE

Heterogeneous equilibrium between tungsten and oxygen and also water vapor at high temperatures. H. ALTERTHUM AND F. KOREF. *Z. Elektrochem.* 31, 508-11 (1925).—A reinvestigation of the work of Wohler (C. A. 17, 2985) taking into account the presence of oxides in the gaseous phase. The heats of vaporization of the oxides WO_2 , W_2O_6 , WO_3 , were calcd. by the modified Trouton's rule $\lambda = 7.4T_s \log T_s$, T_s being observed from the beginning of the Tyndall effect. The equil. const's. were calcd. from the Nernst heat theorem; the ability of O_2 to attack W decreases with rising temp., but the reaction of water vapor increases with rising temp.

G. L. CLARK

The system Na_2SO_4 - Na_2Cl_2 - MgSO_4 - MgCl_2 - H_2O . H. J. ROSE. *Trans. Roy. Soc. Can.*, Sec. III (3) 19, 33 (1925).—Great difficulty in attaining equil. between the constituents of a satd. soln. of thenardite, mirabilite and astrakanite at 25° was experienced. The satd. solns. contain 11.6 moles MgSO_4 , 26.0 moles Na_2SO_4 and 26.3 moles Na_2Cl_2 per 1000 moles H_2O .

J. W. SHIPLEY

The interferometer method for the study of systems of two volatile liquids. G. I. HOOVER AND C. Q. GLASSEY. *Trans. Roy. Soc. Can.*, Sec. III (3) 19, 35 (1925).—The systems $\text{C}_2\text{H}_5\text{OH}-\text{H}_2\text{O}$, $\text{CH}_3\text{OH}-\text{H}_2\text{O}$ at 39°, 76° and 39°, 90° resp. were studied. The results of Vrevskii (C. A. 7, 926), were reproduced.

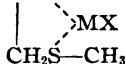
J. W. SHIPLEY

The establishment of the temperature scale to -193° by means of platinum resistance thermometers. A. G. LOOMIS AND J. E. WALTERS. *J. Am. Chem. Soc.* **47**, 2851-6 (1925).—The method of calibration proposed by Henning (*C. A.* **18**, 3522) is shown to be applicable to a Pt resistance thermometer of the calorimeter type. F. R. B.

A simple method for the indirect determination of molecular heats of vaporization. J. NARBUTT. *Z. Elektrochemie* **31**, 511-2 (1925).—A Beckman ebullioscopic app. is simply adapted with suction and open-end water manometer to obtain data, accurate to 0.2%, for substitution in the equation $\lambda = (RT^2/p)(dp/dT)$, where λ is the mol. heat of vaporization, T the abs. boiling temp. at pressure p , and the differential the change in temp. with pressure in the app. GEORGE L. CLARK

Thermal conductivity and thermoelectromotive force of single metal crystals. P. W. BRIDGMAN. *Proc. Nat. Acad. Sci.* **11**, 608-12 (1925).—Plots of the reciprocals of the exptly. detd. thermal conds. against the sp. elec. resistance in the same direction through single crystals of Sn, Bi, Cd, Zn, seem to show a straight-line relationship according to the theory of Voigt. The best straight line through the points does not go through the origin, showing that the Wiedemann-Franz law cannot hold for all directions in a crystal. The thermal e. m. f. between crystal rods of different orientations and Cu was shown to be expressible as $E = at + (t^2b/2)$, where t is $^{\circ}\text{C}$. The coeffs. a and b were obtained as functions of the directions in the crystal. The Thomson heat is shown to be a linear function of the sp. resistance, while the Peltier heat is not. S. K. ALLISON

Researches on residual affinity and coördination. XXIV. Heats of chelation of α -thiolated metallic halides. G. T. MORGAN, S. R. CARTER AND WM. F. HARRISON. *J. Chem. Soc.* **127**, 1917-25 (1925).—S when combined in the form of chelides such as dimethyldithioethylene, $\text{CH}_3\text{SCH}_2\text{CH}_2\text{SCH}_3$ (A) has a remarkable tendency to form complexes of the type $\text{CH}_2\text{S}-\text{CH}_3$, where M is a metal and X an halide. The following



complexes were prepd. by treating a soln. of the salt in the first named solvent with A. A. ZnCl_2 , white crystals, m. $131-2^{\circ}$, slightly sol. in ether, sol. in AcMe, decompd. by H_2O and EtOH. A. ZnI_2 , small white crystals, m. $169-70^{\circ}$, slightly sol. in ether, sol. in AcMe, MeOH and EtOH. A. CdCl_2 , colorless needles, m. 285° , sol. in EtOH, MeOH, insol. in AcMe, slowly decompd. by H_2O . A. CdBr_2 , colorless needles, m. 285° , sol. EtOH, MeOH, ether and acetone. A. CuI (prepd. by adding KI and A to soln. of CuSO_4 in water satd. with SO_2), pale yellow ppt., m. (with decompn.) 156° , insol. in water and ordinary org. media. The heat of the reaction $\text{A} + \text{MX} = \text{A MX}$ was measured and is given in kcal. after the formula for the salt: A. Cu Cl_2 , 14.85; A. CuI , 5.88; A. ZnCl_2 , 13.19; A. ZnBr_2 , 15.35; A. ZnI_2 , 14.18; A. CdCl_2 , 12.16; A. CdBr_2 , 11.27; A. CdI_2 , 9.96; A. HgCl_2 , 13.23; A. HgBr_2 , 11.33; A. HgI_2 , 4.83; A. SnCl_4 , 28.06; A. SnBr_4 , 19.40; A. SnI_4 , 16.58; $\text{A}_3(\text{BrI}_3)_2$, 12.0. These heats are often greater than the heat of formation of the sulfides from the elements. The following subsidiary heats of soln. were measured: SnI_2 in 200 parts CCl_4 , -3.81 ; SnBr_4 in 200 parts CCl_4 , -3.15 ; SnCl_4 in 200 parts CCl_4 , $+0.87$; HgI_2 in EtOH, -2.1 ; HgBr_2 in EtOH, 0.0. F. R. B.

Correction of the thermochemical data of A. Valeur. W. SWIENTOSLAWSKI AND (MLLE.) H. STARCZEWSKA. *J. chim. phys.* **22**, 399-401 (1925).—The heats of combustion of benzoquinone, β -naphthol and anthraquinone as detd. by S.'s standard procedure are 6074.8, 8238.2 and 7422.6 cal. per g. in air at const. vol., resp. With these values as norms the heats of combustion of numerous quinone derivatives as given by Valeur are corrected and tabulated. The correction amts. to -0.26% . F. R. B.

Note on the errors introduced in certain thermochemical determinations and on the coefficients of these determinations. W. SWIENTOSLAWSKI. *J. chim. phys.* **22**, 391-4 (1925).—The types of systematic errors likely to be present in older detns. of the heats of combustion are listed and directions are given for the correction of such results in terms of modern norms. F. R. BICHOWSKY

Correction of the thermochemical data of P. Lemoult. W. SWIENTOSLAWSKI AND M. POROW. *J. chim. phys.* **22**, 395-8 (1925).—The heats of combustion of naphthalene, β -naphthylamine and p -aminoazobenzene as detd. by S.'s standard procedure, are 9612.9, 8812.5 and 7983.7 cal. per g. in air at const. vol., resp. With these values as norms the heats of combustions of numerous amines as given by Lemoult are corrected and tabulated. The correction amts. to -0.521% . F. R. B.

Calorific value and constitution. M. F. BARKER. *J. Phys. Chem.* **29**, 1345-63 (1925).—The following heats of combustion were detd.; benzene 783.4, toluene 941.3,

xylene 1091.3, naphthalene 1238.0, biphenyl 1500.0, phenol 733.0, *o*-cresol 883.7, *p*-cresol 885.0, *m*-cresol 883.0, benzyl alc. 890.0, pyrogallol 618.1, *o*-, *m*-, *p*-dihydroxybenzene 684.9, 683.9, 684.7, benzoin 1670.8, benzil 1621.6, furoin 1114.0, furil 1064.4, lepidene 3288.4, *p*-nitroacetylbenzoin 1864.4, *p*-nitrobenzil 1600.9, *p*-nitrobenzoylbenzoin 2443.4 kcal. per mol. at const. pressure. Details of exptl. procedure and accuracy are not given. Following the usual argument the heats of combustion of the following groups are calcd. =CO 60.7; —OH 12.9; —C=C— 97.7; —C≡C— 122.0; (by a comparison with trimethylene the following structure for these bonds is proposed: —CΔC—, —C⊕C—); —H 69.3, (same as free H in H₂); —C = (in benzene) 97.0;

—C< (in side chains) 82. The value for —C— depends on the angle between the linkages; that of the —COOH group is not that calcd. from its formula but suggests a structure $\text{X}-\text{C} \begin{matrix} \text{OH} \\ \diagup \\ \text{OH} \end{matrix}$. The prism formula for benzene is in best agreement with the data on the hydrogenation of benzene.

F. R. B.

Establishing the heat of combustion of calorimetric standards. Remarks on a paper by Jaeger and v. Steinwehr. P. F. VERKADE AND J. COOPS. *Z. physik. Chem.* **118**, 123-8(1925).—The values adopted for the heat of combustion of benzoic acid, sugar and naphthalene by the "Commission pour l'établissement d'un étalon thermochimique" in 1922 are based on all data published up to that time; hence, the criticism of Jaeger and v. Steinwehr (*C. A.* **19**, 1085) that the results obtained at the Reichsanstalt have not been given consideration is unfounded. Bibliography. F. C. K.

Heat of solution of gypsum in the region of maximum solubility. F. LANGE AND F. DÜRR. *Z. physik. Chem.* **118**, 129-39(1925).—Thermodynamics of solns. yields the expression $(d \ln c/dT)(f_0 + c(df_0/dc)) = -L/RT^2n$. L is the last heat of per mol. soln.; in the case of sparingly sol. substances this may be taken as practically equal to the total heat of soln. f_0 , c and n are the osmotic coeff., concn. of solute in moles/l., and no. of atoms per mol. of solute, resp. Since $f_0 + c(df_0/dc)$ is not likely to be zero in case of a sparingly sol. substance, $L = 0$ must correspond to the condition that the soly of the substance is either max. or min. Data of Hullett and Allen (*J. Am. Chem. Soc.* **24**, 667(1902)) show that CaSO₄·2H₂O has a max. soly. in the neighborhood of 35°. Direct measurements of the heat of soln. at 22.5°, 27.8°, 33.4° and 37.6° yield $L = -590, -300, \pm 0$, and 230 cal./mol., resp., confirming the above prediction. The accuracy of the measurement of L is about 40 cal./mol.

F. C. KRACEK

The passivity of nickel. FRITZ EISENKOLB. *Z. Elektrochem.* **31**, 503-7(1925).—Detns. of the passivification of Ni in oxygen acids give the same value of the transition potential which is only to a very slight extent dependent upon concn. The other metals of the Fe group are not analogous. The passivity of Fe and Ni was studied in H halide acids, in mixts., in order to study effects of the anion, and with rotation of the electrodes. There is no difference in numerical value between active and passive metal.

GEORGE L. CLARK

Saturated standard cells with small temperature coefficients. W. C. VOSBURGH. *J. Am. Chem. Soc.* **47**, 2531-40(1925).—By substituting for the Cd-amalgam electrode of the normal Weston cell a Cd-Sn-amalgam electrode the e. m. f. was increased from 1.01805 to 1.01901 v. at 25°, and the temp. coeff. was decreased to about 2/3 that of the normal Weston cell. The cell thus formed was as reproducible and as nearly const. over short periods of time as the Weston cell. There is no reason to expect any greater variability over long periods of time. A similar cell with a Cd-Pb-amalgam electrode had an e. m. f. of 1.01918 v. at 25° and a higher temp. coeff. than the cell contg. Sn. The presence of Pb in a Cd amalgam increased the tendency for the reaction of the Cd with H ion of the electrolyte. In both these cells the e. m. f. was equal to the sum of the e. m. fs. of the Weston cell and an amalgam cell with one electrode of pure Cd amalgam and the other a Cd amalgam contg. Sn or Pb. Similar amalgam cells with Bi in one amalgam gave an e. m. f. of 1.01976 v. at 25° and with a positive temp. coeff. equal to the negative temp. coeff. of the similar cell with a Cd-Sn-amalgam electrode. Amalgam cells in which one electrode contained Cu had an e. m. f. of only about 10 mmv. and showed that the presence of Cu in the amalgam of a Weston cell would not appreciably alter the e. m. f. or temp. coeff.

JAMES M. BELL

Concentration electromotive force in solutions containing acid. A. R. GORDON AND C. WEBER. *Trans. Roy. Soc. Can., Sec. III* (3) **19**, 26-7(1925).—The p. d. across a liquid surface sepg. 2 air-free CuSO₄ solns. in max. conducting H₂SO₄ can be expressed by P. D. = $IR + B' \ln Z_0/Z$, in which Z_0 and Z are the concns. of the Cu ions and B'

is the Nernst factor ($RT/2F$). For Cu_2Cl_2 in 3 N HCl and Ag_2SO_4 in N H_2SO_4 $B' = RT/F$. The transport no. for Ag in 0.025 N soln. is 0.023 and for 0.0125 N soln. 0.011. J. W. SHIPLEY

A photomicrographic study of the evolution and disappearance of gas during the passage of electricity through glass. J. B. FERGUSON AND O. W. ELLIS. *Trans. Roy. Soc. Can., Sec. III* (3) 19, 34 (1925).—This is a report from a photographic study of the phenomena and verifies the observation recorded in *C. A.* 18, 3303. Glass was found not to behave as a homogeneous medium in respect to the formation and disappearance of gas in an elec. discharge. J. W. SHIPLEY

The electrolysis of soda-lime glass. M. J. MULLIGAN. *Trans. Roy. Soc. Can., Sec. III* (3) 19, 35 (1925).—The elec. migration of Ag from a Ag anode in aq. solns. into glass was observed. Ag from an aq. soln. of AgNO_3 diffused into glass at 100° without the use of the elec. current. J. W. SHIPLEY

Oxidation-reduction potentials of organic substances. I. HANS V. EULER AND ARNE ÖLANDER. *Z. anorg. allgem. Chem.* 149, 1-17 (1925).—After an introductory summary of the theory of oxidation reduction potentials, measurements are given of O_2 electrode potentials (platinized Pt wires referred to a satd. KCl -calomel electrode at 18°) of solns. of different concns. which are buffered by phosphate so as to give p_{H} of 4.15 and 8.0. These solns. are hydroquinone, quinone, MeCHO , $\text{EtOH} + \text{AcOH}$, $\text{EtOH} + \text{AcOH} + \text{MeCHO}$, lactic acid, Na lactate, glucose, fructose, Na benzoate, and K cinnamate. H_2 electrode measurements on buffered hydroquinone solns. are also reported. The value of the O_2 electrode in the phosphate buffer of p_{H} 4.15 is 0.550 v. and of the H_2 electrode is 0.495 v. The value of the H_2 , O_2 chain in 0.5 N acetate mixture ($p_{\text{H}} = 4.15$) is around 0.700 for Au electrodes. D. S. VILLARS

Thermodynamic potential differences at the boundary of two liquid phases. II. SERG. VOZNESENSKII. *Z. physik. Chem.* 117, 457-60 (1925); cf. *C. A.* 19, 3204.—Cells of the type $\text{Ncalomel} | \text{acid} + \text{KOH} | \text{acid} + \text{KOH} | \text{KCl} | \text{Ncalomel}$ in H_2O | in AmOH | AmOH | electrode were made up with H_3PO_4 or citric acid concn. of 50 millimoles per l., and KOH concns. of 0 to 100 millimoles per l. in the aq. phase. Breaks were found in the e. m. f./concn. of KOH curves corresponding to the formation of primary, secondary and tertiary salts. Cells with N KCl in H_2O and AmOH between N calomel electrodes, with varying amts. of butyric or valeric acid added showed no e. m. f. in case of the latter acid, and only a small value with butyric acid at concns. greater than approx. 400 millimoles/l. in the aq. phase. F. C. KRACEK

Some electrode phenomena in electrolysis. J. A. CROWTHER AND R. J. STEPHENSON. *Phil. Mag.* 50, 1066-79 (1925).—A contact or interface resistance exists between an electrolyte and a polarizable electrode. The resistance is inversely proportional to the total pressure on the cell, from which it is deduced that a thin gas film is responsible for the resistance. If the e. d. exceeds a crit. value the resistance of the electrolyte is largely increased. Possibly the liquid is thrown into the spheruloid state by the heat generated in the contact resistance. S. C. L.

The magnetic susceptibility of rubidium bromide, cesium iodide, krypton and xenon. LOUISE CROW. *Trans. Roy. Soc. Can., Sec. III* (3) 19, 63-70 (1925); cf. *C. A.* 18, 1232.—The object was to measure the magnetic susceptibility of 2 compds. differing in the sum of the at. nos. of their constituent elements by unity from that of Kr on the one hand and from that of Xe on the other and then deducing from the results by interpolation the susceptibility of Kr and Xe . The salts RbBr and CsI were placed in glass tubes suspended from a balance and then brought midway between the poles of an electromagnet. The pull in grams due to the magnetic field was measured and compared with that of Hg used in the same tubes and the value for the magnetic susceptibility of Hg at 18° taken as $K = -205 \times 10^{-6}$. Two measurements for CsI gave $K = 78.8 \times 10^{-6}$ and $K = 76.4 \times 10^{-6}$. RbBr gave $K = -62.9 \times 10^{-6}$. On the assumption that the constituent elements were in the ionic condition and that the susceptibility is proportional to the square of the at. nos., for Cs $K = -38.0 \times 10^{-6}$ and -36.8×10^{-6} , for I , $K = -40.8 \times 10^{-6}$ and -39.6×10^{-6} , for RbBr , $K = -29.9 \times 10^{-6}$ and for Br , $K = -33.0 \times 10^{-6}$. Interpolation gives for Kr $K = -31.5 \times 10^{-6}$ and for Xe $K = -38.2 \times 10^{-6}$ and -39.4×10^{-6} which, expressed as vol. susceptibilities at 20° and 760 mm are -13.1×10^{-10} for Kr and a mean of -16.2×10^{-10} for Xe . The magnetic susceptibility of the pure alkali metals K , Rb and Cs measured with the same app. gave for K -1.9×10^{-6} , for Rb -7.0×10^{-6} and for Cs -8.0×10^{-6} at 20° . J. W. SHIPLEY

Color. R. DOSNE. *Chimie et industrie Special No.*, 363-9 (Sept., 1925).—Explanation, discussion and criticism of Ostwald's method of color analysis. A. P. C.

The scattering of light by anisotropic liquids. W. H. MARTIN. *Trans. Roy. Soc. Can., Sec. III* (3) 19, 36-8(1925); cf. *C. A.* 19, 779.—*p*-Azoxyanisole between its m. p., 116°, and 135° is a turbid liquid exhibiting in its optical properties a disordered mass of uniaxial crystals. After filtering through a Mandler diatomaceous earth filter its depolarization factor, with white light and a combination of the Wollaston and Nicol prisms, was found to be 0.85. This value corresponds to that of a liquid compd. of mols. in which vibration can occur in only one direction, that is of needle-shaped mols. The value of 0.85 was almost independent of the color of the exciting light. J. W. S.

Light scattering of "abnormal" liquids. O. C. H. KITCHING. *Trans. Roy. Soc. Can., Sec. III* (3) 19, 30(1925); cf. *C. A.* 18, 20.—Dust-free org. liquids were prepd. by filtration through Mandler diatomaceous filters. Light scattering of aniline, phenol and acetaldoxime at temps from 20° to 100° was measured relative to C_6H_6 and the results were compared with calcd. values. Aniline and phenol behaved as normal liquids but acetaldoxime gave a value double that calcd. and the temp. coeff. was about $1/4$ the calculated value. This deviation is explained on the assumption of equil. between the stereoisomers. J. W. SHIPLEY

The optical constants of magnesium and zinc crystals. M. E. GRABER. *Phys. Rev.* 26, 380-9(1925). D. C. BARDWELL

Coloration of fluorite. H. STEINMETZ. *Z. Krist.* 61, 380-8(1925).—A study of fluorite crystals showing zonal distribution of color. Although the color is oriented according to crystallographic directions, it is also controlled by colloidal-chem. laws not yet understood. I. S. RAMSDELL

Diffusion of light by active and inactive molecules. R. DE MALLEMANN. *Compt. rend.* 181, 371-4(1925).—According to Gans (cf. *C. A.* 18, 20, 1427), theory predicts a difference in the Tyndall effect of active and inactive particles, and this is borne out by experience. This is wrong because the distinguishing mathematical terms are negligible. (Cf. *Bull. soc. phys.* 183, 197.) The Tyndall effect of active and inactive particles differs only in the rotation of the primary vibration. D. S. VILLARS

A method for the determination of the principal indices of refraction of birefringent substances with a Fedorov plate. CARLO PERRIER. *Atti accad. Lincei* [6], 2, 22-9(1925).—A detailed description of the detn. of n of a substance in the solid state by the use of the microscope. E. J. WITZEMANN

The light of the night sky: Its intensity variations when analyzed by color filters. II. LORD RAYLEIGH. *Proc. Roy. Soc. (London)* 109A, 428-44(1925). G. CALINGAERT

Higher oxides of Ag (JIRSA) 6.

Catalogue of British Scientific Technical Books. Compiled by Comm. of the British Science Guild. London: A. F. DENNY, LTD. 489 pp. 12s. 6d. Reviewed in *Chemistry & Industry* 44, 934(1925).

CUSHMAN, ALLERTON S.: **Chemistry and Civilization.** 2nd ed., revised. New York: E. P. Dutton & Co., 171 pp. \$2.50. Reviewed in *Chemicals* 24, No. 24, 7(1925).

BÜCKEN, ARNOLD: **The Fundamentals of Physical Chemistry.** Translated by E. R. Jette and V. K. LaMer. New York: McGraw-Hill Book Co. 699 pp. \$5.50. Reviewed in *J. Franklin Inst.* 200, 699(1925).

PODOR, ANDOR: **Die Grundlagen der Dispersoidchemie.** Dresden: T. Steinkopff. 280 pp. \$3.50. (M 12, bound M 14.) Reviewed in *Eastman Kodak Co., Monthly Abstract Bull.* 11, 656; *Chemistry and Industry* 44, 1189(1925).

FOSTER, WM.: **The Elements of Chemistry.** New York: D. Van Nostrand Co. 576 pp. \$2. Reviewed in *J. Franklin Inst.* 200, 690; *J. Phys. Chem.* 29, 1483(1925).

HATSCHKE, EMIL: **An Introduction to the Physics and Chemistry of Colloids.** 5th ed., revised and enlarged. London: J. & A. Churchill. 183 pp. 7s. 6d. net. Reviewed in *Chem. Trade J.* 77, 451(1925).

HATSCHKE, EMIL: **Laboratory Manual of Elementary Colloid Chemistry.** 2nd ed., revised and enlarged. London: J. & A. Churchill. 153 pp. 7s. 6d. Reviewed in *Pharm. J.* 115, 500; *Chem. Trade J.* 77, 451(1925).

HENRI, VICTOR: **Structure des molécules.** Paris: Ed. J. Hermann. 122 pp., 20 fr. Reviewed in *Chimie et industrie* 14, 818(1925).

KOPACZEWSKI, W.: **Introduction à l'étude des colloïdes, état colloïdal et ses applications.** Paris: Gauthiers-Villars & Cie. 220 pp., 16 fr. Reviewed in *Rev. prod. chim.* 28, 763-4(1925), and in *Chimie et industrie* 14, 818(1925).

LEWIS, W. C. MCC.: **A System of Physical Chemistry.** Vol. II. **Thermodynamics.** 4th ed., revised and enlarged. New York: Longmans, Green & Co. 489 pp.

\$4.75. Reviewed in *Phys. Review* **26**, 869; *Chem. Met. Eng.* **32**, 877; *Chem. News* **131**, 205(1925). Cf. *C. A.* **19**, 936.

MOLINARI, E.: *Trattato di chimica generale ed applicata all'industrie. Vol. I. Chimica Inorganica.* Pt. 2. 5th ed., revised and enlarged. Milan: Ulrico Hoepli pp. 681-1350. L. 45. Cf. *C. A.* **18**, 1426.

OSTWALD, WILHELM: *Farbkunde.* Leipzig: S. Hirzel. 313 pp. M. 9; bound M. 11.

OSTWALD, W., and LUTHER, R.: *Physiko-Chemische Messungen.* 4th ed., revised and enlarged. Leipzig: The Akademische Verlagsgesellschaft m. b. H. 814 pp., bound \$8.35; paper \$7.60. Reviewed in *J. Franklin Inst.* **200**, 830; *Phys. Review* **26**, 869 (1925).

Premier conseil de chimie. Institut international de chimie Solvay. Rapports et discussions sur cinq questions d'actualité. Paris: Gauthier-Villars et Cie. 336 pp. Fr. 30. Reviewed in *Science Progress* **20**, 352(1925).

The Foundations of Colloid Chemistry. Collected papers by colloid chemists (now deceased) published at request of the Colloid Committee of the Brit. Assoc. New York City: Macmillan Co. \$4.92. Reviewed in *Eastman Kodak Co. Monthly Abstract Bull.* **11**, 657(1925).

THOMPSON, R. CAMPBELL: *On the Chemistry of the Ancient Assyrians.* London: Luzac & Co. 158 pp. 25s. net. Reviewed in *Nature* **116**, 703; *Chemistry & Industry* **44**, 1123(1925).

WÄCHTER: *Grundbegriffe der modernen Chemie.* Wien: A. Hartleben. 160 pp. \$4 cents. Reviewed in *Am. J. Pharm.* **97**, 722(1925).

WEBB, HANOR A., and DIDCOCK, JOHN J.: *Early Steps in Science.* New York: D. Appleton & Co. 691 pp. \$1.68. Reviewed in *J. Chem. Education* **2**, 818(1925).

ZSIGMONDY, RICHARD: *Kolloidchemie, ein Lehrbuch.* 5th ed., revised and enlarged. Vol. I. General Part. Leipzig: Otto Spamer. 246 pp. G. M. 11; bound G. M. 13.50. Reviewed in *J. Franklin Inst.* **200**, 555(1925).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Advances in photochemistry. W. MEIDINGER. *Z. angew. Chem.* **38**, 1029-32 (1925). E. J. C

The structure of the hydrogen molecule ion. H. C. UREY. *Proc. Nat. Acad. Sci.* **11**, 618-21(1925).—The energy is calcd. of the steady state in which the electron vibrates in a straight line perpendicular to the middle point of the line joining the nuclei. The energy equation is $W = -Rhc_1 (1/n^2) 1.2300$, where R is the Rydberg const., h Planck's const., c_1 the velocity of light and n the quantum no.; and $2c/a = 1.051n^2$, where c is $1\frac{1}{2}$ the distance between nuclei and a = the radius of the first Bohr orbit for H. The calcd. ionizing potential is 16.65 v., agreeing well with the observation of Olsen and Glockler. Secondly the heat of dissociation and the moment of inertia calcd. agree with exptl. data. The theory predicts that there should be an ultra-violet spectrum belonging to H_2^+ between 850 and 741 Å. U. G. L. CLARK

Structure of the elements of the iron series in the periodic system. M. A. CATALAN. *Anales soc. españ. fis. quim.* **23**, 395-408(1925); cf. *C. A.* **19**, 610.—The arc and spark spectra show a similarity between the first 5 and the second 5 elements 19 K to 28 Ni. The azimuthal quantum number of the fundamental levels is the same for the corresponding elements, the multiplicity of these terms rising up to Mn and falling thereafter. The principal of selection elaborated by Russell and Laporte is discussed. C. proposes to change the Russell designation "ultimate and penultimate lines" to "primary and secondary lines." Certain regularities are found between the resonance lines and multiplicity of their terms, also between the Gaumont *raies ultimes* for these elements. The empirical rule that the *raies ultimes* are always found in multiplets of the type $k \rightarrow k + 1$ given by Meggers is explained. In arc and spark spectra the terms are regular when the multiplicity is rising, are inverted if the multiplicity is falling, and there are both regular and inverted terms when the multiplicity has reached a max. or a min. E. M. SYMMES

Chemical statics of electronic phenomena. L. ROLLA AND G. PICCARDI. *Atti accad. Lincei* [6], **2**, 29-31, 128-32, 173-7(1925).—The ionization of an atom according to the scheme: $A \rightleftharpoons A^+ + \text{electron}$, is considered as an ordinary chem. reaction to which the law of mass action and van't Hoff's formula are applicable. This hypothesis

of Meg Nad Saha (C. A. 15, 468, 799, 1452) that has such important applications in astrophysics lacks direct exptl. proof, although King (C. A. 16, 3255) has supplied qual. evidence in its support. Because of its importance this reaction merits further study and R. and P. have undertaken a quant. exptl. study. A fine metallic thread placed in a flame and at red heat emits electrons. In a flame contg. an atomic species A the reaction $A \rightleftharpoons A^+ + \text{electron}$ takes place and A^+ ions and electrons will be present. The ions remain near or strike against the wire and their charges are neutralized by taking an electron from the metal itself. The electrons remain free in the flame. If these free electrons are collected and are carried away from the incandescent wire a continuous electronic current is obtained. The intensity of this current will be a function of the no. of electrons that pass in a unit of time and more precisely by admitting that $e = 4.774 \times 10^{-10}$ electrostatic units, the current due to 1 electron is 15.84×10^{-20} amp. The no. of electrons is equal to the no. of ions per sec. according to the above reaction and the concn. $[A]$ can be calcd. easily from the wt. of the substance volatilized per unit of time and from Avogadro's no. ($6 \times 10^{23} = N$). One is thus able to calc. the dissoen. const. and the equil. const. of the above reaction. Various systems for collecting the current were tried. The best results were obtained by using a fine wire to generate the electrons, which were collected on a thin plate. These devices are illustrated and described in detail. A weighed pearl of the salt of the metal in question is introduced into the flame on the wire and the current produced at any instant is measured with the galvanometer. The diagram obtained is integrated graphically to obtain the av. total current. The numerical quant. data are given in tables and graphs. From the loss in wt. of the pearl and the other data $[A]$, $[A^+]$, and $[e]$ are obtained $X = \% \text{ dissoen.} = 100 \frac{[A^+]}{[A]}$ and $K = \text{equil. const.} = \frac{[A^+][e]}{[A]}$.

The applicability of the law of mass action to these phenomena was demonstrated. On the basis of the values K for the equil. const. the heat of ionization and the ionization potential can be calcd. With Na this was found to be 116,000 cal (Franck Hertz, (C. A. 11, 2556; 13, 2483) found 117,000 cal.) or expressed in v. $U = 5$ (instead of 5.1 v.). In expts. with Rb, K, Na, Li, Ba, Ca, Tl, Cu, B and P at temps. 1100–1500° only those elements having an ionization potential below 8 v. were appreciably ionized. All elements constituting the acid radicals of salts have very high ionization potentials, generally above 10 v., and consequently at the temp. of these expts. these elements do not give rise to an appreciable electronic current. The current produced is thus due only to the products of ionization of metallic atoms (cf. Arrhenius, *Ann. Phys.* 43, 18(1891)). The relation between the ionization potential and the chem. function of the elements is discussed in the last paper. The ionization potential is independent of the temp. (at least under the conditions used) and so by integrating the formula that expresses the law of mobile equil. the linear law $\log K = -U/RT + C$ is obtained that gives $\log K$ as a function of U when T is const. (C is a const. of integration). If now U is known for 2 different elements the values of $\log K$ can be detd. experimentally for the 2 elements and then the coeffs. of this equation can be calcd., valid for the conditions selected. Once these coeffs. are known U can be calcd. for other elements by detg. the value of $\log K$ experimentally. That this equation is applicable is shown by data given. The divergencies between the predicted value for the ionization potential and the observed potential detd. in the other way is of the order of tenths of a volt. The ionization potentials of 4 elements were detd. in this way. The values follow: Ba 5.1 v. (5.19 v.), Sr 5.6 (5.67 v.), Mo 7.1 v. (7.35 v.), Cu 7.6 v. (7.8 v.). The values in parentheses had been calcd. from spectroscopic data. This method is preferable from the exptl. point of view to the one described above for rapidity of work and accuracy and certainty of results.

E. J. WITZEMANN

The excitation energy necessary for atomic disintegration. ADOLF SMEKAL. *Naturwissenschaften* 13, 800–1(1925).—From data of Kirsch (C. A. 19, 3212) on the const. difference $E_1 - E_2$ ($= 15 - 16 \times 10^{-7}$ ergs) between the energy E_1 necessary for temporary union of a N nucleus with an impinging α -ray particle and the energy E_2 liberated on emission of a H particle from the (N + α) nucleus, S. concludes that (although the suppositions of Kirsch are rather uncertain yet) the resulting O-isotope, O^{17} , apparently has this difference as a quantized energy amt. at its disposal. It represents the excitation energy for the disintegration process and corresponds to a min. range of 4.6 mm. of the α -rays.

B. J. C. VAN DER HOVEN

The behavior of lead containing radium in the formation of formaldehyde according to Thunberg. A. SROLFI. *Atti accad. Lincei* [6], 2, 195–7(1925).—Thunberg (C. A. 18, 848) has recently stated that the photochem. reduction of CO_2 proceeds thus $2H_2O + \text{solar light} \rightarrow H_2 + H_2O_2$. The H_2 evolved and the H_2O_2 react thus: $CO_2 +$

$\text{H}_2 + \text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{CO}_2 + \text{O}_2$ and $\text{H}_4\text{CO}_2 \rightarrow \text{HCHO} + \text{H}_2\text{O}$. T. reduced CO_2 of basic Pb carbonate in this way. S. decided to det. whether basic Pb carbonate contg. Ra G would behave differently in this reaction from basic Pb carbonate prepd. from ordinary Pb. Cotunnite (PbCl_2) was used from a vesuvian fumarole known to be radioactive by reason of radio-Pb (Zambonini, *Atti accad. Lincei*, **16**, 1, 975(1907); Rossi, *Atti accad. Lincei*, **16**, 1, 630(1907)) of which the at. wt. is 207.05 (Piuetti, Migliacci, *Accad. Sci. Fis. e Mat., Napoli* 1925). The expts. were carried out according to the directions of T. The presence of Ra G caused no difference in the formation of CH_2O in comparison with ordinary Pb. E. J. WITZEMANN

A determination of the variation of the mass of the electron with velocity, using homogeneous β -rays. R. A. R. TRICKER. *Proc. Roy. Soc. (London)* **109A**, 384-96 (1925).—The variation of the mass of the electron with its velocity is detd. by a method consisting in the acceleration of the "line" β -rays from RaB and RaC in a focusing app. The accuracy is of a similar order to that in the expts. of Bucherer (*Ann. Physik* **28**, 974(1909)). The results, with rays of velocity up to 0.8 that of light, agree with the theory of relativity within the limits of exptl. error. G. L. CLARK

The absorption coefficient for slow electrons in the vapors of mercury, cadmium and zinc. R. B. BRODE. *Proc. Roy. Soc. (London)* **109A**, 397-405(1925).—The absorption coeff., or the effective area of a mol. within which an electron is deflected, was measured for electrons from 0.4 to 50 v. velocity in the vapors of Hg, Cd and Zn. Except for the change below 4 v. in Cd, and the small drop in Hg below 3 v., the curves are approx. hyperbolas of the same size. There are no indications of long free paths at low velocities. The sudden decrease in the absorption coeff. above the ionization potential, when measured at low pressure, is due to the effect of the ions in the emission of the filament and not to a true change in the absorption coeff. A type of *valve* is described for closing off the app. *in vacuo* at high temps. G. L. CLARK

Study of electron currents through crystals. B. GUDDEN AND R. POHL. *Physik. Z.* **26**, 481-3(1925).—In his study on the action of temp. upon the photoelec. current in crystals, Lenz (*Physik. Z.* **26**, 365; cf. *C. A.* **19**, 3422) omits the fact that temp. affects the absorption of light by crystals. His measurements at different temps. cannot be compared and do not justify his conclusions. C. CALINGAERT

Scattering of electrons in ionized gases. IRVING LANGMUIR. *Phys. Rev.* **26**, 585-613(1925).—Analysis of the current received by a collector placed opposite a hot cathode indicates that there are 3 groups of electrons present, (1) *primary electrons* which retain practically all the momentum they acquired in passing through the positive ion sheath around the cathode, (2) *secondary electrons* moving in random directions with Maxwellian velocity distribution, (3) *ultimate electrons* having a Maxwellian velocity distribution corresponding to a much lower temp. than the secondaries, and dependent upon the gas present and its pressure. The no. of ultimate electrons is roughly 1000 times the primaries and secondaries for Hg, although relatively less for H_2 . In the uniform positive column of arcs only ultimate electrons are present. Consideration of the no. of collisions of electrons with each other and the high temp. maintained indicates that electrons in low-pressure arcs suffer many changes of momentum during time intervals between collisions. Analysis of the effects to be expected when a beam of primary electrons encounters a cloud of stationary electrons, indicates that the scattering is best accounted for by collisions with a cloud of radiation quanta, a *kind of Compton effect*. The observed scattering is about 10^6 greater than the normal Compton effect would give. D. C. BARDWELL

Relative production of positive and negative ions by electron collisions. F. L. MOHLER. *Phys. Rev.* **26**, 614-24(1925).—Positive or negative ions produced in HCl, Hg, I_2 and HgCl_2 by accelerated electrons were collected by a concentric cylindrical electrode maintained at a potential slightly lower or higher than the axial electron beam. The primary electrons were removed by a solenoidal magnetic field. The expts. give no support to the theory that electrons dissociate polar mols. into positive and negative ions, but are in agreement with the results of magnetic analysis that the primary effect is the production of a positive mol. ion. The negative ion curves indicate that only slowly moving electrons can attach themselves to mols. to form negative ions. D. C. BARDWELL

Ionization of hydrogen by slow electrons. H. KALLMANN AND M. A. BREDIG. *Naturwissenschaften* **13**, 802(1925).—Preliminary report on *e/m* detns. of H ionization products. At 16 v. electron energy H_2^+ ions are primarily formed; these produce secondarily some H ions and more H_3^+ ions, also neutral atoms; possibly some H ions are primarily formed. At higher electron velocities up from 30 v. the number of H

ions increases, corresponding to a second ionization potential (Frank and Krüger) of 29 v.

The nature of the ions from hot platinum. H. A. ERIKSON. *Phys. Rev.* **26**, 625-8 (1925).—The mobilities of the ions produced by hot Pt were obtained by driving the ions across a stream of air by means of an elec. field. The mobilities indicated ions of the same mass as for air.

The mobilities of the ions of the active deposits of thorium and radium. H. A. ERIKSON. *Phys. Rev.* **26**, 629-32 (1925).—Two positive active bodies differing in mobility were found in the active deposits of thorium and radium. It is more probable that the different mobility is due to one body being singly charged and the other doubly charged than that it is due to a deposit of an A product and a B product successively.

Characteristics and spectra of low-voltage arcs in hydrogen, nitrogen and mixtures of hydrogen with mercury and nitrogen. C. T. KWEI. *Phys. Rev.* **26**, 537-60 (1925).—A study was made of the breaking voltage of the arc in a spherical bulb containing a Ni disk electrode and a W filament and provided with a quartz window for spectroscopic examn. With pure H₂, the arc broke at 16.2 v., (its ionization potential) By plotting the 2/3 power of the current against the voltage, the ionization potential of the H at. was located at 13.7 v. With pure N₂, the breaking voltage was 16.2 (its ionization potential is 16.9 v.). In mixts. of H₂ and Hg, two arcking and two breaking voltages were observed, the difference between them being 10.4 v. (the ionization potential of Hg). Mixts. of H₂ and N₂ behaved similarly to the mixts. with Hg. Spectroscopic phenomena accompanying these changes were observed and their meaning discussed.

Ionization in reacting gases. A. K. BREWER. *Phys. Rev.* **26**, 633-42 (1925).—See C. A. **19**, 3423.

The effect of knock inducers and suppressors on gaseous ionization. G. L. CLARK, E. W. BRUGMANN AND W. C. THEE. *Ind. Eng. Chem.* **17**, 1226-9 (1925).—By passing the gas through an ionization chamber, using monochromatic Mo X-rays as the ionizing source, and then through a second chamber containing 2 electrodes 20 cm. apart and each at 113 volts potential difference from the chamber, the relative ionization currents at the 2 electrodes give a measure of the rate of recombination of the gaseous ions. Based on air, the rate of recombination was decreased slightly by C₆H₆ vapor, somewhat more by C₆H₆ and BuONO, but was most decreased by C₆H₆ and PbEt₄. The latter fact does not agree with previous theories as to the action of anti-knock compds. Other theories are briefly discussed and further research is suggested.

Electron conduction in crystals. HERBERT LENZ. *Physik. Z.* **26**, 642-3 (1925); cf. C. A. **19**, 3422; **20**, 10.—A reply to Gudden and Pohl's criticism (C. A. **19**, 1659) of L.'s work on the temp. variation of photoelec. current in crystals, especially diamond and ZnS, it is emphasized that the primary (electron) current decreases as temp. is lowered, all other variables being const. Lenz used the undispersed light from a quartz Hg lamp in contradistinction to the monochromatic radiation considered by G. and P. Seven ZnS crystals used by L. gave the same effect. L. is of the opinion that more data are needed before definite theoretical conclusions can be made. Current excited by cathode rays impinging on the crystals does not vary appreciably with the temp. of the crystal.

The photoelectric threshold for mercury. C. B. KAZDA. *Phys. Rev.* **26**, 643-54 (1925).—Very carefully purified Hg gave a value of 2735 A. U. for the photoelectric threshold corresponding to a work function of 4.52 v.

Variation in the photoelectric emission from platinum. A. E. WOODRUFF. *Phys. Rev.* **26**, 655-70 (1925).

Investigation of photoelectric valve coated with potassium. V. M. ALBERS. *Phys. Rev.* **26**, 671-7 (1925).

Indirectly excited fluorescence spectra. S. LORIA. *Phys. Rev.* **26**, 573-84 (1925).—The expts. of Franck and Cario on the fluorescence spectrum of Tl mixed with Hg vapor were repeated and the previous results confirmed. The enhancing effect of inert gases observed by Donat was confirmed. Evidence is obtained that the metastable Hg atom may survive many collisions with normal A or N₂ mols. but easily gives up its energy when colliding with normal Tl or Hg atoms, probably more easily to Tl than to Hg.

The influence of the surrounding medium on frictional electricity. J. H. JONES. *Phil. Mag.* **50**, 1160-77 (1925).—When electricity is produced on a metal by friction with silk the amt. produced depends greatly upon the material used as a basis for the silk; to ensure a large amt. of electricity the material should not be an insulator, but should

possess an appreciable degree of cond. If a metal is rubbed for a prolonged period with silk, the potential of the metal undergoes fluctuations, which may be due to the silk being rubbed away in layers or to a fatigue of this material similar to that which has previously been observed in ebonite. If a metal is being rubbed by silk in air and if the potential of the metal is low, the introduction of any one of the following gases, coal-gas, H_2 , CO_2 to replace the air, causes the potential to rise. On the other hand, if the potential in air was high, the admission of one of these gases caused the potential to fall. The introduction of SO_2 to replace the air in all cases caused the potential to rise, whether the potential in air was high or low. How far this effect may be due to the superior cond. of this gas has not yet been detd. O_2 , and still more O_3 , always caused a fall of potential as compared with that developed in air. This effect does not appear to be due to leakage through these gases. It is suggested that the fall of potential in O_2 may be due to a partial ozonization of the gas by the field, due to the frictional electricity. The influence of these gases on the amt. of frictional electricity produced is greatest when the silk-rubber is mounted on a metal base. If the air surrounding the rubbing-surfaces is replaced by a liquid medium, the potential of the metal is higher if the liquid possesses appreciable conductivity; ordinary lamp-oil is superior in this respect to pure paraffin. This effect may be partly due to the removal by the liquid of some of the charge on the silk-rubber, as suggested in the case of SO_2 . The effect of a liquid insulator (e. g., paraffin oil) as medium increases with rise of temp. of the liquid up to a certain point. This may be due to the gradual increase of cond. of the liquid. At a certain temp. however, the insulation of the oil appears to break down, and the production of frictional electricity almost stops. The temp. of the rubbed metal surfaces rises almost in proportion to its potential. The metal wheel gives the best result in air, ebonite the poorest, while the ebonite wheel gives the best result in oil, metal the poorest. The order of the gaseous media for the best production of frictional electricity is SO_2 , air, N_2 , coal-gas, H_2 , CO_2 , O_2 , O_3 . Liquid media: crude lamp-oil, pure paraffin. S. C. L.

Quantum theory of the polarization of resonance radiation in magnetic fields. J. H. VAN VLECK. *Proc. Nat. Acad. Sci.* **11**, 612-8(1925).—The resultant polarization due to the superposition of unresolved Zeeman components in light from Na vapor emitting resonance radiation in a magnetic field is calcd. as a function of the angle between the elec. vector of the exciting radiation and the magnetic field and the ratio of the energy of frequency D_1 to the energy of frequency D_2 in the exciting beam. In this calcn. the latest theoretical and exptl. values for the intensities of Zeeman components are used. The results are in fair agreement with recent expts. S. K. A.

Recent researches in positive rays. W. WIEN. *Nature* **115**, 780(1925).—A review. F. N. S.

A new laboratory for precision X-ray research. ALICE H. ARMSTRONG AND W. W. STIFLER. *J. Optical Soc. Am.* **11**, 509-17(1925).—The Cruft High Tension Lab. at Harvard University is described. J. H.

An attempt to test the quantum theory of X-ray scattering. R. D. BENNETT. *Proc. Nat. Acad. Sci.* **11**, 601-2(1925).—An attempt was made to test the angular relations between the recoil electron and the scattered quantum by using Geiger counters mounted on a divided circular scale. It was also desired to discover whether the registration of a scattered quantum is simultaneous with the registration of a recoiling electron at the correct angle. Definite results were not obtained, because of (1) the occurrence of coincidences in groups, (2) the time lag in the point counters. Work is being continued. S. K. ALLISON

X-rays from a ruled reflection grating. A. H. COMPTON AND R. L. DOAN. *Proc. Nat. Acad. Sci.* **11**, 598-601(1925).—An X-ray beam fell on the surface of a speculum metal grating, ruled lightly with a grating space of 2.000×10^{-3} cm. The grazing angle of the beam was less than 25 min. of arc, and in this range total reflection takes place. If the grazing angle on the grating face is less than a certain limiting angle, spectra appear on both sides of the totally reflected beam, which constitutes the zero order. Such spectra were obtained from Cu and Mo targets, also from the Mo $K\alpha$ line as reflected from a crystal. The weighted mean value of measurements on five films showing 1 to 4 orders of the Mo $K\alpha$ line is $\lambda = 0.707 \pm 0.003$ A. U. It is hoped to increase the accuracy of the method so that absolute measurements can be made with the same accuracy as that to which the grating space of calcite can be measured. S. K. ALLISON

The fine structure of certain X-ray absorption edges. KATHERINE CHAMBERLAIN. *Phys. Rev.* **26**, 525-36(1925).—See C. A. **19**, 1534. D. C. BARDWELL

The Michelson-Morley experiment. ALFRED DANIELL. *Nature* **115**, 378-9(1925).—On the basis of a "precise single ray" D. calcs. that there should have been

no interference effect in the M.-M. expt. unless the instrument were in rapid motion. The idea is severely criticized by Olijer Lodge.

Optical and magnetic rotatory dispersion. Dispersion, density and absorption spectra of chemically homologous substances. ALFRED KRITHLOW. *Z. wiss. Phot.* 23, 233-82(1925).—An extensive survey of the literature on natural and magnetic rotatory dispersion reveals the need of an adequate expression to connect the dependence of these properties on concn. and wave length. The classical law of Verdet, stipulating lack of dependence of sp. magnetic rotation on concn., as well as Wiedemann's law, demanding proportionality between these factors, are not in accord with recent measurements. K. has made a critical study of a series of 8 homologous mothylenecamphor derivs. in the hope of shedding light on these relations. The expts. as carried out necessitate a clear distinction between "natural" and "magnetic" rotatory dispersion. Natural rotatory dispersion is definitely related to concn. and hence Verdet's const. $R = \alpha'/Hl \cos \beta$ can be calcd. directly from the exptl. magnitudes. α' is the magnetic rotation in mins. (obtained from measurements of the rotation of the plane of polarization in a magnetic field); l is the length of absorbing column; H is the field strength (directly proportional to the current passed through an electromagnet with and without Fe cores); β gives the angular deviation of the light rays in the direction of the field. Values of α' and β are tabulated in degrees for different current strengths and for wave lengths in the range 6548-4861 Å. U. Similar data are recorded for C₁₀H₈ solns. of Al₂Cl₆. Hagenbach's formula $\alpha = A\nu^2 + B\nu^4 + \dots$ (C. A. 9, 1872) is found valid for homologous series, although the more general relation $\alpha = C(\phi)\lambda$ is in better agreement with the data. Since the magnetic rotation bears no definite relation to concn. of the soln., K. has proposed the formula $\alpha = [K_1/(\lambda^2 - \lambda_1^2)] - [K_2/(\lambda^2 - \lambda_2^2)]$, which is an elaboration of Drude's original equation. Dispersion curves calcd. on this basis are characteristically different for simple, complex and anomalous absorption. Cotton's phenomenon (anomalous rotation in the visible region) has been confirmed for the 21 substances investigated (cf. C. A. 15, 501).

H. R. MOORE

Measurement of the dispersion of carbon disulfide in the ultra-violet. G. BRUHAT AND M. PAUTHENIER. *J. phys. radium* 6, 287-94(1925).—See C. A. 19, 1819. H. G.

A spectral white-light filter. HELMUT NAUMANN. *Z. wiss. Phot.* 23, 303-19 (1925).—The requirements of an artificial light source modified to give an impression of daylight are discussed. Thus a simplified modification of Wien's formula $E = C \lambda^{-5}/e^{\lambda T}$ affords a theoretical basis for computing the ratio between the temp. T_1 of the continuously radiating source and the transmitted brightness T_0 . Calcn. of the energy curves for both temps. serves as a guide for estg. the optimum thickness of the filters and other exptl. magnitudes. Practical directions are given for prep. orthochromatic (300-600 mμ) and panchromatic (300-700 mμ) filters with aniline dyes. These filters are calibrated and their efficiencies ascertained by photographic density detns. throughout the entire spectral range of transmission. H. R. MOORE

Decay and regeneration of radio-luminescence. C. H. BIOL, G. D. KAMMER AND A. L. MILLER. *Nature* 115, 801-2(1925).—See C. A. 19, 2448. F. N. S.

Radiation from luminous flames. ALFRED SCHACK. *Z. tech. Physik* 6, 530-40 (1925).—The difference in temp. between the flame and the C particles in it is practically zero. The law of radiation absorption is applicable to this case. The absorption no.

of the C particles changes in the ultra-red and is approx. proportional to $\frac{1}{\lambda_{0.9}}$. Formulas are given for the calcn. of the radiation from the true and the black temps. J. H. P.

Life period of metastable s_3 and s_6 neon. H. B. DORGLO. *Naturwissenschaften* 13, 819; *Verslag Akad. Wetenschappen Amsterdam* 34, 779-86(1925).—For a certain period after interrupting the excitation of neon s_3 and s_6 atoms still exist and are able to absorb $1s_2-2p$ and $1s_6-2p$ lines from another emitting neon tube (cf. Meissner, C. A. 19, 1226). By 2 methods, one with rotating disk, the other with a c. of varying frequency (details to be published later), the life period of s_6 was found to be 1/240 sec., of s_3 1/2000 sec.

B. J. C. VAN DER HOEVEN

Remarks on the Zeeman effect and the structure of the ruthenium arc spectrum. L. A. SOMMER. *Naturwissenschaften* 13, 840-2(1925).—Contrary to conclusions recently given by Meggers and Laporte (C. A. 19, 260), S. found from Zeeman-effect observations on the quintet system that the ground term in the Ru arc spectrum is a reversed quintet F term. This makes the magnetic moment of the Ru atom under normal conditions equal to 7 Bohr magnetons.

B. J. C. VAN DER HOEVEN

The structure of the mercury green line $\lambda = 5460.74$ Å. U. and of the Balmer lines of hydrogen. J. C. MCLENNAN AND H. J. C. IRETON. *Trans. Roy. Soc. Can., Sec. III* (3)

19, 77-87(1925).—The Hg green line was examd. by an echelon grating made by Adam Hilger Co. The plates were 45 in number, 14.76 mm. thick and width of step was 0.1 mm. Light from a specially made Hg lamp was passed through a monochromatic filter designed for the Hg green line and the photographs were taken on panchromatic plates. Time of exposure was 3-9 min. The results showed the green line to be made up of 12 components and when a smaller echelon was crossed with the larger it was shown that 2 components had completely overlapped so that in reality there are 13 components. *Fine structure of Balmer Lines.*—The H α and H β lines were examd. with the echelon described above in the hope of obtaining a photographic record of the predicted third member of the Balmer lines. None was recorded. J. W. SHIPLEY

Analysis of the spectra of thallium by electrodeless discharge. W. C. MCQUARRIE. *Trans. Roy. Soc. Can., Sec. III (3) 19*, 57-62(1925); cf. *C. A.* 18, 1432.—An attempt was made to distinguish one order of spark spectrum from another in the electrodeless discharge spectrum of Tl and to establish the series relationships. A ring discharge through Tl vapor at 530° in a quartz tube was photographed through a Hilger const.-deviation spectrograph. The paper includes plates of the photographs and a table of the wave lengths, intensity and order of the lines observed. J. W. SHIPLEY

The peculiar form of discharge in argon. A. MOSKVIN. *Elektrichestvo (Russia)* No. 8, 464(1925).—The method employed for the purification of A for a special type of discharge was the one used for the rare gases, namely a discharge in the vapors of alkali metals (method of Salet, Zehnder and Mey, supplemented later by Gehehoff and Rottgardt). The app. consists of a cylindrical glass vessel with 2 electrodes. The upper electrode was a Pt plate, the lower one an alkali metal, heated to a temp. slightly above the m. p. The distance between the electrodes was 120 mm. At the time of discharge distinct luminous spheroid-shaped complexes appear near the surface of the alkali metal. They are slowly moving towards the other electrode but in most cases do not reach it, deviating from its course at an angle and disappear. Each sphere represents a luminous mass enveloped in a pale nebulous membrane. The diams of these spheres vary between 1 and 10 mm. The color is yellow when the lower electrode is Na. In most cases these spheres originate in the luminous membrane around the lower electrode; but sometimes between the electrodes and in exceptional cases at the top around the Pt electrode. The general movement, however, was from the Na towards the Pt and the speed varied within very wide limits. The greatest separation of such complexes is noticeable at times of applying the current and at change of potential. On contaminating the A with air (2%) the phenomenon is more pronounced in the sense of the number of spheres formed, but the size diminishes and correspondingly the time period of their existence. In most expts. impure A, or a mixt. of the rare gases, was used. The phenomenon seems to indicate the possibility of the existence of large complexes of activated mols. in an a. c. discharge. The more or less free and slow transport of the spheres at a discharge seems to point towards a low total charge. J. S. JOFFE

The under-water spark spectrum of a number of elements. MARY C. W. BUFFAM AND H. J. C. IRETON. *Trans. Roy. Soc. Can., Sec. III (3) 19*, 113-8(1925); cf. *C. A.* 16, 3037.—The object was to differentiate the spark from the arc spectra. By using an under-water oscillatory condenser discharge and a suitable condenser capacity in the circuit the arc lines were inverted on a dark continuous background while the spark spectra were not. The method was used for isolating the arc lines of Au, Ag, Cu, Co, Ni, Sb and Bi. The spectra were produced between metallic poles in a metal vessel through which distilled water circulated continuously. The light from the spark passed out through a quartz window and was focused on the slit by a cylindrical quartz lens. Hilger spectrographs were used for photographing the spectra. Wave-length tables and eight spectrum plates accompany the paper. J. W. SHIPLEY

Absorption spectra of various elements in the ultra-violet. J. C. MCLENNAN AND A. B. McLAY. *Trans. Roy. Soc. Can., Sec. III (3) 19*, 89-111(1925); cf. *C. A.* 19, 1096.—A continuation of the investigation of the absorption spectra of metals to obtain information regarding the outermost electrons of the neutral atom. This information was obtained by identifying the wave lengths constituting the arc spectrum of the element. Absorption by the non-luminous un-ionized vapor when the light from a spark or arc of the element under investigation was passed directly over the boiling metal was the method used. Making the absorption exposure longer than that of the comparison spectrum made it difficult to decide whether the reduction in intensity was due to selective absorption or to scattering. Absorption spectra of Au, Ag, Cu, Fe and Mn were obtained with the quartz spectrograph and of Au, Ag, Cu, Fe, Sb, Bi, As and Mn with the fluorite spectrograph. Tables of the absorbed wave lengths

together with those observed by others are given and two plates showing various sections from the spectra obtained accompany the paper. An addendum contains tables of absorbed wave lengths for Co, Ni, Cr and Fe obtained by using a carbon arc as source and the absorption lines reversed on the continuous background of the C arc spectrum.

J. W. SHIPLEY

Fluorescence radiation of nitrogen. O. OLDENBERG. *Proc. Nat. Acad. Sci.* **11**, 595-7(1925).—A condensed spark is produced in an atm. of N_2 at a pressure of a few tenths of a mm. of Hg. Stray discharges through the gas are prevented by suitable means. A ray of "ultra-Schumann" light from the spark produces fluorescence in the N_2 in its path. This fluorescence shows bands due to the neutral N mol. and to the N mol. ion, as proved by the work of Wien. In order to explain the high intensity of the bands due to the mol. ion relative to those from the neutral mol. it is assumed that the absorption of a quantum whose energy is greater than that required to remove an electron from the neutral mol. may in one act both ionize the neutral mol. and excite the ion. This corresponds to the simultaneous double electron jumps in the alk. earths which produce the primed spectral terms.

S. K. ALLISON

Fluorescence of colored vegetable materials. L. MEUNIER AND A. BONNET. *Compt. rend.* **181**, 465-7; *Chim. tech.* **14**, 486(1925), cf. *C. A.* **19**, 2758-3034.—Morin of yellowwood, quercetin of quercitron, rhamnetin of Persian berry and luteolin of yellowweed, which are similar in structure to fisetin, do not show fluorescence under Wood's light. The positions of the 4 (OII) groups in the mols. in the vegetable materials det. the occurrence, or not, of fluorescence. The fluorescent behavior of exts. of barberry, quebracho, curcuma, annatto, various red woods, saffron, alkanet and archil are compared with those of fisetin for the purpose of identifying the various vegetable coloring principles.

L. W. RIGGS

The infra-red spectra of certain elements. J. C. McLENNAN, H. G. SMITH AND C. S. PETERS. *Trans. Roy. Soc. Can., Sec. III* (3) **19**, 39-56(1925).—The spectra of N_2 , CO, Hg, Au and Te have been photographed in the region of 6000 to 9000 A. U. The photographs show no direct correspondence between the spectra of N_2 and CO in the infra-red region as was suggested by Nagaoka (*C. A.* **17**, 1587, 2388). Lines were found in the arc spectrum of Hg in the near infra-red region. A number of new lines have been photographed in the red and near infra-red regions. The paper includes wave-length tables and plates of the photographs.

J. W. SHIPLEY

A note on the vibration of the CO_2 group. P. A. TAYLOR. *Phil. Mag.* **50**, 1158-60 (1925); cf. Chapman and Ludlam (*C. A.* **20**, 11).

S. C. LIND

A class of one-valence-electron emitters of band spectra. R. S. MULLIKEN. *Phys. Rev.* **26**, 561-72(1925).—The similarity of the band spectra of the following mols. is discussed. BeF , BO , CO^+ , CN and N_2^+ , all are like Na at. in having $8 + 1$ electrons outside the nuclei and K electrons and their spectra resemble that of Na. MgF , AlO and SiN , contain an additional electron shell, but they are the probable emitters of similar band spectra. It is suggested that bands be grouped according to the no. of valence electrons of the emitters. Two causes of multiplicity in band spectra are suggested: (a) connected with the interaction of the emitting electron with the rest of the mol. and (b) attributed by Kratzer to the interaction of the angular momentum of the emitting and other electrons with that of the nuclei. Second negative N_2 bands of Duffendack may be due to neutral N mols. in each of which two electrons are initially excited. The familiar Al bands are probably due to AlO .

D. C. BARDWELL

Chemical action of light. HANNS JOHN. *Ber.* **58B**, 1563-5(1925).—Parallel expts were performed at Prague, Davos and in central Italy on the photochem. oxidation of toluene in presence of anthraquinone and air to benzoic acid in sunlight. The rates of oxidation in the 3 places were 0.0208, 0.0170 and 0.0397% per hour, resp.

F. C. KRACK

Photochemical potential changes. KARL SCHAUM AND WALTHER SCHLEUSSER. *Z. wiss. Phot.* **23**, 319-24(1925).—The relation $E = kT \log (\varphi/\varphi)(C_1/C_2)$ is found adequate to classify various photochem. and photovoltaic effects. E is the potential set up in the system under the influence of light; C_1 the concn. deduced from van't Hoff's isochore; C_2 the equil. concn. obtained from e. m. f. measurements. Changes in the value of C_1 control the potentials of both irreversible (catalytic) and reversible reactions. Thus the potentials of the catalytic change $2 Hg^{++} + (COO)_2^{--} \rightarrow$

$2 Hg^+ + 2 CO_2$ and the reversible reaction $Fe^{++} + Hg^+ \xrightleftharpoons[\text{dark}]{\text{light}} Fe^+ + Hg^{++}$ are

accounted for on this basis (cf. Baur, *C. A.* **13**, 282, 2627; Rideal and Williams, *C. A.* **19**, 1663). When the equil. concn. is altered by addn. of a foreign substance which

reacts in the light with both constituents (Becquerel effect), recovery of the system in the dark is very often impossible. Nevertheless, it is feasible by suitable regulation of conditions to suppress the Becquerel effect; *i. e.* to modify the characteristic "dark" potential. Persistent illumination of a soln. contg. 0.025 *M* $V_2(SO_4)_3$, 0.05 *M* $VOSO_4$, and 1.0 *M* H_2SO_4 , as well as equimol. mixts. of UO_2SO_4 and $U(SO_4)_2$, produces noticeable changes. Addn. of small amts. of H_2S occasions a more pronounced recovery of the dark potential, in spite of the irreversible sepn. of S. This recovery effect indeed is dependent on the presence in soln. of mixts. of V and U ions in different stages of valence, or a reducing agent such as H_2S , which favors this condition. H. R. MOORE

Mechanism of the photochemical reaction between hydrogen and chlorine. II. A. I. MARSHALL. *J. Phys. Chem.* 29, 1453-61 (1925); cf. *C. A.* 19, 3222. The yield of the photochem. reaction between H and Cl increases from about 20 to over 25,000 mols./quantum over the pressure range from 0.001 to 6.0 cm. Hg. At 5.9 cm. Hg the no. of mols. HCl/quantum does not change with a 20-fold increase of light intensity. A dynamic method was used, the pressures being measured over Hg after freezing out Cl and HCl. Some doubt exists regarding the partial pressures in the reacting system. The quantum calcs. are based on the empirical energy distribution in the Hg arc lamp as detd. by Coblenz, Long and Kahler (*C. A.* 13, 1284) and by Harrison and Forbes (*C. A.* 19, 1093). F. C. KRACEK

Infra-red absorption spectra of organic derivatives of NH_3 (BELL) 10. Photochemical and thermal decomposition of O_3 (GRIFFITH, MCKEOWN) 2. Ultra-violet radiations and antirachitic substances (DRUMMOND, WEBSTER) 11A.

ALLEN, H. STANLEY: **Photo-Electricity—The Liberation of Electrons by Light.** With chapters on Fluorescence and Phosphorescence, Photo-Chemical Actions and Photography. London: Longmans, Green & Co. 320 pp. 18s. net. Reviewed in *Chem. News* 131, 221; *Chemistry and Industry* 44, 1147 (1925).

ELLIS, CARLETON, WELLS, ALFRED A. and BOEHMER, NORRIS: **The Chemical Action of Ultra-violet Rays.** New York: The Chemical Catalog Co. 362 pp. \$5. Reviewed in *Am. J. Pharm.* 97, 885; *J. Franklin Inst.* 200, 700 (1925).

4—ELECTROCHEMISTRY

COLIN G. FINK

Electric power supply of the future for chemical industry. R. S. MCBRIDE. *Chem. Met. Eng.* 32, 848-50 (1925).—A discussion of the relation between the economic use of hydroelec. power developments and the extension of electrochem. manuf. C. J. B.

Heating by electricity in the chemical industries. R. M. KEENEY. *Chem. Met. Eng.* 32, 805-9 (1925).—A development of elec. heating, its theory and the types of resistors used. The properties of some resistor alloys are tabulated. C. J. B.

Electricity in the iron and steel industry. J. C. REED. *Iron & Steel Eng.* 2, 435-51 (1925). E. J. C.

Electric furnaces in foundry and metallurgical service. ERNST BLAU. *Chem.-Ztg.* 49, 673-4, 698-701 (1925).—In the *indirect arc* type of furnace, with from 0.2 to 1 ton capacity, 105-130 v. is needed, while for greater capacity 160-200 v. range is required. Six charges of steel or 10 charges of cast Fe can be melted in 24 hrs., the energy consumption being 800 kw. hr. per ton of steel and a little more than half this per ton of cast Fe. The life of the furnace roof is 3-4 weeks, of the hearth and side walls 300-400 charges. Larger furnaces (25 tons) are made with vertical electrodes, giving lower current consumption, 600-800 kw. hr., and a capacity of 5 charges in 8 hrs. The *Faul* furnace is similar to the *Hercoult* and uses graphite electrodes which can be renewed during the operation. This type gives 9 charges in 24 hrs. for the 5-ton size, and has lower heat losses with higher efficiency (75%). The energy required is 700-800 kw. hr. per ton in smaller types. In the *Humboldt* furnace, the electrodes move on rolls through the side walls and are pressed closer as the charge melts. The sizes run from 0.5 to 30 tons. The *induction* furnace has many advantages. It permits of closer regulation and more uniform heating. Small furnaces operate on 50-cycle a. c., but for larger sizes a lower frequency is necessary. This type of furnace is well adapted to deoxidation with ferro-alloys. Energy consumption is 100-150 kw. hr. per ton of steel. The installation cost is low, and a temp. control within 5° is possible. H. STORITZ

Converting an oil-fired furnace to electric heating. W. J. WALSH. *Elec. World*

86, 1110-1 (1925).—Resistors of 60 kw capacity were inserted in each of 2 chambers and $4\frac{1}{2}$ in. of insulation was placed around the outside of the old furnace chambers. From a 3 months' record the net factory costs were 90¢ less per ton of material treated when elec. heat was used. In addition 20% more material could be annealed in the same size chamber and a better product resulted with less dependence on the human element.

A. D. SPILLMAN

Types of electric heating appliances for industrial use. R. M. KEENEY. *Chem. Met. Eng.* **32**, 855-9 (1925).—Various designs of heaters and their application are discussed and illus. The importance of temp. control and careful consideration of conditions before purchasing equipment are stressed.

W. H. BOYNTON

The potential difference of carbon arcs with arbitrarily varying currents. R. 3. WALKER AND R. R. ROGERS. *Trans. Roy. Soc. Can., Sec. III* (3) **19**, 28 (1925); cf. *C. A.* **18**, 3148.—A d. c. varied and broken by a motor-driven mech. interrupter was used and the p. d. and current were recorded on a Siemens-Blondel oscillograph. Gaseous conductance after the arc was extinguished was observed. The production and extinguishing of the arc under varying conditions of voltage, current and time were recorded.

J. W. SHIPLEY

Some developments in the electrical industry during 1925. JOHN LISTON. *Gen. Elec. Rev.* **29**, 13-69 (1926).—Chapters on electric furnaces, arc welding, research, lighting, etc.

C. G. F.

Söderberg electrode shows low operating cost. M. SEM. *Chem. Met. Eng.* **32**, 865-6 (1925).—Savings in Söderberg electrode consumption are due partly to the absence of butts and partly to less air corrosion of the electrodes. The cost of manu. in the U. S. is 2.5-3.8¢ per lb. (454 g.), depending upon the size of the electrode, type of furnace and local conditions. A hollow type, in sizes up to 56 in. (140 cm.) diam., and with a 20 in. (50 cm.) hole is in regular operation.

W. H. BOYNTON

New process of calking furnace electrodes. ANON. *Elec. World* **86**, 1158 (1925).—A process has been developed of calking the space around furnace electrodes where they pass through the roof or shell of the furnace. The calking material consists of tar, pitch, etc., which forms a fluid seal around the electrodes at the higher temps.

A. D. S.

Artificial graphite electrodes: protection and improvement of electrodes used in the electrolysis of alkali chlorides. UMBERTO POMILIO. *Giorn. chim. ind. applicata* **7**, 63-7 (1295); *Chimie et industrie Special No.*, 286-316 (Sept., 1925).—A detailed description of a large no. of tests on the effects of impregnation of electrodes with paraffin, linseed oil, chlorinated linseed oil, naphthalene and chlorinated naphthalene on the life of the electrodes. Naphthalene and chlorinated naphthalene showed considerable protective action in the presence of SO_4^{--} and ClO_3^- , both of which exert a very destructive action; but with a pure electrolyte in which the anode is subjected to the much less destructive action of pure Cl^- the treatment is not of much advantage. Impregnation with linseed oil (both as such and chlorinated) is quite harmful, especially in the presence of SO_4^{--} and ClO_3^- , treated electrodes being destroyed much more rapidly than untreated ones; and this was confirmed in the course of com. operations. Irregularities and apparent anomalies in the results are attributed to inevitable variations in the graphite electrodes even from the same lot.

A. PAPINEAU-COUTURE

A new anode hanger for parting doré by the Moebius system. E. J. DAVID. *Eng. Mining J. Press* **120**, 368 (1925).—The old type of hanger was made of brass, Ni-plated with a half round spring to maintain tension on the jaws of the hanger. Solid Cu (NO_3)₂ would form at the contact point between the anode and jaws of the hanger, causing high resistance and excessive heating, with rapid corrosion of the hangers. The new hanger is made of pure Ag, cut from a sheet 0.05 in. thick, and is in 1 piece. No overheating from bad contacts occurs, some hangers having been in service ever since 1918.

H. S.

The effect of current and concentration on polarization in a lead cell. J. T. BURGERRANS AND H. R. HUGILL. *Trans. Roy. Soc. Can., Sec. III* (3) **19**, 26 (1925).—Two co axial Pb cylinders, one within the other, were used as electrodes and acids as electrolytes. During discharge polarization for dil. acids was entirely concn. polarization but with 30% H_2SO_4 it was due to exhaustion of active material at one or both electrodes. During charging no regular variation of polarization with concn. could be observed. The previous history of the cell influenced the rate of polarization. No polarization was observed at low current densities.

J. W. SHIPLEY

Glue for polishing [metals]. B. H. DIVINE. *Brass World* **21**, 320-2, 355-6 (1925).

C. G. F.

Preparation of benzaldehyde by electrolytic oxidation of toluene. I. G. KAWADA. *J. Pharm. Soc. Japan No.* **521**, 628-38 (1925).—The optimum conditions for prepn. of BzH by electrolytic oxidation of toluene with MnSO_4 in H_2SO_4 as electrolyte were in-

vestigated. The hourly production of BzH was detd. by iodometric titration. The results are given in 8 curves and 2 tables. The optimum conditions were: anolyte: 800 cc. MnSO_4 in H_2SO_4 (100 g. in 1000 cc. 55% I_2SO_4) and 250 cc. (217 g.) toluene; catholyte 55% H_2SO_4 ; electrodes, porous Pb plate 400 cm^2 ; current, 2 amp. (1 amp. per 300–400 cc. anolyte); e. m. f. 2.75–2.8 v.; temp. 53–55°; time 5 hrs. The use of a diaphragm and vigorous stirring are essential. S. T.

Electric gas purification. GRUHL. *Z. angew. Chem.* **38**, 565(1925).—G. reviews the various methods which have been used in the removal of solid or liquid particles from gases, waste or otherwise, and then describes elec. pptn. He discusses in detail the various methods used, results that can be obtained, the form of electrodes and pptn. chambers and roughly outlines the conditions of operation, such as e. m. f. required, current consumption, materials used in construction of electrodes and insulators and methods of removing pptd. particles. In addition to protection to the health of the community, valuable materials are recovered. G. describes the application of elec. pptn. to a few industries, with the results obtained. HOWARD STOERTZ

Electrical heating for vacuum impregnating apparatus. C. I. SMITH. *Chem. Met. Eng.* **32**, 818(1925).—The vacuum impregnating process affords an excellent means of obtaining a high insulating power. A resinous gum melting around 100° is used at a controlled temp. of between 160° and 170°. The connected load of the heating units described is 63 kw. for a 3000 gal. mixing tank, and two 1500 gal. treating tanks. Data on 7 months continuous operation are given. C. J. BROCKMAN

Impermeabilizing gas-absorbing substances (U. S. pat. 1,563,673) 18.

Electric battery. W. A. BURKHOLDER. U. S. 1,565,786, Dec. 15. Structural features.

Primary electric batteries. H. H. HIPWELL. U. S. 1,565,450, Dec. 15. Structural features.

Dry battery. W. F. HENDRY. U. S. 1,563,628, Dec. 1. Structural features.

Dry battery. D. ROSEN. U. S. 1,566,927, Dec. 22. Structural features.

Dry battery. C. P. DEIBEL. U. S. 1,562,945, Nov. 24. Structural features.

Dry batteries. H. DE OLANETA. U. S. 1,564,951, Dec. 8. Mech. features.

Galvanic battery of the copper oxide type. G. W. HEISE. U. S. 1,563,980, Dec. 1. In cells with Cu oxide depolarizer and caustic electrolyte, a cellulosic material is used to fix dissolved Cu.

Electrolyte for galvanic batteries. R. PORSCKE. U. S. 1,562,517, Nov. 24. A battery is formed with an artificial Mn-O compd. as depolarizer and with an electrolyte comprising a soln. of CaCl_2 , MgCl_2 or other alk. earth metal chloride free from NH_4 salts and also free from dissolved substances of a highly oxidizing character and initially contg. a small quantity of a Hg salt.

Protecting battery terminals from corrosion. G. K. FRANKLIN. U. S. 1,565,994, Dec. 15. Two mixts. are prepd., one consisting of NaHCO_3 5 and graphite 2 5 parts, the other of "ammonia" 2, "carbolic acid" 1, lubricating oil 1 and alc. 1 part. The 2 mixts. are united before use.

Device for releasing oil on immersion in the electrolyte of batteries. M. L. MARTUS, E. H. BECKER and H. B. SCHOENMEHL. U. S. 1,532,252, April 7, 1925.

Storage battery. R. B. OWEN. U. S. 1,565,193, Dec. 8. Structural features.

Storage battery. J. G. JACKSON. U. S. 1,562,887, Nov. 24. Structural features.

Storage battery. E. H. WILLIAMS. U. S. 1,564,163, Dec. 1. Structural features.

Storage battery. S. C. FORD and W. A. SHULER. U. S. 1,564,173, Dec. 1. Structural features.

Storage battery and hydrometer attachment. E. C. CLIFFORD. U. S. 1,564,530, Dec. 8. Structural features.

Storage battery grids. H. W. LORMOR. U. S. 1,566,280, Dec. 22. Structural features.

Storage battery plates. J. M. BURNETT. U. S. 1,564,524 Dec. 8. Structural features.

Storage battery separators. R. N. CHAMBERLAIN. U. S. 1,566,826, Dec. 22. Separators formed from wood are treated with acid-resistant material such as paraffin, rubber or linseed oil and subjected to the action of an alkali, e. g., a 1–2% NaOH or Na_2CO_3 soln. at a temp. of about the b. p. This treatment serves to improve the cond. of the separators.

Utilizing old plate material from lead storage batteries. J. O. LUTHY. U. S. 1,563,506, Dec. 1. See Brit. 230,058 (C. A. 19, 3224).

Preventing corrosion and sulfating of storage batteries. F. D. BASS. U. S. 1,562,489, Nov. 24. A compn. for preventing corrosion of battery terminals is formed from $(\text{NH}_4)_2\text{CO}_3$, NaHCO_3 , creosote, urease, oil and acid-proof paint.

Apparatus for filling storage battery cells with electrolyte. A. R. WILLARD. U. S. 1,565,347, Dec. 15

Container for storage battery electrolytes or other corrosive liquids. K. E. EDGEWORTH. U. S. 1,564,766, Dec. 8. A soft flexible rubber bag is secured within an outer casing of ebonite or similar materials.

Electrolytic cell adapted for electrolysis of water to produce hydrogen and oxygen. A. E. KNOWLES. U. S. 1,566,543, Dec. 22. The cell is constructed automatically to control the liquid level and to wash the gas evolved.

Electrolytic cell adapted for electrolysis of sodium chloride solutions. M. W. COWLES. U. S. 1,564,406, Dec. 8.

Electrolytic diaphragm cells adapted for making caustic soda. W. E. MORTRUDE, JR. U. S. 1,566,804, Dec. 22.

Electrode for primary batteries. F. J. WOLFE. U. S. 1,564,741, Dec. 8. Structural features.

Electrode for use in making sulfuric acid. F. VORLANDER and H. WEBER. U. S. 1,565,691, Dec. 15. Pptg. electrodes for use in H_2SO_4 by the contact process are formed with frames made of Cu and wood or other material which does not react with H_2SO_4 to evolve H. These frames are coated with Pb.

Silicic acid. N. L. COLLINS. U. S. 1,562,940, Nov. 24. An aq. soln of water glass is electrolyzed between a Hg cathode and an anode which is maintained in continuous agitation and which may be formed of Pb.

Electrolysis of alkali chlorides. H. KLOPSTOCK. U. S. 1,565,943, Dec. 15. In electrolysis of KCl or other alkali chlorides by the so-called quicksilver process, involving a transfer of the Hg from the amalgam decomn. cell to the amalgam formation cell by a fluid propelling device, the Hg is protected throughout its transfer by an air excluding fluid such as H_2O or an inert gas.

Copper carbonate. H. HOWARD. U. S. 1,565,367, Dec. 15. A soln. contg. NaHCO_3 or other material which will supply CO_2 and NaClO_4 or other electrolyte is electrolyzed in the presence of a Cu anode, carbonated during the electrolysis, and CuCO_3 formed is removed from the soln.

Electrolytic copper. F. L. ANTISELL. U. S. 1,566,265, Dec. 22. Electrolysis of Cu solns. is carried out in cycles during a definite fraction of each of which the current is impressed. This mode of operation serves to produce dense Cu, free from twinned crystals and amorphous deposits of Cu or H.

Electrodeposition of cadmium. C. M. HOFF. U. S. 1,564,413, Dec. 8. An electrolyte for Cd deposition is formed from reaction products of Cd and Zn, aq. NH_3 soln. and alkali metal cyanide. U. S. 1,564,414 specifies the use of an electrolyte formed with $\text{Cd}(\text{OH})_2$, $(\text{NH}_4)_2\text{SO}_4$, alkali metal hydroxide and cyanide and "gulac."

Electrolytic production of aluminium. J. B. RAILSBACK. U. S. 1,566,694, Dec. 22. A bath for Al production comprises compds. of Al such as Al_2O_3 and a metal, e. g., Li, Be, Mg, Ca, Sr or Ba, the oxide of which is not reducible by Al and which is liberated from an added halide, sulfide, selenide or telluride.

Precipitating gold from solutions. W. H. BATES. U. S. 1,563,957, Dec. 1. A cathode of Hg with an extended surface is used and placed in close relation to an anode with a large active area.

Recovering lighter values from mineral-bearing slimes. C. A. McCOURT. U. S. 1,566,755, Dec. 22. In treating slimes such as those of Au and Ag ores, a continuous flow of an amalgamating soln. is passed through an electrolytic cell and streams of the soln. flowing from the cell are diverted onto the slimes at sep. points during the course of flow travel for the recovery of the lighter values. The amalgamated values are sep'd. from the soln. formed and the spent liquor is returned to the electrolytic cell.

Pickling iron or steel. C. P. MADSEN. U. S. 1,562,710, Nov. 24. Fe, steel or similar surfaces are prep'd. for treatment with Zn or other adherent coating metals by making the article to be coated an anode in a bath contg. H_2SO_4 of more than 86% strength maintained at a temp. above normal (preferably about 55°).

Steel and iron alloys. B. D. SAKLATWALLA. U. S. 1,564,139, Dec. 1. A molten bath of steel or Fe is formed with a molten supernatant electrolyte bath contg. a Cr or U compd. or other unreduced compd. of an alloying metal and the latter is electrically reduced.

Calcium copper alloy. W. G. HARVEY. U. S. 1,563,187, Nov. 24. A molten Ca salt such as CaCl_2 is electrolyzed in the presence of a solid Cu cathode until sufficient

Ca has been taken up by the cathode for it to become molten at the temp. of the molten salt

Metallic coatings on porous nonmetallic materials. K. RIPPER. U. S. 1,563,793, Dec. 1. Wood or other material to be coated is rendered conductive by the use of a cond substance, *e. g.*, graphite, in such a high degree of dispersion that the particles are smaller than the pores of the material treated and the latter is then electroplated.

Coating flexible metal articles with nickel or similar coating metals. C. P. MADSEN. U. S. 1,562,711, Nov. 24. A workable electrodeposit of Ni or similar metal is formed on sheet steel, etc.

Preparing metal surfaces to receive adherent metal coatings. A. Z. PEDERSEN. U. S. 1,564,710, Dec. 8. In prepg. metal surfaces for coating, *e. g.*, prepg. Fe or steel surfaces for coating with Ni, the metal is made an anode in a bath contg. H_2SO_4 of over 75% strength.

Eliminating iron from solutions obtained from leucitic rocks. U. POMILIO and F. GIORDANI. U. S. 1,559,179, Oct. 27. SiO_2 is removed from a soln. such as is obtained by treating leucitic rocks with HCl and the silica-freed soln. is then electrolyzed to remove Fe and further electrolyzed in diaphragm cells to obtain Fe-free products.

Electrodeposition of duplicates of sound records, etc. A. J. CAWLEY. U. S. 1,557,980, Oct. 20. Mech. and elec. features.

Electric resistance furnace. A. D. KEENE. U. S. 1,565,466, Dec. 15.

Electric resistance furnace adapted for heating water. A. GRAUEL. U. S. 1,566,855, Dec. 22.

• **Electric crucible furnace.** M. UNGER. U. S. 1,564,800, Dec. 8.

Electric arc furnace adapted for refining metals. G. EVREYNOFF. U. S. 1,562,825, Nov. 24.

Gas reactions in electric furnaces. M. J. BROWN. U. S. 1,562,684, Nov. 24. In effecting HCN production from H, N and C or similar gas reactions in an elec. furnace employing a resistor of comminuted material such as granular graphite between the electrodes, the resistor material is supplied at such a rate with the reacting gas as to control the elec. resistance

Furnace electrodes. H. A. LAVENE. U. S. 1,566,409, Dec. 22. Porous C electrodes adapted for use in elec. furnaces are treated with 2 sol. compds. such as $CaCl_2$ and Na silicate which form a refractory product in the pores of the electrodes

Automatic current and temperature control for electric furnaces. E. V. SCHAAAL. U. S. 1,563,441, Dec. 1.

Electrically heated core oven. F. A. COLEMAN. U. S. 1,564,945, Dec. 8.

Electroplating. J. G. SWAIN. U. S. 1,565,683, Dec. 15. Articles such as metal automobile rims are subjected to an electrolyte charged simultaneously from anodes of Zn and Hg.

Electroplating iron surfaces. R. J. SHOEMAKER. U. S. 1,566,984, Dec. 22. Fe or steel surfaces to be plated are first covered with an adherent film of Hg and an amalgamated metal such as Cu and the surface is then electroplated with Pb or other metal.

Electroplating with nickel. W. R. KING. U. S. 1,564,581, Dec. 8. Fe or other corroddible metal is coated with a Ni-Zn alloy and then with an outer coating of Ni.

Electroplating apparatus with a rotary plating barrel. F. G. PURINTON. U. S. 1,563,041, Nov. 24.

Electroplated stereotype plate or nickel-plated printing plate. C. N. SMITH. U. S. 1,565,216, Dec. 8. The printing side of a molded stereotype plate to be plated is treated with an aq. soln. contg. $HgCl_2$ to remove foreign substances from the surface of the plate and produce a lusterless surface which is then electroplated.

Preparation of tungsten powder. NAAMLIOOZE VENNOOTSCHAP PHILIPS' Gloeilampenfabrieken. Dutch 13,749, Oct. 15, 1925. WO_3 is dissolved in 1 : 5 NH_4OH , a soln. contg. 5-20% as much K_2CO_3 as the wt. of WO_3 is added, filtered and the soln. evapd on the water bath. From the dried mixed crystals ($K NH_4$ paratungstates) WO_3 is formed by heating in a quartz crucible; it contains some nonvolatile alkali. The oxide, reduced in H_2 gives W powder, well suited for prepn. of W wire. Heating of the WO_3 before reduction in a Battersea crucible (1200°, 3½ hours) makes it take up some SiO_2 and Al_2O_3 , which also improves the qualities.

Composite metallic filaments. G. R. FONDA. U. S. 1,565,724, Dec. 15. A wire of W or similar refractory metal is coated with another alloyable metal such as Fe or Zr and heated sufficiently to cause alloying and diffusion of the coating metal throughout the wire.

Incandescent lamp. G. R. FONDA. U. S. 1,566,848, Dec. 22. C_2H_2 , CH_4 , C_3H_8

or other C-contg. material is used in lamp bulbs for chem. reaction with gases such as H_2O vapor in the bulb to improve its operating properties.

Introducing potassium or similar vapors into electric lamps. A. M. HAGEMAN. U. S. 1,565,564, Dec. 15. An amalgam of relatively high m. p. is prepd. from an alkali metal such as K and introduced into the lamp in contact with one of its metallic parts. Subsequently the amalgam is elec. heated to volatilize the alkali metal.

Cores for cathodes of vacuum tubes. H. T. REEVE. U. S. 1,565,200, Dec. 8. A mixt. of metals including powd. Pt and Ni is pressed into a coherent ingot, heated to a sintering temp. under non-oxidizing conditions, and cold worked into filaments (with annealing at high temp. at intervals). The initial stages of the cooling are effected also under non-oxidizing conditions.

Converting electrical energy into radiant energy during combustion. G. T. SOUTHWATE. U. S. reissue 16,149, Aug. 25. Mobile combustible and oxidizing substances such as combustible gas and air are forced through a nozzle contg. a filling of coke or other porous, elec. conductive material resistant to heat, to maintain combustion and an e. m. f. is impressed upon the filling material sufficient to cause an elec. arc conduction from it into and along the combustion flame, which augments the heating effect, *e. g.*, in smelting.

Electrical commutator brush. R. L. HENRY. U. S. 1,556,990, Oct. 13. A mixt. such as graphite and a phenol-formaldehyde condensation product is solidified by heat and subjected to pressure in such a manner as to give the product different desired resistance characteristics in different directions.

Material for fuses. F. A. FELDKAMP. U. S. 1,564,335, Dec. 8. A material for elec. fuses comprises a mass of metallic particles, *e. g.*, Cu, bonded by solder or other metal of low m. p.

5—PHOTOGRAPHY

C. E. K. MEES

Solarization of the photographic plate. J. M. EDER. *Z. physik. Chem.* 117, 293-8(1925).—The statement of Arens that a bromosilver gelatin plate impregnated with nitrite gives so intensive a direct photochemical blackening that it makes solarization impossible does not correspond with exptl. results in the ordinary solarization region, and the conclusions drawn from this statement are, therefore, unfounded.

E. P. WIGHTMAN

Emulsion films (HOLMES) 2.

Reversal of photographic images. J. G. CAPSTAFF. U. S. 1,564,753, Dec. 8. A light-sensitive element contg. a Ag image and a complementary image of sensitive Ag salts is submitted to a bath which may contain $K_3FeC_6N_6$ and KBr in H_2O soln., to convert the Ag image into a different insensitive image without rendering the sensitive salts insensitive. The element is then exposed to light and developed to produce a Ag image from the light-affected Ag salts. Cf. C. A. 19, 3438.

Multicolored screens for use in photography. J. H. CHRISTENSEN. U. S. 1,564,202, Dec. 8. Basic dyes and mordants such as tannic, molybdic, tungstic or phosphotungstic acids are dissolved in a suitable solvent, *e. g.*, an alc. or NH_3 soln. and the solns. are emulsified in sep. portions of rubber and gum dammar soln. or other substantially neutral viscous emulsifying medium. The major part of the emulsifying medium is removed by dilg. with a solvent such as C_6H_6 , gasoline or CCl_4 , and decanting. A mixt. of differently colored particles is caused to adhere to a neutral carrier, *e. g.*, glass, celluloid or hardened gelatin, and dried after removal of surplus particles.

Producing photographic copies by use of phosphorescent substances. J. H. CHRISTENSEN. U. S. 1,565,256, Dec. 15.

Fluoroscopic screen. I. S. HIRSCH. U. S. 1,563,856, Dec. 1. Heat is applied to the surface of a fluorescent screen (which may be formed of ZnS contg. a trace of Cu) in order to obtain persistence of images on the screen.

Daylight developing of photographic plates and films. G. D. RODRIGUEZ. U. S. 1,563,228, Nov. 24. Mech. features.

Printing color cinematographic films. P. D. BREWSTER. U. S. 1,563,959, Dec. 1. Mech. features.

Sensitizing "kinofilms" for positive copies. A. WEINGARTEN. U. S. 1,564,161,

Dec. 1. In sensitizing "kinofilms," the colloid is treated with a soln. of $K_2Cr_2O_7$, $K_4FeC_6N_6$ and KBr .

Blue prints with dark lines and white fields. R. C. BROWN. U. S. 1,566,305, Dec. 22. An impression or transfer sheet provided upon its under side with an opaque coating is imposed upon a plain sheet and a drawing is superposed. The drawing is traced to produce upon the plain sheet a replica of the drawing for checking purposes and convert the impression sheet into a negative by the transfer of the coating to the plain sheet in the tracing operation. The coating is fixed upon the negative by applying a preservative such as white shellac and copies are printed upon sensitized paper by passing light rays through the open lines of the drawing.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Contributions to the knowledge of ruthenium. VIII. The isomeric chlorides.

JAS. I. HOWE AND L. P. HAYNES. *J. Am. Chem. Soc.* **47**, 2020-5(1925).—The chlorides of Ru exist in 2 series: α -salts, $MRuCl_3$ and $MRuCl_3 \cdot H_2O$, solns. of which are deep brownish red, yielding 2 Cl atoms to H, but which do not take up Cl; β -salts, which are the "aquo" salts of the α , probably isomeric monohydrates. Their solns. are rose-red; H_2O splits off 1 Cl atom and Cl converts them to the hexachloride. The dehydrated β -salts are identical with those formed from the hexa- by the loss of 1 Cl atom. They are isomeric with the α -salts, but not identical. Their solns. give, on standing, the β -salt. The bromo salts thus far examd. are similar to the chloro salts. M. O. L.

The chlorides and oxides of rhodium. LOTHAR WÖHLER AND W. MÜLLER. *Z. anorg. allgem. Chem.* **149**, 125-38(1925).—Only trivalent compds. of Rh with Cl were definitely known hitherto. The authors found the temp. ranges of formation of $RhCl_3$ at 300-948°. If the temp. rises to 968° a mixt. of $RhCl_2$ and $RhCl$ results. The existence of these 2 new chlorides was confirmed by their pressure curves. Like $RhCl_3$ they are insol. in water and acids. Attempts to prep. a tetrachloride were unsuccessful. The authors proved also that besides Rh_2O_3 , RhO and Rh_2O exist. They are produced when Rh_2O_3 is heated above 1113° or 1121°, resp. Like the chlorides they may be sepd. by flotation with C_6H_6 or CCl_4 . They are insol. in acids and aqua regia and are sensitive to H, a reduction taking place accompanied by a spontaneous rise of temp. Rh metal shows no change at 1150°, thus proving to be like Pd the least volatile metal of the Pt group. ÉMIL KLARMANN

The black oxides of praseodymium. WILHELM PRANDTL AND KARL HUTNER. *Z. anorg. allgem. Chem.* **149**, 235-62(1925).—There are contrasting statements in the literature on the no. and the properties of oxides of Pr. When the nitrate, carbonate or oxalate of Pr is ignited in air, a dark brown or black oxide forms which has the formula Pr_6O_{11} according to the analysis carried out by the authors in 3 different ways. Since the ppt. of Pr oxalate obtained from the sulfate retains considerable amts. of the sulfate even after repeated repptn. from dil. HNO_3 , the formation of H_2S may be observed when the reduction is carried out in a current of H gas. This fact is likely to lead to incorrect results of analysis. Some of the phys. and chem. properties of Pr_6O_{11} are given. Thus O_3 forms in small quantities when this oxide is dissolved in acids. The authors state that older reports on the formation of higher oxides cannot be correct. Thus no PrO_2 forms when $Pr(NO_3)_3$ is heated with KNO_3 . It is, however, possible to obtain a compd. of the formula PrO_2 or Pr_nO_{2n} , resp., by heating Pr_2O_3 in a current of O at 300° for 2 days or by melting Pr_6O_{11} with $NaClO_3$ at 270-80° for 15-20 min. $NaBrO_3$ does not change the Pr_6O_{11} . On heating with dil. $AcOH$ a red-brown powder results; its compn. corresponds to the formula $Pr_4O_8 \cdot H_2O$. This suggests that Pr_6O_{11} is a salt-like compd. (praseodymium praseodymate) similar to Pb_3O_4 which consists of PbO and PbO_2 . PrO_2 dissociates above 350°, forming Pr_6O_{11} and O. The authors also investigated the action of other oxides, e. g., La_2O_3 , Bi_2O_3 , Fe_2O_3 , Ce_2O_3 , Nd_2O_3 , on the course of oxidation of Pr_2O_3 . Conclusion: Tervalent Pr resembles tervalent Ce. Pr_2O_3 has the same formula and crystal structure as Ce_2O_3 ; it is, however, unable to form salts with acids analogous to the ceric salts. Some tentative structural formulas of the 2 black oxides are suggested. ÉMIL KLARMANN

Higher oxides of silver. II. Silver peroxide. FR. JIRSA. *Chem. Listy* **19**, 300-6 (1925); cf. C. A. **19**, 3201.—Dissolution of Ag_2O_2 in HNO_3 yields brown solns. of high oxidizing power. The Ag_2O_2 is partly decompd., yielding Ag^+ and active O and partly goes into soln. in the acid. The higher the HNO_3 concn. and lower the temp. the more Ag_2O_2 goes into soln. as such. It can be repptd. by dilg. the acid soln. with H_2O . Salts

of Ag^{++} have been prep'd. by others. The dissociation pressure of Ag_2O_2 is extremely high. Calcn. by means of the approx. Nernst formula based on the heats of reaction det'd. by J. (C. A. 19, 3201) yields pressures of the order of 10^8 and 10^9 atm. at 25° for the reactions (1) $\text{Ag}_2\text{O}_2 = \text{Ag}_2\text{O} + \frac{1}{2} \text{O}_2 + 1000$ cal and (2) $\text{Ag}_2\text{O}_2 = 2\text{Ag} + \text{O}_2 - 5140$ cal., resp. Decompn. takes place according to (1). E. m. f. measurements indicate that solid solns. of Ag_2O and Ag_2O_2 are formed. Very little autocatalysis takes place. The comp'd. is thermodynamically unstable, but practically, on account of some passivity phenomena, its decompn. is negligible at room temp. Some decompn. takes place in the dry prep'n. at 100° ; boiling water acts on the comp'd. until a sat'd soln. of AgOH is formed. The washed residue has the comp'n. corresponding to Ag_2O_2 . Bibliography. F. C. KRACEK.

Different states of the oxide of beryllium. H. COPAUX AND C. MATIGNON. *Compt. rend.* 181, 550-2; *Bull. soc. chim.* 37, 1359-65 (1925).—When basic Be carbonate is calcined, there is a small progressive loss of wt. as the temp. increases from 700 to 1100° . This loss of wt. is due either to loss of occluded H_2O or to polymerization with loss of H_2O and is accompanied by an increase of density. The oxide which has been calcined at 1100° dissolves in HF only half as rapidly as that which has been calcined at 800° and has a larger heat of soln. R. J. HAVIGHURST.

Iron arsenides. E. VIGOUROUX. *Chimie et industrie Special No.*, 283 (Sept., 1925).—The e. m. f. diagram of Fe-As alloys contg. 6-56% As shows the presence of Fe_2As and of Fe_3As . A. PAPINEAU-COUTURE.

Electromotive force diagrams of manganese arsenides. G. ARRIVAUT. *Chimie et industrie Special No.*, 284-5 (Sept., 1925).—The e. m. f. diagram of Mn-As alloys contg. 6-53% As shows the presence of Mn_2As and of Mn_3As . It was not found possible to prep. an alloy contg. 57% As (corresponding to MnAs), as the mixt. decomposed on fusing. A. PAPINEAU-COUTURE.

Complex salts of stannous iodide with the iodides of rubidium and of cesium. V. AUGER AND T. KARANTASSIS. *Compt. rend.* 181, 665-6 (1925).—Addn. of SnI_2 to warm aq. RbI contg. HI gives a liquid which rapidly turns brown in the air and deposits SnI_4 . But with Sn present and with air absent the pale yellow liquid yields products contg. different proportions of Sn and Rb. With excess RbI , the comp'd. SnRbI_3 is formed, yellow needles. Satn. of hot RbI soln. with SnI_2 gives the comp'd. Sn_2RbI_6 , yellow-orange microscopic cubes. By following the same 2 methods with CsI , the comp'd. SnCsI_3 , yellow needles, and the comp'd. Sn_2RbI_6 , yellow-orange cubes, are obtained. These Rb and Cs compds., relatively stable when dry, oxidize in the air rapidly, blackening and forming in part SnRbI_6 and SnCsI_6 . They do not, therefore, correspond to the reaction products of stannous halides with K and NH_4 salts. C. C. D.

Additive compounds of hydrogen chloride and the sulfates of heavy metals. FRITZ EPHRAIM. *Ber.* 58B, 2262-7 (1925).—Unlike water and NH_3 the H halides do not usually show a tendency to form additive compds. Expts. aiming at the prep'n. of additive compds. of the chlorides of heavy metals and HCl were unsuccessful. Additive compds. of the corresponding sulfates and HCl, however, were obtained, when the dry salts were treated with dry HCl at temps. peculiar to each salt. Two mols. of HCl are taken up by 1 mol. of the sulfate (except ZnSO_4). The resulting comp'd. is represented by the formula $\text{Me} \left[\begin{smallmatrix} \text{SO}_4 \\ \text{Cl}_2 \end{smallmatrix} \right] \text{H}_2$, or $\text{Me} \left[\begin{smallmatrix} \text{SO}_4 \\ (\text{HCl})_2 \end{smallmatrix} \right]$. The products are absolutely dry

and possess characteristic dissociation temps. lying close to the decompn. temps. of their chlorides, when treated with concd. H_2SO_4 . It is possible that in the reaction $\text{MeCl}_2 + \text{H}_2\text{SO}_4 \longrightarrow \text{MeSO}_4 + 2\text{HCl}$ first an additive comp'd. $\text{MeSO}_4 \cdot 2\text{HCl}$ forms which subsequently decomposes. Thus this reaction would not have to be regarded as an ion reaction. This surmise is supported by the fact that a great tendency to form such additive compds. is shown by the sulfates of those metals which form slightly dissociated chlorides. $\text{HgSO}_4 \cdot 2\text{HCl}$ shows the greatest resistance against heat. On the other hand no HCl is developed from HgCl_2 even by boiling H_2SO_4 . While CdSO_4 , CuSO_4 and Ag_2SO_4 take up 2 mols. of HCl at room temp., PbSO_4 and ZnSO_4 must be cooled down (the latter takes only 1 mol. of HCl). HgSO_4 absorbs very little HCl at room temp. whereas the absorption becomes very violent at 125° . On heating all these additive compds. give off HCl at a characteristic temp., but 0.5 mol. is retained and may be driven off at a higher temp. This suggests the possibility of existence of another kind of additive compds. EMIL KLARMANN.

Pseudohalogens. II. 1. The fulminic acid residue. 2. The equilibrium between iodine, selenocyanogen and the corresponding silver salts. 3. Polypseudohalides. LOTHAR BIRKENBACH AND KARL KELLERMANN. *Ber.* 58B, 2377-86 (1925); cf. C. A. 19, 1996.—The position of the fulminic acid residue in the electromotive series of pseudo-

halogens has been ascertained by comparison of the cyanate and fulminate of Hg. The electroaffinities of halogens and pseudohalogens are represented by the following series: $\text{TeCN} \cdot \text{SeCN} \cdot \text{I} \cdot \text{SCN} \cdot \text{CN} \cdot \text{Br} \cdot \text{N}_3 \cdot \text{Cl} \cdot \text{OCN} \cdot \text{CNO} \cdot \text{F}$. Since particularly the higher halogens show a tendency to formation of polyhalides of alkali metals, when the normal halides are evapd. at low temps. with the calcd. amt. of dissolved halogen, the same behavior was studied with pseudohalogens. It was established electrometrically that compds. of the type of KI_3 , namely $\text{K}(\text{SeCN})_2$, $\text{K}(\text{SeCN})_2\text{I}$ and $\text{K}(\text{SeCN})_3$, exist in non-aq. solns. The titration was carried out by gradual addition of an ethereal soln. of the pseudohalogen to the alc. soln. of a known amt. of the pseudohalide of K. A Ag wire, superficially covered with AgI, and a soln. of 0.1 N KI in abs. EtOH satd. with AgI (solid AgI was present) were used as a normal electrode. This system is generally recommended as a normal electrode for alc. and ethereal solns. Polypseudohalides of Cs are obtained by evapn. of titrated solns. of the respective Cs halide with an ethereal soln. of the pseudohalogen. Thus $\text{Cs}(\text{SeCN})_3$ was isolated as a red-brown salt, sol. in EtOH, stable in air; it is decomposed by water. These compds. are interesting also from the standpoint of the valency problem, since it may be shown that the outer electron ring of such a complex probably contains 7 electrons in conformity with similar conditions in halogens. The complex formed would give 15 electrons (figured from its individual constituents) 8 of which produce one satd. sphere; the remaining 7 electrons form the outer sphere to which is due the particular chem. nature of the complex, i. e., its relation to the halogens.

EMIL KLARMANN

The reversible system $\text{PbI}_2 + \text{ZnSO}_4 \rightleftharpoons \text{ZnI}_2 + \text{PbSO}_4$. C. G. STOFFELLA. *Boll. chim. farm.* **64**, 481-8(1925).—The reaction is complete from left to right only in dil. equimol. solns. at 100° in spite of its being exothermic. This is due to the considerable increase in the soly. of PbI_2 with the temp. The reaction is incomplete in a satd. soln. at 100° or in a highly dil. soln. at 15° .

MARY JACOBSEN

Neodymium and thallous sulfates. F. ZAMBONINI and V. CAGLIOTI. *Atti. accad. Lincei* [6] **2**, 153-8(1925).—In extending recent work on the system $\text{La}_2(\text{SO}_4)_3 \cdot \text{Tl}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ (Z. and Carobbi, *C. A.* **19**, 2920) the system $\text{Nd}_2(\text{SO}_4)_3 \cdot \text{Tl}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ was also studied at 25° . The same methods of analysis were again used. The $\text{Nd}_2(\text{SO}_4)_3$ used was nearly pure and was the same as was used in prepg. the Nd-K double sulfates (*C. A.* **19**, 2309). Three compds. were found in the solid phase: $\text{Nd}_2(\text{SO}_4)_3 \cdot 4.5\text{Tl}_2\text{SO}_4$ (I), $\text{Nd}_2(\text{SO}_4)_3 \cdot \text{Tl}_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ (II), $\text{Nd}_2(\text{SO}_4)_3 \cdot \text{Tl}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$ (III). The compd. corresponding to I was also found with La having $2\text{H}_2\text{O}$. The Nd compd. corresponding to $\text{La}_2(\text{SO}_4)_3 \cdot 3\text{Tl}_2\text{SO}_4$ was not formed in this system. The field of existence of I is less extensive than that for the La compd. since it competes for existence with II. Neither of the double sulfates described by Zschiesche (*J. prakt. Chem.* **107**, 100(1869)) were found under these conditions. II is obtained as violet crystals in equil. at 25° with solns. contg. 3.8% $\text{Nd}_2(\text{SO}_4)_3$ and 0.26-0.27% Tl_2SO_4 . It is nearly impossible to obtain it entirely pure, i. e., free from $\text{Nd}_2(\text{SO}_4)_3 \cdot 8\text{H}_2\text{O}$ and III. III is obtained as violet crystals in equil. with solns. containing 3.78-0.30% $\text{Nd}_2(\text{SO}_4)_3$ and 0.28-3.00% Tl_2SO_4 and has a wide field of existence. III is isomorphous with double sulfates $\text{NH}_4\text{X}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$ (X = La, Ce, Di) and its crystallographic description is fully given. III loses $6\text{H}_2\text{O}$ at 130° and the rest is eliminated at 200° . I is stable in solns. containing 0.26-0.19% $\text{Nd}_2(\text{SO}_4)_3$ and 3.85-4.70% Tl_2SO_4 and is obtained as a bright violet-red powder.

E. J. WITZEMANN

The double sulfates of the rare earth metals and of the alkali metals. III. Double sulfates of lanthanum and sodium. F. ZAMBONINI and G. CAROBBI. *Atti. accad. Lincei* [6] **2**, 300-2(1925).—In continuing previous work (*C. A.* **19**, 2920) on the double sulfates of the alkaline and rare earth metals the system $\text{La}_2(\text{SO}_4)_3 \cdot \text{Na}_2\text{SO}_4 \cdot \text{H}_2\text{O}$ was studied at 25° by the methods previously describd. The solid phase was $\text{La}_2(\text{SO}_4)_3 \cdot \text{Na}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ and no other was observed. This compd. is stable in contact with solns. containing 0.13-16.28% Na_2SO_4 and 0-0.19% $\text{La}_2(\text{SO}_4)_3$. At 150° this double salt does not lose its H_2O of crystn.

E. J. WITZEMANN

A study of the thermal decomposition of sulfates. Mlle. GERMAINE MARCHAL. *J. chim. phys.* **22**, 413-31, 493-517(1925); cf. *C. A.* **19**, 3201.—In general, sulfates can undergo thermal decompn. according to one of the following schemes: (a) simple dissoc. into metallic oxide and SO_3 , e. g., $\text{MgSO}_4 = \text{MgO} + \text{SO}_3$; (b) dissoc. accompanied by formation of a more stable oxide than that involved in the formation of the original salt, e. g., $3\text{MnSO}_4 = \text{Mn}_3\text{O}_4 + 2\text{SO}_3 + \text{SO}_2$; (c) dissoc. accompanied by dissoc. of the basic oxide, e. g., $2\text{Ag}_2\text{SO}_4 = 4\text{Ag} + 2\text{SO}_3 + \text{O}_2$. At even moderate temps. all of the above reactions are followed by (d) $2\text{SO}_3 = 2\text{SO}_2 + \text{O}_2$. Bodenstein and Pohl investigated the latter reaction (*Z. Elektrochem.* **11**, 373(1905)), giving as their result $\log K_c = -10,373/T - 2.222 \log T + 14.585$. The stoichiometric relations in

volved in the decompn. of the different types of sulfates and a measurement of the total pressures at a series of temps. together with the above equation for K , furnish all the necessary data for the calcul. of the partial pressures of SO_3 , SO_2 , and O_2 in the thermal decompn. of these salts. M. measured the pressure over Hg, which withstood the action of the gases reasonably well. The sulfates were heated in porcelain boats placed inside a porcelain reaction tube, glazed to be air tight; a Pt-wound furnace at 110-v. was used. Temp. control was manual, by means of a coarse and a fine rheostat. Temps. were read by means of a Pt-PtRh thermocouple and a millivoltmeter, with a precision of about 5° at 1000° . The reaction tube was connected to a manometer and a vacuum pump by means of a cemented joint; baryta was interposed between the gas space and the cement. The reactions studied were found reversible through the agreement of the equil. pressure when measured after successively raising and lowering the temp. Data reported in this paper cover MgSO_4 , BeSO_4 and their double salts with K_2SO_4 . These compds. all dissociate according to scheme (a). MgSO_4 melts with decompn. at about 1155° , decompn. beginning at about 880° . The heat of decompn. calcd. from the partial pressure of SO_3 is approx. 66 cal./mol. BeSO_4 begins to decompose below 590° , resulting in the formation of 5 BeO. SO_3 , judging from the rate of loss of wt. on heating in air at 700° . The equation $\log p_{\text{SO}_3} = -14907/T - 14.10 \log T + 57.97$ represents the partial pressure of SO_3 reasonably well at temps. up to 750° ; at higher temps. it yields low results. The heat of decompn. calcd. from the partial pressure of SO_3 is about 41 cal./mol. Comparison with results of Plüddemann on the thermal dissoc. of $\text{Al}_2(\text{SO}_4)_3$ (Diss. Berlin 1907) shows that the latter compd. begins to decompose at much lower temps.; its total pressure at 750° is 76.0 cm. Hg. The double salt $\text{MgSO}_4 \cdot \text{K}_2\text{SO}_4$ melts at about 750° , decompn. of the melt beginning at about 895° . The pressures are appreciably lower than that for MgSO_4 , but could not be measured because the melt attacked porcelain. $\text{BeSO}_4 \cdot \text{K}_2\text{SO}_4$ melts at 900° and begins to decompose at about 700° . The heat of decompn. calcd. from the partial pressure of SO_3 below and above the m. p. is 65.2 and 58.8 cal./mol., resp. F. C. K.

Dissociation pressures of hydrated double selenates. JOHN FERGUSON. *J. Chem. Soc.* 127, 2096-2100(1925); cf. *C. A.* 18, 3328.—Vapor pressure measurements in the temperature range 25° to 75° have been made for equilibria of the type: $\text{M}^{II}\text{SeO}_4 \cdot \text{M}^{II}\text{SO}_4 \cdot 6\text{H}_2\text{O} \rightleftharpoons \text{M}^{II}\text{SeO}_4 \cdot \text{M}_2^{II}\text{SeO}_4 \cdot 2\text{H}_2\text{O} + 4\text{H}_2\text{O}$ for the following pairs: Cu-K, Cu-Rb, Cu-Cs, Cu-(NH₄), Cu-Tl, Co-K, Co-(NH₄), Zn-K, Zn-(NH₄), Ni-K, Ni-Rb, Ni-Cs, Ni-(NH₄) and also for nickel ammonium chromate. The stabilities of these salts, as measured by the temp. at which their dissociation pressures, attain the value of 50 mm. are greatly influenced by the mol. and at. vols. of the groups and atoms in the mols. The sp. action of these atoms and groups introduces irregularities especially noticeable for Cs double salts. In general the stabilities increase with increasing vol. of the cation and decrease with increasing vol. of the anion. JAMES M. BELL.

The hypochloric acid and the alkali superchlorides. Notes on the paper by R. Dietzel and F. Schlemmer. O. v. DEINES. *Z. anorg. allgem. Chem.* 149, 99-100 (1925) —The correctness of the statement of Dietzel and Schlemmer (*C. A.* 19, 3441) is disputed, since apparently erroneous conclusions have been drawn from the basic equation representing the action of Cl on NaOH. EMIL KLARMANN

The corrosion of metals by hydrogen chloride and the ammonium halides. K. A. HOFMANN AND FRIDOLIN HARTMANN. *Ber.* 58B, 2466-75(1925); cf. *C. A.* 19, 2309.

—It has been observed previously that NH_4Cl vapor attacks metals at 250 – 300° more than the equiv. amt. of HCl gas. This is due to a considerable adsorption of NH_4Cl on the metal surface. In a contrast to an opinion previously expressed, that the undissociated NH_4Cl mol. reacts with the metal, it is assumed now that an adsorption compd. e. g., $\text{Cu} \dots \text{NH}_3 \cdot \text{HCl}$ first forms. Its thermal dissociation is more likely to be accompanied by a chem. reaction (liberation of H) than that of $\text{Cu} \dots \text{HCl}$. The hydrochlorides of aniline and *N*-dimethylaniline show a much stronger action than NH_4Cl on account of the smaller diffusibility of these amines. Addn. of water, MeOH, EtOH, Et₂O and diphenylamine does not further the reaction. The addn. of 1 mol. NH_3 to 15 mols. HCl increases the production of H a hundred times. If larger surfaces (powd. metal) are exposed to the action of HCl gas, then its action manifests itself much more because of the larger amt. adsorbed. Thus the difference between HCl and NH_4Cl in their action on Cu is better visualized on small surfaces. The particularly pronounced adsorption of NH_4Cl on Cu is due to the affinity of Cu for NH_3 . Thus less H is developed by Sn and HCl under the same conditions despite the greater energy produced by this reaction. NH_4Br and NH_4I , however, produce more H than NH_4Cl , as the heat of formation of CuBr and CuI from Cu and gaseous HBr or HI, resp., is greater than that of CuCl, the conditions of adsorption being very similar for the 3 NH_4 halides. E. K.

The action of gaseous ammonia on phosphorus chlorides. H. PERPÉROT. *Compt. rend.* **181**, 662-4(1925).—Though the final products of the action of NH_3 on P chlorides are complex N compds., it is shown that the initial reaction products are amines. The usual method of passing NH_3 into a CCl_4 soln. of the P chloride was changed so that sep. solns. of the chloride and of NH_3 in CCl_4 were simply mixed and the solid was filtered and dried *in vacuo*. PCl_5 .—The compn. of the product was approx. $\text{PCl}_5 \cdot 10\text{NH}_3$, but a comparison of its decompn. as a function of temp with that of NH_4Cl and extn. of NH_4Cl by liquid NH_3 both indicated that it was a mixt. of $\text{P}(\text{NH}_2)_3$ and NH_4Cl . PCl_3 .—The product was approx. $\text{PCl}_3 \cdot 6\text{NH}_3$, but unlike the thermal decompn. of the $\text{PCl}_5 \cdot 10\text{NH}_3$, the temp.-decompn. curve did not show a section corresponding to the sublimation of NH_4Cl and the product could not be purified with liquid NH_3 . POCl_3 .—The product was $\text{POCl}_3 \cdot 6 \cdot 3\text{NH}_3$, which could not be rendered free of Cl by liquid NH_3 . The results indicate in general that NH_3 transforms P chlorides into amines, but that an intermediate addn. product unstable to heat is perhaps formed, thus: $\text{PCl}_n + 2n\text{NH}_3 \longrightarrow \text{PCl}_n \cdot 2n\text{NH}_3 \longrightarrow \text{P}(\text{NH}_2)_n + n\text{NH}_4\text{Cl}$. C. C. DAVIS

Residual affinity and coordination. Heats of chelation of dithiolated metallic halides (MORGAN, *et al.*) **2**.

HODGES, F. W.: **Elementary Inorganic Chemistry**. London: Longmans, Green & Co. 230 pp. 3s 6d.

LEMAV, P.: **La chimie du bismuth**. Paris: Librairie E. Le François. 105 pp., Fr. 8. Reviewed in *Chimie et industrie* **14**, 658(1925)

7-ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Advances in the field of the analytical chemistry of the metalloids in 1924. A. GUTHRIE. *Chem.-Ztg.* **49**, 753-4, 758-60, 861-4, 869-72, 886-8, 906-8, 925-8(1925).—A review with bibliography. E. J. C

Potassium bi-iodate as a volumetric standard. MARCEL KOENIG. *Chimie et industrie Special No.*, 116-7(Sept. 1925).—A standard $\text{KH}(\text{IO}_3)_2$ soln. kept in the dark from June 20, 1920 to July 10, 1925 showed no appreciable loss in strength. During the same period and under the same conditions the strength of a 0.1 N $\text{Na}_2\text{S}_2\text{O}_8$ soln. fell from 0.01340 to 0.01245 g/l. To prep. $\text{KH}(\text{IO}_3)_2$ dissolve 26 g KIO_3 in 125 cc. boiling H_2O , add 21 g. of HIO_3 dissolved in 45 cc. hot H_2O and then 6 drops of concd. HCl , cool rapidly, add 100 cc. of 95% alc., filter through a hardened filter, wash 3 times with 10% MeOH and 3 times with 75% EtOH and dry at 100° . In titrating the soln. addn. of 5 cc. of HCl (d. 1.040) is necessary and sufficient to ensure quant. liberation of I. A. PAPINEAU-COUTURE

Potentiometer indication of the reaction between halogens and the ferrocyanide ion. C. DEL FRESNO. *Anales soc. españ. fis. quim.* **23**, 427-37(1925).—Following by potentiometer the general reaction $2\text{Fe}(\text{CN})_6''' + \text{X}_2 \rightleftharpoons 2\text{Fe}(\text{CN})_6'' + 2\text{X}'$, where X_2 is one of the halogens, has shown that the potential gradient occurs with Cl and Br at exactly the equiv. point according to the above equation, so that either halogen can be titrated with $\text{Fe}(\text{CN})_6$ just as well as the latter can be with the halogen. However, since Cl and Br solns. are unstable the method has no great practical use. With I the above equil. is displaced quantitatively to the right only by an excess of halogen, so that the use of this reaction for potentiometric detn. of I by $\text{Fe}(\text{CN})_6$ is impossible. Also in *Z. Elektrochem.* **31**, 617-21(1925) E. M. SYMMES

A new type of the bimetallic electrode system applied in the potentiometer determination of manganese. KARL SANDVED AND JAN BACKER. *Tids. Kemi Bergv.* **5**, 224-8(1925).—The difference in electrode potentials was produced by using 2 electrodes of widely different surface area, namely a 200 cc. Pt dish contg. the soln. to be examd. and a short 0.4 mm Pt rod dipping in the liquid. In the expts. 25 cc. of a soln. contg. 1.2560 g. Mn per l. was dild. with water and 25-100 cc. of 5 N H_2SO_4 and 8 g. of K^+ $2\text{H}_2\text{O}$ and titrated with 0.1 N KMnO_4 at 80° , the final vol. being 130-150 cc. The initial p.d. was about 0.5 v., increasing during the titration to about 0.7 v. and after the turning point rapidly decreasing towards zero. If more than 40 cc. of 5 N H_2SO_4 was used, the end point was not easy to find. C. A. ROBAK

Examination of some methods for the determination of sulfites and of ferrous iron. W. D. BONNER AND D. M. YOST. *Ind. Eng. Chem.* **18**, 55-6(1926).—Known amts of

sulfite were analyzed by methods involving the use of the following oxidants in the form of standard solns.: KI_3 , KBr_3 , KIO_3 , $HClO_4$, $K_2Cr_2O_7$, $KMnO_4$ and $NaBrO_3$. Good results were obtained with the first 5 and low results with all the others, particularly $KMnO_4$. For the detn. of Fe^{++} it is possible to make use of $HClO_4$ as follows: Add the Fe^{++} soln. to a soln. of Na_2HPO_4 contg. $HClO_4$ $FePO_4$ ppt. Add KI , make acid and titrate with $Na_2S_2O_3$. The Fe is not reduced to any extent by the KI because present in a complex phosphate anion.

W. T. H.

Rapid deduction of small amounts of aluminium in certain non-ferrous materials.

G. E. F. LUNDELL AND H. B. KNOWLES. *Ind. Eng. Chem.* **18**, 60-1 (1926).—For the detection and approx. detn. of 0.01–0.1% Al in non-ferrous alloys the following method is recommended. Dissolve 1 g. of alloy in 5 cc. of concd. HNO_3 . Add 30 cc. of 8% $NaOH$ and boil 1 min. Add 8 cc. of Na_2S soln. (made by satg. the same $NaOH$ soln. with H_2S and dilg. with an equal vol. of $NaOH$ soln.). Swirl the soln. a few mins., filter, make acid with 6 N HCl and add 2 cc. in excess. Digest at 40–60° until the ppt. settles, filter, boil off the H_2S and clear with a little HNO_3 if necessary. Add 10 cc. of 36% $AcOH$ and 5 cc. of 0.2% aurin tricarboxylic acid soln. Finally neutralize with 10% $(NH_4)_2CO_3$ in 5 N NH_4OH , adding 5–10 cc. in excess. Compare the color of the red lake with that produced with known amts. of Al . In the analysis of spelter, good results are obtained with a somewhat modified procedure involving only 1 pptn.

W. T. H.

The chromic acid method for estimating small amounts of bromine.

P. L. HIBBARD. *Ind. Eng. Chem.* **18**, 57–60 (1926).—A simple and rapid method for detg. 0.1–10 mg. of Br is based upon treatment with CrO_3 and a little H_2SO_4 , the evolved Br_2 being caught in KI soln. and the resulting KI_3 titrated with standard $Na_2S_2O_3$ soln. Org. matter should be removed, preferably by treatment with Na_2O_2 and any iodide must be decomposed by treatment with Fe^{+++} and boiling off the I_2 . The chloride concn. must be kept low. Details concerning the app. and procedure are given.

W. T. H.

Practical method for the analysis of commercial nickel.

B. SETLIK AND R. FARSKY. *Chimie et industrie Special No.*, 83 (Sept., 1925).—Dissolve 10–20 g. of sample in 50 cc. HNO_3 (d. 1.3), evap. to dryness, take up in 2–3 cc. HNO_3 and 100 cc. H_2O , filter off SiO_2 and SnO_2 , conc. to 100 cc., add 2 cc. HNO_3 , remove Cu by electrolyzing 3 hrs. under 2 volts, redissolve in HNO_3 any MnO_2 deposited on the anode, remove Al_2O_3 , Fe_2O_3 and MnO_2 by double pptn. with NH_4Cl , NH_4OH and H_2O_2 , conc. the filtrate to a small vol., make slightly acid with HCl , add NH_4Cl and NH_4 phosphate, heat to boiling, add NH_4OH to ppt. MgO (the Ni phosphate redissolves in excess of NH_4OH) which is ignited to $Mg_3P_2O_8$ as usual, remove Zn from the filtrate with H_2S in presence of NH_4CNS and det. Ni electrolytically. Dissolve the ppt. contg. the Fe , Al and Mn in HNO_3 , evap. to dryness, add 50 cc. HNO_3 and 10–15 g. $KClO_4$, evap. to a few cc., slowly add 200 cc. cold H_2O , filter off the Mn ppt., if it is contaminated with Fe , reppt. as above, dissolve in excess of 0.1 N oxalic acid and H_2SO_4 and titrate the excess with $KMnO_4$. Conc. the filtrate from the MnO_2 and ppt. $Al_2O_3 + Fe_2O_3$. This method gave the same results as electrolysis for Ni and as the Briesch-Chalupny method for Mg (*C. A.* **16**, 1374).

A. PAPINEAU-COUTURE

Proper conditions for determining manganese by the ammonium persulfate method.

(MISE) M. COURSANGE AND M. J. NAVARRO. *Chimie et industrie Special No.*, 84–92 (Sept., 1925).—For the detn. of Mn in steels, dissolve 0.2 g. in 20 cc. HNO_3 (d. 1.1), add 1 cc. of satd. (70%) $(NH_4)_2(SO_4)_2$, boil till evolution of O ceases, cool by adding 30 cc. cold H_2O , add 5 cc. 0.1 N $AgNO_3$ and then 1 cc. $(NH_4)_2(SO_4)_2$, either heat on the water bath 3 min. after the soln. turns pink or let stand 30 min., dil. the cold soln. to about 200 cc. and titrate with As_2O_3 . If $AcOH$ is required (e. g., when a large amount of $AgNO_3$ was added to prevent pptn. of MnO_2), add it to the dild. soln. 2 min. before titrating. In cast iron (especially white iron) trouble is encountered on account of C compds. which are formed during soln. of the sample causing low results, and from a certain Mn content MnO_2 ppts. out. This is overcome as follows: dissolve 0.2 g. in 40 cc. of hot HNO_3 (d. 1.2), add 1–2 cc. satd. $(NH_4)_2(SO_4)_2$, boil till evolution of O ceases, add successively 40 cc. cold H_2O , 0.1 N $AgNO_3$ (1 cc. per % Mn) and 2 cc. $(NH_4)_2(SO_4)_2$, either heat on the water bath 5 min. after the soln. turns pink or let stand 30 min., add 2 cc. for 20% $AcOH$, let stand 2 min. and titrate with As_2O_3 . Practically identical results were obtained as by the Volhard method.

A. PAPINEAU-COUTURE

Molybdomanganimetry: a new method of microchemical analysis—its principles, reagents and possibilities. G. FONTÈS AND L. THIVOLLE. *Chimie et industrie Special No.*, 93–6 (Sept., 1925).—An outline of the principle of the method, of the prepn. of phosphomolybdic reagent (*C. A.* **15**, 3855; **18**, 3003), and of the possibilities of the method.

A. PAPINEAU-COUTURE

Microchemical molybdomanganimetric determination of metals. G. FONTÈS AND L. THIVOLLE. *Chimie et industrie Special No.*, 97-101 (Sept., 1925).—A detailed description of the methods of detg. Cu and Fe (*C. A.* 18, 3003), with a discussion of the technique. A. PAPINEAU-COUTURE

Microchemical molybdomanganimetric determination of reducing salts. G. FONTÈS AND L. THIVOLLE. *Chimie et industrie Special No.*, 102-5 (Sept., 1925).—Outline of the detn. of Cu as Cu_2O which is not recommended, detn. as Cu (preceding abstract) being preferable. Fe can be detd. as FeO by reducing with Cu in H_3PO_4 soln., cooling, filtering, washing with dil. H_3PO_4 and titrating molybdomanganimetrically. H_3PO_4 completely prevents oxidation in the cold of FeO to Fe_2O_3 . Presence of 1-2 g. Cl does not interfere, but large amts. of SO_3 give high results. If the color of the Cu dissolved during reduction is sufficient to interfere with the titration, ppt. the Fe with NaOH , add a few drops of satd. MgSO_4 soln., filter, redissolve the ppt. in H_3PO_4 and titrate. The methods for detn. of glucose and of lactose are described in detail (*C. A.* 15, 3855; 16, 1788). A. PAPINEAU-COUTURE

The detection of carbonate in bicarbonate with phenolphthalein. V. MACRI. *Boll. chim. farm.* 63, 531-3 (1924); cf. *C. A.* 18, 2788.—It was shown by Mestrezat that the detn. of Na_2CO_3 in NaHCO_3 with phenolphthalein is accurate provided the concn. does not exceed 0.07%. The decolorizing influence of large amts. of salts is very likely due to a salting out of the indicator, since the color reappears on diln. For the pharmacopoeial test a CaSO_4 soln. is suitably added to a 5% NaHCO_3 soln. A Na_2CO_3 content over 4% produces immediately a marked turbidity. MARY JACOBSEN

The remarkable behavior of alkali sulfates in the Kjeldahl determination of nitrogen in nitroaniline. B. M. MARGOSCHES, ERWIN SCHEINOST and MAURYCY FRISCHER. *Ber.* 58B, 2233-7 (1925); cf. *C. A.* 17, 3656.—If 2.0 g. samples of the nitroanilines are treated with 20 cc. concd. H_2SO_4 and various amts. of the alkali sulfates, the % N found increases irregularly from 11-12% with no sulfate added, to 15-18% when 25-40 g. of sulfate are used. Higher results are obtained with K_2SO_4 than with Na_2SO_4 . In all curves the 2.5 g. point for added sulfate is below the 0 point. Equiv. amts. of borax and Na_2SO_4 give check results for N in *o*-nitroaniline (about 0.5 the calcd. figure). While the behavior of *o*-nitroaniline is similar to that of *o*-nitroacetanilide, *p*-nitroacetanilide does not act like *p*-nitroaniline. The amt. of N found in *o*-nitroaniline is independent of the cc. H_2SO_4 used. If the wts. of sample, K_2SO_4 and H_2SO_4 , stand, resp., in the ratios 0.2:10:20, 0.2 15:20, or 0.2:5:20, fairly close checks are obtained in the case of *o*-nitroaniline. As an unexpected development it is found that addn. of HgO to K_2SO_4 decreases the % N obtained. The Kjeldahl reaction yields correct results when the detn. is made on a 0.2 g. sample of *p*-nitroaniline, with 22.5 g. K_2SO_4 and 0.1-0.5 g. CuO . ROSALIE COBB

Color test for nitrous and nitric acids. LAD. EKKERT. *Pharm. Zentralhalle* 66, 733-4 (1925).—0.1 g. of NaNO_2 yields with 5 to 6 cc. of a 33% HCl contg. 0.02 to 0.03 g. resorcinol an immediate saffron-yellow, changing later to brownish red and finally to dark mulberry red, which after a lapse of 20 to 25 min. and addn. of sufficient 0.2 *N* NaOH becomes dark green. An aliquot of the green liquid colors AcMe violet red; another portion develops a rose to onion red with EtOAc ; a 3rd portion becomes on diln. with H_2O violet-red, violet or lilac and eventually green. These solns. then show a fiery red fluorescence with reflected light. If the test soln. contains more resorcinol and the alkali is added after 5 to 10 min. a dark blue color develops, changing gradually to green, then dild. with H_2O to blue with red fluorescence. From 5 to 6 cc. of the same test soln. added to 0.01 g. KNO_3 causes the liquid to assume *only* a pale yellow color after the lapse of 5 min. at the ordinary temp. On heating in a boiling H_2O bath the soln. immediately becomes yellow, then peach red, then in the course of $\frac{1}{2}$ min. dark mulberry red. On treating the cooled liquid with sufficient 0.2 *N* NaOH it becomes dark green. This soln. colors AcMe violet red, EtOAc rose red, becoming on diln. with H_2O violet red or lilac, and showing a fiery red fluorescence with reflected light. On mixing the acid red liquid with a more dil. alkali, the color becomes purple-red, then violet and finally blue, remaining thus even when dild. with H^+O . Other oxidizing agents, as chlorate, develop with the acid soln. an immediate green to red-brown; bromate, a red-brown color; iodate, greenish brown; dichromate, dark green. W. O. E.

Notes on gas analysis, with special reference to the analysis of mine air. J. W. WHITAKER. *Fuel in Science & Practice* 4, 450-4 (1925).—In view of the fact that the Haldane app. (cf. *C. A.* 13, 1197) does not allow the detn. of CO , whereas the Graham app. (cf. *C. A.* 13, 821) detn. only CO , *fractional combustion of CO* in the combustion pipet of the Haldane app. was attempted. CH_4 burns with difficulty unless the Pt is at orange heat and not completely except at a yellow to white heat for 2-3 min. At

dull red CH_4 is unaffected for the first 5 min., whereas small quantities of CO and H are burned completely in 1 min. Furthermore when not over 1% CO or H is present, the temp. rise of the Pt on combustion is not great enough to burn the CH_4 . This latter danger is obviated by an adjustable resistance so that the Pt can be maintained at first non-luminous in the dark, then gradually barely luminous and finally at a dull "fogged" red tint. If the heating is continued many min. at a "fogged red" heat, CH_4 begins to decompose. The CO_2 is then absorbed in KOH as usual. The vol. of CO is that of the CO_2 and the vol. of H is $(2/3)(D-\text{CO}_2/2)$, where D is the total drop in vol. caused by the combustions and CO is the vol. of CO. It was not found possible to burn H separately from CO by adjusting the temp. of the wire. After the CO and H are detd., the CH_4 is estd. in the usual way with the wire at a yellow to white heat and the O is then absorbed by pyrogallol. For the analysis of a mixt conlg unsatd. hydrocarbons, an app. is described and illustrated which is essentially a Haldane app. with 2 additional pipets as recommended by Sinnatt and Slater (cf. *C. A.* 18, 1258). C. C. D.

The determination of small quantities of impurities in argon and nitrogen. G. HEYNE. *Z. angew. Chem.* 38, 1099–101 (1925).—See *C. A.* 19, 3231. H. G.

Sampling malleable iron heats. F. B. BAYLESS. *Chem. Met. Eng.* 32, 882 (1925).—A method is described for getting a sample that will drill easily. W. T. H.

Detection of bismuth in organic material. P. W. DANCKWORTT AND E. PFAU. *Arch. Pharm.* 263, 502–6 (1925).—Treat the sample 24 hrs. in the cold with HNO_3 (1.44), finally heating on the H_2O bath. Evap. the filtrate, and ash the residue together with any material not destroyed by the HNO_3 in a crucible. Dissolve the ash in dil. HNO_3 , add a little CdSO_4 soln. and sat. with H_2S . Since the presence of Cd is not prejudicial to the detection of Bi via Aubry, centrifuge the pptd. sulfide mixt., then wash with H_2O in the same way, dissolve in concd. HNO_3 and evap. to dryness. Dissolve in dil. HNO_3 and test for Bi as follows: Dissolve 1 g. quinine sulfate in 3 drops concd. H_2SO_4 and dil. to 50 cc. by addn. of H_2O . Dissolve 2 g. KI in 50 cc. H_2O . This reagent (made up from equal portions of the 2 solns.) is sensitive to Bi as follows: 0.00001 g. Bi in 1 cc. yields an orange-red ppt., 0.000005 g. Bi a turbidity, 0.000001 g. Bi a weak turbidity discernible only against a white background. In the pptn. of Bi after destruction of the org. matter, the presence of Cu and Fe is quite probable since the former occurs in minute amts. in all organs and would accordingly appear along with the Bi ppt. The same is also true of Fe, at least in minute amt. The presence of Cu in no way impairs the test; that of Fe must, however, be considered since it yields with the quinine reagent a ppt. similar to that of Bi, the ppt. occurring in a diln. of 1:100000. Should both metals be present, the ppt. cannot be differentiated macroscopically, but only by examn. under the microscope. The difference may be detected chemically by treating the ppt. on a cobalt glass with $\text{K}_4\text{Fe}(\text{CN})_6$, whereby the Fe ppt. appears blue while the Cu ppt. remains unchanged as to color. The color contrast becomes more pronounced on treatment with $\text{K}_3\text{Fe}(\text{CN})_6$, which causes the Fe ppt. to disappear on stirring with a glass rod while the Bi ppt. persists. W. O. E.

Micro-methods for the determination of calcium and magnesium in organic liquids. LUIGI CONDORELLI. *Arch. farm. sper.* 40, 71–80 (1925).—*Detn. of Ca.*—Place 1 cc. of blood or other sample in a Pt crucible, evap. to dryness on a water bath and ignite. Dissolve the ash in 0.5 cc. N HCl. By means of a fine pipet bent at right angles, transfer the soln. to a centrifuge tube and rinse out the crucible with 0.5 cc. N HCl and then with 1 cc. H_2O , using the same pipet. Rinse the crucible a 4th and 5th time with 0.5 cc. of 3% $(\text{CO}_2\text{H})_2$. Add a drop of methyl red and place the tube in a boiling water bath, then while hot add N NH_4OH drop by drop from a micro-buret until the soln. is neutral. Add 1 cc. of 8% NH_4Cl and 1 cc. of 9% $(\text{NH}_4\text{CO}_3)_2$. Dil. to 6 cc. with H_2O and allow to stand 24 hrs. Centrifuge 20 min., then pipet off the supernatant liquid, add 5 cc. H_2O and centrifuge again, repeating this operation 3 times. Dissolve the residue in 5 cc. N H_2SO_4 , heat on a water bath and titrate with 0.005 or 0.01 N KMnO_4 . 1 cc. of 0.01 N KMnO_4 = 0.2 mg. Ca. *Detn. of Mg.*—Take an aliquot (e. g., 5 cc.) of the supernatant liquid from the Ca pptn., transfer to a centrifuge tube and add 1 cc. of 25% $(\text{NH}_4)_3\text{PO}_4$ and 2 cc. of 10% NH_4OH . Stir thoroughly and allow to stand 24 hrs. Centrifuge, draw off the supernatant liquid. Rinse the ppt. with 5 cc. of 10% NH_4OH and centrifuge again and repeat this operation twice, testing the final rinse water with molybdic acid and $p\text{-C}_6\text{H}_4(\text{OH})_2$ to assure complete removal of H_3PO_4 . Add 1 cc. of N H_2SO_4 , transfer by means of the pipet to a 25 cc. volumetric flask, washing 5 or 6 times with 1 cc. H_2O . Add 1 cc. of molybdic acid reagent and 2 cc. of a 2% soln. of $p\text{-C}_6\text{H}_4(\text{OH})_2$ in very dil. H_2SO_4 . The color which develops is first yellowish, then greenish blue and reaches its max. intensity in 5 min. Now add 10 cc. of a soln. prepd. by mixing 4 parts of 20% Na_2CO_3 and 1 part of 15% Na_2SO_3 and dil.

to the mark. The azure color is compared colorimetrically with that obtained by treating a standard soln. of KH_2PO_4 (0.0002 *N*) in the same manner. Ratio of heights of columns in the colorimeter $\times 0.4864 = \text{mg. of Mg.}$ A. W. DOX

A few reactions of formaldehyde. N. TARUGI. *Boll. chim. farm.* **63**, 369-74 (1924).—When a slight excess of $\text{Ca}(\text{OH})_2$ slaked in 3 parts water is added to CH_2O and heated with stirring a violent reaction occurs at 95° : $30 \text{ CH}_2\text{O} + 4 \text{ CaO} + \text{H}_2\text{O} = \text{C}_6\text{H}_{12}\text{O}_6\text{CaO} + 2 \text{ C}_6\text{H}_{10}\text{O}_5 + 3 \text{ Ca}(\text{HCOO})_2 \cdot 6 \text{ MeOH}$. If heating is immediately interrupted to avoid further condensation the products are formed in strictly stoichiometrical proportions and the detn. of any of them: total Ca, carbohydrate Ca, H_2CO_3 or reducing sugar affords an exact detn. of the original CH_2O content of the soln. The most rapid method, however, is the detn. of the d. of the end soln. made up to 100 cc. since there is a strictly const. increase with the concn. of CH_2O , the factor being 0.00235 at 15° . Control detns. of CH_2O showed Orchard's method to give the best results, with the understanding, however, that 1 CH_2O ppts. 2 Ag (Tollens). A blank is made to account for the influence of light and the H_2CO_3 content is subtracted from the Ag titer. MeOH does not influence this reaction. MARY JACOBSEN

New color test for tartaric acid. L. EKKERT. *Pharm. Zentralhalle* **66**, 765 (1925).—To a mixt. of 0.01 g. tartaric acid and 0.02 g. pyrogallol add 5 cc. concd. H_2SO_4 , then immerse in a boiling H_2O bath, whereupon an intensely violet color develops. If instead of pyrogallol, β -naphthol is used a blue-green color results. W. O. E

The determination of camphor in plants, industrial products and pharmaceuticals. G. GORI. *Ann. chim. applicata* **15**, 283-300 (1925).—Plants (*Laurus camphora* L., etc.). Even the Giglioli method (*Atti sesto congresso chim. applicata* **4**, 200 (1906)), which is the only one at all reliable for detg. camphor in plants, involves losses of camphor reaching 6-8%. Et_2O is unsatisfactory and CCl_4 is a superior solvent (cf. Gori, *C. A.* **8**, 1140; **9**, 1827, **17**, 672) because Et_2O increases the soly. of camphor in H_2O , whereas CCl_4 reduces its soly. and exts. even traces of camphor sol. in H_2O . Furthermore, instead of tedious phys. sepn. of camphor and camphor oil, the sepn. is much sharper by conversion of all of the components of the oil to compds. sol. in H_2O by oxidation with alc. KMnO_4 . At a low temp. the camphor is not oxidized, while all oil is so. Moisten 200-500 g. of finely divided leaves, bark or roots and distil in a current of steam, maintaining the retort at 160° for 2 hrs. and at 180° for another 0.5 hr. Make slightly alk. with a few drops of 10% KOH , add 3-5 g. of KMnO_4 in H_2O , and keep near 0° for 3-4 hrs., with frequent agitation. Enough KMnO_4 must be used for a permanent violet color. Reduce excess KMnO_4 with SO_2 until colorless, redistil with steam, ext. the camphor in the distillate with 80 g. of CCl_4 , also washing the condensing system. Agitate the combined liquids for some time, sep., filter the CCl_4 layer, wash with CCl_4 and repeat the extn. of the H_2O with 2 more 25 cc. portions of CCl_4 . Evap. the combined exts. at room temp., weigh and maintain over CaCl_2 in an atm. satd. with camphor until of const. wt. The camphor obtained should be pure enough to have a m. p. of 175° . To det. the crude camphor contg. oil the steam distillate is extd. with CCl_4 before oxidation and evapd. to const. wt., after which the oil is oxidized, the camphor detd. and the oil calcd. by difference. *Celluloid*.—Decomp 5 g. of finely divided celluloid with 500 g. of hot 3% KOH , steam distil, ext. the camphor from the distillate with 3 portions of 30, 15 and 15 g. of CCl_4 and proceed as before. *Camphorated spirit*.—Agitate 60 cc. of 10% aq. $\text{Pb}(\text{OAc})_2$ with 10 g. of spirit for 0.5 hr., let stand, ext. with 15-20 g. of CCl_4 and evap. the combined exts. to const. wt. as before. The method is more accurate than that of Jumeau (*Chem.-Ztg.* **1913**, 2174; cf. *C. A.* **8**, 202). *Camphorated oil and ammoniacal liniment*.—Add 500 cc. of H_2O to 10 g. steam distil until exhausted of camphor, ext. the distillate with 30 g. of CCl_4 and proceed as before. *Opodelloch balsam*.—After prolonged agitation of 10-15 g. of balsam with 900 cc. of H_2O and then 100 g. of 10% $\text{Pb}(\text{OAc})_2$ and subsequent standing, steam distil for 2 hrs., ext. the distillate with CCl_4 , evap., and if not pure, oxidize any impurities (e. g., oil of rosemary) with 1 g. of KMnO_4 in 300 g. of H_2O and proceed as before. *Camphorated tablets, pills and gelatin*.—Steam distil the substance suspended or dissolved in H_2O and ext. the distillate with CCl_4 as before. The soly. of camphor in CCl_4 was found to be 0.57:1 at 20° ; in H_2O at 9° , 1.5:1000, in CHCl_3 at 20° , 0.69:1. The soly. of CHCl_3 in H_2O was 0.7-0.9%, depending on the temp. A bibliography of 30 references to previous work relating to the problem in question is included. C. C. DAVIS

Determination of butadiene mixed with other gaseous olefins. B. SOROKIN AND A. BELIKOV. *J. Ind. Chem. (Russia)* **1**, 28-9 (March-April, 1925).—Wash the gas mixt. with H_2O , and 10% NaOH , pass through CCl_4 satd. with dry Cl at $15-16^\circ$, and wash again with 10% NaOH . Combine all the washing liquids, let stand 1.5-2.0 hrs., neutralize excess Cl with Na_2CO_3 , wash with H_2O and dry with CaCl_2 . Evap. the CCl_4

and fractionate the residue. Butadiene gives a tetrachloride, m. 70° , b. $118-22^{\circ}$; the yield is within 2.5-5.0% of the theoretical.

BERNARD NELSON

Estimation of glucose (ROSENTHALER) 11B.

FALES, HAROLD A.: **Inorganic Quantitative Analysis**. New York: The Century Co. 493 pp. \$3.50. Reviewed in *Chem. Met. Eng.* **32**, 878; *Chemicals* **24**, No. 25, 35(1925).

SCOTT, WILFRED W.: **Standard Methods of Chemical Analysis**. 4th ed. Thoroughly revised and enlarged. 2 Vols. Vol. I. Chemical Analysis. Vol. II. Special Subjects. New York: D. Van Nostrand Co. 1805 pp. \$12 net. Reviewed in *Sugar* **27**, 567; *Textile Colorist* **47**, 809(1925); *Ind. Eng. Chem.* **18**, 107(1926)

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Synthesis of cristobalite in the wet way. R. WEIL. *Compt. rend.* **181**, 423-4 (1925).—In a steel tube, modeled after that of C. Friedel and Sarasin, was placed 4 g. of anhyd. pptd. SiO_2 and a soln. of Na_2SiO_3 of a concn less than 1%. After heating to 650° to 750° for 7-15 hrs. and cooling, a mixt. of crystals of quartz and cristobalite in varying proportions was formed. The proportion of cristobalite crystals increases as the concn of the Na_2SiO_3 decreases. With a 1% soln. of Na_2SiO_3 only quartz crystals are formed. The optical characters of the artificial cristobalite are described at length.

L. W. RIGGS

Epsomite from the lower Nord-Ovest mine of Idria. E. ONORATO. *Atti accad. Lincei* [6], **2**, 204 9(1925).—Long silky fibers of epsomite showed: MgO 16.44, CaO trace, SO_3 32.67, H_2O 50.75, and $d = 1.677$; it was, therefore, pure $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$. A white stratified stalactite showed about the same compn. Isomorphous mixts. contained up to 18% $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$. The presence of epsomite in the Triassic of Idria is due to a reaction between MgCO_3 and FeSO_4 produced by the alteration of pyrite.

E. J. WITZEMANN

A new mineral, buttgenbachite. ALFRED SCHOEP. *Compt. rend.* **181**, 421-3 (1925).—This mineral was found as interlaced needles covering cuprite from Likasi, Belgian Congo. It consisted of azure blue crystals with $n = 1.747$ and $d = 3.33$. It loses 0.36% of its wt. after heating several hrs. at 150° . Between 290° and 310° it loses H_2O , nitrous gases and Cu_2Cl_2 up to 20.96% of its wt. Analysis gave: CuO 71.56, Cl 6.02, H_2O 17.34, N_2O_5 5.40, sum 100.32%, which less 1.28, the Cl equiv. of O, leaves 99.04%. The formula is thus $18\text{CuO} \cdot 3\text{Cl} \cdot \text{N}_2\text{O}_6 \cdot 19\text{H}_2\text{O}$, which shows its analogy to connellite. It is named in honor of H. Buttgenbach of the University of Liège.

L. W. RIGGS

Ore deposits of the Saddle Mountain and Banner mining districts, Arizona. C. P. ROSS. U. S. Geol. Survey, *Bull.* **771**, 72 pp.(1925).—These deposits are believed to be genetically related to the intrusion of a quartz-mica diorite. They include Ag-Pb veins, pyritic Au deposits on shear zones, and disseminated pyrite. Contact-metamorphic ore bodies have been mined for Cu, Pb, Zn and Au. V prospects were found. **Copper deposits near Salmon, Idaho.** *Ibid.* *Bull.* **774**, 43 pp.(1925).—The deposits have formed along shear zones partly by replacement and partly by vein-filling. The rare Cu-Fe mineral delafossite is present. The av. ore contains from 2.5 to 6% Cu.

L. W. RIGGS

Alaska's mineral resources and production, 1923. A. H. BROOKS. U. S. Geol. Survey, *Bull.* **773**, 3 52(1925).—The Au, Ag and Cu ores appear to be in large quantities but of rather low grade. Au production is decreasing, while that of Cu, Pb and coal is increasing over pre-war levels.

L. W. RIGGS

Mineral investigations in S. E. Alaska. A. F. BUDDINGTON. U. S. Geol. Survey, *Bull.* **773**, 71-139(1925).—Discoveries of Au, Ni, Pb-Ag and Cu have been made during the past 3 years. **The occurrence of copper on Prince William Sound.** F. H. MOFFIT. *Ibid.* 141-58.—The Cu sulfide deposits of this region are of simple type. The rare mineral chalmersite is widespread. The ore bodies are for the most part of low grade. **Mineral resources of the Kamishak Bay Region.** K. F. MATHER. *Ibid.* 159-81.—Indications of petroleum were found. **The Cold Bay-Katmai District.** W. R. SMITH. *Ibid.* 183-207.—Oil and gas seepages are found. A small Au placer is at Kubugakli. **The outlook for petroleum near Chignik.** G. C. MARTIN. *Ibid.* 209-13.—The outlook is not hopeful. **Geology and gold placers of the Chandalar District.** J. B. MERTIE, JR.

Ibid 215-63.—The Au yield for this district for 1919-1923 ranged from \$10,000 to \$83,000, av. \$30,000 per year. L. W. RIGGS

The potassium salt deposits of upper Alsace, their economical significance. W. WAGNER. *Naturwissenschaften* 13, 785-91(1925).—A review mainly pertaining to the geological development of the Alsatian potassium deposits. B. J. C. VAN DER HOEVEN

Summary of considerations on the genesis of petroleum. I. P. VORTSEHL. *Mon. Petr. Roum.* 24, 964(1925).—The hypotheses regarding the origin of petroleum can be classified as follows: A. Inorganic (1) chem., (2) volcanic; B. Organic (1) animal, (2) vegetable and (3) animal + vegetable sources. V. concludes that petroleum was formed under the influence of regional metamorphism of geosynclinal zones, in consequence of which org. residues (principally of vegetable origin) were submitted to high temps. and pressures resulting in distn M. B. HART

The origin of brown coals. W. PETRASCHECK. *Braunkohle* 24, 593-5(1925).

WM. B. PLUMMER

Carbonic acid gas in the sub-soil of the Ardenne. C. GUILLEAUME. *Ann. Soc. Geol. Belgique* 48, B25-30(1925).—Earth rumblings that have accompanied tornadoes at various places are due to movements of CO₂ existing under pressure at great depths. The gas has probably accumulated in regions of extinct volcanoes. O. F. P.

The geochemical work of V. M. Goldschmidt. FRITZ PANETH. *Naturwissenschaften* 13, 805-9(1925). B. J. C. VAN DER HOEVEN

• The crystal structures of the sulfides of Hg (BUCKLEY, VERNON) 2. The crystal structure of lead dioxide (FERRARI) 2. The system Na₂SO₄-Na₂Cl₂-MgSO₄-MgCl₂-H₂O (ROSE) 2. Coloration of fluorite (STEINMETZ) 2.

KRAUS, EDWARD HENRY and HOLDEN, EDWARD FULLER: **Gems and Gem Materials**. New York: McGraw-Hill Book Co. 222 pp. \$3. Reviewed in *Mining Met.* 6, 591(1925), *Ind. Eng. Chem.* 18, 104(1926).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST AND R. S. WILLIAMS

Ancient copper mining and smelting in Central Africa. GEO. L. WALKER. *Eng. Mining J.-Press* 120, 811-6(1925). E. J. C.

Action of sodium sulfate in the refining of mats. B. BOGITCH. *Compt. rend.* 181, 666-8(1925).—Treatment of Fe, Ni and Cu with a 1 : 3 mixt. of Na₂SO₄ and SiO₂ for 20-25 min. to a max. temp. of 1400-1500° resulted in the following proportions of the metal being oxidized:

Na ₂ SO ₄ %	10	20	30	50
Fe	18.7%	29.1%	42.3%	67.8%
Ni	10.0	—	29.3	57.2
Cu	6.2	—	17.1	34.1

Oxidation of the Fe and Ni is much higher than would be obtained from the reaction Na₂SO₄ = SO₂ + O + Na₂O, because of subsequent decompn of the SO₂. The following S contents were found in the metals with 10, 30 and 50% of Na₂SO₄, resp.: Fe 1.83, 6.9, 17.5; Fe sulfide (29% S) 30.9, 31.4, 31.2; Ni 2.9, 7.1, 10.2; Ni sulfide (23.5% S) 21.6, 22.2, 22.2; Cu ---, 0.08, 0.07; Pb ---, 0.34, 0.35. The reaction involved in the refining of mats by roasting and smelting is essentially MS + MO ⇌ SO₂ + M, which is reversible. With Cu, equil. is reached when the S content of the metal is very low, with Pb, equil. is reached with a somewhat higher S content, and the reaction is, therefore, somewhat more difficult to carry out commercially; while with Ni (or Co), the S content at equil. is so high that the process cannot be used commercially. A. P.-C.

Selection and blending of core sands. A. A. GRUBB. *Metal Ind.* (N. Y.) 23, 444-5(1925). E. J. C.

Direct process for the manufacture of steel. HENNING FLODIN. *Blast Furnace and Steel Plant* 13, 424-5; *Iron Age* 116, 1247-8; *Engineering* 120, 432(1925).—See C. A. 19, 3454. H. G.

Power and fuel consumption in the iron and steel industries of Pittsburgh. S. B. ELY AND W. F. RITTMAN. *Blast Furnace and Steel Plant* 13, 449-55(1925). E. J. C.

Scrap specifications. Tentative classification for material used by iron rolling

mills. NATIONAL ASSOCIATION OF PURCHASING AGENTS. *Iron Age* 116, 1450(1925).

Monel metal (progress in the preparation, treatment and use). ANON. *Apparaturbau* 37, 315-6(1925).—It is suggested that in Germany a "synthetic" metal could be made at a lower cost than the "natural" metal.

Blast-furnace practice in India. J. L. KEENAN. *Blast Furnace and Steel Plant* 13, 426-9(1925); See *C. A.* 19, 3452.

Opening frozen blast-furnace holes. E. E. THUM. *Iron Age* 116, 1244-7(1925).

Tapping the furnace in safety. E. B. SPEER. *Blast Furnace and Steel Plant* 13, 478-81(1925).

Bibliography on zinc retorts and condensers. B. M. O'HARRA. School of Mines and Metallurgy, Univ. of Missouri, *Tech. Bull.* 8, No. 4, 15 pp.(1925).

Metal spinning. WM. MASON. *Metal Ind.* (N. Y.) 23, 485-6(1925).—A description of the equipment required.

Charging cupolas mechanically. WM. G. HAMMERSTROM. *Foundry* 53, 908-11(1925).—An elec. charging device is described.

The equilibrium in the liquid system iron-copper-manganese for slight variations in carbon contents. F. OSTERMANN. *Z. Metallkunde* 17, 278-82(1925).—By means of microscopic study of ternary Fe-Cu-Mn alloys, contg. varying small amts. of C (0.1 to 1.0% C) O. arrives at the following conclusions. Fe and Cu are miscible in all proportions in the liquid state at temps. not exceeding 20° above the liquidus line. Addn. of C brings about formation of 2 layers, the C going almost exclusively into the layer rich in Fe. As little as 1% C extends the gap in miscibility from 100 to 20% Cu, the upper layer being pure Cu, the bottom layer contg. about 20% Cu. On introducing Mn, which alloys completely with both Fe and Cu in the liquid state, the two-layer system can be changed back to a single liquid phase.

Corrosion of brass in condenser pipes. G. MASING. *Naturwissenschaften* 13, 941-4(1925).—A review. (Cf. Bengough and May, *C. A.* 18, 3352.)

The influence of deformation on the transformations in certain light aluminium alloys. LEON GUILLET. *Compt. rend.* 181, 639-41(1925).—The deformation produced by drawing cold duralumin accelerates the transformation which takes place when the alloy is quenched from 475° in water at 15°.

The theoretical and metallurgical basis of electric welding. J. L. FRANKFURT. *Elektrichestvo* 1925, 606-15.

Defective material and processes. HARRY BREARLEY. *Blast Furnace and Steel Plant* 13, 430-3, 470-2, 477(1925).—About steel. Simple means of investigation for defects, such as pickling, etching and S printing, are commended.

Electric steel for staybolt use. T. S. WHEELRIGHT. *Iron Age* 116, 1243(1925).

Steel treating and its value to the steel engineer. R. F. CRUMP. *Iron and Steel Eng.* 2, 409-16(1925).

The chemical and physical mechanism of rusting and corrosion. O. BAUER. *Gas u. Wasserfach* 68, 683-7, 704-7, 715-9(1925).—A general review and discussion.

WM. B. PLUMMER

Metallurgical poisoning of animals at Oroya, Peru (MITCHELL) 11H. Regenerative furnace for heating metals (U. S. pat. 1,565,370) 1. Device for testing the compression strength of foundry sand (U. S. pat. 1,559,921) 1.

ADAM, ALASTAIR T.: *Wire Drawing and the Cold Working of Steel*. London: H. F. & G. Witherby. 212 pp. 40s. net. Reviewed in *Analyst* 50, 644(1925).

CAMP, J. M., and FRANCIS, C. B.: *The Making, Shaping and Treating of Steel*. 4th ed., revised and enlarged. Pittsburgh, Pa.: Carnegie Steel Co. 1142 pp. \$7.50. Reviewed in *Ind. Eng. Chem.* 17, 1206(1925).

CRUMP, N. E.: *Copper*. London: Wm. Rider & Son, Ltd. 236 pp. 10s. 6d. Reviewed in *Metal Ind.* (London) 27, 507(1925).

DERUELE, C.: *La sidérurgie*. Paris: G. Doin. 360 pp. Fr. 10. Reviewed in *Chimie et industrie* 14, 659(1925).

HERMANN, HUBERT: *Bau und Betrieb moderner Konverterstahlwerke und Kleinbessemerieen*. Halle A. Saale: Wilhelm Knapp. 251 pp. paper G. M. 12. Reviewed in *Mech. Eng.* 47, 868(1925).

HEYN, E.: *Physical Metallography*. Translated from the German and augmented

by M. A. Grossmann. New York: John Wiley & Sons, Inc. 440 pp. \$6.00. Reviewed in *Ind. Eng. Chem.* **17**, 1205(1925).

HUGHES, CHARLES H.: **Copper and Alloys** (Chart). New York, 2681 Amboy Road, New Dorp, S. I.: Published by the author. Cardboard, \$1.25; paper, \$1.00. Reviewed in *Mech. Eng.* **47**, 956; *Ind. Eng. Chem.* **17**, 1207(1925).

RICHARDS, ROBERT H., LOCKE, CHARLES E., and BRAY, JOHN I.: **A Text Book of Ore Dressing**. 2nd ed., completely revised. New York: McGraw-Hill Book Co., Inc. 570 pp. \$5.50. Reviewed in *Chem. Met. Eng.* **32**, 878(1925).

SCHWARZ, M. V.: **Eisenhüttenkunde. Vol. II. Das Schmiedbare Eisen**. Berlin and Leipzig: Walter de Gruyter & Co. 176 pp. G. M. 1.25. Reviewed in *Mining Met.* **6**, 590(1925).

THOMPSON, F. C.: **A Course of Metallurgy for Engineers**. London: Witherby. 240 pp. 25s. net. Reviewed in *Analyst* **50**, 587(1925).

Separating ore particles. J. WEATHERY. U. S. 1,564,731, Dec. 8. In sepg. magnetically permeable particles from gang, the mixt. is passed between a progressive multiphase magnetic field and an induced field. U. S. 1,564,732 specifies a similar process.

Treating ores or residues containing zinc. S. C. SMITH. U. S. 1,565,215, Dec. 8. Liquors (such as those obtained by acid treatment of Zn ores) which contain Zn, Cl and SO_4 ions are treated with $BaCl_2$ to ppt. the SO_4 , then treated with $BaCO_3$ to ppt. $ZnCO_3$ and obtain a soln. contg. $BaCl_2$ for further use on succeeding batches.

Treating argentiferous lead-zinc sulfide ores. F. E. ELMORE. U. S. 1,565,072, Dec. 8. The ore is first heated with NaCl to above 400° (but not high enough to cause volatilization of the Pb as a halogen compd.) in the presence of air. The ZnS for the most part remains unattacked. The oxidized mixt. is extd. with a strong soln. of NaCl and Ag is extd. from the residue with a solvent such as a soln. of $CaCl_2$ or $MgCl_2$ and HCl. U. S. 1,565,073 specifies heating a similar ore to about dull redness under conditions such that the ZnS remains substantially undecomposed, then treating the ore to the "acid brine" process, followed by leaching the argentiferous ZnS residue with acid chloride brine solvents which ext. the Ag and leave the ZnS still substantially undecomposed.

Treating iron ores. W. R. VAN SLYKE. U. S. 1,565,689, Dec. 15. Fe ores are sintered to produce a porous material, mixed with a nonporous fuel such as wood or coal and smelted to recover Fe.

Treating iron sulfide ores containing other valuable metals. A. T. K. ESTELLE. U. S. 1,565,353, Dec. 15. Ore contg. Fe sulfide and which may also contain Cd, Ni, Co, Zn or Cu is heated under nonoxidizing conditions, cooled, comminuted, concd., leached with dil. H_2SO_4 , Cu is removed from the resulting soln., e. g., by pptn. with Fe. Fe sulfate is crystd., the crystd. mass is treated with NH_3 and air, dried, washed and $(NH_4)_2SO_4$ sepd. from metal values and crystd.

Treating manganese-silver ores. M. F. COOLBAUGH and J. B. READ. U. S. 1,562,942, Nov. 24. Ore contg. Mn, Ag and sulfides is heated to a temp. sufficiently high (usually about 600-1000) and for a time sufficient to insure roasting of the sulfides other than Ag sulfide and prevent a dead roast and retain the Ag in the form of sulfide. The solid materials and gases are advanced in the same direction through an inclined horizontal kiln and the temp. is lowered below the decomposing temp. of Mn sulfate so that the S contg. gases will react with the Mn mineral and form Mn sulfate. The latter is leached out of the resulting mixt.

Tin from ores. J. R. STACK. U. S. 1,566,352, Dec. 22. Ore or similar material contg. Sn, Fe and other elements is crushed, heated in a closed receptacle to a temp. above the reducing point of Sn but below the reducing point of Fe and subjected to the action of a gas such as producer gas which will reduce the Sn. The latter is removed and the residue treated to recover its remaining metal values.

Separating copper from alloys with iron. H. PEDERSON. U. S. 1,562,472, Nov. 24. In treating Fe contg. C and Cu alloys to obtain Cu, the alloy is subjected to washing with Pb in a liquid condition so that a Pb alloy, rich in Cu, and Fe, free from or poor in Cu, is obtained.

Exothermic roasting of finely divided ore suspended in gas currents. A. D. H. L. FASSOTTE. U. S. 1,563,616, Dec. 1. Mech. features, adapted for use in connection with roasting of ores contg. S or As.

Apparatus for sintering ores. J. R. LINNEY. U. S. 1,563,759, Dec. 1. Sep. pallets or grates are carried on an endless track.

Rotary kiln and auxiliary apparatus for producing zinc oxide from ore, etc. M. P. KIRK. U. S. 1,566,103, Dec. 15.

Charging cupola furnaces. D. BAKER. U. S. 1,563,949, Dec. 1. Mech. features.

Condenser for zinc vapors. O. RAVNER. U. S. 1,562,473, Nov. 24. A condenser for Zn vapor comprises a revolving drum and a stationary tube connected with the drum in such a manner that the condensate formed in the tube will fall back into the drum.

Zinc condenser. H. A. GRINE. U. S. 1,565,928, Dec. 15. A compn. for making molded Zn condensers comprises broken Zn condenser, Zn ore and a refractory bonding material such as clay.

Still and condensing chamber for manufacturing metal dust from zinc or similar metals. M. H. NEWELL. U. S. 1,566,913, Dec. 22.

Zinc and lead. C. E. CRONELIUS. U. S. 1,566,183, Dec. 15. Vapors of volatile metals such as Zn or Zn and Pb are produced by a reduction process and the vapor, without permitting contact with air, is condensed to a powder and the latter, still out of contact with air, is heated and agitated to convert it into a liquid state.

Ferrovanadium. L. F. VOOR. U. S. 1,564,156, Dec. 1. A molten bath of ferrous metal is formed with an overlying layer of slag contg. V compds. A fluxing material such as lime is then spread over the slag together with finely divided Si-contg. reducing material, *e. g.*, ferro-Si, so that the latter gradually descends through the V-contg. slag and reduces the V.

Refining lead. P. W. DAVIS. U. S. 1,566,078, Dec. 15. A molten Pb alloy which may contain Sb (*e. g.*, old storage battery plate metal) is treated with molten PbO under such conditions that the 2 materials are brought together in the form of small particles, *e. g.*, in a rotating furnace.

Hollow drill steel and similar articles. P. A. E. ARMSTRONG. U. S. 1,565,771, Dec. 15. Mech. features are specified for making a tubular body having a body portion initially consisting of steel relatively high in C and a bore lining initially consisting of steel relatively low in C, substantially homogenized by welding and C equalization under heat treatment.

Heat-resisting steel. E. H. NOACK. U. S. 1,562,782, Nov. 24. A steel adapted for furnace parts, engine valves, etc., contains Si 1.5–2.0, Cu 0.50–1.00, Mn not over 0.12 and C not over 0.10%.

Determining transformation points in heat treatment of steel, etc. C. A. MARTIN. U. S. 1,550,272, Aug. 18, 1925. In order to render observable the occurrence of a crit. or transformation point or points or of the decalescence, recalescence or similar stages in the heat treatment of materials such as alloy steel or low-C steel (whose crit. or transformation points are not sharply defined), a plurality of thermocouples is used in circuit with each other and having junctions disposed in the heating zone at different distances from the mass under heat treatment. These thermocouples are connected to an indicating device which shows variations in the rate of temp. change of the material under heat treatment.

Welding iron and steel. C. H. HUMPHRIES. U. S. 1,563,748, Dec. 1. In welding Fe or steel by gas or electrically, the surfaces to be welded are preliminarily treated with a soln. of chromic acid and allowed to dry.

Open-hearth furnace adapted for refining steel. C. DAVIES, JR. U. S. 1,564,049, Dec. 1.

Detinning tinned-iron scrap. H. DAVIES and M. A. ADAM. U. S. 1,565,425, Dec. 15. The scrap is immersed in a soln. substantially satd. with Fe and Sn chlorides in a stripping vessel and Cl gas is injected.

Deoxidizing metals and alloys. A. PACZ. U. S. 1,562,655, Nov. 24. An intimate mixt. of Al powder and Na fluosilicate is used for refining molten metals such as steel.

Alloys. A. PACZ. U. S. 1,562,654, Nov. 24. In prepg. alloys such as those of Si with Al, a double fluoride of Na and one of the metals to form the alloy, *e. g.*, Na fluosilicate, is treated with Al in a molten bath of the other metal component of the alloy. *e. g.*, Al.

Heat-resisting alloy containing chromium, nickel and iron. N. V. HYBINETTE. U. S. 1,563,573, Dec. 1. An alloy adapted for prolonged use at high temps. comprises Cr 10–20, Ni 30–40, C 0.1–1.5 and Si less than 1%, most of the remainder being Fe.

Aluminium alloy. C. A. FONTANE. U. S. 1,563,079, Nov. 24. An alloy adapted for making cooking vessels comprises Al 95–96, Cu 3–4, Mn 0.2–0.8 and Ag 0.2–0.8%.

Alloy of gold, nickel and iron. C. F. HANSEN. U. S. 1,562,958, Nov. 24. An alloy of good tensile strength and workability, adapted for use in dental work, for making hypodermic needles, etc., is formed of Au 55–75, Ni 15–22, Fe or Cr 0.1–4.0 or more and Mn 1–4 or Mg 0.25–0.50%.

Tungsten-platinum-iridium alloy. E. HAAEGN. U. S. 1,566,534, Dec. 22. An alloy adapted for tipping Au pen nibs is formed of W 80-90, Pt 10-17 and Ir 1-3%.

Copper alloy. C. KAZEMER. U. S. 1,566,406, Dec. 22. Cu is melted with glass and the melt formed into sheets which are reduced in thickness by pressure. The sheets are remelted with an admixt. of Ag and glass, the melt is formed into sheets and these are also reduced in thickness by pressure and then converted into small pieces for further remelting and casting.

Pyrophoric alloy of tin and zirconium. H. S. COOPER. U. S. 1,562,540, Nov. 24. An alloy of Zr with 20-40% of Sn is used for igniters.

Ferrozirconium. R. H. MCKEE. U. S. 1,565,280, Dec. 15. An alloy is produced by fusing an O compd. of Zr, e. g., ZrO_2 , with a metallic sulfide such as FeS and removing S by air blasting.

Alloy for electrical contacts. L. A. GARDNER. U. S. 1,565,358, Dec. 15. Au 75, Ni 16.7, Zn 5.34 and Cu 2.96%.

Deoxidizing aluminium bronze. W. G. HARVEY. U. S. 1,563,188, Nov. 24. The molten metal to be deoxidized is treated with an alloy of Cu and Ca in such proportions that the alloy is brittle and has a m. p. substantially below the m. p. of the metal under treatment. An alloy contg. Cu 50 and Ca 50% may be used.

Preventing corrosion in steam digesters. F. G. RAWLING. U. S. 1,566,118, Dec. 15. Na_2CO_3 , Na phosphate, Na silicate, borate or other Na salt of a weakly ionized polybasic acid is added to an aq. soln. of Na sulfite to be used for pulping wood in a steel vessel, with subsequent addn. of a soln. of NaOH to the contents of the vessel during the cooking operation.

Preventing rust. B. D. AVIS. U. S. 1,565,043, Dec. 8. Instruments such as those used in surgical operations are protected from rust by heating them in a dil. soln. of $NaNO_2$ and Na_2SO_4 .

Removing rust from iron. W. F. WANDEL. U. S. 1,565,536, Dec. 15. Fe is freed from rust preparatory to painting it by covering the metal with a layer contg. cod-liver oil and linsed oil or other drying oil and a basic substance such as Fe oxide and $CuCO_3$ and, after the layer has hardened into a coherent mass, stripping it off with included rust.

Tempering cast manganese steel car wheels or similar articles. J. C. DAVIS. U. S. 1,563,170-1, Nov. 24. A series of streams of tempering fluid is directed against the metal.

Cast sheets or metals of low melting point. C. W. HAZELETT. U. S. 1,531,781, March 31, 1925. Alloys such as those of Pb and Sn (e. g., Pb 93 and Sb 7%) adapted for lining acid tanks are cast into thin sheets which are more durable than rolled sheets of the same compn.

Casting copper. L. SHIPLEY. U. S. 1,564,369, Dec. 8. Molten Cu is poured into open molds and immediately covered closely enough to prevent free contact with the air while permitting escape of occluded gases, during a time sufficient to prevent surface oxidation, rapid cooling and sudden degasification of the Cu.

Gray cast iron. K. SIPP. U. S. 1,564,284, Dec. 8. Ni is added to a casting mixt. in quantity to effect, together with the Si present, the required ptpn. of graphite.

Malleable iron castings. W. J. MILES, JR. U. S. 1,564,437, Dec. 8. Impure Fe is melted and certain of its impurities are removed in a cupola. The molten Fe is caused to run directly from the cupola upon the hearth of an air furnace, striking the latter in a fine stream. The metal is thus freed from Si, P and S.

Armor plate. J. B. JOHNSON and S. DANIELS. U. S. 1,563,420, Dec. 1. In the manuf. of armor plate, before it has reached its final thickness it is subjected to a carburizing operation, then rolled to the required final thickness, further carburized on one side only while the other side is protected, to form a "depth of case" of 10-45% of the total thickness of the plate, then heated to about 850°, quenched in oil, reheated to 760° and quenched in H_2O .

Sintering comminuted tungsten or other refractory metals. W. B. GERO. U. S. 1,566,793, Dec. 22. Particles of W, U, Zr or other similar metals in comminuted form are coated with paraffin dissolved in ether or other volatile protective agent and the particles are then sintered into a coherent form.

Treating zinc-coated materials. E. CORNELL, JR. U. S. 1,565,420, Dec. 15. Materials such as other metals which have been coated with Zn are heated to a temp. (which may be about 135°) sufficient to change the grain structure of the Zn and then worked.

Coating ferrous metals with tin and aluminium. C. W. PFENL. U. S. 1,565,496.

Dec. 15. A Sn-coated ferrous metal is heated until the Sn melts and finely divided Al is mixed with the molten Sn until it can absorb no more.

Coating ferrous metals with aluminium. C. W. PRELL. U. S. 1,565,495, Dec. 15. Al is very finely divided in a bath of kerosene, paraffin, palm oil or other air-excluding film-producing material and the product thus obtained is applied to metals such as sheets of ferrous metal to be coated and the coating is heated.

Mold composition. A. PACZ. U. S. 1,566,420, Dec. 22. Molds for casting metals are formed of material contg. Si and a binding material, both in finely divided form, e. g., from ferro-Si and clay.

Ingot molds. W. H. RAMAGE. U. S. 1,565,755, Dec. 15. Fe ingot molds cast in sand are removed from the sand as soon as they can be safely handled, plunged into a chilling bath of H₂O and annealed by their own heat in an enclosed quiescent atm.

Casehardening. I. H. DERBY and C. B. EDWARDS. U. S. 1,550,952, Aug. 25, 1925. Particles of coal-tar coke or other casehardening material treated with an activator are provided with a C shell by coating with pitch and charring; or the particles may be coated with a Cu shell.

Casehardening. G. C. NIXON. U. S. 1,566,766, Dec. 22. A casehardening material is formed of charcoal, coke or other carbonaceous material impregnated with Na₃PO₄.

Furnace for annealing metal sheets, etc. J. E. MONTGOMERY. U. S. 1,566,160, Dec. 15.

Apparatus for use in hot galvanizing of metal articles. W. G. IMHOFF. U. S. 1,566,749, Dec. 22. A galvanizing kettle of ferrous metal is lined with a protective enamel.

Solder. J. B. SPEED and A. H. FALK. U. S. 1,565,115, Dec. 8. A solder of good strength comprises Ag 8-13 and Sn 92-84 parts. Au or Pd 3% increases the strength and toughness.

Electrode holders for arc welding. A. R. ALLARD. U. S. 1,565,405-6, Dec. 15.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Atomic and molecular asymmetry. J. D. MAIN SMITH. *Chemistry and Industry* 44, 1107-10(1925); cf. C. A. 19, 3392.—Polemical with Mann and Pope (C. A. 19, 3480). C. J. WEST

The preparation of hexachloroethane by the chlorination of ethylene. G. F. MILLER. *Ind. Eng. Chem.* 17, 1182-3(1925).—C₂H₄ with Cl₂ in the presence of ordinary com. active C as catalyst at 300-50°, with 10% excess Cl₂, gives 90% of C₂Cl₆, while at 200° the yield is 69%. WM. B. PLUMMER

The reaction between gaseous methyl ether and hydrogen chloride. JITARO SHIDRI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 9A, 97-119 (1925) (In English).—Friedel (*Bull. soc. chim.* 24, 160, 241 (1875)) obtained results which indicated that the formation of the reaction product Me₂O.HCl between Me₂O and HCl was at a min. when the reactants were mixed in equal vols. Ostwald (*Chemie*, 2nd ed., II, 2, 489) showed that the law of mass action required that the reaction product should be at a max. Expts. gave the following values for the equil. const. *K* of the reaction Me₂O.HCl \rightleftharpoons Me₂O + HCl: 1.4906 at 1° and 0.9959 atm., 1.7224 at 5° and 0.9959 atm., 2.0837 at 9° and 0.9956 atm., 3.1744 at 19° and 0.9955 atm. The equil. partial pressures of Me₂O.HCl were at a max. when the 2 reactants were mixed in equal vols., and diminished with an excess of 1 of them. The calcd. values for the heat of reaction *Q* and the integration const. in the van't Hoff equation were -6275 cal. and 5.5373, resp. T. S. C.

Action of metallic sodium on bromoethylene derivatives. ALBERT KIRRMANN. *Compt. rend.* 181, 671-3(1925).—The compds. RCH:CHBr (I) and RCHBr:CH₂ (II) react easily with Na to form 3 products: (1) a large proportion of RCH:CH₂; (2) RCH:CH in considerable amt. from I and in the merest traces from II and (3) small amts. of condensation products. A doubling according to the Wurtz synthesis does not occur, only RR'C:CHBr (III) yielding erythrene hydrocarbons. The following % yields of C₂H₄, C₂H₂ and erythrene hydrocarbons were obtained: C₇H₁₃Br (I) 56, 12, 0; C₆H₅Br (II) 57, 0.02, 0; C₇H₁₃Br (II) 67, 0.002, 0; C₆H₇Br (III) 25, 0, 34; C₈H₁₁Br (mixture of I and II) 58, 14, 0; C₈H₁₃Br (mixture from dehydration of capryl alc. by ZnCl₂) 64, 3, 6. Each type gave results different enough to give valuable information on an unknown substance. Delacoe in similar expts. with Cl derivs. (*Bull. soc. chim.* [3], 35,

345(1906)) used H_2O to facilitate the action, but for various reasons its presence does not explain the reaction, particularly since the rate of reaction is the same with thoroughly desiccated bromoethylene derivs. Nor can the low yield of C_2H_2 derivs. and the high yield of C_2H_4 derivs. be explained, even by assuming that the solvent takes part in the reaction. The only hypothesis which will explain the products from III is that H is formed from mols. which are attacked deeply, leaving residues which easily fix Br, but an exact interpretation of the facts is unwarranted without further expts. now in progress.

C. C. DAVIS

Method of reaction of nitrosyl chloride. I. Nitrosochlorination by means of nitrosyl chloride. HEINRICH RHEINBOLDT AND OTTO SCHMITZ-DUMONT. *Ann.* **444**, 113-35(1925).— Me_2CO and $NOCl$, alone or in CCl_4 or Et_2O , give $MeCOCCl.NOH$, m. $105-6^\circ$, in 45% yields; while it has no pronounced odor, it has a sharp taste and, finely powd., it strongly attacks the mucous membrane. A fresh aq. solu. gives no color with $FeCl_3$; on standing, hydrolysis occurs and there then occurs the typical hydroxamic acid reaction. With $BzCl$ there results 81% of benzoylchloroisnitrosoacetone, m. $113-4^\circ$. $MeCOPr$ and $NOCl$ give a yellow oil, which gives chloroisnitrosomethylpropyl ketoxime, m. 154° (decompn.). Chloroisnitrosomethylisopropyl ketone, m. 87° . Chloroisnitrosopinacolin, m. $133-4^\circ$ (70% yield); Bz deriv., m. $63-4^\circ$; anilino deriv., m. $103-1^\circ$; (with $NaNO_2$ in dil. H_2SO_4 there results 7-nitro-3-trimethylacetyl-2,4- Δ^2 -benzazoxazine, orange-yellow, m. $154-5^\circ$ (decompn.)); *p*-toluidino deriv., m. $123-4^\circ$ (decompn.). Levulinic acid (2 g.) gives 0.15 g. of the chloroisnitroso deriv., m. $145-6^\circ$, whose *Et* ester, m. 145° (decompn.). $BzMe$ and $NOCl$ in the gaseous state give 24.5% of the chloroisnitroso deriv., m. $132-3^\circ$. Its oxime, m. $193-4^\circ$ (decompn.). Anilino deriv., m. 147° . Bz deriv., m. 91° . Chloroisnitrosomethyl-*p*-tolyl ketone, m. $128-9^\circ$ (32% yield). It is decompd. by alkali, giving *p*- $MeC_6H_4CO_2H$. $NOCl$ and *p*- ClC_6H_4COMe give *p*- $ClC_6H_4CO_2H$ and isonitroso-*p*-chloroacetophenone, m. 127° . $PhCH_2Ac$ likewise gives only an isonitroso deriv. Chloroisnitrosobenzalacetone, m. $121-2^\circ$ (decompn.); it is sol. in 40 parts $CHCl_3$ at 18° , 12 parts at the b. p. Br gives a dibromide, m. $156-7^\circ$ (decompn.). Anilino deriv., yellow, m. $176-7^\circ$. Chloroisnitroso-*p*-anisalacetone, m. $143-1^\circ$ (decompn.); there also results some isonitrosoanisalacetone, yellow, m. 173° . $RCOCH.NOH$ and 2 $NOCl$ give $RCOCCl.NOH$, HCl and 2 NO . With the Me_2CO deriv., the yield is about 55%; with $BzMe$, 51%. $AcCH.NOH$ is not changed by HCl at 0° but on raising the temp., it changes to a yellow oil, which does not react with $NOCl$.

C. J. WEST

Possible errors in the use of biological agents in organic chemistry. A warning. C. B. VAN NIEL AND F. VISSER'T HOOFT. *Ber.* **58B**, 1606-10(1925).—The results of fermentation expts. with yeast can be considered significant and due to the yeast only when the duration of the incubation period is short so that other organisms cannot have increased in sufficient numbers to influence the course of the reaction. Expts. of more than 8-10 hrs'. duration are not permissible since the ratio of lactic acid organisms to yeast may be altered in old cultures so that the lactic acid bacilli predominate. Honig and Tempus (*C. A.* **18**, 2872) have identified the product of the oxidation of glucose by Br as 2-ketogluconic acid on the basis of the production of *d*-arabinose after an 8-day fermentation expt. with yeast. On the basis of their expts. Pringsheim (*Zuckerchemie*, Leipzig (1925)) concludes that Boutroux's acid from glucose is 2-ketogluconic acid and not 5-ketogluconic acid as maintained by B. (*Compt. rend.* **127**, 1224(1898)). With lactic acid organisms, B.'s acid would yield a ketopentose, which would form the same osazone as xylose. Since the m. ps. of the osazones of xylose and arabinose are so similar, the identification as the osazone by H. and T. of arabinose formed in a long continued fermentation by yeast of the oxidation product of glucose, is not adequate to prove their contention as to the structure of the oxidation product. Expts. by the authors failed to demonstrate any fermentation of B.'s acid by yeast in pure culture. H. B. L.

Isomerization of vinyalkylcarbinols, $CH_2:CHCH(OH)R$, to β -allylalkyl alcohols, $CH_3(OH)CH:CHR$. RAYMOND DELABY. *Compt. rend.* **181**, 722-4(1925); cf. *C. A.* **19**, 2185.—The migration of the double bond in alcs. contg. the terminal group $:C(OH)CH:CH_2$ into primary alcs. is easily accomplished (cf. Locquin and Wouseng, *C. A.* **16**, 3305) but poor results are obtained in the conversion of secondary to primary alcs. (cf. Baudrenghien, *C. A.* **16**, 3870; **18**, 525). An attempt to convert vinyl ethylcarbinol to β -ethylallyl alc. by the aid of CCl_3CO_2H gave only a 10% yield. But by applying a method already described (cf. Delaby, *C. A.* **17**, 3159; **18**, 664) this isomerization may be accomplished indirectly, the procedure involving the following reactions: $CH_2:CHCH(OH)Et + Br_2 \rightarrow CH_2BrCHBrCH(OH)Et$ (action of HCO_2Na) $\rightarrow HCO_2CH_2CH(O_2CH)CH(OH)Et$ (heat) $\rightarrow HCO_2CH_2CH:CHEt$ (sapon. by KOH) $\rightarrow CH_2(OH)CH:CHEt$. The operations are very simple and only the final rectification needs

much care. The yield is approx. 20%, taking into account the sec. alc. recovered. By this method it should be possible to prep. other homologs of allyl alc. Among them β -propylallyl alc. should by cautious oxidation give β -propylacrolein, a compd. present in leaves, the synthesis of which has never been accomplished. C. C. DAVIS

Trihydroxytriethylamine oxide and substituted hydroxylamines with hydroxyethyl radicals. L. W. JONES AND G. R. BURNS. *J. Am. Chem. Soc.* **47**, 2966-73 (1925).— NH_2OH and $(\text{CH}_2)_3\text{O}$ at 0° and then at room temp. give about 90% of trihydroxytriethylamine oxide, $(\text{HOCH}_2\text{CH}_2)_3\text{NO}$, m. $104-5.5^\circ$, slightly deliquescent, of decidedly sweet taste, slightly basic to litmus, reduces hot $\text{NH}_4\text{OH}-\text{AgNO}_3$ but not Fehling soln. and restores the color to Schiff's reagent. The Bz deriv. is an oil. *Picrate*, very deliquescent, m. $73-4^\circ$. *Chloroplatinate*, m. 99° to 158.5° . Reduction with Zn dust and H_2O gives $(\text{HOCH}_2\text{CH}_2)_3\text{N}$, which was reoxidized by H_2O_2 to the oxide. $(\text{AcOCH}_2\text{CH}_2)_3\text{N}$, b₂₇ $206-7^\circ$ (*chloroplatinate*, m. 123.5°), is oxidized by BzO_2H to the oxide in almost quant. yield. Decompn. of the oxide by NaOH gave a mixt. of sec. and tert. amine, the former predominating. With HCl there results about 30% of the amine salt. *N,N*-Dihydroxydiethylhydroxylamine is a thick liquid which decomp. when heated and was analyzed as the *picrate*, m. $104-6^\circ$, the *chloroplatinate*, m. $117.5-8^\circ$ and the *tri-Bz deriv.*, a thick liquid. Reduction by Zn dust and H_2O and heating with 70% H_2SO_4 at 165° gives morpholine. *O-Ethyl-N,N*-dihydroxydiethylhydroxylamine, thick liquid, analyzed as the *chloroplatinate*, m. $166-7^\circ$; the liquid fraction of the chloroplatinates appeared to be derivs. of compds. of the type $(\text{HOCH}_2\text{CH}_2\text{OCH}_2\text{CH}_2)_2\text{NOEt}$. *O,N*-Diethyl-*N*-hydroxyethylhydroxylamine, lt $(\text{HOCH}_2\text{CH}_2)_2\text{NOEt}$, b₁₆ 63° , b₇₆₀ 170° (35% yield); *chloroplatinate*, m. $143-3.5^\circ$. EtOCONHOH showed no tendency to react with $(\text{CH}_2)_3\text{O}$ nor could it be alkylated with $\text{HOCH}_2\text{CH}_2\text{OH}$. $\text{EtOH}-\text{KOH}$ gave an acid salt, decomp. on heating. β -Chloroethyl *m*-dinitrobenzoate, m. 92° , from *m*-(O_2N)₂ $\text{C}_6\text{H}_4\text{COCl}$ and $\text{HOCH}_2\text{CH}_2\text{Cl}$. $(\text{CH}_2\text{OH})_2$ and $\text{C}_{10}\text{H}_7\text{NCO}$ give the *urethan*, $\text{HOCH}_2\text{CH}_2\text{COO}-\text{NHC}_{10}\text{H}_7$, m. $102-3^\circ$. J. WEST

Oxonium compounds. D. McINTOSH. *Trans. Roy. Soc. Can. Sec. [3]*, III, **19**, 71-2 (1925); cf. *C. A.* **7**, 2142.—Some compds. of the O derivs. of the aliphatic group with Cl and Br have been prepd. No exceptions to the following rules were found: (1) A monoacid alc. unites with one Br or Cl atom. (2) A ketone or an ether unites with 2. (3) A mol. of an ethereal salt unites with 3. The following compds. with Cl and Br, resp. were isolated (no before the halogen = no. of halogen atoms combined with 1 mol. org. substance; 0 = no. compd. could be isolated): PrOH , Cl, Br; iso- PrOH , 0, 0; MeCOEt , 2Cl, 2Br; MeOAc , 3Cl, 3Br; PrOAc , 3Cl, 3Br; iso- AmOAc , 0 Br; EtCO_2Me , 0, 0; PrCO_2Et , 0, 0; Ac_2O , ?, ?. All the substances above gave with HBr compds. conducting the elec. current. Ethylene glycol yields 2 compds. contg. 1 and 2 mols. HBr to one of glycol but no combination with HCl , HI or with halogens occurs. Glycerol did not combine with either the halogens or halogen hydrides. J. W. SHIPLEY

The organoaluminium compounds: ethyl diiodide and diethyl iodide of aluminium. V. GRIGNARD AND R. L. JENKINS. *Bull. soc. chim.* **37**, 1376-85 (1925).—See *C. A.* **19**, 238. H. G.

Antimonial analogs of the cacodyl series. G. T. MORGAN AND G. R. DAVIES. *Nature* **116**, 499 (1925).—Dimethylstibine cyanide has been prepd. By demethylating dimethylstibine trihalide a new series of alkyl antimonials, in which the metal is associated with only one Me radical, has been obtained. Antimony cacodyl itself has not been isolated in a pure state, although its existence has been demonstrated among the reduction products of dimethylstibine. FLORENCE N. SCHOTT

Preparation of ethers in the aliphatic series. JEAN-BAPTISTE SENDERENS. *Compt. rend.* **181**, 698-700 (1925).—Five more ethers were prepd. from the corresponding alcs. by a method already described (*C. A.* **17**, 1949; **19**, 815, 2194). *Heptyl ether*, $(\text{C}_7\text{H}_{15})_2\text{O}$, in a yield of 75 per 100 of alc. *Cetyl ether*, $(\text{C}_{18}\text{H}_{37})_2\text{O}$, m. 55° , decomp. about 300° . *sec-Pentyl ether* $(\text{BuMeCH})_2\text{O}$, d₄¹⁵ 0.778. Allyl alc. with 20 vol.-% $\text{H}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$ (66° B $\acute{\text{e}}$. H_2SO_4 gave a violent explosion) at 105° gave *allyl ether*, a compd. otherwise very difficult to prep. This indicates that non-satd. alcs., like satd. primary and secondary alcs., can easily be prepd. by this method. The following give the b. p. of the ether prepd. by this method, the temp. of etherification and the vol.-% of 66° B $\acute{\text{e}}$. H_2SO_4 : Et_2O 34.8, 135-40, 100; Pr_2O 87-8, 120-5, 40; Bu_2O 140-1, 123-6, 25; iso- Bu_2O 122-4, 120-2, 20; iso- Am_2O 171-2, 130-5, 10; $(\text{C}_7\text{H}_{15})_2\text{O}$ 261.5, 140-5, 3; $(\text{C}_{18}\text{H}_{37})_2\text{O}$ > 300, 140-5, < 2; *sec-Pr}_2\text{O}* 67-8, 98-100, 15; *sec-Bu}_2\text{O}* 120-2, 103-4, 5; $(\text{BuMeCH})_2\text{O}$ 162, 120, 2.5; *sec-octyl ether* 263-4, 135, 1.5. When the ether has a b. p. much higher than the temp. of etherification it does not distil. The proportion of H_2SO_4 remains const. only when the alc. and the hydrocarbons formed do not distil below this temp.,

a condition occurring with but few alcs. With the others the acid becomes more concd. and hydrocarbons are formed at the expense of the yield of ethers. Under the latter conditions a const. amt. of H_2SO_4 can be easily maintained by a continuous replenishment of the alc., thus giving a *continuous process for industrial use*. C. C. D.

Identification of primary alkyl bromides and iodides. C. S. MARVEL, C. G. GAUERKE AND E. L. HILL. *J. Am. Chem. Soc.* **47**, 3009-11(1925).—Primary alkyl bromides and iodides are easily converted into the corresponding mercuric halides (through the Grignard reagent and HgBr_2 or HgI_2), which are suitable derivs. for identification. The following new *mercuric bromides* were prepd.: *Et*, m. 193.5° (all m. p. are cor.); *Pr*, m. 138° ; *iso-Bu*, m. 55.5° ; *Am*, m. 122° ; *hexyl*, m. 118.5° ; *heptyl*, m. 114.5° ; *octyl*, m. 109° . *Mercuric iodides*; *Pr*, m. 112.5° , *Bu*, 117° ; *iso-Bu*, m. 72° . C. J. W.

Stereoisomerism of quadrivalent sulfur, selenium and tellurium. R. F. GOLDSTEIN. *Chemistry and Industry* **44**, 1011-2(1925).—The recently discovered optically active $\text{MeC}_6\text{H}_4\text{S}(\text{O})\text{OEt}$, explained by Phillips by an electronic model (C. A. **20**, 397), can be explained satisfactorily by Werner's theory (the formulas being analogous to those for the optically active amine oxides). The theory may be extended to Se but not to Te, since in the case of Te 2 valencies appear to be different from the other 2.

C. J. WEST

Bromination products of paraldehyde. A. STEPANOV, N. PREOBRASHENSKI AND M. SHCHUKINA. *Ber.* **58B**, 1718-23(1925); cf. Hibbert and Hill, C. A. **17**, 1434.—Bromination of paraldehyde at -15° to -10° in diffuse daylight gives 60-87% of *dibromoparaldehyde* (I), $(\text{C}_2\text{H}_3\text{OBr})_2 \cdot \text{C}_2\text{H}_4\text{O}$, which at 155° decomps. into BrCH_2CHO and AcH . It b_{10} $126-7^\circ$, b_9 $122-3^\circ$, b_8 $120-1^\circ$, b_{14} $135-6^\circ$, m. 57° , volatilizes with steam and can be sublimed, reduces boiling $\text{NH}_3\text{-AgNO}_3$ but does not react with fuchsin- SO_2 or Fehling soln.; mol. wt. in C_6H_6 from 145 in 0.1742% soln. to 289.6 in a 30.882% soln., in $(\text{CH}_2\text{Br})_2$ from 247.3 to 299 in 0.1592 to 7.6172% soln., resp. In the residues from the purification of the I is obtained as by-product *tribromoparaldehyde*, m. 104° , which, by certain modifications in the method of prep. I, can be made the chief product (44%); it b_{13} 176° , b_8 $164-5^\circ$, mol. wt. in freezing C_6H_6 336-46. BrCH_2CHO , obtained by decompn. of I and purified by distn. in CO_2 , forms a colorless transparent mobile liquid b_{747} $104-5^\circ$, d_4^{20} 1.8414, n_D^{20} 1.4798, perfectly sol in H_2O , strongly attacks the mucous membranes and produces yellow stains on the skin, mol. wt. 119-25, mol. refraction 18.97; 10 min. after distn., however, it becomes turbid, then viscous, and soon crystals. to a white solid polymer, insol in H_2O and org. solvents, m. $136-8^\circ$ (volatilizing), reduces cold $\text{NH}_3\text{-AgNO}_3$ but does not redden fuchsin- SO_2 ; its mol. wt. could not be detd. on account of its insoly. Addn. of AcH to the BrCH_2CHO immediately after distn. markedly retards the polymerization. With 2 mols. H_2O the freshly distd. BrCH_2CHO evolves much heat and soon crystals. to a white mass, m. $47-9^\circ$, sol in H_2O , alc. and Et_2O , insol. in cold C_6H_6 and CHCl_3 (but sol. on heating, with decompn.), contg. two HO groups to every 3 mols. of aldehyde (Zerevitinov) and analyzing for $\text{BrCH}_2\text{CH}(\text{OH})\text{-OCH}(\text{CH}_2\text{Br})\text{OCH}(\text{OH})\text{CH}_2\text{Br}$; the mol. wt. in H_2O (125) indicates that it is completely dissociated (probably into hydrates of the monomer, for the soln. gives no color with fuchsin- SO_2). Direct crystn. of the crude I from EtOH yields as by-product $\text{BrCH}_2\text{CH}(\text{OEt})_2$, b_9 $57-8^\circ$, mol. wt. in $(\text{CH}_2\text{Br})_2$ 180-92.

C. A. R.

Some new derivatives of pentadecylaldehyde. STANISLAV LANDA. *Bull. soc. chim.* **37**, 1235-8(1925).—See C. A. **19**, 3251.

H. G.

Phenyl- α -hydroxycrotonamide. An example of the ether of ketone hydrate. J. BOUGAULT. *Bull. soc. chim.* **37**, 1420-36(1925).—See C. A. **19**, 3265.

H. G.

γ,γ' -Dichlorodipropyl sulfide. G. M. BENNETT AND A. L. HOCK. *J. Chem. Soc.* **127**, 2671-7(1925).— $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{OH}$ and Na_2S in an equal wt. of H_2O , boiled 3 hrs., distd. with steam, made acid with HCl and concd., gave γ,γ' -*dihydroxydipropyl sulfide* (I), viscous oil; *bisphenylurethan*, m. $146-8^\circ$. The steam distillate, boiled with HgO , gives a small amt. of the *mercaptide of γ -hydroxypropyl mercaptan*, m. $132-4^\circ$. The HO groups of I are not replaced by Cl through HCl , PCl_3 , PCl_5 or SOCl_2 , but SOCl_2 with PhNMe_2 gives 83% of γ,γ' -*dichlorodipropyl sulfide* (II), pale yellow oil, b_{14} 162° , d_4^{20} (vac.) 1.175, n_D^{20} 1.5075; *chloroplatinate*, $2(\text{ClC}_3\text{H}_6)_2\text{S} \cdot \text{PtCl}_4$, greenish yellow, m. $83.5-5^\circ$. The *dibromide* is unstable and decomps. on standing overnight. MeI and II give crystals, m. $179-81^\circ$, within 0.5 hr. after mixing; on standing these redissolve, and a viscous oil seps.; the residue did not solidify but with HgI_2 gave *dichlorodipropyl-methylsulfonium mercuric iodide*, yellow, m. $84-8^\circ$. Oxidizing agents transform II into the *sulfone*, m. $65-6^\circ$. II and PhONa give the *di-PhO deriv.*, m. 45° ; *di-p-tolylsiloxy deriv.*, m. $50-2^\circ$; *di-piperidino deriv.*, oily, whose *picrate*, yellow, m. $199-200^\circ$. KCN and II give *thiodibutyric nitrile*. K_2S gives a powder, m. $50-70^\circ$, which may be a

polymer of hexamethylene disulfide; mol. wt. in camphor, 1400, 1740. A comparison of the rates of reaction of II with $(\text{ClCH}_2\text{CH}_2)_2\text{S}$ with NaOH in EtOH shows that, the course of the 2 reactions being assumed to be similar, the latter reacts 60 times as fast as the former.

Ethylhexylacetic acid and its esters. A. W. DOX. *J. Am. Chem. Soc.* **47**, 3008-9 (1925).—*dl*-Ethylhexylacetic acid, b. 252-5°, d_{25} 0.8905. *Me ester*, b. 213-5°; *Et ester*, b. 221-3°, d_{25} 0.8580; *Pr ester*, b. 238-40°, d_{25} 0.8578; *Bu ester*, b. 255-7°, d_{25} 0.8571. The esters do not readily form amides.

C. J. WEST

So-called nitrodibromoethylene and the course of the reaction in the formation of bromo- and chloropicrin from polynitrophenols. HEINRICH WIELAND AND HANS JUNG. *Ann.* **445**, 82-92 (1925).—The compd. termed by Merz and Zetter (*Ber.* **12**, 2046 (1879)) as "nitrodibromoethylene" is hexabromotrinisovaleric acid (I), m. 116-7°, obtained in 40% yields from 1,3,5,2,6-(O_2N)₂C₆H(OH)₂ and Br; mol. wt. in AcOH, 695. Concd. H_2SO_4 , HCl and HNO_3 , Br, SOCl_2 , PCl_5 are without action. In EtOH CO_2 is evolved and Br_2CNO_2 and 1,2,3-tribromo-1,3-dinitropropylene (?) results. In Et₂O also, CO_2 is split off and the same products result as with EtOH. H_2O gives CO_2 , Br_2CNO_2 and α,β -dibromoacrylic acid. PhNH_2 and I give bromonitroacetaldehyde anil, yellow, m. 156°, mol. wt. in PhNO_2 252; with dil. HCl there results BrCH_2NO_2 , PhNH_2 and HCO_2H . This was also synthesized from nitroacetaldehyde anil and Br. In the PhNI_2 reaction there are also formed 1 mol. CO_2 , Br_2CHNO_2 and *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$. PhNIINH_2 reacts similarly to PhNH_2 .

C. J. WEST

Decomposition of oxalic acid by acetic anhydride. E. L. WHITFORD. *J. Am. Chem. Soc.* **47**, 2934-8 (1925).—The decompn. of $(\text{CO}_2\text{H})_2$ by Ac_2O is a reaction of the 1st order, the values of $K \times 10^3$ at 25°, 35° and 45° being 12.8, 37.5 and 110.5. Quinoline, cocaine morphine, alanine, strychnine and brucine formed insol. addn. compds. and the evolution of gas practically ceased. Urea, pyrrole, PhNH_2 , PhNHNH_2 , MeCN, EtCN and PrCN showed no appreciable effect upon the rate of decompn. Impure samples of picoline, lutidine and collidine showed a tremendous positive catalytic effect, the systems remaining homogeneous. $\text{C}_6\text{H}_5\text{N}$ also shows a positive catalytic effect but the reaction is complicated by the formation of a solid phase. The compd. $\text{C}_6\text{H}_5\text{N} \cdot (\text{CO}_2\text{H})_2$ may be prepd. by pptn. from Me_2CO solns. and may be used as a basis for purifying $\text{C}_6\text{H}_5\text{N}$. The extent of the decompn. of $(\text{CO}_2\text{H})_2$ in $\text{C}_6\text{H}_5\text{N}$ solns. by Ac_2O is proportional to the amt. of Ac_2O added. The value of reaction-velocity const. in this system is independent of the amt. of the Ac_2O added. The decompn. is probably preceded by the formation of a mol. compd., $\text{Ac}_2\text{O} \cdot (\text{CO}_2\text{H})_2$, which decompn. into CO, CO_2 and 2AcOH.

C. J. W.

Mechanism of oxidation processes. IX. HEINRICH WIELAND. *IX. Ann.* **445**, 181-98 (1925); cf. *C. A.* **19**, 38.—**I. The mode of action of catalase (with Hans Haussmann).** Although it is generally accepted that the 1st step in the utilization of H is the formation of H_2O_2 , all attempts to isolate or detect H_2O_2 in the cells have failed. The activity of catalase is decreased to nearly $\frac{1}{6}$ by the action of 2 cc. 0.001 *N* HCN per cc. of enzyme soln.; aeration did not increase the activity of the enzyme. The retarding action of H, N, CO and MeNC is also discussed; MeNC decreases the enzyme activity 36% (concn., $1.6/100,000$), which is about the same as HCN in a similar concn. H_2O satd. with CO causes a decrease of 50%. The action of colloidal $\text{Fe}(\text{OH})_3$ solns. upon H_2O_2 is also retarded by HCN (though larger amts. are needed than with the enzyme catalase), but the degree is dependent upon the degree of diln. **II. Mode of action of hydrogen peroxide.** (WITH HERMAN LÖVENSKJÖLD.) *Ibid* 198-201.— $\text{MeCH}(\text{OH})\text{CH}(\text{OH})\text{CO}_2\text{H}$ in NH_4OH is oxidized by H_2O_2 to give about 16% of the theoretically possible AcH; no Me_2CO was detected. This acid may be obtained from crotonic acid and H_2O_2 . These facts indicate that H_2O_2 is capable of adding 2 HO groups to the C atoms in an α,β -unsatd. CO_2H acid.

C. J. WEST

Resolution of an asymmetric arsenic compound into its optically active forms. WM. H. MILLS AND RICHARD RAPER. *J. Chem. Soc.* **127**, 2479-83 (1925).—*p*-Tolylmethylidoarsine, Au-yellow oil, b_{15} 163-5°, canary-yellow, m. 29°; with EtMgBr 100 g. give 50 g. *p*-tolylmethyllethylarsine, b_{15} 117°. Oxidation with KMnO_4 to $\text{HO}_2\text{CCCH}_2\text{As}(\text{:O})\text{EtMe}$ and satg. the soln. with H_2S gives *dl*-*p*-carboxyphenylmethyllethylarsine sulfide, m. 183°; the brucine salt, $[\alpha]_{5461}^{20}$ —5.8°, showed a steady decrease in its rotation until after 12 crystns. it had a value of —19.65°; decompn. with NaOH gives the *l*-acid, m. 175-7°, $[\alpha]_{5780}^{20}$ —19.1°, $[\alpha]_{5461}^{20}$ —21.6° (0.5753 g. in 50 cc. EtOH). The morphine salt, $[\alpha]_{5461}^{20}$ —64.9°, showed —51.1° after 10 crystns.; the *d*-acid from this m. 175-6° and showed $[\alpha]_{5461}^{20}$ 18.7°, 22.4° and 39.4° for $\lambda = 5780, 5461, 4359$ (0.2560 g. in 15 cc. EtOH). The presence of the S atom is regarded as the essential feature which enables the resolution.

C. J. WEST

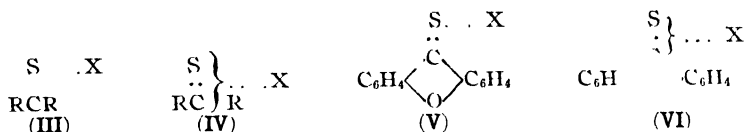
Action of butylmagnesium bromide on the aromatic isothiocyanates. D. E. WORRALL. *J. Am. Chem. Soc.* **47**, 2974-6(1925).—BuMgBr reacts readily and smoothly with aromatic thioisocyanates, forming substituted thioamides of valeric acid. Most of these have an intensely bitter taste. There were prepd. the following *thiovalero derivs.*: *Anilide*, m. 38-9°; *p-toluide*, m. 69-70°; *p-aniside*, m. 62-3°; *p-chloroanilide*, m. 101.5-2°; *p-bromoanilide*, m. 112°; *diphenylamide*, m. 147-8°; *β -naphthylamide*, m. 79-80°. *Bis-thiovalero-p-phenylenediamide*, m. 198-9°. C. J. WEST

Constitution of the Grignard magnesium compounds. III. JAKOB MEISENHEIMER. *Ann.* **446**, 76-86(1925); cf. *C. A.* **19**, 2323.—By means of detns. of n 5% PhCH₂OH can be detd. in PhEtCHOH with an accuracy of about 1%. PhCH₂OH (2 g.) and 2 mols. *p*-O₂NC₆H₄COCl, heated 2 hrs. on the H₂O bath, give only PhCH₂Cl; diln. with 12 cc. Et₂O gives, after 24 hrs' heating, 90% esterification; with 36 cc., after 7 days, 85%. PhEtCHOH and *p*-O₂NC₆H₄COCl alone give 20-25% ester; with 12 cc. Et₂O after 24 hrs. 20% ester; with 36 cc. Et₂O after 7 days, less than 10%. In the formation of the ester care must be taken in washing out the free acid, since the Na salt and the chloride give the *anhydride*, pale yellow, m. 188-9°. PhCOPr is detd. by its 2,4-dinitrophenylhydrazone, red, m. 190-1°. Repetition of earlier expts. gave results similar to those reported. In the decompn. of the cryst. ppt. from 4.4 g. EtBr and 4.2 g. BzH there results 25-50 cc. C₂H₆. No C₂H₄ could be found, but when iso-BuMgBr was used there resulted 12% of Me₂CBrCH₂Br, b. 145-55°. The unsatd. hydrocarbon appears to be formed only during the 1st stages of the reaction. PhEtCHOH (13.6 g.) treated with EtMgBr and then with 5.3 g. BzH give 47% of BzEt and 65% of PhCH₂OH. From the high boiling fraction there was isolated 1,3-diphenyl-1,3-dihydroxy-2-methylpropane, as the *di p-nitrobenzoyl deriv.*, m. 173-4°. C. J. WEST

Basis for the physiological activity of certain -onium compounds. III. Choline derivatives. R. R. RENSHAW AND J. C. WARE. *J. Am. Chem. Soc.* **47**, 2989-95(1925); cf. *C. A.* **19**, 2441.—*Chloroacetylcholine chloroacetate*, markedly hygroscopic, m. 303° (cf. sharp). The physiol. action of most of these compds. has been described by Hunt and Renshaw (*C. A.* **19**, 1912). *Iodomethyl acetate*, b₁₄ 65°, α_{20} 1.902, has distinct lachrymatory properties and decomps. upon distn. at atm. pressure. With Me₃N it gives *acetylformocholine iodide*, m. 152° (cor.); *chloride*, hygroscopic plates, whose *chloroplatinate* forms yellow plates. Hydrolysis with dil. acids gives about 90% of formocholine. Me₃N and ClCH₂CH₂AsCl₂ in PhMe give *dichloroarsylethyltrimethylammonium chloride*, slightly yellow, m. 181.1° (cor.); NaOH gives *arsinsylethyltrimethylammonium chloride*, slightly hygroscopic, cream-colored, m. 194° (cor.). Yields of 89-92% neurine bromide are obtained by the action of 1 mol. equiv. of KOH on bromocholine bromide in abs. EtOH. Br is at first absorbed rapidly when added to an alc. soln. but after about 33% of the calcd. amt. has been added, the velocity of the reaction appears to fall off quickly, which may be due to perbromide formation. Choline chloride and POCl₃ give an extremely hygroscopic compd., probably Me₃N(OPOCl₂)CH₂CH₂Cl, which evolves HCl in the air. C. J. WEST

Organic sulfur compounds. III. Thio ketones. A. SCHÖNBERG (WITH AGNES ROSENBAUM, H. KRÜLL AND UL. OSTWALD). *Ber.* **58B**, 1793-801(1925); cf. *C. A.* **19**, 1424.—This is part of an investigation of the chemistry of the thio ketones as compared with that of the ordinary O ketones. Attempts to prep. thio ketones by the action of free S on a no. of tetraarylethylenes failed, but dioxanthylene (I) and its derivs. on heating with S smoothly yield xanthione (II) derivs. A no. of thio ketones form 1:1 addn. products with HgCl₂; the addn. of the metal salt has a hypsochromic effect, which it is difficult to bring into harmony with the prevailing theories of halochromism. The addn. products of the II are very similar in all their properties to those of the thio benzophenones and the structures III or IV and V or VI (X = inorg. component) are suggested for the 2 series of addn. products, and the addn. products of the 4-thiopyrones, 4-thiochromones and 4-thioflavones are believed to have similar structures. SnCl₄ compds. of benzil derivs. have also been prepd.; they are quickly decompd. by atm. moisture and regenerate their components when treated cold with dil. aq. alkalis. Biphenylenediarylethylenes are formed, with evolution of H₂S, from some thio benzophenones and fluorene. Alkali metals and thio ketones yield colored products very sensitive to air (metal ketyls?). (*p*-MeOC₆H₄)₂CS (VII) with PhMgBr or α -C₁₀H₇-MgBr gives a cryst. substance (VIII), sol. in concd. H₂SO₄ with blue-green color, has no odor, decomp. about 215°, yielding S quant. and (MeOC₆H₄)₂C:C(C₆H₄OMe)₂ (IX); in AcOH suspension with Zn-HCl it gives H₂S and IX; VIII is provisionally assigned the structure of *tetraanisylethylene sulfide*, R₂C.CR₂.S. II is obtained in 80%

yield from I and S at 270° (I does not react with Se in CO₂ at 320° or in boiling CS₂). **2,7-Dimethylxanthione (X)**, m. 188°. **4,4'-Diethoxy-5,5'-dimethylthiobenzophenone (XI)**, from *o*-MeC₆H₄OMe and CS₂ (Gattermann, *Ber.* 28, 2872(1895)), gives 5,4-Me-(EtO)C₆H₃CO₂H, m. 199°, when it is heated in alc. KOH until it is colorless and the resulting product is boiled in PhMe with NaNH₂ and finally hydrolyzed with boiling NaOH. β -Naphthoflavone, obtained in 30% yield from BzCH₂CO₂Et, β -C₁₀H₇OH and P₂O₅ in alc. at 170°, m. 164°, gives with P₂S₅ at 160° 30% of 4-thio- β -naphthoflavone (**XII**), strongly dichroitic needles, m. 149°, forming a green powder and vapor and strongly fluorescent solns. in alc. and C₆H₆. The following *addn. products*, which are odorless, were prep'd. from conc'd. Et₂O solns. of the components: **4,4'-Dimethoxythiobenzophenone (VII)** and **XI** with HgBr₂ and HgCl₂, **II** with HgCl₂, **X** with HgBr₂, all red-yellow. **2,6-Dimethyl-4-thiopyrone-HgBr₂**, colorless. **2,3-Dimethyl-4-thiochromone-HgBr₂**, green-yellow. **XII** with HgBr₂, yellow. *p*-Tolil-SnCl₄, from the components in CS₂, yellow. Anisil-SnCl₄, red. Biphenylenedianisylethylene (2.5 g. from 4 g. **VII** with fluorene at 270°), yellow, m. 148°, sol. in conc'd. H₂SO₄ with red color. Biphenylenebis-[*p*-ethoxyphenyl]ethylene. 9,9'-Dixanthyl is obtained in 1.4 g. yield from 4 g. **II** in AcOH suspension with Zn-HCl.



Correction (dibromosuccinonitrile). ERWIN OTT AND HEINRICH FINKEN *Ber.* 58B, 1703(1925).—Br₂C(CN)₂ (C. A. 12, 3644) takes up 1 mol. H₂O with extraordinary ease, shaken with cold dil. Na₂CO₃; it completely solidifies in a short time with formation of Br₂C(CN)CONH₂, m. 123–4°, identical with the cryst. by-product obtained in the bromination of CH₂(CN)₂ in H₂O and formulated in the earlier paper as dibromosuccinonitrile. The same is true of the by-product, m. 91°, obtained in the chlorination of CH₂(CN)₂, which is, therefore, *dichlorocynoacetamide*. With HBr at 100°, the Br₂C(CN)CONH₂ gives CO₂ and pure Br₂CHCN. C. A. R.

Formaldehyde derivatives of succinimide. E. CHERBULIEZ AND G. SULZER. *Helvetica Chim. Acta* 8, 567–71(1925).—C. and Chambers (C. A. 20, 49) have shown that the acylasparagines undergo rearrangement into acylamino-succinimides, and in the hope of prepg. aminopyrroles from these and analogous compds. derivs. of (CH₂CO)₂NH (**I**) with easily removable acyl groups were prep'd. Ten g. **I** in 10 cc. boiling formalin and a little K₂CO₃, conc'd. *in vacuo* until solid, taken up in 150 cc. boiling PhH, let cool, decanted, and conc'd., gave 13 g. *N*-hydroxymethylsuccinimide (**II**), m. 66°, decamps. into its components in air, or on heating; in C₆H₁₀NH it gives *N*-piperidylmethylsuccinimide, C₆H₁₀NCH₂N(COCH₂)₂, m. 106–7°. **II**, treated with cooling in CHCl₃ with small amts. PCl₅, gives *N*-chloromethylsuccinimide (**III**) b₁₂ 158–60°, m. 58°. *N*-Bromomethylsuccinimide, m. 63–4°. Succinimidomethylpyridinium chloride, decamps. above 65°, m. completely 105°. In CS₂ with AlCl₃ and PhH **III** gives (CH₂CO)NCH₂Ph; heated in alc. with NaOEt it gives *N*-ethoxymethylsuccinimide, b₁₄ 151–2°, b. 262°, m. 31–2°; decompd. by distn. with Zn. In C₆H₅N and Ac₂O **II** gives *N*-acetoxyethylsuccinimide, b₁₀ 170–5°, b. 290°, m. 51°, yields very small amts. of pyrrole bases on distn. with Zn. M. HEIDELBERGER

Constitution of convolvulinic acid. Y. ASAHINA AND M. AKASU. *J. Pharm. Soc. Japan*, No. 523, 779–86(1925).—According to the data published by Taverne (*Rec. trav. chim.* 13, 196), and Hoehncl (*Arch. Pharm.* 234, 647), the constitution of convolvulinic acid (**I**), obtained from Iolop rosin, can be assumed to be MeCH₂CHMe-CH(OH)(CH₂)₈CO₂H. A. and A. repeated the work of T. and H. to det. whether **I** has the side chain. The rosin, obtained from British Drughouse Ltd., was saponified; and the residue was hydrolyzed with dil. H₂SO₄ to obtain **I**. The yield depends upon the concn. of the acid and the temp. of heating. **I** loses its cryst. property when treated with a strong acid at too high a temp. The hydrolysis with 1–0.8% dil. H₂SO₄ at 80–90°, and quick removal of the acid after the decompn. gives the max. yield. **I** thus obtained m. 50°. According to H., when treated with HI and red P, **I** gives a satd. acid C₁₅H₃₀O₂, m. 48°, which H. considers to be a new compd. By the same method of reduction A. and A. obtained a compd. (**II**) which has the same compn., but m. 49.5°. The anilide, m. 78°, exactly the same as pentadecylic anilide. Since the m. p. of the anilide of **II** does not change when mixed with the pure pentadecylic anilide, **II** must be pentadecylic acid, although it m. 2° lower than pure pentadecylic acid. **I** was next

converted to a ketone acid, m. 61° with CrO_3 , and then to oxime, and allowed to undergo Beckmann's rearrangement. When the resulting acid amide is decompd. with HBr , nonanedicarboxylic acid, $\text{C}_9\text{H}_{16}\text{O}_4$, and a small amt. of 2-aminocaproic acid are obtained. I must, therefore, have the structure $\text{Me}(\text{CH}_2)_3\text{CH}(\text{OH})(\text{CH}_2)_3\text{CO}_2\text{H}$, having no side chain. S. T.

Constitution of jalapinic acid. Y. ASAHINA AND J. YAOI. *J. Pharm. Soc. Japan* No. 523, 786-91(1925).—According to Kromer (*J. prakt. Chem.* [2], 57 448), jalapinic acid (I) has a Me group in a side chain. Since K.'s method of identification of methylethylacetic acid as a support for this structure is subject to criticism, A. and A. repeated the work. I was prepd. from scammonium rosin (British Drughouse Ltd.), and reduced with HI and red P. Hexadecylic acid, $\text{C}_{16}\text{H}_{32}\text{O}_2$ (II), m. 61.5° , is obtained. The fact that II is palmitic acid is proved by the mixed m. p. and by the m. p. of its anilide (88°). The position of the OH was next detd. I was oxidized with CrO_3 to the ketone acid, then converted to an oxime and to an acid amide by Beckmann's rearrangement. When the final product was decompd. with HBr , nonanedicarboxylic acid, ω -aminocaproic acid, a small amt. of caproic acid and AmNH_2 (?) were formed. From this, the compn. of I is suggested to be $\text{Me}(\text{CH}_2)_4\text{CH}(\text{OH})(\text{CH}_2)_3\text{CO}_2\text{H}$. S. T.

Configuration of malic acid. ADOLF SONN AND WALTER ROSINSKY. *Ber.* 58B, 1688-90(1925); cf. Freudenberg and Brauns, *C. A.* 16, 3871.—The chloromalic acid (I) obtained by addn. of HOCl to fumaric or maleic acid can be resolved into its components with brucine; replacement of the Cl in the (+)-I gives *d*-tartaric acid, while reduction in the cold yields *d*-malic acid (II), thus establishing the configuration of the latter. Similar results are obtained with the (−)-I. From 13 g. I with brucine in aq. alc. is obtained 15 g. of a brucine salt, prisms with $3\text{H}_2\text{O}$, m. $191-2^{\circ}$, quite stable towards cold H_2O , being unchanged after 10 hrs., but in hot H_2O loses all its Cl in 3 hrs.; $[\alpha]_D^{18} -0.72^{\circ}$ ($\pm 0.01^{\circ}$) (about 6.5% soln. in $\text{C}_6\text{H}_5\text{N}$). Free (+)-I, m. 153° , $[\alpha]_D^{20} 14.0^{\circ}$ [H_2O], $[\alpha]_D^{20} 16.2^{\circ}$ (Me_2CO). *d*-II, from (+)-I in H_2O with a Pt-Zn couple, m. about 100° , $[\alpha]_D^{18} 5.81-5.97^{\circ}$ (Me_2CO). (−)-I, obtained from the filtrate from the above brucine salt, $[\alpha]_D^{19} -7.55^{\circ}$. *l*-II, $[\alpha]_D^{19} -5.75^{\circ}$ ($\pm 0.3^{\circ}$). C. A. R.

Synthesis of the polypeptide-hydantoin tyrosylalaninehydantoin. II. DOROTHY A. HAHN AND ELIZABETH GILMAN. *J. Am. Chem. Soc.* 47, 2941-53(1925); cf. *C. A.* 17, 2106.—In the earlier work it appears that the $\text{MeCHBrCO}_2\text{Et}$ (I) contained appreciable amts. of $\text{BrCH}_2\text{CO}_2\text{Et}$. When this mixt. is heated with the Na deriv. of anisylhydantoin (II), the 1st product which seps is Et 4-anisylhydantoin-1-acetate (III) m. 176° ; prolonged boiling gives mixed crystals, m. $140-2^{\circ}$ (IV), of this and the corresponding propionate. Pure I and II give 70% of Et 4-anisylhydantoin-*N*-1-propionate (V), m. $158-8.5^{\circ}$; 35 g. dissolve in 100 cc. boiling CHCl_3 , 8 g. in 100 cc. boiling EtOH; 6.5 g. III dissolve in 100 cc. boiling CHCl_3 , 3.5 g. in 100 cc. boiling EtOH; 16 g. IV dissolve in 100 cc. boiling EtOH. Hydrolysis of V gives the corresponding acid, m. $255-6^{\circ}$, of which 6 g. dissolve in 80 cc. boiling glacial AcOH. *K* salt, m. 280° (decompn.), of which 4 g. dissolve in 200 cc. boiling 95% EtOH. Catalytic reduction of V (Pd and H in EtOH) gives a mixt. of Et 4-anisylhydantoin-*N*-1-propionates, m. $117.5-8.5^{\circ}$ and $97.5-8.5^{\circ}$; 2.1 g. of the higher melting isomer dissolve in 25 cc. boiling EtOH, the lower melting isomer is much more sol. Hydrolysis gives the corresponding acids, the lower melting ester giving the higher melting acid; the acids, m. $160-1^{\circ}$ and $182-3^{\circ}$; 5 g. of the former and 2 g. of the latter dissolve in 50 cc. boiling H_2O . I, or the acid, heated with HI and red P, gives 2 isomeric 4-hydroxybenzylhydantoin-*N*-1-propionic acids, m. $193.5-5^{\circ}$ and $187-8.5^{\circ}$; demethylation at 100° gives the compd., m. $187-8.5^{\circ}$, while at $130-40^{\circ}$ a mixt. of the 2 is formed. Esterification gives a mixt. of 2 *Et* esters, m. $133-8^{\circ}$ and $152-5^{\circ}$, although the mixt. usually consists of approx. equal amts., sepg. as a cryst. mixt., m. $125-37^{\circ}$. Resolution may be effected by fractional crystn. from dil. EtOH solns. Hydrolysis of the acid or ester gives a mixt. of tyrosine and alanine. C. J. WEST

Isomerization in the hydantoin series induced by the action of hydrogen chloride. DOROTHY A. HAHN AND ELIZABETH GILMAN. *J. Am. Chem. Soc.* 47, 2953-61(1925).—The lower melting form of Et *N*-1-methyl-4-anisylhydantoin-*N*-3-acetate, m. $107-8^{\circ}$, is converted into the higher melting form ($127-8^{\circ}$) by suspending in EtOH and satg. with HCl, the reaction being practically quant. Similarly *N*-1-methyl-*N*-3-methyl-4-anisylhydantoin, m. $91-2.5^{\circ}$, was converted into its isomer, m. $127.5-8.5^{\circ}$; 14.7 g. of this dissolve in 100 cc. boiling EtOH; very slow crystn. gives a 2nd cryst. modification, yellow prisms, which is converted into the colorless needles by crystn. from EtOH satd. with HCl. The reverse transformation by heating the higher melting form with alkali gave a very small amt. of the lower melting form. Both forms gave the same

1,3-dimethyl-4-anisylhydantoin, m. 78-85°, on catalytic reduction; 5 g. of this dissolve in 10 cc. boiling EtOH. The prepn. of the *N*-3-*Me* deriv. of *Me* 4-benzalhydantoin-*N*-1-acetate, m. 66.5-8° and 101-2.5°, will be described later; HCl in EtOH isomerizes the lower melting form into the higher. *Methyl 4-anisalhydantoin-N*-1-acetate, m. 183-4°; it exists in 2 cryst. forms, needles or prisms. In KOH-EtOH with MeI it gives a *Me* deriv., m. 84-5°; 2 g. dissolves in 20 cc. boiling EtOH. HCl in EtOH gives the *isomeric form*, greenish-yellow, m. 129.5-31°. *Methyl 4-anisylhydantoin-N*-1-propionate, m. 163-4°; 20 g. requires 60 cc. boiling CHCl₃, 250 cc. boiling Me₂CO and 600 cc. boiling MeOH for solution. *Me N*-3-methyl-4-anisalhydantoin-*N*-1-propionate, m. 108-4° and 142-3°; the higher melting form is obtained by isomerizing with HCl in EtOH. In the case of the esters studied, the lower melting forms are all very similar in phys. properties and the difference between them and their higher melting isomers is almost const.

C. J. WEST

Thallous salts of lauric and myristic acids. D. HOLDE and K. TAKEHARA. *Ber.* 58B, 1788-91(1925); cf. *C. A.* 19, 2032.—These salts were prepd. in the same way as those of the higher acids and showed the same anomalies in m. ps. Their soly. in 50% alc. is considerable and they cannot, therefore, be used for sepg. lauric and myristic acid from the liquid acids in fats, at least under the conditions of concn. and temp. used for the sepn. of stearic from oleic acid. *Tl myristate*, m. 120-3°, soly. in 50% alc at 25° 0.52-0.54%. *Laurate*, m. 125-6°, soly. 1.46-1.52%.

C. A. R.

Absorption spectra of some derivatives of anisalhydantoin. EMMA P. CARR AND MARIE A. DOBBROW. *J. Am. Chem. Soc.* 47, 2961-5(1925).—From a study of the ultra-violet absorption spectra, it has been shown that the esters obtained by the condensation of MeCHBrCO₂Et with the Na deriv. of anisalhydantoin are *N*-1- and not *N*-3- substitution products, as previously reported by Hahn, Kelley and Schaeffer (*C. A.* 17, 2106). Curves are given from Et 4-anisalhydantoin-*N*-1-acetate, Et 1-methyl-4-anisalhydantoin-*N*-3-acetate and Et 4-anisalhydantoin-*N*-1-propionate.

C. J. WEST

Effect of gum arabic and other emulsifiers on the acid hydrolysis of esters in heterogeneous systems. R. C. SMITH. *J. Chem. Soc.* 127, 2602-5(1925).—The rate of hydrolysis of AcOEt in C₆H₆ by HCl in the presence of solids (lamp black, blood charcoal, kaolin, fuller's earth, pumice, gypsum, BaSO₄, S), irrespective of their soly. in H₂O and C₆H₆, varies but little, being sometimes above and sometimes below the normal value; for S, it increased at first and then diminished; in no case, however, did the deviation from the normal rate exceed 15%. With gum tragacanth and dammar, the normal rate was increased 1.5 times by the latter and more than doubled by the former at a concn. of 1%. With 1% arabic, a slight increase was noticed, but the rate became slower with increasing concn. The rate was diminished by gelatin and isinglass, not appreciably affected by mastic and sandarac and increased by sol. starch. As the concn. of tragacanth increased, the rate increased, even after sufficient gum was present to absorb all the HCl. Numerical results are reported for AcOEt, AcOPr and EtCO₂Et for the gums arabic, tragacanth and dammar and kaolin.

C. J. WEST

Synthesis of 5- β -hydroxyethylbarbituric acid and its alkyl derivatives. L. H. CRETCHER, J. A. KOCH and W. H. PITTEGER. *J. Am. Chem. Soc.* 47, 3083-5(1925).—The following *di*-Et alkylvinylxyethyl malonates, CH₂:CHOCH₂CH₂CR(CO₂Et)₂, were prepd. from RCNa(CO₂Et)₂ and ClCH₂CH₂OCH:CH₂: *Et*, b₁₈ 151°, d₁₆¹⁵ 1.0264; *Pr*, b₁₇ 157°, d₁₆¹⁵ 1.0145; *Bu*, b₁₇ 165°, d₁₆¹⁵ 0.9992; *vinylxyethyl*, b₃ 133°, d₁₆¹⁵ 1.0566. With CO(NH₂)₂ and EtONa there result barbituric acid derivs., which on hydrolysis yield the hydroxyethyl derivs. The following *barbituric acid derivs.* are reported: 2-Thio-5-[ethylvinylxyethyl], m. 136° (all m. ps. cor.); 5-ethylvinylxyethyl, m. 158°; 5-butylvinylxyethyl, m. 141°; 2-thio-5-hydroxyethyl, m. 181° (decompn.); 5-ethylhydroxyethyl, m. 176°; 5-hydroxyethyl, m. above 300°; 2-thio-5-ethylhydroxyethyl, m. 143-5°; 5-propylhydroxyethyl, m. 168°; 5-butylhydroxyethyl, m. 147°.

C. J. WEST

The action of yeast on the glycidic acids. R. KUHN and F. EBEL. *Ber.* 58B, 1447-9(1925).—*cis*- and *trans*-Ethylene oxidicedicarboxylic acids (fumarylglidic acids) on fermentation with bottom yeast, yielded equal amts. of CO₂, while under similar conditions in the fermentation of AcCO₂H, the CO₂ formation was 2-4 times greater. The fermentation of the ethylene oxidicedicarboxylic acids is considered to proceed with the formation of 1 mol. CO₂ and 1 mol. of glycidic acid, which is not further broken down. No MeCHO was produced. Neither AcCO₂H nor the ethylene oxidicedicarboxylic acids were fermented by top yeast.

H. B. LEWIS

Synthesis of two new leucines. KANROKU KURONA. *J. Chem. Soc. Japan* 45, 239-44(1925).—In order to study the mechanism of amino acid fermentation (cf. *C. A.* 20, 213) K. synthesized 2 new leucines that contain tertiary α -NH₂ groups, having an

asymm C (1) *Methylpropyl- α -aminoacetic acid*, $\text{MePrC}(\text{NH}_2)\text{CO}_2\text{H}$. Zelinskii and Stadinikov's method was used (*Ber.* 39, 1722(1906)). Fifty g. MeCOPr , 31 g. NH_4Cl and 38 g. KCN in 200 cc. H_2O and 200 cc. abs. alc. are heated at $50-60^\circ$ for 5 hrs. in a sealed bottle. The contents are then treated with an equal vol. of fuming HCl and satd. with HCl gas while cooling. After standing overnight, they are dild. with H_2O and refluxed for 2 hrs. The product is concd., dried over the steam bath and extd. with abs. alc. The free acid is obtained by the usual method of removing Cl with Ag_2O , Ag by H_2S . The yield was 30 g. It has the compn. $\text{C}_6\text{H}_{13}\text{NO}_2$, m. 295° in a sealed tube, but sublimes in open. The Cu salt is dark green and chars at 200° . The Cu salt is exceedingly sol. in H_2O , fairly in alc., MeOH , hot AmOH , but not in acetone. (2) *Methylisopropyl- α -aminoacetic acid* was prepd. by the same method, from MeCOCHMe_2 . It m. 293° in a sealed tube, sublimes at 290° under atm. pressure. The soly. is exactly same as that of I. Its Cu salt is deep green, very sol. in H_2O and alc. The general phys. properties of these 2 new leucines are the same as those of naturally occurring leucine and isoleucine, making it, therefore, difficult to det. whether these new leucines ever occur in proteins. The exceedingly sol. nature of the Cu salts of these new leucines is probably the only phys. characteristic that might aid in differentiation of these from the already known leucines. S. T.

Mechanism of the oxidation of thymine; 4,5-dihydroxyhydrothymine (thymine-glycol). OSKAR BAUDISCH AND DAVID DAVIDSON. *Ber.* 58B, 1680-4(1925).—See C. A. 19, 2641

Oxidation of isobarbituric acid. A new class of indigoid compounds. DAVID DAVIDSON AND OSKAR BAUDISCH. *Ber.* 58B, 1685-8(1925).—See C. A. 19, 3089.

Oxidation of *d*-glucose by means of copper in sodium carbonate solution (Sol-daine's reagent). F. W. JENSEN AND F. W. UPSON. *J. Am. Chem. Soc.* 47, 3019-24 (1925).—Oxidation of *d*-glucose by means of Cu in the presence of Na_2CO_3 leads to the formation of the same products as in the other Cu oxidations. While hexonic acids are definitely present in the oxidation mixt. they were isolated in much smaller amts. than in the oxidation with Fehling soln. As regards the other products of oxidation there was little difference between these expts. and those with Fehling soln. The oxidation products from 200 g. *d*-glucose, excluding CO_2 , amounted to 142 g., in which the following substances were identified: HCO_2H , 30.86 g.; glycolic acid, 15.3 g.; gluconic acid, 1.2 g.; mannonic acid, small amt.; arabonic acid, 6 g., isolated as the brucine salt; erythronic acid, isolated as the brucine salt and identified as the lactone, 3.6 g.; glyceric acid, 6.2 g., isolated as the brucine salt; *d*-threonic acid, trace. C. J. W.

Preparation of acetacetanilide. HEINRICH PFEIFFER. *J. prakt. Chem.* 111, 240-1(1925).— PhNH_2 (14 g.) and 20 g. $\text{AcCH}_2\text{CO}_2\text{Et}$ are heated 15 min. at 160° ; after cooling to room temp., the flask is cooled in a freezing mixt., giving 50% yields of PhNHCOCHAc , m. 86° . C. J. WEST

Mechanism of carbohydrate oxidation. I. *d*-Glucose, *d*-mannose, *d*-fructose, *d*- and *l*-arabinose and *dl*-glyceric aldehyde. W. L. EVANS, C. A. BUEHLER, C. D. LOOKER, R. A. CRAWFORD AND C. W. HOLL. *J. Am. Chem. Soc.* 47, 3085-98(1925).—An attempt is made to establish, from exact quant. data, obtained under definitely chosen exptl. conditions, the mol. stages through which some of the org. compds. of the more familiar type pass when they undergo this kind of chem. change. When the above named compds. are oxidized with KMnO_4 , the final reaction product in neutral soln. is CO_2 in practically a quant. yield, while in alk. soln. $(\text{CO}_2\text{H})_2$ and a volatile acid also are present; the yield of CO_2 in the case of the hexoses increases with the temp. while that of $(\text{CO}_2\text{H})_2$ decreases; the $(\text{CO}_2\text{H})_2$ reaches a max. yield and the CO_2 a min. one in solns. of KOH of about 0.08 *N*, after which the yield of $(\text{CO}_2\text{H})_2$ gradually diminishes while that of CO_2 shows a corresponding increase; at a concn. of KOH of 1.7-2.0, the yield of $(\text{CO}_2\text{H})_2$ from the oxidation of *d*-fructose at 100° shows a tendency towards a second max., the CO_2 showing a corresponding decrease. Within the limits of exptl. error, the results at 50° are identical for *d*-glucose, *d*-fructose and *d*-mannose and at 75° for *d*-glucose and *d*-fructose, thus offering a verification of the expts. of de-Bruyn and van Ekenstein on the action of alkalies on these 3 sugars. This identity in chem. behavior must be due to the presence of equil. of the same chem. active components in the solns. of the hexoses. This is best explained by the views of Nef, who postulates the existence of a series of enediols, which may undergo splitting and subsequent oxidation in the presence of alkalies and oxidizing agents. The probable mechanism is discussed. II. **The oxidation of *d*-galactose.** WM. L. EVANS AND C. A. BUEHLER. *Ibid.* 3098-101.—*d*-Galactose and *d*-glucose, when oxidized with alk. KMnO_4 at 25° and 50° , do not give the same $(\text{CO}_2\text{H})_2$ - CO_2 ratio at all alkalinities. At 75° the ratio is ap-

prox. the same. The theoretical reasons for this behavior are discussed. **III. The oxidation of the hexitols *d*-mannitol, *d*-sorbitol and dulcitol.** W. L. EVANS AND C. W. HOLL. *Ibid* 3102-5.—In neutral solns. of KMnO_4 the hexitols are practically quant. oxidized to CO_2 ; in alk. solns. $(\text{CO}_2\text{H})_2$ was always present as a final reaction product. The hexitols are more resistant to oxidation than the hexoses. It is probable that the hexitols are oxidized through the intermediate formation of aldohexoses. The results obtained with *d*-sorbitol show that this is oxidized through the intermediate formation of *d*-glucose rather than *l*-gulose. C. J. WEST

Photolysis of ethylene dibasic acids. VOLMAR. *Compt. rend.* **181**, 467-9(1925).—In continuation of previous work (C. A. **19**, 2454) a study was made of various isomeric dibasic acids to det. the influence of the positions (*cis* or *trans*) of the CO_2H groups on the stability towards ultra-violet light. Expts. with succinic, fumaric, maleic, pyrotartaric, mesaconic, itaconic and citraconic acids showed that the ethylenic acids are decompd. more easily than the corresponding satd. acids. The *cis*-isomers are 5-6 times as sensitive to this light as the corresponding *trans*-isomers and represent from the photochem. point of view the labile form. The gas evolved consists almost exclusively of CO . The law of photochem. equivalence (C. A. **18**, 1612) explains the differing behavior of the *cis*- and *trans*-isomers, the latter behaving like a monobasic acid, whereas in the *cis*-isomers the 2 CO_2H groups influence each other spatially. The proximity of the 2 CO_2H groups has, therefore, an influence on the stability of the mol. towards light, whether this proximity involves 2 or 3 dimensions geometrically, which is in accordance with the results of Berthelot (*Compt. rend.* **112**, 287(1891)). If the exposure to ultra-violet light is prolonged, the difference between the *cis*- and *trans*-isomers diminishes because of secondary isomerization, as described by Longworthy and Stoeuner. Thus maleic acid can be detected in solns. of fumaric acid and *vice versa*, the 2 solns. approaching a common state of equil. C. C. DAVIS

Thermal decomposition of acetyl peroxide-succinic acid. F. BRUNNER. *Helvetica Chim. Acta* **8**, 651-4(1925).—The hypothesis that Kolbe's electrochem. synthesis of hydrocarbons (I) was due to the intermediate formation of peroxides and peracids (Fichter and Krummenacher, C. A. **13**, 560) was rendered plausible by F.'s later expts. showing I to be formed when the appropriate peroxide was quickly heated above the explosion point. This is now further tested on a mixed peroxide. $\text{HO}_2\text{CCH}_2\text{CH}_2\text{CO}_2\text{H}$ (Clover and Houghton, *J. Am. Chem. Soc.* **32**, 55(1910)), shaken with Ac_2O until dissolved and dried *in vacuo* over H_2SO_4 and KOH , and the residue washed with abs. Et_2O , gives acetyl peroxide-succinic acid, $\text{HO}_2\text{CCH}_2\text{CH}_2\text{CO}_2\text{OAc}$ (II), indistinctly cryst., *m* 72-5°, explodes 120°. Placed in a bomb, which is described in detail, and plunged into a bath at 180° for 10 min. it gives 94% of the theory of CO_2 and 88.5% of PrCO_2H , analyzed as the Ag salt, the equation being $\text{II} \rightarrow 2\text{CO}_2 + \text{PrCO}_2\text{H}$. The analogy is, therefore, complete with the electrochem. conversion of a mixt. of KOAc and $\text{KO}_2\text{CCH}_2\text{CH}_2\text{CO}_2\text{Et}$ into PrCO_2Et (v. Miller and Hofer, *Ber.* **28**, 2427(1895)). M. H.

Periodicity law and the theory of cyclic unsaturated compounds. P. PETRENKO-KRITSCHENKO. *J. prakt. Chem.* **111**, 23-35(1925).—Theoretical. C. J. WEST

The existence of racemic liquids. F. D. AGUIRRECHE. *Anales soc. españ. fis. quim.* **23**, 409-18(1925).—The *d*-di-Et tartrate and its *dl*-modification were carefully prepd. and the *d*, *n*, surface tension and viscosity of both detd. No differences outside of exptl. error were found. E. M. SYMMES

The structure of benzene. C. W. A. LELY. *Chem. Weekblad* **22**, 357(1925); cf. van Laar, C. A. **19**, 2480.—There is in v. L.'s paper no proof against the triangle formula of benzene. Before more convincing evidence is offered the incidentally doubtful agreement between the calcd. and exptl. value of $10^2\sqrt{a}$ may be considered as a mere coincidence. The fact that C_6H_6 derivs. show the same agreement is only a necessary result of this coincidence, just as all multiples of a number must be divisible by 7, if the number itself is divisible by 7. MARY JACOBSEN

Answer to C. W. A. Lely [structure of benzene]. J. J. VAN LAAR. *Chem. Weekblad* **22**, 357-8(1925); cf. preceding abst.—Lely's argumentation is in striking contrast to the usual method of scientific deduction. The presence of a certain property in a great no. of derivs. is always considered as a proof of this property being inherent to the mother compd. Coincidence is guarded against by the great no. of instances. The 3-ring formula is not disproved but made very improbable. Any other than Kekulé's formula demands a $10^2\sqrt{a}$ so substantially different from 19, that even the critical temp. and pressure of C_6H_6 would be entirely different from the exptl. ones. M. J.

The structure of dihydrobenzenes and related compounds. C. W. A. LELY. *Chem. Weekblad* **22**, 501-7(1925); cf. *J. Chem. Soc.* **85**, 1406(1904); C. A. **3**, 1174; 5,

788; 18, 1991.—Kekulé's benzene formula precludes the existence of

There are, however, indications that these compds. exist. They are formed from *trans*-1,2- and 1,3-dibromocyclohexane. Very likely those of Zelinskii and Gorski, Harries, Crossley and Markovnikov, but only a dibromide, are 1,2, while those of Markovnikov which boil at 100°C. are 1,3 and 1,4. The constitution established by Harries and Harrie method was questioned by Zelinskii and Gorski in view of the oxidation products. The sudden leap in magnetic rotation which occurs between tetra- and dihydrobenzene and has no parallel in the aliphatic series and the difference in Br addn. between the isomeric dienes are suggestive of a peculiar constitution. A comparison of the combustion heats also shows that 25 cal. is consumed for the addn. of the first 2 H. The interpretations of various authors are discussed at length. L.'s theory of synchronous rotation and the triangle formula account very well for these and other phenomena in the aromatic and hydroaromatic series. A 1,2-diene formula for *p*-benzoquinone is developed, based on its behavior towards HCN and Br. Should the existence of 1,2-dienes be proved, then a revision of the entire terpene chemistry would become necessary, the Br addn. serving as a basis for the new classification.

MARY JACOBSEN

Action of nitrous acid upon amides and other "amino" compounds. R. H. A. PLIMMER. *J. Chem. Soc.* **127**, 2651-9 (1925).—Amides and urethan do not react with HNO_2 in the presence of AcOH . Both react quant. in the presence of approx. 2 N HCl . $\text{CO}(\text{NH}_2)_2$ reacts quant with HNO_2 in AcOH . Biuret reacts with 1 N atom in the presence of AcOH , with 2 N atoms in the presence of small amts. of HCl and with 3 N atoms in 2 N HCl . Guanidine and creatine do not react with HNO_2 in AcOH but give off N in HCl . Arginine, excepting its primary $\alpha\text{-NH}_2$ group, behaves in a similar way. Creatinine gives off N corresponding to 1 N atom with HNO_2 in AcOH ; the vol. of N evolved is diminished in the presence of HCl . If HNO_2 in the presence of AcOH is a reagent for the presence of an NH_2 group, amides and the other compds. investigated will possess alternative formulas, which, in the presence of HCl , change to the usually accepted formulas for these compds. C. I. WEST

Spatial relationships about the copper atom. N. SCHLESINGER. *Ber.* 58B, 1877-89 (1925).—S. has made certain observations on the Cu salts of bis-imino acids (I) which can be explained only on the basis of *cis-trans* isomerism, indicating that the 4 atoms or groups united coordinatively to the central Cu atom lie at the 4 corners of a quadrangle (plane configuration) as in the case of the Pt compds. and not at the corners of a tetrahedron (spatial configuration). The **I**, $(\text{CH}_2)_x(\text{NHCCR}'\text{CO}_2\text{H})_2$ (C. A. 9, 74 form, like the NH_2 acids, blue, H_2O -sol. inner complex salts, and also difficultly sol. reddish violet forms with normal mol. wts. Of the **I** with $x = 2$ or 3, only the blue salts are known, of **I** with $x = 10$ only the violet salts, while **I** with x intermediate between the above extremes form both types of salts. The difference between the 2 forms persists even in solns. and the change of the 1 form into the other is shown by the gradual color change of the soln. *Cu chlylenebis-[α -iminoisobutyrate]*, crystals from dil. alc. with $4\text{H}_2\text{O}$, mol. wt. in H_2O 339-41, mol. cond. in H_2O at 25° 4.0-4.3 for V 250. 4.8 for V 500. *Trimethylenebis-[α -iminoisobutyronitrile]* (96% from $\text{CH}_2(\text{CH}_2\text{NH}_2.\text{HCl})_2$ (**II**) and KCN in aq. Me_2CO), m. $91-2^\circ$; *di-HCl salt*. Free acid, threads with $2\text{H}_2\text{O}$, crystals with $1\text{H}_2\text{O}$, does not m. 360° ; *Cu salt*, dark blue crystals with $3\text{H}_2\text{O}$, mol. wt. in freezing H_2O 290.2-7.2. *Trimethylenebis-[α -iminophenylacetoneitrile]* (10.7 g. from 7.35 g. **II**, KCN and BzH in aq. MeOH), m. $97-8^\circ$, smoothly hydrolyzed by fuming HCl to the acid, does not m. 300° , forms a difficultly sol. *di-HCl salt*; *Cu salt*; *di-Me ester* (5 g. as the *di-HCl salt* from 5.5 g. of the acid in MeOH with HCl), m. around $66.5-8.5^\circ$; *di-Et ester*, m. $42.8-3.8^\circ$, forms a *di-HCl salt* which sinters above 200° but does not m. 230° . *Trimethylenebis-[α -iminooctanonitrile]-2HCl*, from **II**, KCN and enanthal (80% yield), decomps. about 185° , m. $215-30^\circ$, decompd. into **II**, HCN and enanthal by hot H_2O ; acid; *di-HCl salt* of acid, decompd. by H_2O , decompd. in a sealed capillary without melting; *Cu salt*; *di-Me ester*, oil. *Di-Me pentamethylenebis-[α -iminopropionate]*, b_{14} 193° , d_{20}^{20} 1.0216, n_D^{20} 1.4533; *di-HCl salt*, becomes yellow on heating, decompd. 173° in a sealed capillary. *Di-HCl salt* of the free acid; *Cu salt*, violet-blue changing to pink on drying but quickly regaining its original color in the air, sol. in molten PhOH with dark blue color, mol. wt. in PhOH 321. *Pentamethylenebis-[α -iminoisobutyric acid]*, does not change 360° ; *di-HCl salt*, decompd. 150° ; *Cu salt*; blue form, prepd. as already described; *violet form*, from as concd. a soln. as possible of the salt $\text{C}_{13}\text{H}_{26}\text{O}_4\text{N}_2\cdot 3\text{C}_2\text{H}_5\text{H}_2\text{O}_4\text{N}_2\cdot \text{Cu}$ (**III**) (obtained by heating the above blue salt, $\text{C}_{18}\text{H}_{24}\text{O}_4\text{N}_2\cdot \text{Cu}$, with H_2O) treated in NH_4OH with exactly the calcd. amt. of $\text{Cu}(\text{OH})_2$ (prepd. from titrated solns. of $\text{Ba}(\text{OH})_2$ and CuSO_4), is unchaned by boiling H_2O .

mol. wt. in PhOH 367–84. In dil. aq. soln., at least, **III** is completely decompd. into its components, its mol. wt. in 2.64% soln. being 308–332. *Ni pentamethylenebis-[α -iminophenylacetate]*, pale grey-green. *Heptamethylenebis-[α -iminopropionic acid]*, crystals with $1\text{H}_2\text{O}$, becomes colored above 270° and decomp.: *di-HCl salt*, exceedingly sol.; *Cu salt*, seps. with $4\text{H}_2\text{O}$. *Heptamethylenebis-[α -iminoisobutyronitrile]*, oil; *di-HCl salt*, m. about 129° (decompn.). *Acid*, does not m. 310° . *Cu salt*; *violet form*, from the acid and exactly the calcd amt. of $\text{Cu}(\text{OH})_2$ in NH_4OH , seps. with $0.5\text{H}_2\text{O}$, sol. in cold C_6H_6 with KMnO_4 -like color changing to blue on heating and back to the original color on again cooling, mol. wt. in PhOH 363–75, converted into the *blue form* by freeing the PhOH soln. of most of the PhOH with H_2O , dilg. with alc., letting stand, and adding Et_2O , can be recrystd. unchanged from alc. but is converted by hot H_2O in a few min. into the violet form, also on longer boiling by alc., is not changed by heating 6 hrs. at 95° in dry form. *Heptamethylenebis-[α -iminophenylacetoneitrile]*, oil (yield, quant.); *di-HCl salt*, m. 144° (decompn.). *Acid*, decomp. about 231° ; *di-HCl salt*; *Cu salt*, obtained only in a light blue, difficultly sol. form; *di-Me ester*, viscous oil, d_4^{20} 1.0854, n_D^{20} 1.5293. *Decamethylenebis-[α -iminoisobutyric acid]* (1.3 g from 3.8 g $\text{CH}_3\text{H}_2\text{N}(\text{CH}_2)_{10}\text{NH}_2\text{HCl}$); *Cu salt*, sol. in PhOH with red color. C A R

Action on dimethylaniline of certain chlorides derived from carbonic acid. H. RIVIER AND P. RICHARD. *Helvetica Chim. Acta* **8**, 490–500 (1925).—*p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{COCl}$ (**I**) was isolated pure for the 1st time by the direct method by passing 1 mol COCl_2 into 2 mols. dry PhNMe_2 (**II**) at 0 – 10° , letting stand several days, adding a little CHCl_3 free from H_2O and alc., filtering *in vacuo* in a desiccator, and washing with CHCl_3 until the more sol. PhNMe_2HCl (**III**) dissolved. It m. 147 – 9° , is extremely deliquescent, passing into the acid; with NaOPh in Et_2O and CHCl_3 free from alc. and H_2O , it gives, on boiling 24 hrs., *Ph p*-dimethylaminobenzoate, m. 180 – 1° ; *picrate*, yellow, m. 146 – 7° . With $\text{Pb}(\text{SEt})_2$ in CHCl_3 at room temp., **I** gives *Et p*-dimethylaminobenzoate, m. 61 – 3° ; *picrate*, yellow, m. 125 – 6° ; with $\text{Pb}(\text{SPh})_2$ the *Ph* analog is formed, decomp. in air; *picrate*, yellow, m. 132 – 3° . **II** and CSCl_2 in CS_2 gave a mixt. from which *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{CSCl}$ could not be isolated and esters could not be prepd.; it gave 6–8% of the free acid, whose salts decompd., yielding sulfides. Other products were (*p*- $\text{Me}_2\text{NC}_6\text{H}_4$) $_2\text{CS}$, R_2CO and crystal violet. **II** and 2 mols. ClCO_2Et react at 150° with evolution of heat, giving chiefly EtCl and CO_2 with a little MeCl , **II** acting merely as catalyst. The reaction is unfinished after several weeks in the cold. ClCO_2Ph and **II** yield an unstable addn. product, which, on heating at 100° and working up, decomp. according to $2\text{PhNMe}_2\cdot\text{ClCO}_2\text{Ph} + \text{H}_2\text{O} \longrightarrow 2\text{III} + \text{CO}_2 + \text{Ph}_2\text{CO}_3$ and $\text{PhNMe}_2\cdot\text{ClCO}_2\text{Ph} \longrightarrow \text{III} + \text{CO}_2 + \text{PhOH}$. ClCSOEt (**IV**) was prepd. in 53% yield by dropping a 20% soln. of 11.5 g. CSCl_2 in CHCl_3 into 2.3 g. Na in 9.2 g. abs. alc., letting stand 3 hrs., shaking with H_2O , drying and distg.; with 2 mols. **II** in the absence of light it yields EtCl and COS , with a little Et_2CO_3 formed by traces of H_2O . In the rigorous absence of H_2O (distn. of the **II** over Na) equimol. amts. of **II** and ClCSOPh react at 110° with evolution of MeCl , CO , and heat. Kept at 160° for 1 hr., *Ph p*-methylaminobenzoate is formed, yellow, m. 109 – 10° , weakly basic. Similarly at 140° ClCOSEt and 2 mols. **II** give *Et p*-methylaminophenyl sulfide, b_{18} 154 – 6° , b 270 – 5° , pale yellow liquid; *picrate*, m. 130.5 – 1.2° ; *Ph p*-methylaminophenyl sulfide, m. 65.5 – 6.5° , b 345 – 50° (slight decompn.); *picrate*, m. 140° ; *nitrosamine*, yellow, m. 160.5 – 1.0° . At 170° or in the cold ClCS_2Et and 2 mols. **II** evolve EtSH , but only a little Et_2CS_2 and a resin could be isolated. ClCS_2Ph reacted at 100° according to: $2\text{PhSCS}_2\text{Cl} + 4\text{II} \longrightarrow \text{III} + (\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CCl} + \text{Ph}_2\text{CS}_3 + \text{H}_2\text{S}$. M HEIDELBERGER

Preparation of some primary amines by the catalytic reduction of nitriles. W. H. CAROTHERS AND G. A. JONES. *J. Am. Chem. Soc.* **47**, 3051–7 (1925).—Although the reduction of nitriles in the usual solvents commonly leads to a mixt. of primary and sec. amines, *o*- and *p*- $\text{MeC}_6\text{H}_4\text{CN}$, PhCN and PhCH_2CN (when Adam's PtO catalyst is used) are smoothly reduced in Ac_2O with the formation of the Ac derivs. of the corresponding primary amines. Sec. amines or their Ac derivs. are absent. *p*- $\text{MeC}_6\text{H}_4\text{CN}$ gives 88% of *p*- $\text{MeC}_6\text{H}_4\text{CH}_2\text{NHAc}$, m. 110 – 1° (all m. ps. are cor.), from which is obtained 88.7% of $\text{MeC}_6\text{H}_4\text{CH}_2\text{NH}_2$, b_{34} 108° . In glacial AcOH there results 71% of (*p*- $\text{MeC}_6\text{H}_4\text{CH}_2$) $_2\text{NH}$, m. 33.5° . In abs. EtOH there results a mixt. of the 2 products. In Bu_2O , there results 74% of *butyryl-p*-methylbenzylamine, m. 71 – 2° . PhCN in Ac_2O , reduced and hydrolyzed, gives 60% of PhCH_2NH_2 . In glacial AcOH , 41.2 g. PhCN gives 20 g. PhCH_2NH_2 and 12.4 g. $(\text{PhCH}_2)_2\text{NH}$. In abs. EtOH , there result about 5 g. PhCH_2NH_2 and 26 g. $(\text{PhCH}_2)_2\text{NH}$. *o*- $\text{MeC}_6\text{H}_4\text{CN}$ (23.4 g.) gives 30.7 g. $\text{MeC}_6\text{H}_4\text{CH}_2\text{NHAc}$. PhCH_2CN gives about 60% of $\text{PhCH}_2\text{CH}_2\text{NHAc}$. *p*-Methylbenzylamine phenylcarbamide, m. 188 – 8.2° ; *p*-tolylsulfonamide, m. 94.7 – 5.5° ; *p*-bromophenylsulfonamide, m. 126.5 – 7.5° . *o*-Methylbenzylamine phenylcarbamide, m. 167.5 – 8° ; phenyl-

sulfonamide, m. 128.3–9.1°; *p*-tolylsulfonamide, m. 118.7–9.2°; *p*-bromophenylsulfonamide, m. 106.5–7°; β -Phenylethylamine *p*-bromophenylsulfonamide, m. 88.5–9.5°; phenylcarbamide, m. 153.5–4.5°.

C. J. WEST

Nitrogen tetroxide as a reagent for diazotization. BRUCE HOUSTON AND T. B. JOHNSON. *J. Am. Chem. Soc.* **47**, 3011–8 (1925).— N_2O_4 reacts with primary aromatic amines in anhyd. C_6H_6 to form the corresponding diazonium nitrate and diazoaminobenzene combinations. The mechanism of these changes is satisfactorily explained by assigning to N_2O_4 the structure of nitrosyl nitrate, $ON \cdot O \cdot NO_2$. With $m\text{-}O_2NC_6H_4NH_2$ and N_2O_4 there results 3,3'-dinitrodiazoaminobenzene, yellow, m. 195–6° (violent decompn.), mol. wt. in boiling Me_2CO , 282. The 4,4'-deriv., m. 225–30° (decompn.), the 2,2'-deriv., 196°. In the reaction there also results the corresponding diazonium nitrate, the relative amts. of the 2 compds. formed being dependent upon the mol. proportion of the N_2O_4 used in the reaction. Of the 3 isomers, the *o*-deriv. reacted far less smoothly with N_2O_4 than its 2 isomers. Further data from the literature are quoted to support the proposed structure of N_2O_4 .

C. J. WEST

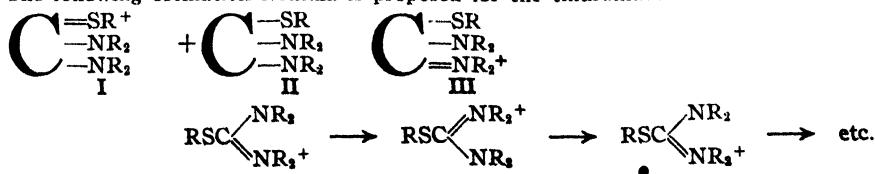
Benzoyl peroxide and secondary amines. STEPHAN GAMBARJAN. *Ber.* **58B**, 1775–8 (1925); cf. *C. A.* **4**, 317.—G. had shown that Bz_2O_2 and Ph_2NH give *o* HOC_6H_4NPhBz , which he assumed to be a rearrangement product of Ph_2NOBz , formed primarily. That this assumption was correct is now shown with a no. of other secondary amines in which the reaction is not complicated by rearrangements. Thus, piperidine with 0.5 mol. Bz_2O_2 in Et_2O gives 95.9% $BzOH$ and 50.2% *O*-benzoyl-*N*-hydroxypiperidine, $C_8H_{10}NOBz$, m. 62°, which reduces Fehling soln. and with $Zn\text{-}AcOH$ in boiling $MeOH$ gives 97.90% $BzOH$ and 98.12% piperidine (as the HCl salt). Again, $NHfEt_2$ with Bz_2O_2 gives 95.9% $BzOH$ and *O*-benzoyl-*N*,*N*-dicylhydroxylamine, oil isolated as the bisulfate (yield, 77.6%), m. 134°, which on reduction gives 98% $BzOH$ and 95.6% $NHfEt_2 \cdot HCl$. Finally, (iso- Bu) $_2NH$ yields *O*-benzoyl-*N*,*N*-disobutylhydroxylamine, whose bisulfate m. 123°.

C. A. R.

Stereochemical studies. IX. Carbothionmalic acids. BROR HOLMBERG. *Ber.* **58B**, 1822–33 (1925), cf. *C. A.* **17**, 1235.—Various alc. acids add CS_2 in alk. soln. with formation of α,Δ -dithiocarbon- or carbothionlonglycolic salts which with alkyl halides yield the acid esters $HO_2CCH_2OCS_2R$ (I); these are unstable and on heating in aq. soln. slowly, in neutral and still more in alk. soln. more rapidly decomp. according to the equations $I + 2H_2O = HO_2CCH_2OH + CO_2 + H_2S + HSR$ or $2I + 2H_2O = 2HO_2CCH_2OH + CO_2 + H_2S + CS(SR)_2$, while with NH_3 and amines they often give only $HSR + NH_4O_2CCH_2OCSNH_2$. The present paper deals with the application of these reactions to malic acid. The reaction with CS_2 is quite slow and considerable amts. of alk. carbonate and trithiocarbonate are formed but by treatment of the product with $EtBr$ is obtained some *mono-Et carbothionmalate* (II) (I, $R = Et$); the compd. obtained from ordinary or *l*(-)-malic acid is *d*-rotatory and is, therefore, to be designated as the *l*(+)-form, in accordance with Wohl and Freudenberg (*C. A.* **17**, 1208; in his preliminary paper, B. designated it as the *l*-form); on decompn. it regenerates the *l*(-)-malic acid. The Et ester of the corresponding *l*(+)-dimethylamide, $HO_2CCH_2OC(SNMe_2)$ (III), gives with $BrCH_2CO_2H$ a *d*-rotatory Et bromosuccinate, which can also be obtained directly from the *d*-rotatory free acid (IV) and can be hydrolyzed to this acid; there, therefore, now seem to be sufficient chem. grounds for calling IV the *l*(+)-form, and the same is true for the *d*-rotatory chloro- and iodosuccinic acids. II (7–8 g., together with about 7 g. $CS(SEt)_2$, from 27 g. malic acid and 3 mols. aq. $NaOH$ (turbined 2 days with 1 mol. CS_2 , then 2 days with 20 g. $EtBr$), pale yellow, m. 147–8° on slow, 150–1° on rapid heating, soly. in H_2O at 25° 24.98 g. per l., $[\alpha]_D$ at 17–8°, 26.55–28.2 in alc., 24.8° in $AcOEt$, 33.5° in Me_2CO , 44.1° in H_2O , $[\alpha]_D$ in aq. soln. half neutralized with KOH 28.9°, fully neutralized with KOH 51.5°, with $Ba(OH)_2$ 47.7°; acid $PhNH_2$ salt, $C_{14}H_{17}O_6NS_2 \cdot H_2O$ (3.1 g. II and 1.0 g. $PhNH_2$ in H_2O); attempts to prep. the neutral salt by using only 1.2 g. II gave the same product, m. 89–91°, loses its H_2O and apparently some $PhNH_2$ over H_2SO_4 , $[\alpha]_D$ 69.8°. Heated 5 hrs. at 122°, 0.5469 g. II loses 0.0290 g. in wt. and it now m. 145–50° and shows α_D 0.05° (0.5 g. in 10 cc. alc.); after evapn. of the alc. and recrystn. from H_2O , the product m. 150–3° (foaming) and its soln., neutralized with $Ba(OH)_2$, shows $[\alpha]_D$ 13.1°, corresponding to a mixt. of 27.5% II and 72.5% of the *dl*-form. The $2\alpha_D$ of a soln. of 0.4220 g. II in 25 cc. H_2O on the H_2O bath changes from 1.49° in 0 hrs. to 0.51° in 31 hrs., that of the acid K salt at 35° from 1.20° to 1.18° after 24 hrs. and 1.16° after 1 week, and that of the neutral K salt (2.13°) remains the same after 24 hrs. and is still 2.09° after 1 week. The racemization in these cases is accompanied by considerable decompn. *dl*-II (25.4 g. from about 90 g. *dl*-malic acid), faintly S-yellow, m. 161–2° on slow, 163–4° (decompn.) on rapid heating, soly. in H_2O at 25° 5.99 g. per l.; *Ba* salt, $C_7H_8O_5S_2Ba$; acid $PhNH_2$ salt, needles

with $1\text{H}_2\text{O}$, m. $85-7^\circ$. *l*(+)-Dimethylamidocarbothionmalic acid (**III**) (10.5 g. crude or 5.3 g. pure product from 12 g. **II** and aq. NHMe_2), prisms or tables with $1\text{H}_2\text{O}$, m. $75-8^\circ$ to a semisolid mass, resolidifies and m. again about 110° (foaming), m., anhyd., $117-8^\circ$ (decompn.), $[\alpha]_D$ in alc. 50.9° , in H_2O 28.55° , in soln. half neutralized with NaOH 7.9° , fully neutralized 7.0° . *Et* ester, from the dried acid with EtOH-HCl , rather thick oil, $[\alpha]_D$ 35.9° (alc.); the 0.5 α_D of a mixt. of this ester and 2 mols. $\text{BrCH}_2\text{CO}_2\text{H}$ in boiling C_6H_6 changed from 5.42° (0 hrs.) to -0.12° after 28 hrs.; the course of the rotation curve (ordinates = rotation, abscissas = time), which falls steeply to 0.30° in 14 hrs., indicates that at least 2 coupled reactions are taking place, probably the formation of a *d*-rotatory bromosuccinic ester, which is then gradually racemized, while an addn. product, formed first, is not capable of existence sufficiently long to have an appreciable influence on the rotation. In a similar expt. in which the heating was continued only 3 hrs. there was isolated from the product a not quite pure *Et* bromosuccinate (Br , 30.41%), b_{13} $125-30^\circ$, d_4^{20} 1.351, $[\alpha]_D$ 29.2° (the higher boiling fractions showed no higher *d* rotation); *Et d*(-)-bromosuccinate, from ordinary asparaginic acid, NaNO_2 and HBr and subsequent esterification with $\text{EtOH-H}_2\text{SO}_4$, b_{12-4} $125-6^\circ$, d_4^{20} 1.350, $[\alpha]_D$ -31.0° . *dl*-Form of **III** (3.4 g. crude or about 2 g. pure product from 4.8 g. *dl*-**II**), tables or prisms with $1\text{H}_2\text{O}$, m. $76-8^\circ$ or, anhyd., $116-7^\circ$ (gas evolution) *l*(+)-Diethylamidocarbothionmalic acid (14.7 g. crude and about 10 g. pure product from 12 g. **II**), tables with $1\text{H}_2\text{O}$, m. $52.5-3.5^\circ$ or, anhyd., $70-2^\circ$, $[\alpha]_D$ 58.4° in alc., 44.4° in H_2O , 25.9° in soln. half neutralized with NaOH , 34.0° in fully neutralized soln. *dl*-Form (4.5 g. crude product from 4.8 g. *dl*-**II**), m. $122-1^\circ$ (gas evolution). **X. l**-Menthylxanthogenamides. BROR HOLMBERG AND WILHELM ROSÉN. *Ibid* 18:34-42; cf. C. A. 19, 56 — *l*-Menthylxanthogenacetamide, from *l*-menthol in xylene turbined 5 hrs. with Na at $140-50^\circ$, then cooled to 30° and treated with CS_2 , the resulting Na xanthogenate (**I**), after drying, being in turn treated in alc. with $\text{ClCH}_2\text{CONH}_2$, very faintly yellowish, m. $98-9^\circ$, $[\alpha]_D$ -61.5° in alc., -68.7° in C_6H_6 . In the prepn. of *l*-O-menthylxanthogenamide (**II**) and its homologs, the magma of **I** and xylene was neutralized directly with aq. $\text{ClCH}_2\text{CO}_2\text{Na}$, shaken the next day with Et_2O , the middle of the 3 resulting layers again shaken out twice with Et_2O and then treated with concd. NH_4OH ; yield, 8-9 g. crude or about 5 g. pure product from 8 g. menthol. The **II** so obtained m. $147.5-8.5^\circ$, $[\alpha]_D$ -112.5° in alc., -120.1° in C_6H_6 . H_2O_2 with **II** under various conditions gives chiefly **S** or H_2SO_4 and a *compd.* $\text{C}_{22}\text{H}_{38}\text{O}_5\text{N}_2\text{S}$ (**III**); e. g. 6 g. **II** in 50 cc. AcOH with 5 cc. of 30% aq. H_2O_2 gave 0.3 g. *l*-menthylurethan, m. $165-6^\circ$, $[\alpha]_D$ -81.4° in alc., -85.2° in CHCl_3 , and 2.5 g. **III**, m. $105-6^\circ$, $[\alpha]_D$ -134.4° in C_6H_6 (the same *compd.* has been obtained from EtOCSNH_2 and H_2O_2 ; cf. also Debus, *Ann.* 82, 277 (1852)). With 3 mols. $\text{BrCH}_2\text{CO}_2\text{H}$ in C_6H_6 at 40° , 33 g. **II** gave 15 g. $\text{HO}_2\text{CCH}(\text{OC-SNH}_2)$ (**IV**), m. 139° (gas evolution), and 16 g. of a menthyl bromide (Br , 35.86%), b_{15} $103-5^\circ$, d_4^{20} 1.160, n_D^{20} 1.4855, $[\alpha]_D^{20}$ 23.3° ; in another expt from 43 g. **II** and 1.25 mols. $\text{BrCH}_2\text{CO}_2\text{H}$ were obtained 21 g. **IV** and 13 g. of a product with 35.71% Br , b_{11} $97-8^\circ$, d_4^{20} 1.161, n_D^{20} 1.4845, $[\alpha]_D^{20}$ 30.5° . *N*-Me homolog of **II** (*l*-O-menthyl-*N* methylthionurethan) (9-10 g. crude or about 3 g. pure product from 8 g. menthol), m. $91-2^\circ$, $[\alpha]_D$ -106.0° in alc., -114.1° in C_6H_6 , gives with $\text{BrCH}_2\text{CO}_2\text{H}$ *N*-methylamidocarbothiolglycolic anhydride, m. $40.5-1.5^\circ$, and a product with 34.82% Br , b_{10} 96.7° , d_4^{20} 1.168, n_D^{20} 1.4856, $[\alpha]_D^{20}$ 22.7° . *N*-Di-Me homolog of **II** (9-10 g. from 8 g. menthol), m. $26.5-7.0^\circ$, $[\alpha]_D$ -107.7° in alc., -106.2° in C_6H_6 , gives with $\text{BrCH}_2\text{CO}_2\text{H}$ $\text{HO}_2\text{CCH}_2\text{OCSN-Me}_2$, m. $93.5-4.5^\circ$, and a product with 36.50% Br , b_{20} 111° , d_4^{20} 1.1666, n_D^{20} 1.4848, $[\alpha]_D^{20}$ 26.7° . C. A. R.

Constitution of thiourea and the thionium salts. II. HANS LECHER, FRITZ GRAF, CLAUS HEUCK, KARL KÜBERLE, FRITZ GNADINGER AND FRITZ HEYDWEILLER. *Ann.* 445, 35-61 (1925); cf. C. A. 18, 3359. — The theoretical discussion indicates that the sulfonium (**I**) and carbonium (**II**) formulations of thionium salts, while not exptly. disproved, are improbable. The immonium (**III**) formula in its rigid form is exptly. disproved. It is very probable that the basic function is divided between the 2 N atoms. The following oscillation formula is proposed for the thionium ion:



CS(NMe₂)₂ in AcOH-HClO₄, treated with Br in ¹AcOH, gives the *dehydro-bis*-[N,N,N',-N'-tetramethylthiuronium perchlorate], does not m. 220° and explodes harmlessly on heating on a spatula. Me₂NC(:S)Cl does not react with Me₃N. *S-Et N-methylamino-dithioformate*, b₃ 103-4°, m. 30-2° (cf. Delépine, *Bull. chim. soc.* [3], **27**, 813(1902)). (MeS)₂C.S and MeI give only Me₂SI. Carbo-bis[methylimide], MeN·C:NMe, could not be purified because of its great tendency to polymerize; in Et₂O soln. picric acid gives N,N'-dimethyl-N-picrylurea, yellow, m. 169° (decompn.). Carbo-bis[propyl-imide], b₁₀ 53°; the elec. conds of M and 0.1 M solns in 50% EtOH are given; definite salts with mineral acids were not obtained, MeI does not add; picric acid in Et₂O gives a cinnabar-red addn compd., m. 166-9° (decompn.), transformed by shaking with concd. HCl into the yellow N,N'-diethyl-N-picrylurea, m. 176-7°. The addn. product in C₆H₆ is deep orange and has a strong yellow-green fluorescence; the picrate in C₆H₆ is pale yellow-green and does not fluoresce. N,N'-Dimethyl-N,N'-diethylthiourea, b₁₂ 124-5° (cor.), in 50% yield from MeEtNH and CSCL₂. N',S-Dimethyl-N-ethyl-N-phenylpseudothiourea, yellow oil, b₄ 118-20°, 92% yield. S-Benzylthiuronium chloride exists in a stable form (IV), m. 172.5-4°, which crystals from EtOH upon seeding, and a metastable form (V), m. 116-8°, pptd. from a satd. soln. by concd. HCl or satd. NaCl soln. or crystal. from abs. EtOH after seeding with V; a melt of the chloride solidifies to the V form; if the melt at 155° is seeded with IV, it solidifies to that form. A satd. soln., pptd. with concd. H₂SO₄ or allowed to crystal. from hot dil. H₂SO₄, gives the bisulfate, sinters 144°, m. 116-7.5°, crystal. from a little H₂O gives the sulfate, m. 181-8° (decompn.). N',N',S-Trimethyl-N-ethyl-N-phenylthiuronium iodide; with TI picrate, it gives the yellow picrate, m. 87-8°. Transformed into the sulfate, it gives the d-α-bromocamphor-π-sulfonate, which showed only the rotation of the bromocamphor-sulfonic acid anion. N',N',S-Trimethyl-N,N'-diethylthiuronium iodide, m. 81.5-3.5°, from MeEtN(MeS)C·NEt and MeI or (MeEtN)₂CS and MeI in Et₂O; the picrate yellow, b. 52.5-3.5°. III. H. LECHER AND FRITZ HEYDWELIER *Ibid* 77-82.—Me₃N and MeSCN give Me₄NSCN, which is unchanged after heating 3 hrs at 180.5°. MeNCS and Me₃N do not react at room temp. but at 100-10° also give Me₄NSCN. MeNCS is unchanged after heating under the same conditions. C. J. WEST

Some properties of phenylhydrazine and factors affecting hydrazone formation. E. G. R. ARDAGH AND J. G. WILLIAMS. *J. Am. Chem. Soc.* **47**, 2976-83(1925).—This work was preliminary to the evolution of a general iodometric method for the detn. of the CO group content in org. compds. The reaction between PhNHNH₂ and I does not proceed normally in the presence of buffer solns. When a buffer is present, sufficient HCl or H₂SO₄ should be added to render the soln. just acid to Me orange. Solns. of PhNHNH₂ and its salts, especially the acetate, are fairly rapidly oxidized by exposure to air, even at room temp. They are stable in an atm. of N₂. Contrary to the general assumption, a very small change in the Sørensen value of the soln. may very considerably affect the equil. in hydrazone formation. I soln. rapidly attacks hydrazones, hence von Meyer's method (*J. prakt. Chem.* **36**, 115(1887)) is of little value. Petrenko-Kritschenko does not appear to have appreciated the speed of this reaction (*Ann.* **341**, 150(1905)). Defects in the standard Fehling soln. method for the detn. of the CO group are pointed out. Me₂CO phenylhydrazone formation can be forced almost to completion by adjusting the final Sørensen value of the soln. to between 5 and 7, and at the same time salting out the hydrazone. If the hydrazone is now extd. by a selective solvent, immiscible with H₂O, the reaction can be made practically quant. Also in *Trans. Roy. Soc. Can.*, Sec. III, (3) **19**, 75(1925) C. J. WEST

Peralkylated guanidines. III. HANS LECHER, FRITZ GRAF AND FRITZ GNADINGER. *Ann.* **445**, 61-77(1925); cf. *C. A.* **18**, 3359.—N,N',S-Trimethylpseudothiourea, b₁₄ 90°, m. 53-4.5°, in 95% yield from (MeNH)₂CS and Me₂SO₄. N,N',S-Tri-methyl-N-ethylpseudothiourea (I), b₁₅ 79-80° (90% yield). N,S-Dimethyl-N,N'-diethylpseudothiourea, b₁₃ 80° (cor.) (90% yield). N,N',N'',N'''-Tetramethyl-N-ethylguanidine, b₁₃ 61.5-3° (cor.), from I and Et₂NH. N,N,N',N''-Trimethyl-N,N'-diethylguanidine (II), b₁₅ 71-2°. N,N',N'',N'''-Trimethyl-N,N'-diethylguanidine, (III), b₁₂ 68-9° (cor.) N,N'-Dimethyl-N,N'',N'''-triethylguanidine (IV), b₁₂ 80-1° (60% yield). Hexamethylguanidonium picrate, yellow, m. 120-1°; this gives a mol. compd. with picric acid, dark yellow, m. 68.5-71.5°, with Na picrate, yellow, m. 165-6.5°; with sym-trinitrobenzene, yellow, m. 73.5-5°. Chloroplatinate, dark yellow, m. 181.5-2° (cor.). Attempts to prep. an ethylate failed. Pentamethylethylguanidonium picrate, yellow, m. 96-9°. II and EtI, III and EtI and IV and MeI all give the same N,N,N',N''-triethyl-N,N'',N'''-triethylguanidonium iodide, very hygroscopic, does not m. 230°; the triiodide, dark, m. 50-4° to a red liquid; picrate, m. 41.5-4.5°; chloroplatinate, m. 186.5-8.5°. C. J. WEST

Action of benzoic and anisic acids on thiophenols. A. BISTRZYCKI AND J. RISI. *Helvetica Chim. Acta* **8**, 582-91 (1925).—B. and Kuba (C. A. **16**, 711) showed that $\text{Ph}_2\text{C}(\text{OH})\text{CO}_2\text{H}$ (I) and ArSR formed compds. of the type $\text{Ph}_2\text{C}(\text{CO}_2\text{H})\text{C}_6\text{H}_4\text{SR}$, while I and PhSH (II) gave Ph_2S or, in HOAc at 40–5° on cautious addn. of H_2SO_4 , a product which is now shown to be α -phenylmercaptodiphenylacetic acid (III), $\text{Ph}_2\text{C}(\text{CO}_2\text{H})\text{SPh}$, rhombs with 1 H_2O , m. anhyd. 126–8°, mol wt. 321, also obtained by boiling $\text{Ph}_2\text{Cl}-\text{CCO}_2\text{H}$ and II in PhH; Na salt, sparingly sol. in H_2O , m. 205°; Ba salt. III yields only 3.4% CO when treated according to B. and v. Siemiradzki (Ber **39**, 53 (1906)); boiled with $\text{C}_2\text{H}_5\text{N}$, however, it gives *S*-benzohydrylthiophenol, softens 76°, m. 78.5°. Attempts to prep. an anhydride directly or to oxidize III to the sulfone failed, but when boiled with POCl_3 and PCl_5 it gave the chloride, m. 15–50°, converted into 2,2-diphenyl-3-oxothionaphthene-2,3-dihydrate, $\text{C}_{14}\text{H}_8\text{CO CPh}_2\text{S}$, m. 145–6°, by slowly heating to

110°, then quickly to 150°. α -1-Tolylmercaptodiphenylacetic acid, sinters above 135°, m. 155°, behaves like III. α -Phenylmercapto-di-*p*-anisylacetic acid IV, decomps. 106–7°, gives a violet color with H_2SO_4 ; Ba salt. Heated with $\text{C}_2\text{H}_5\text{N}$, or alone at 130–40°, IV gives 4,4'-dimethoxybenzohydrylthiophenol, $(\text{MeOC}_6\text{H}_4)_2\text{CHSPh}$, m. 50.5–1.5°, gives a rose-orange color with H_2SO_4 . $\text{PhCH}(\text{OH})\text{CO}_2\text{H}$ and $\text{Me}_2\text{CH}(\text{OH})\text{CO}_2\text{H}$ failed to react as did I, as did also the α - and β -halogen acids tested. M. H.

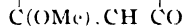
Splitting off of diazoanisole sulfate in the complete synthesis of vanillin. E. AZARETTI. *Profumi italiani* **2**, 279–81 (1924), *Chimie et industrie* **14**, 429 (1925).—Guaiacol is prepd. by Fournau's method from *o*-anisidine by decompn. of its diazonium sulfate in presence of CuSO_4 . If proper precautions are taken, a 72–3% yield can be obtained. A flask with a short, wide neck should be used so that the guaiacol formed may be removed by the steam as soon as formed. It is not necessary to pass steam from a sep. generator, that produced from the diazo soln. being sufficient. This soln. should be added drop by drop at such a rate that the vol. and temp. of the catalyzer remain const. The small quantity of guaiacol remaining at the end can be recovered either by raising the temp. to 105° or by passing a current of superheated steam.

A. PAPINEAU-COUTURE

Report (No. 83) of the most important work appearing in the first half of 1925 on the pure chemistry of the sugars. E. O. VON LIPPMANN. *Deut. Zukerind.* **50**, 1173–5, 1205–6, 1237–8, 1278–9 (1925); cf. C. A. **19**, 3028.

W. L. BADGER

Tautomerism in phloroglucinol derivatives. Monomethyl derivatives of phloracetophenone. ADOLF SONN AND WOLFGANG BÜLOW. *Ber.* **58B**, 1691–8 (1925).—3,5-(HO) $_2$ C $_6$ H $_3$ OMe with MeCN gives a *mono Me ether* (I) of phloracetophenone (II), which condenses smoothly with *p*-MeOC $_6$ H $_4$ CHO in alk. soln. to the chalcone MeO(HO) $_2$ -C $_6$ H $_2$ COCH=CHC $_6$ H $_4$ OMe (III); I is provisionally assigned the benzenoid structure 6,2,4-MeO(HO) $_2$ C $_6$ H $_2$ Ac. Solid I allowed to stand 1–2 days with 1 mol $\text{C}_2\text{H}_5\text{N}_2$ in Et $_2$ O gives an *isomer* (IV) of I which is converted by excess of CH_3N_2 into the di-Me ether and does not condense with aldehydes; this is provisionally assigned the structure CH=C(OH)—CHAc. This would indicate that II has the ketodienol structure corre-



sponding to IV, a view in harmony with its behavior on acetylation. Attempts under the most varied conditions to introduce only one CO_2Me group into II with 1 mol ClCO_2Me in aq. alk. soln. gave only very small amts. of the *mono-OCO $_2$ Me deriv.* (V); besides the *di-OCO $_2$ Me deriv.* (VI) there was obtained unchanged II; on the other hand, in anhyd. solvents in the presence of PhNMe_2 II gives the *tri-OCO $_2$ Me deriv.* (VII). A similar behavior is observed in the partial sapon. of the OCO_2Me derivs., VII with exactly 2 or VI with 1 mol. *N* NaOH does not give V but a mixt. of II and VI. Again, II shaken with 1 mol. BzCl in aq. alk. soln. gives chiefly the di- with only a small amt. of the mono-Bz deriv. I (4.5 g. from 5 g. (HO) $_2$ C $_6$ H $_3$ OMe), m. 205–7°, gives a red-violet color with FeCl_3 in H_2O or alc., dissolves in concd. H_2SO_4 with intense yellow color. 4-Methoxy-2',4'-dihydroxy-6'(?)-methoxychalcone (naringenin 4,6(?)-di-Me ether) (III), brownish yellow, m. 169°, gives a brown-red color with FeCl_3 in alc. and dissolves in H_2SO_4 with red color. IV, m. 136–7°, gives a dark red color with FeCl_3 in alc., dissolves in H_2SO_4 with intense yellow color, is much more stable towards alkalis than II. From 5 g. II in 27 cc. *N* NaOH shaken with 3 cc. ClCO_2Me is obtained 6.5 g. VI, m. 114–5°, gives a red color with FeCl_3 in alc., hydrolyzed by shaking in Et $_2$ O with 2 *N* NaOH to I. V, m. 152°, the best yield ever obtained was not over 10%. VII (50% from II and 7 mols. ClCO_2Me in C $_6$ H $_6$ with PhNMe_2), m. 65°, slowly sol. in excess of cold dil. alkali, more rapidly on warming (with hydrolysis of the OCO_2Me groups), gives no color with alc. FeCl_3 . Dibenzoate of II, m. 109–10°. Monobenzoate, m. 177–

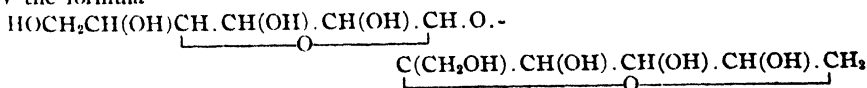
8°. Both Bz derivs. give a red-violet color with FeCl_3 and are hydrolyzed by cold dil. alkali, in which they are easily sol. *Triacetate* of II (3.1 g. from 3.4 g. II with AcCl in $\text{C}_6\text{H}_5\text{-PhNMe}_2$), m. 90°, gives a dark red color with alc. FeCl_3 , slowly dissolves in dil. alkali with yellow color and hydrolysis of the Ac groups. *2,4,6-Trinitroacetophenone*, from $(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{CHO}$ and CH_2N_2 in Et_2O , m. 90–2° (decompn.); *phenylhydrazone*, red, m. 193–4°. *p-Carbomethoxybenzaldehyde*, from $\text{HOC}_6\text{H}_4\text{CHO}$ and ClCO_2Me in NaOH , m. 41–2° (Rosenmund, *C. A.* 12, 2569, gives 18.5°). C. A. R.

Synthesis of 2,3,5(or 2,3,4)-trimethylglucose. J. C. IRVINE AND J. W. H. OLDHAM. *J. Chem. Soc.* 127, 2729–35(1925).—Triacetyldibromoglucose results in 50% yields from the glucosan and PBr_5 ; $[\alpha]_D$ 189.9° (c 1.537 in CHCl_3); 185.9° (c 1.256 in glacial AcOH). Triacetylmethylglucoside bromohydrin, $[\alpha]_D$ –1.4° (c 3.012 in CHCl_3); –3.1° (c 3.014 in MeOH); –2.7° (c 3.006 in glacial AcOH). Hydrolysis gives Me glucoside bromohydrin, m. 153–4° (Fischer gives 148°); its *tri-Bz deriv.*, m. 160–2°, $[\alpha]_D$ –5.0° (c 2.413 in CHCl_3). MeI with Ag_2O , after 4 treatments, gave a product b_1 140°, n_D 1.4720, $[\alpha]_D$ –20.5° (c 1 in MeOH); this apparently contained about 20% of dimethylanhydromethylglucoside; extn. of the Et_2O soln. with H_2O finally removed this, giving *trimethylmethylglucoside bromohydrin*, m. 24°, n_D 1.4735, $[\alpha]_D$ –5.8° (c 3.851 in Me_2CO); –4.7° (MeOH); –7.7° (C_6H_6); –3.5° (CHCl_3). A 3% soln. in MeOH , heated with excess of AcOK at 150° for 3 days, gives 72% of trimethyl- β -methylglucoside, m. 93–4°, identical with the 2,3,5-Me₃ deriv. *Trimethylmethylglucoside iodohydrin*, m. 31–4° (it could not be crystd. because of its great soly.), n_D 1.4992, $[\alpha]_D$ 8.6° (c 3.637 in CHCl_3); 4.1° (c 3.897 in Me_2CO); 6.5° (c 4.221 in MeOH). Dry AgNO_2 at 100° for 2 days gives the corresponding NO_2 deriv., n_D 1.4603, which gives a bright red soln. with NaNO_2 and dil. H_2SO_4 , similar to that with MeNO_2 ; this indicates that the vacant HO group is primary. This work indicates that dibromotriacetylglucose, maltose and glucosan are all convertible into the same form of trimethylglucose. C. J. WEST

Glycerol glucoside. HELEN SIMPSON GILCHRIST AND C. B. PURVES. *J. Chem. Soc.* 127, 2735–45(1925); cf. Fischer, *Ber.* 27, 2843(1894).—Glycerol glucoside is best prepd. by heating a 5% soln. of 20 g. glucose in anhyd. glycerol contg. 0.25% HCl in a sealed tube at 100° until it no longer reduces Fehling soln. Me_2SO_4 and NaOH give the *hexa-Me deriv.*, b_{12} 190–2°, n_D 1.4497, which, upon hydrolysis, yields 2,3,5,6-tetramethylglucose, m. 88°, and $\text{HOCH}_2\text{CH}(\text{OMe})\text{CH}_2\text{OMe}$; this established the constitution of the condensation product. The optical values detd. show that γ -glucosides were present only in small amts., the limits in different preps. being 1.95 and 0.93%. The condensation of glucose and $\text{C}_3\text{H}_5(\text{OH})_3$ was followed polarimetrically; the concn. of the HCl varied from 1 to 3%; the results are given as tables and curves; the min. rotation does not appear to depend on the amt. of HCl present. The reaction product in all cases was the above glucoside. On long standing the optical activity of an acid soln. of glucose in $\text{C}_3\text{H}_5(\text{OH})_3$ reverts approx. to its original value, apparently because the condensation is reversed as a result of secondary reactions between the solvent and the acid. The condensation of glucose in the presence of fructose also was studied; under the conditions employed, the behavior of glucose is not affected by the presence of fructose. α,β -Dimethylglycerol (I), b_{15} 69.5–70.5°, n_D 1.4219, d_4^{15} 1.016, $[\text{R}_L]_D$ 30.02 (calcd., 30.1); the rotation of Et tartrate in this compd. is 11.22° (c 13.37); of nicotine, –152.94° (c 13.46); γ -Bz deriv., b_{12} 162°, n_D 1.5075; the *malate* b_{15} 200°, $[\alpha]_D^{15}$ –10.6° (c 9.05 in CHCl_3). The product obtained from MeONa and $\text{HOCH}(\text{CH}_2\text{Cl})_2$ is identical with I. MeI and Ag_2O give β -methyl- α,γ -dichlorohydrin, b_{14} 58°, n_D 1.4560. Hydrolysis with AcOK in EtOH gave the α -, not the β -methylglycerol. *Trimethylglycerol* (II), $b_{765.4}$ 148°, n_D^{15} 1.4069, d_4^{15} 0.9401, $[\text{R}_L]_D$ 35.06 (calcd., 34.84); the rotatory power of Et tartrate was $[\alpha]_D^{15}$ 5.99 (c 13.36). A mixt. of H_2O and II boils const. at 92°. C. J. WEST

Reduction of cinnamaldehyde to cinnamic alcohol in the presence of platinum oxide-platinum black and promoters. XI. W. F. TULEY AND ROGER ADAMS. *J. Am. Chem. Soc.* 47, 3061–8(1925); cf. C. A. 19, 2196.— PhCH:CHCHO cannot be reduced completely with H and PtO-Pt black unless the catalyst is reactivated frequently with air. In the presence of small amts. of Zn or Fe salts the reduction goes completely to $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{OH}$ without the necessity of reactivation. When Fe salt is used and the reduction is stopped after 1 mol. equiv. of H has been absorbed the product is almost pure $\text{PhCH:CHCH}_2\text{OH}$. In the presence of both Zn and Fe salts in the proper proportions PhCH:CHCHO is reduced to pure $\text{PhCH:CHCH}_2\text{OH}$ and no more than 1 mol. equiv. of H is absorbed. The effects of temp. and character of the catalyst are discussed. C. J. WEST

Cleavage of γ -methyl fructoside by saccharases. Configuration of cane sugar. H. H. SCHLUBACH AND GERTRUD RAUCHALLES. *Ber.* 58B, 1842-50(1925).—Since Fischer's Me fructoside and Hudson and Braun's β -Me fructoside, which is undoubtedly derived from the normal stable form of glucose, are not hydrolyzed by invertin, then, if it be assumed that the point of attack of yeast saccharases is on the fructose part of the mol., it would seem probable that these enzymes have a special affinity for Haworth's highly labile γ -fructose and that if a cleavage of Me fructosides by invertin is at all possible this action should best be shown with γ -Me fructoside (I) and this proved to be the case. The mixt. consisting chiefly of the stereoisomeric forms of I obtained by Menzies' method (*C. A.* 17, 70) is hydrolyzed to a certain extent, and only to this extent, by yeast invertin just as rapidly as sucrose. It is proposed to designate the γ -sugars, which are structural, not stereoisomers of the α - and β -forms, as hetero- or h -sugars. When h -I is treated at 30° with a yeast invertin having a time value of 0.26, the rotation decreases in 35 min. from 19.38° to 6.90° and the reducing value increases from 2% to 35%; there is no further change for 7 days, when there begin a further very slow decrease in rotation and increase in reducing power. Since, according to Hudson, the fructose set free almost instantly reaches the equil. value, -90.9° , of normal fructose, the part split off must also have been l -rotatory, hence the more strongly l -rotatory part of the mixt. of stereoisomers, or, in accordance with Hudson, the β - h -I. Yeast saccharase should, therefore, be called a β - h -fructosaccharase. $[\alpha]_D$ for the β - h -I comes out -17° , that of the unhydrolyzed part 36.36° . The latter, however, is not pure α - h -I, for it also contains the unhydrolyzed portion of the normal Me fructoside mixt. present in the original material. The rotation of the reducing equil. mixt. of tetramethyl- h -fructoses from inulin is 32.9° and that of the tetra-Me compd. obtained from Menzies' mixt. of the I (rotation 26.6°) is 24.69° ; this decrease in rotation can be due only to the presence of normal tetramethylfructose (rotation -123.2°); M.'s mixt. must, therefore, contain at least 6.7% of the normal Me fructoside mixt., which must also remain in the portion not hydrolyzed by the invertin; i. e., the rotation of the pure α - h -I must be considerably higher than 36.36° . This is confirmed by the fact that after sepn. from the liberated fructose by extn. with AcOEt the rotation of the unhydrolyzed portion is considerably higher (35.53°) than that of the original material (19.38°). Since in the hydrolysis of the β - h -I by invertin the β - h -fructose liberated must have a higher rotation than the I, then, if its isomerization to the equil. mixt. of normal fructose proceeds appreciably more slowly than its liberation by the invertin, there should be a primary increase in rotation. Hardly any indication of an increase in rotation during the 1st few min. was observed, however, in a hydrolysis expt. at 0° . It required 8 times as long for the reducing power to reach the same value as at 30° . The initial rotation was 24.67° , final 8.5° , when that of the α -form is calcd. to be 39.1° , β -form -14.5° ; from the final product AcOEt seems to ext. chiefly the α - h -I, the residue obtained on evapg the AcOEt showing $[\alpha]_D$ 53.15° . Fischer's Me fructoside, with an initial reduction value of 30%, showed an increase of 12% after 0.5 hr. treatment with invertin, and then remained const., indicating that more than $1/4$ of the Me fructosides has been hydrolyzed or, assuming that β - h -II: α - h -II = 1:2, that the original F' mixt. contained 50% of h -Me fructosides. Taka-saccharase also hydrolyzes I just as smoothly as sucrose and to an even greater extent (69%) than does yeast saccharase, probably because the former also contains an enzyme which attacks the α - h -I; the residue, $[\alpha]_D$ 53.15° , which was not hydrolyzed by yeast-invertin at 0° , was hydrolyzed 30% further by the Taka-enzyme. There is, therefore, no ground for assuming any difference between α - and β -glucosidases on the one hand and the saccharases from yeast and *Aspergillus oryzae* on the other. The results of this work indicate that the fructose, $[\alpha]_D$ 17° , present in cane sugar is β - h -fructose, and that the configuration of cane sugar is best represented by the formula



C. A. R.

Steric series. VI. Configuration of mandelic acid. KARL FREUDENBERG AND LAURA MARKERT. *Ber.* 58B, 1753-60(1925); cf *C. A.* 19, 1407.—From the fact that the rotations of the mandelic acid (I) from amygdalin and of its hexahydro deriv. (II) are lifted towards the right when the acids are converted into the amides, as with the d -HIO acids ((+)-tartaric, (+)-malic, (-)-lactic, (-)-glyceric) it was concluded (*C. A.* 16, 3871) that I is the d (-)-acid. The measurements on which this conclusion was based had been made in dil. aq. or MeOH soln., but in view of the later observation

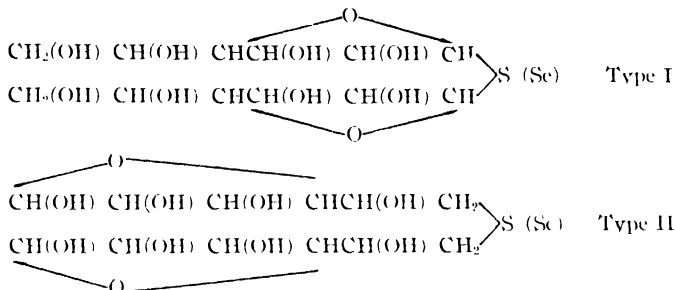
(C. A. 19, 243) that such comparisons of optical consts. are unreliable if the influence of the solvent has not been excluded, the following new measurements, which completely confirm the earlier deductions, have been made. Below are given, resp., the solvent, concn., temp., $[\alpha]$ for the lines 637, 578, 546 and 434, and $[M]_{578}$. Me ester (III) of I: $(\text{CHCl}_3)_2$, 1.08, 20°, —131.8, —172.0, —199.2, —351.9, —285; $(\text{CHCl}_3)_2$, 5.46, 20°, —130.8, —170.0, —200.0, —365.8, —282; $(\text{CHCl}_3)_2$, 15.54, 18°, —136.2, —176.4, —203.4, —377.8, —293; $(\text{CHCl}_3)_2$, 40.41, 20°, —136.2, —176.4, —203.2, —, —293. Et ester (IV) of I: superfused, —, 22°, —100.8, —130.1, —149.8, —277.5, —234. Me acetyl-d(-)-mandelate (V): superfused, —, 20°, —122.2, —155.7, —179.3, —330.4, —324. Et ester (VI): superfused, —, 20°, —97.3, —126.0, —145.3, —268.7, —280. Me benzoyl-d(-)-mandelate (VII): superfused, —, 20°, —124.8, —159.9, —184.3, —339.0, —433. Et ester (VIII): superfused, —, 20°, —109.7, —142.2, —164.2, —303.6, —404. Me hydrocinnamyl-d(-)-mandelate (IX). $(\text{CHCl}_3)_2$, 1.04, 20°, —67.8, —85.6, —98.3, —172.3, —254; $(\text{CHCl}_3)_2$, 4.89, 18°, —70.3, —91.2, —105, —192, —272; $(\text{CHCl}_3)_2$, 19.59, 22°, —73.1, —94.5, —112, —, —282; $(\text{CHCl}_3)_2$, 38.26, 18°, —80.1, —103.8, —120.3, —, —310; superfused, —, 22°, —84.4, —110.8, —127.4, —, —330. Et ester (X): superfused, —, 20°, —68.0, —89.4, —103.2, —, —279. d(-)-Mandelamide (XI): Me_2CO , 5.04, 18°, —59.4, —74.0, —84.2, —140.2, —112; Me_2CO , 12.62, 18°, —61.5, —76.0, —87.1, —115.8, —115, $\text{C}_6\text{H}_5\text{N}-\text{AcOH}$ (1:1), 4.96, 18°, —76.7, —95.5, —107.4, —, —144; $\text{C}_6\text{H}_5\text{N}-\text{AcOH}$, 14.61, 18°, —73.0, —91.6, —104.4, —, —139; $\text{C}_6\text{H}_5\text{N}-\text{AcOH}$, 24.22, 18°, —72.3, —90.7, —103.7, —, —137. d(-)-Hexahydromandelic acid (XII): AcOH , 1.98, 18°, —19.0, —24.7, —27.5, —47.6, —39.0; AcOH , 11.20, 18°, —19.2, —24.6, —28.6, —52.9, —38.9, EtOH , 9.48, 18°, —9.5, —11.2, —13.7, —26.1, —17.7; EtOH , 18.85, 18°, —10.5, —13.2, —15.4, —29.8, —20.8; EtOH , 29.18, 18°, —11.6, —14.5, —16.9, —31.5, —22.9; EtOH , 39.22, 18°, —13.0, —16.3, —18.8, —32.5, —25.7; CHCl_3 , 0.96, 14°, —18.9, —28.0, —34.3, —56.1, —44.3 (extrapolated, —40.4). Me ester (XIII): extrapolated, —, 20°, —19.2, —24.3, —28.3, —53.1, —41.9; extrapolated, —, 12°, —19.9, —24.8, —28.8, —54.1, —42.7. Me acetyl-d(-)-hexahydromandelate (XIV): extrapolated, —, 20°, 11.6, 13.8, 15.3, 21.1, 29.7. Me benzoyl-d(-)-hexahydromandelate (XV): extrapolated, —, 20°, —10.2, —14.0, —17.1, —38.5, —38.6. Me hydrocinnamyl-d(-)-hexahydromandelate (XVI): extrapolated, —, 20°, 8.0, 9.4, 10.2, 13.8, 28.5. Me p-toluenesulfonyl-d(-)-hexahydromandelate (XVII): extrapolated, —, 20°, 21.2, 27.5, 31.2, 52.1, 89.8. d(-)-Hexahydromandelamide (XVIII): EtOH , 5.14, 18°, 39.3, 48.0, 54.3, 81.7, 75.5. Comparison of the values for $(M)_{578}$ (including those previously obtained for d(-)-lactic acid and derivs.) confirms the rule that analogous compds. of the same configuration, subjected to the same changes, undergo a corresponding shifting of their rotations (decrease in l-rotation or shifting towards the right in passing from Me to Et esters, from mandelic to hexahydromandelic derivs., from the acids to the amides). The limitations of this method of detg. configurations are also shown when it is attempted to bring the values for the non-acylated derivs. into line with the others. When the results of Wood and his collaborators (C. A. 17, 1952; 19, 982) on the mol. rotations of d(-)-lactic acid and d(-)-hexahydromandelic esters at 15° and 115° are plotted with $(M)_D$ as ordinates and the mol. wts. of the ester radicals as abscissas, all 4 curves have the same form and in all cases rise in temp. produces a shifting in rotation towards the right. The I, $[\alpha]_{578}^{20}$ —153° (4% H_2O soln.), is obtained in 20 g. yield from 100 g. amygdalin with HCl (d. 1.19) on the H_2O bath. III, m. 58°. IV, b_{16} 137°, m. 34°; yield, 70%. V, from III and Ac_2O in $\text{C}_6\text{H}_5\text{N}$ at 40° (yield, 70%), b_1 100°. VI (yield, 65%), b_1 101°. d(-)-VII, m. 76°. VII, b_2 165°. VIII, b_2 166° (yield, 70%). Me cinnamyl-d-mandelate m. 81°; d-ester, b_2 208° (racemization). dl-Et ester, m. 59°. $\text{PhCH}_2\text{CH}_2\text{COCl}$ (42 g. from 50 g. of the acid with PCl_5 in CHCl_3), b_{16} 112°. dl-IX, m. 65°. IX, m. 34°. dl-X, b_2 282°. X, b_1 172° (yield, 90%). XI, m. 122-3°. XII (its designation by Wood and collaborators as the l-acid is incorrect), m. 129°. XIV, $b_{0.5}$ 87-8° (yield, 80%). XV, $b_{0.5}$ 127-8°, faintly yellow viscous oil (yield, 80%). XVI, $b_{0.5}$ 161-2°, yellowish (yield, 75%). XVII, $b_{0.5}$ 187° (yield, 60%). XVIII, m. 158° (yield, poor). C. A. R.

Derivatives of p-hydroxymethylbenzoic acid. II. Ether esters. F. H. CASE. *J. Am. Chem. Soc.* 47, 3003-5 (1925); cf. C. A. 19, 1417. — $\text{ClCH}_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$ is obtained in 78% yields from p-NCC $\text{C}_6\text{H}_4\text{CH}_2\text{Cl}$ and concd. HCl . Boiling with H_2O until soln. results gives 73% of p- $\text{HOCH}_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$. p-Bromomethylbenzoic acid, m. 223-4° (73% yield). p-Ethoxymethylbenzoyl chloride, b_8 136-8° (85% yield from the acid and SOCl_2 ; benzyl ester, b_8 198-201° (32% yield); p-carbethoxybenzyl ester, b_8 243-4°, m. 36-7° (58% yield); β -diethylaminoethyl ester, b_8 183-5° (59% yield); HCl salt, m. 122-3°. III. Amino esters. *Ibid.* 3005-8. —Et 4-chloromethyl-3-nitrobenzoate, heavy yellow oil, b_1 170-4°, in 67% yield from 4,3- $\text{ClCH}_2(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{CN}$ and H_2SO_4 in EtOH ; refluxed

with AcONa in EtOH, there results the acetate of *Et 4-hydroxymethyl-3-nitrobenzoate*, yellow, m. 57–8°, from which the Ac group is removed by boiling with HCl-EtOH, giving the *HO deriv.* (I), yellow, m. 115–6° (67% yield); the *benzoate*, pale yellow, m. 129–30°; *phenylurethan*, yellow, m. 125–6° (54% yield). *Et 4-hydroxymethyl-3-aminobenzoate*, m. 85–6° (53% yield by reducing with Sn and HCl or 82% with Pt in dil. AcOH; with PtO and FeCl₃ undesirable by-products were obtained) *HCl salt*, m. 129–30° (decompn.). Reduction of the *Bu deriv.* of I, heavy oil, b₃ 198–203°, gives the *ester* of the *NH₂ deriv.*, m. 76–7°.

C. J. WEST

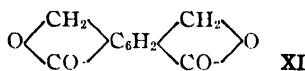
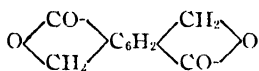
Attempts at synthetic preparation of disaccharides from sugar derivatives containing sulfur and selenium, and their oxidation products. FRITZ WREDE AND WALTER ZIMMERMANN *Z. physiol. Chem.* **148**, 65–82(1925).—Studies were made of 2 types of thio- and seleno disaccharides differing in the location of the S or Se linkage, as follows



In type I (1,1 sulfides or selenides) attempts to replace S or Se by O by treatment with HgO resulted in hydrolysis to the monosaccharide and no *O*-disaccharide could be obtained. In alc soln esterification occurred with formation of β -Et glucoside, and this is proposed as a method for the prepn. of β -glucosides. In a hydrocarbon medium no reaction took place because of the insoly. of the substances, while the Ac derivs. which were sol. underwent oxidation and splitting off of the Ac groups. Thus an exchange of S or Se for O could not be accomplished in the case of 1,1-S or Se sugars or their Ac derivs. Similar expts. with 6,6-S or Se derivs. were likewise unsuccessful. Both 1,1- and 6,6-S derivs., however, can be oxidized to the corresponding sulfones, which are comparatively stable and crystallize readily, but only from the 6,6-Se derivs. could selenoxides be obtained. *Di[tetraacetylglucosyl] 1,1-sulfone* (I), m. 189°, $[\alpha]_D^{20}$ in (CHCl₃)₂ -20.3°, was prepd. by oxidation of di[tetraacetylglucosyl] sulfide in AcOH with KMnO₄ and crystn. from MeOH. *Diglucoyl 1,1-sulfone* ($\frac{1}{2}$ 2H₂O), m. 118°, anhyd., m. 129°, by treatment of I with MeOH satd. with NH₃, evapn. to a sirup and crystn. from dil. EtOH. It is not attacked by yeast or by emulsin. *Di[tetraacetylgalactosyl] 1,1-sulfone* (II), by oxidation of the corresponding sulfide. It occurs in 2 isomeric modifications, m. 175° and 149°, resp. From alc. either form can be obtained at will by seeding with crystals, whereas from C₆H₆ only the 2nd form is obtained. In C₆H₆ $[\alpha]_D^{20}$ = -8.33°, and in MeOH mutarotation from 2.83 to 5.20° was observed in 18 hrs. *Digalactosyl 1,1-sulfone*, m. 182° (gas evolution), $[\alpha]_D^{20}$ -2.10°, was obtained by sapon. of either modification of II with NH₃ in MeOH. *Di[heptaacetylcellosyl] 1,1-sulfone*, sinters 162°, then solidifies and m. 238°, $[\alpha]_D^{20}$ in CHCl₃ -19.9°, was prepd. by oxidation of the sulfide with KMnO₄. *Dicellosyl 1,1-sulfone* (4H₂O), m. above 100° and decomp. 150°, $[\alpha]_D^{20}$ -35.0°. It is not attacked by yeast, but ferments after treatment with emulsin. *Di[triacetylmethylglucosyl] 6,6-sulfone*, m. 232–3°, by oxidation of the corresponding sulfide. *Di[triacetylmethylglucosyl] 6,6-selenoxide*, m. 231°, $[\alpha]_D^{20}$ -18.9°, by similar oxidation of the corresponding selenide. A. W. DOX

Derivatives of cumidinic and pyromellitic acids. H. DE DIETSBACH AND G. ZURBRIGGEN. *Helvetica Chim. Acta* **8**, 546–56(1925).—On passing Br₂ in CO₂ into molten 1,4,2,5-Me₂C₆H₂(CN)₂ and gradually lowering the temp. to 175° until the wt. has doubled there is formed chiefly 1,4-bis[bromomethyl]-2,5-dicyanobenzene (I), m. 163°, and a little 1,4-bis[dibromomethyl]-2,5-dicyanobenzene (II), m. 221°, sepd. by its insoly. in alc., obtained as the chief product if more Br₂ is used. 1,3-Bis[bromomethyl]-4,6-dicyanobenzene (III), m. 114°. All are very irritating, cause eczema, and cryst. with solvent of crystn. 1,4,2,5-Me₂C₆H₂(COCl)₂ below 160° in the same way (cf. Davies, Perkin, and Clayton, *C. A.* **17**, 84) gave the *dibromide* (IV), m. 117–7.5°, of 1,4-bis-

[bromomethyl]benzene-2,5-dicarboxylic acid (V), decomps. 339–40°, from IV and HCO_2H at 85–90°; *di-Et ester* (VI), m. 163–3.5° (decompn.). 1,4-Bis[dibromomethyl]benzene-2,5-dicarboxylic acid (VII), decomps. 259–60°, from the dibromide (VIII), m. 147°, gives off HBr in boiling PhH ; *di-Et ester*, m. 142–2.5°. 1,3-Bis[dibromomethyl]benzene-4,6-dicarboxylic acid, m. 224–5° (decompn.), from the dibromide (IX), m. 104°; *di-Et ester*, m. 93°. In 75% HOAc satd. in the cold with HCl and heated 8–10 hrs. at 180° I gives *p*-pyromellitide (X), decomps. 338–9°, sol. in hot alkalies, also formed from I and boiling



70% H_2SO_4 , or from V in dil. Na_2CO_3 , or from VI. *m*-Pyromellitide (XI), m. and decomps. 277.5–8.5°. X and XI are best recrystd. by dissolving in hot 70% H_2SO_4 and adding a little H_2O . In boiling abs. alc. with dry NH_3 VI yields *p*-pyromellitodiiimidine (X, O = NH), does not m. 350°, insol. in the usual solvents. *m*-Pyromellitodiiimidine, decomps. 340–50°. Pyromellitic dianil, from VI, boiled with PhNH_2 , does not m. 360°. VIII, boiled in H_2O 2–3 hrs. with CaCO_3 slowly deposits, on acidification, 2,5-dicarboxylerephthalaldehyde, m. 257.5–8.5° (decompn.); dioxime, decomps. 153°; bisphenylazone, $\text{C}_{22}\text{H}_{11}\text{O}_2\text{N}_4$, yellow, m. 352°. IX gives 4,6-dicarboxy-*m*-phthalaldehyde, m. 246–7° (decompn.).

M. HEIDELBERGER

Octaethylcellobiose and its acetolysis in comparison with cellobiose and octaacetylcellobiose. KURT HESS AND GÜNTHER SALZMANN. *Ann.* **445**, 111–22(1925); cf. *C. A.* **19**, 3161.—Octaethylcellobiose, $b_{0.5}$ 185–90°, m. 61–6°, results by repeated treatment of heptaethyl- β -ethylcellobioside with Et_2SO_4 ; $[\alpha]_D^{20}$ –2.06° (in CHCl_3); $[\alpha]_D^{22}$ –3.07° (in MeOH). Acetolysis gives a mixt. of the expected triethylacetylglucose and tetraethylacetylglucose, under the same conditions α - and β -octaacetylcellobiose are not attacked, though the β -form is in part transformed into the α -form; cellobiose itself is not split but about 60% acetylated. Hydrolysis gives a mixt. of triethylglucose, identical with that obtained from the acetolysis of ethylcellulose, and tetraethylglucose (2,3,5,6-?), m. 61–4°, $b_{0.5}$ 138–9°, $[\alpha]_D^{20}$ 65.3° (H_2O). β -Benzylcellobioside, m. 187°, $[\alpha]_D^{18}$ –35.46° (H_2O); the *hepta-Me deriv.*, m. 71–2.5°, $[\alpha]_D^{19}$ –32.5° (CHCl_3) (yield, 55%).

C. J. WEST

Influence of phosphorus oxychloride on the catalytic reduction of acid chlorides. F. ZETZSCHE AND OLGA ARND. *Helvetica Chim. Acta* **8**, 591–6(1925).—The initial presence of POCl_3 in p - $\text{C}_6\text{H}_4(\text{COCl})_2$ reduced the yield of aldehyde (detd. as bisphenylhydrazone) on reduction with Pd -kieselguhr in C_8H_{10} at 150° from 64.7% to 11.7%, but did not increase the time of reduction, showing that POCl_3 does not poison the catalyst. It is, however, a contact poison, for if it is gradually vaporized into the reaction mixt. (10 cc. C_8H_{10} , 2 g. BzCl , 0.2 g. catalyst, kept at 105° for 0.5 hr. and then at 140° until evolution of HCl ceases) in a total amt. of over 340 mg. no BzH is formed and the amts. of ester, acid, and non-volatile hydrocarbons formed are increased. The effect of added regulator (cf. Rosenmund and Heise, *C. A.* **15**, 2852) is not entirely abolished. When C_8H_{10} contg. no aldehyde regulator was used, POCl_3 caused a shift toward increased formation of acid and suppression of the volatile hydrocarbons, believed to be due to its reaction with the regulators present and the actual formation of new regulators, rather than a direct action on the catalyst itself. At 200° the effect of added POCl_3 is less. In other reductions, such as of PhNO_2 and $\text{PhCH:CHCO}_2\text{H}$, POCl_3 acts directly on the catalyst, as these substances are recovered unchanged. Quant. data are given and a convention is proposed for expressing the amt. of a regulator in a given sample of solvent.

M. HEIDELBERGER

Chemistry of starch. XIV. H. PRINGSHEIM. Nitric esters of the polyamyloses. J. LEIBOWITZ AND S. H. SILMANN. *Ber.* **58B**, 1889–93(1925); cf. *C. A.* **19**, 2678.—As the evidence advanced by P. for the individuality of β -triarmylose and its identity with β -hexaamylose is apparently not convincing he has undertaken to obtain new data by acylation of the polyamyloses by the Will and Lenze nitration method. The m. ps. and rotations of the various polyamyloses given in the literature have been carefully checked and some new detns. made. The nitration, even with a large excess of the nitrating acid, always gave a mixt. of compds. nitrated to varying degrees; the yield of crude nitrates was always good and they were sepd. into the individual esters by fractionation from alc. or AcOH . On superheating the solns., often even spontaneously, they underwent deep-seated decompn. with evolution of nitrous fumes. α -Tetraamylose octanitrate (I), α -diamylose hexanitrate (II), β -triarmylose hexanitrate (III) and β -triarmylose nonanitrate (IV) were in this way isolated in homogeneous, well-defined form.

and the formation of a *diamylose tetramitate* was proved, although it could not be isolated in pure form. That the two β -compsd. belong to the triamylose series was established by f. p. detns. Both are obtained from the hexa- as well as from the trisaccharide, although triamylose yields relatively more IV. The chief product from α -tetraamylose is I. Sapon. of the nitrates regenerates the original polyamyloses. The α -diamylose was prepd. through the hexaacetate, m. 152° , $[\alpha]_D^{20}$ 106.5° (CHCl_3); the β -hexaamylose, $[\alpha]_D$ 157.1° (H_2O), through the nonaacetate, m. 148° (previously given as 142°), $[\alpha]_D$ 120.4° (CHCl_3); β -triamylose, $[\alpha]_D$ 151.5° (H_2O). I, m. 204° (decompn.), $[\alpha]_D$ 96.4° (PhNO_2), mol. wt. 909-23 (PhNO_2). II, from α -di or α -tetraamylose, m. $206-7^\circ$ (deflagration), $[\alpha]_D$ 79.7° (AcOEt), mol. wt. 573-607 (PhNO_2). III, m. 203° , $[\alpha]_D$ 122.4° (PhNO_2), mol. wt. 782-806 (PhNO_2). IV, m. 198° , $[\alpha]_D$ 90.5° (PhNO_2), mol. wt. 885-948. All the above nitrates gradually become yellow in a desiccator and finally lose up to 75% of their N. C. A. R.

Chemistry of substances of high molecular weight. I. An anhydride of cellobiose. MAX BERGMANN and EWALD KNEHE. *Ann.* **445**, 1-17 (1925).—Cellulose is dissolved in a mixt. of AcCl , AcOH and HCl (prepd. by satg. AcO with HCl); after 2-3 days, the soln. is poured into H_2O , the acetate extd. with CHCl_3 , the product treated with HBr in AcOH , poured into H_2O , extd. with CHCl_3 , the Br removed with AcOAg and the product extd. with MeOH several times, giving *tetraacetylcellobiose anhydride*, sinters 155° , becomes transparent at 165° and m. 185° ; $[\alpha]_D^{20}$ -19.6° ($\text{C}_6\text{H}_5\text{Cl}_4$); mol. wt. in AcOH : concn., 0.31%, 499; 0.59%, 508; 1.27%, 559; 1.85%, 603; 2.50%, 659; 3.10%, 614; calcd., 492; in PhOH , from 535 to 590, with concns. from 0.57 to 2.54% (about 10% too high); in CHBr_3 , 1514 and 1583 at concns. of 0.2 and 0.33%; in molten camphor, 1680 at a concn. of 4.2%. Ac_2O in $\text{C}_6\text{H}_5\text{N}$ gives a *hexa-Ac deriv.*, sinters 178° , m. 229° ; $[\alpha]_D^{19}$ -14.75° ($\text{C}_2\text{H}_5\text{Cl}_4$); mol. wt. in AcOH , 569-631 for concns. from 0.29 to 1.30%; in PhOH , 618 to 692 for concns. from 0.35 to 1.1% (about 15% too high). With Ac_2O , AcOH and H_2SO_4 there results from the tetra-Ac deriv. *octaacetylcellobiose*. Sapon. of the tetra-Ac deriv. with 0.5 N KOH - EtOH gives *cellobiose anhydride*, sinters 200° , decomp. about 285° . It is sol. in dil. alkali, from which it is pptd. by AcOH . Fehling soln. is strongly reduced in the hot but not alk. I solns. It is easily sol. in NH_4OH - CuO , from which it is pptd. by acids or upon diln. Reacetylation gives a mixt. of the 2 acetates. **II. "High molecular" amino acid anhydrides of the piperazine type.** M. BERGMANN, ARTHUR MIEKELEY and ERICH KANN. *Ibid* 17-34.—Glycyl-serine gives rise to 3-methylene-2,5-diketopiperazine, which shows a normal mol. wt. in freezing PhOH ; the 3-methylene-6-methyl 2,5-diketopiperazine (I) from alanyl-serine likewise shows a normal mol. wt. in boiling PhOH as does the iso-compd. (II). The *di-Na compd.* (III) of II ppts. from 20% NaOH and analyzes for $(\text{C}_6\text{H}_6\text{O}_2\text{Na})_2 \cdot 13\text{H}_2\text{O}$; upon drying it still appears to retain $1\text{H}_2\text{O}$. III with Ac_2O in CCl_4 gives the *diacetate* (B) (IV), m. $144-5^\circ$ (cor.), mol. wt. in C_6H_6 , normal. It easily splits off the Ac groups, giving II; with AcOH only 1 Ac is split off, giving a *mono-Ac deriv.* of II, m. 225° . With concd. NH_4OH or dil. HCl this also gives II. I and Ac_2O gives a *diacetate* (A), m. $110-1^\circ$ (cor.). Catalytic reduction of II or IV gives alanine anhydride, m. 282° . Isomethylenediketopiperazine, heated with 5 N HCl 4 days at 70° , gives a *tetrapeptide-HCl*, $\text{C}_{10}\text{H}_{14}\text{N}_4\text{ClO}_6 \cdot \text{HCl}$, does not m. at 300° ; its *Me ester* decomp. 280° . II likewise gives rise to a *compd.* $\text{C}_{13}\text{H}_{21}\text{O}_6\text{N}_4\text{Cl}_2$, sinters 232° , decomp. 238° .

C. J. WEST

Tautomeric phenomena in heterocyclic compounds. GUSTAV HELLER, ARNOLD BUCHWALDT, RUDOLPH FUCHS, WERNER KLEINICKE and JOHANNES KLOSS. *J. prakt. Chem.* **111**, 1-22 (1925).—The Ag salt of phthalimidine and AcCl give the Ac deriv., m. 151° ; BzCl gives a mixt. of a colorless and a light red substance, which could not be sepd. because of change during crystn.; the action of MeI or EtI regenerates the free base, which is not attacked by CH_3N_2 . The Ag salt of saccharin and MeI in Et_2O at 100° give a mixt. of the *N-Me deriv.*, m. $130-1^\circ$, and the *O-Me deriv.*, m. $180-1^\circ$. Similarly, EtI gives a mixt. of the 2 derivs. AcCl gives the *N-Ac deriv.*, m. 193° . BzCl , however, possibly gives a mixt. of the *O*- and *N-Bz derivs.*, the *O-deriv.*, m. $255-7^\circ$, being obtained in very small amts. Saccharin and CH_3N_2 give about 20% *O-Me* and 80% *N-Me* derivs. *o*-Phenyleneurea in dil. NaOH gives a *di-Na salt* (I), but with EtOH - NaOH there results a *mono-Na salt* (II), which dissociates on warming with H_2O . Ag salt, sensitive to the light. I and BzCl give the *N-di-Bz deriv.*, m. $212-3^\circ$; II likewise gives this deriv. besides free urea. The Ag salt and BzCl give the *O-Bz deriv.*, m. 205° . *N-Di-Ac deriv.*, m. 149° , by direct acetylation or from I or II and AcCl . *O-Ac deriv.*, m. 205° , from the Ag salt and AcCl . The K salt of *o*-phthalhydrazide and BzCl give the *O-Bz deriv.*, m. $221-2^\circ$ (90% yield); *O-Ac deriv.*, m. 164.5° . The Ag

salt and MeI give the *O*-Me deriv., m. 187° (50% yield). *O*-Carbethoxy deriv., m. 145°. There is also formed some of the *N*-dicarbethoxy deriv., m. 136°. The Ag salt of phenyloxamide is rather sensitive to light; K salt, glistening leaflets. *O*-Bz deriv., m. 176°, by direct benzoylation; the salts do not react normally with BzCl; an Ac deriv. could not be prepd. The Ag and Na salts of benzoylencurea were prepd. With BzCl this gives some dibenzoylencurea, m. 153-4°, some mono-Bz deriv., m. 206° (decompn.), which yields a cryst. Na salt. Benzoylbenzoylencurea, m. 216-7° (decompn.). Benzoylbencazimide, m. 132-3°. Ac deriv., m. 165° (40% yield). MeI and the Na salt gives only 1 product, m. 123°. Carbethoxy deriv., m. 65-6°; heated with dil. HCl it gives carbonylsalicylamide, m. 224-5°. C. J. WEST

Isolichenin and the degradation of starch. P. KARRER. *Z. physiol. Chem.* **148**, 62-4 (1925).—Polemical. Pringsheim's contention (*C. A.* **19**, 2813) that isolichenin is hydrolyzed by diastase quant into maltose is based upon detns. of reducing power and optical rotation and not upon a quant isolation of any cryst. deriv. of maltose. A 5% yield of mannose phenylhydrazone was obtained by K. from isolichenin prepd. by P.'s method, and a 6% yield from a sample of P.'s own material. P.'s amylobiose and amylotriose might as well be considered reversion-dextrins as hydrolytic products of polyoses, since mixts. with the same properties can be obtained by the action of HCl on maltose. A. W. DOX

Benzene substitution. Different influence of some alkyloxy groups in aldehyde syntheses by means of hydrocyanic acid. ADOLF SONN AND ERICH PASCHKE. *Ber.* **58B**, 1698-703 (1925).—The orienting influence of different alkyloxy groups was studied by subjecting dialkyl ethers of *m*-C₆H₄(OH)₂ with 2 different alkyl groups to the Gattermann aldehyde synthesis (in which the CHO group always enters a *p*-position to one of the alkoxy groups) and detg. by the solidification point method the relative amts. of the 2 isomeric dialkylresorcylic aldehydes formed. To avoid any possibility of splitting off of the alkyl groups by AlCl₃ the condensations were effected in the presence of ZnCl₂ and after decomp. the aldimide HCl salts by short boiling with H₂O the aldehydes were purified through the NaHSO₃ compds.; yield, 50-60%. MeOC₆H₄OH·Et gave 55 parts 2,4- and 45 parts 4,2-MeO(EtO)C₆H₃CHO; MeOC₆H₄OPr yielded about equal parts of the 2 isomers, and MeOC₆H₄OCH₂CH₃ formed about 70 parts 2,4- and 30 parts 4,2-MeO(CH₂CHCH₂O)C₆H₃CHO. The orienting influence, therefore, decreases in the order CH₂CHCH₂O, EtO, PrO, MeO. MeOC₆H₄OCH₂Ph gave about equal parts of the isomeric MeO(PhCH₂O)C₆H₃CHO (total yield, about 40%), together with a mixt. of a little 2,4- with considerable 4,2-HO(MeO)C₆H₃CHO. The pure dialkylresorcylic aldehydes necessary for constructing the solidification-point diagrams were prepd. by alkylating the corresponding mono-Me derivs. whose aldimide HCl salts are obtained by condensation of MeOC₆H₄OH in Et₂O with anhyd. HCN and HCl in the presence of ZnCl₂. *Resorcinol Me benzyl ether* (20 g. from 16 g. MeOC₆H₄OH with PhCH₂Cl and NaOEt), faintly yellow oil, b₁₄ 186°, m. 31-2°. *2-Methoxy-4-ethoxybenzaldehyde* (3.1 g. from 4 g. MeO(HO)C₆H₃CHO with EtBr and NaOEt), m. 58-9°; *4,2-isomer*, m. 64-5°. *O²-Methyl-O⁴-propylresorcylic aldehyde*, prisms with faint aromatic odor, m. 45°; *4,2-isomer*, prisms with a pleasant odor, m. 37°. *O²-Methyl-O⁴-allyl deriv.*, light yellow prisms of characteristic pleasant odor, m. 47-8°; *4,2-isomer*, light yellow, m. 38°. *O²-Methyl-O⁴-benzyl deriv.*, m. 59°; *4,2-isomer*, m. 67°. C. A. R.

Tannins and similar materials. XX. Transformation of cyanidin into catechol. KARL FREUDENBERG, HANS FIKENTSCHER, MAX HARDER AND OTTO SCHMIDT. *Ann.* **444**, 135-45 (1925); cf. *C. A.* **19**, 2041.—*l*-Epicatechol, transformed into the penta-Ac deriv. and then methylated with Me₂SO₄ and KOH (5 times), gives a small yield of the *penta-Me deriv.*, m. 103-4°, α_D¹⁸₇₈ -83° (in C₂H₂Cl₄); the corresponding *d-deriv.*, m. 103-4° and has α_D¹⁸₇₈ 84°; the *dl-deriv.*, m. 113-4°; its *Br deriv.*, m. 138-9°; the same products were obtained by catalytic reduction of cyanidin penta-Me ether, while reduction of cyanidin gives 32% of the free *dl-epicatechol*, decomp. 224°, identified as the penta-Ac deriv., m. 168-9° (cor.). Since cyanidin has been synthesized, this constitutes a synthesis of *dl-epicatechol* and of catechol. C. J. WEST

Preparation of isonuclear bromonitronaphthalenes from the corresponding tetralin derivatives. V. VESELÝ AND L. K. CHUDOŽILOV. *Bull. soc. chim.* **37**, 1436-44 (1925).—See *C. A.* **19**, 3486. H. G.

Catalytic hydrogenation under reduced pressure. RENÉ ESCOURROU. *Chimie et industrie* **14**, 519-29 (1925).—See *C. A.* **19**, 2028. A. PAPINEAU-COUTURE

Δ¹-Dihydronaphthalene. V. The addition of nitrogen oxides and of nitrosyl chloride to Δ¹-dihydronaphthalene. FRITZ STRAUS AND WILLY EKHard. *Ann.* **444**, 146-64 (1925); cf. *C. A.* **15**, 1896.—Δ¹-Dihydronaphthalene (I) (3 g.) in 60 cc. petroleum

ether, treated with the N oxides from 6.5 g. NaNO_2 (liberated by 10% H_2SO_4), gives 2.8 g. of the *pseudonitrosite* (II), decomps. $95-6^\circ$; it is decompd. by warming in soln. and also on standing. Treating II with ice-cold 10% KOH or with piperidine gives the *ac-2-nitro deriv.*, citron-yellow, m. 52° ; reduction with Zn and AcOH gives β -tetralone-oxime, and a small amt. of a compd., m. 206° (decompu.) II, allowed to stand some time, treated with PhNH_2 in boiling EtOH or simply with boiling EtOH, gives *ac-1-oximino-2-nitrotetralin*, m. 136.5° (decomps. 138°), also formed from I and N oxides in AcOH; boiling with 25% H_2SO_4 gives *hydrocinnamic-o-carboxylic acid*, m. $165-6^\circ$. A mixt. of 3 g. I and 3 g. AmNO_2 , treated dropwise with 6 cc. cold fuming HCl, gives 15% of the *bisnitrosochloride*, decomps. $128-9^\circ$ (depends upon rate of heating), heating with piperidine in EtOH gives the *nitrolamine*, $\text{C}_{15}\text{H}_{20}\text{ON}_2$, m. $171-2^\circ$. Indene gives 30% of a *bis-nitrosochloride*, decomps. about 180° ; the *nitrolamine*, $\text{C}_{11}\text{H}_{15}\text{ON}_2$, m. $155-6^\circ$. I and NO_2 give a compd., m. $172-3^\circ$; with MeOH-KOH or with piperidine there results 30–40% of the 2 NO_2 deriv. α -Tetralone (III) and AmNO_2 , treated with EtOK, give a light yellow K salt, which with HCl gives 48.6% of the 2-oximino deriv., m. 140° , decomps. 141° . III and EtNO₂ with EtOK give the K salt of *ac-nitro- α -tetralone*, brownish red, which couples with $\text{HIO}_3\text{SC}_6\text{H}_4\text{N}_2\text{X}$ to give a deep bluish red product; with 15% HCl the salt gives a poor yield of γ -phenyl-o-carboxylic-propylnitrolic acid, decomps. $104-6^\circ$. VI. **Alicyclic 1-hydroxy- α -tetralone and β -naphthohydroquinol; autoxidation of polyhydric phenols.** F. STRAUS, OTTO BERNOLLY AND PAUL MAUTNER. *Ibid* 165-94 —1-Bromo- α -tetralone (IV), m. 40° , is obtained in 92% yields by oxidizing 1-hydroxy-2-bromotetralin or in about 40% yields by bromination of α -tetralone. IV, AcONa and AcOH give 83% of 1-acetoxy- α -tetralone (V), m. $74.5-5^\circ$, b₂₀ 180° (slight decompn.); it reduces Fehling soln. in the cold; shaken with KOH in the air, the light yellow soln. passes through a yellow-brown to a deep dark green and finally to a stable orange-red. By-products are α - and β -naphthol. Warmed with concd. HCl on the H_2O bath, V gives 75% of β - $\text{C}_{10}\text{H}_7\text{OH}$. V, saponid with K_2CO_3 in dil. MeOH in an atm. of H, gives 82% of *ac-1-hydroxy- α -tetralone*, m. $36-6.5^\circ$, b_{0.1} 93° ; it quickly reduces Fehling soln.; in alk. soln. it shows the same color changes as V. PhNHNH_2 gives a deep red product which was not investigated. Concd. HCl gives β - $\text{C}_{10}\text{H}_7\text{OH}$. $\text{Ac}_2\text{O}-\text{H}_2\text{SO}_4$ readily gives V. IV (0.2353 g.) is completely decompd. by 0.06 g. KOH in MeOH in 0.5 hr. With MeONa, 33% is decompd. in 0.5 hr., 64% in 24 hrs., 100% in 48 hrs. The color changes are described. From the violet soln. α -tetralone may be isolated as the oxime. Ag₂O does not react with IV in Et₂O or in boiling Me₂CO. The Br of IV is also quant. removed by $\text{C}_6\text{H}_5\text{N}$ after 1 hr. Piperidine in MeOH gives *dimol. piperido- α -tetralone* (?), m. $212.5-3^\circ$ (decompu.), mol. wt. in freezing C_6H_6 , 453; it is sol. in dil. HCl; with dil. KOH there results an Et₂O-sol. grass-green product. There is also formed in the above reaction a considerable amt. of α -tetralone. In an atm. of H there is no reaction with piperidine; admission of air quickly causes reaction. β -Naphthohydroquinol (VI), m. $103-4^\circ$; its hydrate, m. $59-60^\circ$. Oxidation with 1 equiv. O gives 3,4,3',4'-tetrahydroxy-1,1'-binaphthyl (VII), m. $205-10^\circ$ (Stenhouse and Grove, *Ann* 194, 208(1878) give $176-8^\circ$) and is identical with the product from the oxidation of binaphthyl quinhydrone (VIII). *Tetraacetate*, softens $137-8^\circ$, m. 165° . *Tetra-MeO deriv.*, b_{0.67} $200-20^\circ$, m. $145-7^\circ$. Oxidation of VI with 1–2 atoms O gives a mixt. of VIII and VII, the amt. of VII decreasing with increasing amts. of O. With excess of O there results naphthalic acid. Oxidation of VII with 1 atom O gives a nearly quant. yield of VIII, sinters 245° , m. $250-2^\circ$, decomps. 255° ; with excess of O, naphthalic acid. Oxidation of *ac-1-hydroxy- α -tetralone* with 1 atom O gives VI, with 1.5 to 3 atoms O, VII and VIII, with excess O, naphthalic acid.

C. J. WEST

"Tervalent" carbon. III. **Pentaphenylcyclopentadienyl.** K. ZIEGLER AND B. SCHNELL. *Ann.* 445, 266–82(1925); cf. *C. A.* 18, 2338.—Desoxybenzoin (I) and HCHO are condensed by KOH in EtOH to give 90% of methylencidesoxybenzoin, which is reduced by Zn dust in AcOH to 2,3,4,5-tetraphenyl-3,4-dihydroxycyclopentane; the moist ppt., boiled with H_2SO_4 in AcOH, gives 60% (based on the I used) of tetraphenylcyclopentadienyl; with *p*-ONC₆H₄NMe₂ this gives 80% of the *p* dimethylanyl, nearly black needles, m. $224-6^\circ$, of 2,3,4,5-tetraphenyl-2,4-cyclopentadien-1-one, black-violet, m. $217-8^\circ$ (30 g. from 100 g. I); hot C_6H_6 hydrocarbons dissolve it with a red color; it distills nearly undecompd. It is easily oxidized by hot AcOH-CrO₃, probably giving 1,3-diphenyltriketopropane and benzil; it is also attacked by hot EtONa. It reacts readily with PhMgBr , giving an equal wt. of 1,2,3,4,5-pentaphenyl-2,4-cyclopentadien-1-ol, m. $175-6^\circ$. HCl passed through the gently boiling AcOH soln. gives nearly quant. the 1-Cl deriv., yellow, m. 167° . 1-Br deriv. (II), orange-yellow, m. $188-9^\circ$; 0.001 mol. in 60 cc. abs. Et₂O, shaken with 30 cc. H_2O at 22° for 1 hr., shows no hydrolysis while

found in the region from 2.7μ to 3.4μ is apparently valid in the case of α - $C_{10}H_7NH_2$ and its derivs. The striking similarity in the absorption spectra of α - and β - $C_{10}H_7NH_2$ renders it very probable that the alkyl- β -naphthylamines follow this same differentiation. The possibility of another region of absorption displaying a similar differentiation has been suggested for the region of 6.2μ .

C. J. WEST

Catalytic dehydration of phenol-alcohol systems. II. Naphthol-alcohol systems. W. PLÜSS. *Helvetica Chim. Acta* **8**, 507-12 (1925); cf. *C. A.* **19**, 2648.—A smaller excess of MeOH was used than in the last paper, and the Al_2O_3 had to be renewed frequently, because of the deposition on it of resins and $C_{10}H_7OH$. $C_{10}H_8$ in MeOH, dropped on Al_2O_3 at 420° , is not changed. With β - $C_{10}H_7OH$ (I) the resulting oil was washed with KOH and distd. *in vacuo*. The portion b_{12} 102 – 50° deposited the $C_{10}H_7Me_4$ (II) already described, the residue consisting of tri-Me derivs. Sulfonation of this yielded nothing definite, but nitration of 70 g. of the fraction b_{12} 142 – 50° according to Lesser (*C. A.* **8**, 661) in HOAc with concd. HNO_3 gave 26 g. of a *nitrotrimethylnaphthalene*, m. 142 – 3° , also obtained in 15–30% yield from any fraction b_{12} $>135^\circ$; amino derivative, b_{12} 198 – 200° , m. 115 – 6° , sensitive to light; diazotized, it gives a red dye with I, but not with R-salt. Nitration of II yielded nothing definite. Under 40 mm. at 380° I is not attacked and small amts. HCHO are formed. EtOH, BuOH, AmOH give polyalkylated products contg. O. α - $C_{10}H_7OH$ gives no solid hydrocarbons, while PhOI \dot{e} t is unattacked. ZnO and Al dehydrate alics., but do not act on PhOH or I as does Al_2O_3 .

M. HEIDELBERGER

Symmetrical substitution derivatives of trimethylene dibromide and pentamethylene dibromide. Wm. H. MILLS and LESLIE BAINS. *J. Chem. Soc.* **127**, 2502–7 (1925).— β -Phenyl- β -methylpropane- α,γ -diol, b_{17} 184° , m. 88° , from PhMeCHCHO, HCHO and K_2CO_3 ; di-Ac deriv., b_{20} 179° ; heated with AcOH satd. with HBr 30 hrs. at 100° , and the operation repeated with the oil obtained by pouring into H_2O , 200 g. diacetate gave 20.5 g. α,γ -di-Br deriv., b_{12} 143 – 6° . The glycol in AcOH, satd. with HBr for 3 hrs. at 0° , then heated 7 hrs. at 100° (HBr being passed into the soln.), gave the α -bromo- γ -hydroxy deriv., b_{15} 173° . The α -Cl deriv., b_{15} 117 – 8° , results from the glycol and PCl_5 at 80° for 2 hrs. or from the glycol in C_6H_5N and $SOCl_2$. The diacetate in an equal vol. of AcOH, treated with HBr at 90 – 5° for 19 hrs. after the mixt. had become satd., gave the α -bromo- β -acetoxy deriv., b_{18} 174 – 4.5° . α,γ -Dibromo- β -phenylpropane, b_{14} 152° , strong geranium-like odor, from PhCH(CH $_2$ OAc) $_2$ and HBr. (PhOCH $_2$ CH $_2$) $_2$ CHCO $_2$ H, boiled 10–12 hrs. with a mixt. of const. boiling and fuming HBr, the product taken up in EtOH and satd. with HBr, gives Et α,ϵ -dibromopentane- γ -carboxylate, b_{19} 166 – 7° , garlic-like odor; with piperidine in EtOH it gives 4-carbethoxybis-piperidinium-1,1'-spiran bromide, very hygroscopic, analyzed as the picrate, Au-yellow, m. 130° . Hydrolysis with dil. HCl gives 4-carboxybis-piperidinium-1,1'-spiran bromide, yellow, m. 289 – 90° (decompn.), whose picrate, Au-yellow, m. 169 – 70° .

C. J. WEST

Dibenzoylxylenes and the dinaphthanthracenediquinones. III. H. DE DIESBACH and K. STREBEL. *Helvetica Chim. Acta* **8**, 556–66 (1925); cf. *C. A.* **17**, 3028; **18**, 3188.—The method of transforming ketones or diketones of the types α -Me C_6H_4 Bz (I) and 1,4-, 2,5-Me $_2$ C $_6$ H $_2$ Bz $_2$ (II) into anthraquinones by the direct action of Br $_2$ (cf. Thorner and Zincke, *Ber.* **12**, 1479 (1877), who used Cl $_2$) or by the action of Br $_2$ followed by dehydration agents, is only of limited application, being usually accompanied by bromination of the nucleus. In boiling HOAc with gradual elevation of the temp. to 170 – 80° as BrCH $_2$ CO $_2$ H is formed, I and Br $_2$ give a mixt. of $C_6H_4(CO)_2C_6H_4$ (III) and its Br derivs. In PhNO $_2$ 20% of the theory of III is obtained. 2,4'-Dimethylbenzophenone, from α -MeC $_6H_4$ COC(1, PhMe, and AlCl $_3$, yellowish oil, b. 300 – 3° ; brominated as was I in HOAc, followed by oxidation in hot aq. Na $_2$ CO $_3$ with KMnO $_4$ and condensation with H $_2$ SO $_4$ at 160 – 80° for a few min. it gave 3-bromo-anthraquinone-2-carboxylic acid, decomps. above 310° , forms a red vat, boiled with PhNH $_2$ and Cu salts, the Br is not eliminated, indicating its position as given. 2-Methyl-4'-methoxybenzophenone, b. 325 – 30° , yielded 1,4,2-Br $_2$ (HO)C $_6$ H(CO) $_2$ C $_6$ H $_4$. 2-Methyl-3',4'-dimethoxybenzophenone, m. 75° , yielded no definite results with Br $_2$ in HOAc. In PhNO $_2$ II gave 50% of $C_6H_4(CO)_2C_6H_4(CO)_2C_6H_4$ (IV), while in HOAc it yielded a mixt. of acids giving a violet vat and forming IV and a little Br deriv. on condensation. The 2',5',2'',5''-Cl $_4$ deriv. of II in PhNO $_2$ gave a mixt. of acids and quinone converted into a tetra-Cl deriv. of IV on condensation. The 4',4''-Me $_2$ deriv. (V) of II gave a mixt., while the expected 2,5-[4',4''-dicarboxy-dibenzoyl]terephthalic acid was prepd. by heating V with HNO $_3$ (d 1.15) at 200° for 8 hrs., followed by KMnO $_4$ in boiling aq. Na $_2$ CO $_3$; it decomps. above 340° ; Bu salt. In H $_2$ SO $_4$ at 200° for 5 min. it gives dinaphthanthracene-5,7,12,14-diquinone-3,10-dicarboxylic acid (VI), HO $_2$ CC $_6$ H $_3$ (CO) $_2$ C $_6$ H $_2$ (CO) $_2$ C $_6$ H $_3$ CO $_2$ H, does not m. 340° , purified

over the NH_4 salt; the K and Na salts are sparingly sol.; the vat is blue-violet, oxidizing to blue in air. The 4',4''-(MeO)₂ deriv. of II in HOAc gave a *tetrabromo-2,5-[4',4''-dihydroxydibenzoyl]terephthalic acid*, which, in H_2SO_4 at 200° for 5 min., gave the *tetrabromo-2,9-dihydroxydinaphthanthracene-5,7,12,14-diquinone*, does not m. 330° , sol. in alkalis with a red color, gives a green vat. Condensation of 1,4,2,5-Me₂C₆H₂(COCl)₂ with *o*-C₆H₄(OMe)₂ gave 1,4-dimethyl-2,5-[3',3'',4',4''-tetramethoxydibenzoyl]benzene, m 215° . From 1,3,4,6-Me₂C₆H₂(COCl)₂ were obtained the following. With PhMe, 1,3-dimethyl-4,6-[4',4''-dimethyldibenzoyl]benzene, m. 118° ; with PhOMe, the 4',4''-di-MeO analog, m 95° ; and with *o*-C₆H₄(OMe)₂, the 3',3'',4',4''-tetra-MeO analog, m 137° . M. HEIDELBERGER

- **Effect of the position of the radicals on the properties of benzene derivatives.**
I. PASTAK. *Rev. chim. ind.* **34**, 309-12 (1925).—Brief review. A. PAPINEAU-COUTURE

Parachor and chemical constitution. III. Orientation isomerism in aromatic compounds. SAMUEL SUGDEN AND HENRY WILKINS. *J. Chem. Soc.* **127**, 2517-22 (1925); cf. *C. A.* **19**, 3263.—Within the exptl. error, about ± 2 units, there is no appreciable difference between the parachors of *o*-, *m*- and *p*-isomers of the C₆H₄Me₂, O₂NC₆H₄Me, ClC₆H₄NO₂, BrC₆H₄NO₂ and MeC₆H₄CN, the values obtained from the surface tension and d being in good agreement with the theoretical values. This agreement shows that the Kekulé formula will serve to reproduce the exptl. figures, however, in all cases but 2 the observed parachor is lower than the theoretical figure, which may be accounted for by the equil with a bridged structure. The difference in reactivity of the halogen in these compds is not due to differences in the mol. vol. *o*-O₂NC₆H₄Me, ρ_{762} 219.9-5° (cor.); d_4^{25} 1.180-0.00098 t; γ 41.76, 38.69, 36.76, 34.70 at 19.5°, 44.5°, 62.5°, 79.0°. *m*-O₂NC₆H₄Me, m 16° (cor.); d_4^{25} 1.180-0.00095 t, γ 41.36, 38.73, 36.37, 33.45, 30.53 at 20°, 42°, 61°, 91° and 116°. *o*-ClC₆H₄NO₂, m 33° (cor.); d_4^{25} 1.398-0.00110 t; γ 42.29, 39.80, 37.23, 34.04 at 50.5°, 70.5°, 91.5° and 121°. *m*-ClC₆H₄NO₂, m 46° (cor.); d_4^{25} 1.398-0.00111 t; γ 41.79, 38.76, 36.27, 31.77 at 60.5°, 74.5°, 90.5°, and 129°. *o*-BrC₆H₄NO₂, m 39° (cor.); d_4^{25} 1.735-0.00133 t; γ 43.14, 42.12, 40.56 and 38.94 at 55.5°, 67.5°, 80° and 94.5°. *m*-BrC₆H₄NO₂, m 55.5° (cor.); d_4^{25} 1.728-0.00130 t, γ 42.25, 41.36, 40.10, 38.94 at 63°, 71.5°, 83° and 91°. *p*-BrC₆H₄NO₂, m 127° (cor.); d_4^{25} 1.736-0.00130 t; γ 34.58, 33.12, 31.78, 30.63 at 132°, 145°, 159.5° and 170°. *o*-MeC₆H₄CN, b_{759} 205.5-5°, d_4^{25} 1.017-0.00072 t; γ 35.34, 33.33, 30.96, 28.41 at 51°, 69°, 90° and 116.5°. *m*-MeC₆H₄CN, b_{759} 213 (cor.); d_4^{25} 1.003-0.00082 t; γ 38.20, 35.16, 31.14, 30.88 at 18.5°, 47°, 64.5° and 86.5°. *p*-MeC₆H₄CN, m 29° (cor.); d_4^{25} 1.004-0.00078 t; γ 34.32, 32.67, 31.05, 29.84 at 51.5°, 67.5°, 82.5° and 96°. C. J. WEST

Thiazoles. VII. The behavior of *o*-aminophenyl mercaptan with aldehydes, ketones and gem-dihalides. The synthesis of benzothiazoles. M. T. BOGERT AND ARTHUR STULL. *J. Am. Chem. Soc.* **47**, 3078-83 (1925); cf. *C. A.* **19**, 512.—The claim of Claasz, that *o*-HSC₆H₄NH₂ HCl and aldehydes give benzothiazolines (*C. A.* **6**, 2431), could not be verified. His products on further purification yield thiazoles. Neither ketones nor ketone chlorides condense with HSC₆H₄NH₂. 2-[*m*-Methoxy-*p*-hydroxyphenyl]benzothiazole, pale yellow, m 175.5° (cor.), has a faint, sweet odor; the EtOH KOH soln exhibited a purplish fluorescence. 2-[*m*-*p*-Methylendioxyphenyl]benzothiazole, m 125° (cor.) 2- α -Furylbenzothiazole, m 105° (cor.) (36% yield), has a geranium-like odor. C. J. WEST

Heterocyclic ring systems. II. REINHARD SEKA. *Ber.* **58B**, 1783-7 (1925), cf. *C. A.* **19**, 501.—2,5-Diphenylfuran-3,4-dicarboxylic anhydride with urea at 190-230° gives the corresponding imide, m. 304.45° , sol. in H_2SO_4 with yellow-green color and greenish fluorescence and reprecipitated, unchanged by H_2O . Phenylimide, from the anhydride and CS(NHPh)₂ at 230-40°, yellow, m. 279-80°, sol. in EtOH and AmOH with deep violet fluorescence, in H_2SO_4 with intense yellow color. 2,5-Diphenylpyrrole-3,4-dicarboxylic acid (0.9 g. from 1 g. of the di-Et ester with 3-4 mols. KOH in boiling alc.), m 98° , evolves gas 120-30° and again 175-200° (partial carbonization), sol. in Ac₂O with intense blue-violet fluorescence, in H_2SO_4 -Ac₂O with deep emerald-green color and dark red fluorescence, cautious diln. with H_2O changing the color to corn flower-blue and more H_2O pptg. blue flocks sol. in CHCl_3 with corn flower-blue color. Alkalies change the color to pink. The NH_4 salt gives with AgNO₃ a flocculent Ag salt, with CuSO₄ a light green Cu salt. With Ac₂O at 48-50°, the acid gives the anhydride, m 268° (decompn.), sol. in Me₂CO, AcOH and Ac₂O, with intense blue-violet fluorescence. 3,4-Dimethylthiophene-2,5-dicarboxylic acid, from S(CH₂CO₂Et)₂, Ac₂ and NaOEt in cold

alc., granular powder, m. 327–8° (decompn.); *Ag* salt, amorphous; *Ba* salt, finely granular; *Cu* salt, green. Oxidation of the acid with alk. KMnO_4 under varying conditions always gave, together with much of the unchanged acid, a substance, m. 258° (decompn.), having the compn. of a 4-methylthiophene-2,3,5-tricarboxylic acid C. A. R.

Isomerism of the styryl alkyl ketones. II. The isomerism of the homologs of 2-hydroxystyryl and of 3-methoxy-4-hydroxystyryl methyl ketones. ALEXANDER MCGOOKIN AND DONALD JAMES SINCLAIR. *J. Chem. Soc.* **127**, 2539–44 (1925); cf. C. A. **19**, 481. 2-Hydroxystyryl Et ketone crystals from C_6H_6 in the colorless form, m. 116°; if in the prepn. an excess of 10% NaOH be employed, there results, on pptn. with CO_2 , the yellow isomer, m. 116°, transformed into the colorless form by addn. of a trace of acid to the boiling soln. Decker and Fellenberg's yellow compd. A (C. A. **3**, 1004), m. 246.7°, gives a red alk. salt, the *Ac* deriv., m. 182°, contains C 73.9, H 6.3%, Ac 27.1%; the *carbo*methoxy deriv., sinters 179°, m. 181°, contains C 71, H 6%. The figures do not agree with D. and F.'s formula, $\text{C}_{12}\text{H}_{12}\text{O}_3$. 2-Hydroxystyryl *Pr* ketone, colorless or yellow, m. 113°. The *hexyl* deriv. likewise exists in 2 forms, m. 102.3°, the yellow form being very unstable. 3-Methoxy-4-hydroxystyryl Et ketone, yellow or colorless, m. 93°, the colorless form, from aq. solvents, gives a monohydrate, yellow, m. 79.82°. The *Pr* deriv., yellow or colorless, m. 83°. The following solubilities of 3,4-methylenedioxy-styryl Me ketone in g. per 100 g. EtOH are reported (yellow and colorless isomers): 20°, 1.5, 1.2, 2.2°, 1.8, 1.5; 31°, 4.0, 2.6; 36°, 5.5, 3.3; 43°, 8.0, —; 50°, —, 4.9. 3-Methoxy-4-hydroxystyryl Me ketone (yellow and colorless isomers): 18°, 4.4, 4.8; 9.0, 10.1; 38°, 12.1, 13.7, 39°, 12.1, —; 47°, 16.0, 18.6. All the hydroxystyryl ketones thus far investigated are colored crimson by boiling, concd. HCl, the yellow more rapidly than the colorless isomer C. J. WEST

Mercury and arsenic compounds of some pyrroles. I. HANS FISCHER AND RICHARD MÜLLER. *Z. physiol. Chem.* **148**, 155–79 (1925).—Pyrrole derivs. of the formula $\text{R}_2\text{Hg}(\text{HgCl}_2)$, are readily obtained in cryst. form by treatment of the pyrrole soln. in AcOH with 4% aq. HgCl_2 . Such compds. are decompd. with regeneration of the original pyrrole when the alc. or H_2O suspension is treated with H_2S . This procedure should offer a convenient method for isolating pyrroles from mixts. such as result from reduction of blood pigment. Tetrasubstituted derivs. do not react with Hg. It is improbable, therefore, that Hg is linked to N, a linkage to C being more likely, and this view is supported by the fact that Hg derivs. of PhOH and *p*- $\text{MeC}_6\text{H}_4\text{OH}$ are decompd. in the same manner by H_2S . HgCl_2 deriv. of 2,3,5-trimethylpyrrole, m. 120.5° (decompn.), is difficultly sol. in H_2O and insol. in most org. solvents, but sol. in AcOH. When dissolved in MeAc or pyridine a transformation occurs, since the soly. in AcOH and the m. p. are changed. H_2S decomp. it into the original trimethylpyrrole. HgCl_2 deriv. of 2,4-dimethylpyrrole, m. 136° (decompn.), was prepd. in 93% yield by the same method. Treatment with H_2S liberates the original pyrrole. HgCl_2 deriv. of pyrrole, m. 113° (decompn.). By changing the conditions of temp. and solvent, other products, m. resp. 125°, 165–70° and 150–5°, were obtained. Pyrrole is regenerated by H_2S . HgCl_2 deriv. of *N*-methylpyrrole, decomp. 120–30°. HgCl_2 deriv. of 2,5-dimethyl-3-carbethoxypyrrole (I), m. 239° (decompn.), may be obtained either from AcOH soln. or by fusion of the components. Dilm. of the pyridine soln. with H_2O , gives 2 cryst. products, m. 255° and 170° (decompn.). HgCl_2 deriv. of 2,4-dimethyl-3-carbethoxypyrrole (II), m. 218° (decompn.), was obtained by addn. of alc. solns. of the pyrrole and HgCl_2 and dilm. with H_2O . Cryptopyrrole also forms an insol. HgCl_2 deriv. from which the original substance was recovered by treatment with H_2S . 2,4-Dimethyl-3-acetyl-5-carbethoxypyrrole reacts with HgCl_2 but the product could not be purified sufficiently for analysis. It is believed that mercuration occurs in the side chain. The original substance was recovered as usual by decompn. with H_2S . Treatment of I and II with 1 in KI soln. removes the Hg and substitutes I in the 4- and 5-positions, resp. Hemin was reduced in the usual manner by means of HI in AcOH and the acidic and basic fractions were sepd. by steam distn. From each fraction the HgCl_2 deriv. was pptd. and decompd. by H_2S . In this way hemopyrrole and hemo- and cryptopyrrolecarboxylic acids were prepd. in cryst. form. Tetrasubstituted pyrroles remained in the filtrates from the HgCl_2 pptn. Oxidation of Ph_4C_2 with O_3 gave Ph_2CO and oxidation of dibiphenyleneethene gave a substance, m. 250–2° and diphenyleneketone. Arsenic derivs. of several pyrroles were prepd. in cryst. form but none of these showed trypanocidal action. 2,5-Dimethyl-3-carbethoxypyrrol-5-arsonic acid, m. 245–7° (decompn.), was prepd. by heating the pyrrole with As_2O_5 at 120°. 2,3,5-Trimethylpyrrol-4-arsonic acid (III), m. 230–5° (decompn.), from the pyrrole and As_2O_5 at 95°. Pyrrol-arsonic acid (IV), m. 120–30° (decompn.), could not be crystd. It gave a strong aldehyde reaction with Ehrlich's reagent. H_2S ppts. As_2S_3 from its soln. in mineral acid. Re-

duction of **III** by $\text{Na}_2\text{S}_2\text{O}_4$ and of **IV** by SnCl_2 and **III** gave unstable products without pharmacological action.

A. W. DOX

Replacement of halogens from aromatic compounds. R. H. CLARK AND R. N. CROZIER. *Trans. Roy. Soc. Can. Sec. III* [3], **19**, 153-4 (1925).—C. and C. attempted to find out whether electronic tautomerism explained the substitution reactions of the C_6H_6 ring. Thirteen compds. were heated separately with halogens and alc. KOH, NaOMe or NaOEt. A table containing the results together with those calcd. from the electronic tautomerism hypothesis is given. The replacement found in *o*- and *m*- $\text{C}_6\text{H}_4\text{Cl}_2$, 1,2,4- $\text{C}_6\text{H}_3\text{Cl}_3$, 1,2,4,5- $\text{C}_6\text{H}_2\text{Cl}_4$ and C_6Cl_6 point to the electronic picture of the C_6H_6 nucleus while 2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{NH}_2$, 2,4,6- $\text{Cl}_3\text{C}_6\text{H}_2\text{OH}$, 2,6,4- $\text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{NH}_2$, *p*- $\text{ClC}_6\text{H}_4\text{NH}_2$ and $\text{C}_6\text{Br}_6\text{OH}$ behave in accordance with the isometric equl. postulated by electronic tautomerism.

J. W. SHIPLEY

Sulfuryl chloride. **IV.** Further studies on a new chlorinating agent. Preparation of polychloro derivatives of toluene. OSWALD SILBERRAD. *J. Chem. Soc.* **127**, 2677-84 (1925); cf. C. A. **19**, 3197.—Using a mixt. of PhMe (181 g.), AlCl_3 (10 g.) at 70° and varying amts. of chlorinating agent (SO_2Cl_2 contg. 1% S_2Cl_2), the following products were obtained: With 280 g. agent 88% of a mixt. of 2- and 4-Cl derivs (oxidation of 50 g. gave 21 g. *p*- and 16 g. *o*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$), with 560 g. agent, finally heating a few min. at 100° , 220 g. practically pure 2,4- Cl_2 deriv.; with 840 g. agent, run in during 15 hrs., 83% of a mixt. of about equal parts of 2,4,5- and 2,3,4- Cl_3 deriv., sepn. by crystn. from EtOH gave 40 and 34%, resp. Further action of the chlorinating agent on the 2,4,5- Cl_3 deriv. gives principally the 2,3,4,5- Cl_4 compd.; that some 2,3,4,6-isomer results is shown by nitrating the product from the mother liquor; the method is not recommended for the prepn. of any tetra-Cl deriv., for not only are the isomers formed in such proportions that there is considerable difficulty in sepg. them but also the tri-Cl derivs. show a great tendency to pass directly into the penta-Cl deriv. under the influence of this reagent. With 1632 g. chlorinating agent, there results practically quant. the penta-Cl deriv., m. 217.5° ; this is sol. in 3-4 vols. PhMe at 87° and in 22 vols. at 17° . The penta-Cl deriv. (100 g.) treated with 10 g. AlCl_3 and 200 g. chlorinating agent, gave 88 g. of unchanged product and a compd., m. $272-4^\circ$, possibly $\text{C}_6\text{Cl}_5\text{CH}_2\text{C}_6\text{Cl}_4\text{Me}$.

C. J. WEST

Further study of the utility of ethyl γ,γ -diethoxyacetoacetate as a reagent for the synthesis of glyoxaline. E. W. RUGELEY AND T. B. JOHNSON. *J. Am. Chem. Soc.* **47**, 2995-3002 (1925).—Since the practicability of Pyman's syntheses of histidine depends upon the synthesis of certain glyoxaline derivs., the study of $(\text{EtO})_2\text{CHCOCH}_2\text{CO}_2\text{Et}$ (**I**) has been continued (cf. J. and Pucher, C. A. **16**, 1573). $(\text{EtO})_2\text{CHCO}_2\text{Et}$ is more conveniently prepd. on a large scale by agitating the moist Ag salt in moist Et_2O with EtI at room temp. for 10-12 hrs. The best sample of $(\text{EtO})_2\text{CHCOC}(\text{NOH})\text{CO}_2\text{Et}$ which could be obtained contained 63-5% of the pure NO compd. All attempts to prep. the corresponding NH_2 deriv. by reduction of the NO deriv. failed. While **I** appears to react normally with Br in CS_2 to give the α -Br deriv., the light red oil obtained could not be purified by distn. It shows no tendency to react with $\text{CO}(\text{NH}_2)_2$ to form a glyoxaline deriv.; further, it does not react smoothly with NH_3 . When satd. with HBr there results *Et* α -bromoglyoxalacetate, m. 119° . **I** and ClCH_2OMe are condensed by Na to give 44% of *Et* α -methoxymethyl- γ,γ -diethoxyacetoacetate, b_4 130° , n_{23} 1.4387. *Di-Et* γ,γ -diethoxyacetosuccinate, b_3 153° , n_{21} 1.4370, results in 48% yield from $(\text{EtO})_2\text{CHCO}_2\text{Et}$ and $(\text{CH}_3\text{CO}_2\text{Et})_2$ with Na or in 43-5% yields by the alkylation of **I**. Hydrolysis of this ester gives glyoxalpropionic acid, which reacts normally with NH_3 and HCHO to give glyoxalinepropionic acid. The yield, however, is so low that the ketone ester, from which it is prepd., cannot displace levulinic acid as the best practical source of this compd.

C. J. WEST

Nitro compounds with special reference to the nitration of *m*-chloronitrobenzene and *p*-chlorotoluene. H. H. HODGSON. *J. Soc. Dyers Colourists* **41**, 327-9 (1925).—The work of Holleman (cf. C. A. **3**, 1010; **4**, 754) is reviewed. Fifty g. of *p*-toluidine is diazotized as usual and the clear soln. is added dropwise down the reflux to a soln. contg. 5 g. Cu_2Cl_2 , 16 cc. concd. HCl and 20 cc. H_2O , on the water bath. After 2 to 3 hrs. of heating for complete decompn., the mixt. is steam-distd.; the volatile but slightly impure 4- $\text{ClC}_6\text{H}_4\text{Me}$ passes over. The latter is made just alk. with NaOH to keep back any *p*-cresol formed as a by-product and again steam-distd. Final yield of 4- $\text{ClC}_6\text{H}_4\text{Me}$, 52.5 g. Com. pure samples of 2-nitro- and 3-nitro-4-toluidines were recrystd. 4 times from water and 6 times from alc. and the 3-nitro-4-toluidine 6 times again from alc. These were then converted resp. to 2-nitro- and 3-nitro-4-chlorotoluene as above. Freedom from admixed nitroresols was secured by steam distn. from NaOH soln. Yields about 90%. Several recrystns. of 4,2- $\text{Cl}(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{Me}$ gave a product,

m. 37°, and the 4,3-Cl(O₂N)C₆H₃Me after several distns. had a max. setting point of 4°. It is std. that the product m. 37° consisted of 93.9% 4,2- and 6.1% 4,3-Cl(O₂N)-C₆H₃Me, and that the product setting at 4° consisted of 6-7% of the 4,2- and 93-4% of the 4,3-compd.

Tetrahydroindazoles. K. v. AUWERS, L. FR. v. SASS AND W. WITTEKINDT. *Ann.* **444**, 195-220 (1925); cf. *C. A.* **18**, 834.—1-Methyl-3-hydroxymethylencyclohexan-4-one (I) benzoate (II), m. 96-7°. 1,3-Dimethyl-4-hydroxymethylencyclohexan-5-one (III), b₁₀ 92°, d₄^{16.5} 1.0221, d₄²⁰ 1.019, n 1.49232, 1.49733, 1.50993, 1.52694 at 16.5° for α, He, β and γ, n_D²⁰ 1.4958. Benzoate (IV), m. 87-8°. I and H₂NCONHNH₂. AcOH at 0° give the labile (V) and stable (VI) forms of 5-methyltetrahydroindazole-N-carboxamide, m. 170° and 158°, the ratio being 3:1; V is changed into VI by warming with EtOH-H₂SO₄ or AcOH. With H₂NCONHNH₂.HCl only the labile form results. The benzoate, m. 188-93°, results from II; warmed with AcOH, there results VI; with EtOH-H₂SO₄, V. With 2 mols. H₂NCONHNH₂. AcOH there results VI and the disemicarbazone, m. 206°, then 230-5° (decompr.). III and H₂NCONHNH₂. AcOH give the labile carboxamide, m. 133-4°, then 148-9°, with the HCl salt, there results 60% of the labile form and 20% of the stable form, m. 151-2°; the benzoate, m. 190°; the disemicarbazone (VII), m. 188-91°, then 228-32°. The anilide of III, b₂₃ 218-20°, yellow oil, also yields VII. 5-Methyl-4,5,6,7-tetrahydroindazole (VIII), m. 74-5.5° (picrate, yellow, m. 156-7°). The 4,6-di-Me deriv. (IX), m. 76-7° (picrate, dark yellow, m. 167-8°). With PhNHNH₂, I or II gives the 2-Ph deriv. of VIII, m. 68-9° (perchlorate, m. 158-60°) if the free base or the AcOH salt is used, or the 1-Ph deriv., m. 62.5-3.5° (perchlorate, m. 109-11°), if the HCl salt is used. II and PhNHNH₂. AcOH give a mixt. of the isomers which could not be sep'd. The anilide of I, m. 150.5-1.5°. IV and PhNHNH₂. AcOH give the compd. C₂₀H₂₄O₂N₂, m. 103-6°, which is sapond. to the 2-Ph deriv. of IX, light yellow oil, b₁₃ 194°, d₄^{16.6} 1.0625, n 1.57793, 1.58445, 1.60117 at 16.6° for α, He and β. Perchlorate, m. 199-200°. III and free PhNHNH₂ give a diphenylhydrazone, m. 171-2° which gives a mixt. of isomers on sapon., sep'd. by means of the perchlorates. The 1-Ph deriv., b₁₃ 187°, m. 71-2°, d₄²⁰ 1.0660, d₄^{99.7} 1.0096, n 1.56990, 1.57555, 1.58967 at 20.5° (supercooled) for α, He and β; 1.53791, 1.54329 at 99.7° for α and He. The ratio of the 1- and 2-Ph derivs. was 1:3. The 1-Ph perchlorate, m. 177-8°. III and PhNHNH₂.HCl at 0° give the isomers in the ratio of 1:1, but the total yield is only 30%. At 40°, the yield is 50%, the ratio of 1 to 2, 7:1; at 100° the yield is again 50%, the ratio 9:1. 2-Benzyl-5-methyl-4,5,6,7-tetrahydroindazole, yellow oil, b₂₁ 203° (50% yield); picrate, yellow, m. 132-3°. This also results in 90% yield from VIII and PhCH₂Cl and EtONa. 2-Benzyl-4,6-dimethyl-4,5,6,7-tetrahydroindazole, b₁₂ 201.5-2°, m. 36-7.5°, d₄^{16.1} 1.0423, n 1.55100, 1.55556, 1.56676, 1.57659 at 16.1° for α, He, β and γ; picrate, light yellow, m. 172°. From IX and PhCH₂Cl there results a mixt. of this deriv. with the 1-benzyl deriv., yellow oil, b₁₃ 191-2°, d₄^{17.4} 1.0407, n 1.53963, 1.54391, 1.55446 and 1.56371 at 17.4° for α, He, β and γ. This does not form a picrate. The 2-Et deriv. of VIII, b₁₆ 121°; the 1-Et deriv., b₂₂ 124°; the 2 picrates, yellow, m. 152-3° and 113-4°. The 2-Et deriv. of IX, b₁₃ 118-8.5°, d₄^{15.6} 0.9716, n 1.49584, 1.49915, 1.50417, 1.51393 at 15.5° for α, He, β and γ; picrate, yellow, m. 139-41°. The 1-Et deriv., b₁₆ 121-3°, d₄^{15.4} 0.9753, n 1.49892, 1.50232, 1.51054, 1.51787 at 15.4° for α, He, β and γ; picrate, yellow, m. 114-5°. 2-Carbelthoxy deriv., b₂₀ 182-2.5°, m. 63°, sapond. by alkali to IX; heated to 230-5°, there results the 2-Et deriv. 2,5-Dimethyl-4,5,6,7-tetrahydroindazole, b₁₄ 114°; picrate, yellow, m. 170-1°. 1,4,6-Trimethyl-4,5,6,7-tetrahydroindazole, b₁₃ 118-9°, d₄^{19.8} 0.9886, n 1.49758, 1.50115, 1.50958, 1.51691 at 19.8° for α, He, β and γ; picrate, m. 146-7°. III gives a M₂ ether, b₁₃ 117°; the methylsemicarbazide is a clear yellow oil, which is sapond. to the 2,4,6-tri-Me deriv., b₁₂ 124°, d₄^{25.4} 0.9823, n 1.49398, 1.49728, 1.50528 at 25.4° for α, He and β; picrate, m. 174-5°. 4,6-Dimethyl-2-carbomethoxy-4,5,6,7-tetrahydroindazole, b₁₅ 167-8°, m. 74-5°. C. J. WEST

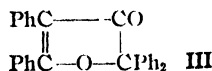
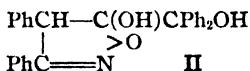
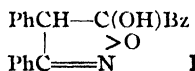
The two forms of o-nitrotoluene. ROBERT H. CLARK AND ROBERT N. CROZIER. *Trans. Roy Soc. Can. Sec. III* [3], 19, 157-8 (1925).—The β-form was prep'd. by keeping the α-modification at the temp. of solid CO₂ and Et₂O for some considerable time. The d., mol. wt. and n_D²⁰ were practically identical for the 2 forms, showing that polymerization was not responsible for them. Chem. tests made in an effort to replace the negative NO₂ group by a negative NH₂ or HO group showed in the majority of cases that displacement was greater with the β- than with the α-form. C. and C. conclude that the evidence supports the electronic hypothesis as an explanation for the existence of the

2 forms and suggest $\text{MeC}_6\text{H}_4\text{NO}_2 \rightleftharpoons \text{MeC}_6\text{H}_4\text{N}^+\text{O}_2^-$ as a plausible structure. J. W. S.

Firmness of the attachment of organic residues. III. JULIUS V. BRAUN, RUDOLF

PUSSGANGER AND MARTIN KÜHN. *Ann* **445**, 201-24(1925); cf. *C. A.* **18**, 1830.—*β*-Bromoallylmethylaniline, b_{13} 136-8° (HCl salt, picrate and methiodide, oily), heated with 2 mols. KOH for 16 hrs. gives 50% propargylmethylaniline (I), b_{13} 108-11° (HCl salt, m. 142°; methiodide, m. 130-2°; picrate, oily). With BrCN there results methylphenylcyanamide, b_{12} 137°, m. 28°, and $\text{CH}_2\text{CCH}_2\text{Br}$, which combines with the original base to give the quaternary bromide, $\text{PhNMe}(\text{CH}_2\text{C}:\text{CH})_2\text{Br}$, m. -170°; the reaction is incomplete and about 50% of the original base is recovered. PhCH_2NMe and $\text{CH}_2\text{CBrCH}_2\text{Br}$ give the amine, $\text{PhCH}_2\text{NMeCH}_2\text{CBrCH}_2$ (impure sample, b_{13} 126-30°) (HCl salt, m. 140°; picrate, orange, m. 121°; methiodide, yellow, m. 111°); boiling KOH in dil. EtOH gives propargylmethylbenzylamine, b_{11} 101-3° (Ag complex, orange, explodes on rapid heating; HCl salt, m. 155°, picrate, oily). The reaction with BrCN is more energetic than with I and is completed in a few min. The products are PhCH_2Br and propargylmethylcyanamide, b_{12} 90°. The propargyl residue appears to be more strongly bound to O than is the allyl residue. Benzoyltrimethylenylaniline, b_{11} 186-7°, m. 74-5°, in 90% yield by reduction of the nitrile with Na and EtOH, with PBr₅ this gives 30% of trimethylenyl bromide (II), b_{15} 106°. PhCH_2NMe and I give trimethylenylbenzylmethylamine, b_{11} 105-6° (picrate, m. 88°). The energetic action of BrCN gives trimethylenylmethylcyanamide, b_{11} 80-3°, and PhCH_2Br . Trimethylenylaniline, b_{12} 113-4° (HCl salt, picrate, methiodide are oily), BrCN gives $\text{PhN}(\text{CH}_3)\text{CN}$, b_{12} 135°, m. 28°. II and PhOH with K_2CO_3 in Me_2CO give 65% of trimethylenyl Ph ether, b_{12} 95°, b. 214°, which is unchanged after heating at 250°. Trimethylenylrhodanide, b_{12} 65-7°. Benzoyltetramethylenylaniline, b_{12} 191-3°, m. 102° (80% yield); PBr₅ gives 31% tetramethylenyl bromide (III), b_{15} 81-3°, d_4^{25} 1.360, this is more stable than II; when 0.2 g. of each is warmed at 100° with 200 parts H_2O , II is completely hydrolyzed in 10 min., while III is largely unchanged, after 1 hr. only 39% of the Br of III is split off; with Me_3N the reaction is slow and in 30% EtOH after 24 hrs., 85% of the III is unchanged; the quaternary base, $\text{C}_8\text{H}_{14}\text{NBr}$, is hygroscopic and m. 214°. Tetramethylenylmethylamine, b_{12} 135° (HCl salt, oily, chloroplatinate, ochre-yellow, decomps. 178°); BrCN gives tetramethylenylphenylcyanamide, b_{11} 158°, indicating that the tetramethylenyl residue is more firmly bound to the N than is the Me group. Tetramethylenylbutylaniline, pale yellow liquid, b_{11} 161-2° (picrate, orange, m. 128°); it reacts very slowly with BrCN and after 0.5 hr.'s heating, 0.5 can be recovered, the reaction products are III and phenylbutylcyanamide, b_{11} 156-8°. α -Thenyl bromide, b_{15} 80-2°, in 90% yield from the alc. and PBr₅, on standing it gradually splits off HBr and gives a dark resin; it is also hydrolyzed by H_2O , splitting off HBr; it easily combines with tert. bases. α -Thenyltrimethylammonium bromide (IV), very hygroscopic, m. 172°. α -Thenylmethylbenzylamine, b_{12} 148-52° (picrate, m. 95°; methiodide, m. 165°). With BrCN there results a Br- and S-free oil, b_{13} 60-85°, and a 2nd fraction, b_{13} 142-50°, the lower fraction gives with Me_3N IV, which was further characterized by transforming it into the chloride and forming the chloroplatinate V, yellow, decomps. 179°. Thenylallylaniline, b_{14} 161-5° (picrate, m. 124-5°); the reaction with BrCN does not yield well-characterized products, but it appears that $\text{CH}_2\text{CHCH}_2\text{Br}$ is split off. Thenylmustard oil, b_{20} 141-2°. Thenylphenylthiourea, m. 123°. Furomethylbenzylmethylamine, b_{13} 131-3° (methiodide, m. 135°); decomps. with BrCN gives an oily quaternary bromide, which forms a dark yellow, amorphous Pt salt, m. 140°, and a yellow oil, yielding with Me_3N the known $\text{C}_6\text{H}_5\text{OCH}_2\text{NMe}_3\text{Br}$, whose Pt salt, m. 148°. Thenylfuromethylmethylamine, b_{14} 132-5° (picrate, m. 78°; methiodide, m. 110°). Reaction with BrCN gives an oily quaternary bromide and thenyl bromide, characterized as V. C. J. W.

Isoxazoline oxides. IV. Benzoyldiphenylisoxazoline oxide. 2nd paper. E. P. KOHLER. *J. Am. Chem. Soc.* **47**, 3030-36(1925); cf. *C. A.* **18**, 2518, 3190.—The product m. 123°, obtained by the action of AcOK upon $\text{PhC}(\text{CHPhNO}_2)\text{HCHBrBr}_3$ is not an isoxazoline oxide but a hydroxyisoxazoline (I). When any 1 of the 4 isomers of this Br compd. is boiled with $\text{C}_6\text{H}_5\text{N}$ in MeOH there results a quant. yield of 2 isomers, m. 151° and 183°, which readily change into the 3rd. α, γ, δ -Triphenylbutanetrione oxime,



for which the method of prepn. is given, is stable only in solid form; in CHCl_3 minute traces of acid rapidly transform it into the purple anhydride, while in EtOH it gives I. With excess PhMgBr (because I always contains MeOH of crystn.) I gives 90% of 3,4-diphenyl-5-hydroxy-5-diphenylcarbinylisoxazoline (II), m. 170-1°; it loses H_2O with difficulty and can be recrystd. from AcOH, AcCl or Ac_2O ; EtOH-NaOH splits off H_2O .

forming 3,4-diphenyl-5-diphenylcarbonyloxazole, m. 157-8°; this is the sole product when I reacts with an equiv. amt. of PhMgBr II and AcCl in MeOH give the Me ether, m. 182-3°. A by-product of the above reaction is 2,2,4,5-tetraphenyl-3-furone (III), pale yellow, m. 178°. Oxidation with O₃ gives a compd., C₂₁H₁₆O₆, yellow, m. 150°, which is further oxidized by CrO₃ to equiv. amts. of BzOH and Ph₂C(OH)CO₂H.

C. J. WEST

"Hesperidin" from certain plants. O. A. OESTERLE AND G. WANDER. *Helvetica Chim. Acta* **8**, 519-36 (1925).—*Scrophularia nodosa*, *Hyssopus officinalis*, fol. bucco, fruct. conii, herb. conii, pennyroyal, *Mentha crispum*, *Mentha pulegium*, *Toddalia aculeata*, and *Linaria genistifolia*, supposed chiefly on microchem. evidence to contain hesperidin (I), really yield the rhamnoglucoside *diosmin* (II), C₃₄H₄₄O₂₁·2H₂O, differing from I in its insol. in aq. NH₃. The plant material was extd. 3 times for 2-3 days with 2% aq. NaOH and the ext. was pptd. with HCl, the washed ppt. dissolved in dil. NaOH, and pptd. with CO₂, this was repeated 10-20 times until no further lightening of the color occurred. Further purification is by boiling with alc., extn. with dil. NH₄OH, and repeated soln. in dil. NaOH and reprecip. with CO₂ until well-marked spherocrystals are formed. Heated a short time with 33% KOH, or better at 130-40° for 4 hrs. with 20 parts aq. alc. (1:1) 5% H₂SO₄, II yields glucose, rhamnose, and *diosmetin* (III), (luteolin Me ether), 3,4-HO(MeO)C₆H₃C·CH·CO·C₆H₂(OH)₂O, occurring in parsley with apiin

(Vongerichten, *Ber.* **33**, 2334 (1900)) and obtained from hesperetin by ring closure (O and Kueny, *C. A.* **10**, 2472). After filtering off unchanged II from the hot soln. III seps. on addn. of much H₂O and is best purified over the acetate, m. 195-6°. With hot concd. KOH it gives 3,4-HO(MeO)C₆H₃CO·Me, 3,4-HO(MeO)C₆H₃CO₂H- and 2,4,6-C₆H₂(OH)₃, heated with HI it gives luteolin. The name "hyssopin" is to be discarded (cf. Tunnann, *C. A.* **12**, 2314).

M. HEIDELBERGER

Syntheses in the fatty-aromatic series. XVI. Chlorinated amines and amino acids. JULIUS V. BRAUN AND HANS REICH. *Ann.* **445**, 225-46 (1925); cf. *C. A.* **18**, 829. —PhOCH₂Ph and 38% HCl give a mixt. of *o* and *p*-HOCH₂C₆H₄CH₂Ph, the total yield after 36 hrs. being 75%. Similarly behaves a mixt. of PhCH₂Cl and PhOH. *p*-Cresyl benzyl ether, b₁₂ 165°, α -naphthyl benzyl ether, b₁₂ 200°, m. 61°, β -C₁₃H₇OCH₂Ph, PhOCH₂C₆H₄CH₂OPh also show the same qual. behavior in that they yield no Cl-contg. decompn. products but small amts. of PhOH or MeC₆H₄OH and products of high mol. wt., partly sol. in alkali. *p*-PhOCH₂C₆H₄CN and PhONa give 80% of *p*-phenoxyethylbenzonitrile, b₁₂ 205°, m. 65°, reduction gives a mixt. of primary and sec. base, the latter predominating; *p*-phenoxyethylbenzylamine, m. 78°, absorbs CO₂ readily from the air and was analyzed as the Bz deriv., m. 116°, HCl salt, m. 260°; picrate, yellow, m. 197°. *p*-Phenoxyethylbenzyl alc., b₁₂ 215-20°, m. 106°; the bromide, b₃ 210°. *p*-Ethoxyethylbenzonitrile, b₁₃ 135°, reduction gives 50% of *p*-ethoxyethylbenzylamine, b₁₃ 135° (HCl salt, m. 235°; picrate, m. 150°) and 30-5% of *di-p*-ethoxyethylbenzylamine, b₁₂ 255°. *p*-Ethoxyethylbenzyl alc., b₁₃ 152°, bromide, b₁₃ 148° (not pure); cyanide, b₁₂ 165°, which is reduced to 25% of *p*-ethoxyethylphenylethylamine, b₁₃ 147° (HCl salt, m. 180°; picrate, m. 130°), and 40-5% of *di-p*-ethoxyethylphenylethylamine, b₁₃ 270-5° (HCl salt, m. 250°, Nc compd., m. 58°). *p*-Chloromethylbenzylamine-HCl, does not m. 300°; chloroplatinate, ochre-yellow, m. 226°; picrate, m. 185°. *p*-Chloromethylphenylethylamine-HCl, does not m. 300°; chloroplatinate, does not m. 300°; picrate, m. 145°. *m*-Bromomethylbenzonitrile, m. 93° (80% yield); *m*-phenoxyethylbenzonitrile, b₁₂ 183-5°, m. 51°. Reduction gives a mixt. of *m*-phenoxyethylbenzylamine, b₁₆ 220° (HCl salt, m. 170°; picrate, m. 179°), and *di-m*-phenoxyethylbenzylamine, b. 290°. *m*-Ethoxyethylbenzonitrile, b₁₂ 133°, is reduced to a mixt. of *di-m*-ethoxyethylbenzylamine, b₁₄ 250° (picrate, m. 212°), and *m*-ethoxyethylbenzylamine, b₁₅ 150-2° (HCl salt, m. 156°; picrate, m. 131°); the corresponding alc., b₁₁ 140-2°; bromide, b₁₂ 140-5°; cyanide, b₁₁ 155°, which is reduced to *m*-ethoxyethylphenylethylamine, b₁₁ 145° (HCl salt, m. 107°; picrate, m. 182°), and *di-m*-ethoxyethylphenylethylamine, b₁₁ 240-5° (HCl salt, m. 135°). *m*-Chloromethylbenzylamine (I) HCl, m. 169°; chloroplatinate, m. 219°; picrate, m. 173°. *m*-Chloromethylphenylethylamine-HCl, decomp. 177-80°; picrate, m. 172°. I gives a Bz deriv., m. 92°, which yields a nitrile, m. 89°, sapon. gives *m*- β -aminoethylphenylacetic acid, m. 210°. *o*-Ethoxyethylphenylethylamine, b₁₁ 140° (75% yield); HCl salt, m. 117°; picrate, reddish yellow, m. 163°. The sec. amine, b₁₁ 250°. *o*-PhOCH₂C₆H₄CH₂NH₂, with HBr or HCl, gives the same phenol base, C₁₄H₁₃ON, b₁₄ 225-35° (slight decompn.), m. 158-9°; exhaustive methylation gives the compd., C₁₈H₂₃ONi, m. 181-3°. *o*-Chloromethylbenzylamine-HCl, m. 222°; chloroplatinate, m. 218°; picrate, m. 187°. *o*-Chloromethylphenylethylamine-HCl, m. 209°; *p*-nitrobenzoyl compd., m. 120-1°. *Di-m*-chloromethylphenylethylamine-HCl, m. 220°; Bz deriv., m.

95°; the corresponding *o*-deriv.-HCl, m. 154°. *o*-Chloromethylbenzylamine gives a Bz deriv., m. 119°, which in turns gives a *nitrile*, m. 135°, saponid. to *o*-aminomethylphenylacetic acid, decomp. 202° (HCl salt, m. 154°); the *Et* ester-HCl, m. 167°; the acid, heated at 160-70°, gives a *lactam*, m. 150°. *o*-Chloromethylphenylethylamine yields an oily Bz deriv., whose *nitrile*, b₁₂ 290-300° and gives *o*-aminoethylphenylacetic acid decomps. 228° (HCl salt, m. 218°); its *lactam*, m. 159°. Cl(CH₂)₃C₆H₄CN gives a *phthalyl* deriv., m. 138°, saponid. to *o*- γ -aminopropylbenzoic acid, m. 213-4° (HCl salt, m. 213.4°), whose *lactam*, m. 100°. C. J. WEST

Two mixed anhydromonohydroxybenzoic acids and their conversion into xanthonecarboxylic acids. RICHARD ANSCHÜTZ, WALTER STOLTENHOFF AND FRITZ VOELTER. *Ber.* 58B, 1736-41(1925); cf. C. A. 16, 3084.—*o*-(*p*-MeC₆H₄O)C₆H₄CO₂H, m. 126° (Ullmann and Zlokasoff, *Ber.* 38, 2111(1905), give 118°); *Ag* salt, cryst. powder sensitive to light. With KMnO₄ the acid gives 98% of anhydro-*o*,*p'*-hydroxybenzoic acid (*diphenyl ether-o,p'*-dicarboxylic acid), m. 220°. Salts: *di-Ag*, sensitive to light; *Ca*, coarsely granular ppt. with 1 H₂O, weathers in the air; *Cu*, green. *Di-Me* ester, m. 72.5°. *Di-Et* ester, faintly yellow, b₁₉ 229°. *Dichloride*, m. 165°. *Diamide*, m. 238°. *Dianilide*, m. 215°. The acid with concd. H₂SO₄, AcCl or SOCl₂ or the dichloride with anhyd. (CO₂H)₂ yields *xanthone-2-carboxylic acid*, m. above 300°; *Ag*, *Ca*, *Cu* (green, with 1 H₂O) salts; *Me* ester, m. 185°; *Et* ester, m. 152°; *chloride*, m. 173°, faintly yellowish; *amide*, m. about 324° (decompn.); *anilide*, m. 271°. Anhydro-*o,m'*-hydroxybenzoic acid (*diphenyl ether-o,m'*-dicarboxylic acid), from *o-m*-(MeC₆H₄O)C₆H₄CO₂H, m. 215°; *di-Ag* and *Cu* (pale green) salts; *di-Me* ester, m. 92°; *di-Et* ester, m. 44°, b₁₆ 181°; *dichloride*, could not be isolated in pure form; *diamide*, m. 284°; *dianilide*, m. 232°. The dichloride slowly heated to 145° in (CHCl₃)₂ with somewhat more than the calcd. amt. of anhyd. (CO₂H)₂ gives 25% of *xanthone-1- or 3-carboxylic acid*, m. 312°; *Ag* salt; *Cu* salt, green ppt. with 1 H₂O; *Me* ester, m. 212°. C. A. R.

Dissociation into free radicals of substituted dixanthyls. II. The dissociating influence of the cyclohexyl group. J. B. CONANT AND L. F. SMALL. *J. Am. Chem. Soc.* 47, 3068-77(1925); cf. C. A. 19, 988.—*p*-Chlorobenzylidenexanthane, yellow, m. 131-1.5°, in 60% yield from *p*-ClC₆H₄CH₂MgCl and xanthone; the xanthydrol could not be purified because of the ease with which it lost H₂O; *perchlorate*, yellow, darkens 200°, fuser 209°. Reduction of the H₂SO₄ or HCl soln. with V salts gave *di-[p-chlorobenzylidixanthyl]ethane*, m. 147-9° (in air, turning brown), 152° (in CO₂, with no color change); in PhBr this absorbed 100% of the amt. of O calcd. to form the peroxide in 4 min. at 20.8°; a sample which had stood in the air for 48 hrs. absorbed the same amt. in 5 min.; after heating 1 hr. at 80°, it absorbed 77% of the theoretical amt. of O, while after 1 hr. at 100°, there was no O absorption. *Isoamylxanthydrol*, m. 95-7° (total yield, 80%), slowly decompd. in contact with the air. The perchlorate, yellow, m. 165°; reduction gives *disoamylidixanthylethane*, m. 137-45° (in air); 158-60° (CO₂); mol. wt., av. 505 (in freezing C₆H₆ under N); in PhBr after 30 hrs. at 21°, 180% of the O required for peroxide formation was absorbed, the end product being xanthone. The solns. when heated undergo reversible color changes which point to an appreciable dissociation at higher temps. *Hexylxanthyl perchlorate*, yellow, m. 126-7°; 1 g. dissolves in about 200 g. glacial AcOH at 25°; it slowly decomps. on standing. *Di-hexylidixanthylethane*, m. 138° (CO₂), sol. in 18 parts boiling Me₂CO, 80 parts Me₂CO at 0°; mol. wt. in *p*-MeC₆H₄Cl, 524, 554; the O absorption increased from 21.2 to 209% in from 1.5 to 55 hrs. The color changes on heating are similar to those of the Am deriv. *Cyclohexylxanthydrol*, m. 158-9°; *perchlorate*, yellow, m. 163° (decompn.); *dicyclohexylidixanthyl*, m. 110-3° (?); the properties of the solns. show that this substance is considerably dissociated in soln. at room temp. The red solns. on diln. show wide deviations from Beer's law and rapidly absorb O, becoming light yellow and yielding a cryst. *peroxide*, m. 147-8°, which dissolves in concd. H₂SO₄ with an orange-yellow color. C. J. W.

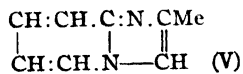
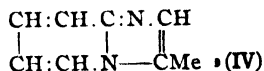
Some new derivatives of phenylarsonic acid. K. KEIMATSU AND S. KAKINUMA. *J. Pharm. Soc. Japan*, No. 520, 520-9(1925).—With a view to prepg. a compd. which contains twice as much As as arsenamine methods of synthesizing phenylenediarsonic acid were first studied, by Bart's diazo method (C. A. 17, 82). (1) Starting with *p*-HOC₆H₄AsO₃H₂ (I): I was nitrated according to Benda and Berthelm (C. A. 6, 749), giving 3,4-O₂N(HO)C₆H₃AsO₃H₂, which was reduced to the NH₂ acid with Na₂S₂O₄. Then the product was diazotized, and H₃AsO₄ added. The free phenylenediarsonic acid thus formed is very difficult to sep. The di-Na salt is also too sol. to be obtained in cryst. form. When equal vols. of free phenylenediarsonic acid and the di-Na salt are mixed, there are obtained small white crystals of the mono-Na salt of 4-hydroxy-1,3-phenylenediarsonic acid, which become brownish gray at 220°, but do not m. even at 290°. Further nitration of this could not be accomplished by Benda's method.

However, by heating at 50–60°, neutralizing, adding the calcd. amt. of acid, drying and then extg. with MeOH, light yellowish crystals of a mono-nitro deriv. of 4-hydroxy-1,3-phenylenediarsonic acid are obtained. Whether this NO₂ is in the 5-position or not is not yet ascertained. (2) Starting with *o*-HO-C₆H₄AsO₂H₂ (II): By Benda's method, II was nitrated. The product decomps. 229–30°. When this is recrystd. from H₂O, it m. 246–7° (III); another nitro compd. (IV) is obtained from the mother liquid. III is identical with B.'s 2,5-HO(O₂N)₂C₆H₃AsO₂H₂. IV decomps. 277–8° and is a mixt. of III and the 3-nitro deriv. III is reduced in MeOH by Na-Hg to 2,5-HO(H₂N)-C₆H₃AsO₂H₂, white crystals changing color at 150° and becoming black at 200°. The further treatment is the same as for I. S. T.

A new method of preparation of quinolinic acid and some of its derivatives. EDUARD SUCHARDA. *Ber.* 58B, 1727–9(1925).—Quinolinic acid (I) is obtained in 500–50 g. yield from 500 g. 8-hydroxyquinoline under H₂O slowly treated with HNO₃ (d 1.52). The imide of I in cold NaOH with NaOCl gives 67.2% β-aminopicolinic acid, 3,2-C₆H₃(NH₂)CO₂H. The imide, m. 233°, of I is obtained in 75% yield from I and AcNH₂ at 120–5° in Ac₂O. C. A. R.

Preparation of tertiary arsines by the Friedel-Crafts reaction. A. F. HUNT AND E. E. TURNER. *J. Chem. Soc.* 127, 2667–71(1925).—PhMeAsCl (15 g.), 60 g. PhMe and 15 g. AlCl₃ give 8 g. *phenyl-p-tolylmethylarsine* (I), b₁₂ 164–5°; it has a fishy odor and slowly oxidizes on keeping; MeI gives *phenyl-p-tolyldimethylarsonium iodide*, m. 93°. PhMeEt(*p*-MeC₆H₄)AsI, m. 150° when recrystd. from EtOH and 158° when crystd. from H₂O; after crystn. from H₂O further crystn. does not change the m. p. *p*-Me-C₆H₄MgI and 20.4 g. PhMeAsCl give 18 g. (76%) of I. PhMeAsCl (15 g.) gives 7 g. (30%) of *phenylmesitylmethylarsine*, b₁₇ 164°, with a fishy odor and slowly oxidized in the air. *Phenylmesityldimethylarsonium iodide*, m. 187°. *Phenylmesitylbenzylmethylarsonium iodide*, m. 179–80°. PhMeAsCl (20 g.) and 60 g. PhBr with AlCl₃ give 5 g. *p*-bromodiphenylmethylarsine (II), b₁₈ 164° (35 g. PhBr were recovered); *p*-bromodiphenyldimethylarsonium iodide, pale yellow, m. 87°. This was also prepd. from *p*-bromophenylarsenious oxide, m. 259–61°, through *p*-bromophenylmethylidoarsine, pale yellow, m. 36.5° (70% yield from *p*-BrC₆H₄AsCl₂, MeI and NaOH in dil EtOH, followed by HCl and a little KI and satg. by SO₂); with PhMgBr this gives 60% of II. *p*-Chlorophenyldichloroarsine, b₂₂ 160°, b. 277°. *p*-Chlorophenylarsenious oxide, m. 198°. *Di-p-chlorophenylchloroarsine*, pale yellow, m. 51°. In the case of the Friedel-Crafts reaction with As compds., it is advisable to use an excess of the non-As component and to remove the HCl as fast as it is formed by gentle boiling. C. J. WEST

Tautomerism of α-aminopyridine. IV. A method of preparation of pyrimidazole and its homologs. A. D. CHICHIBABIN. *Ber.* 58B, 1704–6(1925); cf. C. A. 19, 1275. —Pyrimidazole (I) is obtained by heating α-aminopyridine (II) with BrCH₂CHO or its acetals in sealed tubes at 150–200°. If BrCH₂CH(OMe)₂ (III) is used instead of the free aldehyde, the MeOH resulting from the reaction II + III = LHBr + 2MeOH forms MeBr with the HBr and the MeBr at the high temp. of the reaction may exert a methylating action on the II so that the product will contain large amts. of methylated pyridines. α-Halogenated ketones, XCH₂COR, can theoretically yield 2 isomeric homologs of I, viz. IV and V, but in the 1 case thus far studied (ClCH₂COMe), only 1 of these isomers was obtained. I, b₂₇ 153–5°, is an oil of moldy odor, heavier than H₂O; chloroplatinate, pale orange needles with 2H₂O. Methylpyrimidazole chloroplatinate, red.



C. A. R.

Trypanocidal action and chemical constitution. II. Arylamides of 4-aminophenylarsonic acid. HAROLD KING AND WM. O. MURCH. *J. Chem. Soc.* 127, 2632–51(1925); cf. C. A. 19, 978.—The earlier work showed that, of the arylamides examd, 3'-aminobenzoyl-4-aminophenylarsonic acid was the one to be further developed; this has been done, a series of *p*-substituted *m*-O₂NC₆H₄CO₂H having been prepd., transformed into the acid chloride, condensed with H₂NC₆H₄AsO₂H₂ and reduced. The max. tolerated dose and the min. curative dose on *Trypanosoma equiperdum* in mice are given for several of these compds. Nitration of BzNHC₆H₄AsO₂H₂ at 0° gives 92% of the 3,3'-dinitro deriv. (I), crysts. from 170 parts glacial AcOH as a monohydrate; it forms sparingly sol. Na and K salts. Hydrolysis of I with acid gives a small amt. of *o*-O₂NC₆H₄NH₂, *m*-O₂NC₆H₄CO₂H and 3,4-O₂N(H₂N)C₆H₃AsO₂H₂, though most of I was unchanged after 2 hrs. with 16% HCl; with alkali practically quant. yields of *m*-O₂NC₆H₄CO₂H and 3,4-

$O_2N(H_2N)C_6H_3AsO_3H_2$ were obtained. Reduction of **I** with $FeCl_2$ in $NaOH$ at -5° gives 56% of the 3,3'-diamino compd., clusters of leaflets; the diazo compd. gives with alk. $\beta\text{-C}_{10}H_7OH$ a deep red color. 3',5'-Dinitrobenzoyl-4-aminophenylarsonic acid, needles from 80 parts boiling 90% HCO_2H , in 84% yield from 3,5-(O_2N) $_2C_6H_3COCl$ and $p\text{-H}_2NC_6H_4AsO_3H_2$ (as the Na salt); the max. tolerated dose for mice is 0.5 mg. per g. Attempts to reduce this with $FeCl_2$ in alk. soln. were unsuccessful. 2-Nitro-*p*-toluyl chloride, b_p 167-8° (cor.) and m. 20-1° (cor.). 3'-Nitro-4'-toluyl-4-aminophenylarsonic acid (**II**), needles, in 55% yields; reduction gives 54% of the 3'-amino deriv.; *HCl* salt, needles; *HNO_3* salt, needles; sulfate, square plates. The diazo soln. gives a blood-red color with $\beta\text{-C}_{10}H_7OH$. Nitration of **II** gives the 3,3'-dinitro deriv., needles; hydrolysis with acid gives quant. 4,2-Me(O_2N) $C_6H_3CO_2H$ and 3,4- $O_2N(H_2N)C_6H_3AsO_3H_2$. The 3,3'-diamino deriv., results in 57% yield, forms spherocrystals, gives a yellow diazo soln., which couples with $\beta\text{-C}_{10}H_7OH$ to give a brownish red color. Oxidation of anethole with $KMnO_4$ gives 92% of anisic acid; in alk. soln. at room temp. with 4 atoms O it gave a mixt. of acid and aldehyde; the proportion of acid is increased by carrying out the reaction at 0° . 3-Nitro-4-anisyl chloride, b_p 210°, m. 52.5-3.5° (cor.). 3'-Nitro-4'-anisyl-4-aminophenylarsonic acid (**III**), wooly needles (48.3% yield); the 3'-amino deriv. is obtained in 95% yields; the *HCl* salt, wedge-shaped plates, is most characteristic; sulfate, spherocrystals; nitrate, wooly microneedles; *Ar* deriv. almost insol. in boiling $AcOH$, extremely sol. in 90% HCO_2H , sepg. in anisotropic spherocrysts.; max. tolerated dose for mice, 1.5 mg./g. The *N* formaldehydesulfoxylate was obtained as a powder, from which *HCl* at 50° evolves SO_2 . The carbethoxy deriv. is practically insol. in boiling $AcOH$ but crysts. from 90% HCO_2H in microleaflets, the max. dose tolerated by mice is 0.75 mg./g. The *s*-carbamide crysts. from 90% HCO_2H in microneedles but ppts. from its salts in the gelatinous state. 3''-Nitro-4''-anisyl-3'-amino-4'-anisyl-4-aminophenylarsonic acid, clusters of needles from boiling $AcOH$, the max. tolerated dose for mice being 0.075 mg./g. The 3''-amino deriv., anisotropic solid, results in 75% yields; sulfate, microneedles; nitrate, balls of needles; the max. tolerated dose is 0.02 mg./g. 3''-Nitrobenzoyl-3'-amino-4'-anisyl-4-aminophenylarsonic acid, short, pointed needles from $AcOH$ or square tablets from 90% HCO_2H ; the max. tolerated dose for mice is 0.1 mg./g. The 3''-amino deriv., needles; *HCl* salt, microrods; sulfate, wooly needles; nitrate, anisotropic. Nitration of **III** gave a mixt. of the 3',5'- and 3,3'-dinitro acids, which could not be sepd. by fractional crystn. from 75% $AcOH$ nor by crystn. of the NH_4 salts. The reduction of the mixt. by $FeCl_2$ was unsatisfactory. Hydrolysis of 4-EtOC $_6H_4CN$ with 75% H_2SO_4 gives *Ba* phenol-4-sulfonate, crystg. with 3 H_2O , of which 2.5 are lost in the air; 60% H_2SO_4 for 2 hrs. completely hydrolyzes the nitrite to the acid 3-Nitro-4-ethoxybenzoic acid, m. 200-1°; there also results some 4-nitro- and 2,4-dinitrophenetole. The acid chloride, b_p 215-6°, m. 81-2° (cor.). 3'-Nitro-4'-ethoxybenzoyl-4-aminophenylarsonic acid (**IV**), needles (49% yield); the 3'-amino deriv., wooly microneedles (86% yield); *HCl* salt, small tablets; sulfate, pointed prisms; nitrate, needles; the diazo soln. gives with $\beta\text{-C}_{10}H_7OH$ a bright red color. Nitration of **IV** gives a mixt. of the 3,3'- and 3',5'-dinitro derivs., in the ratio 5:3 as proved by hydrolysis. 4'-Chloro-3'-nitrobenzoyl-4-aminophenylarsonic acid (**V**), needles; this was formed with difficulty, the yield under various conditions varying from 18 to 40%. The 3'-amino deriv. forms leaflets (80% yield); *HCl* salt, oval leaflets; sulfate, square tablets; the diazo soln. gives a bright red color with $\beta\text{-C}_{10}H_7OH$. Nitration of **V** at -5° gives the 3,3'-di- NO_2 deriv., needles; the 3,3'-diamino deriv., pointed plates (76% yield). 4-Ethylcarbonatobenzoic acid, m. 154-6° (94% yield from 4-HOC $_6H_4CO_2H$ and $ClCO_2Et$); 3- NO_2 deriv., m. 168-9° (76% yield); there also results some 4- $O_2NC_6H_4CO_2Et$ and 2,4-(O_2N) $_2C_6H_3CO_2Et$. 3'-Nitro-4'-ethylcarbonatobenzoyl-4-aminophenylarsonic acid, needles (80% yield); hydrolysis gives the 4'-HO deriv., silky needles (97% yield), which is reduced by $FeCl_2$, giving 93.5% of the 3'-amino deriv. (**VI**), needles. From the diazo soln. the diazo oxide seps. as pale yellow needles; it couples with alk. $\beta\text{-C}_{10}H_7OH$ with a cherry-red color. *Na* salt. With Ac_2O and alkali this yields 3'-acetyl-amino-4'-acetoxymethyl-4-aminophenylarsonic acid, soft needles; the max. dose tolerated by mice is 1.75 g./g. *N* $NaOH$ gives the 3'-acetyl-amino-4'-hydroxy deriv., microneedles. **VI** in a mixt. of H_3PO_4 and $AcOH$ gives 3'-amino-4'-hydroxybenzoyl-4-aminoarsenobenzene, amorphous, sol. in $NaOH$ but not in Na_2CO_3 , insol. in HCl but becomes so on addn. of nitrite and then couples with alk. $\beta\text{-C}_{10}H_7OH$. 3-Acetyl-amino-4-acetoxyphenylarsonic acid, needles. **III. Arsonic acids containing the glyoxaline nucleus.** I. E. BALABAN AND HAROLD KING. *Ibid* 2801-14.—Glyoxaline-4(or 5)-carboxyanilide nitrate is dimorphous, both forms crystg. with 0.5 H_2O , unstable fluffy needles and stable, stout prisms, m. 170-1° (decompn.); gradually added to concd. H_2SO_4 at 0° , there results 36 g. of the *p*-nitro deriv. (**I**), crystg. with 2 $AcOH$, m. 307° (cor.).

sol. in 2 *N* NaOH with a pale yellow color (*HCl* salt, crystg. with 1 H₂O, decomp. about 298°; *nitrate*, m 205° (decompn.)) and 14.3% of the *o*-nitro deriv., bright yellow, m. 229° (*HCl* salt, yellow prisms; *nitrate*, yellow, m. 196° (decompn.)). Reduction of I with SnCl₂ and HCl gives the *p*-amino deriv. (II), plates, m 228°; *di-HCl* salt, crystg. with 1 H₂O, blackens about 290°; the diazo soln. couples with alk. β -C₁₀H₇OH with a red color; *chlorostannate*, pale yellow, m. 290° (decompn.); *picrate*, yellow, darkens 256°, decomp. 266°, crystg. with 1.5 H₂O. The *o*-amino deriv. (III), m 270°; *di-HCl* salt, crystg. with 0.5 H₂O, decomp. 310°; *diazoidimide*, m 195-6°, produces no color with alk. β -C₁₀H₇OH; it is very sparingly sol. in H₂O and will detect HNO₂ as a solid cryst. deriv. at a diln. of 1 in 6400 in the presence of AcONa, or, conversely, the amide can be detected at a diln. of 1 in 5000. *Dipicrate*, crystg. with 2.5 H₂O, m 212° (decompn.). II, diazotized and treated with AsO₃ gives 36% of glyoxaline 4' (or 5')-carboxy-*p*-aminophenylarsonic acid, pale yellow, darkens 280°, crystg. from 25% HCO₂H with 1H₂O; *Mg* salt, fine needles, *Ca* salt, anisotropic spherulids; *Na* salt, needles; *HCl* salt, fine needles. Nitration at 0° gives the 3-nitro deriv., yellow plates with 1 H₂O, m. about 327° (decompn.); *Mg*, *Ca*, *Ba* and *Li* salts. Reduction with FeCl₂ in NaOH at -5° gives 86% of the 3-amino deriv., prisms, does not m. 320°; it crysts. with 0.5 H₂O, not lost at 100°. NaNO₂ in a HCl soln. causes the immediate pptn. of the *diazoidimide*, micro-leaflets, which does not couple with β -C₁₀H₇OH; *Mg* and *Ca* salts. 2-*p*-Aminophenylglyoxaline, oil, turns brown on exposure to the air; *di-HCl* salt, prisms, darkens about 300°; *chlorostannate*, needles; *picrate*, orange, decomp. about 239°; no arsonic acid could be prepd. from this compd. 2-*p*-Nitrophenyl-1-methylglyoxaline, pale yellow, m. 116.5° (cor.); *HCl* salt, elongated plates; *chloroaurate*, Au-yellow, decomp. 220° (cor.), soly. 1 part in 300 boiling 3 *N* HCl; *nitrate*, plates, effervescing 186° (cor.); *picrate*, m. 212° (cor.). 2-*m*-Iminophenylglyoxaline, m 203-4°; the monohydrate partly m 130-10° and finally 202-3°; *di-HCl* salt, crysts. with 1 H₂O, m 282° (decompn.); *chlorostannate*, prisms, *picrate*, decomp. 218°. No arsonic acid could be obtained. 2-*o*-Aminophenylglyoxaline, m 136-7°, *di-HCl* salt, m 231-6°, decomp. slightly higher; *chlorostannate*, thin plates; NaNO₂ gives a triazine, m 113-1°, whose *HCl* salt crysts. in needles; it does not couple with alk. β -C₁₀H₇OH; *picrate*, m. 211-2°. 4-*p*-Aminophenylglyoxaline, m 98° (cor.); *di-HCl* salt, darkens 310°; *chlorostannate*, darkens 310°; *dipicrate*, yellow, m 210° (decompn.); the diazo soln. gives an intense purple dye with alk. β -C₁₀H₇OH; but a similar color is obtained with NaOH alone. Pauly's reagent gives an intense red color. Glyoxaline-4 (or 5)-phenyl-*p*-arsonic acid, reddish yellow, does not m 310°; the yield is very small. 4-*o*-Aminophenylglyoxaline, m 131°; *di-HCl* salt, crysts. with 1 H₂O, which is not lost at 95°, effervesce 256°; NaNO₂ gives a bright yellow soln., from which the triazine seps., it is insol. in alkali and does not couple with alk. β -C₁₀H₇OH. *Dipicrate*, decomp. about 200°; normal tartrate, crystg. with 1.5 H₂O and losing 1 H₂O in vacuum over H₂SO₄, m 95-7°, effervesces about 130°; α_{D}^{20} 14.8° (*c* 0.914 in H₂O); *di-d-camphor-10-sulfonate*, m. 198-200°, α_{D}^{20} 21.3° (*c* 1.0 in H₂O). In the action of 28 cc. Me₂SO₄ on 40 g. 2-phenylglyoxaline, there were obtained 32% unchanged product, 18.2% 2-phenyl-1-methylglyoxaline, pale yellow oil, b_{D}^{20} 175° (*HCl* salt, with 2 H₂O); *chloroaurate*, deep yellow, m 189° (cor.), *nitrate*, m. about 100°; *picrate*, m 133° (cor.); *H* ovalate, m 135° (cor.) and, after evapn. of the aq. soln. with HCl, 26.7% of the methochloride, hygroscopic, m. 272° (*chloroaurate*, pale yellow, m. 134° (cor.)). Distn. of the methochloride gave 56% of 2-phenyl-1-methylglyoxaline. The therapeutic action of some of these compds. is given.

C. J. WEST

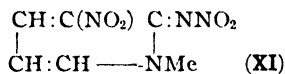
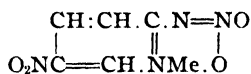
α -Amino- β -picoline and dinitro- α -aminopyridine. Reply to C. R  th. A. E. CHICHIBABIN. *Ber.* 58B, 1707-8 (1925); cf. R. C. A. 19, 1573; R. and Prange C. A. 19, 2823.-C. disputes the claim of R. for priority over Seide (C. A. 19, 518) in the prepn. of α -amino- β -picoline (I) and is convinced that S.'s product, m. 24°, b_{12} 101-2°, and not R.'s, m. 103-4°, b_{11} 113-6°, is the true I. Comparison of C. and Rasorenov's 2-amino-3,5-dinitropyridine (II), m 192° (C. A. 9, 3057), with 5-nitro-2-hydroxypyridine (III) has shown that the 2 compds. are not identical, as claimed by R. and P., and re-analysis of the II has confirmed the results of C. and R. Pure III, m. 186° (cor.). C. A. R.

2-Amino-3-methylpyridine (reply to C. R  th). O. SEIDE. *Ber.* 58B, 1733-4 (1925); cf. R. C. A. 19, 1573.--S. has repeated his prepn. of 2,3-C₅H₃N(NH₂)Me from the purest synthetic β -picoline under the conditions published by R. but has obtained the same results as before. His product, b_{11} 102-3° (cor.), m. 26-6.4°; HCl salt, needles with 1 H₂O, m. 68-75°. R.'s base, m. 103-4°, is apparently α , γ -C₅H₃N(NH₂)Me; in his prepn. he probably used the com. so-called " β -Picolin gereinigt," which as a matter of fact, contains only traces of β -picoline and consists in great part of γ -picoline.

C. A. R.

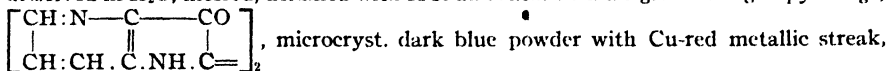
Methylated derivatives of γ -aminopyridine. II. Tautomerism of γ -aminopyridine. A. F. CHICHIBABIN AND E. D. OSSETROVA. *Ber.* 58B, 1708-12(1925); cf. *C. A.* 15, 3109.—The direct action of MeI on α -C₅H₄NNH₂ (I) gives a product (II) yielding with alkalis or moist Ag₂O *N*-methyl- γ -pyridonimine (III); γ -methylaminopyridine (IV) could not be isolated from the mother liquors; the Na deriv. of I with MeI likewise yields chiefly III and no IV. IV can, however, be obtained by treating γ -chlorodipicolinic acid with MeNH₂ and heating the resulting γ -methylaminodipicolinic acid (V) *in vacuo*. Hot concd. alkalis hydrolyze III to *N*-methyl- γ -pyridonimine (VI). *HI* salt (II) of III (4.25 g. from 2.4 g I), m. 187-8°; *picrate*, m. 188-9°; free III, yellowish, b₁₀ 180-1°, solidifies to a very hygroscopic cryst. mass, m. 150-1° which deliquesces and soon turns red in the air, absorbs CO₂ from the air; *chloroplatinate*, red, m. 226-7° (decompn.). VI, obtained by hydrolysis of III or from γ -pyridone and MeI, b₁₃ 230-3°, m. 92-4°; *HgCl₂ compd.*, sinters 120°, m. 177-80° (decompn.). V, gives an intense cherry-red color with FeCl₃ and forms a green flocculent Cu salt IV, m. 115-8°; *chloroplatinate*, orange-red, m. 214-5°; *picrate*, light yellow, m. 168 5-9 0°. C A R.

Nitro derivatives of methylated forms of α -aminopyridine. A. E. CHICHIBABIN AND R. A. KONOVALOVA. *Ber.* 58B, 1712-7(1925).—Nitration of *N*-methyl- α -pyridonimine (I) in cold H₂SO₄ gives a compd., m. 161°, identical with that obtained from Me₂SO₄ and alk. α -C₅H₄NNHNO₂ (*C. A.* 19, 1863) and which undoubtedly is *N*-methyl- α -pyridonenitroimine (II). Concd. H₂SO₄ converts it into the isomer *N*-methyl- β' -nitropyridonimine (III), yellow, m. 181°, also obtained by the action of alkalis on the MeI addn. product (IV) of α , β' -C₅H₃N(NH₂)NO₂. Nitration of α -C₅H₄NNHMe under the above conditions gives a mixt. of NO₂ derivs from which, after treatment with H₂SO₄ as in the isomerization of nitramines, are obtained a compd (V), m. 149°, and III. α , β' -C₅H₃N(NHNO₂)NO₂ (VI) with alk. Me₂SO₄ in the absence of an excess of aq. alkali gives chiefly *N*-methyl- β' -nitro- α -pyridonenitroimine (VII), m. 182°, which in the presence of even very dil. alkalis (Moscow city water) decomp. catalytically into N₂O and β' -nitro-*N*-methyl- α -pyridone, m. 172°, identical with the product obtained by direct nitration of *N*-methyl- α -pyridone. Together with VII is obtained a small amt. of an isomer (VIII), m. 60°, also formed as chief product in the nitration of III, stable towards alkalis in the cold or on gentle warming but with boiling 10% alkalis regenerates III. Whether VII and VIII are *cis-trans* isomers or whether VIII is a structural isomer (IX) is left an open question for the present. Nitration of α , β -C₅H₃N(NH₂)NO₂ in cold concd. H₂SO₄ yields the nitramine C₅H₃N(NHNO₂)NO₂ (X) which with Me₂SO₄ yields a yellow compd (XI), m. 209°, as sensitive to HO ions as the β' -isomer (VII), decomp. into N₂O and *N*-methyl- β -nitro- α -pyridone, m. 176°. With Me₂SO₄ α , β -C₅H₃N(NH₂)NO₂ gives a small amt. of a compd., m. 70 2°. IV, greenish yellow, m. 205-7°. *Picrate* of III, m. 200-1° X, yellowish, m. 137° (decompn.).



C. A. R.

The δ -pyrindigo synthesis. EDUARD SUCHARDA. *Ber.* 58B, 1724-7(1925); cf. *C. A.* 19, 72; Chichibabin, *C. A.* 19, 1275.— β -Aminopicolinic acid (52 g.) with ClCH₂CO₂H and K₂CO₃ in H₂O on the H₂O bath gives 30 g. δ - or [*N*-pyridyl-3-glycine]-2-carboxylic acid, C₈H₅N(CO₂H)NHCH₂CO₂H, m. 245° (decompn.), can be recrystd from dil. acids; 5 g. heated in molten KOH at 260-5°, then cooled in illuminating gas, dissolved in H₂O, filtered, acidified with HCl and satd. with air gives 0.85 g. δ -pyrindigo,



sublimes with decompn. at high temps., very difficultly sol. in org. solvents, easily in concd. H₂SO₄ with blue color, very easily oxidized by HNO₃, decompd. by concd. alkalis with formation of light yellow solns., acids repptg. the dye from fresh solns. but not after they have stood some hrs. in the air; SO₂, HI and even HCl reduce it to the leuco compd.; reduction of the alk. solns. produces a deep-seated change. *Leuco- δ -pyrindigo-HCl*, brick-red, does not m. 360°, is oxidized to the dye at higher temps., dissolves to the extent of 3.68 parts in 100 of H₂O with red-brown color, air oxidizing the soln. to the dye; wool is dyed brown, turning blue after some days. *Leuco- δ -pyrindigo*, green-yellow powder, easily oxidized to the dye in the air, especially if moist or in the presence of dil. alkalis, forms quite stable salts with HCl and H₂SO₄ and red-violet salts with alkalis, concd. alkalis producing deep-seated decompn.; *tetra-Ac deriv.*, gradually

becomes brown in the air, is easily hydrolyzed by boiling acids or alkalis; the AcOH soln. becomes intensely red on short boiling but is decolorized by Ac_2O . C. A. R.

Arsonophenylcinchoninic acid (arsonocinchophen) and derivatives. II. H. O. CALVERY, C. R. NOLLER AND ROGER ADAMS. *J. Am. Chem. Soc.* **47**, 3058–60 (1925); cf. C. A. **19**, 1255.—5-Nitroisatin, m. $254-5^\circ$ (cor.) and BzMe with KOH give 20% of 2-phenyl-4-carboxy-6-nitroquinoline (nitrocinchophen), bright yellow, decomps. about $350-5^\circ$; reduction with SnCl_2 in HCl gives 97% of the 6-amino deriv., bright orange, shrinks 240° , m. $259-60^\circ$ (decompn.). Diazotized and treated with As_2O_3 in KOH- Na_2CO_3 there results 2-phenyl-4-carboxy-6-arsonoquinoline, does not m. 360° . 2,2'-Phenyl-4,4'-carboxy-6,6'-arsenoquinoline, red, does not m. 300° . C. J. WEST

Dependence of rotatory power on chemical constitution. XXVII. The optical properties of alkyl *p*-toluenesulfonates. HENRY PHILLIPS. *J. Chem. Soc.* **127**, 2552–87 (1925); cf. C. A. **19**, 2331.—*Et dl-p-toluenesulfonate* (I), $b_{0.1}$ $99-104^\circ$, n_D^{25} 1.5309, d_4^{25} 1.114, $d_4^1 = 1.137-0.000935t$, γ (dynes/cm.) 38.48, 37.03, 35.23 at 18° , 32° and 49.5° . *Bu ester*, $b_{0.1}$ $90-5^\circ$, n_D^{25} 1.5195, d_4^{25} 1.066. *l-β-Octanol* with $\alpha_D^{21} -8.10^\circ$ gives a *l-β-octyl ester*, $b_{0.1}$ $125-8^\circ$, n_D^{25} 1.5065, $\alpha_D^{22} -22.16^\circ$ (in an Et_2O soln. with K_2CO_3); its rotatory power became $\alpha_D^{19} -8.28^\circ$ after 360 hrs., $\alpha_D^{21} -8.21^\circ$ after 792 hrs., $\alpha_D^{18} -8.01^\circ$ after 1608 hrs. and $\alpha_D^{20} -7.88^\circ$, $\alpha_{5461}^{20} -9.75^\circ$, $\alpha_{4359}^{20} -17.08^\circ$ after 2376 hrs., n_D^{20} 1.5053. The rate of reaction with AcOH was followed by the decrease in optical activity. The ester (II) prepd. with $\text{C}_6\text{H}_5\text{N}$ had n_D^{25} 1.5052, $\alpha_{5893}^{25} -5.98^\circ$, $\alpha_{5461}^{25} -7.56^\circ$, $\alpha_{4359}^{25} -12.16^\circ$ changing after 1433 hrs. to -16.04° , -19.66° and -35.20° , resp. The ester, after 1435 hrs., dissolved in Et_2O and washed with K_2CO_3 , $b_{0.1}$ $105-10^\circ$, n_D^{25} 1.5044, $\alpha_{5893}^{25} -11.64^\circ$, $\alpha_{5461}^{25} -14.03^\circ$, $\alpha_{4359}^{25} -25.68^\circ$. The ester (III) prepd. by heating I with *l-β-octanol*, $b_{0.1}$ 122.4° , n_D^{19} 1.5078, $\alpha_D^{14} -21.16^\circ$, which, after 1511 hrs., showed $\alpha_{5893}^{25} -16.08^\circ$, $\alpha_{5461}^{25} -19.62^\circ$, $\alpha_{4359}^{25} -35.14^\circ$. The recovered ester had n_D^{25} 1.5005, d_4^{25} 1.000, $\alpha_{5893}^{25} -13.52^\circ$, $\alpha_{5461}^{25} -16.25^\circ$, $\alpha_{4359}^{25} -30.09^\circ$. The mutarotation in C_6H_6 was also studied. A series of fractionations of II finally gave a *l-β-octyl l + dl-p-toluenesulfonate*, n_D^{25} 1.5051, d_4^{25} 1.010, $\alpha_{5893}^{25} -29.45^\circ$, $\alpha_{5461}^{25} -35.13^\circ$, $\alpha_{4359}^{25} -66.39^\circ$; at 25.15° , its rotation was const. for at least 762 hrs., but after 860 hrs. it had n_D^{25} 1.5039, $\alpha_{5893}^{25} -8.46^\circ$, $\alpha_{5461}^{25} -9.95^\circ$ and $\alpha_{4359}^{25} -18.04^\circ$. III, on distn., finally gave a mixt. of the *d + dl ester*, n_D^{25} 1.5055, d_4^{25} 1.005, α_{5893}^{25} 6.67° , α_{5461}^{25} 7.61° , α_{4359}^{25} 15.71° ; after 1443 hrs. these values had changed to -15.84° , -19.12° and -34.12° , n_D^{25} 1.5035. These data indicate that some interconversion of the *d*- and *dl*-forms takes place. On heating I menthol and I at 60° and 15 mm. for 48 hrs., there results a *l-menthol ester*, m. 98.100° , $[\alpha]_{5893}^{17} -177.2^\circ$, $[\alpha]_{5461}^{17} -213.0^\circ$, $[\alpha]_{4359}^{17} -387.4^\circ$ (*c* 2.483 in Me_2CO); after 3 crystals, from dil. Me_2CO , it m. $108-9^\circ$, and shows $[\alpha]_{5461}^{17} -239.9^\circ$, $[\alpha]_{4359}^{17} -433.8^\circ$ (*c* 2.609 in Me_2CO) and is considered pure *l-menthyl l-ester*. Oxidation gives *l-menthyl p-toluenesulfonate*. There is evidence that the *l*-rotatory power of the ester increases considerably on standing. If the reaction is carried out in $\text{C}_5\text{H}_5\text{N}$, there results the solid *l + dl ester* and the liquid *d + dl ester*, decomps. 190° at 0.05 mm., $[\alpha]_{5461}^{17}$ 35.04° , $[\alpha]_{4359}^{17}$ 76.38° (*c* 2.782 in Me_2CO). On standing for 91 days the ester becomes cryst. (*l + dl ester*). *l-β-Octanol* and I, heated at 60° and 16 mm. and then at 40° at a lower pressure and the product carefully fractionated, finally gave a *l + dl-I*, $b_{0.1}$ $74-6^\circ$, n_D^{25} 1.5309, $\alpha_{5461}^{25} -3.36^\circ$, which could not be sepd. into fractions with different rotatory powers. On oxidation the activity is lost. The fractions of the *l-β-octyl ester* formed during the above reaction differed considerably in rotatory power; the lowest value observed was $\alpha_{5461}^{25} -34.20^\circ$. The *butyl l + dl-ester*, obtained similarly, $b_{0.1}$ $80-94^\circ$, n_D^{25} 1.5175, $\alpha_{5461}^{25} -4.59^\circ$. After standing 4 days, some racemization occurred during a redistn. Various expts. are also reported in which impure *Et d + dl-ester* was prepd. *dl-p-MeC}_6\text{H}_4\text{SOCl}, treated with 0.5 equiv. of *l-β-octanol* in $\text{C}_6\text{H}_5\text{N}$ and then with PhNH_2 , gives a *l-p-toluenesulfonanilide*, m. 134° , $[\alpha]_{5461}^{17} -1.1^\circ$ (*c* 5.0 in CHCl_3) and -0.65° (*c* 4.669 in $\text{C}_6\text{H}_5\text{N}$). A similar product was obtained with *l*-menthol. The *Et l + dl-ester* was converted into the *Bu d + dl-ester* by warming with BuOH for 18 hrs. at 15 mm. *l*-Menthyl *p*-toluenesulfonate, warmed with glacial AcOH on a H_2O bath for 12 hrs., gave a mixt. of *l*-menthol and *d*-neomenthol. AcONH_4 at 110° for 96 hrs. also causes this transformation. *l-β-Octyl p-toluenesulfonate* and AcOK in EtOH give *d-β-octyl acetate*, while BzOK gives *l-β-octyl Et ether* and benzoate. *d-β-Octyl ethyl ether*, b_{17} $73-4^\circ$, d_4^{20} 0.7838, n_D^{21}*

1.4095, n_{D461}^{21} 1.4105, $\alpha_{D893}^{21.5}$ 15.38°, $\alpha_{D461}^{21.5}$ 18.08°, $\alpha_{D359}^{21.5}$ 33.36°. The original should be consulted for the interesting theoretical discussion.

C. J. WEST

A new pyridanthrone synthesis. REINHARD SEKA. *Ber.* 58B, 1778-83(1925).—*m*-[Cinnamylamino]benzoic acid (I), from $H_2NC_6H_4CO_2H$ and $PhCH:CHCOCl$ in boiling C_6H_6 (yield, 75%), or from $H_2NC_6H_4CO_2H$ and $PhCH:CHCO_2Et$ in sealed tubes at 120°, m 242°; *N*-1c deriv of I with concd H_2SO_4 at 80-90° gives 17-20% 1(N).9-pyridanthrone-(2') (II), yellow, m 406-8°. A com sample of II (*Ger pat* 216,597), after sublimation *in vacuo* and crystn from $PhNO_2$, yielded a product identical with the above *m*-[Cinnamylamino]anistic acid, m 267-8°, similarly gives, but in very small amt. only, the 2-MeO deriv of II, yellow, m 326°, sol in concd. H_2SO_4 with vivid yellow-green fluorescence. *m*-[Cinnamylamino] *p*-toluic acid, m 279°, gives 25-30% of the 2-Me deriv of I (*Ger. pat.* 212,201), yellow, begins to darken 330°, carbonizes 356-9°.

C. A. R.

Methylation of diketopiperazines and piperazines. EMIL ABDERHALDEN AND RICHARD HAAS. *Z. physiol. Chem.* 148, 245-53(1925).—Preliminary to a study of the possibility of increasing the yield of diketopiperazines by methylation of the protein before hydrolysis, a no. of methylated piperazines were prepd. *N,N'*-Dimethylpiperazine-2/III seps in crystals when piperazine in MeOH is refluxed with MeI. *N,N'*-Tetramethylpiperazinium diiodide, decomps 278°, results from further treatment with MeI. Both of these form addn. products with I. Methylation of piperazine by Me_2SO_4 and treatment with HCl and $HgCl_2$ gave a double salt of the compn $C_4H_{10}N_2Cl_2 \cdot 2HgCl_2$. Treatment of this with H₂S gave *N,N'*-tetramethylpiperazinium dichloride, decomps 276°. Sulfate, m 230°, by treatment of the preceding with Ag_2SO_4 . Hydroxide, decomps 175°, was obtained from the sulfate and $Ba(OH)_2$. Methylation of glycine anhydride with Me_2SO_4 gave sarcosine anhydride, and reduction of the latter with Na and EtOH gave *N,N'*-dimethylpiperazine 2/HCl after distg. and acidifying with HCl.

A. W. DOX

Preparation of methylated piperazines. EMIL ABDERHALDEN AND RICHARD HAAS. *Z. physiol. Chem.* 149, 94-9(1925).—3,5-Dimethylpiperazine adds MeI in the same manner as piperazine (cf. preceding abstr.). 1,2,4,5-Tetramethylpiperazine 2/III, (I), m. 257° (decompn.), was prepd. in 75% yield by refluxing 2,5-dimethylpiperazine with MeI. Mono-III salt, m 178° (decompn.), by treating I with NaOH and extg. with $CHCl_3$. The free base, sirup with slight tendency to crystallize, was obtained from I by treatment with Al_2SO_4 and the exact equiv. of $Ba(OH)_2$. 1,1,2,4,5-Hexamethylpiperazinium diiodide (II), m 250°, in 70% yield from dimethylpiperazine and excess of MeI. Hydroxide, m 224°, by treatment of II with Ag_2SO_4 and $Ba(OH)_2$, extn. with EtOH and pptn. by petroleum ether. Dichloride + $HgCl_2$ (III), m 250° (decompn.), in 79% yield by methylation of 2,5-dimethylpiperazine with Me_2SO_4 , addn. of HCl and pptn. with $HgCl_2$. Dichloride decomps 300°, by treatment of II with H₂S. Both I and II form addn. products with I and are pptd. by $KBiF_4$.

A. W. DOX

Sulfonation of 4-chlorophenol. J. M. GAUNTLETT AND SAMUEL SMILES. *J. Chem. Soc.* 127, 2745-6(1925).—Na 4-chloroanisole 2-sulfonate, prisms with 2H₂O, lost at 120°. 4-Chloroanisole-2-sulfonyl chloride, m 104°, the amide, m 151°. Aq. Na_2SO_4 and the chloride give 4-chloroanisole 2-sulfonic acid, m 116°; with Me_2SO_4 and NaOH this gives 4-chloroanisole 2-Me sulfonic, m 91°, while with dil. HI it gives 4-chloroanisole 2-disulfoxide, m 124.5°. 4-Chloroanisole 2-mercaptan, m 42°, volatile with steam. 4-Chloroanisole 2-disulfide, m 105°. The product obtained from the methylation of the sulfonation product of 4-ClC₆H₄OH is identical with that from 5,2-H₂N(MeO)C₆H₃SO₃H.

C. J. WEST

Strychnos alkaloids. XLV. Oxidation experiments with Hanssen's acid. HERMANN LEUCHS (in part with KARL TAUBE). *Ber.* 58B, 1729-32(1925); cf. C. A. 19, 522.—The H acid, $C_{19}H_{22}O_6N_2$ (I), in 2 mols. NaOH with 3% H_2O_2 gives the amine oxide, $C_{19}H_{22}O_7N_2$, isolated as the HBr salt (0.9 g. from 1 g. I), needles with 2 H₂O, gives with $AgNO_3$ only a turbidity, a ppt. being formed only on boiling or adding an acid. Slowly treated in H₂O at 0° with O_3 , I gives 15-20% of the nitrate of I (HNO_3) having been produced from the N in the O during the ozonization) and 30% of unchanged I; no definite compd. could be isolated from the remaining 50% of oxidation products. With 6 atoms Br in H₂O at 100° in sealed tubes, however, I HBr gives, through an amorphous ppt. (perbromide) which slowly re-dissolves, 35% of a compd. $C_{19}H_{22}O_8N_2 \cdot HBr \cdot 3H_2O$, which immediately ppts. AgBr with $AgNO_3$, dissolves in 6-8 parts hot N HBr (sometimes, however, it seps. in thin leaflets which are sol. only in about 30 parts HBr); nitrate, dissolves in about 10 parts hot H₂O or 40-50 parts hot N HNO₃; free acid, obtained in 40% yield from the HBr salt with NaOH, prismatic columns with 1 H₂O;

oxime-HCl, $C_{19}H_{23}O_3N_3 \cdot HCl$, prisms and rectangular tablets with 9.5–9.6% H_2O , sol. in less than 20 parts hot H_2O . C. A. R.

Formation of phenolates with the aid of metals. F. ZETZSCH, H. SILBERMANN AND G. VIELI. *Helvetica Chim. Acta* **8**, 596–602 (1925).—Only Al (*J. Am. Chem. Soc.* **28**, 608–17 (1906)) and the alkali metals appear to have been previously used. With finely divided Mg and 8-HOC₆H₄N (I) in dry C_6H_6 no phenolate is formed, but when increasing small amts. H_2O are added in the form of 96% alc., a max. of 74% of the theory is obtained at a H_2O concn. of 0.1%, the yield falling off rapidly beyond this point. *o*-HOC₆H₄CHO (II) in alc. of various concns. gives a max. yield of 77% Mg salt in 72% alc. The most reactive phenols tested were I and II and 2,3-HO(MeO)C₆H₃CHO (III). *o*-Hydroxychalcones and Me, Et and Ph salicylates did not react. The anils of II and III and *o*-HOC₆H₄CH NNIIPh failed to give Mg and Zn salts, but reacted with Co and Cu. Many of the salts could not be sepd. from the metal powder on acct. of their insol. but in the case of Mg *8-hydroxyquinolate* (IV), if $PhNO_2$ was used as diluent and the Mg and 72% alc. were added in small amts. (method A), the salt was finely divided enough to run through a "Barytfilter" and could then be pptd. by Et_2O ; greenish yellow, mobile powder, turns lemon-yellow 100°, decomps. 200°, insol. in the usual solvents; Zn salt, from Zn powder and I in 72% alc. for 5 days or at the b. p. 6–8 hrs.; purified by extn. with boiling C_6H_{10} (method B); light yellow crystals turning darker above 100°, m. above 260°, yield, 80%. Mg salts of: *salicylaldehyde* (method A), like IV; *2-aceto-1-naphthal* (method B), greenish yellow needles; *1-hydroxyxanthone* (A), yellow needles. Co salts of: *8-Hydroxyquinoline* (B), yellow needles; *salicylaldehyde* (B), yellow needles. Cu salts of: *8-Hydroxyquinoline* (B), greenish brown crystals, *salicylaldehyde* (B), brownish yellow needles, *salicylideneaniline* (B), brown needles, m. 222–6° (cf. Schiff, *Ann.* **150**, 197 (1869)). *Salicylaldehyde*, Zn salt (B), yellow needles from $CHCl_3$. Fe^{++} disalicylate (V) from the acid and Fe powder, boiled in 2% alc. for 1 hr., filtered in a H_2 or N_2 atm., and concd. dry at 140°, yellow, turning green on the surface when exposed to air. Fe^{++} salts of: *8-Hydroxyquinoline*, from I in alc., N NaOH, and V in H_2O , flesh colored to brown hexagons of angle 120°, m. and discolors 120°; *salicylaldehyde*, blue-violet, *o*-vanillin, green, sinters, then turns red and m. 156–8°. The Fe^{++} salts are obtained impure unless all manipulations are rapidly carried out. IV and *p*-O₂NC₆H₄COCl in $CHCl_3$ gave *p*-nitrobenzoyloxyquinoline, m. 171–5°; *p*-nitrobenzoylsalicylaldehyde, m. 123–4°; phenylhydrazone, orange, m. 210–1° (decompn.). A table is given showing the metals with which a no. of phenols react.

M. HEIDELBERGER

Constitution of pine wood lignin. V. PETER KLASON. *Ber.* **58B**, 1761–4 (1925); cf. C. A. **19**, 1851.—To det. the smallest quantity of SO_2 which can be present in a lignosulfonic acid, 43 g. very fine wood powder was extd. with petroleum ether and MeOH and cooked 8 days with nearly satd. H_2SO_4 at about 55°; it now gave 15 g. of a yellow β -C₁₀H₇NH₂ inner salt of the compn. $3C_{10}H_{10}O_3 + H_2SO_4 + C_{10}H_9N \cdot H_2O$, *i. e.*, it is apparently impossible to obtain a compd. with less than 1 mol. SO_2 to 3 of C₁₀H₁₀O₃ and the acid $3C_{10}H_{10}O_3 + H_2SO_4$, which is first formed in the sulfite cooking, must constitute the main part of the sulfonic acids of the waste liquor, although such liquors must also contain acids with more SO_2 . The lignosulfonic acids are not combined with carbohydrates; when the C₁₀H₇NH₂ salt is converted into the K salt with KOH, freed from C₁₀H₇NH₂ with Et_2O and inverted 5 hrs. on the H_2O bath with HCl, it gives no trace of Cu_2O with Fehling soln. By repeated treatment of the waste liquor with SO_2 and cooking at 100° and 120° the S content of the C₁₀H₇NH₂ salt can be raised to 8.31%; this salt, $C_{10}H_{10}O_3 + H_2SO_4 + C_{10}H_9N \cdot H_2O$, is apparently a deriv. of the simple (monomeric) coniferyl aldehyde; when pptd. in nearly neutral soln. it has the compn. $C_{10}H_{10}O_3 + H_2SO_4 + 2C_{10}H_9N \cdot H_2O$, *i. e.*, it is both an anil and an NH_4 salt. With a waste liquor contg. the acid $3C_{10}H_{10}O_3 + H_2SO_4$ pptn. in nearly neutral soln. gives a red salt $3C_{10}H_{10}O_3 + H_2SO_4 + 2C_{10}H_9N \cdot H_2O$. From a luke-warm, not too dil. soln. of β -C₁₀H₇NH₂ HCl shaken with paraldehyde and allowed to stand some days is obtained a yellow-brown cryst. salt $(AcH)_3 + 2C_{10}H_9N \cdot 2H_2O$, while metaldehyde, even on heating, is much more stable towards C₁₀H₇NH₂ HCl. Synthetic PhCH·CHCHO, especially if old, contains polymers; the monomer is dissolved away by shaking with satd. aq. SO_2 at room temp. and the polymers remaining are shaken hot in sealed vessels with aq. SO_2 ; there is thus obtained through the Ba salt an acid which in HCl with β -C₁₀H₇NH₂ HCl gives a yellow, apparently cryst. compd. $(PhCH \cdot CHCHO)_3 + H_2SO_4 + C_{10}H_9N \cdot H_2O$, m. around 160°. The Ba salt with aq. SO_2 at 110–5° does not add more SO_2 and at 130–5° decomps. into its components. Since α -lignosulfonic acid thus corresponds, point for point, with the sulfonic acid of cinnamparaldehyde, it may be assumed provisionally that α -lignin is coniferyl paraldehyde. C. A. R.

yielding with $\text{SnCl}_2 \cdot \text{HCl}$ 78.5% of 2,2'-dimethyl-5,5'-diaminobiphenyl, b_{13} 225–8°, m. 96–8°; *di-HCl salt*. The diamine (3 g.), when diazotized in H_2SO_4 and heated on the H_2O bath, gives 2,2'-*di-p-cresol* (0.4 g. product purified by sublimation under 13 mm.), m. 229°, gives no color with aq. or alc. FeCl_3 or with PbO_2 in boiling C_6H_6 , is not volatile with steam, dissolves in 98% H_2SO_4 without color. Unsuccessful attempts were made to prep. the dicresol from *o*-iodo-*p*-cresol which was obtained in 17.5% yield from the *o*- NH_2 compd. and m. 63–4°; its *benzoate*, m. 53°. *p*- $\text{MeC}_6\text{H}_4\text{OCH}_2\text{C}_6\text{H}_4\text{NH}_2(p)$ on diazotization in $\text{AcOH} \cdot \text{H}_2\text{SO}_4$ gives *p*-cresol *p*-acetoxymethyl ether (62.5% crude product), m. 98°, decompd. on even cautious hydrolysis at 0° with aq. or alc. alkalis or NH_4OH into *p*-cresol (and *p*- $\text{HOC}_6\text{H}_4\text{CH}_2\text{OH}^?$), no further efforts were made to isolate the free $\text{MeC}_6\text{H}_4\text{OCH}_2\text{C}_6\text{H}_4\text{OH}$, as its instability sufficed to show that it was not identical with I or III. *Di-[\omega-chloro-p-cresyl] carbonate*, from $\text{CO}(\text{OC}_6\text{H}_4\text{Me})_2$ and Cl at 120–30° (yield, 39%), m. 95°; 25 g. refluxed with *p*- $\text{MeC}_6\text{H}_4\text{ONa}$ gives 11 g. 3-methyl 6,6'-*di-hydroxydiphenylmethane*, b_{12} 227–35°, m. 135.5°, gives a blue color with aq. FeCl_3 , dissolves in H_2SO_4 without color; *diacetate*, m. 86°; *di-Me ether*, from the phenol in KOH with Me_2SO_4 , m. 74°, also obtained by reduction by the Clemmensen method of 3,6-Me(MeO) $\text{C}_6\text{H}_3\text{COC}_6\text{H}_4\text{OMe}(4)$, prepd. from *p*- $\text{MeOC}_6\text{H}_4\text{COCl}$ and *p*- $\text{MeC}_6\text{H}_4\text{OMe}$.
C A R

Formation of desoxybiliaric acid from bilianic acid, and of desoxycholic and of isodesoxybiliaric acids from isobiliaric and desoxycholic acid. RICHIO KARASAWA. *J. Biochem. (Japan)* 5, 105–12(1925).—To 1 g. of pure isobiliaric acid in 75 cc. 7% KOH , is added in the course of 30 min. 2 cc. Br_2 . The clear soln. is cooled on the water bath to about 30 cc. (it should be acid to litmus), mixed with an equal vol. of H_2O , left overnight, then filtered and the residue washed with ice cold H_2O . The filtrate and wash water are carefully acidified to Congo red with dil. H_2SO_4 until a yellow ppt. is formed. The filtrate from this is again acidified and left for several days. The pptd. substance is dissolved in dil. alc. and decolorized with charcoal. This is then boiled with $\text{Ba}(\text{OH})_2$ and the Ba salt filtered off while hot and washed with hot water. The ppt. is now evapd. on the water bath with a Na_2CO_3 soln. to complete dryness and extd. with H_2O . On acidifying the H_2O ext. with dil. HCl a Br free substance is obtained. The substance which remains insol. in hot water is crystd. from dil. alc. It is easily sol. in acetone and glacial AcOH . Dried *in vacuo* at 110–15°, the acid m. 247–8°. The analyses show it to be isodesoxybiliaric acid. When 2 g. pure bilianic acid in 150 cc. 7% KOH is treated with 4 cc. Br_2 (the remaining procedure being the same as before) there is obtained desoxybiliaric acid, m. 294.5°. Similarly 2 g. of desoxycholic acid, in 150 cc. 7% KOH with 4 cc. Br_2 as above gives a Ba salt, part of which is sol. in hot water and yields desoxybiliaric acid, whereas the fraction insol. in the hot water gives isodesoxybiliaric acid.
S MORGULIS

Scymnol-sulfuric acid. I. SHU OIKAWA. *J. Biochem. (Japan)* 5, 63–70(1925).—The bile from sharks is freed of lipins with ether and CHCl_3 , and is then thoroughly extd. with alc. The combined alc. extracts are evapd. and the residue is treated in H_2O with $\text{Pb}(\text{OAc})_2$ and NH_4OH . The pptd. Pb salts are converted into alkali salts by heating on the water bath with Na_2CO_3 , freed from the carbonates by extn. with alc. and pptd. with ether. The α -scymnol-sulfuric acid is isolated from this mixt. of bile salts as follows. To the Na salts in H_2O is added an equal vol. 40% KOH . On standing in the ice box a ppt. is formed which is removed by centrifuging. The ppt. is redissolved in H_2O satd. with CO_2 and the scymnol-sulfuric acid is pptd. with ether from the H_2O soln. treated with alc. to remove carbonates. After repeated purification by ether pptn. of the alc. soln. the substance was obtained (Na salt) as snow-white needles, sol. in H_2O and alc. but insol. in ether or CHCl_3 . It has a sweetish-bitter taste and gives the Pettenkofer bile acid reaction. The scymnol-sulfuric acid was hydrolyzed with $\text{Ba}(\text{OH})_2$, boiling under a reflux condenser for 30 hrs. when on cooling the scymnol sep'd. out as a cryst. ppt. This was dissolved in alc. and dild. with H_2O until the soln. turned turbid when it was placed in the ice chest. The α -scymnol, $\text{C}_{27}\text{H}_{48}\text{O}_6$, sep'd. rated as needles, with 2 H_2O , having a sweetish-bitter taste, m. 108°, $[\alpha]_{\text{D}}^{20}$ 38.2° (95% alc.), gives a violet soln. in 25% HCl . The O seems to be entirely in the form of OH groups. Its oxidation product, $\text{C}_{27}\text{H}_{48}\text{O}_8$, m. 208°, is readily sol. in Me and Et alc., acetone, CHCl_3 and glacial AcOH , but not readily sol. in ether. In alc. the soln. reacts acid and has $[\alpha]_{\text{D}}^{20}$ 51.7°. S. MORGULIS

Condensation of guaiacol with substituted benzoic acids. H. MANIWA. *J. Pharm. Soc. Japan* No. 515, 39–49(1925).—In order to study the method of phyllo-dulcin synthesis, the condensation of guaiacol with various substituted benzoic acids was attempted. Friedel-Craft's synthesis with 3-nitro-*o*-toluyl chloride and benzoyl-

guaiacol was not successful. Claisen and Schädwell's method, using 3-methoxytoluyl chloride and benzoylguaiacol in the presence of AlCl_3 gave crystals, 2,6-Me(MeO)- $\text{C}_6\text{H}_3\text{COC}_6\text{H}_3(\text{OMe})\text{OH}$ (3,4) (m. 97°), but detailed studies on this compd. could not be continued on account of the lack of material. When *o*-MeC₆H₄COCl is condensed with guaiacol carbonate in the presence of ZnCl_2 at 120° , a cryst. compd. MeC₆H₄COC₆H₃(OMe)OCOC₆H₃(OMe)COC₆H₄Me is obtained and on sapon. gives toluoguaiacol, MeC₆H₄COC₆H₃(OMe)OH, m. 112° , its acetate, m. $96-7^\circ$, benzoate, m. 98° , methyl ether, m. $72-3^\circ$, Et ether, m. $107-8^\circ$, and oxime, m. $164-6^\circ$. On heating with HI, toluoguaiacol gives 3,4-(HO)₂C₆H₃COC₆H₄Me, m. $105-6^\circ$, gives with FeCl_3 a green color, that becomes red with dil. alkali. S T

Formation of safroegenol and isosafroegenol (from safrol and isosafrol). K. KAFUKU. *J. Pharm. Soc. Japan* No 521, 609-24 (1925).—The purified safrol had n_D^{20} 1.5255, d_4^{20} 1.0960, b_6 $101-5^\circ$, b_{760} $231.5-2^\circ$, $[\alpha]_D$ 0 and m. $10-1^\circ$. Isosafrol was prepd. by refluxing pure safrol with alk. alc. and purified. It b_6 $111-2^\circ$, d_4^{15} 1.1196, n_D^{20} 1.5744. Hydrosafrol was prepd. by catalytic reduction with Pt black or Ni. The CH_2O rings of these compds were broken by the action of specially prepd. MeMgI for 5-6 hrs. at 80° ; and by subsequent steam distn., safroegenol, isosafroegenol and hydrosafroegenol were obtained. The safroegenol thus prepd. was identified as 3,4-HO(EtO)C₆H₃CH₂CH₂CH₃, which can be converted into isosafroegenol by a prolonged treatment with hot alk. soln. Its phenylurethan, m. $57.5-9.0^\circ$. The isosafroegenol is 3,4-HO(EtO)C₆H₃CH₂CHMe, m. 86° , its acetate, m. 67° , benzoate 59° , Me ether 63° and phenylurethan 123° . The hydrosafroegenol, m. 42.5° and is 3,4-HO(EtO)C₆H₃Pr, which can be obtained from safroegenol by catalytic reduction or by action of metallic Na and alc. on isosafroegenol. The special MeMgI was prepd. by cong. the ordinary Grignard's reagents to an almost sirupy consistency by removal of all Et₂O. The detailed method of identification of these products and their chem. and phys. characteristics are given in detail. S T

2-Amino-3-methoxybenzaldehyde and several of its derivatives. J. TRÖGER AND E. DUNKER. *J. prakt. Chem.* 111, 207-16 (1925).—2-Amino-3-methoxybenzaldehyde, oily, is obtained in 84% yield by reducing the NO₂ deriv. with FeSO_4 in a soln. of Na₂CO₃ and NaHSO₃; it is not volatile with steam, possesses basic properties, though cryst. salts could not be prepd.; oxime, m. 142° ; semicarbazone, yellow, m. 223° ; phenylhydrazone, m. 139° . In EtOH, it condenses with AcCH₂CO₂Et to give Et *o*-methoxyquin-aldine- β -carboxylate, crystg. with 1 H₂O, m. $76-9^\circ$ or, anhyd., m. $102-5^\circ$ (chloroplatinate, yellow needles). The free acid cryst. with 3 H₂O and m. 126° , Ag salt, amorphous, HCl salt; chloroplatinate, brownish red needles. The aldehyde and AcCH₂CO₂H at 160° give *o*-methoxy- β -acetylcarbostyril, canary-yellow, m. 183° (phenylhydrazone, orange-yellow, m. 119°). C J. WEST

Influence of the position of the NO₂ and NH₂ groups upon the reactivity of the aldehyde group in nitro and amino derivatives of *m*-hydroxybenzaldehyde and *m*-methoxybenzaldehyde. J. TRÖGER AND H. FROMM. *J. prakt. Chem.* 111, 217-39 (1925).—4,3-O₂N(HO)C₆H₃CHO condenses readily with arylsulfonacetonitriles; the following α -sulfon- β -3-hydroxy-4-nitrophenylacrylonitriles were prepd. benzene, light yellow, m. $155-6^\circ$; *p*-toluene, yellow, m. 184° ; *p*-chlorobenzene, light yellow, m. 170° , *p*-bromobenzene, egg-yellow, m. $182-3^\circ$; β -naphthalene, egg-yellow, m. 174° ; *o*-anisole, yellow, m. 187° (Ac deriv., light yellow, m. $156-7^\circ$); *p*-phenetole, Au-yellow, m. 188° . Condensation does not proceed as readily with 6,3-O₂NC₆H₄(OH)CHO and the products are not easily isolated; the following α -sulfon- β -3-hydroxy-6-nitrophenylacrylonitriles were prepd.: *p*-toluene, m. $115-6^\circ$; *p*-chlorobenzene, oily, analyzed as the Ac deriv., m. $130-1^\circ$; *o*-anisole, m. $142-3^\circ$. Similar results were obtained with the Me ethers of these aldehydes. α -*p*-Toluenesulfon- β -3-methoxy-4-nitrophenylacrylonitrile, light yellow, m. 188° ; *p*-chlorobenzene deriv., yellow, m. 206° ; the *p*-Br deriv. was also prepd. 6-Amino-3-methoxybenzaldehyde, analyzed as the HCl salt, and as the phenylhydrazone, m. $179-80^\circ$; the free aldehyde could not be isolated as it appears to polymerize, giving an EtOH- and Et₂O-insol. product. The aldehyde in alc. and *p*-ClC₆H₄SO₂CH₂CN give α -amino- β -*p*-chlorobenzenesulfon-*p*-methoxyquinaldine, egg-yellow, m. $181-2^\circ$, shows a strong green fluorescence in EtOH. 2,3-O₂NC₆H₄(OMe)CHO and *p*-MeC₆H₄SO₂CH₂CN give α -*p*-toluenesulfon- β -3-methoxy-2-nitrophenylacrylonitrile, yellow, m. 209° ; α -*p*-chlorobenzene deriv., yellowish, m. 202° ; α -*p*-bromobenzene deriv., Au-yellow, m. 215° ; α -*o*-anisole deriv., pale yellow, m. 193° . α -Amino- β -benzenesulfon-*o*-methoxyquinoline, canary-yellow, m. $243-4^\circ$; the β -*p*-chlorobenzene deriv., orange, m. 266° ; the β -*p*-bromobenzene deriv., canary-yellow, m. 281° ; the β -*p*-toluene deriv., orange, m. $256-7^\circ$; the β -*o*-anisole deriv., brownish, m. 260° ; the β -*p*-phenetole deriv., m. $272-3^\circ$.

While the 2,3-O₂NC₆H₄(OMe)CHO requires 1–2 hrs for the completion of the reaction, the 2-NH₂ deriv. requires only a few min.

C. J. WEST

Metallic compounds of 1,3-diketones. VI. The action of tin tetrachloride and zirconium tetrachloride upon 1,3-diketones. WALTHER DULTHEY. *J. prakt. Chem.* **111**, 147–52 (1925); cf. *Ann.* **344**, 300 (1905).—BzCH₂Ac (I) and ZrCl₄ in abs. Et₂O give the *compd.* (BzAcCH)₂ZrCl₂, yellow, m. 232–4°; in boiling C₆H₆ an excess of I gives the *compd.* (BzAcCH)₃ZrCl, m. 260°. SnCl₄ and I in CHCl₃ give the *compd.* (BzAcCH)₂SnCl₂, pale yellow, m. 220°. SbCl₅ gives the *compd.* (BzAcCH)₂SbCl₄, orange, m. 184°. (Bz₂CH)₂SbCl₄, orange, m. 232–4°; the *compd.* does not show salt-like properties. The *compd.* (Bz₂CH)₂SnCl₄, m. 243–4°, is so stable that it can be recrystd. from EtOH. A *compd.* with more than 2 BzCH₂ residues could not be prepd.

C. J. WEST

Dibenzalacetone and triphenylmethane. XII. Dimethylacetal and chloromethylate of *p,p*-dimethoxybenzalacetophenone. FRITZ STRAUS and WALTHER HEYN. *Ann.* **445**, 92–110 (1925); cf. *C. A.* **19**, 1410. MeOC₆H₄CCl₂CHCHClC₆H₄OMe, best prepd from the ketone and (COCl)₂, gives with 2% MeONa in C₆H₆, 80% of *p,p*-dimethoxybenzalacetophenone *di-Me acetal* (I), b_{0.8–0.9} 228–30°, light yellow oil, satd. towards alk. KMnO₄, very sensitive towards acids, catalytic reduction gives *p,p*-dimethoxybenzalacetophenone *di-Me acetal*, b_{0.6–0.7} 217–8°, d₂₀²⁰ 1.098, n_D²¹ 1.54139. I in CS₂ with CS₂ satd. with HCl gives a carmine-red HCl salt with steel blue luster, which is very sensitive towards moisture, immediately giving the ketone, m. 101.5°. With MeONa it regenerates I; heated in a stream of H₂, there results the ketone, MeCl and HCl. The salt gives a dimorphous (red and brown) HgCl₂ salt, C₁₇H₁₆O₃CH₃Cl HgCl₂. MeOC₆H₄COCH₂CHC₆H₄OMe is turned to a red powder by passing HCl over it; in liquid SO₂ the HCl salt ppts., dark red; the HBr salt, red, appears to be somewhat more stable the HCl HgCl₂ salt is cinnabar-red. MeOC₆H₄CCl₂CH(OMe)C₆H₄OMe decomps. into the ketone and MeCl; under the influence of a trace of HCl, the chloride is transformed into (MeOC₆H₄C(OMe)CHCHC₆H₄OMe)Cl, from which NaOMe gives the ketone, m. 102°. *p,p*-Dimethoxycinnamylidenacetophenone *di-Me acetal*, pale yellowish brown oil, b_{0.2–0.6} 241–3° (45% yield); the CS₂ soln. is colored violet by HCl and deposits the bluish black HCl salt. Conc'd. HCl gives *p,p*-dimethoxycinnamylidenacetophenone, m. 112.5–3°; conc'd. H₂SO₄ gives an orange soln.

C. J. WEST

Ester and sulfonate derivatives of anthranilic and methylantranilic acids. O. KELLER and G. SCHULZE. *Arch. Pharm.* **263**, 481–502 (1925).—In connection with a study of damascenine, the alkaloid of *Nigella damascena*, certain esters and SO₃H acid derivs. of anthranilic and methylantranilic acids were prepd. and characterized anew. Expts. with the esters showed their formation from low-mol. aliphatic alics. to be smooth, while those of higher mol. wt. and with side chains were obtained only with difficulty. The sepn. of the esters from unchanged acid was effected with Na₂CO₃ and Et₂O in the case of anthranilic acid, while methylantranilic acid was easily extd. from an alk. Na₂CO₃ soln. The ester HCl salts of both acids crystd. readily and were stable in a dry state. All the esters (HCl salts) examd. are hydrolyzed in H₂O, with sepn. of the free esters, in contrast with the behavior of damascenine-HCl (Me methoxymethylantranilate) and of damascenine-SHCl (methoxymethylantranilic acid). These HCl salts yield clear aq. solns. with no apparent hydrolysis, thus indicating in this connection the great influence of the OMe group. The esters described (Me, Et and Pr) of anthranilic, and (Me and Et) of methylantranilic acids are not saponif. either by cold or hot H₂O, or in HCl soln. Damascenine on the contrary suffers hydrolysis on recrystn., as also on the dry heating of its HCl salt. Expts. on the sulfonation of anthranilic acid lead to the conclusion that at present only the *m*- and *p*-sulfonates are known.

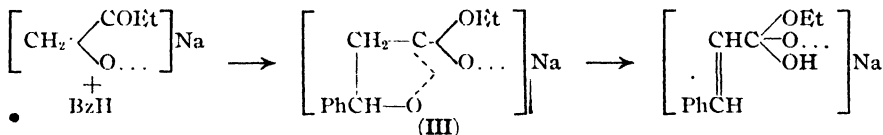
W. O. E.

Hydroxybenzal azides and indoxazenes. HANS LINDEMANN and ALBERT MÜLLHAUS. *Ann.* **446**, 1–13 (1925).—4-Hydroxy-3,5-dibromo-2,6-dimethylbenzal azide, m. 101° (decompn.), from the corresponding bromide and NaN₃; boiling with EtOH gives 3,5,2,6,4-Br₂Me₂(HO)C₆CHO; boiling AcOH gives the corresponding benzonitrile, m. 189° (*Ac deriv.*, m. 161°); sapon. with H₂SO₄ gives the corresponding acid amide, m. 270° (decompn.). 2-Hydroxy-3,5-dibromobenzal azide, m. about 70° (explodes on rapid heating); heating with C₆H₆ or AcOH gives 4,6-dibromoindoxazene, m. 141°, which is changed by heat or EtOH-NaOH into 3,5,2-Br₂(HO)C₆H₂CN, m. 174° (Auwers and Walker, *Ber.* **31**, 3042, give 167–8°), whose *Ac deriv.*, m. 97°. 3,5-Dibromo-4,6-dimethyl-2-hydroxybenzal azide, m. 64° (decompn.); 4,6-dibromo-3,5-dimethylindoxazene, m. 185°, giving 3,5-dibromo-4,6-dimethyl-2-hydroxybenzonitrile, m. 212° (*Ac deriv.*, m. 145°), saponif. by conc'd. H₂SO₄ to the corresponding acid amide, m. 267° (*Ac deriv.*, m. 137°).

C. J. WEST

Course of the reaction in Claisen's cinnamic ester synthesis. HELMUTH SCHEIB-

LER AND HERMANN FRIESE. *Ann.* **445**, 141-58(1925).—Since there is little difference in the yield of $\text{PhCH:CHCO}_2\text{Et}$ (I) and $\text{PhCH:CHCO}_2\text{H}$ (II) when BzH is added to a freshly prep'd. soln. of K and AcOEt , a soln. which has stood for 24 hrs. or when BzH and AcOEt in Et_2O are treated with K , the 1st phase of the reaction consists in the formation of an enolate, $\text{CH}_2\text{:C(OK)OEt}$, of AcOEt . Thus, 10 g. K powder and 22.5 g. AcOEt in 300 Et_2O with 13.3 g. BzH in 100 cc. Et_2O gave 32.9% II and 25% I; if the BzH is added after 42 hrs., there result 32.9% II and 28.2% I; if the 3 reactants are added simultaneously, there result 31.1% II and 29.5% I. With Na in place of K , the % yields of II and I under the 3 conditions above are: 35.6 and 13.6; 59.7 and 20.5; 54.8 and 18.2. The solid reaction product of Na and AcOEt (13.8 g.), mixed with 11.7 g. BzH , gives after 2 days, 7.3 g. II, 4.5 g. I and 2.5 g. unchanged BzH . BzH does not react with anhyd. $\text{AcCHNaCO}_2\text{Et}$. BzH (42.4 g.), 52.8 g. AcOEt and 9.2 g. Na , boiled until the Na had disappeared, the excess AcOEt boiled off and then twice evap'd. with AcOEt , gave about 90 g. of a resinous, brown, hygroscopic mass (III) which, decomp'd. with cold dil. H_2SO_4 , gave 82.4% II and 13.9% I. The use of 4 mols. BzH to 1 mol. EtONa did not improve the yield. III reacts with AcCl in Et_2O to give



II, I, AcOH and AcOEt . In C_6H_6 , 33 g. III and 12 g. AcCl give 8.4 g. II, 10.4 g. I and 10.4 g. resinous product. With PhCH_2I , 15.1 g. III in Et_2O gives 3 g. II, $\text{PhCH:CHCO}_2\text{CH}_2\text{Ph}$, PhCH_2OH and EtOH . AcOCH_2Ph , BzH and Na give 20.8% I and 73% $\text{PhCH:CHCO}_2\text{CH}_2\text{Ph}$. The intermediate condensation product reacts with EtBr to give II, $\text{PhCH:CHCO}_2\text{CH}_2\text{Ph}$, EtOH and PhCH_2OH . BzH , $\text{Me}_2\text{CHCO}_2\text{Et}$ and EtONa give 20.6% of α, α -dimethyl- β -phenylhydraerylic acid, m. 134° and 47.8% of its ester.

C. J. WEST

The formation of phosgene from carbon tetrachloride. F. WIRTH. *Chem.-Ztg.* **49**, 615-7(1925).—A paper citing the poisonous qualities of CCl_4 and particularly the ease with which it is oxidized to COCl_2 , with reference to previous exptl. work upon the subject. No original work is reported.

M. A. YOUTZ

Lactonic esters derived from phenacyl bromide by condensation with ethyl sodiomalonate and analogous substances. R. M. RAY and J. N. RAY. *J. Chem. Soc.* **127**, 2721-3(1925).—The prep'n. of α -substituted tetrahydrophthalenes, the primary object of this work, was not achieved. BzCH_2Br and $\text{CHNa}(\text{CO}_2\text{Et})_2$ give Et phenacylmalonate, which, shaken with 6% KOH in the cold, gives α -carbethoxy- γ -hydroxy- γ -phenyl- $\Delta\beta$ -propenecarboxylic lactone, $\text{PhC:CH.CR}(\text{CO}_2\text{Et})\text{CO}_2\text{O}$ ($\text{R} = \text{H}$), m.

105° ; amide, m. $153-4^\circ$; oxidation with KMnO_4 gives BzOH . $\text{NCCHNaCO}_2\text{Et}$ gives Et diphenacylcynoacetate, m. 141° and a small amt. of a comp'd., m. $125-7^\circ$, which may be a mono-substitution product. $\text{AcCNa}(\text{CO}_2\text{Et})_2$ gives the lactone of Et α -acetyl- γ -hydroxy- γ -phenyl- $\Delta\beta$ -propenecarboxylic acid ($\text{R} = \text{Ac}$), m. $135-6^\circ$. $\text{EtCNa}(\text{CO}_2\text{Et})_2$ gives the lactone ($\text{R} = \text{Et}$), m. $134-5^\circ$. The lactone ($\text{R} = \text{PhCH}_2$), m. 125° ; the lactone ($\text{R} = \text{CHMe}_2$), m. 151° . In these expts., varying amts. of PhAc were obtained as a result of the reduction of the bromide.

C. J. WEST

Relation between chemical constitution and pungency in acid amides. E. C. S. JONES and F. L. PYMAN. *J. Chem. Soc.* **127**, 2588-98(1925).—A no. of acylbenzylamides have been prep'd. by Nelson's (*C. A.* **14**, 547) or Einthorn's method (*Ann.* **343**, 207(1905)). It appears that the shape rather than the wt. of the side-chain is the important factor in the matter of pungency. The m. p. (cor.), yield and pungency are reported: Nonovanillylamide, $57-9^\circ$, 86%, 100; α -isopropylhexovanillylamide, $124-5^\circ$, 80%, 5; $\Delta\omega$ -undecenovanillylamide, $58-60^\circ$, 89%, >100; benzovanillylamide, $144-5^\circ$, 90%, 0.5; phenylacetovanillylamide, 112° , 80%, 0; β -phenylpropiovanillylamide, $80-3^\circ$, 88%, 40; γ -phenylbutyrovanillylamide, $93-5^\circ$, 85%, >40; δ -phenylvalerovanillylamide, 67° , 85%, >40; β -*p*-nitrophenylpropiovanillylamide, 119° , 80%, 20; cinnamovanillylamide, $146-7^\circ$, 85%, 0.5; α, β -dichloro- β -phenylpropiovanillylamide, $164-5^\circ$, 60%, 3; chloroacetovanillylamide, $119-22^\circ$, 76%, 3; dichloroacetovanillylamide, $139-43^\circ$, 75%, 3; trichloroacetovanillylamide, $76-9^\circ$, 56%, 3; bromoacetovanillylamide, $94-5^\circ$, 28%, 3; iodoacetovanillylamide, 114° , 100%, 3; nono-3,4-dihydroxybenzylamide, 78° , 68%, 25; $\Delta\omega$ -undeceno-3,4-dihydroxybenzylamide, $70-4^\circ$, 70%, 50; nono-3,4-methylenedioxybenzylamide, 92° , —, 0; nono-4-hydroxybenzylamide, 92° , 87%, 10; $\Delta\omega$ -undeceno-4-hydroxy-

benzylamide, 92°, 31%, 30; *nono-4-methoxybenzylamide*, 103°, —, —. The following intermediate products were prepd.: *vanillylamine*, m. 145–6° (N. gives 131–3°); HCl salt, m. 227° (cor.); *divanillylamine-HCl*, m. 244° (cor.); the free base, m. 92° (propyl), 104° (cor.); *piperonylamine-HCl*, m. 247° (cor.). *3,4-dihydroxybenzylamide*, brown, m. 158° (cor.). *Isopropylbutylmalonic acid*, m. 105°; distn. gives 77% of α -isopropylhexoic acid, b. 220–5°, whose chloride b. 155–8° and amide, m. 93° (cor.). γ -*Phenylpropylmalonic acid*, m. 95° (cor.), loses CO₂ at 160–70°. *O-Aceto-N-undecanovanyllamide*, m. 88° (cor.). *N-Methylol- Δ^{ω} -undecenoamide*, m. 77° (cor.). Several compds. were prepd. by both Nelson's and Einhorn's method in order to prove the constitution of the latter products.

C. J. WEST

Constituents of the kawa kawa. II. Constitution of methysticin. Y. MURAYAMA AND K. SHINOZAKI. *J. Pharm. Soc. Japan* No. 520, 526–9 (1925); cf. *C. A.* 19, 1706.—According to Winzheimer, (*C. A.* 3, 429), methysticin, C₁₅H₁₄O₆ (I), one of the crust constituents of the kawa-kawa, has the structure CH₂O₂C₆H₄CH:CHCH:CHCOCH₂CO₂Me and with alkali gives methysticic acid, C₁₄H₁₂O₆. When M and S treated I with alkali they obtained a compd. C₁₆H₁₄O₆ (II). It has one MeO, is an isomer of I and is named *isomethysticin*; it m. 186° (W's methysticic acid, m. 184°), is not acid, and does not dissolve in cold alk. carbonate or alkali solns. When heated in the latter solns., it dissolves, but on cooling, the Na salt comes down in a scaly cryst. ppt. which goes back to the original compd. when treated with an acid. When I or II is heated with a dil. mineral acid, methysticic acid (III), m. 94°, is formed as W. states. The constitutions 3,4-CH₂O₂C₆H₄CH:CHCH:CH₂COCHC(OMe)O and CH₂O₂C₆H₄CH

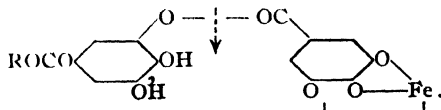
CHCH:CHCOME are suggested for I and III. The optical activity of I is better explained by M and S's formula.

S. T.

Tannins and related compounds. XXI. A rearrangement reaction of catechol KARL FREUDENBERG, GINO CARRARA AND ERNST COHN. *Ann.* 446, 87–95 (1925). 2,4,6-Trimethoxyphenyl 3',4'-dimethoxybenzyl ketone, m. 110°, in 1.2 g. yield from 1.8 g. homoveratric nitrile and 1.7 g. 1,3,5-C₆H₃(OMe)₃ with MeMgI 0.8 g. of this ketone gives 0.1 g. of α -[3,4-dimethoxyphenyl]- β -[2',4',6'-trimethoxyphenyl]- α -propylene m. 87.5–8.5°; catalytic reduction gives the propene, m. 65–6°; this is different from the methylated reduction product from tetramethylanhydrocatechol, m. 104–5°, and is, therefore, to be designated as α -[2,4,6-trimethoxyphenyl]- β -[3',4'-dimethoxyphenyl]propane. 2,3-(MeO)₂C₆H₃CH₂CHO and 1,3,5-(MeO)₂(AcO)C₆H₂CHO in Et₂O satd. with HCl, give an oxonium salt, m. 123–4°, which is catalytically reduced to 3-[3',4'-dimethoxyphenyl]-5,7-dimethoxychroman (I), m. 131°, whose Br deriv., m. 162–3°. This product is identical with the reduction product of tetramethylanhydrocatechol (II). The HCl salt of II, red-violet, m. 126–7°, on reduction gives I. *Veratryl bromide*, b. 120–5° m. 59°. Phloracetophenone di-Me ether gives a mixt. of the ether Ac(MeO)₂-C₆H₂OCH₂C₆H₃(OMe)₂, yellow, m. 148°, and the coumaranol, C₁₉H₂₂O₆, m. 118°.

C. J. WEST

Formation and aging of written characters. II. FRITZ ZETSCHE AND ALFRED LOOSLI. *Ann.* 445, 283–96 (1925); cf. *C. A.* 18, 2008.—The introduction discusses the 2nd step in the aging of ink, the formation of the sec. ink salts from iron-tannin inks. The behavior of various Fe salts of complex alcs. and phenols towards alkali is discussed from the point of view of color changes, from which it is concluded that the Fe salt splits thus:



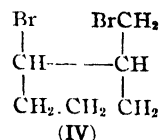
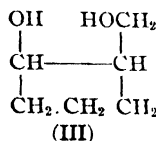
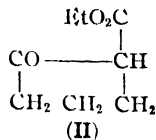
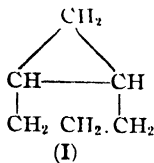
The end product of the ink salts is Fe'' oxalate, as is shown by oxidation of such salts by air. After pyrocatecholferric acid is oxidized by an air stream for 4 days, a dark olive-green compd. seps; from this HOC₆H₄CO₂H exts. about 1/3 of the Fe; this indicates that in the aging of the ink some Fe(OH)₃ is liberated and then probably bound by the decompn. products of the tannin. The following Fe salts were prepd.: *Trihydroxybenzophenone*, C₁₃H₈O₄Fe·2.5H₂O, deep black, does not melt, sol. in alkali with a red-brown color and sepn. of Fe(OH)₃; *gallacetophenone*, C₈H₆O₄Fe·1.5H₂O, olive-black powder; *maclurin*, C₁₃H₈O₆Fe·2H₂O, dark greenish black powder; *luteolin*, [(C₁₅-H₈O₆)Fe]H·3H₂O, olive-green; *quercetin*, C₁₅H₈O₇Fe·1.5H₂O, greenish black powder, does not melt, sol. in alkali with a yellow color and sepn. of Fe(OH)₃; *rhamnetin*, C₁₄H₈O₇Fe·2.5H₂O; *morin*, C₁₅H₈O₇Fe·2H₂O, olive-brown, sol. in EtOH and AcORt; *morin*,

$C_{30}H_{17}O_{14}Fe \cdot 3H_2O$; *Al gallate*, $C_7H_2O_6Al \cdot H_2O$, pure white if prepd. in atm. of CO_2 , otherwise gray to dark gray because of oxidation products; *Al maclurin compd.*, $C_{15}H_7O_6-Al \cdot 2H_2O$, yellow powder, does not melt, decompd. by alkali; *morin* gives the compd. $C_{15}H_7O_7Al \cdot 2H_2O$, light yellow powder, easily sol. in EtOH, darkens in the light. Morin and maclurin may be sepd. from fustic ext. The quantity depends upon the quality of the ext. C. J. WEST

Fungi dyestuffs. III. Atromentin. II. FRITZ KÖGL AND J. J. POSTOWSKY. *Ann.* **445**, 159-70 (1925); cf. *C. A.* **19**, 639.—The hydrocarbon, m. $205-6^\circ$, obtained by distg. atromentin (I) with Zn dust, is now shown to be terphenyl, by analysis, mol. wt. and oxidation to $PhC_6H_4CO_2H$, m. $216-7^\circ$. Detn. of the HO groups by the Grignard reagent indicates 5, as previously reported. I di-Me ether, warmed with Ac_2O and $AcONa$ and decolorized with Zn dust, gives *pentaacetylleucoatromentin di-Me ether*, m. $260-1^\circ$. Reduction of the penta-Ac deriv. of I gives the *leuco compd.*, m. $251-2^\circ$. Oxidation of 0.5 g. I with H_2O_2 in 0.1 N NaOH gives 80 mg. $p-HOC_6H_4CO_2H$; CrO_3 gives $AcOC_6H_4CO_2H$ with either the penta- or hepta-Ac deriv. Oxidation of I with dil. HNO_3 gives *m,p-O_2N(HO)C_6H_3CO_2H*, $(CO_2H)_2$, picric acid and a *dinitro deriv.*, $C_{19}H_8O_{10}N_2$, yellow, does not m. 300° , which contains 3 HO groups and yields a *tri-Ac deriv.*, yellow, m. $282-1^\circ$ (decompn.). *Leucoatromentin* is obtained from I with HI in AcOH or $NaHSO_4$, and yields the hepta-Ac deriv. The leuco compds. are not reduced by H and Pt. KOH at 100° gives the *compd.* $C_{13}H_{10}O_6$, m. 156° , crystg. with 2 H_2O , its mol. wt. in EtOH is normal. The compd. reduces $NH_4OH-AgNO_3$ in the heat, concd. H_2SO_4 gives a yellow solu., turning brown on standing. $FeCl_3$ in EtOH gives a dirty violet color, passing through green and brown to light yellow. Heated with KOH at $150-60^\circ$, there results the previously described compd., m. 183° . **IV. Xylindein, the dyestuff of "green-rotted" wood.** F. KÖGEL AND G. VON TAEUFENBACH. *Ibid.* 170-80. —Extn. of "green-rotted" beechwood with PhOH gives 0.5-0.8% of *xylindenn*, $C_{24}H_{26}O_{11}$, light yellow to deep brown rhombic leaflets, (a brief description of the crystals is given); Na salt, amorphous, sol. in H_2O with a deep bluish green color. Wool is dyed a strong bottle-green (little difference in unmordanted and Cr and Al-mordanted); cotton is scarcely colored; from a vat, both cotton and wool are dyed an emerald-green. The spectral behavior is given for $CHCl_3$, PhOH and concd. H_2SO_4 , solns. *Tetra-Ac deriv.*, yellow, mol. wt. in boiling PhBr, normal. *Di-Me ether*, blue-violet needles, contains 2 free HO groups; it is demethylated by concd. H_2SO_4 . The *diacetylxylindein di-Me ether*, yellow to yellow-green, sinters 260° , m. $291-5^\circ$; Zn dust gives the *leuco compd.*, yellow, m. $293-5^\circ$, mol. wt., 729 (av. of 17 detns.) C. J. W.

Bicyclo-(0,1,3)-hexane. N. D. ZELINSKII AND M. USHAKOV. *J. Russ.-Phys. Chem. Soc.* **56**, 67-71 (1925).—Z. and U. obtained bicyclo-(0,1,3)-hexane (I) starting from Et cyclopentanecarboxylate (II), b_{11} $101-2^\circ$. The ester was first transformed into the corresponding glycol (III), then the latter was brominated and treated with Zn. Bouveault, while reducing esters of keto acids, found that they undergo a mol. disruption resulting in the formation of primary alcs. instead of glycols, but, according to Z. and U., this observation holds true only in the case of keto esters of non cyclic structure. In the case of II the glycol is obtained under the following conditions, to 30 g. of II in 320 g. of abs. alc. in a flask under inverted condenser, 60-65 g. Na is gradually added in small pieces. The flask is heated to $120-30^\circ$ in order completely to dissolve the Na. The product is then decompd. by weak H_2SO_4 and the pptd. Na_2SO_4 filtered and washed with alc. The aq. alc. soln. is satd. with K_2CO_3 , the supernatant alc. layer dried with fused KOH, the alc. evapd. and the residue extd. with ether and fractionated. III is obtained in 45% yield in the fraction, b_{12} $136-7^\circ$. It is easily sol. in water and in alc., sol. in ether. III and 1 mol. of PBr_3 heated 12 hrs. in a sealed tube on a water bath yields a dibromide (IV). The product of reaction is washed with ice water, the IV is extd. with ether, the ether soln. is washed with water and Na_2CO_3 , dried with $CaCl_2$ and fractionated. The fraction b_{16} $109-12^\circ$ contains the dibromide (yield, 65%). It is a mixt. of the *cis*- and *trans*-forms, one of which being less stable than the other darkens, thickens and becomes opaque on keeping. IV (59 g.) dibromide, 185 g. 80% alc. and 75 g. Zn dust were refluxed 3 hrs. on a water bath, the I formed was distd. over with steam, washed and dried. It b_{746} $78-9.5^\circ$, n_{20} 1.4320; yield, 12.2 g. On being shaken with 1% $KMnO_4$ for 1.5 hrs., more than half of the substance oxidized while using up 260 cc. of the soln. The hydrocarbon which had not reacted was distd. over with steam and was found to dissolve Br vapor without reacting with it. It b_{740} $78.5-9.5^\circ$, n_{18} 1.4326, d_4^{20} 0.8178. As the phys. consts. of the substance were hardly changed, Z. and U. suppose that the $KMnO_4$ oxidized part of the hydrocarbon, or more exactly its 2 forms *cis*- and *trans*-, and not impurities. They are

at present investigating whether the above I is identical with that whose formation can be expected starting from hexahydroresorcinol.



BERNARD NELSON

Olefinic terpene ketones from the volatile oil of flowering *Tagetes glandulifera*. I. T. G. H. JONES AND F. B. SMITH. *J. Chem. Soc.* 27, 2530-9 (1925).—The volatile oil of flowering *Tagetes glandulifera* is a bright yellow, somewhat mobile liquid having the powerful cloying odor of the crushed flower; it slowly resinifies on keeping and on exposure leaves a tacky, resinous residue. The oil from the flowering plant has d_{15}^{20} 0.8638, n_D^{20} 1.4820, $[\alpha]_D$ 4°, acid value 2, Ac value 33. The oil from the flowers has d_{15}^{20} 0.8713, n_D^{20} 1.4870, $[\alpha]_D$ 2.5°. Fractional distn. of 3,800 cc. of oil gave finally 800 cc., b_{24} 72-5°, d_{15}^{20} 0.8113, n_D^{20} 1.4695, $[\alpha]_D$ 15° (consisting mainly of *d*-limonene and ocimene); 150 cc. b_{24} 85-90°, d_{15}^{20} 0.8120, n_D^{20} 1.4523, $[\alpha]_D$ 1° (I); 1,300 cc., b_{24} 55-65°, d_{15}^{20} 0.8801, n_D^{20} 1.4890 (II). I consists principally of γ,η -dimethyl- $\Delta\alpha$ -octen- ϵ -one (III), b_{10} 88-9°, b_{760} 185-6°, d_{15}^{20} 0.8351, n_D^{20} 1.4295, $[\alpha]_D$ 1.5°; it does not combine with Na_2SO_4 or NaHSO_4 , does not react with Schiff's reagent or $\text{NH}_4\text{OH}-\text{AgNO}_3$ and is unaffected by 20% H_2SO_4 after boiling several hrs. Semicarbazone, m. 92.5°; oxime, b_{760} 222°, d_{15}^{20} 0.8778, $[\alpha]_D$ 2.4°. Reduction with Na and EtOH gives γ,η -dimethyl- $\Delta\alpha$ -octen- ϵ -ol, b_{20} 92°, d_{15}^{20} 0.8305, n_D^{20} 1.440, $[\alpha]_D$ 1.75°. Catalytic reduction of the ketone gives γ,η -dimethyloctan- ϵ -one (IV), b_{760} 187-8°, d_{15}^{20} 0.8201, n_D^{20} 1.4205, $[\alpha]_D$ 4.5°; semicarbazone, m. 91.5°; oxime, b_{760} 225°, d_{15}^{20} 0.8419, n_D^{20} 1.4338. Reduction with Na and EtOH gives γ,η -dimethyloctan- ϵ -ol, b_{760} 195°, d_{15}^{20} 0.8230, n_D^{20} 1.4270. Oxidation of III with KMnO_4 in Me_2CO gave HCO_2H , AcOH , $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{H}$ and β -isovaleryl α -methylpropionic acid, m. 25°, b_{25} 169-71°, $[\alpha]_D^{27}$ -2.1° (semicarbazone, m. 165°); Et ester, b_{25} 127° (semicarbazone, m. 122°). Oxidation with KMnO_4 gives AcOH and $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{H}$, with a small amt. of $(\text{CO}_2\text{H})_2$; CrO_3 gives AcOH , $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{H}$ and some methylsuccinic acid, m. 112°. Oxidation of IV with CrO_3 gives $\text{EtCHMeCH}_2\text{CO}_2\text{H}$, $\text{EtCHMeCO}_2\text{H}$ and AcOH ; with KMnO_4 , $\text{EtCHMeCO}_2\text{H}$, AcOH and $(\text{CO}_2\text{H})_2$. Fraction II of the oil consists of tagetone (η -methyl- γ -methylene- $\Delta\alpha$ -octen- ϵ one), pale yellow, b_{30} 102°, b_{760} ca. 205-10°, d_{15}^{20} 0.8803, n_D^{20} 1.4895, oxime, b_{25} 126°, d_{15}^{20} 0.9207, n_D^{20} 1.4820, unpleasant odor. Catalytic reduction gives IV. EtOH and Na give a compd., $\text{C}_{10}\text{H}_{18}\text{O}$, b_{760} 197°, d_{15}^{20} 0.8524, n_D^{20} 1.4190, and the pinacol, $\text{C}_{20}\text{H}_{34}\text{O}_2$ (also obtained by electrolytic reduction), b_4 183°, d_{15}^{20} 0.9258, n_D^{20} 1.4820, I no., 328. Oxidation of the ketone gave only $(\text{CO}_2\text{H})_2$ and $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{H}$, with some AcOH .

C. J. WEST

Occurrence of sylvestrene. B. SANJIVA RAO AND J. L. SIMONSEN. *J. Chem. Soc.* 127, 2494-9 (1925).—A careful examn. of the oil from *Pinus sylvestris* and *P. pumilio* showed the absence of sylvestrene, although *d*- Δ^3 -carene was found. The oil from *P. sylvestris* with d_{30}^{30} 0.8661, n_D^{30} 1.4729, $[\alpha]_D^{30}$ 13.2°, acid value, 0.28, sapon. value 6.7, sapon. value after acetylation, 15, was sep'd. into 4 fractions: b_{644} 153-7°, d_{30}^{30} 0.8553, n_D^{30} 1.4637, $[\alpha]_D^{30}$ 20.0° (17.4% of original oil), nearly pure α -pinene; 157-61°, 0.8553, 1.4656, 16.7° (18.7%), mixt. of α -pinene, β -pinene and *d*-carene; 161-7°, 0.8556, 1.4676, 11.7° (30%), practically *d*- Δ^3 -carene; 167-76°, 0.8573, 1.4711, 8° (8.1%), nearly pure carene. The oil from *P. pumilio* with d_{30}^{30} 0.9221, n_D^{30} 1.4831, $[\alpha]_D^{30}$ -9.3°, acid value 7.5, sapon. value, 31.5 (after acetylation, 89.6) was similarly fractionated, the 4 fractions showing the same qual. compn.

C. J. WEST

The chemistry of pinene. I. L. KONDAKOV. *Caoutchouc & gutta-percha* 21, 12489-92 (1924); 22, 12837-8, 12870-3 (1925); cf. *C. A.* 18, 2337.—A critical discussion of past researches on the prepn., constitution and properties of pinene and its derivs., with analyses of essential oils contg. such compds.

C. C. DAVID

Camphor series. X. Synthesis of camphor. I. Catalytic action of reduced copper on borneols. B. MASUMOTO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 9A, 219

-21(1925). (In English).—M. finds that oxidation of borneols to camphor by the catalytic action of reduced Cu is more effective in yield and simpler in manipulation than oxidation by chemicals. By this method *d*-borneol and *l*-isoborneol are equally oxidized to camphor without any side-reaction. Under similar conditions menthol yields menthone and a small amt. of menthene. The menthone formed in this way from *d*-menthol suffers racemization while camphor resulting from borneols by the same treatment suffers no racemization. CuO prepd. from $\text{Cu}(\text{NO}_3)_2$ and NaOH soln., reduced with H at 200° and heated at 200–220° forms a suitable catalyst for oxidizing borneols to camphor. Camphor when passed over reduced Cu or reduced Ni with pure H gives no borneol.

REYNOLD C. FUSON

***l*-Camphor-10-sulfonic acid from synthetic camphor.** HENRY BURGESS AND C. S. GIBSON. *J. Soc. Chem. Ind.* **44**, 496–8T(1925).—The following solubilities in 100 g. H_2O at 8.5° are reported: brucine *d*-camphor-10-sulfonate, 1.783 g; *l*-deriv., 5.094 g. (m. 251–3°, $[\alpha]_{\text{D}}^{25}$ 35.0° (c 1.767)); strychnine *d*-deriv., 3.205 g. (m. 275–8°, $[\alpha]_{\text{D}}^{25}$ –13.7° (c 1.212)), *l*-deriv., 3.053 g. ($[\alpha]_{\text{D}}^{25}$ –37.9° (c 2.070)). The synthetic camphor was transformed into the 10- SO_3H acid by Reychler's method. When the inactive acid was neutralized with 0.5 an equiv. of brucine and 0.5 an equiv. of NH_4OH , the brucine *d*-salt sepd. to the extent of 87% of the theoretical quantity and was optically pure after 2 crystns from H_2O . The acid obtained from the mother liquor was then treated with sufficient strychnine to neutralize the calcd. amt. of *l*-acid present and NH_4OH to neutralize the *d*-acid. The product which sepd. consisted of mixed crystals of the *d*- and *l*-acids. If the acid from the mother liquor is crystd. from AcOEt 5 times it is practically pure *l*-acid. Details of typical expts. are given. C. J. WEST

Reaction of acetyl derivatives of organic acids with benzene and aluminium chloride. J. CRYER. *Trans. Roy. Soc. Can. Sec. III* [3], **19**, 29(1925).—The oily residue obtained when a mixt. of Bz_2O and Ac_2O reacted with C_6H_6 and AlCl_3 gave almost quant. Ph_3CO and very little PhCOMe . Aspirin, AcOPh and AcOEt react vigorously with C_6H_6 and AlCl_3 , giving PhCOMe . Aspirin gave a 70% yield and the other esters a smaller yield. J. W. SHIPLEY

Occurrence of free radicals in chemical reactions. III. HEINRICH WIELAND, HUGO VON HOFE AND KARL BÖRNER. *Ann.* **446**, 31–48(1925); cf. C. A. **17**, 95.—*Benzoylhydrazotriphenylmethane*, m. 118°, in 70% yield from Ph_3CCl and BzNHNH_2 ; oxidation with $\text{K}_2\text{Fe}(\text{CN})_6$ gives 50–80% of the *azo compd.*, S-yellow, decomp. 80–1° (vigorous evolution of N); it is unstable even in cold solns. Warmed in $\text{C}_6\text{H}_5\text{Me}_2$ or very pure petroleum ether in a N atm. to 30–40°, N is vigorously evolved, the soln. becomes deep red, then gradually turns to yellow, the residue gave 60–70% β -benzopinacolin, m. 179°. In the presence of O, there results about 50% β -benzopinacolin and 10% $(\text{Ph}_3\text{C})_2\text{O}$; a small amt. of BzOH is also formed. In CCl_4 there results some BzCl ; this is not formed when the decompn. occurs in CHCl_3 . *p*-Bromobenzoylhydrazotriphenylmethane, m. 177°; the *azo compd.* light yellow, decomp. 67–8°; in soln. this gives an intense carmine-red color and *p*-bromobenzopinacolin, m. 181°; in CCl_4 , there results some *p*- $\text{BrC}_6\text{H}_4\text{COCl}$. *p*-Toluylylhydrazotriphenylmethane, m. 136–9°; the *azo compd.*, m. 60° (decompn.), in soln. gives a deep red color. *p*-Dimethylaminobenzoylhydrazotriphenylmethane, m. 192–5° (60% yield); *azo compd.*, yellow, m. 77° (decompn.) (60–70% yield); decompn. in C_6H_6 , $\text{C}_6\text{H}_5\text{Me}_2$, etc., gives a deep carmine-red color and 25% of dimethylaminobenzopinacolin, m. 224–6°; in an atm. of O_2 , there results from 1.28 g. 0.1 g. of $(\text{Ph}_3\text{C})_2\text{O}$ and small amts. of the pinacolin. *Benzoylhydrazotritolylmethane*, m. 206–8° (decompn.); the *azo compd.*, m. 70–2° (decompn.); decompn. in a CO_2 or N atm. gives 40% of the pinacolin, m. 148–9°; in an atm. of O, there also results the pinacolin besides some $(\text{MeC}_6\text{H}_4)_2\text{C}_2\text{O}$; 1.6 g. *azo compd.* gives 0.064 g. BzOH and 0.010 g. CO_2 . *p*-Tolylhydrazo-*p*-tritolylylmethane, m. 176–8°; the *azo compd.*, yellow, decomp. 60–5°; in a CO_2 atm. there results 40% of tetra-*p*-methylbenzopinacolin, m. 145–6°. *p*-Dimethylaminobenzoylhydrazotritolylmethane, m. 180°; the *azo compd.* yellow, m. 69–70°. *Et triphenylmethylhydrazocarboxylate*, m. 145° (90% yield); the *azo compd.*, light yellow, m. 98° (decompn.). Decompn. begins about 80°, giving a light red soln.; in an O atm. there is formed some $(\text{Ph}_3\text{C})_2\text{O}$ but the principal product is $\text{Ph}_3\text{CCO}_2\text{Et}$, m. 118°. *Et p*-tritolylylhydrazocarboxylate, m. 134–5°; the *azo compd.*, pale yellow, m. 96° (decompn.). Decompn. of 0.9 g. of the *azo compd.* gives 0.0164 g. *di*-*Et peroxidedicarboxylate* (also prepd. from ClCO_2Et and Na_2O_2), a very unstable and explosive compd. Azodibenzoyl is stable at 80–110°; in boiling $\text{C}_6\text{H}_5\text{Me}_2$ about 25–30% of the total N is split off. IV. The reaction of silver salts of carboxylic acids with iodine. H. WIELAND AND F. GOTTFALD FISCHER. *Ibid* 49–76.— AcOAg at room temp. takes up 1 equiv. I without liberating CO_2 ; addn. of H_2O gives AcOH , AgI and AgIO_3 , the latter in the ratio of 5:1. Ag capronate likewise takes up 1 equiv. I, giving

a light yellow product, sol. in hot petroleum ether (80–110°); heated with quartz powder, it splits off 42% CO₂, giving 71% of Am capronate and a small amt. of free acid. Cl₃C-CO₂H splits off AgCl at 80°; at room temp. it absorbs 1 equiv. I; with H₂O it yields free acid. AgI and AgIO₃; heated at 110°, it gives AgCl, thus indicating a complex decompn. *Ag Et succinate*, long needles; soly. at 25°, 2.18%; absorbs 1 equiv. of I, the product being somewhat sol in Et₂O. Heated at 150° for 2 hrs., the product gives 29% CO₂ (of 2 mols.); the acid portion of the residue contains some succinic acid but principally the ester acid; there is also formed some maleic ester acid; the neutral part contains Et succinate, and *Et β-carbomethoxyethyl succinate*, b₁₂ 166–71°, mol. wt., 265, 261 (in camphor). PhCH₂CO₂Ag absorbs 1 equiv. of I; in the decompn. of the product there is a temporary carmine-red color and liberation of a trace of I. Heated to 80°, there is split off 44% CO₂ and the resulting product contains 10% PhCH₂CO₂H and 68% benzyl phenylacetate, b₁₂ 175–6°, b. 318–20°. The compd. with Ph₃CCO₂Ag splits off 48% of CO₂ at 80°; from 3.95 g. Ag salt there results 0.09 g. Ph₃CCO₂H and 2.2 g. Ph₃C triphenylacetate, m. 183–4°; the characteristic Ph₃C color was not observed during the reaction; heating the product in an O atm. gave no trace of (Ph₃C)₂O; this indicates that the radical Ph₃C is not formed in the reaction. The products from cholic and cholanolic acids do not split off CO₂ when heated. Crotonic acid likewise gives no CO₂ when the Ag salt and I are heated, but strongly unsatd. acids are formed. PhCH-CHCO₂Ag and I, at 105–10°, split off 26% CO₂, giving 36% of the acid and a neutral, unsatd. resin, which begins to decomp. at 180° at 0.3 mm. PhC-CO₂H gives a Ag salt only in cold solns., since at about 40° it splits off CO₂, giving PhC-CAG; the Ag salt does not react with I in the cold; in boiling C₆H₆ 2.14 equivs. I are taken up, giving tri-iodostyrene and phenyliodoacetylene. BzOAg decomps. at 150–60°; in Et₂O or C₆H₆ suspension, it absorbs 1 equiv. I at room temp.; decompn. with H₂O gives BzOH, AgI and AgIO₃ (similar to AcOH). Heated with quartz sand at 160–80°, 34% of 2 mols. CO₂ are split off, giving 30% BzOH, about 10% PhI, a little BzOPH and BzOC₆H₄I. Glycolic acid as the Ag salt and I in C₆H₆ split off 35% CO₂, giving some HCHO; lactic acid splits off 46% CO₂, giving AcH; mandelic acid splits off 47% CO₂, giving 60% BzH; benzoic acid splits off 42% CO₂, giving Ph₂CO (CO₂Ag)₂, I and quartz at 40–5°, split off 98.4% CO₂. CH₂(CO₂Ag)₂ gave 62% CO₂. The thermal decompn. of the intermediate product from (CH₂CO₂Ag)₂ and I gives 29% CO₂ and maleic acid. Ag tartrate splits off CO₂ slowly at 165–70°; the org. substances were partly carbonized and the mass contained no AgIO₃. Ag adipate and I, 2 hrs. at 90° and 1 hr. at 150°, give 34% CO₂; the residue contained δ-valerolactone. Ag phthalate and I under boiling C₆H₆ form a complex without liberation of CO₂; addn. of H₂O gives the acid and AgIO₃; heating at 130° gives only the anhydride and AgIO₃. Ag terephthalate and I at 200° give only traces of CO₂. The Ag salt of *trans*-hexahydrophthalic acid and I at 70–5° split off CO₂; at 130° after 1 hr., 31% of CO₂ was split off. The *cis*-acid reacts with I at 120–5°; after 2 hrs., heating 21% CO₂ was split off. Ag maleate reacts with I at 50–5°; an intermediate product could not be found; from 33 g. Ag salt and 25.4 g. I (25% CO₂ split off), there was isolated 0.2 g. fumaric acid and 1.65 g. maleic anhydride. Ag fumarate (8.25 g.) and 6.5 g. I (26% CO₂ split off) at 125° gave 1.5 g. pure fumaric acid. Bz₂O₂ (4.5 g.), 5 g. I and quartz, heated at 100° for 4 hrs., gave 0.68 g. BzOH, 1.16 g. PhI and 0.21 g. Ph₂. The mechanism of these various reactions is discussed.

C. J. WEST

Colored salts of the di- and triphenylmethane series. W. MADELUNG. *J. prakt. Chem.* **111**, 100–46 (1925).—An extensive theoretical discussion of the constitution of the salts of the di- and triphenylmethane series.

C. J. WEST

Action of organomagnesium compounds upon cyanohydrins. II. Y. ASAHINA AND M. ISHIDATE. *J. Pharm. Soc. Japan* No. **521**, 624–8 (1925).—Using the same method as given in paper I (C. A. **17**, 3028), A and I obtained a ketimine-HCl (I) from *p*-MeOC₆H₄MgBr and 6,2-Me(HO)C₆H₃CH(OH)CN. An attempt to produce a benzoil deriv. by hydrolysis of I, resulted in failure. When I is oxidized with Fehling soln., a substance m. 96° was obtained (yield 10%), which is a benzil deriv. (II). When II is heated with alc. KOH, a cryst. compd. (III), m. 172–3°, is formed which is a benzilic acid. An attempt to demethylate III by boiling with AcOH-HBr, resulted in the formation of a resinous amorphous substance. With AcOH and HI, however, A and I obtained needles, m. 143°, which dissolve in Na₂CO₃ and give no color with FeCl₃ nor with coned. H₂SO₄ and do not correspond to phylloulcin. I, II and III have the structures 2,6 - Me(MeO)C₆H₃CH(OH)C(NH HCl)C₆H₄OMe (p), Me(MeO)C₆H₃-COCOC₆H₄OMe and Me(MeO)C₆H₃C(OH)(CO₂H)C₆H₄OMe, resp.

S. T.

Synthesis of phenolphthalein. E. SHPITALSKII AND B. LUKASHEVICH. *J. Chem. Ind. (Russia)* **1**, 2628 (May–June, 1925).—Conforming to Bayer's method of prepn.

gives 65.2% of pure phenolphthalein (I). This method was modified by S. and L. thus: The melt resulting from heating under good stirring $C_6H_4(CO)_2O$, PhOH and $SnCl_2$ 5 hrs. is poured into boiling water, the PhOH is steamed off, the I is washed with water, treated with steam again to remove the last traces of PhOH and finally dried. The temp. of condensation has a paramount influence on the purity of the crude I obtained. If it is raised above 120° even for a short time, the product is very impure. The most favorable temp. is $111-6^\circ$. The yield of the crude I freed from inorg. impurities is about 85% and that of pure I about 79%. The synthesis of I has also been effected by using $C_6H_4(CO_2H)_2$ instead of $C_6H_4(CO)_2O$. With 16.8 parts acid, 20 parts PhOH, 25 parts $SnCl_2$, heated 5 hrs., then by varying the temp. of reaction the following results are obtained:

Temp.	Yield of crude I	M. p. of the product	Quantity of org. impurities insol in alkali
$115-120^\circ$	75	215-249	0.4
$114-116^\circ$	74.3	250-252	0.2
$107-111.5^\circ$	65.4	250-253	0.2

(The figures representing crude I do not include inorganic admixtures.) If the amt of $SnCl_2$ is increased to 39.7 parts, the yield in crude I of the same degree of purity can be raised to 85%. By effecting the condensation at $109-113^\circ$ during 10 hrs. with the increased quantity of $SnCl_2$, the yield can be increased by about 2%. To purify crude I, S. and L. recommend washing it with a small quantity of cold MeOH, crystg. from MeOH and washing.

BERNARD NELSON

Conversion of *dl*-phenyl- α -naphthylglycolic acid into ketones. ALEX. MCKENZIE AND H. J. TATTERSALL. *J. Chem. Soc.* **127**, 2522-30 (1925). — *Phenyl- α -naphthylchloroacetyl chloride* (I), m. $155-6^\circ$. I (5 g.) and excess $PhMgBr$ give 1.1 g. α -naphthyl-deoxybenzoin, m. $109-10^\circ$, which reacts with $MeMgI$ to give α,β -diphenyl- α -[α -naphthyl]propan- β -ol, m. $124-5^\circ$. *Phenyl- α -naphthylacetyl chloride* (II), m. $74.5-5.5^\circ$ (16 g. from 19 g. of acid). C_6H_6 and $AlCl_3$ with II give a compd., $C_{18}H_{15}O$, m. $115.5-6.5^\circ$, gives a deep yellow color with cold concd. H_2SO_4 and a compd. m. $240-1^\circ$, giving a brown color with H_2SO_4 changing to olive green. II and $MeMgI$ give *phenyl- α -naphthylacetone*, m. $84.5-5^\circ$, gives a crimson color with cold concd. H_2SO_4 ; alc. KOH gives $C_{18}H_{17}CH_3Ph$ and $AcOH$. *Phenyl- α -naphthylacetone*, m. $125-6^\circ$, gives an orange-yellow color with cold concd. H_2SO_4 . *Phenyl- α -naphthylmethyl *p*-tolyl ketone*, m. $141-2^\circ$, gives a yellow color with cold concd. H_2SO_4 . C. J. WEST

Addition of azodicarboxylic esters to aromatic hydrocarbons. R. STOLÉ AND G. ADAM. *J. prakt. Chem.* **111**, 167-75 (1925); cf. *C. A.* **18**, 3177. — *Di-Me naphthylene-1,4-dihydrazinotetracarboxylate*, m. 250° (decompn.), reduces hot $NH_4OH-AgNO_3$ contg. NaOH, results in 4 g. yield from 2.6 g. $C_{10}H_8$ and 5.8 g. $(HNCOMe)_2$; the *di Et ester*, m. 234° (decompn.). Heating with HI and $AcOH$ gives 1,4- $C_{10}H_6(NH_2)_2$, whose *di-Bz deriv.* m. 276° (decompn.). *p*-Bis[dicarboxymethylhydrazino]diphenyl, m. 246° (decompn.); the *Et ester*, m. 195° (decompn.). Decompn. gives $(H_2NC_6H_4)_2$. Bis[dicarboxymethylhydrazino]-2,7-fluorene, m. 200° ; *Et ester*, m. 152° ; decompn. gives dibenzoyldiamino-2,7-fluorene, m. 324° ; the dibenzylidene deriv., ochre-yellow, m. 248° (decompn.). Dicarboxymethylhydrazino-1-anthracene, m. 265° (decompn.); the $AcOH$ soln. has a deep violet fluorescence; *Et ester*, pale green, m. 241° (decompn.). Dicarboxymethylhydrazino-9-phenanthrene, m. 214° ; the *Et ester*, m. 158° . The solns. have a deep violet fluorescence; an aq. suspension reduces $NH_4OH-AgNO_3$ after addn. of NaOH. C. J. WEST

Acenaphthene series. III. ω -Aminoacenaphthene and further observations on *m*-aminoacenaphthene. G. T. MORGAN AND H. M. STANLEY. *J. Soc. Chem. Ind.* **44**, 493-6T (1925); cf. *C. A.* **19**, 3268. — Four NH_2 derivs. of acenaphthene are theoretically possible and M. and S. have completed the series by prep. ω - or 1-aminoacenaphthene. A new scheme for designating positions in the acenaphthene group has been proposed wherein one of the side-chain carbons is designated 1 and the numbering continued clockwise; thus H-bearing carbons of the fused nuclei are numbered from 2 to 7, with 8 reserved for the other side-chain carbon. This scheme closely relates acenaphthene to $C_{10}H_8$ and is particularly advantageous in working with di-derivs. Acenaphthene quinone with PCl_5 gave 83% of dichloroacenaphthenequinone, which with Zn and HOAc gave 45% of acenaphthenone, yielding with NH_2OH acenaphthenone oxime, m. $183-4^\circ$. Reduction with Al-Hg in moist ether, Zn and NH_4Cl in 50% alc., $TiCl_3$ and $Na_2S_2O_4$ did not give satisfactory results. Zn and HOAc gave a mixt. of acenaphthene and the desired base, isolated as the HCl salt (35% yield), decompg. 270° . Picrate, yellow, blackening 240° , m. 260° (decompn.). The free base sublimes easily, m. 135° , is strongly

alk. and absorbs CO_2 . An attempt to synthesize acenaphthenone from C_{10}H_8 and $\text{Cl-CH}_2\text{COCl}$ by AlCl_3 led to 69% of β -naphthyl chloromethyl ketone, b_{10} 185–7°, m. 30°. The vapor irritated the mucous membranes. Picrate, yellow, m. 89°. By alk. KMnO_4 the ketone yielded β - $\text{C}_{10}\text{H}_7\text{CO}_2\text{H}$, m. 181° and an oil presumably β - $\text{C}_{10}\text{H}_7\text{COCO}_2\text{H}$. *m*-Aminoacenaphthene-HCl with NaNO_2 gave yellow acenaphthene-3-diazonium chloride, which decompd. slowly with loss of N at room temp., decompd. 150–60°. Heated to 120° it lost H_2O of crystn., then N. With CuCl the diazonium salt gave an oil, 3-chloroacenaphthene, blackening 250°, but not boiling below 290°. A picrate orange, m. 79–80°, was formed. Coupled with diazotized p - $\text{C}_6\text{H}_4(\text{NH}_2)\text{NO}_2$ the 3- NH_2 compd. gave 88% bronze-red 1'-nitrobenzeneazo-3 aminoacenaphthene, m. 200°. Concd. H_2SO_4 developed a deep blue color; there was no change with alc. soda.

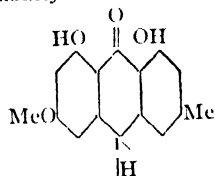
G. ALBERT HILL

Acenaphthene series. IV. Aminoacenaphthenesulfonic acids. G. T. MORGAN AND V. E. YARLEY. *J. Soc. Chem. Ind.* **44**, 513–5T (1925); cf. preceding abstr. *Na* 4-aminoacenaphthene-5-sulfonate (I), in 68% yield by nitration of the sulfonate at *no* over 25°. Reduction with $\text{Na}_2\text{S}_2\text{O}_4$ gives *Na* 4-aminoacenaphthene-3,5-disulfonate, which, diazotized at 5°, gives a light green diazo compd.; on boiling with dil. H_2SO_4 this yields a sulfone, $\text{C}_{10}\text{H}_7\text{O}_2\text{S}_2\text{Na}$. Reduction of I with Fe and H_2O gives the light brown *Na* 1-aminoacenaphthene-5-sulfonate, which gives, with acenaphthene-4-diazonium chloride, a reddish brown azo dye, coloring wool and silk brown shades. 4-Aminoacenaphthene and 80% H_2SO_4 on the H_2O bath for 3 hrs. give the light gray 2-sulfonic acid deriv. (II), whose diazo compd. is olive green; boiling this with H_2SO_4 does not give a sulfone but a 4 HO deriv. 4-Benzamidoacenaphthene-2-sulfonic acid, light brown. II and p - $\text{O}_2\text{NC}_6\text{H}_4\text{N}_2\text{Cl}$ give a deep red azo compd., $\text{C}_{18}\text{H}_{11}\text{O}_4\text{N}_4\text{SNa}$; 4-diazoniumacenaphthene gives a reddish brown compd., $\text{C}_{24}\text{H}_{15}\text{O}_4\text{N}_5\text{SNa}$, dyeing wool and silk reddish brown, β - $\text{C}_{10}\text{H}_7\text{N}_2\text{Cl}$ gives a dark red azo deriv. with the diazo deriv. of II, while 4-aminoacenaphthene HCl in AcONa soln. gives a deep bluish red aminoazo deriv., $\text{C}_{23}\text{H}_{18}\text{O}_4\text{N}_3\text{SNa}$, H_2SO_4 gives a bluish green color; wool and silk are dyed brownish shades of red. Reduction of 4-nitroacenaphthene by $\text{Na}_2\text{S}_2\text{O}_4$ gives principally the 4- SO_3H acid deriv. but about 6% of the 3-deriv. The latter is only slightly sol. in H_2O , does not couple with diazo compds. and is diazotized with difficulty at low temps. C. J. WEST

Reduction products of the hydroxyanthraquinones. VII. WM. B. MILLER AND A. G. PERKIN. *J. Chem. Soc.* **127**, 2684–91 (1925); cf. *C. A.* **19**, 3269. — In the reduction of alizarin 2-Me ether by SnCl_4 and 33% HCl there results a small amt. of 4-hydroxy-3-methoxyanthrone (I), pale yellow, m. 202° (*Ac* deriv., lemon-yellow, m. 185–6°), oxidized by CrO_3 to acetylalizarin 2-Me ether and a much larger amt. of 1-hydroxy-2-methoxyanthrone (II), orange red, m. 135–7° (*di-Ac* deriv., yellow, m. 202°). I, H_2SO_4 and $\text{C}_2\text{H}_5\text{OH}$ give benzalazarin Me ether, orange, m. 247–9°, sol. in H_2SO_4 with a violet red color (isolated as the *Ac* deriv., pale yellow, m. 205–7°); this ether was also obtained by the partial methylation of benzalazarin. II, treated as above, gives isobenzalazarin, (III), orange, m. 260–2° (*Ac* deriv., bright orange-yellow, m. 243–5°; *di-Ac* deriv., yellow, m. 214°), H_2SO_4 gives a green, fluorescent, orange-red liquid and with boiling alkalis, orange yellow solns. which with Ba(OH)_2 yield orange-red ppts. The *Ac* deriv. in boiling EtOH-AcOK gives an orange K salt. The Me ether, deep yellow, m. 196–8° (*Ac* deriv., yellow, m. 178–80°). III dyes mordanted wool shades which are very distinct from those given by benzalazarin. Anthrapurpurin di-Me ether, orange-red, m. 234–5° (*Ac* deriv., yellow, m. 204–5°), from triacetylaurthrapurpurin and Me_2SO . Reduction with SnCl_4 and HCl gives anthrapurpurinanthranol di-Me ether, isolated as the *di-Ac* deriv., m. 178°. C. J. WEST

Chrysarobin. R. EDER AND F. HAUSER. *Arch. Pharm.* **263**, 436–51 (1925); cf. *C. A.* **19**, 2202. — In a continued examl. study of the non-antioxidizable dimol reduction products of hydroxymethylanthraquinones, *viz.*, dehydroanthranol mono Me ether and ararobinol, it is shown with considerable probability that the former is a deriv. of

dihydrodianthrone (dianthrone), of the type



, while the

yellow substance known as ararobinol is like the former a binuclear quinone and stands in similar relationship to chrysophanic acid anthrone as the dehydro compd. to emodin monomethyl ether anthrone.

W. O. E.

Composition of rubicene, $C_{26}H_{14}$ (reply to K. Dziewonski and J. Suszko). RUDOLF PUMMERER AND H. M. ULRICH. *Ber.* 58B, 1806-8(1925).—Rubicene has been prepd. by D. and S.'s pyrogenic method (*Bull. acad. sci. Cracovie* 1921, 53, 2173; cf. C. A. 17, 1459) but the residue from the $CHCl_3$ ext. of the crude product was sublimed under 2 mm., the sublimate extd. with $CHCl_3$ and the residue from the ext. fractionated from alc., ligroin, C_6H_6 , xylene, $PhNO_2$ and xylene again. There was finally obtained a pure product, m. 306° . Eight microanalyses by 4 different men on products prepd. both by D. and S.'s and by P. and U.'s method establish the compn. $C_{26}H_{14}$. C. A. R.

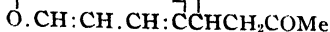
Univalent oxygen. IV. STEFAN GOLDSCHMIDT, ADOLF VOGT AND MAX ALBERT BREDIG. *Ann.* 445, 123-41(1925); cf. C. A. 18, 3375.—The halogen of chlorophenanthrol, even under very energetic conditions, is very difficultly and only partially removed. The Cl in dichlorophenanthrone (I) is more reactive and while the desired reaction was not obtained with $EtONa$, $PhONa$ gives 25-30% of 9-diphenoxy-10-*keto*-9,10-phenanthrene dihydride, m. $136-7^\circ$ (decompn.), decomps. in the sunlight in moist air, especially at summer temp., in a few days, splitting off $PhOH$. Mol. wt. in C_6H_6 normal. Reduction with Zn dust in $AcOH$ gives a nearly quant. yield of phenanthrenehydroquinol mono-*Ph* ether, m. $140-1^\circ$; it is pptd. unchanged from alk. solns. by acids. Oxidation in 3% $NaOH$ with $K_3Fe(CN)_6$ gives 9,9'-diphenoxy-10,10'-phenanthryl peroxide, m. $166-7^\circ$ (decompn.); in the cold its solns. are colorless but in boiling $CHCl_3$ or C_6H_6N a pale rose color develops, indicating dissociation; the mol. wt. in boiling $PhNO_2$ is normal. Reduction with Zn in $AcOH$ gives the *Ph* ether; warming with HNO_3 gives phenanthrenequinone (II); Br in $CHCl_3$ gives the same compd. $PhOH$ and I at 50° give 9-*bis*-*p*-hydroxyphenyl-10-phenanthrone, m. 248° ; *o*- MeC_6H_4OH gives the corresponding *o*-hydroxyacetyl deriv., m. $291-2^\circ$ (decompn.) II and $N_2H_4 \cdot H_2O$ in dil. $EtOH$ give phenanthrazine, m. about 450° ; the concd. H_2SO_4 soln. is deep blue. II or the mono-Cl deriv. is reduced by $SnCl_2$ in $AcOH$ satd. with HCl to 9-phenanthrol, m. $150-1^\circ$ (yield, 50-60%); oxidation with $K_3Fe(CN)_6$ gives an amorphous red-brown compd., probably not the simple phenanthroxyl, since reduction with $(PhNH)_2$ does not give the original 9-phenanthrol. Br gives 9-bromo-10-phenanthrol, m. 127° ; in $CHCl_3$ PhO_2 gives the peroxide, m. about 109° (decompn.); the solns. are decompd. by sunlight at 0° in 10-15 min., while at 0° in the dark after 24 hrs. solns. show the deep red color of the free radical. Titration with $(PhNH)_2$ indicates that equil. between the peroxide and the free radical is reached in about 1 hr., with 30% radical. Beer's law does not hold for solns. of the free radical. The dissociation const. in $CHCl_3$ contg. 0.5% C_6H_5N at 0° is $k = 2.9 \times 10^{-4}$, at 15° , 7×10^{-4} ; the corresponding values for the Cl deriv. are 5.6 and 5 (at 20°)

C. J. WEST

Hydrogenation of furan derivatives. T. KARIYONE. *J. Pharm. Soc. Japan*, No. 515, 1-22(1925).—Four methods of catalytic hydrogenation were used, viz., Pt black, colloidal Pt soln., $Pd-BaSO_4$ and colloidal Pd soln. The furan derivs. used were: (1) Those contg. $-CH_2-$ or $-CH=$ at the α -position of the furan nucleus (furfurethylene, furylacrylic acid, furfuralacetone, furylphenylmethane, and furyl alc. (2) Those having $-CO-$ group at the α -position (furyl Me ketone, furyl Ph ketone, furoin, furil and furyl-ethyl ether). (3) Furfural and its derivs. (furfural, furfural di-Et acetal and furfurylidene diacetate. (4) Furan carboxylic acid and its derivs. (pyromucic acid, Et pyromucate, pyromucic amide, furfuronitril, β -(?)-nitropyromucic acid, dehydromucic acid, di-Me dehydromucate and α -methylfuran- β -carboxylic acid. The results of hydrogenation of these substances are given in detail, including the kind of catalyzer and the solvent used, no. of mols. H taken up and the hydrogenated products and other phys. properties such as m. p. and b. p. In general, the conclusions may be summarized as follows. The members of group (1) are the most easily hydrogenated, next (2) and α - CO_2H acid derivs. are rather difficult to be reduced. The dehydromucic acid can be easily reduced by Na-Hg, but difficultly by catalytic hydrogenation. In (3), the di-Et ester is the easiest to be reduced, furfural being the most difficult. When 1 mol. H was added to those having a side chain with a double bond, K. found that furfurethylene gave a large amt. of the original substance and a trace of the 6-hydro deriv., while furylacrylic acid gave quant. furylpropionic acid. Certain interesting comparisons between the speeds of the H absorption by Ph and furan derivs. are illustrated in 5 curves. The following 7 derivs. of furan could not be hydrogenated by Pt black or Pd catalyzers:—1,4,2- $Me_2(HO_2C)$, 1,3,2- $Me_2(HO_2C)$, 1,3,4,2- $Me_3(HO_2C)$, 1,4,2,3- $Me_2(HO_2C)_2$, 4,3,1- $Me(HO_2C)(HO_2CCH_2)$, 1,4,2- $Ph_2(HO_2C)$, 1,4,2,3- $Ph_2(HO_2C)_2$. S. T.

Some furan derivatives. A FUJITA. *J. Pharm. Soc. Japan* No. 519, 456-71 (1925).—The chem. behavior of derivs. of furfuralacetone (I) is reported. I was prepd. according to Claisen and Ponder's method (*Ann.* 223, 144), and reduced by Na-Hg in $MeOH$ contg. $AcOH$. Two products are formed; (a) furfurylaceton, d_4^{20} 1.0308, n_D^{26}

1.47446, mol. refraction 37.66, and (b) the portion b_{12} 93–5°, which probably has the structure, $\text{O} \cdot \text{CH} \cdot \text{CH} \cdot \text{CH} \cdot \text{CCHCH}_2\text{COMe}$



instead, not only the double bond in the side chain becomes satd., but the furan nucleus itself becomes hydrogenated. Next furfurylacetone is converted to an oxime, d_4^{20} 1.0907, n_D^{18} 1.51266, mol. refraction 42.08, which on reduction with Na-Hg in AcOH-MeOH, gave δ -furylbutan- β -amine; the interesting pharmacol property of this compd will be reported by Kubota. When difurfuralacetone was reduced similarly by Na-Hg, F. obtained 2 derivs.: (a) difurylacetone, and (b), a compd. $\text{C}_{13}\text{H}_{12}\text{O}_3$, m. 188°, which is probably 3,4-difurylpentanone. Supplementary data on mol. refraction are given for some furan derivs. S T

Production of cyclotelluripentanedione dichlorides. G. T. MORGAN, F. J. CORBY, O. C. ELVINS, EVELINE JONES, R. E. KELLETT AND C. J. A. TAYLOR. *J. Chem. Soc.* 127, 2611–25 (1925).—In the reaction of TeCl_4 with β -diketones, certain constitutional features must be present in order that the ketone may react in the desired sense; these conditions are discussed and are illustrated in the following preps. *n*-Propylpropionylacetone, b_{750} 210°, gives an intense bluish purple color with FeCl_3 , has a pleasant terpenoid odor and yields a greenish gray Cu salt, m. 178° (decompn.). With TeCl_4 in CHCl_3 it gives 62% of 2-methyl-4-propylcyclotelluripentane-3,5-dione 1,1-dichloride, darkens 145°, blackens 150°; $\text{K}_2\text{S}_2\text{O}_8$ in ice-cold H_2O readily reduces it to the free ketone, Au-yellow, m. 102° (slight decompn.). 3-Isopropylpropionylacetone, b_{750} 195°, does not give a color with FeCl_3 and does not yield a Cu salt; TeCl_4 gives the corresponding 4-isopropyl dichloride, darkens 168°, blackens 173°; the free ketone is light yellow, m. 127°. 3-Methyl-3-ethylpropionylacetone, b_{10} 118° (25% yield), fragrant odor, does not give a color with FeCl_3 , a Cu salt nor could a Te salt be isolated, though it may have been present in the tar which is formed. 3-Benzylpropionylacetone, b_{20} 185°, fragrant odor, gives an intense reddish violet color with FeCl_3 , and a pale gray, silvery Cu salt m. 182°. TeCl_4 gives the 4-benzyl dichloride, m. 168°; the free ketone, yellow, m. 121° (decompn.); it does not sublime in vacuo. 3-Isobutylacetylacetone, b_{10} 93 1°, gives a bluish purple color with FeCl_3 and a steel-gray Cu salt, m. 158°. TeCl_4 gives 4-iso-butylcyclotelluripentane-3,5-dione 1,1-dichloride, m. 142°; the free ketone, yellow, m. 150°. β -Phenylpropionylacetone yields a Cu salt, grayish blue, m. 158°. TeCl_4 gives a non-cryst. dichloride, from which $\text{K}_2\text{S}_2\text{O}_8$ liberates 2-benzylcyclotelluripentane-3,5-dione, yellow, decompn., 159°. 2-Decylcyclotelluripentane-3,5-dione 1,1-dichloride, m. 89° (21% yield); the free ketone, pale yellow, m. 98–9° (decompn.). $\text{PhCH}_2\text{COCH}_2\text{COEt}$ and TeCl_4 give a product m. 64–8°, which gives the enolic reaction with FeCl_3 and is very sensitive to H_2O ; it is not a member of the series under consideration. 2-Methylcyclotelluripentane-3,5-dione dioxime, grayish yellow, darkens 153°, m. 161.5°; a small amt. of a sol. product (in boiling C_6H_6), m. 135–50°, was probably impure dioxime. 2-Methyl-4-ethylcyclotelluripentane-3,5-dione yields a monoxime, bright yellow, m. 157°, and a dioxime, grayish yellow, blackens 170°, decompn. 182°. 3-sec-Butylacetylacetone, b_{13} 109–11° (9% yield); it yields no Cu deriv. but with TeCl_4 gives 37% of 3-sec-butylcyclotelluripentane-3,5-dione 1,1-dichloride, darkens 162°, m. 168–9°; the free ketone, primrose-yellow, m. 145°. The corresponding sec-butyl dichloride, darkens 136°, m. 162°, results in 35% yield from *dl*-sec-amylacetylacetone, b_{16} 116° (gives a purple color with FeCl_3 and a greenish gray Cu salt, m. 120°); the free ketone, pale yellow, m. 138–9°. 3-sec-Amyldipropionylmethane, b_{18} 137°, gives a purple color with FeCl_3 and a greenish gray Cu salt, m. 105°; the condensation with TeCl_4 gave only oily products. *Te* acetylmethylcyclohexanone, m. 159–60°, $[\alpha]_{589}^{17}$ 106.4° (0.5 g. in 10 cc C_6H_6).

C. J. WEST

Interaction of tellurium tetrachloride and monoketones. G. T. MORGAN AND O. C. ELVINS. *J. Chem. Soc.* 127, 2625–32 (1925).—*Te* bisacetone dichloride, m. 126–8°, in 17% yield from Me_2CO , TeCl_4 and CHCl_3 ; reduction causes decompn. with liberation of *Te*. *Te* methyl ethyl ketone trichloride, m. 101–1.5° (75% yield). *Te* bismethylpropyl ketone dichloride, m. 92–3°, decompn. in contact with mother liquor. *Te* bismethylisopropyl ketone dichloride softens 85°, m. 90° (52% yield). *Te* bismethylbutyl ketone dichloride, m. 62° (1.1 g. from 3 g. ketone). *Te* bismethylisobutyl ketone dichloride, m. 95° (45% yield). *Te* diethyl ketone trichloride, m. 77–8° (84.6% yield). *Te* dipropyl ketone trichloride, m. 70° (77% yield); hydrolyzed in moist air. *Te* pinacolin trichloride, softens 110°, m. 114–5° (21% yield); the mother liquor deposited *Te* bispinacolin dichloride, m. 191–2° (26% yield); while this is much more permanent in the air than

the trichloride, all attempts to remove the Cl were unsuccessful. EtCOCHMe_2 and TeCl_4 gave only a brown sirup, but $(\text{iso-Pr})_2\text{CO}$ did not react with TeCl_4 . *Te phenyl-ethyl ketone trichloride*, m. $114-5^\circ$ (61% yield). *Te phenyl propyl ketone trichloride*, m. $128-9^\circ$ (71% yield). *Te phenylbenzyl ketone trichloride*, m. $142-3^\circ$ (60% yield); this is reduced by aq. $\text{K}_2\text{S}_2\text{O}_8$ to a yellow solid, which is very unstable and decomps. on exposure or in CHCl_3 soln.

C. J. WEST

Complex metal compounds of indigo blue. III. K. KUNZ AND W. STÜHLINGER. *Ber. 58B*, 1860-8(1925); cf. C. A. 18, 686. --This work was carried out to obtain further data on the valence relationships in the complex and addn compds of indigo (I) with metals, NaOH, alcoholates, SnCl_4 , Grignard reagents, etc., the guiding principle being to find a parallelism between I and chlorophyll. Like the latter, so also I under suitable conditions reacts with Cu or Zn acetate, forming compds identical with those previously obtained with the metals; almost the calcd. amt. of AcOH is split off at the same time. Only the acetates of the heavy metals react in this way; $\text{Mg}(\text{OAc})_2$, e. g., forms no Mg compd. The mechanism of the reaction has not yet been established experimentally. *N,N'*-Diphenylindigo (II) also reacts with $\text{Cu}(\text{OAc})_2$ with formation of a new type of complex contg. Cu with an abnormally high coordination no. With FeCl_3 the indigoid dyes form addn. products contg. 1 mol. salt to 1 or 2 mols. dye; MeCN is the best solvent, the least trace of $\text{C}_6\text{H}_5\text{N}$ leading to a regeneration of the components; $\text{Fe}(\text{OAc})_3$ and enol Fe salts do not react. To exclude the possibility that it is the two C.O. groups in I and its derivs which are responsible for the formation of these addn compds [2-methylindyl] [2'-methylindolydene]-methane (III) was studied and found to react like I with heavy metal acetates and FeCl_3 . Na-K in xylene at 140° seems to form true substitution products, with evolution of the calcd. amt. of H and only a barely perceptible change in color. II-Cu compd., III.Cu , from II shaken with $\text{Cu}(\text{OAc})_2$ in dry $\text{C}_6\text{H}_5\text{N}$ until the blue color of the soln. changes to a pure green is extremely sensitive in soln. to moisture, AcOH , etc.; attempts to det. the amt. of AcOH split off in its formation gave positive but, owing to the great sensitiveness of the dye towards the oxidizing action of the $\text{Cu}(\text{OAc})_2$, not conclusive results. 7,7'-Dimethylindigo (V) (0.5 g.) with dry FeCl_3 in MeCN at 30° gives 0.2 g. of a compd. 2IV.FeCl_3 , almost black crystals forming in MeCN or CHCl_3 green solns. which rapidly deposit IV on addn. of a drop of H_2O , while in PhMe at $70-80^\circ$ is obtained a compd. IV.FeCl_3 , dark green powder slightly decompd. even by washing with dry PhMe, instantly regenerates IV with traces of moisture, acids, even abs. alc. With Zn and Cu acetates in $\text{C}_6\text{H}_5\text{N}$, SnCl_4 in C_6H_6 , IV reacts like I while thioindigo does not react even with SnCl_4 . The compd. II.FeCl_3 (0.4 g. from 0.5 g. II and FeCl_3 in MeCN at 30°), blue-black crystals, strongly dichroitic by transmitted light under the microscope, immediately decompd. by H_2O or alc.; on shaking in Et_2O suspension with concd. NaOH or $\text{C}_6\text{H}_5\text{N}$ it decompd. through an exceedingly unstable red intermediate product. The 7,7'-Me₂ deriv. of II with K yields a very unstable red compd. $(\text{C}_{30}\text{H}_{22}\text{O}_2\text{N}_2)\text{K}$. Compds of III: III.Cu , crystals with greenish metallic luster, from III in $\text{C}_6\text{H}_5\text{N}$ treated below 85° dropwise with $\text{Cu}(\text{OAc})_2$, regenerates III with acids. III.Ag , red. III.FeCl_3 , from the components in MeCN, green, more stable towards H_2O than the I analog.

C. A. R.

Complex metal compounds of chlorophyll. I. K. KUNZ AND K. SEHRBUNDT. *Ber. 58B*, 1868-76(1925).--The striking similarity of the chlorophyllins to the metal compds. of indigoid derivs described in the preceding abstr. led to a renewed study of chlorophyll (I); the first results of this study are reported in the present paper. Dried powd. nettle leaves were extd. with Me_2CO according to Willstätter, the I was saponified with KOH in MeOH, the K chlorophyllin (II) subjected to alk. degradation in autoclaves and the di- CO_2H acid rhodophyllin (III) or the mono- CO_2H acid pyropheophyllin (IV), depending on the conditions, was isolated in cryst. form. At first the Mg-contg. phyllins were isolated according to W. and the porphyrins were then prepd. from them but in the later work no attempt was made to isolate the very sensitive phyllins and the metal-free compds. were prepd. directly by a simplified process. The series of isomeric CO_2H acids, starting from pheophytin (V), was also studied and a shortened process for obtaining directly the metal-free compds. erythroporphyrin (VI) and phylloporphyrin (VI), without isolating the phyllins, was worked out. Removal of the last CO_2H group from the end products of both series by heating with very small amts. of soda-lime (40-50 mg.) gave in very poor yield ethiophyllin (VII) and ethioporphyrin (VIII); the amt. of crystd. VIII available was about 120 mg. Comparison of I with indigo shows that both have a pronounced ability to form complexes with metals and mol. compds., the reaction being accompanied by a deepening in color. The resulting compds. generally contain 1 atom of metal or 1 mol. of salt to every 4 pyrrole nuclei. Their reactivity towards chem. agents varies widely; while very sensitive towards acids,

they are quite stable towards alkalis; in both the indigo and the I derivs., the firmness of the union increases from the very labile alkali compds. to the extraordinarily inert Cu (indigo) or Mg (I) compds. Attempts to eliminate any possible disturbing influence of CO_2H groups in the prepn. of heavy metal compds. of I derivs. by using mostly porphyrin esters led to the formation of a no. of complex Cu and Zn compds. with 1 atom metal to 4 pyrrole nuclei; rhodoporphyrin (IX) with cold $\text{Cu}(\text{OAc})_2$ gave a compd. with 8 pyrrole nuclei per atom of Cu. As in the case of indigo, so the porphyrin esters smoothly react in xylene with Cu, without evolution of H_2 , yielding the same compds. as with $\text{Cu}(\text{OAc})_2$. Similar (qual.) results are obtained with Zn- or Mg Al. ZnCO_3 on shaking in cold C_6H_6 with porphyrin esters forms with surprising ease complex compds. with 1 atom Zn per mol. of ester. Repetition of Willstätter's work on the prepn. of a cryst. Fe compd. of IX gave only unchanged IX contaminated with Fe salts but FeCl_3 in MeCN gives a compd. entirely analogous to that obtained from indigo. Finally, with K in anhyd. solvents porphyrin esters, like indigo, react very slowly or not at all, no evolution of H_2 can be observed. *Me pyrroporphyrin (X) compds.*: *X.Cu*, from X and $\text{Cu}(\text{OAc})_2$ in MeCN at $60-70^\circ$, red needles, does not decomp. in hot AcOH-HCl , also obtained from X and Cu powder in C_6H_6 at $100-20^\circ$. *X.Zn*, easily decompd. by HCl . $\text{C}_{33}\text{H}_{34}\text{O}_2\text{N}_4\text{K}$, from X and K in C_6H_6 -ligrou in ice, obtained as a red-violet soln. instantly changed to the original brown-red by H_2O , alc. or acids. *Cu and Zn compds. of Me rhodoporphyrin; FeCl}_3* compd., $(\text{C}_{33}\text{H}_{34}\text{O}_4\text{N}_4) \cdot \text{FeCl}_3$, brown red, decompd. by acids, H_2O and $\text{C}_3\text{H}_5\text{N}$. C. A. R.

Crystallographic data for some organic compounds. GILBERT GREENWOOD *Mineralog. Mag.* 20, 393-405(1925).—*Menthyl bromomethylcyclophenylhydrazonocarboxylate*, m. p. $133-4^\circ$, is orthorhombic-hemihedral with $a:b:c = 0.923:1.064:1$. *Menthyl bromomethylcyclo-p-tolylhydrazonocarboxylate*, m. p. $155-6^\circ$, is also orthorhombic hemihedral with $a:b:c = 0.927:1.064:1$. *4,5-Dibromo-1-methylglyoxaline-HCl*, m. p. 179° , and d. = 2.082 is monoclinic-holohehdral with $a:b:c = 0.897:1.065:1$, $\beta = 82.12^\circ$. *Glyoxaline-4(5)-sulfonic acid*, m. p. 307° and d. = 1.838 is tetragonal with $c = 0.839$, $\epsilon = 1.625$, $\omega = 1.551$. *2-Methylglyoxaline-4(5)-sulfonic acid*, m. p. 279° and d. = 1.686, is monoclinic-holohehdral with $a:b:c = 0.529:1.0408$; $\beta = 60.38^\circ$. *4(5)-Bromoglyoxaline-5(4)-sulfonic acid*, m. p. 280° and d. = 2.085, is also monoclinic-holohehdral with $a:b:c = 0.851:1.0492$; $\beta = 61.15^\circ$. *2-Methyl-4(5)-bromoglyoxaline-5(4)-sulfonic acid*, m. p. 266° and d. = 1.968, is orthorhombic-holohehdral with $a:b:c = 0.594:1.0432$. *1-Methyl-5-bromoglyoxaline-4-sulfonic acid*, m. p. 284° and d. = 2.186, is monoclinic-holohehdral with $a:b:c = 0.945:1.0512$; $\beta = 85.24^\circ$. *Triphenylphosphine oxide*, m. p. 153° and d. = 1.206 is orthorhombic holohehdral with $a:b:c = 0.630:1.0390$. *p-Tolylazobenzylformaldoxime* with d. = 1.234 is monoclinic-holohehdral with $a:b:c = 1.352:1.1216$; $\beta = 83.17^\circ$. A fission product of lupulone, $\text{C}_{38}\text{H}_{46}\text{O}_4$, m. p. 91° and d. = 1.150 is orthorhombic-holohehdral with $a:b:c = 0.610:1.0701$. *5-Carbolime*, m. p. 225° and d. = 1.352, is monoclinic-holohehdral with $a:b:c = 0.8013:1.04285$, $\beta = 68.46^\circ$. W. F. HUNT

Dissociation constants of imidazole-4,5-dicarboxylic acid. H. PAULY. *Ber.* 58B, 1791-2(1925) — Reply to Lehmstedt (*C. A.* 19, 2825). P. and Ludwig used the Bredig method (*Z. physik. Chem.* 13, 288(1894)) to det. the 2nd dissociation const. of the acid. C. A. R.

2-m-Xylidino-5-ethoxy-4,5-dihydrothiazole. V. K. NIMKAR AND F. L. PYMAN. *J. Chem. Soc.* 127, 2746(1925); cf. Burtles, Pyman and Roylance, *C. A.* 19, 1709 — The action of concd. H_2SO_4 on acetalyl-m-xylalylthiocarbamide gives 2-m-xylidino-5-ethoxy-4,5-dihydrothiazole (?), m. $102-3^\circ$ (cor.), whose picrate, m. 152.4° (cor.) (previously reported $142-3^\circ$). C. J. WEST

Thiodiazines. II. Condensation of ω -bromoacetophenone with 4-substituted thiosemicarbazides. PRAFULLA KUMAR ROSE. *Quart. J. Ind. Chem. Sec.* 2, 95-114(1925). — Whereas the condensation of thiosemicarbazides with PhCOCH_2Br (I) to form thiazole derivs. has been found to depend upon the basic character of the 2 extreme NH_2 groups, (cf. *C. A.* 19, 831; 7, 1478) it is now seen that the basic character of the 4-N atom partaking in ring formation cannot be regarded as the sole factor in detg. the relative yields of thiazole derivs. Although no independent method for measuring the mobility of the H atom is available, it would seem that the relative proportions of thiodiazine and thiodiazole formed in the different cases depends upon this relative mobility. The results obtained indicate that the formula for a substituted thiosemicarbazide is $\text{RNHC(SH)}: \text{NNHR}'$ rather than $\text{RN:C(SH)NHNHR}'$. The methylation product of 2-amino-5-phenyl-1,3,4-thiodiazine previously regarded as 2-methylamino-5-phenyl-1,3,4-thiodiazine (cf. *C. A.* 19, 831) is now regarded as 2-imino-3-methyl-5-phenyl-2,3-dihydro-1,3,4-thiodiazine (cf. *C. A.* 17, 1640; 18, 677). The thiodiazines are stable compds. forming salts

with acids; the alkylamino derivs. are less stable than the arylamino derivs.; boiling with H_2O or aq. alkali causes decompn.; the isomeric thiazole hydrazones are more basic and susceptible to oxidation. Phenyl-, *o*- and *p*-tolylthiazoles give a ppt. with HNO_3 , a property absent with the α -naphthylthiazole and the thiazines. Six g. of **I** and 5 g. $PhNHCSNHNH_2$ (**II**) gave 6.5 g. of 2-phenylamino-5-phenyl-1,3,4-thiodiazine-*HBr* (**III**), m. 191° , and 13% of 2-keto-3,4-diphenyl-2,3-dihydro-1,3-thiazole hydrazone-*HBr* (**IV**) which softens at 206° and m. $224-6^\circ$ (decompn.); the free bases obtained by treatment of the *HBr* salts with NH_4OH and recrystn. from $C_6H_6N + H_2O$ are colorless and m. 198° and 175° (decompn.), resp.; the *Ac* deriv. of **III** is amorphous and m. 110° . **Ac_2O** and **II** form 1-acetyl-4-phenylthiosemicarbazide (**V**), m. 173° . Equimol. amts. of **I** and **V** gave 2-keto-3,4-diphenyl-2,3-dihydro-1,3-thiazole acetylhydrazone-*HBr*, m. 224° , on treatment with NH_4OH yields the amorphous free base (**VI**); on boiling with dil. HCl it yields **IV**. Acetone 4-phenylthiosemicarbazone, from Me_2CO and **II**, m. 128° and when treated with 1 mol. **I** gave 2-keto-3,4-diphenyl-2,3-dihydro-1,3-thiazole isopropylidenhydrazone-*HBr*; NH_4OH converts this to the free base, yellow, m. 165° . Anisaldehyde (**XII**) and **II** form anisylidene 4-phenylthiosemicarbazone, m. $180-1^\circ$ and when treated with **I** gives 2-keto-3,4-diphenyl-2,3-dihydro-1,3-thiazole anisylidenhydrazone, m. 161° ; it is also obtained from **XII** and **VI**. Benzylidene-4-phenylthiosemicarbazide and **I** form 2-keto-3,4-diphenyl-2,3-dihydro-1,3-thiazole benzylidenhydrazone, yellow, m. 191° . 4-*p*-Tolylamino-5-phenyl-1,3,4-thiodiazine-*HBr* from **I** and *p*- $MeC_6H_4NHCSNHNH_2$ in abs. alc. was recrystd. from alc. and m. 195° ; free base, m. 179° ; *Ac* deriv., m. 115° . The *HBr* salts of 2-*o*-tolylamino-5-phenyl-1,3,4-thiodiazine (**VIII**) and 2-keto-3-*o*-tolyl-4-phenyl-2,3-dihydro-1,3-thiazole hydrazone are both obtained by interaction of *o*- $MeC_6H_4NHCSNHNH_2$ and **I**; the former m. 185° and the latter m. $206-8^\circ$ (decompn.); the pale yellow free bases, m. 148° and 136° , resp. When **VIII** is treated with 1 mol. **Br** in $AcOH$, a mono-*Br* deriv., $C_{10}H_9N_3SBr$, m. $155-6^\circ$ is obtained. 2-Allylamino-5-phenyl-1,3,4-thiodiazine-*HBr* from **I** and $CH_2=CHCH_2NHCSNHNH_2$, obtained in 90% yield, m. 165° , the free base, greenish yellow, m. 99° . α - $C_{10}H_7NHCSNHNH_2$ and **I** yield the *HBr* salts of 2- α -naphthylamino-5-phenyl-1,3,4-thiodiazine (**IX**) and 2-keto-3- α -naphthyl-4-phenyl-2,3-dihydro-1,3-thiazole hydrazone, m. 220° (decompn.) and 208° (decompn.), resp.; the free bases, m. $166-7^\circ$ and 179° , resp., the former being yellow and the latter pale greenish yellow; the *Ac* deriv. of **IX** is a white amorphous powder. β - $C_{10}H_7NHCSNHNH_2$ and **I** gave 76% of 2- β -naphthylamino-5-phenyl-1,3,4-thiodiazine-*HBr*; a soln. in C_6H_6N on adding H_2O yields the yellow free base, m. 153° . **I** and $MeNHCSNHNH_2$ (**X**) react to form the yellow 2-methylamino-5-phenyl-1,2,4-thiodiazine, m. $144-5^\circ$ and the yellow 2-keto-3-methyl-4-phenyl-2,3-dihydro-1,3-thiazole isopropylidenhydrazone, m. $92-3^\circ$, also obtained from acetone 4-methylthiosemicarbazone (from **X** and Me_2CO , m. 118°) and **I**. Anisylidene-4-methylthiosemicarbazone (**XI**) (from **XII** and **X**, m. 207°) and **I** yield the *HBr* salt of 2-keto-3-methyl-4-phenyl-2,3-dihydro-1,3-thiazole anisylidenhydrazone (**XI**), m. $235-6^\circ$ (decompn.); the free base, m. 128° ; **XI** is also obtained from **XII**, **X** and **I**. A yield of 2.7 g. of 2-ethylamino-5-phenyl-1,3,4-thiodiazine, m. 158° , was obtained from 2.38 g. $EtNHCSNHNH_2$ and **I**; from the mother liquors a very small amt. of material was obtained which is probably 2-keto-3-ethyl-4-phenyl-2,3-dihydro-1,3-thiazole isopropylidenhydrazone. On boiling **III** with concd. HCl **IV** is obtained; the *p*- and *o*-tolylthiazine derivs. similarly yield the corresponding *p*- and *o*-tolylthiazole derivs. N. A. LANGE

Preparation of heterocyclic aldehydes. III. Triazolaldehydes. C. A. ROJAHN AND HANS TRIELOFF. *Ann.* **445**, 296-306 (1925); cf. *C. A.* **18**, 2339. 1-Phenyl-5-methyl-1,2,3-triazole-4-carboxyl chloride, b_p 105° (slight decompn.), m. 133° ; amide, m. $217-8^\circ$; anilide, m. $149-50^\circ$. Catalytic reduction of the chloride gives 1-phenyl-5-methyl-1,2,3-triazol-4-aldehyde (**I**), m. 52° ; semicarbazone, m. $226-7^\circ$; aminoguanidone nitrate, m. 224° ; anil, m. 256° ; syn-oxime, m. 162° ; attempts to acetylate the oxime gave the nitrile of 1-phenyl-5-methyl-1,2,3-triazole-4-carboxylic acid, m. $63-4^\circ$. The condensation product of **I** and $NCCH_2CO_2Et$, $C_{15}H_{14}O_2N$, m. $126-7^\circ$. The oxime, reduced with $Na-Hg$ in $EtOH-AcOH$, gave 1-phenyl-4-aminomethyl-5-methyl-1,2,3-triazole-*HCl*, m. $182-4^\circ$, whose picrate, yellow, m. 328° . **I** and Na in $AcOEt$ yield 1-phenyl-5-methyl-1,2,3-triazol-4-acrylic acid, m. 189° . The mother liquor from **I** contains 1-phenyl-5-methyl-1,2,3-triazole, m. 64° , and 1-phenyl-4,5-dimethyl-1,2,3-triazole, m. 98° , whose picrate, m. 131° . In 1 reduction expt. there resulted the acid anhydride, m. 189° . 1,5-Diphenyl-1,2,3-triazole-4-carboxyl chloride, yellowish, m. 101° ; amide, m. 174° ; anilide, m. $147-8^\circ$. 1,5-Diphenyl-1,2,3-triazol-4-aldehyde, m. $104-5^\circ$ (70% yield); oxime, m. 176° ; semicarbazone, m. 224° ; aminoguanidone nitrate, m. 205° ; anil, m. $136-7^\circ$; $CNCH_2CO_2Et$ condensation product, m. $165-6^\circ$. 1-Phenyl-5-chloro-1,2,3-triazole-4-carboxylic acid, m. $189-90^\circ$; *Et* ester, m. 78° ; chloride, m. $125-6^\circ$; amide, m. $182-3^\circ$; anilide, m.

146°. Attempts to prep. the chloride of 1-phenyl-1,2,3-triazole-4,5-dicarboxylic acid gave a resinous mass, but the CHCl_3 soln. with NH_3 gave the *diamide*, m. 228°. 2-Chloro-5-methyl-1,3,4-triazole and ClCO_2Et gave 2-chloro-3(or 4)-*N*-carbethoxy-5-methyl-1,3,4-triazole, m. 58–9°.

C. J. WEST

Pyrylium compounds. XV. Arylated pyridines. 7. *m*-Substituted triphenylpyrylium compounds. W. DILTNEY AND W. RADMACHER. *J. prakt. Chem.* **111**, 153–66 (1925); cf. *C. A.* **19**, 519.—2-[*m*-Nitrophenyl]-4,6-diphenylpyrylium chloride-ferric chloride (I), greenish yellow, m. 218°, in 2.6 g. yield from 2- $\text{O}_2\text{NC}_6\text{H}_4\text{Ac}$ and 2.5 g. PhCOCH:CHPh in AcOH and FeCl_3 ; the pseudo base (2-[*m*-nitrophenyl]-4,6-diphenylpyranol) is amorphous and very unstable and was analyzed as the *picrate*, orange-red, m. 251° and the *perchlorate*, Au-yellow, m. 276–7°. I in EtOH suspension, treated with NH_3 , gives 2-[*m*-nitrophenyl]-4,6-diphenylpyridine, m. 141–2° (*purate*, yellow, m. 184°; *perchlorate*, pale yellow, m. 176°). SnCl_2 in HCl gives the *m*-amino deriv., m. 151°; *Bz deriv.*, m. 224–5°; *dipicrate*, yellow, m. 207°; *monoperchlorate*, yellow, m. 235°, *diperchlorate*, m. 170–1°. 4-[*m*-Nitrophenyl]-2,6-diphenylpyrylium chloride-ferric chloride, yellow, m. 237–8° (35% yield); the pseudo base, yellow, m. 135°; in 1.1 H_2SO_4 it shows a green fluorescence; *purate*, reddish yellow, m. 248°, *perchlorate*, dark yellow, m. 268°. 4-[*m*-Nitrophenyl]-2,6-diphenylpyridine, m. 150–1°; *picrate*, yellow, m. 188°; *perchlorate*, m. 271–2°. The *m*-amino deriv., m. 168–9° and gives a violet fluorescence in concd. H_2SO_4 ; *dipicrate*, m. 209°. 4-[*m*-Aminophenyl]-2,6-diphenylpyrylium *diperchlorate*, m. 281–2° (yield, 15%); the pseudo base, m. 132–3°, shows a greenish blue fluorescence in concd. H_2SO_4 and is not very stable in the air; *hydrobromide*, decomps. above 290°; *dipicrate*, brown needles, m. 232–3°; in C_6H_6 there results a yellow *monopicrate*, m. 230–1°; in AcOH , a red *monopicrate*, m. 236–7°. 2-[*m*-Methoxyphenyl]-4,6-diphenylpyrylium *perchlorate*, yellow, m. 194°; the *m*-HO deriv., yellow, m. 193–4°, in concd. H_2SO_4 it shows a pale bluish green fluorescence. 2-[*p*-Methoxyphenyl]-4,6-diphenylpyrylium *perchlorate*, yellowish red, m. 235–6°; the *p*-HO compd., Au-yellow, m. 278–80°. The relative value for the basicity of the perchlorates of these compds., assuming the basicity of triphenylpyrylium perchlorate to be 1, is, m-NO_2 , 0.8; m-MeO , 2.4; p-MeO , 2.49; m-HO , 2.6; the *p*-HO deriv. showed no turbidity after adding 180 cc. H_2O to 1 g. of the substance, and crystd. unchanged from the soln. Even after adding 40 l. water there was no change.

C. J. WEST

Methylation of tyrosine. EMIL ABDERHALDEN AND ERNST SCHWAB. *Z. physiol. Chem.* **148**, 17–22 (1925).—By treating a suspension of *dl*-tyrosine in $\text{Et}_2\text{O-EtOH}$ with CH_3N_2 and evapg. the solvent, a strongly basic oil was obtained, from which the *O*-*Me* ether of tyrosine *Me ester*, b_{12} 158°, was isolated by extrn. with Et_2O . *HCl salt*, m. below 100°. The residue consisted of *dimethyltyrosine Me ester*, and from this the corresponding *anhydride* was obtained by sublimation. In the presence of a small amt. of H_2O the methylation of tyrosine proceeds still further with formation of tyrosine betaine, m. 222° (decompu.). *HCl salt*, m. 107°; *chloroplatinate*, m. 232° (decompu.).

A. W. DOX

Action of ammonia upon bisimmonium bromides. JULIUS V. BRAUN AND FRIEDRICH ZOBEL. *Ann.* **445**, 247–66 (1925); cf. Schlotz, *Ber.* **31**, 1700 (1898).—S. reported that the action of NH_3 on $\text{C}_6\text{H}_4(\text{CH}_2)_2\text{NBr}(\text{CH}_2)_2\text{C}_6\text{H}_5$ gave a bisxylylenimine; this view seemed to be supported by its thermal decompu. into dihydroisindole and piperidine (*C. A.* **17**, 390). Doubt was thrown on this interpretation by the action of NH_3 upon the bromide from piperazine and 1,5- $\text{C}_6\text{H}_{10}\text{Br}_2$, which gave rise to $\text{H}_2\text{N}(\text{CH}_2)_4\text{N:C}_6\text{H}_{10}$; this raised the question as to whether all the so-called bisimines were not really primary tertiary bases. Synthesis of such compds. proved this assumption. Piperidine and $\text{Cl}(\text{CH}_2)_4\text{NHBz}$ give the *Bz deriv.*, b_{12} 240°, m. 57–8°, of δ -aminobutylpiperidine, b_{12} 102–5°, d_4^{25} 0.9075, identical with the previously described tetramethylenepentamethylenebisimine; di- PhSO_2 deriv., needles. $\text{PhO}(\text{CH}_2)_6\text{NH}_2$ and $\text{Cl}(\text{CH}_2)_4\text{NHBz}$ give 70% of *phenoxyamylbenzoyltetramethylenediamine*, whose *HCl salt* m. 171–3°; 10 hrs. heating with concd. HCl at 120° gives ϵ -chloroamyltetramethylenediamine-di-*HCl*, m. 246–8°, the free base from which b_{12} 103–5° and is identical with the above. The compd. previously described as bispyrrolidine is more likely δ -aminobutylpyrrolidine, whose *dibenzenesulfonyl deriv.*, m. 146°. $\text{PhO}(\text{CH}_2)_6\text{NH}_2$ and $\text{Cl}(\text{CH}_2)_6\text{NHBz}$ give *phenoxybutylbenzoylpentamethylenediamine-HCl*, m. 160–2°; concd. HCl gives δ -chlorobutylpentamethylenediamine-di-*HCl*, m. 215–7°; *chloroplatinate*, m. 215–6°. ϵ -Aminoamylpyrrolidine, b_{10} 112–4°, d_4^{20} 0.920; *HCl salt*, m. 150–2°; *chloroplatinate*, m. 212°, crystals, with 1 H_2O ; *tetra-Me deriv.*, m. 290°. Benzoylaminopiperidine, b_{10} 255°, m. 74°; ϵ -aminoamylpiperidine, b_{13} 115° (previously termed bispiperidine, *Ber.* **38**, 176 (1905)). ϵ -Aminoamylconiine, b_{10} 145°, d_4^{19} 0.898; this is identical with the compd. obtained from

NH₂ and piperidine-coniinium bromide. The "bisxylylenimine" of S. is really *o*-amino-methylbenzylidihydroisoindole (I), b₁₂ 220–5°, m. 72° and synthesized from dihydroisoindole and ClCH₂C₆H₄CH₂NHIBz; the previously described *p*-O₂NC₆H₄CO deriv. is the *mono*- not the di-. *Salicylidene deriv.*, m. 113°. *Monobenzenesulfonyl compd.*, m. 151°. NaNO₂ in AcOH gives the *o*-HO deriv., m. 114°. I yields a *picrolonate*, m. 230°. I also results by heating ClCH₂C₆H₄CH₂NH₂ alone or in alk. soln., the yield of dihydroisoindole being only about 20%. With ClCH₂C₆H₄CH₂CH₂NH₂, the yield of tetrahydroisoquinoline is about 50%, the remainder being *o*-aminoethylbenzyltetrahydroisoquinoline, oil, b₁₂ 240–3°, mol. wt (camphor) 250; *picrolonate*, m. 230°; phenylsulfonate, m. 162°; *salicylidene deriv.*, yellow, m. 67°; *p*-nitrobenzoate, m. 109°. *o*-Amino-methylbenzylpiperidine, b₁₁ 158–60°; *picrate*, m. 192°; *benzenesulfonyl compd.*, m. 94°; *Bz deriv.*, m. 111°. *ε*-Aminoamylidihydroisoindole, b₁₁ 180°; *Bz deriv.*, m. 99°; *picrate*, m. 140°; *benzenesulfonyl compd.*, m. 123°. C. J. WEST

Absorption spectra and lactam-lactim tautomerism. R. A. MORTON AND EDWARD ROGERS. *J. Chem. Soc.* 127, 2698–700(1925).—Absorption spectra are shown for carbostyryl and its *N*- and *O*-ether and for *o*-hydroxycarbanil and its *N*- and *O*-ethers. The work of Hartley and Dobbie (*J. Chem. Soc.* 75, 640(1899)) on isatin and *o* hydroxycarbanil is unsatisfactory and the revision shows that absorption spectra do not provide any very obvious means of deciding the structure. With 1,3,5-C₆H₃(OH)₃ and carbostyryl, repetition of the work does not controvert the conclusions of H. and D. In general, conclusions based on the shape of absorption curves need careful examn. before reliance can be placed on them. Absorption spectra measurements should be interpreted by quant. considerations concerning frequencies of max. absorption.

C. J. WEST

Quinoline derivatives. I. Synthesis of substituted 2-phenyl-4-methyl-quinolines.

HANNS JOHN AND FR. NOZICKKA. *J. prakt. Chem.* 111, 65–82(1925).—PhNH₂ (9.3 g.), 43.8 g. PhCH:CHAc (I) and 6 g. PhNO₂, warmed with 25 g. concd. H₂SO₄ in 10.8 g. H₂O 6 hrs., give 1.5 g. of the picrate of 2-phenyl-4-methylquinoline (II); 28 g. PhNH₂, 36 g. H₂O and 2.7 g. PhNO₂, mixed with 35.4 g. concd. H₂SO₄ with strong cooling and then with 10.9 g. I and heated 5 hrs. at 135–40°, give 4% II; from 15.3 g. PhNH₂, 11.6 g. H₂O, 2.6 g. PhNO₂, 41 g. concd. H₂SO₄ and 12.2 g. I, there results 0.2% II; other variations of the ratio of H₂O and H₂SO₄ gave a max. of 9.5% of II; 4.4 g. PhNH₂ HCl, 5 g. I, 17 drops H₂O and 3 drops concd. HCl give 12.8% II. *p*-MeOC₆H₄NH₂ HCl (5.4 g.), 5 g. I, 3 drops HCl and 17 drops H₂O, heated 6 hrs. in a sealed tube at 135°, give 8.8% of 2-phenyl-4-methyl-6-methoxyquinoline, m. 129°; very dil. solns. in org. solvents show a blue fluorescence; *HCl salt*, needles; *HgCl₂ salt*, needles, nearly insol. in boiling H₂O; *ferrocyanide*, needles; *picrate*, yellow needles. The corresponding *ε*-HO deriv., m. 153°, is formed in 5.3% yield from *p*-EtOC₆H₄NH₂ HCl, I and HCl by heating 20 hrs. at 110°; *HCl salt*, long needles, *HgCl₂ salt*, needles; *ferrocyanide*, needles; *chromate*, yellow needles; *picrate*, needles. The 6-HO deriv., m. 211–2°, results in 7.7% yield from *p*-HOC₆H₄NH₂, I and HCl in a tube at 110° for 40 hrs.; *HCl salt*, H₂SO₄ salt, *K salt*, *Na salt*, *HgCl₂ salt*, *ferrocyanide*, *chromate* and *picrate*. *Ethers*: *Pr*, m. 110°; *iso-Bu*, m. 101°; *iso-Am*, m. 117°; *allyl*, m. 96.5°; *phenacyl*, m. 143°. *p*-MeC₆H₄NH₂ and I with H₂SO₄ give 8.2%, with HCl, 14.2%, of 2-phenyl-4,6-dimethylquinoline, m. 93–3.3°; *HCl*, H₂SO₄ and *HgCl₂ salts*, *ferrocyanide*, *chromate* and *picrate* 2-Phenyl-4-methyl-5(or 7)-methoxyquinoline, m. 99.5°, in 14.8% yields; same salts as above. The corresponding 5(or 7)-EtO deriv., m. 105.5°, also results in 14.8% yields; same salts as above. The 5(or 7)-hydroxy deriv., m. 228°, results in 12.1% yields; same salts as above. 2-Phenyl-4,5(or 4,7)-dimethylquinoline, oil (16.3% yield); same salts as above. 2(or 3)-Phenyl-4(or 1)-methylnaphthoquinoline, m. 152° (24.6% yields); same salts as above. II. H. JOHN AND G. WÄBER. *Ibid* 83–99.—2-Phenyl-4,8-dimethylquinoline, m. 91.5°, (14.3% yield); *HCl*, H₂SO₄ and *HgCl₂ salts*; *ferrocyanide*, *chromate*, *hydropiodide* and *picrate*. 2-Phenyl-4-methyl-8-chloroquinoline, m. 79–80° (1.5% yield); various salts. The 8-HO deriv., m. 58°, results in 10.6% yields from 7.25 g. *o*-HOC₆H₄NH₂, 7.5 g. I, 7 drops concd. HCl and 3.6 cc. H₂O by heating 12 hrs. on a H₂O bath; various salts. The 8-MeO deriv., m. 98°, results in 13% yields; various salts; *picrate*, Au-yellow, m. 153°. 8-EtO deriv., m. 98° (14.4% yield); *picrate*, Au-yellow, m. 182°. 2-Phenyl-4-methyl-8-quinolinecarboxylic acid, m. 201–2°, in 8.7% yield from *o*-HOCC₆H₄NH₂ HCl; various salts are described. 2-Phenyl-4-methyl-6-chloroquinoline, m. 91.5°, in 2.8% yield from *p*-ClC₆H₄NH₂ HCl; 6-Br deriv., m. 100° (3.8% yield); 6-I deriv., m. about 50° (yield, very poor). 6-Et deriv., m. 74° (15% yield). Various salts of these bases are described. 2-Phenyl-4-methyl-6-quinolinecarboxylic acid, m. 228° (5% yield). 2-Phenyl-4,5,8-trimethylquinoline, m. 111.5° (7.1% yield); the 4,5,6,8-tetramethylquinoline deriv., m. 128° (6.2% yield). 2-Phenyl-

4-methyl-6-[dimethylamino]quinoline, m. 131°; 2-Phenyl-4-methyl-8-hydroxy-naphthoquinoline (or the 3,1,9-deriv.), m. 107° (11.8% yield), from I and 2,7-H₂NC₁₀H₆OH. Various salts of all these are qual. described. C. J. WEST

β-Substituted o- and p-anisole- and phenetolesulfonquinaldines, their derivatives and their behavior towards nascent hydrogen. J. TRÖGER AND C. BROHM. *J. prakt. Chem.* **111**, 176-92(1925); cf. *C. A.* **17**, 2580.—β-(o)-Anisolesulfonquinaldine (I), m. 159°, from equiv. amts. of o-H₂NC₆H₄CHO and o-MeOC₆H₄SO₂CH₂Ac; *HCl* salt, needles, losing HCl at 105°; *nitrate*, decomps. 105°; *sulfate*, slightly yellow, decomps. about 200°; 4-sided prisms; *chloroplatinate*, Au yellow, decomps. about 230°. Reduction with Sn and HCl gives o-MeOC₆H₄SH and tetrahydroquinaldine. I and paraldehyde with ZnCl₂ give the *ethylidene deriv.*, m. 216°, whose side-chain is not oxidized by HNO₃. *Benzal deriv.*, m. 198°; *HCl* salt, yellow, slowly decomps. at 105°; reduction gives o-MeOC₆H₄SH and stilbazoline, C₆H₁₁NCH₂CH₂Ph. *Cinnamylidene deriv.*, yellow, m. 203°. *p-Anisolesulfonacetone*, m. 76.5° (oxime, m. 134°; *phenylhydrazone*, yellow-brown, m. 140°), with o-H₂NC₆H₄CHO this gives β(p)-anisolesulfonquinaldine, m. 122°; *HCl* salt, needles, slowly decomps. at 105°; *nitrate*, decomps. 105°; *sulfate*, decomps. 130°; *chloroaurate*, Au-yellow, decomps. about 105°. Reduction gives p-MeOC₆H₄SH and tetrahydroquinaldine. *The benzal compd.*, m. 200°; *cinnamylidene deriv.*, m. 149°. *o-Phenetolesulfonacetone*, m. 59° (oxime, m. 122°). β(o)-Phenetolesulfonquinaldine, m. 184°; *HCl* salt, m. 213° (decompn.); *nitrate*, decomps. 105°; *sulfate*, decomps. 186°; *chloroplatinate*, yellow, decomps. 178°. Reduction of the base gives o-EtOC₆H₄SH. *p-Phenetolesulfonacetone semicarbazone*, m. 179°. β(p)-Phenetolesulfonquinaldine, m. 113°; *HCl* salt, decomps. 105°; *nitrate*, darkens 105°, m. gradually at 135°; *sulfate*, m. 173° (decompn.); *HgCl₂ salt*, m. 155°. Reduction gives p-EtOC₆H₄SH. C. J. W.

Cyanine dyes. IX. The mechanism of the condensations of quinaldine alk-ioides in presence of bases. WM. H. MILLS AND RICHARD RAPER. *J. Chem. Soc.* **127**, 2466-75(1925); cf. *C. A.* **19**, 289.—This work was undertaken to support the theory of reaction proposed by M. and Smith (*C. A.* **17**, 1023). While the oils formed by the action of alkalis upon quinaldine alk-ioides could not be obtained pure, β-naphthoquinaldine-MeI and NaOH gave 1-methyl-2-methylene-1,2-dihydro-β-naphthoquinoline (I), bright yellow, gradually decomps. above 80°; on exposure to air, it becomes bright green, and even in vacuum it forms a tar within a few days. p-MeNC₆H₄CHO condenses with I, giving the *compd.* C₂₆H₂₂N₂ (II), scarlet; the 1:1 deriv. gave a similar *compd.* (III), C₂₆H₂₂N₂, scarlet powder. III and III in hot EtOH give p-dimethylaminobenzylidene β-naphthoquinaldine-EtI, m. 231-5°, also prepd. from β-naphthoquinaldine-EtI and p-MeNC₆H₄CHO. The methylene base (IV) from quinaldine-EtI and p-MeNC₆H₄CHO, treated with HI, give p-dimethylaminobenzylidenequinaldine-EtI, m. 247-8°, also synthesized as above. II and piperidine-III give the same green *compd.*, m. 237-9°, as is obtained by condensing the MeI salt and MeNC₆H₄CHO by piperidine. IV and PhCH₂I give quinaldine-EtI and dibenzylquinaldine-EtI (V), yellow, m. 214-6° (for synthesis see following abstract). Benzylquinaldine-EtI, yellow, m. 172-3°, by reducing the benzylidene *compd.* with HI or from benzylquinaldine and EtI; the anhydro base obtained with NaOH and Et₂O, treated with PhCH₂I, gave V. IV and p-toluquinaldine-EtI in EtOH contg. a little HCHO give 6-methyl-1,1'-diethylcarbocyanine iodide, which sensitizes a gelatino-bromide plate up to λ6950 for moderate exposures with a max. at λ6400 and λ5500. 5,6-Benzo-1,1'-diethylcarbocyanine bromide, needles with a green metallic luster, giving a blue EtOH soln.; it crystals with 1 mol. MeOH. The absorption shows a main band at λ6250 and 2 subsidiary bands at λ5750 and λ5350. C. J. W.

Dibenzylquinaldine. WM. H. MILLS AND A. T. AKERS. *J. Chem. Soc.* **127**, 2475-8(1925); cf. preceding abstr.—Dibenzylacetamide, m. 128-9°, in 30 g. yield from 40 g. acid through the chloride, gives with MeMgI as dibenzylacetone, b₁₆ 120-2°, BzH gives benzylidenedibenzylacetone, m. 66-7°; o-H₂NC₆H₄CHO gives 50% of dibenzylquinaldine, m. 74°, whose methiodide, yellow, m. 204° and EtI, m. 215-6°. In the prepn. of (PhCH₂)₂CHCOCl, if PCl₅ is used, or if the distn. with SOCl₂ is too slow, there results benzylhydrindone, whose semicarbazone, m. 198-9°. This also results by the reduction of the benzylidenhydrindone with Na-Hg in MeOH-EtOH. C. J. WEST

α-Phenyl-β-anisolesulfonquinoline and α-phenyl-β-phenetolesulfonquinoline. J. TRÖGER AND D. DIMITROFF. *J. prakt. Chem.* **111**, 193-206(1925).—α-Phenyl-β-(o)-anisolesulfonquinoline (I), m. 219°, from o-H₂NC₆H₄CHO and o-MeOC₆H₄SO₂CH₂COPh; *HCl* salt, yellowish, stable up to 160°; *nitrate*, decomps. at 105°; acid *sulfate*, stable at 160°; reduction gives o-MeOC₆H₄SH and tetrahydro-α-phenylquinoline (II), analyzed as the HCl salt. The methiodide of I, deep red, m. 206-8°. Ag₂O regenerates I. *p-Anisolesulfonacetophenone*, m. 110 (oxime, m. 134°; *phenylhydrazone*, m. 138°). *α-Phenyl-β(p)-anisolesulfonquinoline*, m. 187°; *HCl* salt, loses HCl at 125° and decomps.

at 155°; *nitrate*, m. 110° (decompn.); *acid sulfate*, begins to decomp. 170°. *Methiodide*, orange-yellow, m. 133-5°; moist Ag_2O regenerates the original base. Reduction of the base with Sn and HCl gives *p*- $\text{MeOC}_6\text{H}_4\text{SH}$ and II. *o*-Phenetolesulfonacetophenone, m. 99° (*oxime*, m. 129°; *phenylhydrazone*, m. 177°). α -Phenyl- β (*o*)-phenetolesulfonquinoline, yellowish, m. 174-5°; *HCl salt*, begins to decomp. 135°; *nitrate*, m. 110°, decomps. 145°; *acid sulfate*, decomps. about 170°. *Methiodide*, Au-yellow, m. 122°. Reduction with Sn and HCl gives *o*- $\text{EtOC}_6\text{H}_4\text{SH}$ and II. α -Phenyl- β (*p*)-phenetolesulfonquinoline, m. 153-4°; *HCl salt*, decomps. 105°; *nitrate*, decomps. 105°; *acid sulfate*, begins to decomp. 130°; *methiodide*, deep red, m. 169-70°. Reduction of the base gives *p*- $\text{EtOC}_6\text{H}_4\text{SH}$ and II.

C. J. WEST

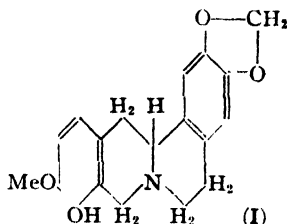
The action of alkalis on peptides and on ketopiperazines. P. A. LEVENE AND M. H. PFALTZ. *J. Gen. Physiol.* **8**, 182-8(1925).—"The tripeptide glycyl-*l*-alanlylglycine in soln. of either 1 or 10 equivs. of alkali does not undergo racemization on standing. The dipeptide *l*-alanlylglycine under the same conditions does not undergo racemization. In ketopiperazines, *l*-alanlylglycine anhydride and *l*-prolylglycine anhydride under the influence of dil. alkalis, racemization takes place. Racemization in the present expts. was never complete. The degree of racemization seems to depend, on the one hand, on the stability of the ketopiperazine ring; on the other, on the concn. of the alkali." Methods are given. Further work is in progress.

C. H. R

Further studies on demotropic forms of diketopiperazines and the formation of the latter and their combination with amino acids. EMIL ABDERHALDEN AND ERNST SCHWAB. *Z. physiol. Chem.* **149**, 298-301(1925); cf. *C. A.* **20**, 57.—"The tautomeric form of leucylglycine anhydride, m. 245°, was obtained by heating the ordinary anhydride with tyrosine in the presence of 10 parts of glycerol 5 hrs. at 190°, and extg. the reaction mixt. with CHCl_3 . It reacted with CH_2N_2 but the resulting Me ester could not be crystd. When leucylglycine anhydride and leucine were heated together with glycerol the products were leucineimide and leucyl[glycylleucine] anhydride or leucyl[leucylglycine] anhydride, m. 249°. By heating *dl*-leucine with glycine in glycerol the products obtained were leucineimide, 55% of leucylglycine anhydride, m. 238-9°, and a small amt. of glycine anhydride.

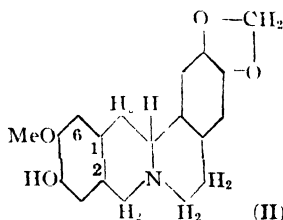
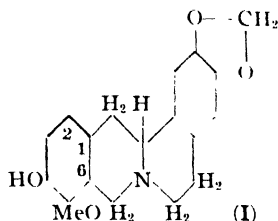
A. W. DOX

Alkaloid of *Nandina domestica*. I. The constitution of nandinine. Z. KITASATO. *J. Pharm. Soc. Japan* No. 522, 695-701(1925).—By an improved method of extn., a cryst. nandinine (I) was prepd. and its phys. properties and chem. compn. were detd. The bark of *Nandina domestica* was soaked in 50% alc., contg. 0.5-1% HCl, for a week. The residue was twice extd. with warm 95% alc. for 12 hrs. each. All the alc. exts. were concd., the resinous matter was removed by adding H_2O , and the free base was pptd. with NH_3 . The dried ppt. was then extd. with Et_2O , the ext. was shaken with 1% HCl and the Et_2O layer was sepd. On standing overnight colorless needles were obtained. The pure I thus prepd. has the compn. $\text{C}_{19}\text{H}_{19}\text{NO}_4$, confirming the result of Eykman's analysis of amorphous nandinine (*Ber.* **1884**, 441). It m. 145-6°, has $[\alpha]_D^{20}$ 63.2° (alc.), and has one MeO and phenolic OH. The preliminary study of the chem. nature of I suggests that it has OH in place of one MeO of tetrahydroberberine. When I is methylated with CH_2N_2 it gives a substance m. 138-9°, having no phenolic OH, which was identified as the *d*-canadine of Gadamer (*C. A.* **5**, 2078). In order to det. the position of the OH and MeO in I, the HCl salt of berberine was fused with urea, to remove the chloromethyl group, and K. obtained the berberrubine of Frerichs (*C. A.* **4**, 2443). When this was reduced to hydroberberrubine, and optical sepn. using *d*-bromocamphorsulfonic acid (NH_4 salt) was applied, *d*-hydroberberrubine which is identical with I, was obtained. The conclusion is that I is *d*-hydroberberrubine, i. e., the MeO at position 5 of tetrahydroberberine is substituted by OH. The constitution of I therefore, must be as follows:



From the residue of the final Et_2O extn., K. obtained a new alkaloid, nandazurine, m. 350°, the chem. compn. of which will be reported later. II. **Synthesis of inactive**

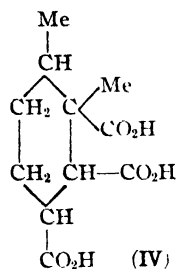
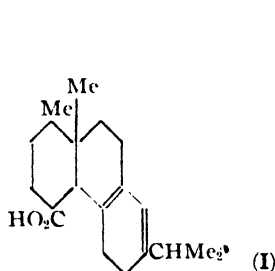
ψ -nandinine. *Ibid* No. 523, 791–8.—Since nandinine is *d*-hydroberberubine, K. expected that by the method of Pictet and Gams (*Ber.* 44, 2480(1911); cf. *C. A.* 5, 3413), of synthesizing berberine, using vanillin, a synthesis of an isomer of nandinine (I) should be easy. However, in an attempt to put in CH_2 between the vanillyl ring and the imino group, by treating 1-vanillyl-6,7-methylenedioxytetrahydroisoquinoline and HCHO , the chain closed at position 2 instead of at 6, giving therefore II. Since Perkin, Jr (*C. A.* 1686(1924)), obtained similarly ψ -tetrahydroberberine in an attempt to repeat P. and G.'s synthesis of berberine, K names this new compd ψ -nandinine. It m. 181° , and is identified by its easy conversion to the ψ -tetrahydroberberine, m. 177° , of P.



S T

Polarity theories and four-membered rings. The non-existence of 2,3,3-triphenyl-methylene-1,2-oxamine. G. N. BURKHARDT, ARTHUR LAPWORTH AND JAMES WALKER. *J. Chem. Soc.* 127, 2458–61(1925).—Ingold and Weaver (*C. A.* 18, 3193) state that PhNO and $\text{Ph}_2\text{C}:\text{CH}_2$ give rise to 2,3,3-triphenylmethylene-1,2-oxamine, this compd. is now shown to be $\text{Ph}_2\text{C}:\text{NPh}:\text{O}$ (Angeli, Alessandri and Aiazzi Monum. *C. A.* 5, 3403). Thus, such facts as have been fully established are in complete harmony with Robinson's theory of polar reactions of PhNO and in general with electrochem conceptions of org. chem. reactions. C J WEST

Higher terpene derivatives. XXV. Anhydride formation and nitric acid oxidation of abietic acid. L. RUZICKA AND M. PFEIFFER. *Helvetica Chim. Acta* 8, 632–6(1925). Exception is taken to Knecht's claim (*C. A.* 18, 759) that abietic acids (I), heated to 180° , undergo anhydride formation. Expts. are given showing that I from 2 different sources is mainly unchanged under these conditions, and that part of the loss consists not only of H_2O , as K. assumed, but also CO_2 and oils. The hydrocarbons remaining in the residue can give C and H values approximating those of the anhydride. By essentially the method used by Virtanen (*C. A.* 15, 3096), who reported that oxidation of I with HNO_3 yields no 1,2,5- $\text{C}_6\text{H}_3(\text{CO}_2\text{H})_3$ (II), a 10% yield of pure II was easily obtained from I from American colophony, this being in agreement with the formula



for I (cf. also R. and Meyer, *C. A.* 16, 3893; R., Schinz and M. *C. A.* 18, 681). **XXVI. Degradation of abietic acid with potassium permanganate and ozone.** L. RUZICKA, J. MEYER AND M. PFEIFFER. *Ibid* 637–50.—Oxidation of I (prepd. according to *C. A.* 16, 2500) in 1% aq. KOH with KMnO_4 (10 atoms O), with gentle warming toward the end, gave no ppt. with CO_2 , but yielded an amorphous mixt. with HOAc, corresponding roughly to $\text{C}_{16}\text{H}_{22}\text{O}_4$ and $\text{C}_{17}\text{H}_{24}\text{O}_4$, similar to Aschan's "colophenic acids" (*C. A.* 15, 3097); that a keto acid is present is shown by the isolation of an amorphous semicarbazone, m. 225° (decomn.). An attempt to sep. the Me esters of these acids by fractional distn. yielded no definite results as almost all b.p.s. $200\text{--}10^\circ$; after sapon. of the esters the amorphous semicarbazones m. ca. 240° , that of the last fraction corresponding to the acid $\text{C}_{16}\text{H}_{22}\text{O}_4$. After removal of the above acids the soln. was made alk. and concd., filtered from a small additional ppt. on adding HCl, and extd. with Et_2O .

The residue, heated in a high vacuum at 105°, and the distillate treated with SOCl_2 and PhNH_2 , yielded $\text{Me}_2\text{CHCONHPh}$ (III). A similar Et_2O ext., unheated, slowly deposited (> 1 yr.) an acid, possibly (IV), $\text{C}_{11}\text{H}_{16}\text{O}_6$, m. 224°; tri-Me ester (V), from the Ag salt, m. 75°, rhombs, $a:b:c = 0.8289:1:0.9620$. Oxidation of I during 1 month with KMnO_4 (24 atoms O), repeatedly heating at 30° toward the end, gave an Et_2O ext. as above from which $(\text{CH}_3\text{CO}_2\text{H})_2$ sepd. The portion of the Me esters of the remaining acids (several % of the I taken), b_{12} 100–80°, taken up in concd. HCl, deposited V. Oxidation of I Me ester (VI) in aq. MeAc with KMnO_4 (6 atoms O) and MgSO_4 , cooling with ice, evapd. the MeAc *in vacuo*, taking up in Et_2O , and extg. with dil. NaOH, gave a small amt. of acid products which were not investigated. The neutral portion, corresponding to the Me esters of the above "colophenic acids," b_2 225–35°, both the 1st and last fractions corresponding to $\text{C}_{21}\text{H}_{30}\text{O}_4$; when sapond. the amorphous semicarbazone m. ca. 225° (decompn.); the acid(s) $\text{C}_{20}\text{H}_{20}\text{O}_4$ lose(s) H_2O when boiled 15 hrs with Ac_2O and NaOAc, then giving an amorphous semicarbazone decomp. ca. 240°. Ozonization of I in CCl_4 yielded chiefly ill-defined split-products, including semicarbazones decomp. ca. 225° and 260°; V was also isolated. Similarly VI yielded neutral and acid products; the latter giving (di)-Me esters, b_1 195–210°, corresponding roughly to $\text{C}_{18}\text{H}_{28}\text{O}_6$. Ozonization of VI in HOAc, followed by heating first to 100° and then to 110°, followed by another ozonization for 4 days and heating again, yielded chiefly oily acids sol. in dil. Na_2CO_3 . Repeated treatment of the Ag salts with MeI and fractionation gave esters approximating to $\text{C}_{15}\text{H}_{24}\text{O}_6$, $b_{0.6}$ 132–7°, and $\text{C}_{18}\text{H}_{28}\text{O}_6$, $b_{0.6}$ 203–5°. The fractions, $b_{0.6}$ 125–55°, treated with HCl, deposited leaflets, but the whole was heated at 100° and the HCl then evapd. off, finally depositing a cryst. acid, $\text{C}_{17}\text{H}_{16}\text{O}_6$, m. 215–6°, apparently a homolog of IV; when reconverted into the Me ester over the Ag salt crystals were not obtained. Full details of the oxidations are given

M. HEIDELBERGER

The homogeneity of α -lignin. E. HAGGLUND. *Biochem. Z.* **158**, 350–6 (1925).—Spent sulfite liquors were boiled 13, 15, 17, 18 and 20 hrs. and α -lignosulfonic acids pptd. from each fraction by β - $\text{C}_{10}\text{H}_7\text{NH}_2$. Analysis of these fractions indicated that α -lignin is homogeneous.

F. A. CAJORI

Lignin. I. WILLIAM KÜSTER AND E. SCHNITZLER. *Z. physiol. Chem.* **149**, 150–72 (1925).—Assuming that lignin is an individual substance, the evidence of these expts. indicates that the mol. is built up of 2 distinct parts, 1 of which is present in preponderant amt. Hence the mol. may be regarded as built up of a high and a low mol. constituent in equal proportions or else as a simpler nucleus condensed with several mols. of the other substance. The method consisted in fusing pine sawdust, from which the resin had been removed, with 2 parts of β -naphthol at 180–200°. The melt was dissolved in CHCl_3 and a 1st reaction product, m. 155° (decompn.), pptd. by Et_2O . From the filtrate a 2nd product, m. 160–8° (decompn.), was pptd. by petroleum ether. The mother liquor yielded a cryst. substance $\text{C}_{22}\text{H}_{14}\text{O}$, m. 205–6°, for which the name *merolignin* is proposed. The yield of this is 10% of the original lignin. The total wt. of the 3 products is equiv. to that of the lignin, although gaseous products also are formed, among which H_2O , CO_2 and MeOH were identified, hence it is inferred that part of the β -naphthol enters into the reaction. A 2nd fusion converts the 1st product into the 2nd, but no further yield of merolignin is thus obtained. This product is amorphous, contains MeO and has the empirical formula $\text{C}_{18}\text{H}_{13}\text{O}_3\text{OMe}$. The merolignin may be extd. along with the β -naphthol by benzene, and its solns. show intense blue fluorescence. The O must be in oxide form, since the empirical formula excludes aliphatic OH, the substance is neutral, and aldehyde and ketone groups could not be demonstrated. Bromination of merolignin in CHCl_3 gives a gold-red cryst. product $\text{C}_{21}\text{H}_{14}\text{Br}$, m. 267° (decompn.). Concd. HNO_3 converts merolignin into a dark red cryst. substance $\text{C}_{18}\text{H}_{11}\text{O}_3\text{N}$, m. 203°. It appears that merolignin possesses a benzenoid structure which readily passes into the quinonoid form and then undergoes further changes. It shows certain resemblances to the resin acids which are regarded as phenanthrene derivs. The m. p. is the same as that of p - $\text{Ph}_2\text{C}_6\text{H}_4$, but a comparison of the 2 substances showed that they are not identical. In contrast to lignin, cellulose does not dissolve in β -naphthol under the conditions of these expts.

A. W. DOX

Partial bromination of phlorhizin. I. KEIZO MISAKI. *J. Biochem. (Japan)* **5**, 1–7 (1925).—A dibromophlorhizin is obtained when crystd. phlorhizin in H_2O -free MeOH is carefully treated with Br water at -5° to -10° . It has $[\alpha]_D -35.8^\circ$, m. 160° and has the compn. $\text{C}_{21}\text{H}_{27}\text{O}_{10}\text{Br}_2$. When shaken with H_2O and ether to which Br_2 is added slowly, the excess of Br_2 being removed by repeated shaking with ether until it remains colorless, it gives hexabromophloretin and glucose. II. **Bromophlorin and bromo- p -hydroxyphenylpropionic acid, cleavage products of dibromophlorhizin.**

Ibid 9-12.—Six g. dibromophlorhizin in 80 cc. 12.5% Ba(OH)₂ is refluxed on a water bath for 9 hrs. The mixt. is acidified to Congo red with dil. H₂SO₄, filtered and the filtrate is extd. repeatedly with ether. On evapg. the ether crystals are obtained which sep. from hot water in prismatic plates which give the Br flame test, m. 90°, and dissolve readily in Na₂CO₃ with liberation of CO₂. Its compn. shows it to be monobromo-*p*-hydroxyphenylpropionic acid. The liquid which remained after the ether extn. has been shown to contain bromophlorin and bromophloretinic acid, which are thus to be regarded as products of the Ba(OH)₂ hydrolysis of the dibromophlorhizin. S. M.

Remarks on the communication of Stefan Goldschmidt and Christian Steigerwald: degradation of proteins by hypobromite. EMIL ABDERHALDEN. *Ber.* 58B, 1821-2 (1925).—A. complains that his work and that of his pupils is slighted in the paper of G. and S. (*C. A.* 19, 1084). C. A. R.

Benzidine researches, passivity of Zn dust (IZNAILSKII, KOLPENSII) 2. Solubility relations in isomeric organic compounds (KOHMAN, ANDREWS) 2. H₂O₂ as an oxidizing agent in acid solution (HATCHER, HOLDEN) 2. Dispersion, density and absorption spectra of chemically homologous substances (KRETHOW) 3. Preparation of BzII by electrolytic oxidation of PhMe (KAWADA) 4. Glutathione. Its influence in the oxidation of fats and proteins (HOPKINS) 11A. Kettle for digestion, extraction and filtration (U. S. pat. 1,562,870) 1. Feeding solids or semisolids to chemical apparatus (U. S. pat. 1,563,066) (U. S. pat. 1,565,249) 1.

SCHMIDT, JULIUS: *Jahrbuch der Organischen Chemie*, 1924. 11th ed., revised. Stuttgart: Wissenschaftliche Verlagsgesellschaft, 285 pp., paper G. M. 22; bound G. M. 25. Reviewed in *Chemistry & Industry* 44, 800(1925).

Methylal. C. B. CARTER. U. S. 1,566,819, Dec. 22. Methylene chloride, NaOH and MeOH are heated together in an autoclave to about 100-125° to produce methylal, which may then be hydrolyzed and distd. to obtain formaldehyde. Similar reactions may be carried out with EtOH, PrOH and BuOH.

Hexamethylenetetramine. C. B. CARTER. U. S. 1,566,820, Dec. 22. In the production of pure (CH₂)₆N₄ from crude mixts. contg. it, NH₃ is introduced into a solu. of (CH₂)₆N₄ to lower the satn. point and cause pptn. of the (CH₂)₆N₄.

Separating hexamethylenetetramine from ammonium chloride. C. B. CARTER. U. S. 1,566,822, Dec. 22. Methylene chloride and aq. NH₃ are heated and excess NH₃ is employed to lower the solvent power of the liquor for (CH₂)₆N₄ and increase it for NH₄Cl. Pptd. (CH₂)₆N₄ is sepd. from the liquor. NH₃ is distd. from it and the remaining liquor is then cooled and NH₄Cl, which ppts., is sepd.

Separating hexamethylenetetramine from ammonium chloride. C. B. CARTER. U. S. 1,566,821, Dec. 22. A strong aq. NH₃ solu. is used which has a selectively greater solvent power for NH₄Cl than for (CH₂)₆N₄.

"Derivatives of hypothetical imines," etc. K. F. SCHMIDT. U. S. 1,564,631, Dec. 8. In forming PhNH₂, *p*-xylydine or various "derivs. of hypothetical imines including amiaes and their substitution products." C₆H₆, *p*-xylene or other "org. compds. of the hydrocarbon type" are treated with hydrazoic acid in the presence of concd. mineral acids, to effect direct introduction of NH₂.

4-Nitro-1-acetonaphthalide-6 (or 7)-sulfonic acid. W. M. RALPH. U. S. 1,566,425, Dec. 22. In producing "nitro-acetyl-Cleve's acid," "acetyl-Cleve's acid" in solu. in H₂SO₄ is subjected to nitration and the resulting nitroacetyl acid is isolated in the form of its Na salt by adding the nitration mixt. to Na₂CO₃ and H₂O to effect neutralization and salting out by the action of the Na₂SO₄ formed.

Sodium salts of aromatic sulfonic acids. H. W. HILLYER. U. S. 1,546,239, Dec. 8. A solu. contg. a Ca salt of a sulfonic acid, *e. g.*, of nitrochlorobenzenesulfonic acid, is treated with NaCl to effect formation and pptn. of the corresponding Na salt.

Indoxyl. H. H. DOW. U. S. 1,564,218, Dec. 8. In making indoxyl or its derivs., a phenylglycine material intermixed in a caustic alkali melt is also treated with a hydrocarbon oil, *e. g.*, kerosene, which is vaporizable at a temp. between that at which the caustic alkali is molten and that at which decompn. of the phenylglycine material tends to occur. This assists in control of the reaction.

***m*-Amino-*p*-cresol methyl ether.** C. G. DERRICK, T. H. LEAMING and W. M. RALPH. U. S. 1,564,214 Dec. 8. *m*-Nitro-*p*-cresol is methylated in the presence of an excess of NaOH and the resulting mixt., while still hot, is subjected to reduction by adding Na sulfide, in the presence of H₂O.

Acyated alkylenediamines. M. HARTMANN and J. KAGI. U. S. 1,534,525, April 21, 1925. By the reaction of an acid halide or anhydride on unsymmetrical substituted alkylenediamines, preferably in H_2O or other solvent and in some cases in the presence also of an alkali, there is obtained in quant. yield a monoacyl or an unsymmetrical diacyl deriv. Unsym. diethylethylenediamine yields a monoacetyl deriv. which is a yellowish oil, b_p 137–8°. The linoleic acid deriv. is a thick oil insol. in H_2O but sol. in org. solvents. Distearylethylenediamine, monostearylethylenediamine, di- and mono-oleylethylenediamines, mixed derivs. from olive oil and propylenediamine hydrate, oleylpiperidyl-*N*-ethylamine, stearyldimethylethylenediamine (m. 71°), oleylphenylethylenediamine, oleyldiethylethylenediamine and the hydrochloride and tartrate of the latter are described. These compds. are applicable for technical and therapeutic purposes.

Alcohols from monohalogenated hydrocarbons. C. B. CARTER and A. E. COXE. U. S. 1,566,818, Dec. 22. In effecting reaction between CH_3Cl or other monohalogenated hydrocarbon deriv. and alkali such as $NaOH$, a temp. of about 100° is employed and the reaction is carried out under pressure, the alc. produced being removed from time to time to maintain an alc. concn. below 20% in the reaction vessel.

Methanol and methylene chloride from methane. J. WEBER and P. ERASMUS. U. S. 1,565,345, Dec. 15. Gaseous $MeCl$ is caused to react with milk of lime under the action of heat and pressure. $MeCl$ admixed with CH_2Cl_2 is used and unabsorbed gas comprising CH_3Cl_2 is withdrawn from the reaction chamber.

ω -Haloalkyl arsonocarbaniates. R. ADAMS and C. W. RODEWALD. Can. 254,983, Oct. 27, 1925. An arsanilic acid or a substituted arsanilic acid is treated with an alkali and an ω -haloalkyl halocarbonate. The product is acidified and allowed to crystallize.

Styrene and its homologs. I. OSTROMISLENSKY and M. G. SHEPARD. U. S. 1,511,175, June 9, 1925. Styrene and its homologs are produced from hydrocarbons having 8 or more C atoms such as ethylbenzene, xylene, homologs and analogs, by pyrogenic decompn. Temps. of about 450–700° are employed. U. S. 1,541,176 (I. OSTROMISLENSKY) specifies manuf. of styrene by dropping melted cinnamic acid into a receiving chamber at normal pressure heated to 295–8°, decomposing the cinnamic acid to form styrene, conducting the vapors of the styrene away from undecomposed cinnamic acid, condensing and purifying by steam distn. and fractionation.

Hydrochloride of 3,3'-diamino-4,4'-dihydroxyarsenobenzene. P. A. KOBER. U. S. 1,564,860, Dec. 8. A purified 3,3'-diamino-4,4'-dihydroxyarsenobenzene is dissolved in HCl in such amt. that no free uncombined HCl remains in the resulting soln. is evapd. to dryness under a pressure of 2–10 mm. Hg.

Synthesizing aldehydes, acids or similar compounds. G. WIETZEL and R. WIETZEL. U. S. 1,562,480, Nov. 24. In synthesizing higher ales., aldehydes, acids or similar higher mol. compds. contg. O, CO is caused to act on vaporized $MeOH$, $EtOH$ or other vaporized aliphatic alc. at an elevated pressure and temp., *e. g.*, 200 atm. and 420°, and in the presence of a catalyst, *e. g.*, one contg. alkali, Cr and Mo.

Compounds of halogen acids with 2-phenyl-6-methylquinoline-4-carboxylic acid and its esters. H. W. RHODEHAMEL and E. H. STUART. U. S. 1,552,568, Sept. 8, 1925. 2-Phenyl-6-methylquinoline-4-carboxylic acid hydriodide forms orange yellow crystals, m. 268.5°. The hydrobromide and hydrochloride, m. 289° and 254.5°, resp. The hydriodide of the *Et* ester, m. 177° and the corresponding hydrobromide, hydrochloride and hydrofluoride, m. 176°, 171° and 170–172°, resp. The hydrobromide, hydrochloride and hydriodide of the *Pr* ester, m. 170°, 148° and 164°, resp. and the corresponding compds. of the normal butyl ester, m. 123–6°, 118° and 158°, resp. These compds. may be prepd. by treating 2-phenyl-6-methylquinoline-4-carboxylic acid or one of its esters with a halogen acid, preferably in excess, and then drying; or, by dissolving the 2-phenyl-6-methylquinoline-4-carboxylic acid or an ester in alc., acetone or other org. solvent and adding a mol. proportion of the halogen acid. The halogen acid compd. crystallizes and is filtered off and dried.

2-Aminoanthraquinone. O. D. CUNNINGHAM. U. S. 1,564,210, Dec. 8. Anthraquinone-2-sulfonic acid is subjected to the action of aq. NH_3 soln. in the presence of a sol. Ba salt, *e. g.*, $BaCl_2$, and of NH_4Cl , at a temp. of about 150–200°.

Amino derivatives of anthraquinone, etc. H. A. E. DRESCHER and J. THOMAS. U. S. 1,528,470, March 3, 1925. Halogen derivs. of anthraquinone are treated with an imide of a dibasic acid such as phthalimide in the presence of Cu and an acid absorber, *e. g.*, $NaOAc$, at temps. usually about 200°, in order to eliminate the halogen in the form of an acid and form another deriv. from the anthraquinone and the imide. By treating this product, *e. g.*, with H_2SO_4 , the dibasic acid may be regenerated and an amino deriv. of anthraquinone formed. Numerous examples are given, including production of 1-

phthalimidoanthraquinone from 1-chloroanthraquinone and its conversion into 1-aminoanthraquinone, production of 1,5-diphthalimidoanthraquinone and its conversion into 1,5-diaminoanthraquinone, production of 1-chloro-5-phthalimidoanthraquinone from 1,5-dichloroanthraquinone and its conversion into 1-chloro-5-aminoanthraquinone, production of 1-phthalimido-2-nitroanthraquinone from 1-chloro-2-nitroanthraquinone and its conversion into 1-amino-2-nitroanthraquinone, production of 1-amino-2-methyl-4-phthalimidoanthraquinone from 1-amino-2-methyl-4-bromoanthraquinone and its conversion into diamino-2-methylantraquinone, production of 1-methylamino-4-phthalimidoanthraquinone from 1-methylamino-4-bromoanthraquinone and its conversion into 1-methylamino-4-aminoanthraquinone, production of 1-phthalimido-2-aminoanthraquinone from 1-chloro-2-aminoanthraquinone and its conversion into 1,2-diaminoanthraquinone, production of 2-phthalimidoanthraquinone from 2-bromoanthraquinone and its conversion into 2-aminoanthraquinone, production of 1-succinimidoanthraquinone from 1-chloroanthraquinone. PhNO_2 may be used as a vehicle for the reaction.

1-Phthalimidoanthraquinone and similar compounds. H. A. E. DRESCHER and J. THOMAS. U. S. 1,528,470, March 3, 1925. Halogen compds. of anthraquinone, *e. g.* 1-chloro-, 1,8- or 1,5-dichloro-, 1-chloro-2(or 4)-nitro-, 1-amino-2-methyl-4-bromo-, 1-methylamino-4-bromo-, 1-chloro-2-amino-, or 2-bromoanthraquinone, are treated with an imide of a dibasic acid such as phthalimide, in the presence of Cu and an acid absorber, *e. g.*, NaOAc, at elevated temps. (generally 180–200°), to eliminate halogen in the form of an acid and form 1-phthalimidoanthraquinone or a similar deriv. The latter can be treated with an acid such as H_2SO_4 to regenerate the dibasic acid and form an amino deriv. of anthraquinone. Numerous examples are given.

Diphenylamine chloroarsine. W. L. TANNER. U. S. 1,557,384, Oct. 13. A mixt. of As_2O_3 and diphenylamine-HCl is heated.

Apparatus for chlorinating naphthalene, etc. S. BROWN. U. S. 1,546,044, Dec. 1.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Collagenous fibrils—their origin, structure, and arrangement. G. C. HERINGA and H. A. LOHR. *Proc. Acad. Sci. Amsterdam* 28, 509–17(1925).—The prepn. of histological specimens by paraffin or celloidin imbedding results in the destruction of the connective tissue—a result not obtained when the gelatin freezing method is used. A study of the collagenous fibrils in specimens of the umbilical cord and skin by the latter method caused H. and L. to conclude that the fibrils in the interstitial substance originate from needle-shaped ultramicros present in that area; that the interstitial substance does not induce the formation of fibrils everywhere to the same extent, that the cells exert no influence on the course of the fibrils and the tendency of the fibrils to form a sinuous course and close tapelike complexes is caused by physical properties of the fibrils themselves. A hypothesis to explain the behavior of the fibrils based on colloid chemistry is given.

H. J. DEUEL, JR.

Protoplasm. The chemical constituents of the plasmodium of *Reticularia lycoperdon*. ALEXANDER KIESEL. *Z. physiol. Chem.* 150, 149–76(1925).—The plasmodium of this slime-fungus was collected from tree stumps and immersed in EtOH . Analysis gave the following values: oil 17.85, lecithin 4.67, cholesterol 0.58, reducing sugars 2.74, non-reducing sol. carbohydrates 5.32, glycogen 15.24, difficultly hydrolyzable polysaccharide 1.78, nitrogenous extractives 12.00, protein (partly nucleoprotein) 20.65, plastin 8.42, nucleic acid 3.68, oil from lecithoproteins 1.20, unknown 5.87%.

A. W. DOX

Biocatalysts and carbohydrate metabolism. III. HANS V. EULER and KARL MYRBÄCK. *Z. physiol. Chem.* 150, 1–15(1925); cf. *C. A.* 20, 70—Pancreatic insulin has no sp. influence on the fermentation velocity of bottom yeast H. Expts. without accurately controlled acidity and PO_4 content are not conclusive. Cozymase is not replaceable by pancreatic insulin. Insulin-free cozymase is a sp. activator for phosphatase, and hence may be considered the coenzyme of phosphatase. This, however, does not exclude the possibility that insulin may in some way be concerned in the phosphate exchange of sugars, though at present no evidence of this is available. Ester-

ification of hexoses (formation of zymophosphate) by chopped muscle in the absence of O is not appreciably activated by pancreatic insulin.

A. W. DOX

The natural porphyrins. XVIII. Chemical findings in a case of porphyrinuria (Petty). HANS FISCHER, HANS HILMER, FRITZ LINDNER AND BRUNO PÜTZER. *Z. physiol. Chem.* **150**, 44-101(1925); cf. *C. A.* **20**, 57—The porphyrin patient, Petty, whose urine and feces had furnished most of the material for the investigations described in this series of papers, died Jan. 21, 1925. After the autopsy, which revealed a great variety of pathological conditions, the sep. organs were subjected to chem. treatment for the isolation and identification of the porphyrins contained there in. The skeleton was found to be highly pigmented, and the porphyrin present was identified as uroporphyrin, while coproporphyrin was absent. This selective pigmentation is significant. The bone marrow, contd. both porphyrins and probably also Kämmerer's porphyrin. Coproporphyrin was found in the blood but no uroporphyrin was present. The spleen, which was much enlarged, contd. an abundance of coproporphyrin, while uroporphyrin predominated in the liver and kidneys. Although the skin was mahogany-brown no porphyrin could be demonstrated. The bile was normal with respect to bile pigments but contd. a large amt. of coproporphyrin.

A. W. DOX

The elementary composition of hair. ZDENKO STARY. *Z. physiol. Chem.* **150**, 202-4(1925).—Detns. of C, H and N on a no. of samples of human hair gave results in agreement with those reported in the older literature, but not in agreement with those of Rutherford and Hawk (*C. A.* **1**, 1298) even when the samples received the same preliminary treatment

A. W. DOX

Glutathione. Its influence in the oxidation of fats and proteins. J. G. HOPKINS. *Biochem. J.* **19**, 787-819(1925).—H. used muscle tissue almost exclusively, and the estns. of uptake were made in the Barcroft "differential manometer." In aq. systems contg. GSH (reduced or thiol form of glutathione) together with an emulsion of unsatd. fatty acids (linolenic, linoleic) or lecithin, so long as the p_H is 3.4-4, the concn. of the SH group is long maintained, and O many times in excess of what is required to oxidize the SH to S-S is taken up, a corresponding amt. of the fatty acid or lecithin being oxidized. H. agrees with Meyerhof's mechanism of oxidations for such systems (*C. A.* **18**, 2349): the preliminary formation of a peroxide by 2 thiol groups; and the decompn. of the peroxide, the O being transferred to the unsatd. linkages of the fatty acids while the original SH groups are reconstituted. Here the thiol group is concerned essentially with O transport. At p_H 7.4-7.6, the system $GSH + \text{unsatd. fatty acid}$ behaves differently; here the O uptake is equal to the amt. of O required to oxidize the SH. The SH group is no longer an O carrier in the sense that Meyerhof postulated for acid systems, but its case probably becomes one represented by $AO_2 + B \longrightarrow AO + BO$, where A is an autoxidator and B an acceptor. During the oxidation of the SH group fatty acids are simultaneously oxidized in such a way that equipartition of O occurs. Neither in acid nor in slightly alk. systems do fats behave as do the fatty acids. In an acid system, for a period of 1-3 hrs., the oxidation is slow, but then becomes quite rapid; in an alk. system, there is a rapid oxidation, falling off somewhat after the second hr. Proteins are oxidized by glutathione (GSH or the oxidized form, G_2S_2) provided the protein itself displays an SH group (as shown by the nitroprusside reaction). Proteins of water-extd. muscle contain the SH group and are oxidized in neutral and faintly alk. but not in acid (p_H 3.0-4.5) solns. The protein SH is oxidized and the nitroprusside reaction disappears, while the total O taken up amounts to 10 times the O equiv. of the SH. The oxidized protein can again be reduced by contact with glutathione (GSH), cysteine or thioglycolic acid; it now responds to the nitroprusside test, and, in the presence of glutathione, again takes up O much in excess of the O equiv. of the SH. In contrast to the proteins of water-extd. muscle, the proteins from blood serum must first be denatured before they exhibit oxidation-reduction reactions. H. does not overlook the fact that Fe may play a part in these oxidations (see Warburg and Sakuma, *C. A.* **18**, 845). "The metal [Fe] is only another link in the chain . . . none of the results to which significance is attached in this paper is due to the direct influence of Fe alone."

BENJAMIN HARROW

Factors influencing the action of pancreatic lipase. B. S. PLATT AND E. R. DAWSON. *Biochem. J.* **19**, 860-74(1925).—The enzyme was prepd. either according to the method of Umeda (*C. A.* **9**, 1789) or to that of Willstätter (*C. A.* **18**, 2718). The lipase was detd. by estg. the amt. of acid liberated from Et butyrate or from olive oil (see Willstätter (*C. A.* **18**, 2718)). The optimum p_H of lipase obtained from a purified pancreas powder, if borax-boric acid buffer solns. are used, is 8.4, and if phosphate-borax buffer solns. are used, 7.0. Lipase does not promote hydrolysis of Et butyrate

in the absence of activators. Phosphates are necessary for the complete activation of lipase. The results suggest that the protein structure which has been ascribed to lipase is characteristic of the substances associated with the enzyme rather than of the enzyme itself. The ester-hydrolyzing properties of the enzyme have been definitely altered by changing the accompanying protein. The apparent destruction of lipase by trypsin is due, in part, to the removal by hydrolysis of proteins which activate the lipase.

BENJAMIN HARROW

The present situation of the problem of plasma structure. JOSEF SPEK. *Naturwissenschaften* 13, 893-900(1925).—A review.

R. J. C. VAN DER HOEVEN

Examination of an adipocere cadaver. GEORG STRASSMANN AND FANTL. *Deut. Z. ges. ger. Med.* 6, 168-74(1925).—The appearance of the corpse is described. Chem. analysis of samples gave the following results: ether-sol. portion 82.16, ash 4.03, water 1.22%. Cholesterol was very small in quantity. The ether-sol. fraction showed an acid no. 207.75, sapon. no. 238.85, ester no. 31.10 and an I no. 8.18. F. K.

Gas formation in the heart of the cadaver. LADISLAV JANKOVIC. *Deut. Z. ges. ger. Med.* 6, 379-80(1925).—J. shows that in his climate diagnosis of air embolism is possible only when the cadaver is opened within 2 days after death. Beyond this period putrefaction sets in and various gases are elaborated.

FRANCES KRASNOW

Osmosis of some anesthetics in water and lipid-containing gels. S. YUMIKURA. *Biochem. Z.* 157, 359-70(1925); cf. *C. A.* 19, 2435.—The rate of diffusion into gelatin of cocaine, novocaine, tutocaine, alypine and eucaine is detd. in the presence of lecithin both with and without alkali. Since alypine and eucaine diffuse into the gel most rapidly, and are also most toxic, this toxicity is then a function of the rate of diffusion. In the presence of lecithin, cocaine diffuses most rapidly. As higher animals have more lipid material than lower animals, the greater toxicity of cocaine in this case is to be expected.

W. D. L.

Osmosis in aqueous gel with and without addition of lipid. S. YUMIKURA. *Biochem. Z.* 157, 371-6(1925); cf. preceding abstract.—By using various amts. of lecithin in gelatin gels, it is found that the rate of diffusion of surface-active substances, such as caprylic acid and octyl alc., increases with increase of lecithin. With substances of smaller surface activity, e. g., butyric acid and isoamyl alc., smaller differences are noted.

W. D. L.

Osmosis of some acids into gelatin. S. YUMIKURA. *Biochem. Z.* 157, 377-82(1925); cf. preceding abstract.—The rates of diffusion of the surface-inactive H_2SO_4 , HCl, lactic and formic acids at various concns. are compared. The acids arrange themselves in the series $\text{HCl} > \text{H}_2\text{SO}_4 > \text{HCO}_2\text{H} > \text{CH}_3\text{CH}(\text{OH})\text{COOH}$.

W. D. L.

Lipoid theory and surface activity theory. II. I. TRAUBE AND S. YUMIKURA. *Biochem. Z.* 157, 383-7(1925); cf. preceding abstracts.—This is a discussion of the possible correlation of the facts in the above abstracts to diffusion phenomena in plants and animal tissues.

W. D. L.

Preparation, solubility, and specific rotation of wheat gliadin. D. B. DILL AND C. L. ALSBERG. *J. Biol. Chem.* 65, 279-304(1925); cf. *C. A.* 19, 3479, 3503.—Preps. of gliadin have been obtained contg. 17.54% of N and with an exceedingly low av. ash content of 0.08%. The pptn. in aq. soln. was made with vigorous shaking as the gliadin is pptd. as a foam which can be thoroughly washed; LiCl instead of NaCl was used to promote pptn. as it is sol. in alc. and Et_2O . Gliadin is irreversibly altered by standing in contact with 75-85% alc. but the temp. and condition of the gliadin, whether dry or moist, are important variables. Heretofore it has been assumed that gliadin is not altered by any concn. of alc.; hence this finding is quite significant in connection with its detn. in flour. Cooling of a soln. of gliadin in alc.- H_2O results in the production of a turbidity at a definite temp. which varies with the % of alc. but is practically independent of the concn. of the gliadin. This temp. is, therefore, called a crit. peptization temp. There appears to be no upper limit to the soly. of gliadin in Me, Et and *n*-Pr alc.- H_2O mixts. above the crit. temp., as it readily forms concn. (20%) solns. in 10% EtOH at 50° and is peptized in 80% alc. at 31°. It is peptized at room temp. (20°) in solvents contg. approx. 35-77% of alc. It is also sol. in solns. of KSCN, NH_4SCN , KI, urea, chloral hydrate, glycerol, ethylene glycol, the propylene glycols, mixts. of glycerol and abs. alc. contg. over 25% of glycerol, and in 10-25% solns. of Me-Et ketone. With solvents contg. 70, 60 and 50% of EtOH by vol., $[\alpha]_D^{20}$ was -89.8, -91.0, and -90.3°, resp., values from 1 to 2° lower than most values in the literature. These values increased considerably over a temp. range of 20-50°. In *n*-Pr alc.- H_2O $[\alpha]_D^{20}$ averaged -98.2° and did not vary significantly with the proportion of H_2O . In 30% aq. urea soln. $[\alpha]_D^{20}$ was -116.5°. No racemization occurred

on heating this soln. at 37° for 7 days; hence the formation by urea and gliadin of an alkali albuminate seemed unlikely.

A. P. LOTHROP

A further investigation of the chemical properties of insulin. D. A. SCOTT. *J. Biol. Chem.* **65**, 601-16(1925); cf. *C. A.* **19**, 2059.—The chem. properties have been studied of a very pure insulin product having a physiol. assay of 25,000 units per g. of powder and a N content of 0.006 mg. per unit of activity. The essential steps in the prepn. were extn. with HCl-alc.; pptn. of the concentrate with $(\text{NH}_4)_2\text{SO}_4$; dissolving the ppt. and repptg. in warm alc.; fractional pptn. at different acidities; and pptn. with $\text{CCl}_3\text{CO}_2\text{H}$. The % compn. of 2 samples was as follows: C 50.76 and 50.03; H 6.57 and 6.66; N (Kjeldahl) 14.0; ash 0.4. P was not present and the Molisch and orcein tests were negative. The av. % distribution of N in 2 samples was as follows: NH_2 9.7, humin 0.4, arginine 10.0, histidine 4.95, lysine 5.1, cystine 0.55, total bases 20.5, total filtrate 67.7, amino N of filtrate 65.2, non-amino N of filtrate 2.5. BzCl and CS_2 completely inactivated the insulin in alk. soln. and HCHO and HNO_2 greatly decreased its activity (the latter more than 95%). "From a consideration of the following points—the action of trypsin, the action of sp. reagents, the chem. tests, the combustion analysis, the distribution of N—the similarity between insulin and a protein is apparent. Whether the purified product used in this study contains 2 or more proteins, having very similar phys. properties, can only be detd. by further research."

A. P. LOTHROP

Action of ether on protoplasm. L. V. HEILBRUNN. *Biol. Bull. Marine Biol. Lab.* **49**, 461-75(1925).—Water enters etherized muscle less rapidly than normal muscle, but this does not necessarily imply a change in the properties of the plasma membrane following etherization. Ether does not lower the permeability of sea urchin eggs to water. Dil ether solns. cause a sharp decrease in the viscosity of sea urchin protoplasm, both in fertilized and in unfertilized eggs. Slightly more concd. ether solns. produce a coagulation which is irreversible.

L. W. RIGGS

Change in the electrical conductivity of visual purple under the influence of illumination. P. LAZAREV. *Compt. rend.* **181**, 476-7(1925).—The retinal purple of the frog was dissolved in solns. of the salts of the biliary acids. After prolonged dialysis the cond. of the soln. of the purple was detd. in the dark and in the light and was found to have the greater cond. in the light. This fact forms the basis of the author's ionic theory of luminous sensations.

L. W. RIGGS

Enzymic hydrolysis of natural and artificial amylophosphates. SAMEC. *Compt. rend.* **181**, 532-3(1925).—A 1% soln. of potato starch, which contains a phosphoric ester, heated to 120° for 30 min. and a soln. of artificial acid amylophosphoric ester were used. Upon these 2 solns. an ext. of the ground seeds of *Glycine hispida* and dry exts. of muscles of porpoise and femurs of the calf were allowed to act at 37°. The operations were protected from bacteria by layers of toluene. At the end of the enzymic action the mixts. were dialyzed in parchment sacs to remove the electrolytes and the remaining mixt. was purified by electrodialysis to a const. cond. The colloidal residue contained the non-dialyzable P which was detd. by burning the sacs. The water in which the dialysis was made contained H_3PO_4 resulting from enzyme action, and at the same time the H_3PO_4 bound to the dextrans or sugars. The quantity of the first was detd. by pptn. by Mg mixt. and after filtration the quantity of the second was detd. in the filtrate. The results assembled in a table show the amts. of P_2O_5 (1) in the colloidal remainder, (2) in the org. dialyzable fraction and (3) in the free dialyzable fraction.

L. W. RIGGS

Influence of the mode of dissolution of amylase on the saccharification of starch. P. PETIT AND RICHARD. *Compt. rend.* **181**, 575-7(1925).—Three methods of dissolving the amylase were tested, *viz.*, boiling water, water agitated by a stream of H_2 , and water agitated by a stream of air. The max. maltose per 100 of starch is attained with a p_{H} of 4.2 and the amylase dissolved in boiling water. Of the other methods of dissolving amylase it was found that H_2 had a less depressing action than air. With solns. of p_{H} 8.0, on the contrary, the soln. of amylase by water charged with H_2 gave the largest yield of maltose, but only about 0.4 that yielded at p_{H} 4.2. With p_{H} 3.2 the results were near those with p_{H} 8.0.

L. W. RIGGS

Acidification of the medium by cellular cytotoxicity. (MMR.) ANNA DRZEWINA AND GEORGES BOHN. *Compt. rend.* **181**, 692-4(1925); cf. *C. A.* **16**, 1279, 2182.—To a tube contg. sea water is added either KCl to make 0.05 N, or an equal vol. of fresh water, and some hundreds or thousands of *Convolvula*. After the lapse of about 15 min. the liquid showed a p_{H} of 4.4 as estd. by methyl red. Thus a few mg. of *Convolvula* can convert the p_{H} of 10 cc. of a liquid from about 7.0 to 4.4.

L. W. RIGGS

Preparation of muscle albumin (myoalbumin) by the acetone method; its principal properties. MAURICE PIETTRE. *Compt. rend.* 181, 737-9(1925).—Muscle plasma, prepd. by grinding and pressure, is satd. with Et_2O and allowed to stand in the cold with occasional shaking for 24 hrs. when it is passed through a cloth filter. This operation with Et_2O and filtering is repeated 4 or 5 times until only a slight ppt. forms and the liquid is almost water white. To 100 cc. of the latter is added 120 to 130 cc. of acetone, a few cc. at a time and with vigorous shaking. A granular white ppt. forms which contains all the proteins of the liquid. This ppt. is filtered off and is dried completely under the air pump. The very hygroscopic cake thus formed is taken up with 30 to 40 cc. of water in which it is mostly sol., and placed in the ice box for 24 hrs. when it is centrifuged, the ppt. is washed with water until the washings are not clouded by heat, to sep. the insol. materials resembling globulins. The aq. liquid and added first washings are satd. with Et_2O for 24 hrs. in the ice box, the slight ppt. which forms is filtered out and a second pptn. is made with 1.3 times its vol. of acetone, followed by taking up with water, agitation with Et_2O and filtration, which gives a solu. of myoalbumin, which is further purified by fractional pptn. with alc. Myoalbumin has properties closely resembling those of serum albumin, lactalbumin and ovalbumin. It is distinguished by its coagulation temp. of 45° to 47° and by its sp. rotatory power of -26.4° to -30° .
L. W. RIGGS

Promoting action of anemic blood upon the formation of red blood-corpuscles. G. FÖRSTER AND F. KISS. *Magyar Orvosi Archivum* 26, 401-6(1925).—The serum of animals made anemic through bleeding, when injected into anemic animals, prevents the reduction of the erythrocytes which otherwise takes place the day after bleeding, and accelerates the process of regeneration. Plasma and hemolyzed red blood corpuscles act in a manner similar to that of anemic serum.
L. W. RIGGS

Mechanism of carbohydrate utilization. A. L. RAYMOND. *Proc. Nat. Acad. Sci.* 11, 622-4(1925).—The mechanism of alc. fermentation as accomplished by enzymes is believed to be as follows: (a) The hexose reacts with inorg. phosphate to form a hexose monophosphate ester; (b) this splits into 2 triose groups one of which contains all of the P; (c) the triose phosphate condenses to a hexose diphosphate and the triose remainder of (b) is transformed into alc. and CO_2 ; (d) the hexose diphosphate is hydrolyzed back to hexose and an inorg. phosphate. The P-free triose of (b), $\text{C}_3\text{H}_6\text{O}_3$, is believed to be a reactive substance which is not identical with any known isomer of this empirical formula, and it is intended to include the hydrated or dehydrated forms such as $\text{C}_3\text{H}_8\text{O}_4$ or $\text{C}_3\text{H}_4\text{O}_2$. The transformation of $\text{C}_3\text{H}_6\text{O}_3$ to alc. and CO_2 is believed to proceed as suggested by Newberg and Kerb (cf. *C. A.* 8, 1805). It is believed that the presence of insulin or an insulin-like material is necessary in order that reaction (a) shall take place. The mechanism of the animal metabolism of carbohydrates is believed to be related to that proposed above for alc. fermentation.
L. W. RIGGS

Inactivation of insulin by glucose with a comment on the genesis of diabetes. J. R. MURLIN. *Science* 62, 332-4(1925).—Insulin treated *in vitro* with glucose loses much of its power to lower the blood sugar of normal fasting rabbits. Fructose has little if any inactivating effect *in vitro* upon insulin. The relations of the liver and pancreas to diabetes are discussed.
L. W. RIGGS

Binding of acid and alkali by proteins. R. A. GORTNER AND W. F. HOFFMAN. *Science* 62, 464-7(1925).—The chem. nature of a protein and the power of a protein to bind acid and alkali in stoichiometrical relationships depend on the chem. groups within the protein mol., and is limited to the range between p_H 2.5 and p_H 10.5. It is suggested that there are 2 types of combinations between proteins and acid or alkali: (1) a chem. type as above indicated and (2) an adsorption type of combination which takes place at p_H values outside of the limits 2.5 to 10.5.
L. W. RIGGS

Ultra-violet radiations and antirachitic substances. J. C. DRUMMOND AND T. A. WEBSTER. *Nature* 115, 837(1925); cf. *C. A.* 2, 3310; 19, 353, 2964. —The fogging of a photographic plate erroneously attributed to the emission by cod-liver oil of invisible ultra-violet light capable of passing through quartz but not through glass may be due to a phosphorescence of the fused silica. Quartz which has been exposed to ultra-violet light may continue to emit rays capable of fogging a photographic plate after 21 days at room temp.
FLORENCE N. SCHOTT

An amphoteric substance in the radula of the whelk (*Buccinum undatum*). C. F. A. PANTIN AND T. HOWARD ROGERS. *Nature* 115, 639-40(1925).—The radula of *Buccinum* seems to consist of 2 zones, a newly formed part (chitin A) and an older part (chitin B). Data are given showing that when these 2 chitins are stained with basic and acidic ions, Ag^+ and $\text{Fe}(\text{CN})_6^-$, at known p_H values, it was found that chitin A combines with both anions and cations irrespective of the p_H . Chitin B appears to be

an amphoteric substance with an isoelec. point at about p_H 2.6. Chitin A seems to undergo a profound change when it is converted into chitin B. F. N. S.

Determination of the calcium-ion concentration by means of indicators; ionic equilibrium in the body. F. HAFFNER AND R. SIMON. *Arch. expl. Path. Pharm.* **109**, 129-42(1925).—The Ca-ion concn., like the H-ion concn., can be detd. colorimetrically by means of acid dyestuffs which enter into combination with Ca. Dianilbraun M11 is the best indicator for use in biol. solns. with a Ca concn. of 0.1-0.001 M. For the increase in Ca ions in inorg. solns. the surviving frog musculature has no buffer effect comparable to that for the p_H . The action of Ca on the size of the frog vessels and on the frog heart is increased by increasing the alky., despite the fact that the concn. of Ca ions is reduced, a result to be interpreted as a sensitization for Ca by OH ions. G. H. S.

Theory of the bioelectric current. W. DEUTSCH. *Arch. ges. Physiol.* (Pfluger's) **209**, 675-84.—Monds' expt. can be readily reproduced, but certain precautions must be observed to obtain abs. values. The time between the prepn. of the phase (protein) and the detn. has an effect, for within a period of 30 hrs. the potential has fallen and after 3 days the change is still greater. In opposition to this the "concn.-effect" increases. The albumin-paraglobulin fraction, as well as hemoglobin, behaves essentially like euglobulin, indicating that for the production of the p. d. lipid substances are not essential. Study of the relation of the protein phase to different electrolyte solns. shows that there is no connection between dyestuff absorption, lipid soly., and the c. m. f. of dyestuffs. Polyvalent cations, such as La, as well as alkaloids such as quinine and cocaine show a moderately great activity. Narcotics like phenylurethan and phenylurea exert no influence on the c. m. f. Reaction changes of the protein phase occur, as in the expts. of Matsuo and Mond, in that a reversal of the direction of the current occurs with change in reaction, i. e., at one time the anion, at another the cation of the electrolyte becomes active. G. H. S.

Preparation and properties of amylase from germinated wheat and rye. N. M. NAYLOR, MABEL SPENCER AND MARGARET HOUSE. *J. Am. Chem. Soc.* **47**, 3037-9 (1925).—The amylases from germinated wheat and rye compare very favorably with amylase from malt described by Osborne and by Sherman on the following points: they are obtained by the same process of dialysis and fractional pptn. with EtOH, they give the typical protein tests and they show optimum activity at a corresponding range of H-ion concn. in the starch substrate. C. J. WEST

Action of yeast on the glycidic acids (KUHN, EBEL) **10**. Possible errors in the use of biological agents in organic chemistry (NIEL, HOOFF) **10**. Protein films on collodion membranes (HITCHCOCK) **2**. Theory of permeability of membranes for electrolytes (MICHAELIS) **2**. Seymuk-sulfuric acid (OKAWA) **10**. Formation of desoxybilanic acid from bilanic acid and of desoxycholic and isodesoxybilanic acids from isobilanic and desoxycholic acids (KARASAWA) **10**. Relation between chemical constitution and pungency in acid amides (JONES, PYMAN) **10**. Fermentation of dried tobacco (FODOR, REIFENBERG) **17**.

DODDS, E. C., and DICKENS, F. **The Chemical and Physiological Properties of the Internal Secretions.** New York: Oxford Univ. Press. 214 pp. \$2.50.

LEVENE, P. A.: **Hexosamines and Microproteins.** (Monographs on Biochemistry) London: Longmans. 10s. 6d. net.

LUFF, ARTHUR P., and CANDY, HUGH C. H.: **A Manual of Chemistry for Medical Students.** 7th ed., revised and enlarged. Vol. I. Introduction and Inorganic Chemistry. London: Cassel & Co., Ltd. 578 pp. 11s. net. Reviewed in *Chem. News* **131**, 189; *Analyst* **50**, 643(1925).

MAXWELL, IVAN: **Clinical Biochemistry.** Melbourne: W. Ramsay. 121 pp. Cloth, 12s. 6d.

PETTIBONE, C. J. V.: **Physiological Chemistry.** St. Louis, Mo.: C. V. Mosby Co. 393 pp.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

The determination of the content of the protein molecule in cyclic complexes. OTTO FÜRTH. *Ergebnisse Physiol.* **24**, 52-66(1925).—A description of the different methods for the detn. of tyrosine, tryptophan and histidine. H. J. DEUEL, Jr.

Barbituric acids and the picric acid reaction. A. W. DOX. *Z. physiol. Chem.* **150**, 118-20(1925).—The red color obtained by treating diketopiperazines with picric

acid and NaOH may be obtained also by treating barbituric acid with the same reagent. However, neither mono- nor dialkylbarbituric acids give this reaction. This is not surprising in the case of the dialkyl derivs., considering their great stability toward oxidizing agents, but is rather significant in the case of monoalkyl derivs. because these contain 2 carbonyls with the same adjacent groupings as the diketopiperazines. It is believed that the color obtained by treating barbituric acid with the picric acid reagent is due to formation of picramic acid, since both the colored product formed in the reaction and picramic acid itself gave a yellow dye when diazotized and coupled with sulfanilic acid. Abderhalden's use of the picric acid reaction for demonstrating diketopiperazines is believed warranted in view of his direct identification of piperazines after reduction and the improbability of the presence of other reacting substances among the hydrolytic products of proteins. The reaction is certainly not obtained with all ring systems contg. the CO group.

Estimation of glucose, especially in urine. L. ROSENTHALER. *Arch. Pharm.* **263**, 518-20 (1925).—The following reagents are required: (1) a soln. of 5 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in 500 cc. of H_2O ; (2) a soln. of 173 g. Rochelle salt, 45 g. NaOH and 40 g. $\text{K}_4\text{Fe}(\text{CN})_6$ in 500 cc. of H_2O ; (3) a soln. of a cyanide contg. phenolphthalein soln. obtained by treating 0.5 g. phenolphthalein in 30 cc. EtOH with sufficient H_2O in an evap. dish to develop turbidity, addn. of 20 g. NaOH followed by Al powder in small portions sufficient to discharge the color, then diln. to 150 cc. with H_2O . The reagent consists of about 0.1 g. KCN dissolved in 10 g. of the phenolphthalein soln. A mixt. of 10 cc. of soln. (1) and (2) is reduced by 10.45 mg. of glucose. To standardize, heat 10 cc. of soln. (1) accurately measured, 10 cc. of soln. (2) and 10 cc. of H_2O in a 200-cc. Erlenmeyer flask to boiling, then run in from a buret sufficient glucose soln. to develop a green color. A drop of the liquid transferred to a filter paper previously moistened with soln. (3) develops an immediate red spot. Addn. of the glucose soln. is continued drop by drop until the spotting test becomes negative. If 10 cc. had been added up to this point, it would have contd. 10.45 mg. glucose, or had a strength of 0.1015%. In any case a 2nd detn. should be made. In tests involving the accuracy of the method on 4 samples each contg. 0.95% glucose with 1 cc. normal urine, 0.1 g. urea, 0.1 g. NH_4Cl , 0.01 g. uric acid resp., the following values of glucose were found: 1.09, 0.91, 0.96 and 0.98%. W. O. E.

The oxidative enzymes of the leucocytes. HEDWIG MIELKE. *Klin. Wochschr.* **4**, 2201-2 (1925).—The method used was that of Graham excepting that Merck's benzidine tablets, which contain BaO_2 , were used in place of H_2O_2 and benzidine. The results obtained are compared with those obtained by the Graham method. MILTON HANKE.

Estimation of phosphorus compounds in blood. R. V. STANFORD AND A. H. M. WHEATLEY. *Biochem. J.* **19**, 697-705 (1925).—Slight modification of the well-known colorimetric methods. BENJAMIN HARROW.

Estimation of calcium in blood. R. V. STANFORD AND A. H. M. WHEATLEY. *Biochem. J.* **19**, 710-4 (1925).—Ppt. 5 cc. plasma with 25 cc. $\text{CCl}_3\text{CO}_2\text{H}$ (6.5%). To 20 cc. of filtrate in a centrifuge tube, provided with a stirrer, add a drop of methyl red, then concd. NH_4OH in drops until the liquid is just alk., then 0.5 N HCl in drops until the liquid is just acid again. Add 1 cc. 0.5 N HCl, 1 cc. 4% oxalic acid and 1 cc. 26% AcONa . Let stand overnight, centrifuge, and wash the ppt. twice with satd. CaC_2O_4 soln. Dissolve the ppt. in 1 cc. N H_2SO_4 and titrate with 0.01 N permanganate. Distribution of Ca compds. in blood (figures in hundredths of a milligram): plasma, in five cases, from 9.6-11.0; corpuscles, in five cases, from 1.4 to 3.2. B. H.

Estimation of allantoin in presence of uric acid, creatinine and amino acids. EINAR LANGFELDT AND JÖRGEN HOLMSEN. *Biochem. J.* **19**, 715-6 (1925).—The method used was that of Wiechowski (*C. A.* **9**, 2694). The estn. of allantoin by mercury pptn. gives figures for the amt. of allantoin in aq. soln. which are not more than 10% below the real amt. In the presence of amino acids in small quantities, and of creatinine and uric acid in quantities such as are contained in normal urine, the figures for allantoin are higher and closer to the real amt. When the amino acids are present to the extent of 0.2% or over, the figures are too high. BENJAMIN HARROW.

The isolation of natural crystallized lecithins. H. H. ESCHER. *Helvetica chim. acta* **8**, 686-91 (1925).—A pure phosphatide product is the prerequisite for the prepn. of cryst. lecithins. Five to 10 kg. cautiously dehydrated egg yolk or ox brain was extd. with boiling alc. and CHCl_3 until the snow-white protein powder yielded no more to the solvent. The concd. soln. was pptd. with acetone. The addition product of phosphatides and acetone is always amorphous, often smeary. Cryst. ppts. indicate contamination by proteins. Speed is essential; the prepn. including mincing must be completed in 2-6 hrs. The nearly colorless product, which can be powdered when

dry, is relatively unstable in air. Properly stored it remains unchanged for years. Lecithin was isolated from this product by fractional crystn. from abs. alc. After the removal of the cephaline and sphingomyelin fractions at room temp. and below 0°, 75% of the phosphatides consisting of lecithins crystallized at -35°. It melts below 0°. The fraction least sol. in ether, m 244-5° is snow-white, hygroscopic and has the I value 50, corresponding to 1.5 double bonds. From the mother liquid two other lecithins with 2.5 and 3.5 double bonds were isolated.

MARY JACOBSEN
The significance of "odor" diagnosis in criminology. R. KOCKEL. *Deut. Z. ges. ger. Med.* 6, 1-4 (1925).—Discussion of a case.

FRANCES KRASNOW
A titrimetric micromethod for determination of phosphoric acid. K. SAMSON. *Deut. med. Wochschr* 51, 1571-2 (1925).—A method depending upon titration of precipitated phospho-molybdate.

LOUIS LEITER
Cholecystography: oral administration of sodium tetraiodophenolphthalein. E. A. GRAHAM, W. H. COLE, SHERWOOD MOORE AND G. H. COPIER. *J. Am. Med. Assoc.* 85, 953-5 (1925).—Successful cholecystograms can be made by oral administration of Na tetraiodophenolphthalein and Na tetrabromophenolphthalein. Doubtful results of cholecystography following oral administration should at present be confirmed by intravenous injection.

I. W. RIGGS
Determination of Ca and Mg in organic liquids (CONDORELLI) 7.

C—BACTERIOLOGY

A. K. BALLS

Metabolism of acid-fast bacteria. V. The quantitative metabolism expenditure of the timothy bacillus and of the trumpet bacillus. H. WOLFF. *Biochem. Z.* 158, 319-33 (1925).—The quant. needs of the timothy bacillus and the trumpet bacillus for Mg, K, Na, S, P, N and C were detd. by recording the bacterial growth in media to which varying amts. of the element under investigation were added. From such data, media favorable for the max. growth of the bacillus can be constructed.

F. A. CAJORI
Use of dyes in agar media. MAX LEVINE. *J. Am. Water Works Assoc.* 14, 267-72 (1925).—Variation in the actual dye content of available American and foreign dyes used in eosin-methylene-blue agar has resulted in a need for some type of control and certification.

D. K. FRENCH
Bacillus typhosus morphologically compared with certain bacilli present in natural waters. LUCIUS NICHOLS AND EDWIN BURGESS. *Ceylon J. Sci.* (Sect. D, Med. Sci.) 1, pt. 2, 47-56 (1925).—*B. typhosus* could be distinguished morphologically from *B. coli* and any of 40 bacilli isolated from water. Cultures for comparison were grown on nutrient agar contg. 0.5% added NaCl, on similar agar contg. 1% NaCl and on similar agar contg. no added NaCl. The 40 bacilli isolated from water were capable of producing acid and gas from lactose broth in 33 cases, and capable of producing acid but not gas in 6 cases. A plea for more careful morphological study of the organisms is made.

JACK J. HINMAN, JR.
Observations on the cultural and biochemical characters of *Monilia castellanii* (*Cryptococcus castellanii*) and *Monilia macroglossiae* (*Cryptococcus macroglossiae*). SERGIO RE. *J. Trop. Med.* 28, 317-9 (1925).—The organisms are cultured on various media and the results obtained confirm Castellani's description of the two fungi.

FRANCES KRASNOW
Virulence of cholera vibrios in relation to the age of the cultures. M. MELNIK. *Compt. rend. soc. biol.* 92, 941-3 (1925).—Agar cultures have a max. virulence at the age of 16 hrs; bouillon cultures, 4 days; the curve of virulence of the culture on agar rises and declines rapidly, while that of bouillon cultures rises slowly and remains for a long time at a const. level, then commences to decline slowly.

S. MORGULIS
Effect of the products of autolysis of different organs on methanol extracts of tubercle bacilli and of the timothy bacillus. L. ISAFU. *Compt. rend. soc. biol.* 93, 249-50 (1925).—Most of the internal organs of mesodermic or endodermic origin neutralize or inhibit the action of MeOH exts. of tubercle bacilli and the timothy bacillus, while brain tissue of ectodermic origin is entirely without influence.

S. MORGULIS
The determination of the energy by which *Bacterium coli* develops at the expense of glucose. OTTO FURTH. *Ergebn. in Glucose media breaks down this sugar first to pyruvic acid,*

Methods for the detn. of the synthesis of the living cells. The source of energy is lactic acids and the ans of which the organism breaks the pyruvic acid down to Bacterium coli grow in which acid is grow.

G. F. REDDISH

The total luminous efficiency of luminous bacteria. E. N. HARVEY. *J. Gen. Physiol.* **8**, 89–108(1925).—The light emitted by a single individual of *Bacterium phosphorescens* was calcd., also its O_2 consumption in sea water. Intensity of luminescence does not diminish till the O_2 concn. falls below 2%, after which it decreases rapidly. Above 2% O_2 , the bacteria use equal amts. of O_2 in equal times; below this value, the rate of O_2 absorption is probably proportional to the O_2 concn. The max. light from a single bacterium was 24×10^{-14} lumens (19×10^{-14} candles); the max. value in lumen secs. per mg. O_2 absorbed was 14, av. 9.25. The total luminous efficiency was 0.00156. Since some of the O_2 is used in respiratory oxidation the luminescence efficiency must be higher. KCN may reduce the O_2 consumption to $1/20$ the original value, but reduces luminescence to only $1/4$ its original value. By separating respiratory from luminescence oxidation in this manner, the luminous efficiency is 5 lumens per watt or 0.0078 which compares favorably with 16 lumens per watt for a tungsten vacuum lamp or 3.9 lumens per watt for a tungsten nitrogen lamp. The specific luminous emission of this bacterium is 3.14×10^{-6} lumens per sq. cm. One bacterium absorbs 215,000 molecules O_2 per sec. and emits 1,280 quanta of light at $\lambda_{max} = 510\mu$. By assuming that 1 mol. O_2 uniting with luminous material results in the emission of 1 quantum of light energy, only $1/168$ of the absorbed O_2 is used in luminescence and the luminous efficiency becomes 168 lumens per watt or 26 2/3%. C H R

Germicidal action of certain vegetable essences. A. MOREL AND A. ROCHAIX. *Bull. sci. pharmacol.* **32**, 257–70; *Parfumerie moderne* **18**, 261–9(1925).—The essences were tested in the gaseous and in the liquid form on meningococci, *B. typhosus*, staphylococci, *B. diphtheriae* and anthrax bacilli. When applied in a state of vapor the germicidal activity decreased in the following order: lemon, thyme, orange, bergamot, juniper berry, clove, citronella, lavender, gomenol, mint, rosemary, santal, eucalyptus, badian. When applied in the liquid state the order of decreasing activity was thyme, lemon, juniper berry, mint, gomenol, orange, citronella, cloves, lavender, rosemary, bergamot, eucalyptus, santal, anise, badian. A given bacterium differs more or less in its resistance to different essences. L. W. RIGGS

Asepsis. H. HALILAY. *Indian Med. Gazette* **60**, 455–9(1925).—Most high-pressure steam sterilizers are too small and are likely to be overloaded. The steam pressures at which the sterilizers are worked are usually too low to insure complete sterilization. A pressure of 30 lbs. is necessary, although this is a higher pressure than many sterilizers on the market are designed to stand. Flowers of S placed in the middle of the drum with the goods will show whether a temp. of 114.5° has been reached. It is difficult to heat the interior of a drum tightly packed with surgical dressings. L. W. RIGGS

Therapeutic preparation of lactic acid bacilli. J. REICHEL AND C. ROOS. U. S. 1,540,951, June 9, 1925. A culture medium prepd. from casein by digesting it with trypsin and rendering it alk. with Na_2CO_3 is used for the propagation of *B. acidophilus* or *B. bulgaricus*, the bacilli are sepd. by settling or centrifuging, mixed with yeast and the mixt. is compressed.

D—BOTANY

B. M. DUGGAR

The action of photocatalyzers on the early sprouting of resting buds and on the germ. A. NIETHAMMER. *Biochem. Z.* **158**, 278–305(1925).—The bursting of winter buds and the germination of seeds were found to be accelerated by continuous illumination by artificial light of high intensity (300 Hefner candle). The effect of light was increased when such photocatalyzers as eosin, erythrosin, methylene blue, $FeSO_4$, $Fe(SO_4)_3$ and $U(SO_4)_2$ were injected directly into the buds, or in the case of the seeds placed in the bath in which the seeds were germinated. F. A. CAJORI

The action of sodium carbonate on germs and plant growth. D. FEHÉR AND ST. VÁGI. *Biochem. Z.* **158**, 357–65(1925).—The toxic action of Na_2CO_3 on plant growth is believed to be due to NaOH formation by hydrolysis. If the OH ion is depressed, as by the presence of humus, Na_2CO_3 is less toxic. A concn. of 0.4 to 0.5% Na_2CO_3 completely hindered germination and growth of wheat 1.5% Na_2CO_3 in sandy soils checked growth. Trees are less resistant to Na_2CO_3 than other plants. F. A. CAJORI

The effect of wounds upon the rotation of the protoplasm in the internodes of Nitella. SUSAN P. NICHOLS. *Bull. Torrey Bot. Club* **52**, 351–63(1925).—Initial puncture of the cell wall by a needle usually results in immediate cessation of protoplasmic streaming throughout the cell. The opening is plugged in a few min. and rotation resumed, except in a zone extending in the direction of movement

from the wound. On repeated puncture the streaming shows less general and prolonged interruption. A toxic substance may be formed by the injured protoplasm and carried out into the cell by currents flowing over the injury, causing stoppage of movement. On repeated wounding an antitoxic substance may be developed, resulting in lessened interference with streaming. Or puncturing may result in increased viscosity or the setting of the protoplasm into a gel. JOSEPH S. CALDWELL

The chemical constituents of the fruit walls of Myxomycetes. ALEXANDER KIESSEL, *Z. physiol. Chem.* **150**, 102-17 (1925).—The air-dried fruiting bodies of *Lyogala epidendron* were crushed and emptied of their spore contents by shaking, then repeatedly washed with H_2O and finally dried at $108-10^{\circ}$. Analysis showed 3.63% N, 3.98% Et_2O ext., 2.84% ash. Hydrolysis by acid gave reducing sugar equiv. to 50.5% of the material. This was identified as glucose by the prepn. of osazone and no other sugar could be demonstrated. Treatment of the wall substance with 2% H_2SO_4 left 58.38% undissolved, and prolonged treatment with 66-80% acid left 27.63% of residue. Alkali fusion at $160-80^{\circ}$ dissolved 98.1-99.3% of the material with evolution of NH_3 . The N free poly-saccharides may be sepd. from the N-contg. substances by treatment with 8% $NaOH$ at water bath temp., and the insol. residue thus obtained accounts for 90.5% of the total carbohydrate. Hence if glucosamine-contg. carbohydrates occur, other nitrogenous substances, e. g., proteins, must also be present. For the polysaccharide insol. in hot 8% $NaOH$ the name *myxoglucan* is proposed. The amt. of NH_3 liberated from the material by boiling with 8% $NaOH$ and that obtained by alkali fusion were identical and represented 18.5% of the total N. The N rendered sol. by acid hydrolysis represented 66.7% of the total. Neither glucosamine nor protein was actually demonstrated, but it is believed that the greater part of the N is present in protein like substances, especially since treatment with pepsin-HCl dissolved a considerably greater portion of the N than did the same concn. of HCl alone. A. W. D.

Continuous respiration studies of dormant seeds of Xanthium. JUNJI OTA, *Bot. Gaz.* **80**, 288-99 (1925).—There is an increase in the respiration rate of dry seeds during the first day of subjection to favorable germinative conditions in the respirometer, then the respiration falls rapidly to a low level, after which there is a slow decrease in rate as long as the expt. is continued. If the seeds are soaked in cold water previous to placing them in the germinator, the respiration rate reaches its max. earlier than unsoaked seeds, otherwise the curve is the same as that for unsoaked seeds. Respiratory activity runs parallel with catalase activity. BENJAMIN HARROW

The variation in the moisture and nitrogen content of the potato during growth and storage. T. W. FAGAN, *Welsh J. Agr.* **1**, 110-5 (1925).—A gradual decrease in moisture and a corresponding increase in dry matter occurred in potatoes during growth. The percentages of total N and protein N both showed a steady increase. The ratio of protein N to total N also increased until at the time of harvesting it was 55 to 58% of the total. In expts. during two seasons the compn. of the potatoes at the time of harvesting was H_2O 77.33-78.12, total N 0.316-0.297, and protein N 0.181-0.161, resp. Similar variations during growth also occurred in the leafy portion of the plants, the compn. at the time of harvesting being H_2O 22.19-30.32, total N 1.149-1.014, and protein N 0.970-0.812, resp. The percentages of total N and dry matter increased slightly during storage but the ratio of protein to total N remained fairly constant. K. D. JACOB

The influence of environment on the protein content of wheat. F. T. SHUTT, *Can. Chem. Metallurgy* **9**, 195-7 (1925).—The protein content of wheat was increased by 6.15% and reduced by 6.18% through environmental factors. H. R. KRAYBILL

The chemistry of Japanese plants. III. Chemical development in the growth of bamboo shoots. SHIGERU KOMATSU AND CHOJI TANAKA, *Mem. Coll. Sci. Kyoto Univ.* **9A**, 1-14 (1925); cf. *C. A.* **18**, 849; **19**, 2840. Bamboo shoots from 5 different sections of the jungle were cut into 5 pieces each and analyzed. The upper portions of the shoots contain the least carbohydrates and the largest amt. of simple nitrogenous substances and fatty acids. The pentosan content was const. throughout the shoot. The total ash content decreases with age. H. R. KRAYBILL

Attempt to prove Wieland's theory of respiration. K. TANAKA, *Biochem. Z.* **157**, 425-33 (1925).—In order to prevent the decompn. of H_2O_2 formed during the oxidation of CO, HCN dissolved in H_2SO_4 is used. The yield of H_2O_2 increases from 6% of the theoretical yield without the HCN to 61% with HCN. However, no H_2O_2 could be demonstrated to be formed in the oxidation of EtOH. HCN does not prevent respiration by *Chlorella*, but no H_2O_2 is formed in the dark although H_2O_2 is formed in the light, when O_2 and not CO_2 is given off. Therefore, the H_2O_2 is formed because of a photo-oxi-

dation of the chlorophyll. The Traube-Wieland reaction is, therefore, either not involved in respiration, or does not go on to an appreciable extent. W. D. L.

Presence in the emulsin of almonds of two new enzymes, primeverosidase and primeverase. MARC BRIDEL. *Compt. rend.* **181**, 523-4 (1925), cf. *C. A.* **19**, 2514.—The emulsin of almonds, when used in sufficient amts. and for sufficient time (30 days), hydrolyzes an aq. soln. of monotropitoside. The hydrolysis is not arrested by primeverose, the latter being hydrolyzed to glucose and xylose. Therefore, the emulsin of almonds contains 2 enzymes which have not been noted hitherto, *viz.*, *primeverosidase* and *primeverase*. L. W. RIGGS

Sugars furnished by gein. H. HERISSEY AND J. CHEYMOL. *Compt. rend.* **181**, 565-6 (1925); cf. *C. A.* **19**, 1442.—Gein extd. from underground parts of *Geum urbanum* L. upon hydrolysis with boiling dil. H_2SO_4 yields *d*-glucose and *l*-arabinose. Hydrolysis of gein by gease gives *vicianose*, a sugar hydrolyzable by boiling dil. acids to *d*-glucose and *l*-arabinose. After vicianin from seeds of *Vicia angustifolia*, gein becomes a second actual source of vicianose. L. W. RIGGS

Energy yield in the development of various vegetable organisms as a function of the oxygen content of the surrounding air. EMILE P. TERROINE, R. BONNET AND A. HÉE. *Compt. rend.* **181**, 685-7 (1925).—Expts. to det. the energy yield during 3 days growth of *Sterigmatocystis nigra* in atm. contg. from 21 to 100% of O_2 , also to det. the energy yield of germinating lentils and black soy beans in air and in O_2 proved that an increase in the percentage of O_2 in the atm. surrounding the organism even up to 100% does not affect the yield of energy. L. W. RIGGS

Influence of the conditions of the medium on the germination of seeds in the absence of calcium. R. CÉRIGHELLI. *Compt. rend.* **181**, 728-30 (1925).—Maquenne and Demoussy (cf. *C. A.* **11**, 2817, 2922) proved that Ca is indispensable to the normal germination of seeds. C. found this condition to hold whether the medium was sterilized or not, whether the cotyledons were immersed or not, and whether the operation was carried out in pure water or in the vapor of water. L. W. RIGGS

Rapid method for demonstrating the effect of plants on a culture solution. P. L. HIBBARD. *Science* **62**, 515-6 (1925).—A method is given for sprouting wheat seeds and cultivation of the plants to a height of 10-15 cm. On successive days the bundle of plants is supplied with dil. solns. of single salts in a vol. sufficient to keep the roots immersed. At the end of the period of absorption the remaining soln. is made up to its original vol. with distd. water, and the liquid tested for the ions remaining. In this way culture solns. contg. the following named plant foods, resp., were tested: KNO_3 , KCl , $Ca(NO_3)_2$, KH_2PO_4 , $KHCO_3$, $NaNO_3$, $Mg(NO_3)_2$, $(NH_4)_2SO_4$, and $MgSO_4$ were tested. The pH was detd. in each solution after absorption by the plants by means of phenolsulfonephthalein indicators. In some cases the same culture soln. was tested after different periods of absorption. The usual pptg. reagents were used for Ca, Mg, sulfate and phosphate. Sodium cobaltinitrite was used for K and diphenylamine for nitrate. L. W. RIGGS

Acidity produced in salt solutions by Sphagnum. MACGREGOR SKENE AND GLADYS L. STUART. *Nature* **115**, 605-6 (1925).—A pH detn. of salt solns. contg. *Sphagnum* gives the same values as does that of solns. of $NaCl$ and HCl , and corresponding salt acid mixts. of the other salts employed, *viz.* pH 4.6, 4.6, 5.5, 5.9, 9.5, for $NaCl$, Na_2SO_4 , $NaOAc$, Na citrate, Na borate. These results seem to prove that the acidity produced in these salt solns. after shaking with *Sphagnum* is due to the acid of the salt employed, and not to org. humic acids as suggested by Odén. FLORENCE N. SCHOTT

The root bacilli of "Diplotaxis erucoides," D. C. R. PEROTTI. *Atti accad. Lincei* [6], **2**, 46-52 (1925).—In extending the work on this organism P. (*Atti acad. Lincei*, **28**, I, 331; **29**, II, 361) studied the influence of the bacteria on the N nutrition of *Diplotaxis erucoides*, D. C. *Diplotaxis erucoides* is damaged by the absorption of ammo. compds. (asparagine) and in the presence of NH_3 or nitric N definitely prefers the latter. This plant showed itself adapted to substrates poor in N and may be said to be oligotrophic. N balance studies showed a gain of N in the plant when no N compds. were supplied. The role of bacteria in the fixation of molecular N_2 in non-leguminous plants is still incompletely known. E. J. WITZEMANN

ONSLow, MURIEL, WHELDALe: **The Anthocyanin Pigments of Plants.** 2nd ed. revised. Cambridge: The University Press 314 pp. 21s. net. Reviewed in *Science Progress* **20**, 354; *Nature* **116**, 672 (1925).

STILES, W.: **Photosynthesis, the Assimilation of Carbon by Green Plants.** London: Longmans, Green & Co. 268 pp. 16s. Reviewed in *Chemistry & Industry* **44**, 1145 (1925).

E—NUTRITION

PHILIP B. HAWK

The specific dynamic action of foodstuffs and their relation to the basal metabolism in diabetes. H. C. GEELMUYDEN. *Ergebnisse Physiol.* **24**, 1-42(1925).—The theories on the causes of specific dynamic action are much at variance with the generally accepted views of the American school. The specific dynamic action of carbohydrates is caused by the formation of glycogen, an exothermic reaction, while that of fat is bound up with the change of its decompn. products (CH_3COOH and $\text{CH}_3\text{COCH}_2\text{COOH}$) to glucose. The sp. dynamic action of the amino acids is partly traced to the deamination and the formation of urea and partly to the change of the non-nitrogenous residues into glucose. Their relation to the basal metabolism in diabetics is discussed.

H. J. DEUEL, JR.

The simultaneous experimental production of severe xerophthalmia and rickets in young rats. WILHELM STEPP. *Ergebnisse Physiol.* **24**, 67-70(1925).—On raising the CaCO_3 content of a xerophthalmia-producing diet (oat flakes 40.0%, casein 5.0%, NaCl 1.0%, CaCO_3 1.5%, dextrin 52.5%) to 3.0%, typical rickets was produced simultaneously with xerophthalmia in young rats fed 4-5 weeks on this ration.

H. J. DEUEL, JR.

Antineuritic yeast concentrates. I. H. W. KINNERSLEY AND R. A. PETERS. *Biochem. J.* **19**, 820-6(1925); cf. *C. A.* **19**, 95. K. and P. used pigeons for their test material. They call "torulin" the principle in yeast which cures symptoms of head retraction in pigeons induced by feeding upon polished rice. The activity of the products was measured by using the equation torulin activity = no. of days' protection after cure/wt. in mg. of the dry prepn. $\times 100$. Up to the stage involving the use of acid alc. to ext. torulin from the charcoal, the technic used was the same as that previously described (see *loc. cit.*). Treatment with BaS was omitted; instead, charcoal absorption was applied direct to the acid fluid after removal of the Hg ppt. The subsequent treatment includes many steps, involving the use of 60% alc., Pb acetate, 90% MeOH, dialyzed Fe, alc., ether and fractionations in mixts. of alc. and ether. The authors obtained a yeast concentrate of 1190 T. A. (torulin activity) which cured and protected in doses of 0.084 mg. per day, but did not cause increase in the weight of pigeons after cure of the polyneuritic symptoms. This supports the view that what is commonly called vitamin B probably consists of 2 factors. B. H.

Survey of acid milk in infant feeding. VIRGINIA T. WEEKS. *Arch. Pediatrics* **42**, 722-34(1925).—The types of acid milk used contain lactic acid, vinegar (AcOH), citric acid (lemon juice), or HCl . The acid decreases the buffer action of the milk, and increases gastric activity and the peptic digestion of the milk proteins. Lactic acid milk is preferred; it can be tolerated by infants for a long period of time; HCl milk is least popular. Vinegar milk and lemon juice milk yield good results; the latter also has antiscorbutic properties. A bibliography is appended. J. S. H.

Dried milks for infant feeding. ALICE D. WEBER. *Arch. Pediatrics* **42**, 735-42(1925).—A concise summary, with bibliography, of the prepn. of dried milk on the com. scale, and of its use in pediatrics. JOSEPH S. HEPBURN

Protein milks in infant feeding. V. A. BLENKLE. *Arch. Pediatrics* **42**, 743-60(1925).—A concise description, with bibliography, of the various com. protein milks and their use in pediatrics. JOSEPH S. HEPBURN

Thick cereal formulas and butter flour mixtures in infant feeding. R. A. ECKHARDT. *Arch. Pediatrics* **42**, 761-6(1925).—The prepn., chem. compn., and use of these high calorie diets are described. A bibliography is appended. J. S. H.

Comparison of deficiency of vitamin A and of total underfeeding on the development of the organism. H. SIMONNET. *Bull. soc. hyg. aliment.* **13**, 419-43(1925).—Comparative expts. with rats show that during the first period of deficient diet the animals having the deficient diet behave like those fed normally as regards the amt. of food ingested. The phase preceding the second period is characterized by an appreciable decrease in the amt. of food ingested. During most of the equil. period the amt. of food taken spontaneously by the animals with deficient diet is remarkably const. The third period is not one of true inanition, as the animals still take an appreciable quantity of nourishment. The amt. of food taken per 100 g. body wt. decreases regularly with both normally and deficiently fed animals, though with slight differences in both cases. When the deficiency is removed, the animals take more food for a few days, and then reduce the amt. to its original value, showing that an amt. which was insufficient with a deficiency of vitamin becomes sufficient when vitamins are supplied. Rats given *ad lib.* of a deficient diet do not utilize the food as efficiently (whether considered per

animal or per 100 g. body wt.) as those underfed by giving them a complete diet to the same amt. as freely taken by those with deficient diet. With the deficient diet, the thymus gradually disappears, the testicles become atrophied and the reserve fat disappears; while with the complete diet the thymus persists, the wt. of the testicles remains const. and the reserve fat persists. With very young animals, under feeding has much greater effects than in older animals.

A. PAPINEAU-COUTURE

Avitaminosis C (with or without tuberculosis) and the cholesterol of the blood and of the suprarenals. G. MOURIQUAND AND LEULIER. *Compt. rend.* **181**, 434-5 (1925).—Acute or chronic avitaminosis C is accompanied by profound disturbances in the metabolism of the cholesterol of the suprarenals, even if these disturbances are without appreciable relation to the cholesterolemia. The disturbance is aggravated by the association of tuberculosis with the alimentary deficiency.

L. W. RIGGS

Vitamin A in beef, pork and lamb. RALPH HOAGLAND AND G. G. SNIDER. *J. Agr. Research* **31**, 201-21 (1925).—Feeding tests with the albino rat using 10 samples of beef from a like number of cattle showed that none of the samples supplied sufficient vitamin A to induce normal growth when used to the extent of 15-30% in the rations, but that nearly sufficient vitamin A for normal growth was furnished when the samples were used in proportions of 50-95%. Results obtained with dried fresh pork as a source of vitamin A were less satisfactory than those obtained with beef. In tests made with lamb, 3 of the 6 samples examd. were rather poor in vitamin A, one contained a fair proportion while the remaining 2 were richer in vitamin A than any of the other samples of meat used in the tests.

W. H. ROSS

Effect of nourishment on cell function. III. E. ABDERHALDEN AND ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) **209**, 611-2 (1925); cf. *C. A.* **19**, 1589.—When proper precautions are taken in making the detns., particularly as regards the p_{H_2} , the total hippuric acid values are essentially the same in animals fed upon oats as in those fed upon green foods. Type of food does modify, as previous expts. have shown, the ability to synthesize mercaptal acids.

G. H. S.

ALLEN, R. M.: **Vitamins in Diet and Health.** New York: Vitamin Food Co., Inc. 37 pp. Reviewed in *Baking Tech.* **4**, 318 (1925).

MCREE, INEZ N.: **Food and Health.** New York City: Thomas Y. Crowell Co. 345 pp. \$2.50. Reviewed in *Am. J. Pharm.* **97**, 785 (1925).

F—PHYSIOLOGY

ANDREW HUNTER

The determination of the primary ether extract of blood. H. I. BING AND H. HECKSCHER. *Biochem. Z.* **158**, 395-402 (1925); cf. *C. A.* **19**, 2218, 2232.—The primary ether ext. of blood contained neutral fat and cholesterol. The normal variation of this ext. in man was found to be from 0.06% to 0.12%, as detd. nephelometrically.

F. A. CAJORI

Muscular exercise, lactic acid and the supply and utilization of oxygen. A. V. HILL AND C. N. H. LONG. *Ergebnisse Physiol.* **24**, 43-51 (1925); cf. *C. A.* **19**, 673.—An abstract of earlier papers which represents an attempt to apply to man the principles discovered by the investigation of isolated muscle. The role of lactic acid in muscle contraction is discussed as well as its presence in man, likewise, the relation between muscular exercise and oxygen intake and oxygen requirement, the oxygen debt, and the recovery process after exercise is dealt with.

H. J. DEVEL, JR.

The extrahepatic formation of bilirubin. F. C. MANN. *Ergebnisse Physiol.* **24**, 379-98 (1925).—A yellow pigment accumulates progressively in the urine, plasma and fatty tissues following hepatectomy in the dog. It is usually noted in the first sample of urine secreted after the removal of the liver. In from 3 to 6 hrs. after the operation, the plasma becomes yellow-tinged. In animals which live 16 hrs. or more after hepatectomy, the sclerae also become tinged, at autopsy all the fatty tissue of the body is found to be a dirty yellow. The formation of this yellow pigment which gives a positive reaction for bilirubin is not dependent on any of the intraabdominal organs or the liver. Its rate of development under certain conditions is accelerated by the intravenous injection of laked blood. It seems highly probable that normally a high percentage of the bile pigment excreted by the liver is extrahepatic in origin. The site of the formation of bile pigment is not detd. but probably occurs in the bone marrow or lymph nodes or possibly also in the endothelial cells throughout the body.

H. J. D., JR.

A new simple colorimetric micro-method for the determination of blood sugar, and contributions to the physiology of blood sugar. I. B. GLASSMANN. *Z. physiol. Chem.* **150**, 16-43 (1925).—The method is based on the fact that glucose forms a yellow

condensation product with resorcinol when the mixt. is heated in the presence of HCl . The product is probably an *anhydrodiglucoresorcinol*. Detn. is made by comparing the color with that obtained by the same treatment of a standard glucose soln. In the micro-method the blood sample (0.1 cc.) is absorbed on a strip of blotting paper and the glucose extd. with EtOH . After evapn. of the solvent the residue is treated with 2 cc. of 1% resorcinol and 4 cc. of 25% HCl and heated in a boiling water bath 1 hr. The standard glucose soln. (0.5%) and a paper blank are simultaneously treated in the same way. The color comparisons must be made at about 60° to prevent opalescence; hence the usual type of colorimeter is not suitable. The 3 tubes are, therefore, immersed in hot H_2O in a special contrivance and color comparisons made by diln. with H_2O until the colors match. The method is sensitive to 0.01 mg. glucose, and has the enormous advantage of excluding all other reducing substances present in the blood. It is applicable also to the detn. of sugar in other body fluids. Examn. of the blood of healthy fasting persons by this method showed, in contradiction to the prevailing dogma, that 45% of the blood samples were sugar-free or practically so, although precautions for the prevention of glycolysis were rigidly observed. The hypoglycemic syndrome, therefore, is not based on the fall of blood sugar below a definite value, but is to be ascribed to the action of a poison which, under the influence of insulin, accumulates in the blood and is neutralized by glucose or its cleavage products. The av. of 9 detns. of sugar-positive blood samples during inanition was 0.077% glucose, and of 11 detns. after meals 0.118%. Sugar detns. on the blood and urine of diabetes showed that no parallelism exists between hyperglucemia and glucosuria, but that a higher glucosuria seems to correspond to a higher hyperglucemia. Comparative detns. by this method and by the micro-method of Bang on diabetic and normal persons showed that reducing substances are included in the Bang detn. on diabetic blood and these may exceed the actual sugar content; in the blood of healthy persons, on the other hand, the differences between the 2 methods lie within the limits of error. The av. of 3 detns. on chicken blood was 0.112%, whereas the literature gives 0.2%. EtOH exts. no glucose from the erythrocytes of sheep blood, but if the erythrocytes are first hemolyzed the sugar values of the serum and of the corresponding erythrocyte soln. are practically equal. The blood sugar is not identical with ordinary chem. pure glucose but represents a more reactive form.

A. W. DOX

Metabolism of the nursing infant. J. ELLINGHAUS, ERICH MÜLLER and H. STEUDEL. *Z. physiol. Chem.* **150**, 133-48 (1925).—Metabolism expts. with infants during alternate dietary periods of human milk and of cow milk mixt. showed that the urinary N , NH_3 , urea, uric acid, creatinine and amino acids do not correspond to those of adults on the basis of body wt. If, however, the comparison is made on the basis of body compn., i. e., the smaller proportion of muscular and larger proportion of glandular tissue in the infant, and therefore relatively higher glandular and lower muscular activity, then the metabolism of both infant and adult is found to be comparable. Where slight variations are noted they may be attributed to the factor of growth impulse. Otherwise there is no basis for the assumption that the metabolism of infants is in any way essentially different from that of adults.

A. W. DOX

Contributions to the study of brain metabolism. II. Carbohydrate metabolism. E. G. HOLMES and B. E. HOLMES. *Biochem. J.* **19**, 836-9 (1925); cf. *C. A.* **19**, 3108. — A comparison of blood-sugar values and resting lactic acid content of the brains of rabbits shows that the fall of the latter resulting from the injection of insulin does not occur until the blood sugar has reached a fairly low level. At the convulsive or flaccid (pre-convulsive) stage the brain lactic acid content is very small. It appears probable that the fall in the resting lactic acid content of the brain after insulin injection is not due to a direct effect of insulin in promoting increased oxidation of lactic acid, but is rather caused by a fall in the blood-sugar level, and the resulting shortage of glucose in the brain.

BENJAMIN HARROW

Chemical and physical studies on mineral, particularly iron, metabolism. OSKAR BAUDISCH and L. A. WELO. *Naturwissenschaften* **13**, 749-55 (1925). — Clear mineral water from Franzensbad, Czechoslovakia, (0.0178 gr Fe^{++} kg.) direct from the source was sealed in evacuated flasks. On exposure to light the contents became opalescent and turbid, whereas in the dark the water kept its original properties. The ppt. formation runs parallel with the disappearance of the catalytic power of the mineral water; light accelerates the aging. The iron at first is present in the "active" form, repeatedly described by B. in previous papers. The biol. properties of mineral waters are discussed from the point of view of Werner's coordination theory and the action of light.

B. J. C. VAN DER HOEVEN

Physico-chemical influences on nerve stimulation. II. Influence of ion con-

centration and osmotic pressure. USHIO TANAKA. *Z. Biol.* **83**, 399-414(1925).—None of the solns. used maintained the conduction speed at such a high level as isotonic Ringer's soln. More often there was a decrease in the conduction speed to a greater or less extent. Hypertonic solns. do not increase the conduction rate of the stimulus. An increase was experienced with solns. having normal osmotic pressure and $\frac{1}{2}$ the ionic concn.

FRANCES KRASNOW

The sedimentation rate of erythrocytes. VIII. The effect of diluted plasma and serum on the sedimentation rate of erythrocytes. F. v. KRÜGER. *Z. Biol.* **83**, 435-44 (1925); cf. *C. A.* **19**, 2230.—With increase in diln. (water) of plasma and serum, the sedimentation rate decreases. The effect in serum is more marked. There is a greater diminution in the sedimentation rate in 2% NaCl soln. than in distd. water despite equal viscosity. The decrease is greater when diln. is made with hypertonic NaCl soln. Diln. with cane sugar has like effects.

FRANCES KRASNOW

Skin temperatures in normal children. F. B. TALBOTT, ALICE J. DALRYMPLE AND MARY F. HENDRY. *Am. J. Diseases Children* **30**, 483-90(1925).—The temp. of the skin under clothing varies, that of the trunk being higher than the extremities and exposed parts of the body. Exposure to room temp. resulted in an immediate fall in skin temp. without any change in rectal temp. The skin, therefore, has some power of regulating the rate in which the heat is transported to it, and is able to prevent heat loss as it is able to accelerate heat loss by perspiration. **Skin temperature and basal metabolism during fasting.** *Ibid* 491-5. During fasting the rate of heat production in the body diminishes. The longer the fast the greater the fall in the skin temp. The pulse rate was lowered and sometimes also the blood pressure. I. N. KUGELMASS.

Binding of calcium by animal tissues. XI. TH. BREHME AND P. GYÖRGY. *Biochem. Z.* **157**, 243-52(1925); cf. *C. A.* **19**, 2371.—To show whether a protein in cartilage with an isoelec. point more to the acid side than that of serum albumin is responsible for Ca deposition, the effect of neutralized yeast nucleic acid upon Ca deposition is detd. When Na nucleate, serum albumin, globulin, fibrin and hemoglobin are dialyzed against Ca solns., they take up increasing amts. of Ca in the order named. This explains the unequal distribution of Ca between a cell and its nucleus. The distribution of Ca also depends upon the concn. of diffusible Ca present, and upon the Donnan equil. **XII.** OTTILIE BUNDE. *Ibid* 253-62. When solns. of $\text{Ca}_3(\text{PO}_4)_2$ are dialyzed against gelatin, the ratio Ca/PO_4 on the side of the gelatin increases markedly for 6 hrs. and then decreases. When agar is used in place of the gelatin the variation is negligible. Therefore, the theory of Freudenberg and György that protein plays an active role in calcification is substantiated. W. D. L.

Chemistry of the blood during parenteral excitation of the activity of digestive glands, especially of the stomach. K. ONOHARA. *Biochem. Z.* **157**, 271-6(1925); cf. *C. A.* **19**, 1883.—From the variations in H_2O and Cl content of blood after injection of pilocarpine, secretin, acetylcholine and atropine, it is found that H_2O generally decreases and Cl varies as the H_2O varies. These changes are similar to the changes caused by ingestion of a protein or carbohydrate meal. Replacement of the H_2O lost occurs by a transference of H_2O from tissues to blood. It is not known whether this compensatory transference of H_2O and Cl from the tissues is due to an enteral stimulation due to circulatory changes, or to a reflex action of the mucous membrane of the stomach upon the tissues. W. D. L.

The speed of settling of erythrocytes and the Hofmeister series. D. v. KLOBUSITZKY. *Biochem. Z.* **157**, 277-82(1925).—Blood from the dog was mixed with CaCl_2 , NaCl, KCl, NH_4Cl , Na_2SO_4 , NaNO_3 , NaBr, NaI and NaSCN, and the rate of settling of the corpuscles compared. The effect of the salts showed that they formed a Hofmeister series. Added sugar quickened the rate of settling. W. D. L.

Blood clotting and the Hofmeister series of ions. J. CSAPÓ AND D. v. KLOBUSITZKY. *Biochem. Z.* **157**, 354-8(1925).—The salts of K decrease the time of blood clotting in the order $\text{SO}_4 < \text{Cl} < \text{NO}_3 < \text{Br} < \text{I} < \text{SCN}$; salts of Na in the order $\text{Cl} < \text{NO}_3 < \text{SO}_4 < \text{I} < \text{SCN}$; salts of NH_4 in the order $\text{Cl} < \text{SO}_4 < \text{NO}_3$. The series of cations is $\text{Na} < \text{K} < \text{NH}_4$. W. D. L.

Synthesis of carbohydrate in muscle. O. MEYERHOF, K. LOHMANN AND R. MEIER. *Biochem. Z.* **157**, 459-91(1925); cf. *C. A.* **19**, 2073.—The recovery period in muscle is studied. When lactic acid is perfused through frog muscle, some disappears and glycogen increases in amt. If the muscle be suspended in solns. of lactic acid the respiration may increase as much as 100% but the same proportionality is found between carbohydrate formed and O consumed as in normal recovery. The lactic acid formed by fatigue increases the oxidation in muscle, which, in turn, facilitates the removal of the lactic acid. The following substances are without influence upon the respiration:

glucose, fructose, alanine, dihydroxyacetone, asparagine, glycerophosphoric acid and glycolic acid. Ethylene glycol, glyceraldehyde and dihydroxymaleic acid accelerate oxidation slightly, glyceraldehyde about 30%. Acetaldehyde in concns. up to $N/500$ stops the oxidation; methylglyoxal in $N/100$ soln. increases the oxidation slightly. Pyruvic acid increases the oxidation similarly to lactic acid and the carbohydrate formed increases. This conversion of pyruvic acid to glucose entails a reduction and the respiratory quotient should equal 1.2. The respiratory quotient found equals 2.0. There is no decarboxylation of pyruvic acid and none is oxidized. The extra CO_2 varies much, and is less under N than under O, *e. g.*, anaerobic respiratory quotient equals 1.5. The pyruvic acid which disappears is greater than the calcd. amt. The heat of combustion of pyruvic acid is 3172.4 cal. per g. Pyruvic acid in the muscle of warm-blooded animals behaves similarly. In phosphate soln., NH_3 is evolved and urea is formed to an extent which indicates that 15% of the total oxidation is due to the oxidation of protein. However, amino acids are ineffective in raising this NH_3 formation in muscle. The respiration of liver cells, on the other hand, is increased by the presence of amino acids, *e. g.*, of asparagine and alanine, the NH_3 formation with alanine being 3, and of asparagine 10 times the normal formation.

W. D. L.

Studies in carbohydrate metabolism. II. The mutarotation of β -glucose under various conditions. CHRISTEN LUNDSGAARD AND S. A. HOLBØLL. *J. Biol. Chem.* **65**, 305-22(1925); cf. *C. A.* **19**, 3520. **III. The nature of the glucose in the blood of normal individuals.** *Ibid* 323-42.—Blood was dialyzed in collodion membranes (dried in 70% alc.) against 0.9% NaCl soln. for 90 min., coagulation being prevented by the addn. of 2% NaF. The dialyzates were then examd. with the polariscope. The blood from 11 normal persons was examd., 7 men and 4 women varying in age from 18 to 50 years. Of these 3 were investigated both during fasting and after administration of 100 g. of glucose; the others after ingestion of glucose only. A lower $[\alpha]$ than that of α,β -glucose was found in all cases, the values varying from +15.9 to 42.2°. This form of glucose finally reverts to α,β -glucose and the course of the mutarotation is in complete agreement with that found for new-glucose. "It must, therefore, be taken as proved that new-glucose can be detected in the blood of normal persons both while fasting and also after taking glucose. This result, taken together with the previously demonstrated mode of production of new-glucose, supports the view that new-glucose is the first link in the chain of the transformation of glucose in normal carbohydrate metabolism." **IV. The nature of the glucose in the blood of patients with diabetes mellitus and of patients with benign glucosuria.** *Ibid* 343-62.—New-glucose could not be detected in the blood of 9 out of 10 patients with severe or moderately severe diabetes but in 5 of these it was present in the blood 2 hrs. after administration of insulin. It was found to be present in the blood of 2 individuals with benign glucosuria. When new-glucose was found to be present in the blood, it was also possible to demonstrate the removal of glucose from the blood during its passage through the capillaries, in diabetics showing no new-glucose this was not the case. It is, therefore, assumed "that new-glucose is an essential link in normal carbohydrate metabolism and probably the first, and that insulin exerts its action in the organism in conjunction with a substance always or usually present in the muscles, by transforming α,β -glucose into new-glucose which can then be further broken down in the organism." **V. The form of glucose in different body fluids.** *Ibid* 363-9.—New-glucose is present in the spinal, edema, and pleural fluids of individuals with normal carbohydrate metabolism; in the 2 former fluids the concn. is greater than that in blood dialyzate. "This greater concn. may be due to the fact that dialysis is not necessary so that the detns. are made, therefore, before the mutarotation has begun, or to the fact that the concn. of new-glucose is greater in the tissue fluids than in the blood."

A. P. LOTHROP

Chemical findings in the blood of the normal dog. R. L. HADEN AND T. G. ORR. *J. Biol. Chem.* **65**, 479-81(1925).—The following av. results were obtained by the consecutive analysis of the blood of 200 normal dogs which usually had been fasted 48 hrs. before the specimens were obtained: non-protein N 30.8, urea N 11.7, creatinine 1.5, amino acid N (100 analyses) 6.7, sugar 82, chlorides (as NaCl) 468 mg. per 100 cc., and the CO_2 -combining power of the plasma 34.8 vols. %. The % range of the various components is also given.

A. P. LOTHROP

Mucus of the stomach. M. BRESTKIN AND K. BIKOV. *Archiev Biologicheskikh Nauk*, Moscow **24**, 97(1925); *J. Am. Med. Assoc.* **85**, 862.—Mucus, obtained during digestion when its production was stimulated by food, or at other times when stimulated by mech. or chem. irritation, contains a coned. enzyme which can act on the food substances. Digestion *in vitro* takes place more vigorously if mucus is present.

L. W. RIGGS

Physiology of the liver. Present state of our knowledge. A. J. CARLSON. *J. Am. Med. Assoc.* **85**, 1468-72(1925).—An address. L. W. RIGGS

The female sex hormone. II. An analysis of the factors producing puberty. R. T. FRANK, H. M. KINGERY AND R. G. GUSTAVSON. *J. Am. Med. Assoc.* **85**, 1558-9 (1925); cf. *C. A.* **19**, 2523.—Injection of the female sex hormone into immature female white rats in from 3 to 5 days causes opening of the canal and estrual phenomena without the occurrence of ovulation. After a further interval of from 5 to 7 days, the artificially produced puberty may be followed by spontaneous, regular cyclical phenomena consequent to follicle ripening and ovulation. If the threshold of puberty is once crossed, sexual maturity may be maintained spontaneously in immature rats. These findings indicate that puberty results from the elaboration, in sufficient amt., of the female sex hormone, and that the advent of puberty is not due to the removal of an inhibitory influence, such as might be exerted by one or more of the glands of internal secretion, such as the thymus or the pineal gland. L. W. RIGGS

Relation between the sodium chloride content of the blood and the formation of gastric hydrochloric acid. J. MOSONYI. *Magyar Orvosi Archivum* **26**, 407-11(1925).—Since the HCl of the stomach arises from the chlorides of the blood, a diminution of these chlorides occurs after stomach digestion. Expts. calcd. to apply the decrease of chlorides of the blood to the diagnosis of various gastric secretion anomalies are in progress. L. W. RIGGS

The increase of the carbon dioxide content of the blood in the course of digestion. H. TANGL. *Magyar Orvosi Archivum* **26**, 412-4(1925).—During the digestion which follows a period of starvation the loosely combined CO₂ content of the blood is increased about 10%. This increase is chiefly in connection with the HCl secretion. With this increase of CO₂ there is also an elevation of the CO₂ tension of the alveolar air. L. W. RIGGS

Lactic acid of blood under respiration. BINET AND COLLAZO. *Médecine*, Paris, **6**, 924(1925); *J. Am. Med. Assoc.* **85**, 1761.—Blood was drawn simultaneously from the right heart and the carotid of chloralosed dogs. An excess of lactic acid by 3 to 11 mg per 100 cc. of blood was manifest in the blood of the right heart, as compared with that of the left. Asphyxia increased the content of lactic acid 32 mg. before, and 55 mg. 6 min. after, the beginning of asphyxia. The increase of lactic acid was still manifest for a certain time after the respiration became normal. Panting for 10 min. reduced the amt. of lactic acid from 36 to 20 mg. L. W. RIGGS

Distribution of insulin in the normal and pancreatic diabetic dog. MARTIN NOTHMANN. *Arch. exptl. Path. Pharm.* **108**, 1-63(1925).—The pancreas, liver, muscle, blood, spleen, kidney, heart, lung, thyroid, salivary gland, brain and testis of normal dogs were tested for the presence of substances which, acting like insulin, would reduce the blood sugar in rabbits. With one exception (the spleen of one dog) all organs yielded active exts., whose effects were identical with those of insulin. In the rabbit deprived of food they caused a fall in blood sugar and the glycogen content of the liver and musculature of normal rabbits was diminished. In animals with pancreatic diabetes the exts. reduced the blood pressure and simultaneously diminished the sugar output through the urine. Exts. prepd. from the tissues of dogs with pancreatic diabetes were without insulin-like action with the exception of those prepd. from liver tissue. In these animals the amt. of active principle in the liver was but slightly less (4.03 units per 100 g. of fresh liver) than that of the liver of the normal animal (4.44 units). To a high degree the amt. present in the liver is independent of the glycogen content of the liver and of the time after extirpation of the pancreas. Ether narcosis does not modify the content in insulin-like material. The principle derived from the liver of pancreatic diabetic dogs markedly reduces the glycogen content of the liver and muscle of normal rabbits and may lead to convulsions. Injected intra-arterially it changes the blood sugar relationships in both the arterial and venous blood. Injections of the liver ext. allowed dogs to live for 24 days after complete removal of the pancreas. Here, blood sugar was reduced, as was sugar excretion, but the glycogen content of the animal remained normal. Apparently the insulin-like substance of the dog with pancreatic diabetes is identical in all respects with that of normal dogs and with insulin. G. H. S.

Mineral metabolism. INOSUKE NOGUCHI. *Arch. exptl. Path. Pharm.* **108**, 64-72 (1925).—In making detns. of the K, Ca and Na of the serums of normal persons and of those with renal disease it is essential that the serum be sepd. from the red blood cells as promptly as possible if the K value is to have significance. With Ca and Na this is less important. After administration of KCl the K of the serum is considerably increased, while the Ca may show a simultaneous reduction or the Na may be diminished

Administration of NaHCO_3 to two cases of chronic nephritis caused an increased blood Na in both and a fall in K in one. Novasurol injection increased the K but did not materially change the Ca and Na, indicating that the effect is not directly upon the kidney but rather upon a change in relations between the tissues and the blood. **II. Mineral metabolism in patients with renal disease.** *Ibid* 73-7.—In patients with chronic renal disease considerable increases in the serum K were observed at times, associated with particularly severe disturbances. The same increase in serum K is observed in dogs deprived of kidney tissue. Such an increase in K is not referable to an output of K by the erythrocytes; it is derived from the tissues. G. H. S.

The opposite action of high and low calcium concentrations on the sugar output of the isolated frog liver. E. GEIGER AND L. MÜLLER. *Arch. expl. Path. Pharm.* 108, 238-47(1925).—The influence of Ca upon the sugar output of the isolated frog liver depends upon 2 factors. There is a stimulating factor associated with the intact liver, which must have the same basic mechanism as the action of adrenaline. The inhibitory factor becomes apparent in the tissue paste expt., being associated with a reduction in the permeability of the cells. With low concns. of Ca the favoring component can be measured, but when the concn. is increased the inhibitory effect becomes dominant. G. H. S.

Effect of loss of water through osmosis upon the function of nerves and muscles. M. BÜRGER AND L. LENDLE. *Arch. expl. Path. Pharm.* 109, 1-21(1925).—The muscles and the peripheral nerves of frogs become paralyzed when placed in hypertonic dextrose solns. contg. Ringer salts. The time of onset of the paralysis is dependent upon the concn., and within limits is also dependent upon the extent of the osmotic water loss. The paralysis passes over into a state of hyperirritability. With a given concn. of dextrose the paralysis of the peripheral nerves develops somewhat later than does that of the muscles, and as the paralysis develops the nerve loses relatively more water than does the muscle. Up to a point where functional damage is too great the muscle deprived of water can be restored - a reversible reaction—but the nerve, which loses water more slowly, if functionally impaired cannot be completely restored. In muscle the max. wt. loss and the paralysis are simultaneously occurring phenomena; with nerve the max. loss in wt. considerably precedes the paralysis. G. H. S.

Function of the parathyroids. I. The parathyroids and the thyroids in their relation to the healing of fractures and the calcification of bones. SHIGESHI OGAWA. *Arch. expl. Path. Pharm.* 109, 83-107(1925).—The thyroid impairs the healing of fractures, while the parathyroids favor the process. In a similar way the hormones of these glands show an antagonism in that Ca deposition is favored by that of the parathyroids and inhibited by that of the thyroids. **II. As a heat-regulating organ.** *Ibid* 300-17.—Extirpation of both the thyroid and parathyroid glands results in a disturbance to the heat-regulating mechanism. In rats and in rabbits the removal of the parathyroids alone interferes with heat control. The injection of parathyroid preps. somewhat compensates for the loss in regulatory function in animals deprived of both thyroid and parathyroid glands, while the injection of thyroid prep. fails to prevent the disturbance. In animals deprived of the parathyroids, as in those lacking both the thyroids and the parathyroids, warming is followed by the onset of intense convulsive attacks, but in rats lacking thyroid substance these attacks do not occur if parathyroid tissue remains intact. Thus, the hormone of the parathyroid, but not that of the thyroid, is involved in heat regulation. G. H. S.

Methemoglobin reversion. II. Perfusion experiments. KYUICHI SAKURAI. *Arch. expl. Path. Pharm.* 109, 198-213(1925); cf. C. A. 20, 66. In the perfusion of the isolated surviving cat lung with defibrinated blood contg. methemoglobin a significant reversion of the methemoglobin to oxyhemoglobin occurs. The percentage reversion depends upon the conditions of the expt. With a perfusion period of from 94 to 103 min. the reversion amounts to 26.1% in the ordinary perfusion of the isolated lung under air respiration; with H respiration the av. is 26.5%; with the addn. of Na thiosulfate the av. is 36.5%; in combined perfusion of lung and liver the av. is 36.6%, while with simultaneous lung and liver perfusion with the addn. of Na thiosulfate to the perfusion fluid, it is 44.8%. The reversion process is not modified by the presence or absence of O. Na thiosulfate intensifies the process. Liver and lung together have a greater effect than lung alone. The max. restitution never exceeds 50%. These values hold for blood which contains at the beginning of the expt. not more than 60% of methemoglobin. When the initial content is increased above 70% the process of reversion is rendered more difficult. G. H. S.

Central regulation of the blood sugar. D. DE LA PAZ. *Arch. expl. Path. Pharm.* 109, 318-31(1925).—Within the brain-stem there is, apparently, a blood-sugar-regulat-

ing center, the control of which is related to the cerebrum. If the sugar concn. falls below normal through diln. this center stimulates sugar production, while in hyperglucemia it apparently inhibits or diminishes the production of sugar. The adrenals are of significance in blood sugar regulation only insofar as they are in connection with this center and are influenced by it. Apparently diln. of the peripheral blood stimulates the center in a reflex manner, since an intrajugular injection often has a greater effect than does an intra-arterial injection. G. H. S.

The frog membrane as an organ of water resorption. I. Irreciprocal permeability. V. BAUER. *Arch. ges. Physiol.* (Pflüger's) **209**, 301–32(1925).—As regards water and salt solns. the frog membrane manifests a one-sided reaction, the normal direction of its continuous water transport being from outside inward. Many of the features of the irreciprocal permeability as it has been observed are due to the fact that the media placed upon the opposing surfaces of the membrane do not conform to the normal physiol. conditions, the result being that the membrane is damaged. Distd. water quickly causes injury, making the membrane irreversible, and with a prolonged contact killing it, the effect being of greater intensity when in contact with the physiol. inner side. Nevertheless, it does impair the functional activity of the outer side through an excessive action on the mucous glands. These glands are also injured by hypertonic saline solns. Sugar solns. also lead to very considerable changes in the membrane, rendering it thicker. G. H. S.

Humoral transmission of stomach-vagus stimulation in rabbits. R. BRINKMAN AND J. V. D. VELDE. *Arch. ges. Physiol.* (Pflüger's) **209**, 383–6(1925); cf. *C. A.* **19**, 1887.—If the carotid blood of a rabbit is removed immediately after vagal stimulation and injected intravenously into a normal rabbit it induces a typical vagal gastric contraction. G. H. S.

Hyperthyroidization experiments in dogs. I. Physiological evaluation of thyroid preparations. R. H. MARK. *Arch. ges. Physiol.* (Pflüger's) **209**, 437–64(1925).—Thyroid preps. cause a definite increase in the N excretion per kg. of body wt. The urea elimination parallels the total N excretion, but the NH_3 excretion is not materially changed. Creatinuria also occurs after thyroid has been administered for a longer time. Diuresis is increased, but it is by itself not a measure of the value of a thyroid prep. As regards loss in wt., iodothylin is more effective than fat-free thyroid and this in turn is about twice as effective as thyroid ext. The pulse rate is augmented after the oral administration of thyroid preps. Apparently the I content of the preps. is not the factor which det. their characteristic effects. **II. Action of thyroid preparation in the adult.** *Ibid.* 693–701.—With hyperthyroidization the amt. of N excreted per kg. of body wt. is diminished, i. e., the N balance becomes positive. As a rule the loss in wt. is slight. The pulse rate usually shows no disturbance, but in some cases it is diminished. In young dogs the particularly noteworthy change is a considerable decrease in the diuresis which always occurs. These observations in young dogs correlate well with the observed fact that children react to thyroid less intensely than do adults. G. H. S.

Irreciprocal permeability of animal membranes for gases: frog membrane and frog lungs. ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) **209**, 493–8(1925).—Nascent O passes through the frog membrane from the outside inward, but not from the inside outward. CO_2 passes outward from within, but not in the opposite direction. In the lung CO_2 passes inward only, while O goes to the inner side much more readily than from inside outward, as is also the case for NH_3 . G. H. S.

Hemolysis studies. II. Salt action and saponin hemolysis. RUDOLF MOND. *Arch. ges. Physiol.* (Pflüger's) **209**, 499–511(1925).—Although in general at various H-ion concns. K increases the hemolysis, with other ions there is a noteworthy contrast in the action of SO_4 and Ca. In the neighborhood of the isoelec. point SO_4 ions inhibit the hemoglobin outgo from red cells while Ca ions favor it, but as the reaction is removed from the isoelec. point it inhibits the dissolving action of the OH ions. For every salt a characteristic curve of hemolysis occurs with the passage of time. These curves intersect each other to some degree so that a reversal of ion action occurs as the period of action is extended. Here also the opposing action of SO_4 and Ca appears at different p_{H} values. The SO_4 inhibits hemolysis; Ca favors it in the beginning while later Ca causes an outspoken retardation aside from the H and OH ions. The ions of the neutral salts alter the permeability of saponin-treated blood corpuscles in an entirely opposite manner from that of normal cells. This is particularly true for the rate of hemolysis in Na_2SO_4 and CaCl_2 . In an alk. reaction, except for CaCl_2 solns., saponin in low concns. markedly inhibits hemolysis. G. H. S.

Role of the pylorus in pancreatic secretion. ANNA TONKICH. *Arch. ges. Physiol.*

(Pflüger's) 209, 512-5(1925).—The ordinary trophic action on the pancreas, *i. e.*, the increase in the N content in the juice after the passage of a milk-cream-butter mixt. into the duodenum persists even after the fundus is sepd. from the pyloric portion of the stomach. This result does not occur if the mixt. is introduced into the duodenum and the latter is sepd. from the pylorus. Obviously the pyloric region must be considered as the point of origin for the trophic impulse in pancreatic secretion to fat.

G. H. S.

Chemical regulation of the heart beat by the liver. LEON ASHER. *Arch. ges. Physiol.* (Pflüger's) 209, 605-6(1925).—Fluids which have been perfused through the liver acquire thereby the property of modifying the heart beat, the effect resembling that of adrenaline.

G. H. S.

Internal secretion of the pineal body of rats. ERNST HOFMANN. *Arch. ges. Physiol.* (Pflüger's) 209, 685-92(1925).—The pineal gland was completely removed by cauterization and subsequent events showed that these glands have no noteworthy influence upon the increase in wt., on growth in length, in fat development, or on sexual maturity, indicating that there is no connection between the pineal organ and the germinal glands. Heat regulation was unaffected.

G. H. S.

G—PATHOLOGY

H. GIDEON WELLS

The effect of sodium ricinoleate upon bacterial toxins and the value of soap-toxin mixtures as antigens. W. P. LARSON, R. D. EVANS AND E. NELSON. *Proc. Soc. Exptl. Biol. Med.* 22, 194-6(1924).—The detoxifying action of the Na salts of various fatty acids was tested by adding an equal quantity of a 1% soln. of the soap to tetanus and to diphtheritic toxin. The soaps of oleic, stearic and palmitic acids did not detoxify. The soaps of lauric, myristic, cinnamic and hendecenoic acids detoxified to a certain extent. Na ricinoleate had a marked detoxifying action; 0.2 cc. of a 1% soln. prevented symptoms in a guinea pig when sufficient tetanus toxin to cause death was given. Detoxifying soaps form clear solns. in physiol. NaCl soln.; they dialyze readily through hardened collodion sacs and they markedly depress the liquid air surface tension. Colloidal solns. when added to the soap prevent the detoxifying action, which seems to be an adsorption phenomenon. Immunizing tests showed that the toxin is imprisoned unchanged, and is slowly released from the soap-toxin mixt.

C. V. B.

Optical desensitization with warm-blooded animals. T. AWOKI. *Biochem. Z.* 158, 337-49(1925).—The characteristic symptoms which appear in white mice that have been injected with hematoporphyrin when they are exposed to strong light were abolished when the mice had been injected also with inactivated human serum. Desensitization was not induced by the reducing agents $\text{Na}_2\text{S}_2\text{O}_3$, $\text{Na}_2\text{S}_2\text{O}_4$, Na_2SO_3 , glucose or sucrose. Urethan diminished the irritation following light exposure but not the later symptoms that lead to death.

F. A. CAJORI

The fat-cholesterol content of the blood of patients with Basedow's disease. H. I. BING AND H. HECKSCHER. *Biochem. Z.* 158, 403-16(1925).—The fat and cholesterol in the blood of patients with hyperthyroidism was found to be low (0.06%). After medical or surgical treatment it returned to normal (0.12%).

F. A. CAJORI

The fat-cholesterol content of the blood in thyroidectomized horses. H. HECKSCHER. *Biochem. Z.* 158, 417-21(1925).—The fat and cholesterol content of the blood was found to be higher in thyroidectomized horses than in normal horses and rose to a higher level after fat feeding in the thyroidectomized animals than in the normals. **The fat-cholesterol content of the blood of cretins.** *Ibid.* 422-7.—The fat and cholesterol in the blood of grown or half-grown cretins were higher than those in normal, though in cretins who were still children, normal values were usually found.

F. A. CAJORI

Factors concerned in the preparation of diphtheria toxoid. P. J. MOLONEY AND C. B. WELD. *Trans. Roy. Soc. Can.* 19, Sect. V, 111-6(1925).—The paper gives results dealing with the influence of various factors on the modification of diphtheria toxin by HCHO. A satisfactory method for the production of diphtheria toxoid is detailed.

A. T. CAMERON

The Ramon test: diphtheria toxin-antitoxin flocculation. P. J. MOLONEY AND C. B. WELD. *Trans. Roy. Soc. Can.* 19, Sect. V, 117-23(1925).—The indicating tube in the Ramon test does not always represent a balanced mixt. of toxin (or toxoid) and antitoxin, but depending on the serum used may be neutral, toxic, or antitoxic. The test cannot be used as a measure of antitoxin as defined in Ehrlich units, but may be used as a rough guide prior to animal testing. It perhaps can be used to det. whether or not a toxoid (or anatoxin) possesses any immunizing value. It can be used as a

guide in detg. changes of antigenic value of toxoid undergoing modification.

A. T. CAMERON

Some chemical properties of diphtheria toxoid. P. J. MOLONEY AND C. B. WELD. *Trans. Roy. Soc. Can.* 19, Sect. V, 125-7(1925).—Toxoids may be kept for months at room temp. without deterioration. Purified toxoid does not appear to be so stable. It is protein-like, gives a positive but weak biuret, positive Millon, xanthoproteic and Hopkins-Cole reactions and contains unoxidized S. About 0.5 mg of the dried product in soln. is sufficient to bring about a state of active immunity. This contained 11% N (corrected for ash).

A. T. CAMERON

The clinical assaying of insulin and the insulin requirement. R. M. WILDER. *Endocrinology* 8, 630-8(1924).—In studies on uncomplicated cases of diabetes it was found that the insulin prep. previous to Oct. 1923 was assayed quite uniformly at a glucose equiv. of 1.7 g. while that prep. since that time has not been as accurately standardized but is equiv. to approx. 2.0 g. of glucose per unit. The glucose equiv. of insulin is altered on high-protein and carbohydrate diets while starvation diminishes the insulin requirement. The amt. of glucose oxidized by a unit of insulin is markedly lowered by acute complications especially infections. Insulin must act directly on glucose with a definite chemical reaction since the glucose equiv. in uncomplicated cases of diabetes did not vary with patients of different wt. and age. H. J. D., Jr.

"Uricolytic index" in diabetic dogs. EINAR LANGFELDT AND JÖRGEN HOLMSEN. *Biochem. J.* 19, 724-6(1925).—"Uricolytic index" (U. I.) expresses the percentage of the total of the uric acid N plus allantoin N represented by the allantoin N. The U. I. of normal dogs is not altered when fed with 5 g. nucleic acid, the U. I. of diabetics decreases under these conditions, indicating a diminished power to destroy uric acid.

BENJAMIN HARROW

Some metabolic differences, following X-radiation, between normal rats and rats immune to Jensen's rat sarcoma. E. C. DODDS, WILFRED LAWSON AND J. C. MOTTRAM. *Biochem. J.* 19, 750-2(1925).—"Immune" animals do not differ from normal animals in the non-protein N or urea blood content prior to X-radiation. After the X-radiation, the "immune" animals show a marked reduction in the blood-urea content (it falls from a normal value of 35 mg. per 100 cc. to about 14 mg. per 100 cc.). B. H.

Blood and tissue changes in cancer with reference to diagnosis and treatment. J. A. SHAW-MACKENZIE. *J. Trop. Med.* 28, 297-302(1925).—Review and discussion.

FRANCES KRASNOW

Studies on the morning alkaline tide of the urine in normal persons and in patients with nephritis. J. E. MCCORVIE. *J. Clin. Invest.* 2, 35-66(1925).—Normal persons showed the morning diuresis and alk tide, while nephritics reacted like the normal or showed a limitation in one or both of the features. A high initial alkaline tide may be followed by an acid tide in abnormal persons. An acid tide is of serious import. The p_H parallels the alk. % and the urinary CO_2 . The phosphate content of night urine of nephritics is much lower than that of normals.

LOUIS LEITER

Studies in liver function. II. The concentrations of cholesterol, bile acids and pigments of duodenal contents in health and disease of the liver or its ducts. C. W. MCCLURE AND ELDORA VANCE. *Bost. Med. Surg. J.* 192, 433-7(1925); cf. *C. A.* 19, 3505.—The estn. of these substances in duodenal contents after the introduction of $MgSO_4$ was used as a functional test of the liver. While there are certain sources of error it seemed justified to conclude that the liver function is deranged in lesions involving either the parenchyma of the liver or its blood supply and in chronic cholecystitis. $MgSO_4$ introduced into the duodenum may affect the functional state of the liver. Bile in the duodenum after $MgSO_4$ lavage undergoes very little modification as the result of action on the part of the gall bladder.

JULIAN H. LEWIS

Experimental transplacental infection by filterable tuberculosis virus. A. CALMETTE, J. VALTIS, L. NEGRE AND A. BOQUET. *Compt. rend.* 181, 491-3(1925).—The authors were able to transmit tuberculosis to the progeny of guinea pigs after injection of bacteria-free filtrates of cultures of *B. tuberculosis*. The new-born guinea pigs died of the infection without evident infection of the placenta of the mother, which indicates that the filterable elements of the tubercle bacillus passed on through the placenta to the fetus without causing active infection of the placenta.

G. F. REDDISH

Comparative studies on the metabolism of normal and malignant cells. J. B. MURPHY AND J. A. HAWKINS. *J. Gen. Physiol.* 8, 115-30(1925).—A classification of tissues on the basis of their metabolism does not correspond to the biol. grouping. These studies do not support the conclusions of Warburg (*C. A.* 19, 2702). C. H. R.

The albumin reaction and the tyrosine reaction of sputum. ANDRÉ TERCINET. *Bull. sci. pharmacol.* 32, 524-7(1925).—The ninhydrin reaction and the action of an

oxidase prep'd. from *Russula delicata* were studied. These reactions are not sufficient to establish a diagnosis of tuberculosis. L. W. RIGGS

Immunizing properties of dysenteric toxin. J. DUMAS, G. RAMON AND SAÏD BILAL. *Compt. rend.* **181**, 198-9(1925).—The anatoxin prep'd. from the dysenteric bacillus of Shiga caused the production of immunizing antibodies in the rabbit, in the horse and in man. L. W. RIGGS

The rose bengal test for liver function. Rate of elimination from the circulation of man. W. J. KERR, G. D. DELPRAT, N. N. EPSTEIN AND MAX DUNIEVITZ. *J. Am. Med. Assoc.* **85**, 942-6(1925).—The dye fulfils the following requirements: (a) it is nontoxic in the amts. necessary for the tests; (b) it is a crystalloid; (c) it is eliminated through the liver; (d) it remains in the circulation for a sufficient length of time to allow detns. of the dye in the plasma to be made. Patients with definite cirrhosis or other extensive liver disease show a marked retention of the dye in the circulating blood. Obstruction of the biliary passages causes a retention of the dye, but in such cases there are other clinical evidences of such obstruction. In all other cases studied the results are within normal limits. L. W. RIGGS

Pathologic physiology of liver in relation to intoxication and infection. E. L. OPIE. *J. Am. Med. Assoc.* **85**, 1533-7(1925), cf. following abstract.—The liver by means of the peculiar endothelium of its sinusoids fixes insol. morg. particles, such as bacteria and substances in colloidal suspension, and perhaps by the same means many substances dissolved in the plasma. With immunization, the liver shows increased ability to fix bacteria and foreign proteins and to render them harmless. The liver removes from the portal blood many injurious agents which enter from the gastro-intestinal tract and prevents their entrance into the systemic circulation. Fixation of injurious substances may cause destructive changes in the liver and permanent lesions of the organ. L. W. RIGGS

The evaluation and treatment of disturbed liver function. C. W. McCURE, W. L. MENDENHALL AND MILDRED E. HUNTSINGER. *J. Am. Med. Assoc.* **85**, 1537-40 (1925); cf. preceding abstract.—The functional condition of the liver is estd. with oleic acid and the resulting bile is obtained by means of a duodenal tube. This bile is analyzed for bilirubin, total pigments, bile acids and cholesterol. The results show that $MgSO_4$ has a pronounced effect on the functional activity of the liver in man and animals, increasing or decreasing that activity according to the amt. of $MgSO_4$ which reaches the liver. Under properly controlled conditions $MgSO_4$ can modify favorably a functional state of the liver which has been deranged by disease, but its successful use requires much experience. L. W. RIGGS

Hydrogen-ion concentration of the blood in atrophic and dyspeptic infants. Z. BOKAY. *Magyar Orvosi Archivum* **26**, 381-3(1925).—The measurements of p_H gave partly normal and partly acid values. Atrophy is not followed by acidosis as a consequence, but creates a tendency to acidosis. A pronounced alkalosis occurred in one case of pylorus spasm and probably was due to loss of acid by continuous vomiting. L. W. RIGGS

Immunizing antigen of the pneumococcus. III. The purification of the water-soluble antigen. WM. A. PERLZWEIG AND C. S. KEEFER. *J. Exptl. Med.* **42**, 747-52 (1925).—Actively immunizing fractions of protein nature have been isolated from broth culture filtrates of pneumococcus Type I by ultrafiltration, pptn. at a definite H-ion concn. (p_H 4.1) and the sepn. of a sol. pterate fraction. The method appears to be suitable for the initial purification of this antigen. C. J. WEST

FREUND, ERNST, AND KAMINER, GISA: *Biochemische Grundlagen der Disposition für Karzinom*. Vienna: Julius Springer. Paper, M. 4.50.

II—PHARMACOLOGY

ALFRED N. RICHARDS

The effect of some intermediary products on the gas metabolism of rabbits. V. LAUFBERGER. *Biochem. Z.* **158**, 260-77(1925).—The respiratory quotient of rabbits was detd. after various substances were administered by stomach sound. EtOH and dihydroxyacetone were found to be completely combustible and exerted a carbohydrate-sparing action. Succinic acid, pyruvic acid and lactic acid were not completely burned to CO_2 and H_2O in the body but underwent further chem. change to other materials. F. A. CAJORI

The effect of insulin on the water-salt economy of non-diabetic organisms. H. VOLLMER AND J. SEREBRIJSKI. *Biochem. Z.* **158**, 366-94(1925).—In normal fasting rabbits, insulin injection caused an increase in blood Cl and diln. of the blood. These

changes were found to be associated with maintenance of osmotic regulation of the blood and also are involved in insulin action
F. A. CAJORI

The specific action of carbonic acid on the respiratory center of men and rabbits. ISTVAN HETÉNYI, GYULA HOLLÓ AND ISTVAN WEISS. *Biochem. Z.* **160**, 242–5 (1925).—Injection of 20 cc. NaHCO_3 soln. in man was followed by a rise in blood p_{H} and plasma bicarbonate and a fall in alveolar CO_2 . The stimulating action on the respiratory center was due not to free CO_2 but to HCO_3 ions. This was further confirmed by injecting rabbits with NaHCO_3 and H_2CO_3 of blood reaction or slightly more acid and noting that the stimulatory action of H_2CO_3 was not dependent on an alk. blood reaction.
F. A. CAJORI

The antagonistic effect of hypophysis and insulin on diuresis. N. KLISSIUNIS. *Biochem. Z.* **160**, 246–9 (1925).—The diuresis following the giving of 500 cc. of H_2O to dogs was diminished by injection of hypophysis ext. When insulin was administered simultaneously with hypophysis ext., diuresis occurred unchecked. Insulin alone had no effect on the diuresis.
F. A. CAJORI

The influence of some substances on the secretion of Harder's glands. S. BEL FANTI. *Biochem. Z.* **158**, 435–42 (1925).—Muscarine Me_4NI , Et_3NHIO_3 , and ecl serum when injected intravenously caused a milky secretion of Harder's glands, located in the eyelid of the guinea pig. Synthetic muscarine, $(\text{NH}_4)_2\text{SO}_4$, pilocarpine and betaine did not stimulate these glands to secretion.
F. A. CAJORI

The treatment of disease with heavy metals and bactericidal agents. W. E. DIXON. *Tubercle* **7**, 1–6 (1925).—A review of recent chemotherapeutic attempts in tuberculosis with Cu salts, Au salts and sanocrysin.
H. J. CORPER

Chemotherapeutic experiments on tuberculous guinea pigs. FELIX KLOPFSTOCK. *Z. Tuberk.* **40**, 119–22 (1924).—Subcutaneous injection of "Elektrocuprol" (Heyden) into tuberculous guinea pigs initiated 2 weeks after infection with a human strain resulted in a rapid emaciation and death from intercurrent diseases without any appreciable effect upon the disease in the animals. "Elektrokollargol" and "Elektroferrol Heyden" resulted in an increase of life duration of the treated animals. "Lecutyl" ointment byunction, chaulmoogra oil and the propyl esters of the chaulmoogric fatty acids were without influence upon tuberculous guinea pigs.
H. J. CORPER

Experiments with krysolgan in tuberculosis. TORU KOZUMI. *Z. Tuberk.* **41**, 109–19 (1924).—Krysolgan injections had no influence upon tuberculosis in guinea pigs or rabbits. A 1% soln. for 4 hrs. did not kill tubercle bacilli *in vitro*. Such action as is attributable to krysolgan is believed to be non sp. and its use in man generally is not justified.
H. J. CORPER

The effect of thyroxin on the respiratory and nitrogenous metabolism of normal and myxedematous subjects. W. M. BOOTHBY, I. SANDIFORD, K. SANDIFORD AND J. SLOSSE. *Ergebnisse Physiol.* **24**, 728–56 (1925).—Following the administration of thyroid or thyroxin to 2 myxedematous and one normal subject, there is a temporary rise in N excretion which indicates an increased catabolism of stored protein but which is without effect on true endogenous protein metabolism. With the subject originally in N equil. and kept on a const. protein intake, there is an immediate large increase in N elimination with a correspondingly large negative N balance during the period when the heat production is being elevated on account of the administration of thyroxin; however, after the heat production has reached its max. and is maintained there by small doses of thyroxin, there is a gradual decrease in N output for 2 to 4 weeks until it has reached its former value. Creatinine and uric acid elimination are unchanged following thyroxin although there is a slight excretion of creatine during the period of high N output. The loss in wt. of the subjects which was largely water following thyroid ingestion when compared with the N loss indicates the breakdown of an albuminous fluid of about 2% N which is probably responsible for the edema of myxedema. There were no changes in the non-protein N or other N partition products in the blood of the normal after thyroxin, in the myxedematous patients an increased blood urea resulted. The decay curves showing the effect of thyroxin on the basal metabolism with their mathematical formulas are given.
H. J. DEUEL, JR.

Glucemia and glucolysis in phlorhizin diabetes treated with insulin, with special reference to the protein sugar. MICHELE BUFANO. *Arch. farm. sper.* **40**, 1–22 (1925).—Detns. of free and combined sugar in the blood of phlorhizinized rabbits before and after placing the samples 1 hr. in the thermostat at 36° were made for the purpose of ascertaining the effect of insulin on glucemia and on subsequent glucolysis. Phlorhizin alone has no effect on the combined sugar, while with insulin irregular variations were noted. In neither case was any effect on glucolysis of combined sugar observed as compared with that of the normal animal. The free sugar in the blood is greatly di-

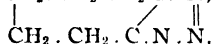
minished by the phlorhizin treatment, and still further diminished when this is followed by injection of insulin.

A. W. DOX

Pharmacological investigation of a bismuth colloid. ALFREDO CHISTONI. *Arch. farm. sper.* **40**, 23-48(1925).—By heating Bi phosphate with NaOH and albumin a colloidal prepn. of Bi is obtained, which is claimed to be more stable and of a higher degree of dispersion than other preps. of colloidal Bi on the market. For optimum stability the prepn. should contain 1% Bi. Pharmacological tests show that only a slight flocculation occurs in the tissue in the region of a subcutaneous injection or in the various organs of the body, with the possible exception of the lung. Elimination is principally through the kidneys, the intestinal wall and the salivary glands.

A. W. DOX

Cardiazole, a new water-soluble analeptic suitable for intravenous application. I. K. F. SCHMIDT. II. F. HILDEBRANDT. III. L. KREHL. *Klin. Wochschr.* **4**, 1678-80(1925).—I. Cardiazole is pentamethylenetetrazole, $\text{CH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{N} \cdot \text{N} \cdot \text{N}$.



white, m. 57-8°, very sol. in H₂O and in most org. solvents. Its aq. soln. can be kept indefinitely and may be autoclaved. With concd. HCl in a sealed tube at 250° it gives N₂, CO₂ and H₂NCH₂CH₂CH₂CH₂CH₂NH₂. HgCl₂ ppts. from aq. solns. C₆-H₁₀N₄ HgCl₂, white, m. 175°, sol. in 800 pts. H₂O. II. The pharmacol. behavior of cardiazole is similar to that of camphor. It is, however, absorbed so rapidly that the action is almost as prompt on subcutaneous as on intravenous application. It is a powerful heart stimulant (frog and rat). Concns. (in the perfusion fluid) up to 0.5% are not toxic. Hearts poisoned with CHCl₃, CCl₃CHO or choline are promptly revived with cardiazole. It has no inhibitory action on smooth muscle. III. The therapeutic subcutaneous dose is 0.1 g. The injection is usually painless; absorption is very rapid. Cases of cardiac collapse are revived.

MILTON HANKE

A simple method for the biological assay of hypophysis preparations. S. LOEWEN AND M. ILSON. *Klin. Wochschr.* **4**, 1692(1925).—Small pieces of frog skin, immersed in a nutrient medium, react toward hypophysis ext. exactly as does the intact frog. The skin becomes deeply pigmented. Examn. of such skin sections under the microscope shows that this coloration is caused by an excitation of the dormant pigment cells with a consequent pigmentation. A max. conversion of dormant into active pigment cells occurs in 15 min. The percent conversion of dormant into active, fully pigmented cells, in 15 min., is directly proportional to the strength of the prepn. A good prepn. gives 100% conversion. This method of assay is preferable to the uterus contraction method because the reaction is specific for hypophyseal ext.

MILTON HANKE

The influence of injections of heavy metals on diabetes mellitus. ERICH SCHILLING AND RUDOLF ARNOLD. *Klin. Wochschr.* **4**, 1818-9(1925).—Compds. of Fe, Hg, Ag and Bi were tried. The results were not unidirectional; so no definite conclusions can be drawn.

MILTON HANKE

The antagonism between insulin and adrenaline. E. BODEN AND F. WANKELL. *Klin. Wochschr.* **4**, 1823(1925).—Insulin markedly increases the rate and intensity of the contractions of an isolated intestine. Adrenaline is completely antagonistic; atropine is transitorily antagonistic. Insulin and adrenaline give identical results with a Laeven-Trendelburger frog prepn.; both decrease the rate of flow from 18 to 4 drops per min. In this respect, then, they are not antagonistic.

MILTON HANKE

Inhibition of exudation by pituitrin and by various other substances that act upon the reticulo-endothelial system. PAUL SAXL AND FERDINAND DONATH. *Klin. Wochschr.* **4**, 1866-7(1925).—Pituitrin and *arsphenamine*, by acting upon the reticulo-endothelial system, inhibit the exudation, and to a smaller extent the production of edema, in cases of mustard oil conjunctivitis. *Atrillavine* does not inhibit exudation but does inhibit the edema.

MILTON HANKE

The action of extracts of bilberry leaves on depancreatized dogs. E. EPPINGER, R. E. MARK AND R. J. WAGNER. *Klin. Wochschr.* **4**, 1870-1(1925).—Depancreatized dogs were injected with an ext. of bilberry leaves. The excretion of sugar is reduced, in some cases, to zero. The Minkowski quotient is very low. The animals live as long as treatment is continued. Blood sugar is high.

MILTON HANKE

Demonstration of circulating heavy metals. T. KOMIYAMA. *Klin. Wochschr.* **4**, 2012-3(1925).—A suspension of S was injected into one thigh (mouse) and a suspension of an insol. salt of Pb, Bi or Hg was injected into the other thigh. The S depot began to turn black within 12-24 hrs. as a result of the formation of metallic sulfide. After 36-48 hrs. the metallic salt depot began to turn black. Evidently, both the metallic ion and the S must be circulating in a form such that metal sulfide can form. If a

salve contg. a Bi salt is massaged into the area just above the S depot, the outer epidermis becomes dark-colored within 6 hrs. After 2 days the S depot is also colored. When the salve is massaged into the skin of the right leg, the S depot being in the left leg, a coloration of the skin below the massaged area does not occur; but the S depot becomes dark colored within 12-24 hrs. Metal salts, absorbed as salve, circulate in the blood for 3-4 days. If the salve is removed after 12 hrs. and S injected, remotely, at different time intervals, the S depot will become dark-colored within 12 hrs. even 3-4 days after the salve has been removed.

MILTON HANKE

Can strontium replace calcium pharmacologically? S. HIRSCH AND ALB. OPPENHEIMER. *Klin. Wochschr.* **4**, 2015-6(1925).—Frog hearts that have been brought to a standstill by immersion in 0.85% NaCl soln. begin to beat when they are immersed in a Ringer soln. in which the Ca has been replaced by Sr. In this respect the Sr is only 0.5 as effective as Ca. The restorative action of Sr is transitory. An isolated rabbit heart, when perfused with a Sr-contg. Ringer soln. (no Ca), shows a reduction in the size of the excursion, elongation of the systole, diminution of the diastole and an occasional arrhythmia. Sr is 0.5 as active as Ca in the perfusion expt. and its action is transitory. Sr cannot replace Ca.

MILTON HANKE

The effect of calcium and potassium ions on the pituitrin blood-sugar reaction. E. KYLIN. *Klin. Wochschr.* **4**, 2068(1925).—Pituitrin elevates the blood sugar. KCl (0.2 g.) augments and CaCl_2 (1.0 g.) reduces the action of pituitrin in this respect. The salt injection preceded that of the pituitrin by 1 hr.

MILTON HANKE

Action of arspenamine on the frog heart. F. JACOBSON. *Klin. Wochschr.* **4**, 2068-9(1925).—Neoarsphenamine and K are identical in their action upon the isolated frog heart, the diastole is increased and the systole is correspondingly decreased. This effect can be promptly removed by the addition of Ca. The toxic effects of arsenic prepns. can be avoided by injecting CaCl_2 along with the arsenical.

MILTON HANKE

Cimozyl in pulmonary tuberculosis. PAUL CANAKIS. *Boll. chim. farm.* **63**, 193-4 (1924); *Thesis, Montpellier* 1923.—Cimozyl contains 0.05 g. benzyl cinnamate and 0.1 g. cholesterol in 5 cc camphorated oil. Injections of 5 cc. daily resulted in regression of the lesions, decrease of fever, increase of red and white cell count. The bacteria of the sputum showed agglutination and degeneration. C. attributes this effect not to bacteriolysis proper, but to destruction of the bacterial membrane by cell diastases, the production of which is stimulated by Cimozyl. The response of infantile tuberculosis is particularly good, probably because of the restoration by cholesterol of the lipoids of the attacked ganglia.

MARY JACOBSEN

Pharmacological study of the oil of knee pine. AJAZZI MANCINI. *Boll. chim. farm.* **64**, 449-59(1925).—The oil of *Pinus mughus* and *Pinus pumilio* has no irritating action in direct contact with mucous membranes. When inhaled or subcutaneously injected it produces in frogs and white mice after a short excitation period depression ending in paralysis and death. Rabbits tolerate daily oral doses of 0.3-1 g. per kg for several weeks without any renal lesions. Almost the entire oil is eliminated in the urine as a glucuronate. The germicidal power tested by the methods of Chamberland and Cadeac-Meunier on *B. subtilis*, *Staph. aureus* and *albus*, Shiga-Kruse and pneumococci was found to be negligible.

MARY JACOBSEN

Is antimony an antimalarial remedy? H. SMITS. *Geneeskundig Tijdschr. Nederland. Indie* **65**, 518-20(1925); cf. *C. A.* **16**, 3129 and Tewfik-Salim, *Arch. Schiffs. Tropenhyg.* **29**, 183-6(1925).—Stibenyol, Stibosan and Heyden 661 with 33, 30.5, and 12.5% Sb proved to be ineffective in a no. of malaria cases, all of which yielded promptly to quinine. Unlike tartar emetic they had no untoward effects and are therefore recommended for all cases, which in addition to malaria need Sb treatment.

M. J.

Sodium bromide in dermatology. F. L. SCHEEPE. *Geneeskundig Tijdschr. Nederland. Indie* **65**, 521-4(1925); cf. Lebedjew, *Dermatol. Wochschr.* **76**, 1003.—Ten % NaBr given intravenously is harmless and a powerful agent in all itching dermatoses. Acute eczemas and dermatitides usually yield to a few injections without local treatment. Chronic eczemas and other itching dermatoses (lichen ruber, psoriasis vulgaris, scabies, parasitic eczema) are always favorably influenced, probably because of the rapid disappearance of pruritus and secondary scratch infections.

MARY JACOBSEN

The biochemistry of alkaline earths. ERNST HODEL. *Helvetica chim. acta* **8**, 514-8(1925).—Strongly diuretic solns. contg. 0.2 mol. CaCl_2 and SrCl_2 each, 10.0 g. NaCl and 1.0 g. KCl in 1000 cc. were injected into the jugular vein of rabbits in order to find whether Ca can be replaced by Sr in the body. In the blood Ca was far in excess of Sr, the larger part of the latter being excreted in the urine. A Sr depot was found in the skin, while Ca was retained in the kidneys. In the spleen only Ca was

found. The liver contained both ions in equiv. amts. The expts. show the tendency toward a rapid elimination of the foreign ion. MARY JACOBSEN

Changing opinions regarding pancreas therapy. H. R. HARROWER. *Am. Med.* **31**, 127-31(1925).—A discussion showing that insulin is not entirely destroyed by digestion; insulin does not represent the entire pancreas value; oral pancreas therapy is of value in supplementing insulin in certain cases. FRANCES KRASNOW

Intravenous application of radium. E. E. FIELD. *Am. Med.* **31**, 435-7(1925).—Injection of RaCl_2 (absolutely free from BaSO_4) is beneficial in the treatment of high blood pressure, apoplexy and senile decay. FRANCES KRASNOW

Chemotherapy of antimonial compounds in kala-azar infection. XVI. Observations on blood cultures of kala-azar patients on NNN medium during 1922-24. 1. Comparative value of peripheral blood culture, spleen blood culture and spleen puncture in the diagnosis of kala-azar. 2. The period at which sterilization of the peripheral blood takes place during treatment with urea stibamine. U. N. BRAHMACHARI AND B. B. MAITY. *Indian J. Med. Research* **13**, 21-4(1925).—Ninety seven % of the cases (140) showed positive peripheral blood culture. 81.5% of the spleen blood culture cases (220) showed positive culture. The period for sterilization due to urea stibamine treatment varied. 9 cases were sterilized in 4 days, 3 in 6 days, 15 in 10 days, 7 in 16 days and 3 required more than 16 days. FRANCES KRASNOW

Cephalandra indica (Telakucha) in diabetes. R. N. CHOPRA AND J. P. BOSE. *Indian J. Med. Research* **13**, 11-6(1925).—Contrary to current opinion, the fresh juice from the leaves of *Cephalandra indica* produces no marked reduction in the sugar of the blood or urine. FRANCES KRASNOW

Studies in iodine-feeding. II. The effect of iodine as potassium iodide when administered in varying amounts to pregnant ewes. J. M. EYVARD, A. R. LAMB AND W. G. GAESSLER. *J. Am. Vet. Med. Assoc.* **67**, 746-55(1925).—The optimum I content of rations is unknown. Doses of 2-6 g. KI showed marked unfavorable effects while $\frac{1}{2}$ to 1 g. prevented goiter. Cf. *C. A.* **19**, 3299. FRANCES KRASNOW

Experiments in metallurgical poisoning of animals at Oroya, Peru, at an elevation of 12,200 feet. J. F. MITCHELL. *J. Am. Vet. Med. Assoc.* **68**, 330-5(1925).—Tolerance of cattle and sheep for As, Pb oxide and flue dust is a matter of general health, rather than of elevation. Healthy animals took large doses before developing symptoms while a sick one died promptly. Sheep are not so much affected as cattle. Sheep in good health withstand and get fat on 4.285 g. As, 25.443 g. Pb oxide or 13.098 g. flue dust. FRANCES KRASNOW

Male fern—its toxicology and its use in liver rot. R. F. MONTGOMERIE. *J. Comp. Path. Therap.* **38**, 1-26(1925).—The administration of male fern ext. in amounts much less than that which may prove lethal to Welsh Mountain ewes destroys all the flukes present in the larger bile ducts. "Damstole" is not more efficient. Neither prep'n will destroy immature flukes present in the parenchyma of the liver or very small bile ducts. FRANCES KRASNOW

Treatment of camels affected with *Trypanosoma soudanense* with "Bayer 205" and further observations on the formol-gel test. R. H. KNOWLES. *J. Comp. Path. Therap.* **38**, 42-6(1925).—"Bayer 205" seems valuable in the treatment of trypanosomiasis in camels. One dose of 10 g. has proved efficient. The reaction to the formol-gel test disappears gradually after the treatment. FRANCES KRASNOW

The physiological and chemical studies of the Tanret guanidine base, galegine. HELMUT MÜLLER. *Z. Biol.* **83**, 239-64(1925).—Galegine is isolated as the picrate, $\text{C}_6\text{H}_5\text{N}_3 \cdot \text{C}_6\text{H}_5\text{N}_3\text{O}_7$, m. 178° and the chloroaurate of dihydrogalegine, $\text{C}_6\text{H}_5\text{N}_3 \cdot \text{HAuCl}_4$, m. 147°. Galegine is contained in *Galega officinalis* and in the leaves of the "geiss-klee". Yeast does not act on galegine. During putrefaction it is changed to optically inactive oxydihydrogalegine. Subcutaneous administration of galegine causes death 6 to 8 days with symptoms similar to those obtained when the plant is fed. It is excreted in the urine. Three new cryst. compds. of galegine were isolated. The quantities recovered were too small for identification. FRANCES KRASNOW

Investigation of the respiratory quotient after alcohol intake during work. H. J. BRECHMANN. *Z. Biol.* **83**, 325-48(1925).—Upon the administration of 30 g. alc., there was obtained a marked depression of the respiratory quotient when the subject was burning mainly carbohydrate. FRANCES KRASNOW

Clinical and experimental studies on sodium benzoate. A. W. BRYAN. *J. Clin. Invest.* **2**, 1-33(1925).—2.4 g. BzONa (equiv. to 2.0 g. BzOH) was given by mouth to patients and normal persons. In the latter 70% or more of the BzOH equiv. was excreted as hippuric acid in the urine in 2 hrs., 85-90% or more in 3 hrs. In nephritis the excretion was considerably reduced, even in early cases when the blood urea was

normal. In nephrosis normal values were found. Hepatic disease in man or exptl. lesions in dogs affects the results only insofar as sufficient glycocoll may not be available for the synthesis. Excretion of free BzOH above 3% of the administered dose of BzONA suggests secondary hepatic lesion.

LOUIS LEITER

The present status of chlorine gas therapy. H. B. VEDDER. *Ann. Clin. Med.* **4**, 21-9(1925).—The optimum concn. is 0.015 mg. per l. The best length of exposure is 1 hr. It can be used for simple respiratory infections, for whooping cough, and in the early stages of influenza.

JOHN T. MYERS

Physiological action of (alcoholic) aromatic solutions. A. DOULY AND R. M. GATTEFOSSÉ. *Chimie et industrie Special No.*, 392-6(Sept. 1925); cf. *C. A.* **18**, 1712.—Previous results obtained on the non-toxicity and therapeutic effects of pure volatile compds. and terpeneless essential oils have been extended to their EtOH solns. Guinea pigs that were given large doses of 30% alc. (0.5 g. for 8 days, 1 g. for 5 days, 1.5 g. for 10 days, 2 g. for 5 days, 2 days rest, and a final lethal dose of 6-7 g.) showed all the signs of alcoholism after the 3rd day, while animals having received the same doses of alc. contg. anethole, tincture of fennel and terpeneless lemon oil, resp., remained in good health to the end, and postmortem examn. showed no abnormal conditions.

A. PAPINEAU-COUTURE

The role of surface tension in the increase of anesthesia by alkalinization of solutions of cocaine hydrochloride. JEAN RÉGNIER AND ROBERT DAVID. *Bull. sci. pharmacol.* **32**, 513-23(1925); cf. *C. A.* **19**, 3000.—Contrary to the conclusions of other investigators, the addn. of alkali to fresh solns. of cocaine increases the anesthetic power neither by setting free a more powerful anesthetic nor by a diminution of the surface tension. The increased anesthetic power is due to the action of the alkali on the receiving cell.

L. W. RIGGS

Pancreatic extract of *Acanthias vulgaris*; its action compared to that of insulin from beef pancreas. E. DUCLOUX AND (MLE.) G. CORDIER. *Compt. rend.* **181**, 312-4(1925).—The hypoglycemic action of the subcutaneously injected pancreatic ext. of the shark (*Acanthias vulgaris*) upon the guinea pig and upon the rabbit appears (1) to bear no proportional relation between the quantity of the shark insulin injected and the wt. of the animals; (2) there is no proportional relation between the hypoglycemia and the quantity of shark insulin per same wt. of animal; (3) the lowering of the sugar is greater following intracardiac injections.

L. W. RIGGS

The fate of camphor and of the oil after experimental injection of camphorated oil. LÉON BINET AND RENE FABRE. *Compt. rend.* **181**, 441-3(1925).—The expts. were made with dogs. The camphorated oil consisted of neutral olive oil and camphor 9 to 1, to which was added 0.1 g. of diphenylanthracene to 1000 g. to render the soln. fluorescent. The camphorated oil was injected aseptically either subcutaneously or intramuscularly in doses of 20 g. After injection the animals were placed in a cage for urine collection and were killed 2, 3, 5, 7, 9, 19, 24, or 48 hrs. after the injection, when the camphor in the urine and tissues and the oil in the tissues were detd. The camphor is rapidly eliminated from the tissues by the renal route, while the oil remains at the site of the injection for some weeks and is absorbed by means of an afflux of leucocytes which surround the oily droplets—a veritable encystment.

L. W. RIGGS

Diuretic action of ammonium chloride and novasurol in cases of nephritis with edema. N. M. KEITH, C. W. BARRIER AND MARY WHELAN. *J. Am. Med. Assoc.* **85**, 799-806(1925).—A group of patients selected on account of their inability to excrete salts and water was treated with controlled diets, NH_4Cl and novasurol. The combined action of these 3 factors produced beneficial effects when each singly was ineffective. These results have not been obtained previously. Diuresis, in cases of edema, is associated with increased excretion of Na whether it occurs spontaneously or following the exhibition of NH_4Cl or novasurol.

L. W. RIGGS

Basis for the physiological activity of certain onium compounds. R. RENSCHAW. *Science* **62**, 384-9(1925).—A cooperative research is underway among the workers in different labs., to study the physiol. activity of onium compds. on the nervous system. The process of action is complex and does not appear to be due to their chem. decomposition, their activity as bases, nor to their distribution coeffs. The mobility of their ions is not of primary significance. To be physiologically active these substances must exist in the body fluids as cations. Various probabilities to account for their action are proposed. Several papers on the subject will appear shortly.

L. W. RIGGS

Significance of hexylresorcinol and its homologs in relation to the problem of internal antiseptics. VEADER LEONARD. *Science* **62**, 408-12(1925).—Hexylresorcinol is by far the most powerful germicide ever described as possessing anything like its degree of non-toxicity to animals and to man. It has been developed and applied as an internal

urinary antiseptic by a logical and orderly application of the chem. and biol. characteristics of its lower homologs, and exemplifies a method by which sp. problems in internal antiseptics may be gradually narrowed down through the enhancement of desirable biol. properties definitely attributable to chem. constitution. L. W. RIGGS

The cardiovascular and diuretic action of calcium salts. L. BRULL. *Arch. intern. med. exp.* 1, 613-47(1925).—See C. A. 19, 132. FLORENCE SEIBERT

Testing purgatives in the white mouse. S. LOEWE AND GERTRUD FAURE. *Arch. expl. Path. Pharmacol.* 107, 271-86(1925).—The passage of food through the intestine of the white mouse can be followed by administering India ink by stomach tube and by detg. the distance to which the pigmented material has advanced after different intervals of time. Material passes through the intestinal tract of the mouse very rapidly; within 1 hr. after the stomach is filled the process begins and within a further half hour the food has traversed half of the length of the intestine. The effect of purgatives in modifying the speed of the transfer can readily be detd., and of the substances tested it appears that senna and colocynth were very good, $MgSO_4$ and castor oil were good, and $HgCl_2$ was very uncertain in its action. G. H. S.

Mode of action and point of attack of procaine on the small intestine. FRITZ SCHNELLER. *Arch. expl. Path. Pharmacol.* 108, 78-95(1925).—Apparently procaine has its primary action upon the "receptive substance" of the intestinal musculature. Reduction in the physiol. tonus is clearly evidenced by the prompt loss in motility. Upon the small intestine treated with choline or physostigmine the action of novocaine is unchanged although contraction to Ba in the usual dosage is not abolished. The procaine-treated intestine requires large doses of choline and physostigmine to induce the usual stimulation; $BaCl_2$ is active in the normal amts. G. H. S.

Blood picture in those who work with hydrocyanic acid. C. M. HASSELMANN. *Arch. expl. Path. Pharmacol.* 108, 106-20(1925).—Study of the blood of about 100 persons who had worked with HCN for a greater or less length of time showed that the hemoglobin content was usually high, the no. of red cells were somewhat increased although normal in morphology and staining properties, the white cells were not materially changed although there was a slight lymphocytosis and the basophils were slightly above normal. Monocytes were frequently increased. Blood pressure was within normal limits. G. H. S.

Possibility of experimentally altering the physiological secretory equilibrium between the pancreas and the adrenals by irradiation and the effects upon the vegetative nervous system. I. Irradiation miosis and mydriasis. OTTO RISSE AND FRITZ POOS. *Arch. expl. Path. Pharmacol.* 108, 121-48(1925).—By suitable irradiation procedure pharmacol. highly active substances appear in the circulation in amts. which cause both a mydriasis and a miosis with the denervated and the maximally atropinized pupil. The mydriatic substance is probably adrenaline. The miosis is of peripheral origin and is probably due to some substance of hormonal derivation, whose chief characteristic is to remove atropine paralysis of the pupil. The pancreas must be considered in connection with its possible source. G. H. S.

Physiology and pharmacology of irritability of the frog heart. I. The isolated ventricle. KARL JUNKMANN. *Arch. expl. Path. Pharmacol.* 108, 149-206(1925).—The rhythmic changes in irritability of the frog heart comprise an abs. refractory phase, a relatively refractory phase, a period of abs. irritability, and a period of diminishing irritability. Corresponding to these changes in irritability are changes in contractility. Substances of the narcotic group, EtOH, Et₂O, $CHCl_3$, urethan, veronal, and paraldehyde, in suitable concns. shorten the refractory phase without altering contractility. Substances of the digitalis group, digitalis, scilla, oleander glucoside, cymarine, and strophanthin, widen the contraction curve with a simultaneous slight lengthening of the abs. refractory phase and an ultimate shortening of the refractory phase with increase in irritability. $BaCl_2$ greatly extends the contraction curve and lengthens the latent period. Abs. irritability and general contractility are both modified. $CaCl_2$, like digitalis, shortens the refractory phase. $SrCl_2$ does not alter either irritability or contractility. Of the alkaloids, quinine, quinidine, and atropine show their greatest effect—a reduced irritability—only after a considerable period. Caffeine and adrenaline broaden the contraction curve. With caffeine the abs. refractory phase is lengthened, the abs. irritability is somewhat reduced. Adrenaline increases the abs. irritability somewhat. With physostigmine the increase in irritability in the relatively refractory phase is delayed. Morphine and strychnine shorten the refractory phase and have a variable effect upon contraction. The latent period may be greatly lengthened; with high concns. the effects resemble that of quinine. Acetylcholine shortens the refractory phase; irritability is unchanged or diminished; and contractility is

considerably reduced. The ethereal oils cause a more or less outspoken reduction in contraction and an abs. and relative shortening of the abs. refractory phase. Irritability is reduced. Camphor causes a primary shortening of the refractory phase and of contraction and irritability is diminished. II. *Ibid* 313-52. —Ether causes a marked retardation of rate; the abs. refractory phase is somewhat shortened, but the development of irritability and the abs. irritability are hardly changed. Stimulus conduction is favored. CHCl_3 greatly retards the rate, while irritability and cond. are not materially changed although the latent period is lengthened. Chloral hydrate causes a marked slowing of rate; the abs. refractory phase is prolonged and irritability is somewhat reduced. BaCl_2 markedly retards frequency; the abs. refractory phase is lengthened; irritability is changed but little; stimulus conduction is diminished; and the latent period is prolonged. Digitalis and strophanthin modify frequency but little, nor is irritability greatly changed. Only in the toxic stage is conduction modified. Quinine slows the rate and lengthens the abs. refractory phase both as to irritability and conduction. It also lengthens the latent period. Quinidine, atropine, physostigmine, and morphine have similar effects, as, in many respects, has camphor also. G. H. S.

Phases of action of digitalis on the isolated heart. L. GARCAWY-LANDAU. *Arch. expl. Path. Pharmacol.* 108, 207-19 (1925).—The true action of a poison on an isolated organ can only be ascertained by considering all phases of its action. From a consideration of all of the phases of action it appears that the isolated heart of *Bufo vulgaris* is as sensitive to digitalis as is that of *Rana esculenta*, presenting the same characteristic changes in activity. With a dose that is quickly toxic, the curve of action is characterized by a rapid initial fall in activity and a max. heart contraction at the beginning of the recovery phase. The increased activity of the phase of recovery is considerable and may be intensified very markedly by various agencies, e. g., by repeated preliminary treatment with alc. The effects of digitalis on contraction height are not lost by repeated treatments with the drug. During protracted exposure to digitalis the period of heart inactivity is interrupted by single or group contractions of the same character as those which appear when activity is restored by washing. The amplitude of the max. contractions does not depend upon the height of the contractions prior to the digitalis treatment, but is rather a const. The peculiarities of the successive phases of action of digitalis may be interpreted as an expression of a stimulation of heart muscle and an inhibition in the production and conduction of stimuli. G. H. S.

Comparative digitalis evaluation in frogs and cats. T. KURODA. *Arch. expl. Path. Pharmacol.* 108, 230-7 (1925).—In testing several preps. in both frogs and cats the variability in the results obtained in frogs was somewhat greater than that in the results obtained with cats. G. H. S.

Pharmacological study of the action of intracutaneous stimulation. I. FRIEDRICH LUTHLEN and HANS MOLITOR. *Arch. expl. Path. Pharmacol.* 108, 248-54 (1925).—The intracutaneous injection of non-irritating solns. (0.9% NaCl) in the absence of pain (deeply narcotized animals) considerably increases the irritability of the vagus to faradic stimulation. The same action is manifest in other tissues whose nerve endings have a relationship similar to those of the outer layers of the skin, e. g., the conjunctiva and the cornea. G. H. S.

Action of adrenaline, hypophysis extract and histamine on the blood stream of the small vessels of the frog tongue. HANS KILLIAN. *Arch. expl. Path. Pharmacol.* 108, 255-79 (1925).—Upon the entire arterial bed of the tongue of the frog adrenaline causes a sp. active contraction. The nature of the effect depends upon the differing degrees of susceptibility of the different sections of the bed rather than upon the natural direction of flow. The degrees of susceptibility appear to be directly dependent upon the anatomical strength of the walls of the vessels and the arrangement of their muscular elements. The regions of the valves of the arterioles and the arterial capillaries are the most susceptible, reacting first and to the smallest doses. This peculiar susceptibility of the valve is not, however, sp. for adrenaline. The local action of adrenaline is manifest in a diln. of 1 to 1 million. Hypophysis ext. actively contracts the arterial bed. As with adrenaline, the venous bed is modified only secondarily. Here again the first effects are observed in the valve regions; in fact the difference on the vessels as compared with adrenaline is a matter of degree, hypophysis ext. being less active. The vascular reaction of hypophysis exts. parallels the melanophore reaction; adrenaline never causes the latter. Histamine acts as a general vaso-dilator, acting upon the entire arterial system, and at times upon the venous capillary bed. G. H. S.

Methemoglobin restitution. VI. Ferricyanide and quinone at different reactions. ROLF MEIER. *Arch. expl. Path. Pharmacol.* 108, 280-94 (1925).—Ferricyanide reacts

with oxyhemoglobin at p_H 5.7 almost the same as at 9.2. At p_H 5 and in a molar relationship of 1, about 98% as much O is liberated as by a satd. ferricyanide soln. At p_H 7, the corresponding percentage is 95%. In an alk. reaction about 90% is liberated. With a molar relationship of 2 in a neutral reaction a max. O liberation is obtained; while in an alk. reaction there is slightly less than a max. liberation. Quinone reacts in acid reactions about as intensively as ferricyanide. With a 2-fold molar excess the max. O liberation is attained. At a neutral reaction it requires a 10-fold excess to liberate 90% of the available O. In alk. reactions the quinone itself is oxidized. G. H. S.

Intravenous silver therapy. III. Solubility of silver salts in the blood and body fluids with reference to silver-protein combinations. K. v. NEERGAARD. *Arch. expl. Path. Pharmacol.* **108**, 295-312 (1925); cf. *C. A.* **20**, 71.—The degree to which Ag ions can occur in the blood after the introduction of dissociated Ag compds. is detd. primarily by the concn. of Cl ions and corresponds to approx. $1 \cdot 10^{-9}$. The max. concn. of Ag to be attained in the tissues is, therefore, a function of the Cl content. When dissociated Ag is added, the Ag-ion concn. in the blood increases far more slowly than in an isonic electrolyte soln., and it requires a some 500-fold amt. to attain the max. concn., so that an amt. of about 750 mg. per l. is necessary to attain this end. The component of the blood which causes it to differ so greatly from a pure electrolyte soln. is the albumin, apparently the globulin is inert. The formation of compds. with Cl and with albumin occur simultaneously, and there is an equil. between the 2 reactions.

• **IV. The silver-ion concentration in the process of disinfection in physiological media.** *Ibid.* 143-63.—The concns. of $AgNO_3$ in distd. water and in bouillon necessary for growth inhibition and for germicidal action are. In distd. water a Ag ion concn. of 0.12×10^{-6} , $N = 0.13$ mg./l. is inhibitory and is much greater than that required to give the same effect in bouillon ($1.8 \times 10^{-9}/N = 0.00019$ mg./l.). The discrepancy between the concn. of Ag ions necessary for bactericidal action in distd. water and that in a physiol. medium is explained by the fact that in the latter, together with the ionized Ag, complex Na Ag chlorides are formed and these also exert a disinfecting action. Detns. of the Ag-ion concn. show that in water, bouillon and in serum the union of Ag with bacteria is an adsorption process.

V. Does an unknown physical force—oligodynamic action of Saxl—play a role in intravenous silver therapy? *Ibid.* 164-77.—There is no evidence that an unknown phys. force is operative. G. H. S.

Digitalis and the "peripheral" heart: A new method of blood pressure analysis. A. N. SCHESTAKOFF. *Arch. expl. Path. Pharmacol.* **108**, 353-64 (1925).—With the circulation in the arterial systems in equil. the amt. of blood flow per min. = $M = 2h_m xy$, where h_m is the av. pressure and xy the sum of the systolic phases in 1 min. According to Garrad's formula $xy = 20\sqrt{n}$, where n = the pulsations per min. From this may be derived the sec. vol., $S = 2h_m xy/60$; the beat vol., $N = 2h_m xy/n$; the amplitude vol., $Q = 2h_m(xy-n)/n$; the av. cross section of the arterial reservoir $\pi x^2 = 2h_m(xy-n)/An$, where A = the pulse amplitude; the tonus of the vessels $a = An/xy-n$; and the extent of the arterial reservoir, $V = \pi x^2 h$. Primarily digitalis acts directly on the central heart, so that its energy is increased and the blood output per beat is augmented, with a resultant change in equil. within the system. This change is reflected in a reflex effect of the vasomotor system, regulating the pulse and the tonus of the vessels. This adjustment takes place very quickly, but can be accomplished only if the conduction capacity of the vasomotor system and the vessels is normal. G. H. S.

Intestinal peristalsis. II. Peristaltic processes during the action of saline purgatives. MAX BAUER. *Arch. expl. Path. Pharmacol.* **109**, 22-34 (1925).—With salt concns. of 2 to 4% the inhibition of peristalsis, following the primary stimulation, is but temporary and is relatively slight. With greater concns. of salts (10 to 20%) in large doses without an adequate amt. of fluid the transportation of the intestinal contents is not stimulated. Furthermore, the higher the concn. of salt the longer is the period of inhibition.

III. Effect of oils, colocynth, gamboge and calomel on the peristaltic process. *Ibid.* 233-48.—With the isolated guinea pig intestine differences in the action of castor oil, croton oil, colocynth, gamboge and calomel can be observed comparable to those noted in the intact animal. Castor oil and croton oil cause, at times, an increased peristalsis with an accelerated transportation of material. With croton oil irritating effects are often so strong that they lead to a closure of the intestinal lumen and to an arrest of the peristalsis. Colocynth has a strong stimulating effect on the intestinal musculature; in active concns. the peristalsis is often augmented, with a disturbance in the physiol. regularity. Small quantities of gamboge stimulate physiol. peristalsis, with an abnormally rapid progression of the waves, but with higher concns., as with colocynth, physiol. regularity is destroyed. Calomel strengthens peristalsis

and transfer of material, the peristaltic waves being intense with the physiol. regularity undisturbed.

Evaluation of glucosides active on the heart by oral administration to frogs. L. LENDLE. *Arch. expl. Path. Pharmacol.* **109**, 35-49(1925).—When administered by mouth to frogs strophanthin and digitalein are much less active than when given subcutaneously while with digitoxin, verodigen, and possibly with scillitoxin also, the lethal doses are essentially the same whether given by mouth or by injection. Convallamarin stands midway between the 2 groups, the lethal dose by mouth being 13.2 times greater than the subcutaneous dose. When given *per os*, essentially the same activity is shown by digitalis in either the powder or in the infusion form. Curarized frogs are as susceptible as are normal frogs to lethal doses of digitalis.

Experimental study of the action of the local anesthetics psicaine and tutocaine. WILHELM WAGNER. *Arch. expl. Path. Pharmacol.* **109**, 64-73(1925).—Tested by the infiltration method in man or by the method of surface anesthesia on the rabbit cornea psicaine is effective in approx. the same concn. as is cocaine. Tutocaine, on the contrary, is only about a fourth as active as cocaine. The minimal lethal dose of tutocaine is 4 times as great as that of cocaine; that of psicaine is twice as great. Psicaine causes a relatively marked irritation and hyperemia of the tissues, reactions which are lacking with tutocaine. When combined with adrenaline the anesthesia is prolonged, although the concn. of anesthetic cannot be diminished. The addn. of K_2SO_4 intensifies the action of both preps. in infiltration anesthesia. For surface anesthesia the action is strengthened by the addn. of phenol. Solns. of the preps. deteriorate rather quickly (1-2 days) on standing. With the isolated frog heart both preps. behave like cocaine.

Comparison of the narcotizing and toxic effects of some halogen hydrocarbons. JOHANNES MÜLLER. *Arch. expl. Path. Pharmacol.* **109**, 276-94(1925).—The narcotizing effects for white mice of $CHCl_3$, methylene chloride, tetrachloromethane, tetrachloroethane, dichloroethylene, ethylidene chloride, ethylene chloride, Pr chloride, EtBr and Pr bromide were tested, their relative values being detd. by comparison with $CHCl_3$. This last, used in a concn. of 0.027 g. per l., gave a deep narcosis after some 30 min. and was ultimately fatal after an exposure of 1.5 to 2 hrs., necropsy showing fatty infiltration of the liver with degenerative changes. Methylene chloride was about 3.5 times less active than $CHCl_3$. Tetrachloromethane was 1.5 times less active as a narcotic and was somewhat more toxic than $CHCl_3$. Tetrachloroethane had the highest narcotizing action of all of the compds. tested, being 3.5 times stronger than $CHCl_3$. In narcotic action dichloroethylene is to $CHCl_3$ as 1.5 is to 1. Fatal after-effects did not appear with ordinary doses but pronounced changes in the organs followed exposure to high concns. Ethylidene chloride was only $1/2$ as active as $CHCl_3$ and fatal after-effects did not appear. EtCl was fatal in doses which had no narcotizing effect. The least active compd. as a narcotic was Pr chloride, being $1/7$ as active as $CHCl_3$. Its toxicity was slight. EtBr bromide was $1/4$ as active as $CHCl_3$; Pr bromide $1/3$ as active. The latter was toxic in narcotizing concns. Thus, as regards narcotic effect the series stands: Pr chloride, EtBr, methylene chloride, ethylidene chloride, Pr bromide, dichloroethylene, tetrachloromethane, ethylene chloride, $CHCl_3$ and tetrachloroethane. Arranged according to increasing toxicity: Pr chloride, dichloroethylene, ethylidene chloride, methylene chloride, Pr bromide, ethylene chloride, EtBr, $CHCl_3$, tetrachloromethane and tetrachloroethane.

Pharmacological estimation of atropine and scopolamine solutions and their stability. GUSTAV KÜHL. *Arch. expl. Path. Pharmacol.* **109**, 295-9(1925).—Minute quantities of atropine and of scopolamine can be detected by means of blood pressure detns. in cats. The salts of both compds. undergo no loss in acid and alk. reactions (up to pH 9.2) and in heating at 100° for 30 min. They are relatively resistant to alkali.

Absorption, excretion, and distribution of small quantities of lead. BEHREND BEHRENS. *Arch. expl. Path. Pharmacol.* **109**, 332-57(1925).—Administered by mouth Pb (as chloride) is absorbed very slowly, the max. concn. being reached only after 10 hrs. With the administration of small quantities the degree of absorption is proportional to the amt. ingested, but with larger doses the proportion absorbed is diminished. Excretion is chiefly through the feces; the urine contains but little, the expired air none. The extent of the excretion is to a degree proportionate to the concn. of Pb in the body, being relatively high during the first 24 hrs. and then diminishing. After oral, like after intravenous administration, Pb appears particularly in the liver, kidney, bone and intestine. Skin, brain, fatty tissues, muscle and lung are practically free from Pb.

G. H. S.

Influence of saponin upon the absorption of strophanthin and digitoxin. L. KOFLER AND R. KAUREK. *Arch. expl. Path. Pharmacol.* **109**, 362-9(1925).—When saponin is administered by mouth simultaneously with strophanthin or with digitoxin the action of the latter compds. is increased to such an extent that the amt. of strophanthin necessary to cause systolic arrest of the frog heart is reduced to $\frac{1}{3}$, of digitoxin to $\frac{1}{6}$, of the normal amt. This effect is apparently due to an increased absorption from the digestive tract. The effective intralymphatic dose of strophanthin is 0.001 mg. per g.; the *per os* dose is 0.09 mg.; but with a simultaneous administration of saponin the effective oral dose becomes 0.0027 mg. Saponin has a similar, but less pronounced, effect in mice. The lethal dose of digitoxin is reduced by saponin to $\frac{1}{4}$, that of strophanthin to $\frac{1}{2}$. The effect of saponin upon the toxicity of strophanthin for rabbits is doubtful. G. H. S.

Arsenic tolerance. E. AND J. KEESER. *Arch. expl. Path. Pharmacol.* **109**, 370-7(1925).—Although a participation of the lung in the elimination of As could not be detected, the hair of 2 dogs tolerant to As contained such large amts. of As as to make it clear that the hair and probably the entire ectoderm plays a significant role in the deposition and excretion of As. G. H. S.

Pharmacology of body position and the labyrinthine reflex. XIII. Hashish. ERNST JOEL. *Arch. ges. Physiol.* (Pflüger's) **209**, 526-36(1925).—After the administration of ext. of *Cannabis indica* by mouth dogs and cats show an intoxication picture characterized by reeling, lack of movement, a cataleptic-like condition and a general lethargy. The reflex mechanism which regulates body position is but slightly deranged. In decerebrate cats no comparable effect is observed. Apparently the peculiarities of the action of hashish are due to a predominating effect upon the cerebrum. **XIV. Action of bulbocapnine on the intact cat.** GEORG SCHALTENBRAND. *Ibid* 623-42.—In doses of 2.5-5 mg. per kg. of body wt. bulbocapnine causes a loss of movement in cats, but is without effect upon either position reflexes. Larger doses (10-25 mg.) cause a complete loss in motion with a retention of flexion, and the labyrinthine head position reflex as well as the body position reflex are abolished. Still larger doses (40 mg.) restore these reflexes and the retention of flexion becomes changed to a retention of extension. The vision reflex becomes active and muscle tonus is increased. With max. doses (70 mg. or more) tic-like movements develop, with an extreme increase in reflex irritability and the appearance of an epileptic state. Death takes place during a period of respiratory inactivity. **XV. Action of bulbocapnine on the spinal cord and decerebrate cat.** *Ibid* 643-52.—In the spinal cord of the cat small doses (0.0001-0.015 g.) diminish reflex irritability; large doses (0.03 g. or more) cause an increase in tonus, spontaneous twitchings, tremors, etc., and effects resembling those of strychnine—increased reflex, reduction in threshold, distribution of reflex action over the entire body. In decerebrate cats large doses show the same effects, but with small doses a diminution of reflex action is not observed. **XIV. Action of bulbocapnine on thalamus cats.** OTTO GRINDT AND GEORG SCHALTENBRAND. *Ibid* 653-63.—Tested on thalamus cats, small doses (0.0004 g. per kg.) given intravenously to animals with isolated leg muscles caused a marked loss or abolition of the periodic motor discharges, while the spinal cord reflexes remained unchanged. Unconfined thalamus cats did not react at all to small subcutaneous injections, but with larger doses (0.02 g.) they became quiet. The reactions characteristic of the intact animals were lacking. Larger doses (0.04 g.) caused a return of spontaneous activity with a loss of coordination. Doses of 0.1 g. caused tonic convulsions with augmented reflexes. The epileptic state did not appear. **XVII. Action of bulbocapnine on cats with damaged cortex. Localization of symptoms which develop in the intact animal during bulbocapnine intoxication.** GEORG SCHALTENBRAND. *Ibid* 664-74.—In the acute expt. bulbocapnine acts on the animal with damaged corpus striatum exactly as on the thalamus animal. Animals with a bilateral destruction of the centralis react more strongly than decerebrate animals, and less intensively than does the normal animal. Apparently bulbocapnine attacks the whole of the central nervous system, and, in general, small doses are depressing while large doses are stimulating. Cataleptic-like phenomena occur after av. doses only in animals with an intact cerebrum. G. H. S.

Role of some electrolytes on the innervation mechanism of secretory processes. I. Action of vegetative poisons on the activity and on the electrolyte content of the saliva of the submaxillary gland. DANIEL ALPERN. *Arch. ges. Physiol.* (Pflüger's) **209**, 723-37(1925).—The saliva is characterized by a const. relationship as to its content in Ca and in K salts. The relation of these salts to each other is of particular importance as regards salivary secretion, since the coeff. of the relation of Ca to K det. the character of the secretory process. Pilocarpine, and physostigmine especially, give

occasion to a salivary secretion of normal electrolyte content, while suprarenine causes an increase in the Ca content or a reduction in K. Adrenaline saliva is to be considered as a mixed secretion product, in that it is induced both by a stimulation of the sympathetic nerve endings and by stimulation of the parasympathetics. Casensiti zes to the sympathetic action of suprarenine; K appears to be antagonistic to this action. The effect of Ca is undoubtedly connected with the action of the sympathetic nerves, while K is associated with the parasympathetic innervation. II. Effect of section and of stimulation of nerves on the activity and electrolyte content of the saliva of the sub-maxillary gland. *Ibid* 738-52.—Further evidence of the close relationship of Ca and K is presented. G. H. S.

A discussion of the use of alkali in the treatment of diabetic coma. BYRON D. ROWEN AND GILBERT M. BECK. Buffalo General Hospital, *Bull.* 3, 13-7(1925).—For diabetic coma or threatened coma 20-25 g. NaHCO_3 is recommended, particularly in patients who show a retention of org. acids or where a degree of nephritis is present. NATHAN VAN PATTEN

Effect of ethyl urethan anesthesia on the acid-base equilibrium and cell contents of the blood. J. A. HAWKINS AND J. B. MURPHY. *J. Exptl. Med.* 42, 609-18(1925).—When anesthesia is produced in rabbits or rats by injections of Et urethan, the CO_2 content and p_{H} of the whole blood of the animal are more or less rapidly increased to a point where there is a marked uncompensated alkalosis which reaches its max at 24 hrs. and persists for 48 hrs. The increase in the CO_2 content and p_{H} of the whole blood is accompanied by a decrease in the circulating lymphocytes and an increase in the polymorphonuclear leucocytes. C. J. WEST

Proposed standardized method for the therapeutic study of compounds in experimental rabbit syphilis. G. E. WAKERLIN, W. F. LORENZ AND A. S. LOEVENHART. *J. Pharmacol.* 26, 187-97(1925).—See *C. A.* 19, 3128. C. J. WEST

Effect of strophanthin on pulsation rate in the dorsal blood vessel of *Lumbricus terrestris*. C. L. WIBLE. *J. Pharmacol.* 26, 199-201(1925).—Strophanthin exerts its characteristic action on an elementary heart, in this case, the dorsal blood vessel of the earthworm. C. J. WEST

Pharmacology of the isolated vein ring. K. J. FRANKLIN. *J. Pharmacol.* 26, 215-25(1925).—Contraction of the isolated vein ring is caused by adrenaline, EtOH, Ba, Ca, K, large amts. of chloral hydrate, digitalin, ergamine, ergotoxin, Et₂O in some cases, nicotine, pituitrin and strophanthin. Relaxation is caused by adrenaline after ergotoxin, small quantities of chloral hydrate, Et₂O in some cases, nitrite, CO_2 and urethan. No effect is caused by atropine, acetylcholine, pilocarpine, apocodeine, caffeine, theobromine, diuretin, cocaine, Mg, quinidine and strychnine. Rhythmical movements have been observed in veins before the application of any drug and also under the influence of adrenaline, ergamine and ergotoxin. C. J. WEST

Action of urethan on involuntary muscle. K. J. FRANKLIN. *J. Pharmacol.* 26, 227-32(1925).—Urethan in doses between 1.45 and 1.200 causes diminution in tone and in rhythmic movements in involuntary muscle, as studied in isolated tissue preps. In the rabbit it affects the mesenteric vein, intrapulmonary bronchus, pulmonary artery, inferior vena cava, uterus, spleen and small intestine. In the ox it relaxes the mesenteric vein. It has no effect on the systemic aorta or gall bladder of the rabbit. It relaxes the mesenteric artery and intrapulmonary bronchus in the sheep. The action of drugs which normally cause contraction of some of the muscular tissue used is lessened or abolished. C. J. WEST

Relationship between chemical structure and physiological action. The effect of *l*-suprarenine (synthetic epinephrine) and various derivatives upon the blood sugar of normal rabbits. H. E. DUBIN, H. B. CORBITT AND LOUIS FREEDMAN. *J. Pharmacol.* 26, 233-41(1925).—The hyperglucemic action of the compds. studied is in the following order of decreasing intensity: *l*-suprarenine, *dl*-suprarenine, *dl*-Me ether of suprarenine, *d*-suprarenine, epinine, *dl*-Et ether of suprarenine, methylaminoacetopyrocatechol, suprarenine anhydride, tyramine and pyrocatechol. The importance of the sec. HO group in the configuration of the mol. is shown. Whether its orientation is such that the *d*- or the *l*-form results, is also of importance. When substitution occurs or H_2O is split out to form the anhydride, the effect on the animal organism is altered as indicated by the decreased hyperglucemic action. C. J. WEST

Influence of the adrenals on the toxicity of morphine. J. M. ROGOFF AND JOS. DE NECKER. *J. Pharmacol.* 26, 243-58(1925).—There is no foundation for the statement that double adrenalectomy in rats causes them to become 50-500 times more sensitive to morphine than normal animals. There is, indeed, no evidence that any significant change in tolerance occurs. Most of the deaths, resulting from double

adrenalectomy in rats, occur within a period of about 10 days, beginning toward the end of the 1st week following the operation. Tests for tolerance of depressing drugs or potent bacterial toxins cannot yield reliable results if made during this period of high mortality in adrenalectomized rats. C. J. WEST

Acute cocaine poisoning, its prophylaxis and treatment in laboratory animals. A. L. TARUM, A. J. ATKINSON AND K. H. COLLINS. *J. Pharmacol.* **26**, 325-35(1925); cf. *C. A.* **19**, 1907.—The av. min. fatal subcutaneous dose of cocaine is 100 mg. per kg. body wt. in the rabbit and 26.7 mg. per kg. in the dog. Artificial respiration alone is sufficient to raise the min. fatal dose in the rabbit from 100 to approx. 350 mg. per kg. In the dog and cat artificial respiration does not significantly change the min. fatal dose. The prophylactic administration of barbital Na and paraldehyde to the dog produces a condition in which the fatal dosage of cocaine lies above 100 mg. per kg., approx. a 4-fold increase in tolerance. Convulsions are completely and practically instantaneously controlled by an intravenous injection of this mixt. Likelihood of recovery from acute intoxication by cocaine in the dog is roughly inversely proportional to the time convulsions are permitted to continue. Cocaine poisoning is believed to be due to the effects of direct medullary injury together with the deleterious indirect effects of the cocaine-poisoned brain on the medullary centers. C. J. WEST

Active principles of the pituitary extract. H. H. KNAUS. *J. Pharmacol.* **26**, 337-46(1925).—Ext. equal to 1 mg. of moist posterior lobe of the pituitary injected intravenously produces in the pithed cat a strong action on the uterus lasting for at least 1 hr. together with a marked rise of blood pressure. The corresponding dose for a human being is an ext. equal to about 25 mg. of the moist gland and this appears to be the max. dose that should be given intravenously. Larger doses are permissible for hypodermic or intramuscular injection, especially as the absorptive capacity of the subcutaneous tissues is impaired during pregnancy. C. J. WEST

Action of certain drugs and ions on the rat uterus. H. H. KNAUS AND A. J. CLARK. *J. Pharmacol.* **26**, 347-58(1925).—Adrenaline causes inhibition of the rat uterus *in situ* as well as when isolated but the concn. required to produce an effect *in situ* is 10-100 times that which acts on the isolated uterus. The uterus in a late stage of pregnancy is inhibited as readily as the virgin uterus. The min. dose per kg. body wt. of adrenaline which inhibits the rat uterus *in situ* is about 0.0005 mg., which is similar to the amt. required to produce a visible rise of blood pressure in larger animals. Pituitary ext. and K excess cause similar effects, which are the opposite of those produced by adrenaline. The dose of fresh posterior pituitary lobe needed to produce a demonstrable effect on the uterus *in situ* is about 0.16 mg. per kg. body wt., this is much greater than the amt. needed to stimulate the cat uterus and the dose per rat is as high as $\frac{1}{60}$ of the active principle in a rat pituitary. Variations in the Ca content of Locke fluid do not produce in the isolated uterus of the rat effects the opposite of those produced by similar variations in the K content. C. J. WEST

Comparative study of hypnotics of the barbituric acid series. CARL NIELSEN, J. A. HIGGINS AND H. C. SPRUTH. *J. Pharmacol.* **26**, 371-83(1925).—The following figures give the min. fatal dose in mg. per g. of rat, the min. effective dose in mg. per g. of rat and the safety margin (difference between the 2 values expressed in % of the min. fatal dose) for 16 derivs. of barbituric acid: Di Et (barbital) 0.31, 0.225, 27, iso-PrEt, 0.11, 0.09, 18; BuEt (neonal), 0.19, 0.0625, 67; iso-AmEt (amytal), 0.11, 0.0575, 59; PhEt (luminal), 0.14, 0.11, 21; (PhCH₂)Et, produced convulsions, iso-PrBu, 0.16, 0.0725, 55; di-Bu, 0.38, 0.20, 47; diallyl (dial), 0.15, 0.06, 60, Et-allyl, 0.18, 0.1025, 43; Pr-allyl, 0.175, 0.072, 59; iso-Pr-allyl (allonal), 0.125, 0.0525, 58; Bu-allyl, 0.27, 0.075, 72; iso-Bu-allyl, 0.175, 0.0525, 70; sec-Bu-allyl, 0.09, 0.0375, 58; iso-Am-allyl, 0.17, 0.085, 50. C. J. WEST

Mechanism of vagus inhibition as produced by adrenaline. W. J. R. HEINEKAMP. *J. Pharmacol.* **26**, 385-96(1925).—Eserine lowers the threshold of vagus stimulation. Adrenaline effects inhibition of the heart before and after section of the vagi and after nicotine, but not after atropine. The slowing is more pronounced after a sensitizing dose of eserine. This action under the conditions of these expts. is a synergistic action of eserine. The inhibition is not due to central stimulation by the blood pressure but seems to be a direct stimulation of the parasympathetic nerve app. in the heart. The site of action of adrenaline, whether on the sympathetics or parasympathetics, depends on which set of nerves has the lower threshold, adrenaline acting on that one. C. J. WEST

CUSHNY, A. R.: **The Action and Uses in Medicine of Digitalis and Its Allies.** London: Longmans, Green & Co. 303 pp. 18s. Reviewed in *Analyst* **50**, 533; *Chemistry & Industry* **44**, 935(1925).

RENNER, ALBRECHT: **Schlafmittel-Therapie**. Berlin: Julius Springer. 125 pp. Reviewed in *Am. J. Pharm.* 97, 651(1925).

SCHMIDT, HANS: **Antimon in der neueren Medizin**. Leipzig: Johann Ambrosius Barth. 68 pp. G. M. 3. Reviewed in *Am. J. Pharm.* 97, 787(1925).

I—ZOÖLOGY

R. A. GORTNER

The mucoproteins of the snails, *Helix aspersa* and *Helix pomatia*. P. A. LEVENE. *J. Biol. Chem.* 65, 683-700(1925).—"The carbohydrate radical isolated from the mucoproteins of the mucus of *Helix aspersa* and *pomatia* belongs to the group of mucosins. On partial hydrolysis the polysaccharides yield the disaccharide mucosin. From the product of complete hydrolysis there were isolated H₂SO₄, chitosamine, and a volatile fatty acid. On distn. with HCl, the mucosin yielded furfural in a quantity required by the theory of the structure of this disaccharide. From the bodies of the snails a substance is obtainable which may be regarded as animal gum and which consists largely of a polygalactose, perhaps of an acetylated polygalactose. From the bodies of the snails by mere extn. with H₂O and by further treatment by the process of Pflüger and Nerking (for the isolation of glycogen) an identical polysaccharide can be isolated."

A. P. LOTHROP

Body fluids of the honey bee larva. II. Chemical constituents of the blood, and their osmotic effects. G. H. BISHOP, A. P. BRIGGS AND E. RONZANI. *J. Biol. Chem.* 66, 77-87(1925); cf. *C. A.* 18, 866.—As compared with human blood the blood of the honey bee contains more sugar during the feeding period but during pupation the sugar content reaches a level comparable to mammalian blood. Amino acids are 50% higher, proteins slightly lower and fats higher than in human blood. The inorg. P is 1070% of that in human blood, Ca 150%, Mg 800%, K 172%, Na 41%, and Cl 33%; carbonates are only slightly lower, varying with conditions. The total salt content is thus much lower. The amino acids are the most effective fraction osmotically, having twice the value of the inorg. salts. Changes in sugar content with changed activity account for a large part of the lowering of the osmotic pressure during pupation. Approx. 90% of the osmotic pressure can be accounted for by the constituents detected by analysis. Formation of unionized compds. of Ca with amino acids probably holds part of the Ca in soln. as a prepd., analyzed salt soln. ppts. at the *p_H* of the blood. "A soln. of amino acids sepd. from a casein tryptic digest has an osmotic pressure considerably higher than can be accounted for by the known constituents. It is possible that similar metabolites may be present in blood to account for the unexplained fraction of its osmotic pressure."

A. P. LOTHROP

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Acid- and base-forming elements in foods. G. W. CLARK. *J. Biol. Chem.* 65, 597-600(1925).—Data are given on the amts. of acid- and base-forming elements in the following foods: white and Graham bread, Graham crackers, shredded wheat, rice, whole milk, cheese, canned roast beef, eggs, fresh green peas and string beans, peeled raw potatoes, tomatoes, raisins, dried apples, dried prunes, apple base jelly. The data are in the nature of a supplement to the material presented by Sherman, Forbes and others and presumably indicate the effects that different soils and climate might have upon the mineral content of the various foods. Most of the materials analyzed were California products which were used during 2 extensive expts. in adult mineral metabolism.

A. P. LOTHROP

Viscosity studies with Nebraska wheat flours. M. J. BLISH AND R. M. SANDSTEDT. *Cereal Chem.* 2, 191-201(1925).—Coeffs. of correlation were computed for loaf vol. and each of the following factors, resp.: actual viscosity with and without removal of electrolytes, ratio of viscosity to protein content both with and without removal of electrolytes. The correlation between viscosity and protein content also was computed. There was a decided positive correlation between loaf vol. and protein content, although it was rather low. A positive correlation of the same order between actual viscosity (without preliminary removal of electrolytes) and loaf vol. was found. In case of the removal of the electrolytes there was a slight positive, but lower correlation between loaf vol. and ratio of actual viscosity to protein content. The positive correlation between actual viscosity and protein content was rather high. Therefore, for

this series of flour, protein content would have been just as valuable a constituent for predicting baking strength as knowledge of actual viscosity. Constant "b" suggested by Gortner as a measure of gluten quality was detd. for 19 flours. Diastatic power and glutenin were detd. for each of these flours. From these data either of two conclusions is possible: (1) No generally known viscometric procedure has been perfected by means of which gluten strengths of Nebraska flour may be predicted with reasonable accuracy; (2) there is some important factor aside from gluten quality—as measured by viscometric procedure—glutenin content, or diastatic value which detcs. baking strength in Nebraska flours

RUTH BUCHANAN

Hydrogen ions and their application to mill control. H. E. WEAVER. *Cereal Chemistry* 2, 209-12(1925).—The desirability of maintaining a uniform H-ion concn. in various grades of flour led to the making of observations and recording of results for a period of more than 3 years. The change in H-ion concn. occurs on different crops and during different seasons, and does not lend itself to mill control by blending or selection. The tempering process affects the H-ion concn. of wheat but little when carried to a period of 36 hrs. Longer periods of tempering might be the cause of unsound and musty flour. The tempering process offers no means of controlling H-ion concn. of mill products. The Alsop process of bleaching effects a slight increase in the H-ion concn. of a flour; Cl effects a substantial increase in H-ion concn. The use of Agene or Novadel is without effect

R. B.

Viscosity and baking quality. E. E. SMITH. *Cereal Chemistry* 2, 179-89(1925).—Ten flours covering a wide range of viscosity and baking quality and of known grade and origin were studied. A Sheely pipet was used for viscosity detn. Viscosities detd. by leaching out sol. constituents do not seem to possess any more merit than those detd. in flours without leaching. All flours of high viscosity were of excellent baking quality. Flours of low viscosity ranged from excellent to poor in baking quality, except possibly in the case of short and standard patents, within each of which grades there seems to be some correlation between viscosity and baking quality

R. B.

A study of methods of determining loaf volume of bread. W. O. WHITCOMB. *Cereal Chemistry* 2, 305-10(1925).—The efficiency of the more commonly used methods employed in measuring bread was studied. Standard loaves made from wood and enameled so as to make them impervious to water were used. Of the methods tested three depend on displacement of seeds and one depends on the displacement of water after the loaf has been waterproofed. Rape, flaxseed, sweet clover, millet, vetch and wheat were seeds used for displacement. Millet and peas showed the greatest variation in range of 3 or more readings while the peas showed the greatest deviation from the standard. Millet and sweet clover showed the least deviation from the standard. It is not practicable to measure vol. closer than 10 cc. Greater deviation was noticed in the use of different measuring devices than in different seeds.

RUTH BUCHANAN

Effects of diastase and malt extract in dough. F. A. COLLATZ and O. C. RACKH. *Cereal Chem.* 2, 213-27(1925).—Exptl. data show that the Lintner value of a flour is not an accurate index of its converting powers in a dough. With the flour as a substrate, an accurate idea of the reducing sugars which will be formed in a dough can be obtained. When diastatic malt is added to a dough, a large amount of conversion takes place in mixing, this being evidenced by a soft, wet or sticky dough. The addition of diastatic malt ext. to flours of av. baking strength apparently decreases the quality of the resulting bread.

RUTH BUCHANAN

The composition of cakes. W. C. LUCKOW. *Baking Tech.* 4, 296-9(1925).—Analyses are given of gold, silver, sponge, chocolate layer and devil's food cakes as put out by a large firm. Between bread and cake from the caloric standpoint there is very little difference

RUTH BUCHANAN

The composition of pies. Wm. C. LUCKOW. *Baking Tech.* 4, 209-12(1925).—Moisture, fat, ash, N-free ext., total sugar, starch and calories per lb. as calcd. from analyses are about the same for the fruit pies. Moisture and fat of custard with coconut are somewhat higher. The N-free ext., starch and total sugar are about the same for the fruit pies but somewhat lower for coconut with custard and custard pies. This may be accounted for in part by the fact that the fruit pies had 2 crusts and the others 1.

RUTH BUCHANAN

Report of Committee on Methods, American Association of Cereal Chemistry. C. E. MANGELS. *Cereal Chem.* 2, 235-51(1925).—Chemists are requested to report 2 decimal places for moisture, 3 for ash and 2 for protein. A tolerance between 2 different labs. of 0.3% moisture, 0.02% in ash (if same method is used) and 0.25% on protein when calcd. to a uniform moisture basis is allowable. Methods for moisture should specify a definite time of heating rather than heating to const. wt. and direc-

tions for cooling in a desiccator should be made more specific as to time. It is recommended that different methods of standardizing acids for Kjeldahl detn. be studied collaboratively and also the viscosity of flours. The effect of time and temp. on the capacity of boric acid to fix ammonia is to be studied
RUTH BUCHANAN

Hygroscopic moisture of cereal grains and flaxseed exposed to atmospheres of different relative humidity. D. A. COLEMAN AND H. C. FELLOWS. *Cereal Chemistry* **2**, 275-87(1925).—Wheat responds readily to changes in humidity of the surrounding air, the rate depending entirely upon the conditions of exposure. Protein content or percentage of dark hard and vitreous kernels shows no relation to the hygroscopic moisture. The hygroscopic moisture of samples of different market classes of wheat does not vary appreciably. The hygroscopic moisture in corn, oats, barley, buckwheat, rice and rye does not differ much from that of wheat, but flaxseed contains appreciably lower percentages of hygroscopic moisture than the cereal grains which were studied. Hygroscopic moisture does not increase at a uniform rate when in equil. with increasing relative humidity of the atm. Each increment of increase in humidity is accompanied by an acceleration in the rate of increase in content of hygroscopic moisture. The curve resulting from plotting humidity as abscissas against hygroscopic moisture as ordinates takes the form of a parabola.
RUTH BUCHANAN

Variation in the composition of milk. TOCHER. *Scottish J. Agr.* **8**, 70-1(1925).—Of a total of 750 samples of milk from as many individual cows, 10% contained less than 3% butter fat and 24% contained less than 8.5% of solids other than fat.
K. D. JACOB

Acidity-reduction in cream for butter making. The use of bicarbonate of soda. G. M. VALENTINE. *New Zealand J. Agr.* **31**, 1-8(1925).—A general discussion with particular reference to the precautions necessary in the use of NaHCO_3 for reducing the acidity of cream.
K. D. JACOB

Effect of projecting staples on butter packed in "four-one" boxes. ANON. *New Zealand J. Agr.* **31**, 31(1925).—Galvanized Fe staples in direct contact with butter packed in wooden boxes and placed in cold storage for 6.5 months were corroded but the butter around the staples was not discolored, possessed no marked taste, and contained only a trace of Zn. Fe wire staples under the same conditions were badly rusted, and discolored the butter for a distance of 0.25 in. One layer of paper reduced the rusting and corrosion and two layers afforded complete protection.
K. D. JACOBS

Variation in the composition of cheese. BERRY. *Scottish J. Agr.* **8**, 70(1925).—The av. compn. of the dry solids in samples of Scottish, New Zealand and Canadian Cheddar cheese, resp. collected during 1924 was as follows: fat 51.10, 33.30, 51.60; protein 39.90, 36.90, 39.20; fat:protein ratio 0.77, 0.69, 0.76; ash 5.90, 5.20, 5.50; moisture on original 35.70, 32.60, 29.70.
K. D. JACOBS

Cheese standards. ANON. *Scottish J. Agr.* **8**, 70(1925).—From the results of analyses of domestic cheese it is concluded that a standard of 50% fat is, on the whole, too high for Scotland.
K. D. JACOBS

Disinfecting and washing citrus fruit. II R. SHIVER. *Chem. Met. Eng.* **32**, 812(1925).—In the recently developed procedure for washing and disinfecting citrus fruit with solns. of soap and borax (C. A. **19**, 555) the use of hard water develops a greyish cast on the surface of the fruit. Investigations carried out in a packing plant where the use of these solns. made up from hard water could not be generally adopted because of complaints from the fruit-markets showed that Ca and Mg salts were deposited on the fruit during the process. In using soft water this difficulty is eliminated.
D. THUESSEN

Requirements of pectin for the commercial jelly maker. ELOISE JAMESON. *Ind. Eng. Chem.* **17**, 1291-2(1925).—The necessity of using exact proportions of ingredients in order to form an ideal jelly is emphasized. The technic of jelly making is described. The following topics are discussed: (1) high jelling power, (2) standardized jelling power, (3) a pH value when in soln. below 7 but high enough so that it will not make a jelly without additional acid, (4) ability to cause quick setting of jelly, (5) neutrality of color and flavor for mfg. fine flavored jellies and jams—for low-grade jellies pectin preps. with fruit flavors may be desired, (6) ability to make a clear soln., (7) ease of use, (8) stability during storage and use.
I. W. RIGGS

Use of sodium nitrite in curing meats. W. L. LEWIS, R. S. VOSE AND C. D. LOWRY, JR. *Ind. Eng. Chem.* **17**, 1242-5(1925).—The usual amt. of NaNO_2 may be replaced by 0.1 its wt. of NaNO_2 in curing hams, bacon, tongues and beef. Much work remains to be done before the new agent can be applied with assurance to all types of cured meats.
L. W. RIGGS

Fish meals. I. The nature of the water-soluble nitrogen compounds. W. L.

DAVIES. *J. Soc. Chem. Ind.* **44**, 487-91T(1925).—The distribution of N and acidity in 2 "yellow" meals (A, B), 3 "white" meals (C, D, E) and a fish manure (F) is, resp. NH₄ N 1.96, 2.94, 2.37, 2.17, 2.10, 1.58; other volatile base N 0.38, 1.70, 0.99, 1.39, 1.20, 0.56; other alc.-sol. N 7.86, 10.26, 8.64, 11.84, 12.10, 3.51; alc.-insol., H₂O-sol. N 11.50, 25.50, 11.00, 24.40, 21.10, 22.65; insol. protein N 78.30, 59.60, 77.00, 60.20, 58.20, 71.70; volatile acids (as AcOH) 11.52, 7.08, 0.93, 0.15, 1.42, —; non-volatile acids (as lactic acid) 1.00, 0.93, 1.13, 0.95, 0.92, —. By "other alc.-sol. N" is meant a fraction contg amino acids and polypeptides and other higher protein degradation products sol. in alc. By "alc.-insol., H₂O-sol. N" is meant a fraction contg a small quantity of sol. protein, and alc.-insol. proteoses, peptones, and polypeptides. The amt. of the simpler degradation products of proteins is larger in the "yellow" than in the "white" meals, while the latter contain more of the higher protein-fission products, which is attributed to the prolonged drastic treatment to which the former type of meal is subjected. The detn. of volatile fatty acids shows that more decompos. of fat and of amino acids has occurred in the "yellow" meals. A. PAPINEAU-COUTURE

A study of the process of making clamp silage. A. AMOS AND H. E. WOODMAN. *J. Agr. Sci.* **15**, 44-53(1925).—An investigation of the changes occurring during the preservation of the oat and tare crop in the clamp silo reveals that the material in the silo may be divided into 3 types: an upper thick layer of moldy material, a "sweet" silage in the middle layers and a wet "sour" silage in the bottom layer. The loss of dry matter in the "sour" silage layer amounted to 1/5 of the dry matter of the drop originally in that layer and was accompanied by a heavy destruction of carbohydrates. The loss in dry matter in the sweet layer was much smaller and was comparable in magnitude with that occurring during the production of "green fruity" silage in tower silos. Chem. characteristics of the "sour" silage were a high proportion of volatile bases to amino acids, and volatile acids were present in appreciable excess of non-volatile org. acids. Crude protein of this silage consisted to an appreciable extent of NH₄ compds. of org. acids of inferior nutritive value. Fiber was in excess of the amt. of carbohydrates present. R. B. DEEMER

The feeding of cows. Steamed bone flour as a mineral supplement for milk cows. A. C. McCANDLISH. *Scottish J. Agr.* **8**, 55-7(1925).—Steamed bone meal, fed at the rate of 0.5 lb. per cow per day as a supplement to the regular ration, produced an av. increase of 2% in the fat content of the milk but did not alter the total milk production and produced no significant variation in the acidity and rate of coagulation of the different samples. K. D. JACOB

The variation in moisture and N content of the potato (FAGAN) 11D. Evaporator for milk (U. S. pat. 1,562,713) 1. Filter for milk (U. S. pat. 1,563,904) 1.

ROUSSET, H.: **Conserves alimentaires.** Paris: Desforges, Girardot & Cie. 253 pp. 13.50 fr. Reviewed in *Chimie et industrie* **14**, 820(1925).

Food composition. E. MONTI. U. S. 1,563,515, Dec. 1. A fruit ext., e. g., grape pomace ext., after treatment to effect predigestion of proteins, is mixed with a substantially equal quantity of torrefied flour, and with flavoring, sugar and baking powder, and the mixt. is dried at a temp. not exceeding 100°.

Bran food. J. L. KELLOGG. U. S. 1,564,181, Dec. 1. A mixt. of bran with malt or other diastatic material is moistened and heated to convert the bran starches into malt sugars. The product is then cooked, dried, disintegrated and toasted.

Sterilizing canned foods. W. B. FENN. U. S. 1,563,971, Dec. 1. The contents of a can are subjected to steam under pressure and the steam under pressure is sealed within the can. The can and its contents are preliminarily subjected to a vacuum to prep. it for the subsequent steam treatment.

Esters of fatty acids. R. H. MCKEE. U. S. 1,542,513, June 16, 1925. Artificial food products for use in treating diabetes and acidosis comprise dihydroxy-alc. esters of fatty acids of odd-number of C atoms, e. g., glycol esters of fatty acids contg. 11 to 19 C atoms. The fatty acids are first prepd. synthetically and are then esterified, e. g., with glycol by heating to about 150° *in vacuo* or in a current of CO₂.

Cooking and extracting vegetable substances. C. R. MABEE. U. S. 1,565,282, Dec. 15. Moistened material is subjected to alternate compression and expansion, (e. g., by the action of a screw conveyor within the extn. app.) while heated and under superatm. pressure, in order to break down the starch granules and fiber structures, effect a partial conversion into sugars and render the product more assimilable. An

app. is described adapted for the treatment of sugar cane, fodder, hay or other vegetable materials for prepg. foods for human or animal consumption. U. S. 1,565,283 specifies a somewhat similar process in which the material under treatment may be heated and passed successively (first at about 95° and then at about 100°) through steam-jacketed tubes contg. screw conveyers.

Treating flour with benzoyl peroxide and similar compounds. T. KROEBER. U. S. 1,565,375, Dec. 15. Benzoyl peroxides or other similar compds. used for treating flour or like substances are comminuted to a fineness not larger than that of particles of ordinary flour (*c. g.*, by the method described in U. S. 1,555,805 (*C. A.* 19, 3491)) before use as specified in U. S. 1,380,334 (*C. A.* 15, 3349) to increase their effectiveness of action.

Dough. L. N. EARL. U. S. 1,563,694, Dec. 1. A special formula (in which both baking powder and yeast are used) is given for prepg. a dough which may be marketed as such for making biscuits, rolls, etc., and which may be kept for several days before use at temps. such as those used for keeping fresh meats.

Preserving fruits. J. G. MAGAW and A. S. MAGAW. U. S. 1,564,599, Dec. 8. Fruits and berries are preserved (without addn. of H₂O) by adding dextrose to them, subjecting the mixt. to a freezing temp. and maintaining approx. a zero temp. until ready for use.

Composition for preserving eggs. C. C. SHAFER. U. S. 1,562,854, Nov. 21. Eggs are coated with a mixt. formed from heavy petroleum oil, gum damar, Burgundy pitch, cerasin wax, Japan wax and sugar or other carbohydrate.

Desiccating eggs. C. E. BARNHILL. U. S. 1,563,953, Dec. 1. Egg yolks and albumin are sep'd. and the albumin is exposed in the form of a thin suspended film so that both sides of the film are subjected to the drying action of a warm air current.

Treating milk. A. W. BOSWORTH and L. H. CHRYSLER. U. S. 1,563,891, Dec. 1. Milk is treated with NaH₂PO₄ or other substance contg. the PO₄ radical under such conditions as still to leave the casein of the milk in soln., the milk is rendered slightly alk. so that Ca in the milk is converted into insol. Ca phosphate, the latter is removed, and any undesired excess of alkali remaining in the milk is neutralized. This treatment is adapted for prepg. milk for feeding infants.

Apparatus for pasteurizing milk in bulk. D. C. KERCKHOFF and R. COPP. U. S. 1,563,905, Dec. 1.

Chocolate-flavored milk beverage. S. J. DAVIS. U. S. 1,563,020, Nov. 24. A mixt. of milk, sugar and chocolate is heated to about 70° for 15 min., homogenized at about the same temp. under 2000 lbs. pressure per sq. in., and sterilized.

Food. H. S. MELLORT. U. S. 1,564,262, Dec. 8. Chocolate flavor is added to coned milk and the resulting mixt. is homogenized while warm, cooled, sweetened and subsequently sealed in containers and sterilized.

Bleaching chocolate. J. B. BARNITT. U. S. 1,563,682, Dec. 1. Ground, roasted cacao nib from which the cacao butter has been largely expressed is treated with a slightly alk. H₂O₂ soln.

Renovating butter. R. KAISER. U. S. 1,541,150, June 9, 1925. Inferior or rancid butter is decomposed in milk and the cream regenerated is churned again after addn. of a mixt. of butyric acid obtained from pure butter and butyric ether. The rancid butter and milk are heated and homogenized together before sep'n. of the cream.

Apparatus for reducing the offal of slaughterhouses to grease and tankage. H. P. TAYLOR. U. S. 1,567,014, Dec. 22.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The fourth (French) congress of industrial chemistry. MAURICE DESCHIENS. *Chimie et industrie Special No.*, 1-63 (Sept. 1925).—A detailed account of the proceedings. A. PAPINEAU-COUTURE

The administration of industrial research. EDW. R. WEIDLEIN. *Ind. Eng. Chem.* 18, 98-101 (1926). E. J. C.

Applications of catalysis in the chemical industries. II. Hydration and dehydration. P. PASCAL. *Technique moderne* 17, 757-64 (1925); cf. *C. A.* 19, 2990.—A review of the hydration of C₂H₂ to AcH, hydrolysis of fats and of carbohydrates, dehydration of alcs. for the manuf. of C₂H₄, synthetic rubber, Et₂O, prepn. of esters, manuf. of Me₂CO and of synthetic resins. A. PAPINEAU-COUTURE

Use of cold in chemical industries. CH. DARLET. *Chimie et industrie Special No.*, 144-8 (Sept. 1925).—Brief review of its possibilities. A. PAPINEAU-COUTURE

The chemist and industrial health. J. G. CUNNINGHAM. *Can. Chem. Met.* 9, 218-20 (1925). E. H.

Protection of personnel and plant in chemical works. REX FURNESS. *Chem. Age* (London) 13, 438-41 (1925). E. H.

The engineer—his due and his duty in life. THOMAS CARTER. *Electrician* 95, 706-7 (1925).—An address. C. G. T.

What is your capital ratio? C. R. DELONG. *Chem. Met. Eng.* 32, 853-4 (1925).—The first of a series of articles on the economic phases of the chem. engineering industries. "Capital ratio" means the relation of capital invested in the industry to the value of the products it produces. Capital ratios in numerous industries are compared for 4 different years, and the chem. industries are shown to have a relatively high ratio. W. H. BOYNTON

Some recent improvements in commercial crystallization processes. J. H. FRYDLENDER. *Rev. prod. chim.* 28, 721-8, 757-60 (1925).—Review. A. P.-C.

The heat insulation of kilns and other high temperature installations. A. T. GREEN. *Trans. Ceram. Soc. (Eng.)* 24, 240-61 (1924-5).—The selection of insulating material for high-temp. work cannot be based on insulating efficiency alone. It is essential to know the proposed use, particularly the face temp. The following data are required: coeff. of thermal cond. at temps. 300-800°, or the insulating efficiency based on a test simulating industrial conditions; % porosity, together with some description of the nature of the pore-spaces; refractoriness, together with the temp. at which the material disintegrates or otherwise loses its structure; crushing strength as an indication of the mech. strength. H. F. S.

Cable paper [for insulators] (BELANI) 23.

Beiträge zur Geschichte der Technik und Industrie. 1924 Year book of Vereines Deutscher Ingenieure. Edited by Conrad Matschoss. Berlin: V. D. I. Verlag. 278 pp. \$1 75. Reviewed in *Mining Met.* 6, 590 (1925).

BRANNT, W. T. AND WAHL, W. H. *Techno-Chemical Receipt Book*. New and enlarged ed. New York: Henry Carey Baird & Co., Inc. 516 pp. \$2.50. Reviewed in *Chemicals* 24, No. 15, 42 (1925).

The Chemical Engineering Catalog, 1925. 10th ed. Francis M. Turner, Jr. Tech. editor. New York: The Chemical Catalog Co., Inc. 1182 pp. Price \$10 00, leasing fee, \$2 00 (\$3.50 foreign). Reviewed in *Ind. Eng. Chem.* 17, 1207; *J. Franklin Inst.* 200, 827 (1925).

Fortschritte der Chem. Technologie in Einzeldarstellungen. Edited by B. Rasow. Dresden and Leipzig: Theodor Steinkopff. Vol. VI. *Optische Messungen des Chemikers und des Mediziners*, by Fritz Löwe. 166 pp. M. 6; bound, M. 7.20. Vol. VII. *Mineralöle*, by Egon Eichwald. 151 pp. M. 6; bound, M. 7.20. Vol. VIII. *Industrie der Fette und Seifen*, by O. Steiner. 83 pp. M. 4; bound M. 5.20.

HAMILTON, ALICE: *Industrial Poisons in the United States*. New York: The Macmillan Co. 590 pp. 21 s. net. Reviewed in *Nature* 116, 604 (1925).

HAUSBRAND, E.: *Principles and Practice of Industrial Distillation*. Translated by E. Howard Tripp. London: Chapman & Hall, Ltd. 312 pp. 21s net. Reviewed in *Intern. Sugar J.* 27, 607; *Chem. News* 131, 221; *Chemistry and Industry* 44, 1145. (1925).

HOWE, H. E.: *Chemistry in Industry*. Vol. II. New York: Textile Colorist, Inc. 391 pp. \$1.00. Reviewed in *Textile Colorist* 47, 809 (1925); *Ind. Eng. Chem.* 18, 105 (1926); cf. *C. A.* 18, 3661.

Industrial Chemistry. Vol. I. *Inorganic*. Vol. II. *Organic*. Edited by Allen Rogers, et al. New York: D. Van Nostrand Co. 1267 pp. \$10. Reviewed in *Ind. Eng. Chem.* 17, 1296; *J. Franklin Inst.* 200, 829; *Textile Colorist* 47, 809; *Chemicals* 24, No. 21, 45 (1925).

MEYER, JULIUS: *Der Gaskampf und die chemischen Kampfstoffe*. Leipzig: S. Hirzel. 424 pp. Price, paper, M. 12; bound, M. 14. Reviewed in *Ind. Eng. Chem.* 17, 1297 (1925).

RABOZÉE, H.: *Cours de Connaissance des Matériaux*. I—Les métaux et les bois. II—Les matériaux pierreux. Paris: Dunod. Each 296 pp., each Fr. 40.

Solvents: Cotton Solutions and Plasticizers for Lacquers. New York: U. S. Industrial Alcohol Co., Inc., 32 pp. Reviewed in *Chemicals* 24, No. 21, 45 (1925).

Where to Buy Everything Chemical. 1925 ed. London: W. H. Smith & Son.

Deoxidizing enclosed atmospheres. C. J. RODMAN. U. S. 1,557,092, Oct. 13. To deoxidize the gaseous contents of elec. transformer tanks or the like, there is used a mixt. or alloy of Mg 20 and Pb 80% or other metal reactive with O and an inert material such as asbestos. This mixt. is coated with a protective material such as asbestos.

Dehydrating emulsions by externally charged particles. W. MEREDITH. U. S. 1,562,712, Nov. 24. In breaking *emulsions of petroleum* with H_2O or similar emulsions, electrically charged particles such as H_2O particles are added to the emulsion and facilitate coalescence and sepn. of H_2O present in the emulsion.

Separating fibrous material from liquids. W. F. BOYSEN. U. S. 1,557,797, Oct. 20. In forming abrasive wheels, artificial lumber or other articles of fibrous material by extg. the liquid through a perforated forming device, a reagent (such as a neutralizer for pulp contg. acid) is drawn through the material by the suction device, followed by the impregnation of the material with an adhesive or cementing compn. by similar action.

Pulverizing fibrous vegetable materials. E. B. PUTT. U. S. 1,565,864, Dec. 15. Paper pulp or similar fibrous material is immersed in a dil. acid, e. g. H_2SO_4 , and heated until the fiber settles, filtered out from the acid, washed, dried and pulverized. The product thus obtained is adapted for use in dentifrices, cosmetics and other compds.

Drying and conditioning leather or other substances by heated air currents. G. D. HARRIS. U. S. 1,564,566, Dec. 8.

Drying and oxidizing paper, rubber, hides or other materials. G. D. HARRIS. U. S. 1,564,565, Dec. 8. Mech. features.

Composition for producing lachrymating gases. D. B. BRADNER. U. S. 1,565,899, Dec. 15. Chloroacetophenone is combined with fuel material including nitrocellulose to produce an effective concn. of lachrymating gas in non-persistent form by combustion and volatilization. The materials may be packaged in the form of cartridges with fuses attached.

Waterproof heat-insulation. J. H. STONE. U. S. 1,564,797, Dec. 8. A lagging for refrigerating pipes, etc., comprises granulated cork 6-24, loose hair 1-4 and rubber (dissolved in C_6H_6) 1-4 parts.

Insulating material. I. LILIENFELD. U. S. 1,563,205, Nov. 24. An elec. insulating material is formed from cellulose ethyl or benzyl ether or other cellulosic ether in admixt. with a hydrocarbon material of high b. p. and non-conductive character or with various other substances.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Water resources of California. PAUL BAILEY. *J. Am. Water Works Assoc.* 14, 309-14(1925).—A general article covering seasonal variation in vol. and unequal geographical distribution.

D. K. FRENCH

Characteristic water supply struggles in West Virginian cities. E. S. TISDALE. *J. Am. Water Works Assoc.* 14, 331-6(1925).—An historical study of the struggle in West Virginia to control water-borne typhoid fever through treatment of its water supply.

D. K. FRENCH

The salinity of artesian waters of lower and middle Belgium. (Second note). J. DELECOURT. *Ann. soc. geol. Belgique* 48, B41-B52(1925); cf. *C. A.* 19, 231.—The main flows of Belgium and France may be divided into 4 distinct zones: (1) The southern zone of hard waters. French hardness is 20-30°. The saline residue rarely exceeds 500 mg. per l. The water is drinkable. (2) Zone of precipitation. Intermediate between 1 and 3. Diminished hardness. Residue, 1 g. per l. Suitable for use. (3) Saline zone. Ca salts are absent. Characterized by presence of alk. salts. Hardness less, alk. residue 1-3 g. per l. Not recommended for use. (4) Zone of super-salinity. Chlorides of Ca and Mg, also of the alkalis, are present. Saline residue is greater than 3 g. per l. Totally unfit for use.

O. F. POINDEXTER

Supply of bathing and drinking water on plantations. A. W. A. JACOMETTI. *Arch. Suikerind.* 33, 1010-7(1925).—Description of a Jewell installation in Java, illustrated.

F. W. ZERBAN

Studies of the horizontal and vertical regions of activity of surface water, streams and springs. FRANZ HOCHER. *Gas u. Wasserfach* 68, 575-8, 590-2, 610-3, 625-7(1925).—A lengthy mathematical discussion with many diagrams, tables, etc.

WM. B. PLUMMER

Water supply of the city of Los Angeles with particular reference to the area supplied by pumps. WM. W. HURLBUT. *J. Am. Water Works Assoc.* **14**, 379-83(1925).—General and descriptive. D. K. FRENCH

Softening public water supplies. J. C. WHITE. *J. Am. Water Works Assoc.* **14**, 106 19(1925).—The Porter-Clark and zeolite processes are discussed with especial reference to the value of a softened water to the consumer. D. K. FRENCH

New Lackawanna water station shows low operating cost. H. W. MACHEMER. *Railway Rev.* **77**, 354(1925); *Railway Eng. Maintenance* **21**, 377.—The D. L. & W. R. R. recently rebuilt their water station at Groveland, N. Y. The lime and soda ash treating facilities consist of an intermittent plant with air agitation and subsequent filtration through pressure filters. Three 85,000-gallon steel tanks are used for treatment. A 4-hr. sedimentation period is provided. R. C. BARDWELL

Chlorophenol tastes in Milwaukee's water supply. R. W. CUNLIFFE. *J. Am. Water Works Assoc.* **14**, 423-33(1925).—Because of intermittent epidemics of objectionable odor and taste in its supply, Milwaukee conducted an extended search for the source of impurities which on chlorination were responsible. Phenol, Semet-Solvay and coal-gas plants were found to be the chief offenders. Methods of disposal are outlined. D. K. FRENCH

Missouri-Kansas-Texas improves water supplies. J. H. DAVIDSON. *Railway Age* **79**, 415; *Railway Eng. Maintenance* **21**, 309(1925).—A comprehensive program for improvement of water supply quality on the M. K. & T. R. R., extending over the system has shown marked improvement in locomotive performance. Prior to 1916 various boiler compds. were used with inconsistent results. At the close of 1923, 35 complete lime and soda ash softeners and 52 soda ash plants were in service, at 60% of the water stations, and 65% of water used was treated. The complete softeners are of the continuous type with various feeding arrangements. Reduction in boiler failures has amounted to between 85% and 97%. Saving in fuel varies from 6% to 14% for different class of service. Improved water conditions have helped to make possible the increase in continuous locomotive run of from 275 to 869 miles. Photographs, diagram and charts are included. R. C. BARDWELL

Providing a railroad's water supply. R. C. BARDWELL. *Railway Age* **79**, 517, 585 (1925).—Increasing attention given to water quality and pumping equipment is reducing railway transportation costs. Various features of treating and pumping equipment are discussed. R. C. B.

Water supply for textile mills. C. L. HUBBARD. *Textile World* **68**, 2891-4(1925).—Water clarification and softening for textile mills is discussed. CHAS. E. MULLIN

Treated water increases locomotive efficiency. R. C. BARDWELL. *Railway Rev.* **77**, 669; *Railway Age* **79**, 769(1925).—General paper on methods of water softening as applied to railway use. Estd. figures are given on consumption and cost data. R. C. B.

Amounts of soap and builder necessary to soften water of different degrees of hardness. H. B. ROBBINS, H. J. MACMILLAN AND L. W. BOSART. *Ind. Eng. Chem.* **18**, 27-9(1926).—An attempt is made to point out the most economical procedure to be followed where hard water must be used in laundry work. The general conclusion is that for max. economy soda ash should first be added with agitation; a little time should be allowed for it to react with the water before addn. of the soap. The amt. of soda to be added varies with the hardness of the water. EDWARD BARTOW

The "OMS" purifier, a new clarification process for industrial waste water. OTTO MOHR. *Apparatebau* **37**, 304(1925); 1 cut.—An improved Dorr thickener with a small tank attached to the bottom in which is a cylindrical vessel, open at the top into which most of the mud raked from the thickener falls and from which it is withdrawn through a pipe entering the top of the inner vessel. Part of the mud enters at the bottom of this vessel also (cf. *C. A.* **18**, 874). J. H. MOORE

Treated water in swimming pools. F. H. STOVER. *J. Am. Water Works Assoc.* **14**, 440-1(1925).—The danger of contaminated water and the harmless nature of its treatment are emphasized. D. K. FRENCH

Composition of mud balls. W. S. MAHLIE. *J. Am. Water Works Assoc.* **14**, 420 2(1925).—Org. matter, SiO₂, and oxides of Fe and Al were the principal ingredients. There was no relation between size and compn. D. K. FRENCH

Reconstruction of filters at Louisville. W. H. LOVEJOY. *J. Am. Water Works Assoc.* **14**, 352-6(1925).—A general descriptive article. D. K. FRENCH

Sensitivity of the o-tolidine and starch-iodide tests for free chlorine. A. M. BUSWELL AND C. S. BORUFF. *J. Am. Water Works Assoc.* **14**, 384-405(1925).—A

very thorough research comparing the two methods under virtually all conditions. Although the tests are equally sensitive the authors recommend the *o*-tolidine test on account of the stability of the reagent and the simplicity of the method, and because it is less affected by certain interfering substances. D. K. FRENCH

Standard methods of water analysis (rept. of Comm. no. 1). J. J. HINMAN, JR., et al. *J. Am. Water Works Assoc.* **14**, 343-7 (1925).—No important changes are contemplated in the 1915 Standard Methods. A résumé is given of research work in progress as well as of that recommended. D. K. FRENCH

The behavior of magnesium chloride in boiler feed water. J. H. VOGEL. *Kali* **19**, 394-6 (1925).—A controversial review. The deleterious effects of $MgCl_2$ in boilers are not caused by the splitting of HCl , but by other phenomena (cf. V. Die Abwasser aus der Kaliindustrie, Berlin, 1913, p. 250). WM. B. PLUMMER

Physical properties of boiler scale. G. PARIS. *Chimie et industrie* Special No., 138-42 (Sept. 1925).—A description of various types of scale according to their constituents and mode of formation. A. PAPINEAU COUTURE

Experiences with small service pipes. J. E. GIBSON. *J. Am. Water Works Assoc.* **14**, 295-308 (1925).—In a plea for better service pipes G. covers present practice of installation, and considers the many different metals used in pipe material and the uses for which they are best fitted. In the discussion, the uses of copper pipe and the "Admiralty" alloy are mentioned. D. K. FRENCH

Protection of steam boilers against scale and corrosion. R. CAILLOL. *Chaleur et industrie* **6**, 357-62, 419-24, 469-74 (1925).—A review and discussion of the relative merits and drawbacks of the various processes of feed-water purification and of protection of the inside of boilers against scaling and corrosion. A. PAPINEAU COUTURE

Iron incrustation in water pipes: the responsibility of iron algae. DAVID ELLIS. *Water and Water Eng.* **27**, 352-4 (1925).—Hard nodules found in water pipe were sepd from the pipe wall by the tar coating giving the impression that material came from water rather than from the pipe and was probably due to algae. Although the organisms were present and iron sufficient for their growth was contained in the water, formation of nodules in this way could not be demonstrated. It was shown that tar coating was porous to water and the iron came from the pipe. Soft slimy deposits may be due to bacteria and iron from water. E. has never found hard nodules in wood pipe. JACK J. HINMAN, JR.

The corrosion of iron pipe lines. GUSTAV WIEGAND. *Gas u. Wasserfach* **68**, 731-4 (1925).—Conditions existing in a no. of German cities are described and preventive measures discussed. WM. B. PLUMMER

Electrolytic conductivity and hydrogen-ion control of waste disposal. H. C. PARKER. *Water & Water Eng.* **27**, 445-8 (1925).—See C. A. **19**, 2716. H. G.

The relation between drinking water and goiter. W. VON GONZENBACH. *Gas u. Wasserfach* **68**, 667-71 (1925).—A general discussion of the distribution of goiter in Central Europe, of its effects, particularly the causation of habitual miscarriage in case both of female animals and women, and of its prevention. WM. B. PLUMMER

Iodine treatment in Michigan. E. D. RICH. *J. Am. Water Works Assoc.* **14**, 325-30 (1925).—Accepting the idea that goiter is caused by a deficiency in iodine, a comprehensive study of the state supplies was made and a map shows the distribution of available iodine. Various methods of making up I deficiencies are outlined and its general distribution in table salt is considered the best and most logical. D. K. F.

Destruction of lice (*Pediculus corporis*) on the body or on clothing by soapy emulsions of the oleoresin of the pyrethrum of Dalmatia. A. JUILLET and H. DIACONO. *Bull. sci. pharmacol.* **32**, 413-28, 464-78 (1925).—Soapy emulsions of the oleoresin of *Pyrethrum cinerarifolium* Trev. make an excellent lice killer. Insecticides made by pulverizing the heads of the plant are of little use. The oleoresin is best extd in a thermo-centrifuge with trichloroethylene as the extg. liquid. The alkyl. of the soapy emulsion is important and should be equiv. to 0.8 g. $NaOH$ per 100. Less alkyl., neutrality, and to a greater degree, acidity prevent the toxic action. K soaps are preferred to Na soaps. The quantity of pyrethrum ext. (obtained by C_2HCl_3) should not be less than 0.252 g. per 100 cc. of the prepd. emulsion. The presence of C_2HCl_3 in the emulsion is an advantage, the optimum concn. being 0.8 g. C_2HCl_3 per 100 cc. The duration of contact of the emulsion should be not less than 20 min. Pyrethrum exts. are harmless to man but toxic to insects, therefore, they are suggested as a prophylactic measure against those diseases which are transmitted by lice. L. W. RIGGS

MOLLIEUX, P.: *Analyse bactériologique des eaux potables*. Paris: Librairie L. LeFrançois. 192 pp. Reviewed in *Chimie et industrie* 14, 658(1925).

Filter for water. W. H. BERNTSEN. U. S. 1,565,233, Dec. 8.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Modern tendencies in soil research. G. W. ROBINSON. *Welsh J. Agr.* 1, 130-4 (1925).—A discourse. K. D. JACOB

Soil studies on the waste lands of Lleyn. H. T. JONES AND G. W. ROBINSON. *Welsh J. Agr.* 1, 142-7(1925).—The phys. and chem. characteristics of 3 types each of dry and wet waste soils of Wales are summarized. K. D. JACOB

Alkali investigations in the Sudan. A. F. JOSEPH. *J. Agr. Sci.* 15, 407-19(1925).—This investigation covers a period of over 10 yrs. and deals with the area in Sudan known as the Gerzira, the soils of which consist of a brown heavy clay rather high in water-sol. salts and possessing considerable alk., the origin of the soil being acolian. Samples taken at the same time from good and bad plots in the same area show a strong correlation between salt content and crop-yielding power. There is also a strong correlation between p_H and fertility. R. B. DEEMER

The problem of soil acidity in North Wales. RICH WILLIAMS. *Welsh J. Agr.* 1, 135-41(1925).—The typical soils of North Wales are derived from rocks devoid of CaCO_3 and consequently they are usually acid in reaction. The p_H of the ordinary fertile soils varies from 5.6 to 6.8. They are highly buffered and are considered "unsatd." with respect to Ca, the lowland soils usually contg. much more available Ca than the upland soils. K. D. JACOBS

The available phosphate in soils. E. VANSTONE. *J. Agr. Sci.* 15, 460-5(1925).—A modification of Dyer's method for detg. available P_2O_5 is proposed. Results on soils of known agricultural history obtained by shaking 20, 40, 60 and 80 g. of soil for 30 mins. in 500 cc. of a 1 and 2% $\text{C}_6\text{H}_5\text{O}_7$ soln. are compared with results by Dyer's method. The value of the ratio of sol. P_2O_5 /total P_2O_5 is especially studied. R. B. DEEMER

The exchangeable bases in some Scottish soils. A. M. SMITH. *J. Agr. Sci.* 15, 466-75(1925).—The exchangeable Fe, Al, Ca, Mg, K, and Na are reported for 20 soils from different parts of the east of Scotland, detn. is made by extn. with $\text{N NH}_4\text{Cl}$ soln. Data on p_H , "lime-requirement" and loss on ignition are given for comparison. Until a sufficient no. of soils have been examd. and classified it is concluded that it is unlikely that any satisfactory generalization on the subject will be forthcoming. R. B. DEEMER

Studies in soils reaction. III. The determination of the hydrogen-ion concentration of soil suspensions by means of the hydrogen electrode. E. M. CROWTHER. *J. Agr. Sci.* 15, 201-20(1925); cf. *C. A.* 19, 2098.—A H electrode app. is described. Closely related soils may show considerable difference in p_H value, with no change in their degrees of buffer action, as indicated by titration curves with lime water. While these lime requirements are correlated with the p_H values, in dissimilar soils no such relationship holds. Neutral salts increase the H-ion concn. of both acid and slightly alk. soils. Na salts give lower H-ion concn. than the corresponding K or Ca salts, and chlorides give lower p_H values than sulfates. The degree of buffer action is unaffected by the addn. of a neutral salt. Previous extn. with H_2O causes a considerable increase in the p_H value of its suspensions. A no. of soils showed an increase of about 0.1 p_H for twofold diln. The "salt effect" and "diln." effect appear to be of the same type. It is recommended that the soil-water ratio of 1:5 be generally adopted. The indicator methyl red gives erroneous p_H values in turbid soil suspensions because of the absorption of the red form, which is apparently a cation capable of undergoing "base exchange" with the soil. R. B. DEEMER

Cohesion in colloidal soils. F. HARDY. *J. Agr. Sci.* 15, 420-33(1925).—Resistance to (a) transverse breaking, (b) crushing and (c) parting under tensile pull of standard blocks of soil are reported in this investigation. Three highly colloidal siliceous soils contg. ants. of CaCO_3 ranging from 7.2 to 0.2% and 2 lateritic soils were examd. The most significant results were obtained by employing, in a special tenacity app., granular test-blocks, prepd. by moistening sieve-graded dry soil packed into rectangular molds. It is believed that results thus obtained furnished a reliable measure of the

cohesiveness of soil colloidal matter, especially in soil blocks brought to a const. moisture content in a humidifier. The method of prepn. simulates the effect of rain in causing the "running together" of colloidal soil particles. "The relative cohesiveness of the soils examd. appears to follow the same order as their rates of settling from aq. suspension. This observation strengthens the view that cohesiveness in colloidal soils is to a certain extent due to chem. forces that depend on the presence of active atoms or at. groups possessing powerful fields of residual affinity, although probably film tension also plays a part."

R. B. DEEMER

Percolation in colloidal soils, considered in relation to swelling and cohesiveness. F. HARDY. *J. Agr. Sci.* 15, 434-43 (1925).—The results of expts. on the rate of horizontal flow, and on the rate of gain in mass, of kerosene and of water in fine and crumb fractions of certain West Indian colloidal soils, comprising 3 siliceous soils contg. different amts. of CaCO_3 and 2 lateritic soils are described and tabulated.

R. B. D.

Studies in the physical properties of soils. II. A note on the cohesion developed by capillary forces in an ideal soil. W. B. HAINES. *J. Agr. Sci.* 15, 529-35 (1925); cf. *C. A.* 19, 2097.—"Using the conception of the 'ideal soil' a calcn. has been made of the cohesion due to the capillary attraction between the particles when wetted. Exptl. verification of this theory is afforded by cohesion tests on the ignited silt fraction sepd. from soil." **III. Observations on the electrical conductivity of soils.** *Ibid* 536-43.—H. proposes to overcome difficulties in soil resistance measurements encountered by previous workers in this field by using a fluid (Hg) contact with the soil.

R. B. D.

Soil structure in relation to non-capillary and capillary porosity and its significance in soil fertility. A. G. DOVARENKO. *Sci. J. Agronomy* (Russia) 1924, No. 7-8.—Of all the physico-chem. properties which characterize the soil in the dynamics of its biophysicochem. processes the capillary and non-capillary porosity and their relations play a decisive role. The effectiveness of either one of the above causes such processes as moisture and air penetration, moisture-holding capacity, capillary rise, evapn., relation of moisture and air, biol. activities, accumulation of available plant food, properties of the soil soln., osmotic pressure, concn. and degree of elec. dissociation, H-ion concn., gas exchange and the phenomenon of soil and atm. electricity. The various vapors, fertilization and effectiveness of long-continued grass culture are a reflection in the character of the porosity on one hand and on the corresponding dynamics of the biophysicochem. processes on the other hand. The soil structure appears to be an inherent factor of the fertility of the cultivated land.

J. S. JOFFE

The relationship between the vapor pressure and water content of soils. A. N. PURI, E. M. CROWTHER AND B. A. KEEN. *J. Agr. Sci.* 15, 68-88 (1925).—The water contents of a characteristic series of soils, when in equil. with the atm. of different humidities, were detd. by 2 methods. Results are substantially the same by both. Absorption at definite relative humidities is almost independent of temp. over the range 20° to 40° for high relative humidities, but decreases with increasing temp. for lower relative humidities. Hysteresis is noted in all soils. The apparent water content increases regularly with the temp. of heating up to 200° . Heated to temps. between 100° and 200° , soils show substantially the same water absorption at different relative humidities. Reagents known to disintegrate the soil markedly affect this absorption. Addition of salts to the soil and vapor-pressure curves of soil fractions also are reported.

R. B. DEEMER

A simple method of obtaining the size distribution of particles in soils and precipitates. DONOVAN WERNER. *Trans. Faraday Soc.* 1925, advance proof.—Use is made of a glass tube $1\frac{1}{2}$ cm. in diam. and $1-1\frac{1}{2}$ m. long. A suspension of the material is placed in the tube and the velocity of sedimentation measured as the velocity with which the height of the sediment increases. This height is read off on a scale alongside the glass tube with the aid of a magnifying glass. The measurement of this velocity of the sedimentation gives an accumulation curve and from this curve the size distribution can be calcd. by the method developed by Oden (*C. A.* 10, 2429). From tests made with sand, clay and SrSO_4 crystals, it is concluded that the method can be used for particles as large as $100-150\mu$ and as small as 10μ , or less, providing there is a sufficient quantity of the material available to permit the detn. of the increase of the sediment height.

W. H. ROSS

The movement of soil moisture. A. F. LEBEDIEV. *Ann. Don Agr. Inst.* (Russia) 3, 1-220 (1919).—A comprehensive survey with original expts. The following are discussed: theory of Folger, condensation of water vapor of the atm. in the upper soil layers, the movement of water vapor in soils and subsoils, the movement of water under the influence of mol. forces and under the influence of gravity, and the origin of subsoil water.

J. S. JOFFE

Dephenolization in soils. II. N. N. SEN-GUPTA. *J. Agr. Sci.* **15**, 497-515 (1925); cf. *C. A.* **15**, 3167.—The results and conclusions refer to the nature and the cause of the disappearance of phenol and the cresols in soils previously treated with acid. The elucidation of this cause suggests the possibility of associating the instantaneous loss in untreated soil and the slow chem. loss with the same cause. Results are, however, conflicting, but on the whole they lend support to the hypothesis that all the various types of dephenolization are due fundamentally to 1 agent, MnO_2 . R. B. D.

A method for determining the degree of humification of soil organic matter. G. W. ROBINSON AND J. O. JONES. *J. Agr. Sci.* **15**, 26-9 (1925).—Since H_2O_2 (6% soln) seems completely to oxidize soil org. matter, or at least brings it into a sol. state, and is without action upon fibrous org. substances it is proposed to use this method for estg. the approx. degree of humification of soil org. matter. In soils so far examd. the highest degree of humification is found in peats and uncultivated soils. The degree of humification may possibly be correlated with the prevalence of anaerobic conditions.

R. B. DEEMER

The determination of nitrogen in heavy clay soils. D. V. BAL. *J. Agr. Sci.* **15**, 454-9 (1925).—In the detn. of N by the Kjeldahl method certain heavy black cotton soils of the Central Provinces, India, gave higher results when the soil was moistened with H_2O prior to digestion with H_2SO_4 . Fifty cc. of H_2O were used for this moistening, CuSO_4 and K_2SO_4 being added when decompn. of the acid commenced. These soils apparently contain a cementing material probably contg. Fe insol in H_2SO_4 which protects the org. matter in the interior. It is suggested that this may be a source of error in many soil N detns.

R. B. DEEMER

Advances in the fertilizer industry in the years 1921 to 1924. G. WICHERN. *Chem.-Ztg.* **49**, 885-6, 893-5 (1925).—A review with bibliography.

E. J. C.

Soil nutrients in relation to vegetation and reproduction. E. J. KRAUS. *Am. J. Botany* **12**, 510-6 (1925).—Some phases of the problem are discussed in the light of present knowledge.

P. R. DAWSON

The lime factor of production. BACHALA. *Prog. agr. vit.* **84**, 327-32 (1925). A discussion of the role of lime in the soil, its importance as a plant nutrient, and its effects upon the assimilation of nutrients and the reaction of the soil.

P. R. DAWSON

Lime in viticulture. L. SOURSAC. *Prog. agr. vit.* **84**, 467-9 (1925). A résumé and discussion.

P. R. D

Influence of the soil reaction upon the absorption of phosphorus and potassium in the presence of various phosphatic fertilizers. ANTONIN NEMEC AND MIHOVIL GRAČANIN. *Compt. rend.* **181**, 194-6 (1925).—Flat-bottom crystg. dishes, contg. 100 g. of soil, 0.05 g. P_2O_5 , from different sources and 200 g. pure sand washed free of nutrients with HCl and water, were planted with 100 grains of rye each. After 18 days the amts. of P and K in the roots and stalks of the seedlings were detd. Much more of the P_2O_5 of superphosphate was absorbed in an acid than in a neutral medium. With Constantine mineral phosphate, bone meal, Reitmeir's reform phosphate and tetraphosphate, there was generally a greater absorption with a more acid condition. On acid soils the plants absorbed more K than in those slightly alk. Superphosphate favored the highest absorption of K, particularly on acid soils.

P. R. DAWSON

Recent experiments to determine the fertilizer requirements of a soil. FRITZ MARTIN. *Centr. Zuckerind.* **33**, 1112-5 (1925).—The familiar methods for estg. soil acidity or lime requirement are described and discussed, *i. e.*, the Comber, Hasenbäumer and Daikuhara methods. Neubauer's methods for the detn. of P_2O_5 and K in soils are similarly treated.

P. R. DAWSON

The use of high concentrations of potassic fertilizers. L. HAUMONT. *Prog. agr. vit.* **84**, 491-7 (1925).—In an expt. conducted in Belgium with forage beets manure alone yielded 33,500 kg. per hectare. The application of 1000 kg. NaNO_3 , 1000 kg. superphosphate and 1000 kg. Thomas slag per hectare increased the yield to 79,450 kg.; while the same application with the addn. of 2500 kg. of 14% sylvinit gave a return of 124,420 kg. Such results are attributed to the fact that with high concns. of K the absorbing power of the soil is exceeded and the relatively slow diffusion of this nutrient is overcome, leaving a large excess for immediate assimilation. One heavy application followed by normal concns. is recommended.

P. R. DAWSON

Fundamental investigations on basic slags. MCARTHUR. *Scottish J. Agr.* **8**, 72-3 (1925).—The results of pot and field tests indicated that under particular soil conditions the dicalcium silicate present in open-hearth, fluorspar basic slag can function as an ingredient for the correction of soil acidity. It is stated that the mol. compn. of a slag, particularly as regards the combinations of P, Si and Ca, is of more importance than the actual percentage compn. The work is being continued.

K. D. JACOB

Basic slags and mineral phosphates. E. VANSTONE. *J. Agr. Sci.* **15**, 36-46 (1925); cf. *C. A.* **19**, 2255.—The relationship between phosphate sol in 2% CaH_2O_8 and total P_2O_5 was investigated. Phosphate of known compn., basic slags and mineral phosphates were examd. This relationship when shown graphically is, in nearly all these cases, a straight line passing through the origin. In 3 slags of wide citric soly., the soly. is a const. independent of the wt. taken, if allowance is made for a small const. analytical error. Exceptions are noted. Results are confirmed by pot tests. Comparisons are made of basic slags, superphosphates and steamed bone flour with mineral phosphates. R. B. DEEMER

A new method of evaluating basic slags and mineral phosphates. E. VANSTONE. *J. Agr. Sci.* **15**, 491-6 (1925). The cause of low soly. in CaH_2O_8 of phosphates is the increasing concn. of sol. Ca citrate formed from the combined lime in the basic phosphate, and between this sol. Ca citrate and the phosphate that has become sol. a reversed reaction takes place which can be prevented by using an acid, such as $\text{C}_2\text{H}_2\text{O}_4$, which will form an insol. salt. Pot expts. with beans are given, which support the conclusion that the rate of soln. in $\text{C}_2\text{H}_2\text{O}_4$ indicates the rate at which P_2O_5 is taken up by the plant. R. B. DEEMER

Basic slag and grassland. ANON. *The Fertiliser, Feeding-Stuffs and Farm Supplies J.* **10**, 661 (1925).—The compn. of 10 samples of high-grade, and fluor spar slags varied as follows: total P_2O_5 17.2 to 42.5, P_2O_5 as fluorapatite 0 to 26.9, and citric acid-soly. 16.4 to 98.4%. The citric acid-soly. of the slags varied inversely as the amt. of fluorapatite present, the latter being calcd. from the F content. K. D. JACOB

The value of mineral phosphates to British agriculture. C. B. GREENING. *The Fertiliser, Feeding-Stuffs and Farm Supplies J.* **10**, 161-5 (1925).—A résumé of expts. with ground raw rock phosphate as a fertilizer. K. D. JACOB

Manufacture of dicalcium phosphate. R. DECKERT. *Chem.-Ztg.* **49**, 789-90 (1925).—The process of prep. CaHPO_4 from low-grade continental phosphate rock is described. The essential steps consist of preliminary drying, grinding, digestion with 20% HCl to liberate the H_2PO_4 , filtration, pptn. with milk of lime, filtration and drying. The product contains 40% citrate-sol. P_2O_5 , out of a total of 41%, is light and easy to distribute, and can be stored indefinitely without deterioration. P. R. DAWSON

Fertilizing in relation to the disease resistance of crops. BRYNMOR THOMAS. *The Fertiliser, Feeding-Stuffs and Farm Supplies J.* **10**, 487-8 (1925). In one expt. the percentage of healthy potato plants was increased from 42.7 on the control plots to 54.1 on plots receiving K_2SO_4 at the rate of 200 lb. per acre. In another expt. the percentage increased from 28.5 to 58.8. The lower-grade K_2O salts were much less efficient in this respect than either the chloride or sulfate. Application of superphosphate at the rate of 600 lb. per acre to a soil already contg. unusually large amts. of available P_2O_5 decreased the percentage of healthy plants from 59.6 on the control plot to 26.6. Although an excess of N usually decreases the disease-resisting powers of plants, T. was able to obtain a progressive increase in the percentage of healthy potato plants with applications of $(\text{NH}_4)_2\text{SO}_4$ up to 800 lb. per acre supplied as a balanced fertilizer with potash and superphosphate. Potash is the detg. factor in promoting the disease resistance of plants. N and P_2O_5 , particularly the former, are liable to exercise an adverse effect when used in excessive amts. Each variety of plant has a certain definite ratio of K_2O , N and P_2O_5 which is the optimum for increasing its disease-resisting powers. The importance of maintaining this ratio is emphasized. K. D. JACOB

A preliminary study of the relationship between fertilizing and susceptibility to disease in potatoes. H. W. MILES AND B. THOMAS. *J. Agr. Sci.* **15**, 89-95 (1925).—Influence of N, K and P, compd. fertilizer and gypsum upon potatoes was studied. Excessive N applications favor the incidence of disease in this crop. The quantity of nitrogenous fertilizer applied may be regarded as excessive only when not balanced by adequate amts. of K_2O . Also the capacity for resistance varies directly with the quantity of K_2O . Some of the forms of K_2O are more effective than others. Heavy dressings of a well-balanced compd. fertilizer tend to increase the immunity of the crop to disease. R. B. DEEMER

The value of calcium cyanamide as a fertilizer. H. J. PAGE. *Fertiliser, Feeding-Stuffs and Farm Supplies J.* **10**, 871-3 (1925).—A general discussion with particular reference to vegetation expts. K. D. JACOB

Results of tests of plant protecting agents in 1921-1924. A. KÖLLIKER. *Chem.-Ztg.* **49**, 654-5, 674-5, 700-1, 774-5, 790-2 (1925).—The results are summarized of comprehensive tests upon a wide variety of com. preps. and chem. reagents as to their

fungicidal and insecticidal efficacy against various pests. Lab. methods of evaluation are described and discussed.

P. R. DAWSON

Notes on experimental work. Weed destruction by spraying. ANON. *The Fertiliser, Feeding-Stuffs, and Farm Supplies J.* 10, 523-4(1925).—The no. of weeds on a heavily infested plot of barley were greatly reduced in comparison with the check plots by spraying with a 50% soln. of $(\text{NH}_4)_2\text{SO}_4$ at the rate of 37.5 gallons per acre. Plots sprayed twice with the same amt. of soln. as above each time were practically free from weeds at the end of 4 weeks.

K. D. JACOB

The scientific control of pests and diseases (of plants). THEODORE PARKER. *The Fertiliser, Feeding-Stuffs and Farm Supplies J.* 10, 593-4, 666-7(1925).—A discussion of certain of the chem. factors concerned in the application and effect of sprays, washes and dusts

K. D. JACOB

Dry treatment for smut diseases of cereals. KATHLEEN SAMPSON AND D. W. DAVIES. *Welsh J. Agr.* 1, 169-76(1925).—A review of exptl. work on (1) the use of dry Cu carbonate to control bunt of wheat, (2) the use of Cu carbonate to control seed-borne diseases other than bunt of wheat, and (3) the use of dild. Cu carbonate and other chem. dusts. A bibliography of 33 references is appended.

K. D. JACOB

Stinking-smut of wheat. III. Field germination tests of seed treated with formalin and Clarke's wheat protector. J. C. NEILL. *New Zealand J. Agr.* 31, 24-5(1925); cf. *C. A.* 19, 2722.—Samples of seed wheat were dipped in formalin, 1 pint of com. formalin contg. 39% formaldehyde to 40 gallons H_2O , and in a soln. of 1 lb. of Clarke's Wheat Protector in 1.5 gallons and allowed to drain and dry slowly. The formalin treatment caused an immediate loss in germination of 5% on 1-year old seed. The loss progressively increased to 26% on storage of the seed for 3 weeks prior to planting. Germination of new seed was only slightly reduced. Clarke's Wheat Protector increased the percentage germination of both new and 1-year old seed, and storage for 3 weeks had no appreciable effect on germination in either case.

K. D. JACOB

A new process for disinfecting seed. W. E. FISCHER AND K. SCHARER. *Chem.-Ztg.* 49, 757-8(1925).—The use of solvents of a lower b. p. than water eliminates the difficulties of drying dipped seed. Immersion of flax seed for 0.5 to 1 hr in C_2HCl_3 or CCl_4 produced very satisfactory results and improved germination.

P. R. DAWSON

Methods of combating chestnut blight. J. DUFRENOY. *Cuir tech.* 14, 490-5(1925).—Chestnut blight is caused by an organism (*Blepharospora cambivora* Petri) which gains entrance through the roots. Individual trees may be saved by cutting off infected roots, and disinfecting the soil with CuSO_4 . This method is impractical on a large scale. The only feasible method for combating the disease is the replacement of susceptible with immune species.

H. B. MERRILL

The preparation of emulsions of mineral oils in cupric sprays for winter treatment of fruit trees. A. PAILLOT. *Prog. agr. vil.* 84, 405-6(1925).—The formula recommended consists of 2 kg. CuSO_4 , 4 kg. $\text{Ca}(\text{OH})_2$, 10 l. petroleum and 90 l. water. Directions for prepn. and application are given. The type of oil used for automobile motor lubrication is very well adapted to this purpose, but waste oils are not as satisfactory.

P. R. DAWSON

The chemical effect of the addition of a "spreader" to the mixed lime sulfur-lead arsenate spray. W. GOODWIN AND H. MARTIN. *J. Agr. Sci.* 15, 476-89(1925).— CO_2 of the air produces sol. As in mixed lime S-Pb arsenate spray and the effects of casein, lime, lime-casein and gelatin were studied. Casein increases the amt. of sol. As but has no effect upon the polysulfide S. The addn. of lime caused a decrease in sol. As but also reduced the fungicidal value of the spray on account of the reaction with S liberated from CaS . The effect of lime-casein is influenced by the amt. of lime or casein in the mixt. The use of gelatin increased the sol. As but had no effect on the reaction of CaS . All of these reagents retard the rate of decompn. of the spray.

R. B. DEMER

Poisonous sprays and fruit contamination. ANON. *The Fertiliser, Feeding-Stuffs, and Farm Supplies J.* 10, 455(1925).—A blue powder present as a thin coating on com. apples contained CuSO_4 14.0, As_2O_3 1.5, and Ca salts, etc., 84.5%. The powder resulted from spraying with Bordeaux mixt. and was not present in sufficient amt. to be considered dangerous to health.

K. D. JACOB

Effect of sulfur upon nitrogen content of legumes. J. R. NELLER. *Ind. Eng. Chem.* 18, 72-3(1925); cf. *C. A.* 20, 87.—Both elemental S and gypsum increase the N content of alfalfa 32 to 44% and of clover 10 to 23%. Since the crop yield was increased, the total increase in fixed N was very great. The S content of the crop is sometimes increased.

J. J. WILLAMAN

A test of the tobacco powder and lime mixture for the destruction of warble mag-

gots. H. W. THOMPSON. *Welsh J. Agr.* **1**, 206-7(1925).—Two treatments with a mixt. composed of 1.5 lbs. fresh lime, 4 lbs. tobacco powder and 1 gallon H_2O applied at 3-day intervals killed an av. of 74.5% of the maggots infesting 95 cattle in 6 herds.

K. D. JACOB

The work of Celso Ulpiana in chemistry and in agriculture (SCURTI) **2**. Coating salts with inert particles [for insecticides] (U. S. pat. 1,562,821) **18**.

BRUN, P.: **Industrie des cyanures.** Paris: Gaston Doin. 460 pp. Fr 20 Reviewed in *Chimie et industrie* **14**, 820(1925), *Ind. Eng. Chem.* **18**, 107(1926).

MURRAY, J. ALAN: **The Science of Soils and Manures.** 3rd ed. revised and enlarged. London: Constable & Co., Ltd. 298 pp. 12s. 6 d. net. Reviewed in *Industrial Chemist* **1**, 407; *Chem. News* **131**, 220(1925).

Treating seed grain. A. SCHMIDT, A. STEINDORFF, A. FLUSS and O. SCHAFFRATH. U. S. 1,565,237, Dec. 8. Equal amts. of a 0.2% aq. soln. of the hydrochloride of diaminodihydroxyarsenobenzene and a 0.2% aq. soln. of $CuSO_4$ are used for treating seeds by immersion for a period of about 1 hr., to destroy parasites. $HgCl_2$ and other org. As compds. also may be used.

16 THE FERMENTATION INDUSTRIES

C. N. FREY

Processes for the production of absolute alcohol. RENÉ PIQUE. *Chimie et industrie Special No.*, 200 16(Sept. 1925).—A review of processes proposed, more particularly of those which have been used commercially.

A. PAPINEAU-COUTURE

The dehydration of alcohol by lime. PÉRARD AND GRIMAUD. *Chimie et industrie Special No.*, 217-20(Sept. 1925).—Tables and curves are given showing the rate of dehydration at various temps. of EtOH of different strengths when mixed with different quantities of lime of various strengths (76-97% CaO). Cannot be abstracted

A. PAPINEAU-COUTURE

The dehydration of alcohol. III. L. GAY AND A. MASSOL. *Chimie et industrie Special No.*, 221-33(Sept. 1925); cf. *C. A.* **18**, 3519.—In a preliminary study of the miscibility of the gasoline-EtOH- H_2O system G. and M. detd. and plotted the miscibility isotherms at 20° and at 5°. The method used (described in detail) consisted essentially in adding to an initially homogeneous mixt. of known compn. maintained at const. temp. one of the constituents until the appearance of permanent cloudiness. The method is extremely sensitive and allowed of measuring solubilities as low as 0.003% of gasoline in the mixt. A study of the dehydrating action on aq. alc. of satd. solns. of $(NH_4)_2SO_4$, $Na_2S_2O_4$, KF and K_2CO_3 showed that the latter is the only one that is suitable. A study of the dehydrating action of satd. K_2CO_3 on EtOH-gasoline mixts. showed that with gasoline-EtOH mixts. contg. less than 15% gasoline, it is best to dehydrate separately the aq. alc. and a gasoline-alc. mixt. contg. 15% gasoline, and to mix the dehydrated liquids in the desired proportions. With a mixt. contg. more than 15% gasoline, it is best to dehydrate the mixt. directly. The results on the whole are applicable to other dehydrating agents; but the proportion of gasoline below which it is preferable to dehydrate the 2 separately will vary according to the dehydrating agent and according to the compn. of the gasoline.

A. PAPINEAU-COUTURE

Industrial alcohol from agaves. II. BOULARD. *Chimie et industrie Special No.*, 234-9(Sept. 1925).—A discussion showing the ease with which industrial alc. could be cheaply produced as a by-product from the treatment of agave for the production of textile fiber (sisal).

A. PAPINEAU-COUTURE

Composition of yellow oil obtained in the manufacture of *n*-butyl alcohol by fermentation. C. S. MARVEL AND A. E. BRODERICK. *J. Am. Chem. Soc.* **47**, 3045-51 (1925).—The high-boiling residue from the manuf. of BuOH (about 0.5 to 1% of the total yield of solvents) is a dark amber liquid with the odor of crude BuOH. It is a mixt. of BuOH, active AmOH, iso-AmOH, $C_6H_{13}OH$, and the butyric, caprylic and capric esters of these alcs. The alcs. were identified by conversion to the α -acid esters of 3-nitrophthalic acid. The *Am ester* m. 132-3°, the *hexyl ester*, 121-2°. Twelve l. of crude yellow oil gave: 5.1 l. of BuOH, 220 cc. mixed AmOH, 100 cc. hexyl alc., 700 g. $PrCO_2H$, 12 g. caprylic acid, 28 g. capric acid. The solid product suspended in the oil is a mixt. of the Fe and Cu salts of these acids.

C. J. WEST

Acid production during fermentation of sugar by yeast in the presence of calcium carbonate. S. KOSTYCHEV and L. FREY. *Z. physiol. Chem.* **146**, 276(1925); *Wochschr. Brau* **42**, 217-8. -In the presence of CaCO_3 and $(\text{CH}_2\text{COOH})_2$ and absence of N, acetic and malic acids are found. $(\text{CH}_2\text{COOH})_2$ is produced from glutamic acid by yeast as follows: $\text{CH}_2(\text{COOH})\text{CH}_2\text{CH}(\text{NH}_2)\text{COOH} + \text{O}_2 = (\text{CH}_2\text{COOH})_2 + \text{CO}_2 + \text{NH}_3$. Acetic acid is probably produced from AcH. The production of malic acid is difficult to explain. It is not believed acetic and malic acids are produced by bacteria associated with yeast. If glutamic acid breaks up in the following way: (1) $\text{CH}_2(\text{COOH})\text{CH}_2\text{CH}(\text{NH}_2)\text{COOH} + \text{O} = \text{CH}_2(\text{COOH})\text{CH}_2\text{COCOOH} + \text{NH}_3$; (2) $\text{CH}_2(\text{COOH})\text{CH}_2\text{COCOOH} \rightarrow \text{CH}_2(\text{COOH})\text{CH}_2\text{CHO} + \text{CO}_2$; (3) $\text{CH}_2(\text{COOH})\text{CH}_2\text{CHO} + \text{O} \rightarrow (\text{CH}_2\text{COOH})_2$; then possibly aspartic acid should give: (1) $\text{CH}_2(\text{COOH})\text{CH}(\text{NH}_2)\text{COOH} + \text{O} = \text{CH}_2(\text{COOH})\text{COCOOH} + \text{NH}_3$; (2) $\text{CH}_2(\text{COOH})\text{COCOOH} \rightarrow \text{CH}_2(\text{COOH})\text{CHO} + \text{CO}_2$; (3) $\text{CH}_2(\text{COOH})\text{CHO} + \text{O} \rightarrow \text{CH}_2(\text{COOH})_2$. However, carboxylase does not split $\text{CH}_2(\text{COOH})\text{COCOOH}$ as it does $\text{CH}_2(\text{COOH})\text{CH}_2\text{COCOOH}$ to 1 CO_2 per mol., but yields 2 mol. of CO_2 and 1 of CH_2CHO , the latter being then reduced to $\text{C}_2\text{H}_5\text{OH}$ or oxidized to CH_3COOH . Probably $\text{CH}_2(\text{COOH})\text{COCOOH}$ is reduced and forms $\text{CH}_2(\text{COOH})\text{CH}(\text{OH})\text{COOH}$. A small amt may arise as shown by Thunberg from $(\text{CH}_2\text{COOH})_2$, $(\text{CH}_3\text{COOH})_2$ + 2HM, M being methylene blue, and $(\text{CH}_3\text{COOH})_2 + \text{H}_2\text{O}$ yields $\text{CH}_2(\text{COOH})\text{CH}(\text{OH})\text{COOH}$. C. N. FREY

The soaking of barley. A. REBOUL. *Brasserie et malterie* **15**, 261-5(1925).—When barley is put in water the reaction of the latter gradually changes. If acid is gradually added so as to maintain the p_{H} const. at 4.5, the no. of cc is proportional to the sq. root of the time in hrs.; and if alkali is gradually added to maintain the p_{H} const. at 8.5, the no. of cc is proportional to the time. The p_{H} of the water used for soaking barley has no effect on the absorption of water nor on the germination of the barley.

A. PAPINEAU-COUTURE

The barleys of 1925. J. RAUX. *Brasserie et malterie* **15**, 275-81(1925).—Analyses of barleys produced in different parts of France are tabulated and commented on.

A. PAPINEAU-COUTURE

The stability of beer. A. FERNBACH. *Ann. brass. dist.* No. 22(1925); *Bull. assoc. inst. sup. fermentations Gand* **26**, *Ann. soc. brassieurs* **34**, 337(1925).—Acidity has a greater effect on stability than the nature and amt. of the proteins. Beer with low assimilable N will not keep well if the p_{H} is high; while even with a high assimilable N it will keep well if the p_{H} is sufficiently low. Similarly hops will exert a protective action only with a low p_{H} .

A. PAPINEAU-COUTURE

The function p_{H} in brewing. MARC H. VAN LAER. *Chimie et industrie* **14**, 511-8(1925).—A review.

A. PAPINEAU-COUTURE

Cooking of beer worts with steam. J. D. WILLEMART. *Chimie et industrie* **14**, 686-90(1925).—From a discussion of various methods of boiling worts, W. brings out the advantages of heating by means of an open coil, and the importance of proper and efficient agitation of the liquid from the standpoint of improving both the flavor and stability of the beer.

A. PAPINEAU-COUTURE

The function of hydrogen-ion concentration in the preparation and conservation of wines. J. VENTRE. *Ann. école agr. Montpellier* **18**, 88-99(1925); *Chimie et industrie* **14**, 776(1925).—General discussion.

A. PAPINEAU-COUTURE

Solutions of ammonium sulfophosphate in vinification. GASTON CHEVALIER. *Rev. vit.* **63**, 325-30(1925).—A study of the data on the subject leads to the conclusion that, while SO_2 in variable concns. appears to be indispensable in all vinifications, on the contrary NH_4 phosphate should be used only very judiciously in the case of musts deficient in this respect or in naturally slow or depressed fermentations, and not as a general practice, as must be done when NH_4 sulfophosphate solns. are applied.

P. R. DAWSON

Action of oxygen gas on wines. L. E. GRANDCHAMP. *Chimie et industrie Special No.*, 561-4(Sept. 1925); cf. Picdallu, Malvezin and G., *C. A.* **14**, 3748; G., *C. A.* **18**, 3249. —After briefly reviewing the work of Pasteur and Berthelot on the function of O in the aging of wines, G. discusses the action of O in preventing "casse" (pptn. in the wine subsequent to clarification) and its effect on the bouquet of the wine. New wine contains relatively large quantities of esters which are not easily oxidized, while the bouquet of aged wines is due to the gradual development of easily oxidizable aldehydes. Treatment in the cold of new wines with sufficient O (introduced by means of a Chamberland filter over which the wine is made to circulate slowly in a thin film) completely to ppt. the substances which can produce the "casse", followed immediately by filtration of the wine, does not prevent development of the bouquet on aging. It at most gives a slight flat taste which is not persistent.

A. PAPINEAU-COUTURE

The various methods of preserving, aging and refining wines. P. MALVEZIN. *Chimie et industrie Special No.*, 565-73 (Sept. 1925).—After briefly reviewing other methods and agents, M. brings out the advantages of the use of allyl mustard oil (cf. M. and Bidart, *C. A.* 18, 438; Delage, *C. A.* 18, 439; Roos and Hugues, *C. A.* 19, 698; Moreau and Vinet, *C. A.* 19, 699).

A. PAPINEAU-COUTURE

Variation in the sulfurous acid content of grape musts. L. MOREAU and F. VINET. *Chimie et industrie Special No.*, 578-81 (Sept. 1925).—For a given must and under given conditions, after addn. of SO_2 a certain proportion of the latter gradually combines with the constituents of the must and part remains free. The reaction is complete after 30 days (except for a very slow oxidation of residual free SO_2 under certain conditions), and it is 90% complete in 3 days. With increasing addns. of SO_2 , up to 2 g. per l., the amt. of residual free SO_2 (which alone is efficient as a preservative) increases proportionally to the total SO_2 added, above a certain min. addn. which varies with the must and conditions of treatment. M. and V. show how this can be used for detg. the amt. of residual free SO_2 which will remain after a given addn. of total SO_2 under given conditions, and conversely how much SO_2 must be added to obtain a given free SO_2 content.

A. PAPINEAU-COUTURE

Oxidation and aeration of wines in casks. J. DUBAGUÉ. *Chimie et industrie Special No.*, 606-7 (Sept. 1925).—A brief review of the modern conception of the mechanism of the action of O and CO_2 in the aging of wine.

A. PAPINEAU-COUTURE

Theory and practice of the clarification of wines. L. MATHIEU. *Chimie et industrie Special No.*, 608-14 (Sept. 1925).—A review.

A. PAPINEAU-COUTURE

Sanitation in the wine industry. H. DELAUNAY. *Chimie et industrie Special No.*, 615-8 (Sept. 1925). The chief factors of improper sanitation in wine handling and storage plants are poor ventilation, humidity and darkness, which are generally considered essential to proper aging of the wine. Sanitary conditions can be maintained without interfering with proper aging of the wine, as proved by actual conditions in some modern plants. The vapors and SO_2 given off by the wine during handling do not exert any harmful effect on the health of the workmen. There is no special disease or infirmity attributable to this occupation.

A. PAPINEAU-COUTURE

The use of sulfurous acid in the cider industry. WARCOLLIER and LÉMOAL. *Chimie et industrie Special No.*, 624-30 (Sept. 1925).—When SO_2 is added to the juice of fresh sound apples, about 50% combines with the aldehydes, sugars, etc., while with juice from damaged apples or apples having reached a very advanced stage of maturity about 90-95% of the SO_2 combines. SO_2 can be almost completely removed by boiling under reduced pressure from recently sulfited juice of fresh apples, but not from juice which has been sulfited for some time nor from the juice of damaged or over-ripe apples. SO_2 can be nearly all removed from hard cider or from cider brandy by means of charcoal, MnO_2 or PbO_2 .

A. PAPINEAU-COUTURE

The analysis of grape musts in the light of present-day knowledge and practical conclusions to be drawn therefrom. L. FERRÉ. *Chimie et industrie Special No.*, 582-8 (Sept. 1925).—A discussion of the importance, in wine making, of the total and free tartaric and malic acid contents of must and of the significance of the ratios between them.

A. PAPINEAU-COUTURE

Chemical determination of alcohol in wines and fermented liquors. ERNEST MARTIN. *Chimie et industrie Special No.*, 589-91 (Sept. 1925); cf. Astruc and Radet, *C. A.* 19, 1926.—The method consists essentially in adding 5 cc. H_2O to 1 cc. of wine, distg. (without a condenser) into standard $\text{K}_2\text{Cr}_2\text{O}_7$, and titrating the excess with standard FeSO_4 . The method is claimed to be accurate to less than $\pm 0.1\%$.

A. P.-C.

Effect of dextran on white wines made from musts affected by Botrytis (noble rot). J. C. DELAGE. *Chimie et industrie Special No.*, 592-600 (Sept. 1925).—Sauternes and Barsac wines of the 1917 vintage prepd. according to the most approved practice and bottled in 1921 became cloudy in the bottles; but if the bottles were uncorked the wine cleared up completely overnight. The compn. and taste were quite normal. The trouble was traced to a retarded pptn. of muco-cellulosic colloids which were present in the musts owing to the action of *Botrytis* on the grapes. The wines affected had been bottled after 3-4 yrs. because the stocks of bottled wines were practically exhausted, while previously they were generally bottled only after 5-6 yrs., under which conditions the dextran had practically all pptd. out.

A. PAPINEAU-COUTURE

Application of concentration to grapes and to fresh and fermented grape juice. L. ROOS. *Chimie et industrie Special No.*, 601-5 (Sept. 1925).—A brief review of work done on the concn. of wine by evapn., showing that this cannot be successfully carried out without destroying the flavor of the wine. The advantages of concn. of the fresh juice and the possible uses of the concd. juice are discussed.

A. PAPINEAU-COUTURE

Wine and medicine in antiquity. RENÉ PIQUE. *Chimie et industrie* Special No., 552-60 (Sept. 1925).—Historical, with bibliography of 94 references. A. P.-C.

Fermentation processes. A. RÖMER. U. S. 1,510,195-6, Sept. 30, 1924. See Brit. 161,870 (*C. A.* 15, 2525).

Normal butyl alcohol. F. BOINOT. U. S. 1,565,543, Dec. 15. See Can. 253,511 (*C. A.* 19, 3347).

Acetone and butyl alcohol by fermentation. G. W. FREIBERG. U. S. 1,537,597, May 12, 1925. A mash of carbohydrate material such as that from potatoes or maize is fermented with "*Bacillus butylaceticum*." Details are given of the isolation, properties and use of this bacillus. Cf. *C. A.* 19, 3347.

Yeast. S. SAK. U. S. 1,566,431, Dec. 22. A yeast-nutrient mass is filtered, the residue is washed, propagation of yeast with aeration is initiated in the wash H_2O , and, during the propagation, the original wort is added, substantially continuously.

Yeast. R. F. BACON. U. S. 1,532,858, Apr. 7, 1925. See Brit. 225,252, *C. A.* 19, 1614.

Preparation of pressed yeast. S. K. D. M. VAN LIER. Dutch 13,773, Oct. 15, 1925. Yeast on cultivation tends to metabolize first the substances that are easily assimilable, later on (forced growth) those that are more difficultly digestible. Yeast of better quality is obtained by succeeding a period of forced growth by a cultivation in an easily digestible medium (contg 10% of the totally digested sugar). Several periods of forcing either N or C metabolism may be alternately used.

Conditioning and drying yeast. F. M. HILDEBRANDT and C. N. FREY. U. S. 1,534,387, Apr. 21, 1925. In treating yeast after propagation to enable it better to retain its baking properties, the yeast is subjected to a conditioning treatment with aeration in a soln. contg sugar and nutrient salts, caused to pass into a dormant state by lowering its temp. to 0°, thawed, mixed with corn meal or the like to absorb exuded moisture, desiccated, and if desired, further desiccated after an admixt with refined mineral oil and sufficient H_2O to make a pasty mass.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Advances in the chemistry, culture and manufacture of tobacco. RICHARD KISSLING. *Chem.-Zig.* 49, 965-6, 969 (1925).—A review with bibliography. E. J. C.

Frederick Belding Power. C. L. ALSBERG. *Ind. Eng. Chem.* 18, 103 (1926).—A brief biography, with portrait. E. J. C.

Volumetric estimation of the alkaloids of opium. L. BARTHE and F. DUFILHO. *Bull. soc. pharm. Bordeaux* 63, 170-2 (1925); cf. *C. A.* 19, 2386.—The purified opium alkaloids, obtained as described in an earlier publication, and the filter upon which they have been collected are placed in a 200-cc. porcelain capsule, 25 cc. of 1 N HCl are added and the whole is triturated with a glass rod until a homogeneous mixt. is obtained. The mixt. is then transferred to a 1000-cc. graduated flask, the capsule is washed with 3 25-cc. portions of 1 N HCl and the washings are added to the contents of the flask. The capsule is then washed with 200-300 cc. of distd. H_2O in several portions, this is also added to the contents of the flask and then sufficient distd. H_2O to make 900 cc. The flask is then closed, shaken for several minutes, filled to the 1000-cc. mark and allowed to stand for 1 hr. The liquid is then filtered. To 100 cc. of the filtrate, a few drops of an alc. soln. of methyl red are added and titration is effected with 1 N NaOH. The buret reading (n) is taken and 1 cc. subtracted from this. Another 100 cc. of the filtrate is then taken, methyl red is added, followed by $n-1$ cc. of 1 N NaOH added at one time. The titration is completed by adding 0.1 N NaOH drop by drop. If, e. g., 9 cc. 1 N NaOH + 7.1 cc. 0.1 N NaOH are required, the total corresponds to 9.71 cc. of 1 N NaOH. Then $10-9.71 = 0.29$ cc. N HCl combined with the alkaloids in 100 cc. of filtrate and $0.29 \times 10 = 2.9$ N HCl combined with the total alkaloids in 5 g. of opium. Expressed as anhyd. morphine of which the coeff. is 0.285, the results for 100 g. of opium will be $0.285 \times 2.9 \times 20 = 16.53$ g. A. G. D.

Some tests for the identification of veronal sodium. CLÉMENT GÉNOT. *J. pharm. Belg.* 7, 701-5 (1925).—G. gives the various solvents in which veronal sodium is sol. and those in which it is insol., the various forms of crystals obtained from various solvents and numerous chem. tests and color reactions are given. A. G. DUMÉZ

Researches on the fermentation of dried tobacco. I. Methods for separating

nicotine and ammonia. ANDOR FODOR AND ADOLF REIFENBERG. *Biochem. J.* **19**, 827-9(1925).—The tobacco leaves are steam distd., the mixt of NH_3 and nicotine in the distillate is acidified with H_2SO_4 , pptd. with HgI_2 in KI (2 g. per 100 cc.)—under which conditions NH_3 gives no ppt.—the ppt. allowed to remain overnight and washed by decantation, and the N in it detd. The NH_3 is distd. from the filtrate in the usual way. **II. The enzymic production of volatile products from nicotine under the influence of tobacco-leaf extracts.** *Ibid* 830-5.—The fermentative effect is greater with unfermented tobacco leaves allowed to dry naturally than with tobacco obtained by drying rapidly. The greater part of the activity disappears during the fermentation process.

BENJAMIN HARROW

Thiosept oil. E. BELANI. *Petr. Z.* **21**, 1439(1925).—The shale oils of Tirol (Austria) contain S compds. They are carefully distd. in the so-called Meguin retorts, where, after a quick preliminary distn., they are transferred while still hot into special retorts with elec. heating and are further distd., with vacuum and steam. The resulting "Thiosept oil" boils between 100 and 250° and has a high content of unsatd. compds. which are valuable medicines for skin diseases caused by parasites and bacteria. The next fraction is the "Sulfoscept oil" which has a sharp odor and kills insects (flies, etc.) instantly.

M. B. HART

Dependency of medicine on chemistry. J. S. HEPBURN. *Catalyst* **10**, no. 10, 1-2(1925).—The contributions of chemistry to the progress of medicine during the past century are shown by comparison of the U. S. Pharmacopeias of 1820 and 1920.

JOSEPH S. HEPBURN

Identification of alkyl derivatives of barbituric acid. ALDO ZAMPARO. *Boll. chim. farm.* **64**, 257-8(1925).—One cc. H_2SO_4 and 2 drops of 2% NaNO_2 added to 0.1 g. substance produce no reaction with diethylbarbituric acid, a gradually appearing faint yellow color in the cold and a pink one in the heat with the diallyl deriv. and with the cold and hot ethylphenyl deriv. a rapidly appearing yellow-orange, which disappears on diln.

MARY JACOBSEN

Some tests for the identification of adaline. CLÉMENT GÉNOT. *Chimie et industrie* **14**, 679-85(1925).—The phys. and chem. properties of adaline, $\text{H}_2\text{C}_6\text{BrCONHCONH}_2$, are reviewed. The microscopic appearance of the crystals obtained by evapn. at 30° of solns. of adaline in various solvents are described and illustrated. The m. p. was found to be 117°, and the m. p. in admixt. with various proportions of bromural, hedonal, sulfonal, tetronal, trional, urethian and veronal, which are the most likely adulterants, are tabulated. A large no. of microchem. and of color reactions are described. For details, the original should be consulted, as it cannot be satisfactorily abstracted.

A. PAPINEAU-COUTURE

Some chemical properties of adrenaline. G. REBIÈRE. *Chimie et industrie Special No.*, 384-9(Sept. 1925).—Adrenaline hydrochloride, neutral and acid benzoates, neutral and acid salicylates were obtained by adding the theoretical amts. of acid (HCl gas dissolved in abs. alc., BzOH and salicylic acid dissolved in Me_2CO) to the adrenaline (I) and evapn. to const. wt. at low temp. *in vacuo*. The resultant thick sirups crystallize spontaneously in time. To prep. the picrate, dissolve slightly more than the theoretical amt. of picric acid in Et_2O , add I, shake, let stand 2-3 days in a stoppered flask with frequent shaking, and filter off the yellow cryst. I-picrate. A study of the cond. (*via* Kohlrausch) of 0.01 N HCl , H_2SO_4 , H_3PO_4 , AcOH , salicylic and benzoic acids on addn. of increasing quantities of I showed that neutralization of the acid takes place in a similar manner to neutralization by the strong bases. With H_3PO_4 there are formed both mono-adrenaline di-H and di-adrenaline mono-II phosphates. A study of the p_{H} of 0.01 N HCl , AcOH and oxalic acid gave the same indications as the cond. but the increase in p_{H} with excess of I is not as sudden as with water-sol. alkalis. The addn. of small quantities of I (0.05 g. to 100 cc. of 0.1 N acid) to HCl and oxalic acid reduced the p_{H} . With dil. FeCl_3 solns. I salts give an emerald-green, changing to violet with alkalis (Vulpian's reaction). The limit of sensitiveness of the reaction is reached with 5 cc. of 0.1% FeCl_3 and 0.01 mg. I or with 5 cc. 0.005% FeCl_3 and 0.2 mg. I. The green color changes to red on heating, while the green obtained similarly with pyrocatechol changes to dirty gray on heating. Addn. of a few cc. of I soln. to a 0.01-0.02% HgCl_2 soln. gives a rose color on heating. With a fairly concd. HIO_3 soln. I gives a yellow color in the cold, changing to purple on heating. The reaction is sensitive to 0.01 mg. I. A reagent was prepd. as follows: 10% $\text{K}_2\text{Fe}(\text{CN})_6$ soln. 10 cc., 0.1 N NaOH 100 cc., distd. H_2O to 10 cc. (this is evidently a misprint, probably for 1 l.), dil. 1 cc. to 200 cc. The reagent gives a blood-red color with I, is decolorized on heating, turning dirty green in acids and golden yellow in alkalis. 1 cc. of the dild. reagent gives a distinct color with 0.1 mg. I; 5 cc. gives a very slight

color with 0.001 mg. I, perceptible against a white background. Addn. of 5 cc. 0.01 N I-HCl and 2 drops AcOH to 5 cc. of 5% NaNO₂ gives an orange-red color in the cold. Under the same conditions pyrocatechol gives yellow, turning red on heating. On adding 1 drop of 0.001 N I-HCl to 1 cc. 0.01 N AgNO₃ and 1 drop 0.1 N NaOH and heating to boiling, reduction takes place, perceptible against a black background. The reaction is sensitive to 0.001 mg. I, and the sensitiveness would probably be increased by examg. in the dark by means of a ray of light passing through the soln. (Tyndall effect). I can be detd. colorimetrically by the HIO₃ reaction or by the Vulpian reaction. In the latter case, the intensity of the red color obtained on heating is proportional to the I content. In the Vulpian reaction there is partial reduction of the FeCl₃, which can be measured by adding K₃Fe(CN)₆ and detg. the resultant Turnbull's blue colorimetrically. Very dil. solns. of Ag, Pd or Au salts, when heated with I, are reduced with formation of colloidal solns. which can be made remarkably stable by addn. of a suitable protective colloid. Ag and Au should be reduced in alk and Pd in neutral soln.

A. PAPINEAU-COUTURE

Introduction to the microchemical investigation of essential oils. RAOUL CRI-GHELLI. *Chimie et industrie Special No.*, 397-404 (Sept. 1925).—A discussion of the importance and necessity of working on small quantities of material (even on one plant or portion of plant) in biological investigations of essential-oil-bearing plants, and of possible methods of micro-analysis including extn. of the oils, nephelometry, colorimetry, polarimetry, refractometry, spectrometry, olfactometry, ultimate and proximate analysis and the detection of the essential oil in different parts of the plant.

A. PAPINEAU-COUTURE

Oil of lavender. ETABLISSEMENTS A. CHIRIS. *Parfums de France No. 33*, 318 (Nov. 1925); cf. *C. A.* 18, 3683; 19, 873.—Analysis of 21 samples of Italian oil of lavender and of 3 samples of English oil by P. Rovesti (*Profum. italici* (1925) 208-22) gave results for total alcs. and for total oxygenated compds. (free alcs. + esters) which practically fall within the limits previously assigned for the French oils (73-80% and 81-91%, resp.)

A. PAPINEAU-COUTURE

The sources of geraniol. ANON. *Parfums de France No. 31*, 243-51 (Sept. 1925); *No. 32*, 272-80 (Oct. 1925); *No. 33*, 302-11 (Nov. 1925). (In French and English).—Brief monograph on oils of *palmarosa*, *geranium* and *citronella*. A. PAPINEAU-COUTURE

Adulteration of oil of limes. ANON. *Parfumerie moderne* 18, 254 (1925).—Distd. oil of limes is adulterated with terpenes obtained as a by-product in the production of terpeneless oil of limes, and sometimes also with the terpenes of oil of lemon. Five samples of oil of limes adulterated in this way had: d 0.856-0.858, $[\alpha] + 39^\circ$ to $+51^\circ$, n 1.4706-1.4715. They gave only about half the normal yield of terpeneless oil.

A. PAPINEAU-COUTURE

Ether for anesthesia. F. ATHIAS. *Thesis (Algiers)*, 1924; *Chimie et industrie* 14, 744-5 (1925).—The decompn. of Et₂O is due mainly to the action of atm. O, is more rapid in the light than in the dark, occurs much less in colored or opaque containers, and can be reduced by addn. of traces of hydroquinol to pure Et₂O. A. P.-C.

Estimation of atropine. P. BOURCET. *Bull. sci. pharmacol.* 32, 585-8 (1925).—One hundred g. of the drug is pulverized to pass without residue, through an 80-mesh sieve and is mixed with 20 g. of impalpably ground CaO. The mixt. is ground in a mortar to a homogeneous mass and is extd. in a Soxhlet app with Et₂O for about 4 hrs., or until a little of the ext. acidified with 2% HCl no longer gives the Valscr reaction for alkaloids. The Et₂O ext. is cooled and is acidified with HCl up to 2%. The acid soln. is decanted through a filter and the filtrate is made alk. by NaOH in slight excess. The bases set free are extd. with CHCl₃, the CHCl₃ ext. is filtered through a filter lined with dry Na₂CO₃ and is distd. from a tared flask. The residue dried at 100° and weighed represents the total non-volatile alkaloids. The tared flask with its residue is placed in the oven at 120° for 5 hrs. in order to isomerize the hyoscyamine if present. The contents of the flask are then dissolved in boiling anhyd. Et₂O, the soln. is filtered and neutralized by an Et₂O soln. of H₂C₂O₄. The resulting ppt. of oxalates is washed with Et₂O, is dried at 100° and weighed.

L. W. RIGGS

Evaluation of ergot preparations. ALFRED BRAUN. *Arch. expil. Path. Pharm.* 108, 96-105 (1925).—In the removal of the adrenaline effect upon the rabbit uterus the effects of ergotamine are dependent upon both the concn. and the time of action.

G. H. S.

Chemical changes in pure ether. S. MATSUNAMI. *J. Pharm. Soc. Japan No. 520*, 529-39 (1925).—Pure anesthetic ether was subjected to various conditions for different times and then the production of vinyl alcohol or vinyl ether tested with Nessler reagent. If the ether is distd. with inert gas, such as N or CO₂, and kept in a brown-glass bottle,

it undergoes the least chem. change. Nessler reagent detects the formation of the aldehyde (or vinyl alcohol) in ether when the amt. of the product reaches 0.00006 g. per 100 cc. ether. Sulfurous acid-fuchsin soln. can be used as a reagent instead of Nessler soln. The negative test with Nessler reagent is almost too delicate a criterion to be used for the requirement of ether as anesthetic use. S. T.

Estimation of morphine in opium. F. MACHIGUCHI AND S. SHIRONO. *J. Pharm. Soc. Japan* No. 524, 849-61 (1925).—Add 2 g. of $\text{Ca}(\text{OH})_2$ to 8 g. of opium powder dried under 60° , shake with 80 cc. H_2O for 1 hr. and filter. Add 50 cc. of the filtrate to a thick-walled bottle (100-cc.) contg. 20 cc. $\text{Et}_2\text{O}-\text{C}_6\text{H}_6$ mixt. (8:2), and 1 g. NH_4Cl , shake for 10 min. and let the mixt. stand over 20 hrs. Collect the ppt. on filter paper (9 cm.), wash 4 times with 5 cc. H_2O , dry under 60° ; cool and wash with 20 cc. $\text{Et}_2\text{O}-\text{C}_6\text{H}_6$ (1:1). Dry the ppt. at $96-100^\circ$, dissolve in 0.1 *N* HCl , and titrate with 0.1 *N* NaOH , using 3 drops of methyl red as an indicator. The amt. of the acid used by the ppt. when multiplied by 0.5704 gives the % of the morphine in opium. By this method, M. and S. obtained 18.4239%, in a sample which gave 18.2528% according to the German Pharm., 18.8232 according to the U. S. Pharm., 18.0246 according to the Brit. Pharm., and 17.18833 according to the Japanese Pharm. S. T.

Emulsion films (HOLMES) 2. Determination of camphor (GORI) 7. Detection of Bi in organic material (DANCKWORTT, PFAU) 7. Wine and medicine in antiquity (PIQUE) 16.

GILLOT, PAUL: *Recherches chimiques et biologiques sur le genre Mercurialis*, Nancy: M. Colin. 186 pp.

KRÖMEKE, FRANZ: *Friedrich Wilhelm Sertürner, der Entdecker des Morphiums*. Jena: Verlag Gustav Fischer. 93 pp. M. 5. Reviewed in *Am. J. Pharm.* 97, 785 (1925).

Medicinal mixture. J. K. LILLY U. S. 1,562,459, Nov. 24. A mixt. of phenylcinchoninic acid with the hydriodide of phenylcinchoninic acid is used for treating arthritis.

Styptic mixture. C. R. DOWNS. U. S. 1,563,346, Dec. 1. Phthalyl peroxide 60 is used with phthalic acid 40 and a filler such as talc 100 parts.

Remedy for syphilis. S. BERGEL. U. S. 1,534,832, Apr. 21, 1925. Lipoids are repeatedly injected into parts of an animal's body most capable of resistance to syphilis (monkeys or other animals susceptible to syphilis being used). Then spirochetes contg. syphilitic material and suspended in lecithin are repeatedly injected and at the same time repeated injections are made of substances which may contain gall, Na taurocholate, saponin-contg. material or sarsaparilla. The concn. and quantities of the doses of spirochetes are gradually increased and those of the dissolving agents gradually decreased. Exudants from the animal's body caused by inflammation, exts. from the lymphatic glands, the spleen and the omentum and blood serum of the animal are collected, and lecithin is sepd. from the collected substances by filtration. The filtrate may be used alone or with arsphenamine as a therapeutic agent.

Concentrated enzymic composition adapted for therapeutic use. S. A. WAKSMAN. U. S. 1,561,385, Dec. 8. A fungus-impregnated culture medium such as one prepd. with *Aspergillus oryzae* is lixiviated with H_2O and a fresh mass of fungus-impregnated culture medium is soaked in the liquid ext. and the mixt. dried.

Chemically pure ether for anesthesia. NEDERLANDSCHE GIST EN SPIRITUSFABRIEK. Dutch 13,636, Oct. 15, 1925. Benzidine dissolved in boiling, previously purified and dried ether seps. out on cooling to $+15^\circ$ in prismatic crystals, contg. $\frac{1}{2}$ mol. ether of crystn., stable at room temp. After drying, these crystals on distn. at 100° in a stream of H_2 yield chemically pure ether. *o*-Tolidine or tetramethylbenzidine may be used instead of benzidine.

Ether for anesthesia. NEDERLANDSCHE GIST EN SPIRITUSFABRIEK. Dutch 13,637, Oct. 15, 1925. The ethereal mother liquor from the benzidine crystals (cf. preceding abstr.) after distn. gives ether suitable for anesthetic purposes.

Stable analgesic solution containing novocaine and magnesium sulfate. C. W. HOOPER. U. S. 1,563,087, Nov. 24.

Disinfectant and detergent. L. F. WHITLOCK. U. S. 1,563,604, Dec. 1. A mixt. of niter cake 90-98 and vegetable ivory 2-10 parts, in powd. form.

***d*- ψ -and-*l*- ψ -Cocaine.** O. WOLFFS and H. MAEDER. U. S. 1,534,558, Apr. 21, 1925. *d*-*l*- ψ -Ecgonine methyl ester is converted by means of optically active acids

into the corresponding salts, the *l*- ψ -salt is sepd. from the *d*- ψ -salt by fractional crystn. of the latter, and the bases are isolated and benzoylated. Detailed examples are given.

Morphine solution. C. W. HOOPER. U. S. 1,563,086, Nov. 24. A sterile stable soln. is formed of NaHSO₃ 0.1, MgSO₄ 50, novocaine 2.5, morphine sulfate 0.5 and H₂O 100 parts.

Neorsphenamine. P. A. KOBER. U. S. 1,564,859, Dec. 8. Arsphenamine base is converted into a formaldehyde sulfoxylate deriv. and the latter is pptd. and filtered off from the reaction mixt., the ppt being mixed with a strong Na₂CO₃ soln., excess of free alkali being avoided. The resulting soln. is evapd. under a pressure of 2-10 mm. Hg.

Alkylated acridinium compounds. L. BENDA. U. S. 1,565,891, Dec. 15. An alkoxyacridine, e. g., 3,6-dimethoxyacridine, is alkylated in the acridine N. Production of 3,6-dimethoxy-10-methyl (also ethyl-, benzyl-, and hydroxyethyl-) acridinium chloride is described. These products have comparatively high bactericidal properties and are of low toxicity but possess substantially no dyeing properties.

Double salts of calcium dimethylxanthine and salicylic acid. H. VIETH. U. S. 1,547,698, July 28, 1925. Therapeutic compds. of high diuretic efficiency comprise double salts of Ca (or Sr) dimethylxanthine and salicylic acid. Several neutral and basic salts prepd. from theobromine and theophylline, Na salicylate and CaCl₂ or SrCl₂ are described.

Alkylamino esters of *p*-aminobenzoic acids. O. EISELB. U. S. 1,550,350, Aug. 18, 1925. By esterifying *N*-monoalkyl- and *N*-monoalkyloxyalkyl derivs. of *p*-aminobenzoic acid with amino alcohols and by alkylating the *p*-aminobenzoic acid alkylamino esters, alkylamino esters are obtained which are of stronger local anesthetic effect than cocaine. Numerous examples and details of procedure are given.

Testing antirachitic values of cod-liver oil and other substances. T. F. ZUCKER. U. S. 1,563,134, Nov. 24. Tests of the *p_H* of the feces of rats or other test animals fed with the substance being tested indicate the antirachitic value of the substance.

Vitamin preparation. I. F. HARRIS. U. S. 1,510,883, June 9, 1925. Vitamin preps., especially preps. of H₂O-sol. vitamins such as derived from yeast, are preserved from deterioration by admixt. with lactose and galactose or other relatively non hygroscopic sugars.

Dentifrice. J. T. LELAND. U. S. 1,566,218, Dec. 15. Sep. compns. which react together to produce NaI are prepd. and used together, e. g., a mixt. of CaCO₃, I and glycerol and a mixt. of NaCl, starch, menthol and liquid soap.

Perfume. A. CORTI. U. S. 1,565,796, Dec. 15. Nitrodibromobutyl-*m*-cresol methyl ether, m. 100°, has an odor resembling musk and "a true smell of ambergris." It may be made by treating dibromobutyl-*m*-cresol methyl ether with a mixt. of HNO₃ and H₂SO₄ at 5-10°.

Embalming fluid. E. BARTA. U. S. 1,565,773, Dec. 15. HgCl₂, NaCl, NaOH, thymol, camphor, "eosin rubrum," formol, "concd. formaldehyde" and oil of bergamot are used.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

The development and present position of the Chilean saltpetrer industry. PAUL KRASSA. *Z. angew. Chem.* 38, 921-5 (1925). E. J. C.

Chili saltpetrer. EMILIO PAPASGLI. *Rass. min. met. chim.* 58, 77-9 (1925).—A description of the history, character, extent, exploitation and use of Chili NaNO₃. C. C. DAVIS

The preparation of raw potash salts. H. PAPPÉE. *Kali* 19, 174-9, 217-23, 235-41, 275-81, 321-4, 356-64, 402-6 (1925).—The various mech. and chem. methods for the prepn. of raw K salts are reviewed briefly; these include the ordinary wet methods and various processes depending on flotation, electro-magnetic sepn., differential crushing, elutriation and centrifuging. A ternary soly. diagram for KCl in satd. NaCl plus various amts. of MgCl₂ (0-350 g./kg. H₂O) is given. The ordinary method for the extn. and concn. of carnallite is described and the plant and app. are schematically represented. Clarification, i. e., removal of clay slimes, is one of the most serious difficulties. The problem of clarification is discussed quant. The rate of settling of 10 g. of slime from 1 l. of H₂O, mother liquor of sp. gr. 1.2977, end liquor of sp. gr. 1.3043, and dild. end liquor of sp. gr. 1.164, resp., is shown by curves. Expressed as % remaining in suspension at the end of 0.5 hrs. it was, resp., 1.2, 36.3, 41.0, 40.6;

at the end of 7 hrs., 1.0, 4.0, 10.3, 1.4. Data are given for the rate of settling of individual particles of the various constituents of the slimes (*i. e.*, clay, anhydrite, kieserite, NaCl, KCl) in solns. of KCl, MgCl₂ and raw salts. Large-scale expts. on the use of shaker tables and settling systems for the sepn. of slimes and the recovery of K salts from them are described, detailed data being given. Further data and discussion of the foregoing clarification expts. are also given. The raw K salts as mined in 7 districts and as used in 10 plants are classified in great tabular detail as to their compn., physical characteristics, crushability, amt. and characteristics of the slime constituents, etc.

WM B. PLUMMER

Making sodium nitrite by the arc process. H. K. BENSON. *Chem. Met. Eng.* **32**, 803-4 (1925).—See *C. A.* **19**, 2728.

C. G. F.

Commercial status of nitrogen fixation. J. M. BRAHAM. *Chem. Met. Eng.* **32**, 862-4 (1925).—A review of com. methods now in use for the fixation of atm. N.

W. H. ROSS

Recent developments in the nitrogen-fixation industry. ANON. *Nature* **115**, 465 (1925).—A review.

F. N. S.

Commercial manufacture of hydrogen and nitrogen by means of reducing gases. Use of large quantities of ammonia. F. LEFEBVRE. *Chimie et Industrie Special No.*, 317-25 (Sept. 1925).—Essentially a description of the process recently developed by the Société l'Oxydrique Française for the production of H₂ (Brit. pats. 199,364; 206,822; 230,046; *C. A.* **18**, 310, 1183, **19**, 3355). The process is also applicable for producing practically pure N by passing air instead of steam over the reduced Fe, the small quantities of SO₂ and CO₂ which may be present being easily eliminated. A. P.-C.

The rate of solution and availability of commercial limes. R. T. HASLAM, F. W. ADAMS and R. H. KEAN. *Ind. Eng. Chem.* **18**, 19-23 (1926).—The rate of soln. (which in general det. the availability of the lime) is shown to depend on the fineness and is directly proportional to the area and to the ultimate soly. of the lime. In an acid forming a sol. lime salt, the increase in rate of soly. over that in H₂O is proportional to the concn. of acid. If an insol. salt is formed the rate of soln. is decreased. For an availability test to be of any value the test must be based on the particular process in which the lime is to be used. Thirteen graphs and 1 drawing of app. are used in the investigation.

J. G. R. ARDAGH

Diatomaceous earth. C. W. DAVIS. *Bur. Mines, Repts. of Investigations No. 2718*, 11 pp. (1925).—The compn., properties, and uses of diatomaceous earth are discussed. Its occurrence and production in Nevada, particularly for miscellaneous uses, in the building trade, as insulation, and for filtration are emphasized. This apparent d. of a dried sample is a measure of the air space and is recommended as a rapid test for valuation as an insulation material. A simple app. giving good results on small samples and its operation are described. A bibliography is appended.

W. H. BOYNTON

Safety in the manufacture of HNO₃, H₂SO₄ and mixed acids and NH₄NO₃ as used in the manufacture of explosives (KERSHAW) **24**.

BLUCHER, HANS: *Plastische Massen. Die Erzeugung, Verarbeitung und Verwendung.* Leipzig: Hirzel. 291 pp. Price M. 8; bound M. 10. Reviewed in *Ind. Eng. Chem.* **17**, 1296 (1925).

MAYER, H.: *Das Wasserglas, seine Eigenschaften, Fabrikation und Verwendung.* Pt. 79. Sammlung Vieweg. Tagesfragen aus den Gebieten der Naturwissenschaften und der Technik. Braunschweig: F. Vieweg & Sohn Akt.-Ges. 52 pp. R. M. 2.50.

Hydrochloric acid. J. H. EGGLESON. U. S. 1,563,732, Dec. 1. HCl gas and an absorbing liquid such as H₂O and dil. HCl are passed in contact within a tube which is externally cooled, the resulting HCl soln. is sepd. from the unabsorbed gases, a portion of the liquid acid soln. is removed and the remaining portion is dild. and used for further absorption of gaseous HCl in the tube.

Carbon and hydrocyanic acid. R. W. POINDEXTER. U. S. 1,562,914, Nov. 24. Natural gas, kerosene vapor or other hydrocarbon material is mixed with NH₃ and the previously unheated mixt. is introduced into an externally heated zone where it is quickly heated to reacting temp.

Treating sulfide ores and concentrates. M. DEKEYSER. U. S. 1,566,379, Dec. 22. Sulfide ores and concentrates are roasted to produce SO₂, ozone is mixed with the latter and the resulting mixt. is subjected to the action of a catalyst, *e. g.*, oxidized Fe shavings, in order to produce H₂SO₄.

Rotary sulfur burner adapted for use in sulfuric acid manufacture. H. HOWARD. U. S. 1,566,538, Dec. 22.

Apparatus for making sulfuric acid. H. HOWARD. U. S. 1,565,366, Dec. 15. Contact of SO_3 with acid (in making 98% H_2SO_4) or contact of other gases with liquids is effected in an absorption app. in which is placed a contact plate of cast Fe having numerous small perforations and formed in detachable sections.

Removing arsenic from phosphoric acid. O. WOLFE and H. MAEDER. U. S. 1,562,818, Nov. 24. H_3PO_4 contg. As is treated with PH_3 and the pptd. As is sepd.

Composition for removing ammonia from gases. R. P. MASE. U. S. 1,564,433, Dec. 8. Activated charcoal is impregnated with CuSO_4 or other anhyd. Cu salt.

Alkali silicate and aluminate from potash feldspar. S. W. SCOFIELD and J. B. LARUE. U. S. 1,563,875, Dec. 1. Cryst. feldspar is converted into amorphous feldspar, e. g., by calcining at 1350-1400°, and the amorphous feldspar is heated with caustic alkali soln. in a closed vessel; 1 to 2 times the quantity of 90% alkali based on the wt. of the feldspar and an amt. of H_2O substantially equal to that of the feldspar are used. A pressure of about 300 lbs. per sq. in. and a temp. of about 270° are employed and the digestion is continued until insol. materials are solubilized. More H_2O is then added.

Aluminium chloride. L. BURGESS. U. S. 1,566,269, Dec. 22. Material contg. Al silicide is treated with dry HCl gas at a temp. which will produce and vaporize AlCl_3 . The latter is sepd. from FeCl_3 by fractional condensation.

Magnesium chloride. R. C. LORD. U. S. 1,537,479, May 12, 1925. The NH_4Cl mother-liquor of the NH_4 -soda process is treated with dolomitic lime to provide $\text{Ca}(\text{OH})_2$ for quant. reaction with the NH_4Cl in the liquor. Liberated NH_3 is expelled and the remaining slurry treated with CO_2 at a temp. of 60-80° to convert the MgO or $\text{Mg}(\text{OH})_2$ into MgCl_2 . After removal of the pptd. CaCO_3 by filtration, the soln. is evapd. to cause sepn. of NaCl and then further evapd. to obtain solid $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$.

Separating sodium chloride, carbonate and sulfate. C. E. DOUBEAR. U. S. 1,563,613, Dec. 1. A mixt. contg. NaCl , Na_2CO_3 and Na_2SO_4 is leached with a soln. of NaCl , the soln. is sepd. from the undissolved residue and treated with CO_2 and pptd. NaHCO_3 is sepd. The soln. is then treated with NH_3 and pptd. Na_2SO_4 is sepd. NH_3 is distd. off and the final liquor is used for treating a further quantity of the mixed salts.

Calcium nitrate. C. EYER and R. GRIESSBACH. U. S. 1,564,410, Dec. 8. Solid Ca nitrate is prepd. contg. a small proportion of an NH_4 salt such as NH_4NO_3 in mol. distribution, which serves to promote satisfactory solidification.

Potassium carbonate. H. KLOPSTOCK and W. NEUMANN. U. S. 1,562,891, Nov. 24. A KOH soln. is treated with CO_2 in limited quantity so that some KOH will remain in the mother liquor to retain impurities in soln. and pptd. K_2CO_3 is sepd. from the soln.

Arsenates. T. A. MITCHELL and K. TOABE. U. S. 1,564,093, Dec. 1. As_2O_3 is oxidized to arsenic acid in the presence of a concd. soln. of arsenic acid and there is simultaneously added a metallic element such as Pb the arsenate of which is desired. The arsenate is pptd. and the rates of forming arsenic acid and of pptg. the arsenate are regulated so as to maintain a substantially uniform high concn. of the arsenic acid.

Arsenates. H. P. BASSETT. U. S. 1,562,490, Nov. 24. Arsenious compds. such as As_2O_3 in H_2O are treated with a sufficient quantity of a base, e. g., lime, capable of forming a sol. chloride and insol. arsenates to form arsenites of the base. Cl_2 is then added to form arsenates of the base and a chloride of the base, the soln. being maintained acid during the oxidation, and afterward more of the base is added to render the soln. slightly alk. and form insol. arsenates and a sol. chloride.

Separating sodium and potassium hydroxides. T. SUTTER. U. S. 1,562,805, Nov. 24. A soln. contg. both NaOH and KOH is concd. until crystn. occurs at a relatively high temp. (about 60°) and KOH crystals are sepd. at this temp., and, in order to sep. NaOH , the mixt. is dild. so that crystn. occurs only at a lower temp. and NaOH crystals are sepd. at this lower temp.

Reducing sulfates to sulfides. A. H. WHITE. U. S. 1,565,300, Dec. 15. Salts such as Na_2SO_4 or other sulfates are heated with charcoal or other carbonaceous material and a metal oxide such as lime capable of reacting with CO_2 to form a carbonate with evolution of heat at the temp. at which the reduction is carried out and in sufficient quantity to form carbonate with the principal part of the CO_2 evolved in the reduction. The temp. of heating is above 300° but below the temp. at which the carbonate formed dissociates completely (preferably about 600-900° with Na_2SO_4).

Decolorizing and clarifying hydrous magnesium silicates (revivification). M. L. CHAPPELL. U. S. 1,562,868, Nov. 24. A material from the Amargosa Valley, Nevada or other material mainly composed of hydrous Mg silicates, after use for decolorizing

and clarifying petroleum, is revived by treating with a color solvent such as acetone and alc., contg. H_2SO_4 .

Artificial cryolite. H. SPECKETER. U. S. 1,563,536, Dec. 1. In producing artificial cryolite free from Fe from solns. of AlCl_3 or other Al salt contg. Fe, there is added to the soln., while stirring, 9 mol. proportions of HF , at the most, and 3 mol proportions at least of alkali metal chloride, *e. g.*, NaCl , to each mol. proportion of Al_2O_3 and the ppt. thus obtained, in the presence of H_2O , is treated with alkali metal fluoride, *e. g.*, NaF .

Apparatus for making anhydrous metallic chlorides. F. T. WOHLERS. U. S. 1,564,302, Dec. 8. Material such as a metal is fed to a rotary uniformly heated fused silica reaction chamber, together with Cl, and reaction products are led off and condensed.

Coating salts with inert particles. L. A. BUNDS. U. S. 1,562,821, Nov. 24. A ground salt such as CuSO_4 for prepg. *insecticides*, etc. is conveyed in a current of hot air while inter-mixed with talc powder or other inert and more finely ground powder, so that evapn. from the salt particles leaves a salt residue on the particles in which the inert particles are embedded so that they serve to prevent agglomeration.

Hydrogen sulfide. E. BINDSCHEDLER and E. W. RUGELEY. U. S. 1,565,894, Dec. 15. A mixt. of hydrocarbon oil and S is heated and the H_2S thus formed is purified by passing it through charcoal or other material of high absorptive capacity.

Chlorine. E. M. PARTRIDGE and E. W. SCARRITT. U. S. 1,566,040, Dec. 15. A mixt. for generating Cl on contact with moisture comprises a pyrosulfate, a chloride and a permanganate, *e. g.*, $\text{Na}_2\text{S}_2\text{O}_7$, NaCl and KMnO_4 .

Receptacle for liquid oxygen. C. MOTT. U. S. 1,564,612, Dec. 8.

Decolorizing carbon. J. N. A. SAUER. U. S. 1,563,295, Nov. 24. Wood, peat or other carbonaceous material is subjected to a practically continuous heating operation in successive stages. Activating gases are withdrawn and reintroduced into the app. used in a continuous manner.

Activated carbon. G. W. WALLACE. U. S. 1,565,129, Dec. 8. Carbonaceous materials such as peat or wood are subjected in a closed chamber to downwardly moving hot gases coming from a flame burning above the material so that a zone of carbonization travels downwardly, and the carbonized material is cooled without access of air.

Removing suspended impurities from solutions of caliche, borax or other substances by flocculation and filtration. W. BROADBRIDGE, E. EDSEY and W. G. SELLERS. U. S. 1,562,863, Nov. 24. In treated solns. such as those from caliche, a flocculating agent, *e. g.*, oleic acid and wood tar, is added to the soln. to flocculate suspended impurities and facilitate their removal by filtration.

Activating bone char. C. B. DAVIS. U. S. 1,565,911, Dec. 15. Bone char is treated with a C-forming distillate from coal, such as one distg. at $315-450^\circ$, which is nonvolatile at ordinary temps., and passed through a kiln out of contact with air at a temp. of redness but under 1000° , cooled out of contact with air, washed with hot H_2O and then dried and kilned out of contact with air prior to use in refining sugar or for other purpose.

Filtering and decolorizing material from bone. P. L. WOOSTER. U. S. reissue 16,225, Dec. 15. See original pat. No. 1,518,289; C. A. 19, 564.

Synthetic stone resembling sapphire. D. BERTOLINI. U. S. 1,565,777, Dec. 15. Asynthetic stone having the hardness of natural sapphire and the appearance of natural aquamarine comprises Al_2O_3 86 and MgO 14% and a trace each of oxides of Co and V.

Lime putty. D. A. EVANS. U. S. 1,566,587, Dec. 22. In curing "lime putty," H_2O is allowed to settle through the putty mass and excess H_2O is filtered as it discharges from the bottom of the mass.

Hydrating lime. J. P. RICH. U. S. 1,565,107, Dec. 8. A weighed charge of unground lime is added, with agitation, to a calcd. quantity of H_2O to slake all the lime and the agitation is continued while a jet of air is supplied to assist the agitation and sepn. of impurities. The hydrated lime is withdrawn by suction.

Molding cement mixtures or other plastic materials. F. C. RUPPEL. U. S. 1,562,520, Nov. 24. Mech. features adapted for avoiding air bubbles at the surface of the finished articles. The molds are lined with celluloid or similar material.

Sheet-celluloid mold for cement mixtures or other plastic materials. F. C. RUPPEL. U. S. 1,562,519, Nov. 24.

Plant for calcining and clinkering calcite, magnesite, cement mixes and similar materials. R. D. PIKE. U. S. 1,557,873, Oct. 20.

Adhesive. F. G. OKIE. U. S. 1,565,027, Dec. 8. A waterproof adhesive adapted for use with abrasive particles comprises driers 3, white lead 4 and varnish 17 parts.

U. S. 1,565,028 specifies sand paper and similar articles made with the use of waterproof adhesives such as specified above (cf. *C. A.* 19, 565)

Adhesive from corn starch. W. R. LONG. U. S. 1,564,970, Dec. 8. Corn starch is treated with HCl and H₂O and allowed to stand for 24–48 hrs. and then agitated and subjected to heat and to steam pressure.

Porous filling material for acetylene storage tanks. A. B. RAY. U. S. 1,565,328, Dec. 15. Fragments of activated C are bonded with a sugar soln. (which is carbonized on the material) or other bonding agent which does not substantially impair the absorptive capacity of the C.

Rendering paper envelope "windows" or similar transparent material "glareless." C. E. SWETT and W. E. SWIFT. U. S. 1,566,239, Dec. 15. The material is subjected to friction while lubricated, *e. g.*, with a mixt. of a sulfonated oil and H₂O.

Translucent film containing asbestos. N. SULZBERGER. U. S. 1,556,973, Oct. 13. Films adapted for *elec. insulation* or other purposes are made from asbestos and colloidal Al silicate and coated with spar varnish.

Mat finish on asphalted asbestos board or similar materials. W. R. WHITNEY. U. S. 1,566,241, Dec. 15. The surface of the material is decomposed, *e. g.*, by treatment with H₂SO₄.

Phenolic condensation product. C. B. CARTER. U. S. 1,566,823, Dec. 22. (CH₂)₆N₄ and NH₄Cl are produced by reaction between methylene chloride and NH₃. PhOH or other phenolic substance is digested with a soln. of these products (the phenolic compd. is used in excess of equimol proportion with respect to the (CH₂)₆N₄). A fusible sol. resinous product is obtained and sepd. It is adapted for conversion into a hard infusible product.

Phenolic condensation product. C. B. CARTER and A. E. COXE. U. S. 1,566,817, Dec. 22. Phenol itself or other similar phenolic substance and methylal, *e. g.*, dimethyl methylal, are subjected to the action of heat and pressure in the presence of acid and H₂O to obtain artificial resinous products.

Foam stabilization. N. T. EWER. U. S. 1,562,878, Nov. 24. An ext. of chestnut oak bark substantially free from tannin is used for stabilizing fire extinguishing foams (cf. *C. A.* 19, 1177).

Reflocculating china clay or other substances. G. W. ACHESON. U. S. 1,563,713, Dec. 1. China clay, fuller's earth, graphite or other substances in finely divided condition are subjected to successive deflocculation and reflocculation under attrition.

Laminated material for manufacture of self-lubricating gears, etc. L. T. FREDERICK. U. S. 1,564,774, Dec. 8. Woven fabric is arranged in layers and impregnated with a phenolic condensation product capable of hardening under heat and pressure, together with graphite 5%, or less.

Copper linings in vacuum vessels, etc. M. VOLMER. U. S. 1,560,444, Nov. 3. A thin, hardly visible coating of Ag is deposited on the inner surface of a double-walled vacuum vessel or the like. Cu is then deposited over the Ag, the vessel is heated while evacuating the space in the double wall and the Cu coating is simultaneously subjected to the action of H or other reducing gas which prevents oxidation of the Cu.

Cleaning and polishing silver. C. M. HEMEN. U. S. 1,564,786, Dec. 8. A cleansing and lacquer-forming compn. is made from castile soap 4 lbs., oxalic acid 8 oz., NaHCO₃ 12 oz., cottonseed oil or other vegetable oil 1 qt., H₂O 9 gals. and sufficient Paris white substantially to absorb the liquids of the mixt.

Etching. W. A. STRAW. U. S. 1,565,869, Dec. 15. The material to be etched, *e. g.*, glass, is treated with a reagent such as a CaF₂ paste which alone will not cause etching and then immersed in an acid bath, *e. g.*, H₂SO₄, which also alone would not produce the desired etching, so that the 2 reagents together cause the etching.

Impermeabilizing gas-absorbing substances. E. A. G. STREET. U. S. 1,563,673, Dec. 1. Porous electrode substances for batteries, *e. g.*, C electrodes, or other gas-absorbing materials are treated with a concd. colloidal soln. of starch, glue, silica or other suitable nonmetallic substance to form a pectized covering impenetrable to liquids.

Gas-impervious membrane. J. G. E. WRIGHT and V. K. QUACKENBUSH. U. S. 1,532,015, March 31, 1925. The throat lining or bladder of cattle or similar internal animal membranes are prepd. for use in manuf. of bellows, diaphragms, etc., by treatment with glycerol, nigrosine and ethylene glycol, which renders the membrane pliable at low temps., impervious to gas and capable of withstanding wetting without stiffening on drying.

Dental cement. P. W. KRUGER. U. S. 1,562,834, Nov. 24. A Mg cement powder that reacts with guaiacol is mixed with guaiacol and balsam of fir. Cf. *C. A.* 20, 267.

Dental paste for temporary fillings. J. L. SMITH. U. S. 1,564,375, Dec. 8. Beeswax 1, petroleum jelly 3, calcined magnesnia 1, Na baborate 1 and NaHCO_3 2 parts.

Acid-treated cork tips for billiard cues. J. S. PIGA. U. S. 1,532,943, Apr. 7, 1925. Cork tips are treated with acid, *e. g.*, HCl , to effect a uniform slight roughening.

Belt dressing. A. GONDERMAN. U. S. 1,566,592, Dec. 22. Extra heavy lubricating oil 1 qt., rosin 2 lbs. and beeswax 3 oz.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Operating conditions of Boetius glass furnaces. H. XINGNESSE. *Chaleur et industrie* 6, 536-9(1925).—A discussion of the operation of this type of furnace, showing its disadvantages and giving a heat balance observed in com. operation. A. P.-C.

The rapid production of vitrified clay wares by the combined effects of heat and pressure. A. J. DALE. *Trans. Ceram. Soc. (Eng.)* 24, 262-7(1925).—The application of comparatively low mech. pressures can exert a considerable accelerating effect on the rate of vitrification of certain types of materials at temps. in the region of 1050° . It appears probable that acceleration will be more marked under higher pressure values (up to 4000 lbs. per sq. in.) attainable in a no. of com. briquetting machines. This opens up the possibility of the rapid firing of tiles, building bricks and articles made from surface clays and other materials possessing fairly low refractory values; and of the briquetting, without bond, of certain calcined refractory oxides. H. F. S.

A visit to the osmosis plant at Carlsbad. S. R. HIND. *Trans. Ceram. Soc. (Eng.)* 24, 73-85(1925).—An illustrated description of the works of the Carlsbad Kaolin Electro-Osmosis Co. The process employed does not increase the purity of the product over that obtained by settling alone, but it is a convenient means of removing the clay from suspension. H. F. KRIEGE

The dehydration of kaolinite. Y. V. SAMOILOV. *Trans. Ceram. Soc. (Eng.)* 23, 338-9(1925).—From a study of the heating curves of kaolinite and other Al silicates, S. concludes that in the process of dehydration, kaolinite is decomposed into Al_2SiO_5 and SiO_2 . H. F. S.

The temperature gradient obtained by different rates of heating in unfired bricks, between 15° and 250° . L. S. THEOBALD AND A. T. GREEN. *Trans. Ceram. Soc. (Eng.)* 24, 105-23(1925).—Three com. brands of brick are examd. for their thermal response to heating during the water-smoking period. Temp. readings are taken at the interior and exterior of the brick to det. the thermal cond. and the heat absorbed during the changes produced by heating. The max. rate for the safe heating of green brick to a temp. of 250° is detd. H. F. KRIEGE

An investigation of the effects of load, temperature and time on the deformation of firebrick materials at high temperatures. A. J. DALE. *Trans. Ceram. Soc. (Eng.)* 24, 199-215(1925).—The results of the independent effects of load, temp., and time on the deformation of a typical firebrick at temps. within the subsidence range are: (1) the flow of firebrick material under stress at temps. within the subsidence range is in certain respects qualitatively analogous to the stress-flow relations of "plastic" materials at ordinary temps. (2) For any given temp. within the subsidence range, a yield load range exists; at loads below this yield load range, flow under stress is probably a viscosity effect; at loads immediately above the yield value, flow is presumed to be both viscous and plastic. During this period, the ratio is large compared with the corresponding ratio at stress values below the yield value. (3) The higher the temp. the lower is the value of the yield load. (4) Providing a certain temp. is exceeded, the deformation temp. relation for firebrick material is exponential, *i. e.*, $D = ce^{bt}$, where c and b are consts. for a given loading; below this temp. the deformation-temp. relation is approx. linear, *i. e.*, $D = kT$; the deformation-time relation previously put forward, $D = kt^m$, holds for different load and temp. values under the test conditions. Practical indications have been obtained with regard to the regulation of the rate of rise of temp. during the initial firing of a firebrick setting, the need for accurate limitation of temp. below a prescribed max., dependent on the mat. and on the load to be sustained, the general method of applying a modified Mellor and Moore load-test result to industrial considerations. H. F. S.

An investigation of the changes taking place during the industrial burning of fireclay bricks. A. T. GREEN AND L. S. THEOBALD. *Trans. Ceram. Soc. (Eng.)* 24, 124-58

(1925).—Samples of firebrick were withdrawn from 4 kilns at various stages during the burning and examd. physically. True sp. gr. detns. indicated the changes in the kaolinite mol between 450° and 570°, the polymerization of the Al_2O_3 mol. at about 900°, and defined the vitrification range. The rapid increase in porosity between 600° and 900° is due to the burning out of carbonaceous matter and the change in constitution of the kaolinite. The decrease in porosity above 900° is associated with vitrification. By detg. the loss on ignition the time factor of the dehydration of kaolinite is obtained. Vol. contraction, color changes, formation of "iron" specks and blotches, and the stages of vitrification were observed. Consideration is given the time factor for doing the necessary heat work in the kilns. H. F. KRIEGER

Observations on the elimination of carbonaceous matter from fireclay bricks. L. S. THEOBALD AND A. T. GREEN. *Trans. Ceram. Soc. (Eng.)* **24**, 159-69(1925).—No apparent change took place in half bricks or smaller test pieces on heating them up to 500°, but at 600° oxidation became noticeable. Complete elimination at this temp. could be effected by prolonged heating. If 650-900 temps were used there formed a bluish white ring surrounding the black core. This ring later gave place to a yellow area, especially in a deficiency of air. If the carbonaceous matter was burned out below 600° no yellow core formed but a uniform salmon pink color developed. The elimination decidedly affects the true sp. gr. of the brick. H. F. K

Some fallacies to be avoided in the standardization of any method of testing the load-bearing capacities of refractories, at high temperatures, and a suggested method for standardization. A. J. DALE. *Trans. Ceram. Soc. (Eng.)* **24**, 216-27(1925).—Methods which involve rapid application of load are unsuitable as standardized methods of testing the load-bearing capacities of refractories at high temps; methods which require the penetration of loaded rods into the material also are of questionable value. Any method of testing the load-bearing capacity of firebrick at high temp. is to be avoided, from the standardization viewpoint, if it involves merely one detn. of the amt. of subsidence at a fixed temp. and under a fixed load. The results from such a test will not necessarily place the materials in order of merit from the practical load-bearing point of view. Any high-temp. load-test on fireclay products which involves merely the recording of the temp. (or cone) at which collapse takes place, under a fixed load and const. rate of rise of temp., may also yield anomalous results. H. F. S.

Fractional fusion of refractories. R. HUSTIN. *Chimie et industrie* **14**, 691-2 (1925).—On changing the lining of a reheating furnace from ordinary grade of brick to a special grade, the life of the lining was increased from 1 week to 4 weeks. The special bricks fused partially during the first week, after which fusion stopped and the bricks gave good service. Analysis of the unaffected and of the fused portions of the bricks gave: SiO_2 78.80, 56.30, Al_2O_3 18.28, 31.53; Fe_2O_3 2.47, 8.97; CaO 0.56, 2.17; MgO 0.26, 0.62%, resp. The change in compn. is due to the loss of 51% (on the original wt. of the brick) of free SiO_2 , which formed fusible silicates with fluxing agents introduced with the C. The resultant increase in the Al_2O_3 content of the outside of the brick increased its refractoriness, resulting in increased life of the lining. Similar reactions might occur in the absence of external fluxing agents by reaction of the free SiO_2 with the fluxing agents in the brick itself. A. PAPINEAU-COUTURE

The relation between under-load refractoriness, ordinary refractoriness, and composition, physical and chemical, of refractory materials. II. Firebricks. A. J. DALE. *Trans. Ceram. Soc. (Eng.)* **24**, 170-98(1925); cf. C. A. **19**, 3358.—The information obtained from the ordinary refractory test is not a reliable criterion as to the behavior of refractory material of the aluminosilicate type under load conditions at elevated temps.; nor can the cone or temp. at which complete failure under load occurs be accepted as an infallible indication of rigidity at lower temps. Under the test conditions of this work, all the firebrick materials examd. exhibit a diminution in the coeff. of thermal expansion under a load of 50 lbs. per sq. in. at temps. below 1300°; in certain cases as low as 1000°, but with the majority of materials 1200° appears to be a crit. point in this respect. Complete failure under load at high temps. is preceded by deformation occurring during a more or less extended temp. range. The rate and amt. of deformation (d) under load at 1350° is related to the time (t) of heat treatment at this temp. by the equation $d = (t/a)^m$; with the units adopted herein, a value of m greater than unity is an indication that ultimate failure under load results chiefly from the effect of temp. on the property of cohesion; a low value of m accompanies deformation with marked softening or diminished internal friction of the brick substances. With 3 exptl. clay-grog mixts., the value of m was lower with the highly grogged bricks than with the bricks of lower grog content or the straight clay bricks.

A classification of firebrick materials based on their load behavior at high temps. has been suggested. H. F. S.

Furnace ash as a refractory material. H. E. WEIGHTMAN. *Power* **62**, 557-60 (1925).—The materials used in refractories are briefly described. Causes of refractory failure are given. A method is described by which a suitable refractory for patching may be prep'd. from coal ash. D. B. DILL

The influence of oxidizing and reducing atmospheres on refractory materials. I. Experiments with a cone mixture containing added amounts of a ferruginous material. A. E. J. VICKERS AND L. S. THEOBALD. *Trans. Ceram. Soc. (Eng.)* **24**, 86-97, 98-104 (1925). By using a Hirsch elec. furnace, the effect of different atms. on a cone mixt. contg. 0.25% Thiviers earth has been det'd. The softening temp. of the test pieces increased in O_2 and in air compared to the values obtained in N_2 as standard. SO_2 and CO_2 seem to act as reducing gases. H_2 acts strongly as a reducing gas, the softening temp. of the test piece with the highest Fe content being lowered some 250° . Variations in the color were noted with the different atms. With the same app. it was found that the reducing action of CO lowered the softening point 170° for the cones contg. 2.50% Fe_2O_3 and 0.085% FeO as Thiviers earth. With water vapor more striking results were observed than with H_2 . This greater activity is explained by the ionization of the H_2O vapor under the conditions maintained. H. F. KRIEGER

The heat-insulating efficiencies of some diatomaceous earth products and slag wool. A. T. GREEN AND H. EDWARDS. *Trans. Ceram. Soc. (Eng.)* **24**, 228-39 (1925).—There is a definite porosity (apparent sp. gr., consistency or packing density) for materials of the same constitution, which gives a max. insulating efficiency. Pure diatomaceous earth packed so as to possess an apparent sp. gr. of 0.34 has a greater insulating effect than the same material loosely packed (apparent sp. gr. 0.08), or the same material in slab form possessing an apparent sp. gr. of 0.46. The greatest insulating efficiency of slag wool is obtained with a packing of 10 lbs. per cu. ft. (apparent sp. gr. 0.16) in low temp. practice. H. F. S.

Regenerative furnace for melting glass (U. S. pat. 1,565,370) 1. Reflocculating china-clay (U. S. pat. 1,563,713) 18.

Melting and fining glass. A. L. HARRINGTON. U. S. 1,564,235, Dec. 8. A glass batch is preliminarily fused in a pot, the pot is transferred to an elec. furnace with its molten contents, and the operation including the fining is there completed.

Coating materials with glass. C. E. NELSON. U. S. 1,566,911, Dec. 22. Preheated powd. glass is fed to a blowpipe flame and melted as it passes through the flame and is applied to the surface to be coated.

Increasing the softening temperature of vitreous materials. W. C. SPROESSER. U. S. 1,565,598, Dec. 15. The surface of glass X-ray tubes or similar vitreous material is treated with a soln. of $Na(NH_4)HPO_4$ or other substance which will react to produce a similar effect.

Porcelain articles. E. L. DILLMAN. U. S. 1,566,841, Dec. 22. A mold is formed of plaster of Paris, asbestos and siliceous or other non-fusing compn., an impression is made in the mold, the impression is filled with fusible material such as a porcelain compn. which is adapted for producing dental plates or other articles which are being formed, and, after heating the mold and contents to a temp. which fuses the porcelain and subsequently cooling, the mold is moistened to effect its disintegration.

Dental plates. E. L. DILLMAN. U. S. 1,566,840, Dec. 22. In forming dental plates from fusible material such as porcelain a model is formed of "rare earth" or other material sol. in the presence of moisture, a porcelain plate is formed on the model and fused with it, and the model is then disintegrated and removed by moistening.

Continuous kiln for drying ceramic ware. T. LARSSON. U. S. 1,567,023, Dec. 22.

Refractory brick. R. YOUNGMAN. U. S. 1,564,394, Dec. 8. An unburned refractory brick adapted for building furnace walls comprises calcined magnesite 60, chrome ore 35 and Na silicate 5%.

Refractory material of fused silica. W. A. HARTY. U. S. 1,563,853, Dec. 1. Sand is fused in an elec. furnace beneath a layer of amorphous or cryst. $SiCl_4$.

Enamels and glazes. F. SOMMER AND M. GROTH. U. S. 1,564,907, Dec. 8. Both unburnt clay and burnt clay are used together in enamels and glazes such as may also contain ZrO_2 in order to avoid formation of blisters or bubbles.

Zirconium oxide in enamels, etc. C. J. KINZIE. U. S. 1,562,890, Nov. 24. Crude material contg. ZrO_2 as its principal constituent is mixed with a relatively small quantity

of independently vitrifiable ingredients such as a glass-yielding frit and the charge is heated to decompose and eliminate impurities and produce an enamel opacifier.

Abrasive articles. M. F. BEECHER and M. C. BOOZE. U. S. 1,567,020, Dec. 22. Grains of Al_2O_3 or other abrasive material are mixed with a vitrifiable bonding substance such as a clay and feldspar mixt. in dry condition and the unfired dry mixt. is fired to vitrify the bond. The product is adapted for use as a brick, tile or for grinding wheels.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Note on the chemical analysis of portland cement. G. BAIRE. *Chimie et industrie Special No.*, 331-4 (Sept. 1925).—B gives in great detail a technic for the detn. of SiO_2 , Al_2O_3 , Fe_2O_3 , CaO , MgO , SO_2 , sulfide S and loss on ignition, suitable for artificial portland (not for slag) cement, which gives sufficiently accurate results for ordinary work, in a reasonable time.

A. PAPINEAU-COUTURE

Note on the determination of loss on ignition of cements containing slag. G. BAIRE. *Chimie et industrie Special No.*, 335-6 (Sept. 1925).—Ignition of cement contg. slag causes partial oxidation of CaS to CaSO_4 . In order to obtain correct results SO_2 should be detd. in the cement both before and after ignition and the loss on ignition as found corrected for the O absorbed.

A. PAPINEAU-COUTURE

A new quick-hardening slag cement. P. PRÉVOST. *Chimie et industrie Special No.*, 337-8 (Sept. 1925).—"Louve" brand cement, manufd. by the Société Générale des Chaux et Ciments, has the following av. compn.: combined SiO_2 21.2, sand 12, Al_2O_3 13.8, Fe_2O_3 1.6, CaO 46.3, MgO 2.1, SO_2 0.9, undetd. 9.6%; fineness, 1% held on a 75-mesh (per in.) sieve, 10% held on a 175-mesh sieve; apparent d. 0.880, deformation at 100° 1 mm. Setting begins in about 5 hrs. and is complete in 8-15 hrs. Results of tests are given showing it to have considerably higher tensile and crushing strengths after 1, 2, 7, 28 and 90 days than slag and artificial portland cements meeting the specifications of the City of Paris. The process of manuf. is not disclosed. A. P.-C.

Action of sodium and magnesium sulfates on calcium aluminates. G. R. SHELTON. *Ind. Eng. Chem.* 17, 1267-70 (1925).—Previous work on the action of Na_2SO_4 and MgSO_4 solns. on port cement (C. A. 19, 2117) was continued by studying the action of the same solns. on $\text{CaO} \cdot \text{Al}_2\text{O}_3$, 5 $\text{CaO} \cdot 3\text{Al}_2\text{O}_3$ and 3 $\text{CaO} \cdot 5\text{Al}_2\text{O}_3$, both before and after hydration with H_2O . The hydration product of each was a mixt. of hydrated 3 $\text{CaO} \cdot \text{Al}_2\text{O}_3$ and amorphous substance. The amt. of the latter and the time for complete hydration both increased with the Al_2O_3 content of the aluminate. *Sulfoaluminate crystals* were formed from all 3 Ca aluminates, cryst. and hydrated, with Na_2SO_4 of all concns. and with MgSO_4 below 0.1 M concn., the largest quantities being formed from hydrated aluminates and dil. solns. Their max. and min. values of n were 1.463 ± 0.003 and 1.461 ± 0.003 , resp. Above 0.1 M concn., the only cryst. product from MgSO_4 was gypsum. Layers of gel, most abundant with MgSO_4 , surrounded the cryst. aluminate grains and ultimately protected them from further action. This protection was greatest with concd. solns. and with the aluminates of max. Al_2O_3 content. With cryst. aluminates and very dil. solns., hydrated 3 $\text{CaO} \cdot \text{Al}_2\text{O}_3$ crystals formed only momentarily or not at all, in contrast to the behavior of cryst. 3 $\text{CaO} \cdot \text{Al}_2\text{O}_3$ in such solns., which grew large and remained unchanged.

C. C. DAVIS

Relation between water permeability and water absorption of concrete. E. VALD ANDERSON. *Ind. Eng. Chem.* 18, 17-8 (1926).—No direct relation was found. Direct detn. of permeability is recommended.

RAYMOND WILSON

Modern roads and the chemical problems which they bring up. LÉON BALLAN. *Chimie et industrie Special No.*, 346-59 (Sept. 1925).—General discussion of the use of hydraulic cements, bitumens, and coal-tar products in road-making.

A. P.-C.

Conservation of mine timber in North American mining practice. ROBERT NOWOTNY. *Braunkohle* 24, 760-2 (1925).—A brief discussion of American methods of preservation of mine timbers.

WM. B. PLUMMER

Relation of moisture content of wood to its decay. W. H. SNELL, N. O. HOWARD AND M. U. LAMB. *Science* 62, 377-9 (1925); cf. C. A. 15, 3744.—The purposes of this study were: to det. the relation of decay of certain light woods to the air-moisture balance; to compare the air-moisture requirements of *Lenzites sepiaria*, *L. trabea*, *Trameles serialis*, *T. carnea*, *Fomes roseus* and *Leninus lepidus*; and to correlate the matters of moisture, air content and decay to the sp. gr. of the wood decayed. The max. moisture content at which decay can take place in common com. woods is 190

to 200%. Beyond this point there is not enough air to support the growth of the fungi. In general the moisture content favoring a max. decay will vary inversely as the sp. gr. It is thought that heavy woods resist decay because of the small air content and not from the presence of tannin or resins. L. W. RIGGS

Thermal decomposition of sulfates and some reactions of CaSO_4 (MARCHAL) 6. Rubber composition [as wall covering] (U. S. pat. 1,566,247) 30. Plant for calcining cement mixes (U. S. pat. 1,557,873) 18.

TAYLOR, FREDERICK W., THOMPSON, SANFORD E. AND SMULSKI, EDWARD. **Concrete, Plain and Reinforced**—Vol. I. 4th ed. rewritten. New York: John Wiley & Sons, Inc. 969 pp. \$8.

Cement. C. LEONARDT. U. S. 1,563,755, Dec. 1. In prepg. a plastic waterproof cement, limestone or other material contg. CaCO_3 is treated with HCl, asphalt and crude petroleum oil or other oleaginous substance is added, and the resulting mixt is added to ordinary port. cement.

Cement mixtures. K. WINKLER. U. S. 1,565,839, Dec. 15. Cement mixts. are gaged with a soln. of CaCl_2 of about 23° Bé. to which 3% or less of powd. Mn oxide and Cr oxide has been added. This mixt. serves to produce a quick setting highly waterproof product.

Refractory cement. F. C. F. LE COUITRE. U. S. 1,565,472, Dec. 15. Finely powd. Zr ore is mixed with org. and inorg. binders such as dextrin 0.4 and H_3BO_3 0.2% and with about 30% of substantially pure ZrO_2 .

Flexible cement composition. O. OLESEN. U. S. 1,566,917, Dec. 22. A mixt. adapted for packing in air-tight containers comprises sand 8, port. cement 4, Ca soap 4 and Zn soap 1 part.

Waterproof portland cement. C. N. MILLER. U. S. 1,566,498, Dec. 22. A mixt. of β -naphthol and a non-volatile oil such as a petroleum oil is used for waterproofing cement at the time of grinding the clinker.

Gypsum from anhydrite. M. FARNSWORTH. U. S. 1,566,186, Dec. 15. Anhydrite is ground to such a size that the largest particles are between 18 and 135 microns and the av. particle size is between 7 and 30 microns and the ground material is hydrated.

Bituminous paving mixture. G. COBB. U. S. 1,565,258, Dec. 15. Bitumen 3.5–5% is mixed with crushed rock aggregate passing a No. 200 mesh sieve not over 5%, passing a No. 10 mesh sieve 5–15%, passing a $\frac{1}{4}$ in. screen 15–25%, passing a $\frac{1}{2}$ in. screen 20–35% and passing a $\frac{3}{4}$ in. screen 20–40%.

Bituminous soap for binding and waterproofing. L. S. VAN WESTRUM. U. S. 1,565,125, Dec. 8. A product adapted for use as a binder or waterproofing agent in paving, building materials, etc., is prepd. by mixing, while hot, 30–50 parts asphalt, 3–8 parts resin, 3–8 parts linseed oil and 5–50 parts NaOH soln. until sapon. is complete.

Wall-board composition. J. W. OELHAFEN. U. S. 1,564,706, Dec. 8. Sawdust 89, molasses 1, Na silicate 5 and whiting 5%.

Preserving wood. C. T. HENDERSON AND L. ROSENSTEIN. U. S. 1,565,503, Dec. 15. An emulsion for preserving wood is formed of about 85% of an asphalt base mineral oil or a similar H_2O -repellent liquid, mixed with about 10% of a toxic inorg. salt such as ZnCl_2 or NaF in aq. soln. and with about 5% of an org. emulsifying agent, *e. g.*, sulfonic acids.

Grained finish on wood produced by charring. J. SHULER. U. S. 1,566,985, Dec. 22. Cypress, pine, oak or other wood is treated with a soln. (such as an aq. soln. of HCl and KNO_3) which will protect the softer portions against charring to a greater extent than it will protect the harder portions and the surface is then subjected to charring and rubbing.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Hans Bunte. A. SANDER. *Z. komp. u. flüssige Gase* 24, 109(1925).—An obituary.

R. L. DODGE

In memory of Hans Bunte. G. KEPPELER. *Z. angew. Chem.* 38, 977–80(1925); portrait. C. MATSCHOFF. *Z. Ver. deut. Ing.* 69, 1442–3(1925).

E. J. C.

Combustion control by means of triangular diagrams. GEORGES DE GUELDRÉ.

Chaleur et industrie 6, 466-8(1925).—Polemical against Sunnen (*C. A.* 19, 3007).

A. PAPINEAU-COUTURE

Recent progress in the use of pulverized fuel. H. BROWNLIE. *Chaleur et industrie* 6, 499-506(1925).

A. PAPINEAU-COUTURE

Proposed methods for the determination of the volatile matter of solid fuels. D. J. W. KREULEN. *Bull. fed. ind. chim. Belg.* 4, 183-200, 255-73(1925); cf. *C. A.* 19, 1765.—A very thorough review of proposed methods and app., and of exptl. work bearing upon their use. Bibliography contains 61 references.

WM. B. PLUMMER

Use of fuels on Wilton "economizer-grates." A. C. WINKLER. *Chimie et industrie Special No.*, 163(Sept. 1925).—Comparative tests with ordinary coal (ash 9.70, volatile 8.71%) on an ordinary grate and with low-grade coal (ash 13.46, volatile 8.44%) on a Winkler "economizer-grate" showed a saving of 27% in fuel cost in the latter case.

A. PAPINEAU-COUTURE

The briquetting of brown coal. F. W. FOOS. *Braunkohle* 24, 753-6(1925).—A brief discussion and analytical examn. of methods in use. The coal may enter the press at 60°, in which case its temp. will rise during pressing to about 100°, this temp. being sufficient to cause superficial alteration of the briquet. Carbonization yields for the hard shiny outer layer thus formed are compared to yields for the inner portion of the briquet.

WM. B. PLUMMER

Spiral conveyors in tube driers in brown coal briquetting plants. ERICH BÖER. *Braunkohle* 24, 756-60(1925).—Description of various forms of driers.

W. B. P.

The present status of coal carbonization in Germany. G. CANTIENY. *Combustion* 13, 209-13(1925).—See *C. A.* 19, 2873.

J. F. BYRNE

Influence of the ash constituents in the carbonization and gasification of coal, with special reference to nitrogen and sulfur. I. Preparation and preliminary examination of special cokes. C. B. MARSON AND J. W. COBB. *Gas J.* 171, 39-45(1925).—M. and C. prepd. special impure cokes by the addn. of SiO_2 , Al_2O_3 , CaO , CaCO_3 , Fe_2O_3 , Na_2CO_3 and NaOH to a coal contg. less than 1% ash, at the two temps. of 500° and 800° and compared the behavior of such cokes with each other and with the pure cokes. The heating period for coke prepn. was 5 to 6 hrs. The pure coke was spongy and swollen. The Fe_2O_3 coke was smaller in bulk, compact, finely porous, and much more resistant to crushing than the others; its sp. gr. apart from added oxide was no higher than that of the pure coke. NaOH destroyed the coking quality, while Na_2CO_3 gave a compact, finely porous coke particularly resistant to crushing. The effects of Al_2O_3 and SiO_2 were not noticeable. Fe_2O_3 , CaO and CaCO_3 reduce the N left in the coke prepd. at 800° while NaOH and Na_2CO_3 increase it. These effects are not noticeable in the cokes prepd. at 500°. The N content was lower in the pure coke prepd. at 800° than in that prepd. at 500°. Fe_2O_3 , CaO , NaOH and Na_2CO_3 in the descending order named increase the S content of the 800° cokes; Fe_2O_3 and CaO are also effective to a less extent at 500°. The S content of the 800° coke was less than that of the 500° coke. An historical review and the analytical methods used are given.

A. E. G.

Investigations on the low-temperature carbonization of coal. J. SAINTE-CLAIRE DEVILLE. *Chimie et industrie Special No.*, 164-72(Sept. 1925).—Description of the results of low-temp. carbonization tests carried out by the Sarre Mines, with a discussion of the possibilities of this process from an economic standpoint. On the whole the results reported do not bring out anything very new; but D. draws attention to the advisability of drying the coal before carbonization (e. g., by the waste gases from the retort), and to the fact that with very shaly coals the output from the retort is not greatly affected owing to the higher d. and lower sp. heat of the shale.

A. P.-C.

Low-temperature carbonization of lignites and bituminous shales. CHARLES BERTHELOT. *Chimie et industrie Special No.*, 174-80(Sept. 1925).—From a discussion of the mechanism of distn. and requirements for optimum conditions of low-temp. carbonization, B. concludes that the Salerni retort is the one best adapted for the latter process. With a small (100 kg.) intermittent retort, he obtained the following tar yields from various fuels: lignites 44-165 kg. per ton; bituminous coal 30-137 kg. per ton; bituminous shale 56-280 kg. per ton, all on the dry basis. The possible field of application of the process is discussed.

A. PAPINEAU-COUTURE

The carbonization of non-coking coals with particular reference to lignite. W. W. ODELL. *Proc. Am. Gas Assoc.* 1925, (advance copy) 7 pp.—A review and discussion of the work of the Bureau of Mines and the Lignite Utilization Board of Canada, describing in particular the construction and operation of the carbonizing app. developed by the latter workers.

WM. B. PLUMMER

The mechanism of the carbonization of coal in the by-product coke oven. N. A. ROSS. *Gas World* 83, 12-4(1925).—R. considers the carbonization theories of Illing-

worth, Beilby and Foxwell, makes comparisons, draws conclusions and gives his own theory. Before the plastic stage H_2O is driven off, β - and γ -comps. are formed by thermal decompn. of the coal, β - and γ -comps., commence to decompose and cell formation commences. During the plastic stage β - and γ -comps. decompose completely, the resultant gas extrudes molten γ -comps., plasticity is set up, and coke structure formed. Toward close of this stage the coke hardens. After the plastic stage the thick soft cell walls are further broken down and the remaining volatile matter is evolved with formation of the microstructure. A. E. GALLOWAY

Industrial furnaces. W. TRINKS. *Mech. Eng.* **47**, 1065-71(1925).—A comparison of boiler and industrial furnaces, and a discussion of: fuels for industrial furnaces, furnace efficiencies, automatic temp. control, means of detg. furnace sizes, and the selection of fuel. A chart indicates the selection of furnaces for industrial heating operations, and numerous types of industrial furnaces are illus. W. H. BOYNTON

Industrial-furnace efficiency. V. J. AZBE. *Mech. Eng.* **47**, 1061-4(1925).—Thermal efficiencies in industrial furnaces are very low. Too little attention has been given to them. Losses are the same as those encountered in boiler furnaces, but, in industrial heating furnaces, are in most cases more difficult to lessen or eliminate. No standard of comparison for industrial heating app. has been established. W. H. B.

Relation of boiler house equipment to plant economy. THEODORE MAYNZ. *Chem. Met. Eng.* **32**, 851-2(1925).—Requirements of a boiler plant may be divided in 3 main items: power, process steam and building heat. Industries using steam in process work should be equipped for the most economical operation. Accessory equipment should include: stop and non-return valves, soot blowers, flowmeters and CO_2 recorders, or boiler meters equipped with the above app. The transmitting machinery should be properly designed. W. H. BOYNTON

Institution of Gas Engineers' annual Presidential address. J. F. BELL. *Gas J.* **170**, 863-9(1925).—A review of the Institution's activities and of the progress of the industry. A statistical comparison of gas, elec., and coal consuming appliances is made. Economic phases are discussed. Thermal values of gas coal and coke, thermal efficiencies of horizontal and vertical retorts, blue water and carburetted water gas, and low-temp. carbonization are given. A. E. GALLOWAY

Gas tariffs. VAUPEL. *Gas u. Wasserfuch* **68**, 707-11(1925).—Rate systems in use in several German cities for domestic and industrial gas consumers are described and discussed. WM. B. PLUMMER

The economics of gas production on the thermal basis. GEORGE EVETTS. *Gas J.* **170**, 813-52(1925).—An extended discussion of economic phases and a strong argument for the manuf. and sale of gas on the thermal basis. The vol. of the gas must be considered in conjunction with the heat units. The following factors must influence the choice of the declared calorific value: (1) the satisfaction of the consumer; (2) the class of coal available; (3) relative values of coal, oil and residual products; (4) and (5) the capacity and type of existing plant; (6) the capacity of the distribution system; (7) latest development in mfg. processes; (8) operating costs; (9) capital costs and rate of interest on money. A. E. GALLOWAY

The manufacture of blue water gas. A. PARKER. *Nature* **115**, 501-2(1925).—A review. F. N. S.

Water-cooled water gas generator with automatic ash removal at the Rotterdam gas works. M. C. SISSINGH. *Gas u. Wasserfuch* **68**, 734-6(1925).—The generator wall at the fire zone is formed by an annular boiler, no refractory being used; the internal diam. of the generator being 2.6 m., the space between the walls of the annular boiler is 0.5 m., it being of welded construction from ordinary boiler plate. Above the fire zone the generator wall is of ordinary refractory construction. In the test described the fuel coke contained 11.6% ash and 87.3% C + S, the slack discharged by the automatic rotary grate contg. 48.8% ash, 47.5% C, 3.7% H_2O . The gas yield was 1 cu. m./0.53 kg. coke (net), its heating value 2556 kg. cal./cu. m., steam used per cu. m. gas 0.386 kg., % steam undecomposed 38.3. The generator wall boiler furnished 84.5% of the total steam required. Considerable savings in operating costs, especially labor, are indicated. WM. B. PLUMMER

Report of sub-committee on tests on and developments of oil sprays for water gas machines. J. H. WOLFE. *Proc. Am. Gas Assoc.* **1925**, (advance copy) 7 pp.—Résumé and discussion of a questionnaire returned by 21 companies. Of these 16 used a mist type spray; further details as to cooling, etc., are given. The rates of input of oil, gal./min./gross sq. ft. carburettor area, were as follows: lowest min. rate 0.18; lowest max. rate 0.20; lowest av. 0.23; highest min. 0.88; highest max. 0.96; highest av. 0.94; in 17 out of 27 cases the av. rate was between 0.30 and 0.60. The oil used varied in

gravity from 20 to 40° Bé, with 17 out of 21 using 30–40° oil. The formulas used by the various companies for calcg. oil efficiencies are listed. WM. B. PLUMMER

Report on waste heat and illuminating gas boilers. R. E. KRUGER. *Proc. Am. Gas Assoc.* 1925 (advance copy) 6 pp.—Curves are given for returns earned by such installations for various existing coal costs. The "usual" and the "Rochester" methods of cleaning illuminating gas boilers are described in detail. Some operating data are given. WM. B. PLUMMER

Operating results on vertical retorts (24-hour period) in the Hanover gas works. FRANZ KLEEMAN. *Gas u. Wasserfach* 68, 747–8(1925).—The plant consists of 10 vertical ovens each contg. 6 retorts, the whole being fired by 2 producers and equipped with regenerators. The charge is 5000 kg./retort, and the coking time 24 hrs. The gas yield is 41.9 cu. m./1000 kg. raw coal, its heating value 4625 kg. cal./cu. m., its compn. 3.2% CO, 3.2 C₂H₄, 0.8 O₂, 14.2 CO, 11.3 N₂, 14.4 inerts. Coal analysis as charged is 3.2% total H₂O, 8.8 ash, 29.2 volatile matter. Coke fired to producers is 13.8 kg. (dry coke)/100 kg. coal charged. Av. temp. in heating flues is 1235°. WM. B. PLUMMER

Liquid purification of coal gas: its interest for the sending of gas over considerable distance. CH. BERTHELOT. *Chimie et industrie* 14, 663–78(1925).—A discussion of gas-purification processes, describing in detail the process by means of soda ash soln. for the removal of S compds. and recovery of free S, bringing out its advantages over the Fe₂O₃ method and showing that when coke oven gas is used as illuminating gas it is preferable to purify it at the coke-oven plant rather than at the gas distributing station. A. PAPINEAU COUTURE

Experiences with refractories in vertical retorts. T. F. E. RHEAD AND R. E. JEFFERSON. *Gas World* 82, 625–8(1925).—Three graphs are presented showing temps. during heating up. The total expansion was 1.13% of the original height. Examn. of dismantled materials shows very little fusion near the top of most of the combustion flues, fusion in the waste-gas system was not very great until the uptake flue was reached. Conditions in the siliceous and lower firebrick belts were spalled, little changed, slightly fused, or badly fused in places. A. E. GALLOWAY

Use and development of exhaust steam regenerators. R. E. KRUGER. *Proc. Am. Gas Assoc.* 1925 (advance copy) 2 pp.—Steam accumulators for water gas plants as previously described (cf. *C. A.* 19, 2399) are in operation in various plants but reliable data as to their performance are not yet available. WM. B. PLUMMER

Report of sub-committee on developments and results on carburetors, checkered and checkerless. J. H. WOLFE. *Proc. Am. Gas Assoc.* 1925 (advance copy) 15 pp.—Statistical résumé and discussion of replies to a questionnaire on carburetor operation returned by 60 operators. Where conditions have permitted reduction or elimination of the carburetor checker brick, most reports show oil efficiencies equal to or better than av. Mist type oil spray was used by 68% of the companies, solid stream type by 23%, both types by the rest. As temp. control points 67% of the companies used the bottom of the superheater, 12% the top of the superheater, 10% the top and bottom of the superheater, 7% the bottom of the carburetor, while only 1 company used the top of the carburetor. The oil consumption for various B. t. u. values of finished gas has been plotted as an approx. straight line curve (with notation giving fuel, oil and operating characteristics for the various cases). WM. B. PLUMMER

Developments in gas calorimetry. C. V. BOYS. *Gas World* 82, 581–4; *Gas J.* 170, 933–6(1925).—B. discusses developments with his box gas calorimeter and the Boys bell meter and proposes a gasworks method of sampling. A. E. GALLOWAY

Report on oil gas machines. ROBERT LINDSAY. *Proc. Am. Gas Assoc.* 1925 (advance copy) 7 pp.—Plant construction and operating data are given for the single-shell type ("straight shot" method) and the double-shell type (Jones) plants for oil gas manuf. All by-products being disregarded the returns from each process are approx. the same, but if the light oil be recovered and if there be a market for the lamplblack (in the latter process the lamplblack yield is reduced 50% by the use of steam) the straight shot process is estd. to give 10 cents/1000 cu. ft. finished gas greater difference in value of materials and products than does the two-shell process. WM. B. PLUMMER

Report on the Chrisman down run process. H. K. SEELEY AND L. W. SELTZER. *Proc. Am. Gas Assoc.* 1925 (advance copy) 6 pp.—The process is briefly described and results are given from the operation of 3 different plants. The approx. av. of these results is: saving in generator fuel 2–3 lbs./1000 cu. ft.; oil consumption decreased 5% in one case, increased 0.3% in another; make/set/hr. unchanged or increased up to 10%. WM. B. PLUMMER

The wear of internal parts of motors using blast furnace gases. P. MARTINET.

Tech. moderne 17, 765-8(1925).—A discussion of the action of the impurities of the gas and of the lubrication on the various parts of the motor which are subjected to high temps.

A. PAPINEAU-COUTURE

Report of the uncarburetted section of the water gas committee. H. C. BLACKWELL. *Proc. Am. Gas Assoc.* 1925 (advance copy) 3 pp.—Of the 9 companies in the U. S. known to manuf. blue water gas, 8 have furnished descriptions of equipment and operating data, which are tabulated. Of these, 6 produce blue gas for mixing with natural gas, 1 for heating coke ovens, and 1 for standby purposes. WM. B. PLUMMER

Tables for the calculation of pipe lines for compressed gas. J. HOUEL. *J. usines gaz* 49, 337-42(1925).—Eight large scale charts are given which graphically represent the formula $Q = 262,500 [(p_1^2 - p_2^2) D^{5.33} / \delta L]^{0.5}$, where Q is the delivery in cu. m /sec, p_1 and p_2 are the initial and final pressures in kg., resp., D and L the diam. and length of the pipe in m., resp., and δ is the d. of the gas. These charts cover the following ranges: δ , 0.4-0.6; D , 8-220 cm; L , 1-100 km.; Q , 100-50,000 cu. m /hr.; p , up to 15 kg.

WM. B. PLUMMER

Recovery of benzene and of volatile solvents by means of solid absorbents. EDUARD URBAIN. *Chimie et industrie Special No.*, 245-51(Sept., 1925).—Essentially a discussion of the merits of activated charcoal for gasoline and solvent recovery and more particularly of U.'s process which is characterized by the use of indirect heating or cooling of the absorbent, thereby effecting better utilization of the steam injected to recover the solvent and better control of exothermic absorptions.

A. P.-C.

Relation of tar utilization to coal carbonization. S. R. CHURCH. *Chem. Met Eng.* 32, 869-70(1925).—A brief discussion advocating the use of "intermediate" carbonizing conditions, representing a compromise between high and low-temp carbonization, as giving the best combination of high yields and desirable properties of the products

WM. B. PLUMMER

Low-temperature tar yields from Hungarian coals. ERNST LASZLO. *Braunkohle* 24, 733-9(1925).—Available results from com. practice are summarized and results given for lab. expts in Fischer's small rotary assay retort. The data cover a large no. of typical coals; ultimate and proximate analyses are also given

W. B. P.

Composition of some low-temperature tars now being produced on a semi-commercial scale. J. D. DAVIS AND A. E. GALLOWAY. *Proc. Am. Gas Assoc.* 1925 (advance copy) 12 pp.—Exhaustive analytical data are given for 7 low-temp. tars, a coke-oven tar, and a water-gas tar; the low-temp. tars are not identified by the process producing them, but carbonizing conditions and yields are briefly given. The app. used for the lab. tar distns is the standard Bureau of Mines petroleum distn assay app., 300 cc. of tar being distd. in a glass flask to 275° vapor temp. when the distn is continued at 40 mm. pressure to a vapor temp. of 300°; cuts are taken every 25° during both parts of the distn. Tar acids, bases, unsatd. hydrocarbons (sol. in 95% H_2SO_4), aromatic hydrocarbons (sol. in 37 N H_2SO_4), sulfonation residue, and sp. gr. were detd. for each 25° fraction and for the total distillates. The data of the distns. proper are tabulated. Other data given include heating value and ultimate analyses of the tars, tar sp. gr., viscosity, and free-carbon content. The results are discussed from the standpoint of the effect of carbonizing conditions on tar yields and properties.

WM. B. PLUMMER

Modern tar-distillation plant and process. H. M. SPIERS. *Chem. Age* (London) 13, 544-6(1925).

E. H.

Carbonization Committee report. A. M. BEEBE. *Proc. Am. Gas Assoc.* 1925 (advance copy) 8 pp.—A general discussion of the present situation and of the program for the coming year, in particular of tests of coke reactivity and of the general characteristics of cokes produced under various com. conditions from the same coals, which tests are being carried out under the auspices of the Am. Gas Assoc. W. P. P

Report of the operators' section. D. W. WILSON. *Proc. Am. Gas Assoc.* 1925 (advance copy) 4 pp.—Further and more detailed discussion of the carbonization tests of the same coal in various plants (cf. preceding abstr.). The coal used is a Pittsburgh Seam gas coal, the plants including 2 intermittent vertical retort installations, 2 of continuous vertical retorts, 1 of horizontal through retorts, and 2 coke ovens. Tests of the cokes are to be carried out jointly by the Mass. Inst. of Tech. and the Bureau of Mines.

WM. B. PLUMMER

Study of cokes from various types of plants using the same coals. R. T. HASLAM. *Proc. Am. Gas Assoc.* (advance copy) 1925, 4 pp.—Description of methods to be used at the Mass. Inst. of Tech. in tests of coke samples from the cooperative carbonization tests (cf. preceding abstr.). Particular emphasis is laid upon the detn. of coke reactivity.

A. C. FIELDNER. *Ibid* 2 pp.—Similar description of the methods to be used in the Bureau of Mines tests of these cokes. WM. B. PLUMMER

The improvement of coke in gas works operation. GERHARD. *Gas u. Wasser-fach* 68, 699-702(1925)—A general discussion of coal mixing, etc. WM. B. PLUMMER

Low-temperature carbonization. S. R. ILLINGWORTH. *Gas World* 82, 608-10 (1925).—A review covering the following: problems and difficulties of low-temp. carbonization; blending and avoidance of swelling; overcoming the difficulty of bulk carbonization; future of the system based on small coal; yields of products; throughput; cooperation between low- and high-temp. methods. A. E. GALLOWAY

The case for low-temperature carbonization in America today. H. W. BROOKS. *Power* 62, 634-8, 680-4(1925).—Low-temp. carbonization is more profitable than by-product coke oven methods on account of lower operating and investment costs, higher oil and richer gas yields and, in certain processes recommended, the delivery of a finely divided, easily ignitable coke which may be more efficiently utilized for power generation. The Middle West is considered the most favorable location for such an installation. Its supply of cheap non-coking bituminous coals can be converted into by-products of local value and a pulverized semi-coke suitable for efficient power production. The economics of high-temp. and of low-temp. methods of carbonization are compared in detail. Also in *Power Plant Eng* 29, 1087, 1139(1925). D. B. DILL

Domestic coke and factors affecting coke formation. J. D. DAVIS AND L. C. KARRICK. *Proc. Am. Gas Assoc.* 1925 (advance copy) 6 pp.—A brief general discussion of the methods and principles of coking. High-temp. carbonization methods applied to coking coals yield the most satisfactory dense domestic fuel. Combinations of briquetting with low-temp. carbonization yield satisfactory domestic fuels, but the com. feasibility of such processes in this country has not yet been demonstrated. WM. B. PLUMMER

Rate of travel of fusion zone in coke ovens. W. P. RYAN. *Proc. Am. Gas Assoc.* 1925 (advance copy) 17 pp.—A general discussion. Further data from tests similar to those of Wilson (*C. A.* 19, 1486) are also reported. The curves for the rate of travel of the fusion zone, or of isotherms below 1100° F., through the charge are in agreement for those calcd. for the rate of heating of a solid slab of const. heat capacity and cond. which is heated by walls of const. temp. This indicates that the thermal characteristics of the coal, plastic coal, and semi-coke are all of the same order of magnitude, and that the heat effects of fusion and thermal decompn. are negligible. As the charge is heated above 1100° F., however, its heat cond. increases suddenly to several times its original value. Since the rate of travel of the fusion zone decreases as its distance from the heating wall increases, until the effect of preheating at the center of the oven causes the rate of travel to increase again as it nears the center, it is evident that the greater the oven width the lower will be the min. rate of travel reached before this increase takes place. Hence since the initial and final (at wall and at oven center) rates of travel are the same regardless of the oven width, it is seen that the wider the oven the lower the av. rate of travel of the fusion zone, *i. e.*, that a given increase in oven width will produce a disproportionately greater increase in the coking time. WM. B. PLUMMER

By-product coke-oven practice. IX, X. R. A. MOTT. *Fuel in Science & Practice* 4, 373-81, 441-9(1925); cf. *C. A.* 19, 3369.—A comparison of waste heat, recuperative and regenerative types of ovens, with a discussion of oven design and the dimensions to be employed under different conditions, charging and discharging, quenching and loading coke and the properties and use of refractories. XI. *Ibid* 463-73.—A review and discussion of various theories of coking, the evaluation of coking power and quant. data on the coking process, including 29 references. C. C. DAVIS

Coke-oven accidents in the United States during 1924. WM. W. ADAMS. *Bur. of Mines, Tech. Paper* 388, 38 pp.(1925). E. J. C.

Calorific value and constitution (BARKER) 2. The effect of knock inducers and suppressors on gaseous ionization (CLARK, *et al.*) 3. Fuel from sulfite cellulose lye (U. S. pat. 1,564,142) 23.

BUNBURY, H. M. AND DAVIDSON, A.: **The Industrial Applications of Coal Tar Products.** London: Ernest Benn, Ltd. 284 pp. 42s. net. Reviewed in *Pharm. J.* 115, 500(1925).

COHEN, J. B. AND RUSTON, A. G.: **Smoke: A Study of Town Air.** 2nd ed. revised and enlarged. London: E. Arnold & Co. 108 pp. 8s. 6d. Reviewed in *Chemistry and Industry* 44, 874(1925).

Combustion. Reference book on the Theory and Practice of the Principles of Combustion. Industrial Gas Series. New York City: Am. Gas Assoc., 342 Madison Ave. 74 pp. Price \$1.50 to members; \$3.00 to non-members. Reviewed in *Ind. Eng. Chem.* 17, 1205(1925).

FISCHER, FRANZ: **The Conversion of Coal into Oils.** Translated and edited by R. Lessing. New York: D. Van Nostrand Co. London: Ernest Benn, Ltd. 284 pp. \$8 (36s. net). Reviewed in *Chemicals* 24, No. 15, 42; *Engineering* 120, 533 (1925).

KERSHAW, J. B. C.: **Fuel Economy and Smoke Prevention.** 3rd ed. revised and enlarged. London: Constable & Co., Ltd. 16s. net. Reviewed in *Engineering* 120, 590(1925).

Treating coal with substances which facilitate breaking or mining. R. LESSING. U. S. 1,532,826, Apr. 7, 1925. Breaking up and mining of coal is facilitated by treating the coal *in situ* with 0.1% of SO₂, pyridine, aniline, quinoline or other substance which weakens the union between the constituents of the coal.

Coal briquets. E. EDSEER and W. H. BEASLEY. U. S. 1,562,876, Nov. 24. Finely divided coal is agitated as an acidified pulp with a frothing agent such as cresol and kerosene and with a pitch or tar or a similar substance having normally no affinity for the coal particles and adapted to serve as a binding medium, to effect agglomeration.

High-pressure hydrogenation of heavy mineral oils, coal distillates and slack. INTERNATIONALE BERGIN COMPAGNIE VOOR OLIE- EN KOLEN-CHEMIE. Dutch 13,594, Oct. 15, 1925. The materials are heated (300–500°) in H₂ at 50–100 atm. with the addition of about 5% alkali metal as catalyzer for the desulfuration and cracking. Porous substances, fuller's earth, charcoal, coke ash may be added to the mixt. for further refining of the product.

Fuel for internal-combustion engines. J. F. P. DE LA RIBOISIÈRE. U. S. 1,534,573, Apr. 21, 1925. A hydrocarbon fuel contg. a considerable proportion of hydrocarbons b. above 160°, and which may also contain alc. and ether, is admixed with phenyl compds. such as those of Se, Te, Th, Tl, U, W, Ti, Bi, V, or Al, dibenzyl salicylate, benzyl amines, benzyl anilines, benzyl alcs., benzylhydroxy amines or similar compds. in small quantity to increase the power developed from the fuel and decrease the consumption of fuel.

Fuel briquets. A. D. PARKER. U. S. 1,564,890, Dec. 8. Starch and borax are heated in H₂O and emulsified with hot asphalt to form a binder for culm or other material to be briquetted.

Briquetting fuels. R. KATTNER. U. S. 1,562,564, Nov. 24. Coal fines or other fuel material is mixed with MgCl₂ and MgO is then added and the mixt. is molded and pressed, H₂O also being added if necessary.

Gaseous fuel. J. HARRIS. U. S. 1,565,933, Dec. 15. A gas adapted for use in cutting metals comprises natural gas mixed with about 2½% or more of ether vapor. U. S. 1,565,934 specifies CO instead of natural gas and U. S. 1,565,935 specifies casing head gas with about 5% of ether vapor.

Fuel spreader for gas generators, etc. O. B. EVANS. U. S. 1,564,546, Dec. 8.

Phenols from gas liquors. L. W. HEFFNER and W. TIDY. U. S. 1,566,795, Dec. 22. Liquors contg. small quantities of phenols are heated to 98° or higher in the presence of sufficient NH₃ to drive off the phenol as phenolate. U. S. 1,566,796 specifies a similar distn. of ammoniacal liquors contg. phenols.

Gasoline from "wet" natural gas. H. A. MOSSOR. U. S. 1,565,749, Dec. 15. Wet natural gas is first compressed and cooled to remove as liquid a portion of its gasoline content. The compressed gas is then subjected to the action of an absorbing menstruum, the latter is sepd. from the denuded gas and the pressure on the menstruum is reduced to liberate its gasoline content as vapor. The vapor thus liberated is mixed with wet natural gas before the latter is subjected to the compression and cooling step.

Catalytic oil-gas retort apparatus. L. BLANCHET. U. S. 1,565,409, Dec. 15.

Open-hearth furnace adapted for burning tar, oil, coal or gas. W. DYRSSEN. U. S. 1,564,330, Dec. 8.

Composition for removing carbon deposits from internal-combustion engines. J. BIRD. U. S. 1,565,779, Dec. 15. Tablets are formed from (NH₄)₂CO₃ and C₁₀H₈.

Calcining petroleum coke or similar materials. A. S. WALDEN. U. S. 1,564,730, Dec. 8. A stream of the material is moved through zones of successively increasing temp., e. g., in a horizontal inclined rotary kiln, the temp. at which the solid residue begins to undergo oxidation being that of an intermediate zone. The evolved gases are burned with a deficiency of O in the zones hotter than the intermediate zone and the residual gases are subsequently completely burned in the zones of lower temp.

Coking pitch or similar materials. F. W. SPERR, JR. U. S. 1,563,595, Dec. 1. In producing a low-ash coke from materials such as pitch a portion of the material is heated to expel part of the volatile matter and produce a semi-coke. The latter is mixed with additional pitch and the mixt. subjected to a coking temp.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The exploitation of the Italian petroleum fields. GAETANO CASTELLI *Rass. min. met. chim.* **58**, 81-8(1925).—An illustrated description of the extent and methods of exploitation of the individual fields and the character of the petroleum products.

C. C. DAVIS

The petroleum reserves of Roumania. ARMANDO RABISCHON. *Rass. min. met. chim.* **58**, 94-6(1925).

C. C. DAVIS

Oil for Canada from her tar sands. R. B. DAY. *Oil & Gas J.* **24**, No. 14, 21, 130 (1925).—A description of the Athabaska Region in Alberta is given. Methods suggested for the utilization of the bituminous sands of the Athabaska Region include the sepn. of the oil and sand by extn. with solvents, hot water, or mud; mixt. of the sands as they exist with dry sand or crushed limestone for use as paving material, the destructive distn. in closed retorts. The third method is most feasible since by cracking the heavy oil a 25% gasoline and 30% kerosene yield will be obtained with a residual oil which may be further cracked.

M. B. HART

Conservation and treatment of crude oil recovered from sand formations. M. E. LAYNE. *Oil Age* **22**, No. 6, 23(1925).—In the sepn. and recovery of gas and oil encountered in deep wells in loose sand under high pressure, controlling and balancing of this pressure are necessary. Great care should be taken that the clay-treated circulation water is free from all trash. The clay fills the openings in the sand and it can only be removed by thorough washing outside of the screen. But if the openings in the sand are partially filled with trash, this refuse will be drawn into the screen openings, clogging a large part of the same when the bringing in of the well is undertaken. It is important thoroughly to wash the outside of the screen and remove the clay wall from the sand back of the screen before the pressure is removed from the inside of the screen, by washing.

M. B. HART

Changes undergone by mineral oils in colloidal systems. F. EVERS. *Z. angew. Chem.* **38**, 659-62(1925).—Although an exhaustive analysis of the changes undergone by mineral oils in the capillaries of the materials (*i. e.*, in colloidal systems) from which transformers and switches are made, cannot now be made on account of the lack of information, E. is convinced that it is these changes that cause the deterioration of transformer and switch oils in service. The high concns. of O_2 and of H_2O in the oil in the capillaries increase the rates at which acidic substances that by dehydration and condensation give rise to sludge are formed. Analyses of a very old sample of oil from a transformer are given; the sample differs radically from gilsonite, which also is sol. in C_6H_6 . The part of the oil that is insol. in petroleum ether has the following elementary analysis: C 78.8, H 7.1 and O 14.1. The removal of acidic substances and "tar" from a used transformer oil is much less complete when silica gel is used than when silicates are used. The removal of acid is better when a given proportion of the silicate is used in successive portions rather than as a single portion. W. F. F.

Specific heats, heats of vaporization and critical temperatures of California petroleum oils. E. H. ZEITFUCHS. *Ind. Eng. Chem.* **18**, 79-82(1926).—Sp. heats were detd. by heating the oils in a sealed capsule and dropping the capsule into H_2O contained in a Dewar flask. Errors caused by differences between the sp. heat of vapor and liquid and by the heat of condensation of vapor were minimized by nearly filling the capsule with oil. Oils were heated to 371.1° as a max. A table and graphs show the heat of liquid (above 25°) vs. temperature. Other tables and graphs show calcd. sp. heats (true) as functions of the sp. gr. Critical temps. of petroleum ether, gasoline, crude naphtha, crude kerosene, gas oil and mineral seal distillate were detd. by heating samples in a Pyrex tube (2 mm. bore \times 8 mm. outside diam.). Heats of vaporization were calcd. at the mean b. p. by means of Trouton's rule. Curves showing the relation between latent heat of evapn. and temp. were plotted for pure hydrocarbons and the slopes of the tangents at the b. p. were found to be nearly equal. Curves for the oils were then drawn tangent to a line at the mean b. p. parallel to the tangents of the curves

for pure hydrocarbons and of the general shape of these curves. The curves were extended to the critical temp., where the latent heat of evapn. has the value, 0. The data are suitable for use in engineering calcs.

W. F. FARAGHER

Sulfuric acid absorption and iodine values of various petroleum products and cracked distillates obtained therefrom. J. C. MORRELL and GUSTAV EGLOFF. *Ind. Eng. Chem.* **17**, 1259-61 (1925).—Absorptions were detd. by shaking 5 cc. of oil with 4 cc. of H_2SO_4 (1.84 sp. gr.), in a 10-cc. graduated cylinder. After centrifuging, the vol. of the undissolved oil was read. Upon comparing charging stocks and crude-petroleum distillates made from them in a commercial Dubb's unit, the absorptions are greater for the stocks than for the corresponding distillates. With Hanus soln., the I nos. of oils are found to decrease by increasing the wt. of oil in a fixed vol. of soln., or by decreasing the vol. of soln. for a given wt. of oil. Nevertheless, for a given oil, const. I nos. are obtained if the ratio of wt. of oil to vol. of Hanus soln. is kept const.

W. F. FARAGHER

Thermal expansion of California petroleum oil. E. H. ZEIFFUCHS. *Ind. Eng. Chem.* **17**, 1280-3 (1925).—Refinery products from typical California crude petroleum were investigated. Glass pycnometers were used at temps. up to 200° and a steel pycnometer was used up to 410° . Sources of error are discussed. No single equation expresses the relation between sp. vol. and temp. over the whole range. California products below 25°A.P.I. have a slightly lower rate of expansion, and those above 25° a greater rate than the tables in Bur. Standards, *Tech. Paper No. 77* show (cf. *C. A.* **10**, 2983).

W. F. FARAGHER

Linton process attracts attention. C. E. KERN. *Oil & Gas J.* **24**, No. 8, 146 (1925).—The Linton process for the production of gasoline and lubricating oils is explained as being a conversion not a cracking process which converts heavy residual into light hydrocarbons, without pressure and without volumetric loss. This is accomplished by gradually pre-heating crude oil under certain conditions and letting it run in a thin film over mildly heated surfaces in a specially constructed apparatus which forms a motor spirit concentrate (or anti-knock element called canary concentrate) and a straight motor fuel. Further, a high-class lubricant, having characteristics similar to those of castor oil, is made from the topped crude.

M. B. HART

Little petroleum formed by true oil shales in nature. F. M. VAN TUYLAND and C. O. BLACKBURN. *Oil & Gas J.* **24**, No. 10, 188 (1925).—Expts. conducted to test the hypothesis that oil exists as such in shale indicate that important quantities of petroleum have not been formed from true oil shales except possibly in the vicinity of igneous intrusions where the temps. have been unusually high. Kerogen and petroleum are not genetically related but represent different end products of transformation of org. debris, probably because of differences in bacterial action, at the time of deposition. Cylinders of oil shale were caused to flow in specially constructed steel spools under pressure. Detn. of the free oil content before and after flowage indicated that no free oil was produced at elevated temps.

M. B. HART

New process for bleaching gasolines obtained by cracking or by catalysis. A. MAILHE. *Compt. rend.* **181**, 668-9 (1925).—Gasoline contg. diolefins and other easily polymerized hydrocarbons can be refined and decolorized by boiling with metallic chlorides (especially SnCl_2), or by passing the vapors over the chlorides at about 200° . The treated gasoline is washed with NaOH and with H_2O and is rectified. The SnCl_2 can be used repeatedly and when its activity decreases it is easily regenerated by treatment with HCl . The process is also applicable to crude benzenes.

A. PAPINEAU-COUTURE

Expansion methods of refining. R. K. COLLINS. *Ref. & Nat. Gasoline Mfr.* **4**, No. 8, 23 (1925).—The Collins Expansion Process used by the Sunrise Laboratories Corporation is either a batch, semi-continuous or continuous process in which the initial material is charged either direct or through a heat exchanger to the shell type horizontal stills. When recoverable straight-run gasoline is present the first stills are used for skimming, the fourth, fifth and sixth stills being equipped with Collins Expanders. Vapors from No. 4 still pass into No. 1 expander where a thermo mech. treatment has the effect of rearranging their at. and mol. structure to produce a larger yield of gasoline, naphtha or kerosene as desired. Bottoms from No. 4 still pass into No. 5 still and are treated in No. 2 expander, etc. The thermo mech. adjustment in each expander differs, producing a common product. The product is passed through dephlegmators and expanders, and is then condensed and treated as usual.

M. B. HART

Re-running eliminated in skimming plant. G. TRIPLETT. *Refiner & Nat. Gasoline Mfr.* **4**, No. 7, 32, 34, 36 (1925).—Re-running has been eliminated by cutting back the stream from the tower into the still while it is still hot. The Christman reflux tower used at the Caddo Central Oil and Refining Co. is a horizontal tower equipped

with pans and perforated baffle plates. Each pan has a pipe from the center leading from the tower. If any stream from a tower comes over in undesirable condition it can be turned back into the stills and re-run while hot. Still further saving is made possible by preheating the crude in a shell containing a manifold coil of 2-inch pipe 2000 ft. long.

M. B. HART

Better handling of gas will add much to recovery of oil. J. F. SHAW. *Nat. Petr. News* 17, No. 34, 56-9 (1925).—Tables show the vol. of free gas (sea-level basis) contained in one gallon of petroleum under given pressure, the percentage of petroleum in an underground reservoir which will be lifted to the surface by the energy of the absorbed gas; vol. of free air (sea level basis) at a given pressure which is theoretically required to raise 1 gallon of water to a given height in feet; and the gas pressure at various fields.

M. B. HART

Losses in treating crude oil for bottom settlings. H. KAYE. *Oil & Gas J.* 24, No. 9, 101 (1925).—Serious loss in the gravity of crude oil occurs between the time the oil is pumped and when it is sent on to the pipe line. Remedies suggested in connection with an improved type of treating plant are. (1) Test wells for bottom settlings to det. the quantity of tret-o-lite necessary and the temp. required to break the emulsion, which may show the efficiency of settling. (2) Oil storage tanks should be tight with a thief opening which allows 10 to 50 sq. in. of oil surface in contact with air. (3) Plants should be arranged to allow 5 to 10 lbs. pressure if desired which will allow application of heat and permit more vapors to be adsorbed. (4) Keep temp. of oil const. (5) Draw water off the flow tank as far as possible; if possible pump through the 2-inch lead line directly into an upright joint of casing and siphon the water out. (6) A ventilated shed or umbrella to divert sun rays should be used.

M. B. HART

The formolite reaction. A. M. NASTIUKOV. *J. Ind. Chem. (Russia)* I, 28-30, May-June (1925).—The following modification of the original procedure is designed to facilitate the operation of freeing the formolite ppt. of the hydrocarbons which have not reacted. Condense in the usual way the oil, H_2SO_4 and formalin in the proportion 1 4 2. Reflux 1 hr. on the water bath and add 5 times its vol. of water. If some transparent oil (free of formolite) is supernatant, carefully remove by means of a pipet. Place the mass in a flask with an inverted air condenser and heat 1 hr. in a current of steam, neutralize with ammonia in excess and filter with suction. Wash the ppt. with water and benzine (or petroleum ether), dry at 100° and weigh. To the wt. in g. of the formalite add 5.25% (to account for the persistence of moisture and for the change of wt. due to the reaction with formalin); the number obtained is the formolite number. The formolite numbers obtained are about the same as those which are obtainable by the original method. By the modified process the formolite obtained is powder-like and never sticky and is, therefore, easily filtered and dried; it shows, however, after being dried at 100°, a considerable partial soly. in benzine (or petroleum ether).

BERNARD NELSON

Vacuum assay distillation test. A. G. PETERKIN, JR. AND S. W. FERRIS. *Ind. Eng. Chem.* 17, 1248-9 (1925).—A simple app. that can be operated easily has been developed. One hundred cc. of oil is used, and the temps. are read when 1, 3, 5, 10, 20, —, 90 and 95 cc. have distd. at the rate of 5 cc. per min. A pressure of 10 mm. has been found suitable. Comparison with the Bureau of Mines method (40 min.) can be made by adding 39° to each of the temps. Volatile products are distd. at first at at. pressure until the temp. in the vapor is 285°. A special pressure regulator is described. A capillary tube (1 mm. bore), slightly longer than the barometric height, is immersed to the proper depth in a tube of Hg. Since the capillary tube is open to the air and the space above the Hg in the tube communicates with the distn. app. and the pump but not with the air, bubbles of air escape from the capillary into the space above the Hg in the tube when the pressure is decreased by a h. of mm. of Hg equal to the depth of immersion of the capillary. To the bottom of the capillary is sealed a piece of tubing 7 mm. in diam. and 25 mm. in length. This tube is provided with a lip to insure regular escape of bubbles of air. Two or three strings extend from the lip to the air space above the Hg in the tube. Since these strings are not wet by Hg they provide channels through which the bubbles rise without disturbing the surface of the Hg. The results of the distn. of three motor oils are presented.

W. F. FARAGHER

Relation between boiling point and some other properties of petroleum products. J. B. HILL AND S. W. FERRIS. *Ind. Eng. Chem.* 17, 1250-2 (1925).—Crude petroleum were distd. at reduced pressure in the lab. with no special attempt to fractionate them. Steam was admitted when the rate of distn. became slow at temps. at which cracking had to be avoided. These fractions were examd. (Saybolt Universal viscosities at 100° and 210° F., sp. gr., refractive index, and pour-point) and were distd. in the vacuum

assay app. of Peterkin and Ferris (cf. preceding abstract). The relationships between the b. p. of the fractions when 50% had distd. and the various phys. properties of the original fractions are analyzed for each crude. The range of b. p. of the fractions varied from 75 to 115°. These fractions, therefore, are "close" and may be considered to approx. closely in phys. properties "closer" fractions having the same b. p. at the 50% point. Similar data should be useful in detg. the yields of lubricating oils and in detg. the compn. of an unknown blended oil.

W. F. FARAGHER

Tetraethyl lead poison hazards. T. MIDGLEY, JR. *Ind. Eng. Chem.* 17, 827-8 (1925).—Hazards in manuf., handling and mixing with gasoline, distribution of treated gasoline and using of treated gasoline are discussed. The advantages to the public attendant upon the use of PbEt_4 in gasoline are such that "unless a grave and unescapable hazard exists in the manuf. of PbEt_4 , its abandonment cannot be justified." Serious hazards are limited to manuf. and handling of PbEt_4 itself; these hazards are recognized and can be obviated. PbEt_4 is a slow poison, 0.05 as poisonous as HgCl_2 . The symptoms of poisoning are, in order of appearance, drop of blood pressure, drop of body temp., reduced pulse-rate, sleeplessness, loss of wt., nausea or tremor and delirium tremens. In early stages, removal from exposure gives complete restoration. If sleeplessness has developed, the patient is kept in the open air and given light exercise without use of soporifics.

W. F. FARAGHER

The cracking of ozocerite. E. R. TOPORESCU. *Compt. rend.* 181, 669-71 (1925).—Treatment under pressure of ozocerite with AlCl_3 gave:

% AlCl_3 used	Distn. begins	% Distillate	% Benzene	% Kerosene	Residue %
5	163°	33	6	19	8
15	123°	51	30	5	16
25	111°	12	7	2	3

An Engler distn. test of the distillate obtained with 15% AlCl_3 gave: b. p. 34°, to 70° 33% (of the rectified distillate), to 100° 65%, to 145° 90%, to 150° 100%, residue 1, loss 8% (of the original distillate). A certain amt. of unsatd. hydrocarbons is formed.

A. PAPINEAU-COUTURE

Bituminous shales as a source of hydrogen. CAMILLE MATIGNON. *Chimie et industrie Special No.*, 181-2 (Sept. 1925).—The gas obtained by the Société Lyonnaise des Schistes Bitumineux in Scotch retorts contains about 25% H_2 , which could be raised to 50% by preventing leakage of air. Its compn. after removal of CO_2 would be approx. CO 12, C_nH_{2n} 2, CH_4 18, H_2 68%. M. suggests recovering both H_2 and C_2H_4 by liquefaction by the Claude process and converting into NH_3 and EtOH , resp.

A. PAPINEAU-COUTURE

The bituminous deposits of Lattakia. P. M. F. SCHMITZ. *Matières grasses* 17, 7323-5, 7347-50 (1925).—Essentially a résumé of Marckwald's report (*C. A.* 16, 3201), supplemented by S.'s personal observations.

A. PAPINEAU-COUTURE

The neutralizing action of activated bleaching-clays on acidified lubricating oils. O. ECKART. *Z. angew. Chem.* 38, 885-7 (1925).—German clays (particularly from lower Bavaria) that have been "opened" with mineral acids have become strong competitors of bone-black and fuller's earth in the refining of oils. These clays have greater bleaching action than fuller's earth. The best of them contain when marketed about 0.036% of mineral acid, calcd. as HCl . They do not, however, increase the amount of acid in an acid-alkali-treated oil when as much as 3% by wt. of clay is used at 95° for 10-180 min. The acid of an acid-treated oil is removed more slowly by these clays than by fuller's earth, but almost the same removal of acid is effected (10 min for fuller's earth; 45 min. for clays). Oils that are decolorized by the clays in times shorter than 45 min. darken again during 2-3 days; the oils treated with clay for 45 min. or longer are permanently decolorized. The removal of acid by the clays is effected by adsorption, whereas fuller's earth effects the removal partly by chemical action. Oils are deacidified more thoroughly by dry clay than by moist clay. The ability of a clay to remove acid from an oil is related closely to its bleaching effect. The addition of 5% of CaCO_3 to a clay gave a product that removed acid from an oil as rapidly and thoroughly as fuller's earth. The addition of 2.5% of Na_2CO_3 or CaO gave a product that was superior to fuller's earth. The commercial fuller's earths that were used were shown to contain 1.7-6.5% of $\text{CaCO}_3 + \text{MgCO}_3$.

W. F. FARAGHER

Lubrication and lubricants. X. JACODER. *Industrie chimique* 11, 396-401 (1924); 12, 351-4, 492-6 (1925).—A review covering the utility of lubrication, qualities required of a good lubricant, manuf. of com. lubricating oils and greases and control of lubricants and of lubrication.

A. PAPINEAU-COUTURE

Composition and commercial applications of a few spirits of turpentine. GEORGES DUPONT AND (MISS) M. BARRAUD. *Chimie et industrie Special No.*, 474-81 (Sept., 1925); cf. *C. A.* 16, 4339-41.—Spirits of turpentine from Austrian black pine (*Pinus laricina austriaca*) was found to have the following compn.: *l*-pinene (and traces of nopinene) 96, a *d*-hydrocarbon (*d*-limonene?) 1, sesquiterpene 1, esters, oxidation products and *d*-tail products 2%. $[\alpha]_D^{20}$ of the products obtained from different trees varied from -25.35° to -48° , which is attributed exclusively to variations in the inactive pinene content. This is the first time such variations have been observed in the product from different individuals of the same species. Spirits of turpentine from Spanish black pine (*Pinus laricio*, "pino salgareno") was found to have the following compn.: *l*-pinene 90, *l*-limonene 5, sesquiterpene 1.5, oxidation products and tails 3.5%. These 2 spirits of turpentine have practically identical compns. and in com. syntheses would behave like Bordeaux spirits of turpentine. They are the only ones known to consist almost exclusively of *l*-pinene. Reactions in which inactive pinene gives max. yields could probably be carried out commercially on a mixt. of spirits of turpentine from black pine and from Aleppo pine which has a high *d*-pinene content. Spirits of turpentine from *Pinus longifolia* was found to contain: *l*-pinene 21.8, nopinene 9.7, *d*-terpene and Δ^3 -carene 37.6, *l*-terpene 1.7, oxidation products and longifolene 20.3, residue and tails 5.9%. Owing to a relatively high content of non-volatile constituents it has poor drying properties and must be redistd., only about 75% being used. Its use in the chem. industry will depend on ultimate utilization of the chem. properties of carene, which is the most important constituent. Spirits of turpentine from *Pinus pinea* was found to contain: *l*-pinene 16.7, *l*-limonene 75.4, sesquiterpene 6.6, residue 1.7%. It could be used as a source of *l*-limonene by sepn. of the *l*-pinene by means of an efficient distn. column.

A. PAPINEAU-COUTURE

Necessity of a precise definition of spirits of turpentine. DANIEL BÉGUERIE. *Chimie et industrie Special No.*, 465-7 (Sept., 1925).

A. PAPINEAU-COUTURE

(Definition of) spirits of turpentine. A. GÉRAUD. *Chimie et industrie Special No.*, 484-5 (Sept., 1925).—See *C. A.* 19, 1944.

A. PAPINEAU-COUTURE

Bordeaux pine (*Pinus maritimus*) and its industries. G. DUPONT. *Chimie et industrie Special No.*, 65-74 (Sept., 1925).—An address.

A. PAPINEAU-COUTURE

The future of the wood distillation industry. G. DUPONT. *Tech. moderne* 17, 725 30 (1925).—A discussion of the improvements required in the industry to allow it to compete with the synthetic production of AcOH and MeOH.

A. P. C.

Carbonization of Moroccan conifers. R. MASSY. *Chimie et industrie Special No.*, 183-5 (Sept., 1925).—Lab. distns. of "thuya" (*Callitris quadrivalvis*) gave charcoal 27.17-32.59, pure filtered tar 7.87-12.31, pyrolygneous acid 27.33-38.28, total acidity (as AcOH) 1.08-1.40, crude wood spirits (as 100% MeOH) 0.50-0.55%. The charcoal makes a very low-grade fuel. The tar (known locally as "er-reld") (d_{20}^{20} 1.078) gave on distn.: below 150° 1.81 (1.20 H₂O), 150-240° 20.28, 240-60° 13.99, 260-80° 7.57, 280-300° 5.65, residue 48.50%, had an acidity (as AcOH) of 1.59% and gave the Hirschsohn-Pepin test for oil of cade. Tar (known locally as "gatrane er-rekik") produced by native methods from cedar (*Cedrus atlantica*) is a black mobile liquid, $d.$ below 1, acidity (as AcOH) below 1%, 65% of which distils at 150-300° at atm. pressure and which gives the Hirschsohn-Pepin test for oil of cade. On neutralizing with CaO and evapg. to a sirupy consistency, the pyrolygneous acid from both woods gives a brown acetate rich in sol. tar, which could doubtless be used in therapeutics.

A. PAPINEAU-COUTURE

Measurement of the vapor tension of gasoline, etc. (DAVIS) 2. Thiosept oil (BELANI) 17. Filter and trap for purifying gasoline (U. S. pat. 1,563,259) 1. Filter for gasoline (U. S. pat. 1,563,247) 1. Apparatus for pressing paraffin (U. S. pat. 1,560,443) 1. Dehydrating emulsions by externally charged particles (U. S. pat. 1,562,712) 13. Rotary apparatus for dry distillation of ligneous acetate material (U. S. pat. 1,566,778) 1. Apparatus for distilling methanol from wood (U. S. pat. 1,562,880) 1. High-pressure hydrogenation of heavy mineral oils (Dutch pat. 13,594) 21.

American Petroleum Supply and Demand. By Comm. of Am. Petroleum Inst. New York: McGraw-Hill Book Co. 269 pp. \$3. Reviewed in *Mining Met.* 6, 590 (1925).

Treating natural petroleum emulsions. C. G. HINRICHS. U. S. 1,566,008, Dec. 15. A natural petroleum emulsion is mixed with a Cl deriv. of ricinoleic acid or other Cl addn. product of a liquid fatty acid in sufficient quantity to effect a sepn. of the

constituents of the emulsion. U. S. 1,566,009 specifies the use of KCNS or other H_2O -sol sulfo cyanide.

Electric dehydration of aqueous petroleum emulsions, etc. H. C. EDDY. U. S. 1,565,992, Dec. 15. After preliminary elec. treatment and sepn. of H_2O and solids the oil residue is filtered to effect further sepn. of H_2O .

Electric and centrifugal separation of oil and water in petroleum emulsions, etc. C. W. GIVIN. U. S. 1,565,997, Dec. 15.

Heat interchanger for petroleum oils and vapors. G. EGLOFF. U. S. 1,566,528, Dec. 22.

Distilling petroleum oils. F. M. CLARK. U. S. 1,566,828, Dec. 22. The heat from a fire-heated still and setting is utilized, at the end of a pressure-distillation of a heavy oil for the production of gasoline, for the treatment of the residues of the distn. which have a d. of about 20° Bé. After the still fire is withdrawn, steam is passed through the residues and the evolved vapors are condensed until about 60% of the oil of the residues has been removed and condensed. The residual material is then withdrawn from the still.

Cracking petroleum oil. B. T. BROOKS. U. S. 1,563,012, Nov. 24. A petroleum oil is cracked under conditions which produce a product rich in olefins. This material is treated with strong aq. H_2SO_4 of somewhat less than 66° Bé strength, the oil is sepd from immiscible substances, treated with alkali and distd. It is suitable for use as a "motor spirit" (This pat. was applied for May 1, 1918.)

Cracking hydrocarbon oils. F. G. NIECE. U. S. 1,565,326, Dec. 15. Vapors and gases from a cracking chamber are subjected to a condensing temp. Other hydrocarbon material such as fuel oil is fed to a body of molten Pb or similar molten material through an inner chamber in the molten body and at the same time gases and vapors remaining uncondensed from the condensing operation first mentioned are also heated by the molten material. U. S. 1,565,327 specifies an app. for carrying out this process.

Cracking oil and freeing it from carbon. L. D. WYANT. U. S. 1,563,818, Dec. 1. Oil is heated to cracking temp. and agitated to maintain C in suspension. Portions of the oil carrying C are ejected from the main body of oil in the heating chamber by the action of pressure directly generated through the gases and vapors evolved from the oil in the process and devices are provided for sepg. and discharging C from the oil in the still.

Apparatus for cracking hydrocarbon oils. F. G. NIECE. U. S. 1,566,341, Dec. 22. The app. is adapted for cracking oils by passing them through molten Pb or similar molten material.

Apparatus for cracking hydrocarbon oils by passing them through molten lead or similar material. F. G. NIECE. U. S. 1,566,416, Dec. 22.

Dephlegmator adapted for use in distilling hydrocarbon oils. J. W. HANCOCK. U. S. 1,564,464, Dec. 8.

Oil still. J. PRIMROSE. U. S. 1,566,921, Dec. 22. The still comprises banks or groups of tubes exposed to hot gases in different parts of their course and connections for taking off, returning to and causing to reflow through the hottest tubes only oil that has already passed through the still.

Apparatus for distilling petroleum and separating carbon from the products. W. H. STILSON. U. S. 1,564,984, Dec. 8.

Still for distilling and coking crude petroleum. P. YOUNG. U. S. 1,564,312, Dec. 8.

Petroleum still. M. F. DEBAJLIGETHY. U. S. 1,562,690, Nov. 24.

Oil and gas separating apparatus. C. J. WOLFE. U. S. 1,565,135, Dec. 8. The app. is adapted for sepg. gas and oil at wells.

Oil from shale. C. S. FOGH. U. S. 1,563,271, Nov. 24. Oil shales and oil sands are heated while being passed through a practically gas-tight rabble furnace, by contact with substantially non-oxidizing gases to vaporize volatile constituents and products in continuous flow. After sepn of a condensate from volatilized substances, the fixed gases are reheated and passed through the furnace as the heating agent.

Oil-shale retort. S. H. CORFIELD. U. S. 1,562,541, Nov. 24.

Retort for distillation of oil shale. J. T. POPE. U. S. 1,564,271, Dec. 8.

Preventing evaporation losses of gasoline or other substances from storage tanks. R. E. WILSON. U. S. 1,566,944, Dec. 22. A body of silica gel is connected with a vapor escape pipe from the tank and the silica gel is attemperated to a temp. at least as high during suction into the tank as that prevailing during expiration from the tank.

Revivifying fuller's earth. F. W. HALL. U. S. 1,562,550, Nov. 24. Spent material used in refining mineral oils is subjected to the distg. action of a carrier gas, e. g., steam, and is then heated in the presence of air to a higher temp. (cf. C. A. 20, 268).

Vanadium. H. L. BALDESCHWIELER. U. S. 1,563,061, Nov. 24. V is recovered from *petroleum ash* by treating it with an alk. reagent such as a hot 20% NaOH soln.

Lubricating oil. R. W. HANNA, O. E. CUSHMAN and T. W. DOELL. U. S. 1,566,000, Dec. 15. A lubricating oil of green fluorescence is obtained from a petroleum oil (such as one with an asphaltic base) normally yielding an oil of different fluorescence, by combining with the oil an oil from the residuum of a cracking process.

Refining lubricating oils. J. W. WEIR. U. S. 1,564,501, Dec. 8. Lubricating oil stock is treated with H_2SO_4 , allowed to settle and the major portion of the sludge is removed. A comminuted solid adsorbent material such as bauxite or fuller's earth is then added and the mixt. is heated sufficiently to decompose the remaining sludge and liberate SO_2 . The adsorbent material is then sepd.

Viscous oily liquids from acetylene and coal-tar hydrocarbons. L. LILIENFELD. U. S. 1,563,203, Nov. 24. C_2H_2 is brought into contact with coal-tar hydrocarbons b. above 140° in the presence of $AlCl_3$. Products are obtained which are clear to yellow oils of high viscosity and possess *lubricating properties*.

Packing asphalt. H. R. DILLEHAY and A. R. LUKENS. U. S. 1,565,798, Dec. 15. Asphalt is prevented from adhering to the inner surface of paper cartons by lining them with a mixt. of Fe oxide, lampblack and clay or similar materials.

Distilling and refining asphalt or similar materials. D. PYZEL. U. S. 1,562,723, Nov. 24. Liquid bituminous substances such as asphalt or asphaltic residuum are mixed with sand, sawdust, coke, coal or other solid matter and the mixt. is passed through a rotating kiln in the form of coherent balls in contact with hot non-oxidizing gases which serve to effect distn. and coking.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The determination of α -cellulose. C. G. SCHWALBE. Tech.-Wiss Teil, *Papierfabr.* **23**, 697-705(1925); cf. C. A. **20**, 283.—A detailed report of the German Fiber Analysis Comm. on the detn. of α -cellulose in sulfite pulp. Comparative tests on 4 sulfite pulps from different countries in 7 German labs. using the Jentgen, the Waentig and the Comm. methods demonstrated that accurate check analyses were not possible: the Waentig procedure gave the most deviating values; the Jentgen method gave the highest and most const. figures; and the other method came between these two. The Comm. method: Treat 3.5 g. air-dry pulp, cut into pieces 1 cm. sq., with 75 cc. 17.5% NaOH soln. (less than 2% Na_2CO_3) in a 250cc. beaker for 1 hr. at exactly 20° by using a thermostat or a water bath. Then crush the mass in a porcelain mortar until homogeneous, cover with a crystg. dish and allow to remain for 30 min. at room temp. (20°). Filter on a Buchner funnel, without filter, refilter, soak for 2 min. in 8% NaOH soln. at room temp., suck off and so treat until 200 cc. are consumed. Wash with distd. water till free from alkali, add 50cc. AcOH soln. (5%), suck off after 2 min. and wash until neutral. Dry in a glass weighing bottle at 105° to const. wt., and det. the ash content. The influence of time, temp. and the method of mixing are discussed. Substitution of the mixing operation by a beating or a rasping of the pulp is not advised. The use of Turkey-red oil as an aid to uniform mercerization is suggested. Three suggested α -cellulose methods were also compared with the others. It is recommended that a compromise be made between the Jentgen procedure and one of the modified methods, which latter consists in treating 3.5 g. air-dry pulp with 50 cc. 17.5% NaOH soln. for 45 min. with frequent stirring. Filter on a porcelain funnel without filter, wash with 400 cc. 8% NaOH soln., with distd. water to neutrality (2 l.), with 100 cc. AcOH and finally with water. Before drying to const. wt. at 105° , wash the mass with abs. EtOH.

J. L. PARSONS

Cable paper. E. BELANI. Tech.-Wiss Teil, *Papierfabr.* **23**, 728-9(1925).—The properties and manuf. of paper for cable insulation are briefly described. Its use as a carrier of thin sheets of metals, as permalloy (78% Ni, 22% Fe), etc., is mentioned. The application of the Schoop metallizing process is discussed. J. L. PARSONS

Reeds for the manufacture of pulp in Russia. V. IUFIRIEV, M. MILJEANT and A. KOGAN. *Zellstoff u. Papier* **5**, 445-6(1925).—*Phragmites communis* from the Dniest River region in Russia yields a stalk of relative high density and an ash content of approx. 6% (of which 84.4% is SiO_2 , 2.7% Al_2O_3 and Fe_2O_3 , 1.5% $Ca(OH)_2$, 0.8% $Mg(OH)_2$ and 10.6% alkalis, H_3PO_4 and Mn). Ultimate analysis gave 5.3% H, 42.8% C and 37.8% N and O. The pulp content (method of Henneburg and Stomann)

of the stem was 51.8% (ash 9.29%) and of the leaf portion 25.2% (ash 0.79%). By the soda process, a yield of 33.3–36.1% pulp from the stems and 21.3–24.2% from the leaf portion was obtained. The digested fibers were 2–3 mm. long and thin and cylindrical in shape, resembling silk. They possess qualities suitable for the manuf. of bag paper.

J. L. PARSONS

Review of the patent literature on chemical processes for the purification and refining of pulps and fibrous materials, 1898–1925. A. SCHROBE. Tech.-Wiss. Teil, *Papierfabr.* 23, 655–8, 687–9(1925).—Brief abstracts of 66 German and foreign patents.

J. L. PARSONS

Roots of the licorice tree as raw material for paper. ANON. *Zellstoff u. Papier* 5, 400(1925).—The licorice tree (*Glycyziza glandulifera uralensis*) grows abundantly in Turkestan, its roots contg. about 20% licorice, of which 18–19% is extd. The extd. residue cooked 4 hrs. in an autoclave with 15% $\text{Ca}(\text{OH})_2$ or 5% NaOH at 3 atm. resulted in pulp fibers similar to esparto, 3–4 mm. long and 0.015 mm. thick. The yield of paper stock, based on the dry wood, was about 50%. Paper made in this manner appeared suitable for packing purposes. Phys. tests on hand-made sheets yielded a tearing length 1050–2040 m., a % stretch 2.7–6.5 and a folding endurance 5–16.

J. L. PARSONS

Paper and pulp from beech wood. ANON. *Zellstoff u. Papier* 5, 401(1925).—Beech wood yields a superior sheet and a pulp which is softer than spruce pulp. It finds use in the manuf. of artificial silk, explosives and celluloid. As a by-product of the digestion process, a N substance is available for fertilizer purposes.

J. L. P.

Effect of heat on the strength properties of bag paper. W. HERZBERG. *Wochbl. Papierfabr.* 56, 1393–5(1925); Tech.-Wiss. Teil, *Papierfabr.* 23, 748–50(1925).—The results of a large no. of tests on the effect of heat on bag papers used for holding cement, etc., are summarized as follows: (1) compared with the paper sheets under ordinary conditions, paper made from soda pulp yielded a 22% and an all sulfite paper a 11% higher tearing length after a 24 hr. exposure to 80° and immediate testing; (2) similarly the % stretch was reduced to 51 with the soda paper and to 63 with the sulfite sheet; (3) the folding endurance was decreased to 15% with the soda and to 2% with the sulfite and (4) the bursting strength was 7% less with both papers. It was shown that cement bags made from soda pulp are preferable.

J. L. PARSONS

Differentiation between sulfite and soda pulp fibers in paper. KORN. *Wochbl. Papierfabr.* 56, 1417–20(1925).—In using the Lofton and Merrit stain for the differentiation and estn. of unbleached sulfite and soda pulp fibers in paper, the red coloration of the former is more intensive than the blue color of the latter, thereby leading to an over-estn. of the sulfite pulp constituent. A modified form of Wisbar's staining method permits of a more accurate microscopic examn. Further testing of the Alexander staining method showed that all sulfite pulp fibers, as well as soda pulp fibers from deciduous trees, straw, esparto and grass in the bleached condition, give the characteristic coloration. Soda pulp fibers from many coniferous woods, especially pine, cannot be distinguished with certainty from sulfite fibers. The method may be simplified by omitting the Congo red staining treatment and the use of a more concd. $\text{Ca}(\text{NO}_3)_2$ soln.

J. L. PARSONS

Lignin (KÜSTER, SCHNITZLER) 10. Homogeneity of α -lignin (HAGGLUND) 10. Constitution of pine wood lignin (KLASON) 10. Relation of moisture content of wood to its decay (SNELL, *et al.*) 20. Drying and oxidizing paper (U. S. pat. 1,564,565) 13.

Cellulose ether compositions. L. LILIENFELD. U. S. 1,563,204, Nov. 24. Moldable compns. are formed from ethyl cellulose, benzyl cellulose or other alkyl, aryl or aralkyl ethers of cellulose, plasticized by the addn. of oily products obtained by the action of C_2H_2 on tar oil constituents b. above 140° in the presence of AlCl_3 . Cf. C. A. 19, 3592.

Esterifying cellulose. N. B. GRILLET. U. S. 1,566,398, Dec. 22. In esterifying cellulose, *e. g.*, to produce cellulose acetate, the reaction is carried out in the presence of a liquid solvent of the desired reaction product in a comparatively large closed vessel which is rotated to agitate the mixt.

Recovering acetic values from cellulose acetate mixtures. E. S. FARROW, JR. U. S. 1,536,334, May 5, 1925. Cellulose acetate particles contg. less than 50% HOAc are agitated with an excess of EtOH at 75° until the HOAc is removed from the particles and converted to EtOAc . Air is blown into contact with the particles to take up and carry away vapors of the residual alc. and EtOAc and the latter are condensed and sepd. Other alcs. may be used instead of EtOH . An app. is described.

Fuel, etc. from sulfite cellulose lye. C. G. SCHWALBE. U. S. 1,564,142, Dec. 1. Sulfite cellulose lye is mixed with sawdust and chlorides of Mg, Ca or Na and the mixt. is heated to 150–200° under pressure to produce a material adapted for use as a fuel after leaching out sol. salts, etc.

Cooking pulp. W. D. GREGOR, W. M. OSBORNE and A. J. KEMZURA. U. S. 1,565,090, Dec. 8. A digester is partially filled with cooking liquor such as acid sulfite soln. and the material to be pulped, *e. g.*, wood in chip form, is fed into the partially filled digester in such amt. as will permit its circulation during the cooking, additional cooking liquor being then introduced to complete the charge.

Fiber board. A. L. CLAPP. U. S. 1,566,309, Dec. 22. A dry moldable material is produced by heating out cellulose in the presence of animal matters such as waste hair or hide scraps and H₂O until the cellulose is hydrated to the point of sluminess. The material is then formed into sheets. U. S. 1,566,310 specifies making dense hard fiber board by heating cellulosic material such as waste kraft paper until the fibers are well hydrated, sheeting, drying and subjecting to high pressure.

Rotating digester for wood pulp. E. MORTERUD. U. S. 1,566,339, Dec. 22.

Film-forming composition. H. A. GARDNER. U. S. 1,564,664, Dec. 8. Nitrocellulose or other "organo oxy-cellulose compd." is used with a toluene sulfoamide-aldehyde resin.

Reducing viscosity of nitrocellulose. N. S. KOCHER and V. E. KIMMEL. U. S. 1,564,689, Dec. 8. Nitrocellulose is treated with a soln. contg. HCl or other inorg. acid together with an alkali metal chlorate, *e. g.* KClO₃, to reduce its viscosity characteristics. The reaction is stopped before the demitration reduces the N content below 9.5%. The resulting product is adapted for forming solns. for spraying.

Removing pyridine from nitrocellulose. L. W. EBERLIN. U. S. 1,564,765, Dec. 8. Colloidized nitrocellulose contg. pyridine is treated with a chlorinating agent such as Cl₂ gas in the presence of a mixt. of H₂O and a penetrant, *e. g.*, acetone 20 and H₂O 80%, until the pyridine is substantially decomposed. The nitrocellulose is then removed from the mixt. and treated with Na₂S₂O₃ or other "anti-chlor" soln. to neutralize free Cl.

Celluloid printing plates. H. RENCK. U. S. 1,565,815, Dec. 15. The surface of a celluloid plate is softened by glacial HOAc or other suitable solvent, the softened surface is coated with an aq. soln. of gelatin contg. glycerol and HOAc or other softening agent for celluloid, the gelatin coating is dichromated, exposed and developed.

Branding carbon paper. H. W. A. DIXON. U. S. 1,565,310, Dec. 15. Different parts of the backing sheet are heated to different temps. to cause absorption of different proportions of the transfer material and produce a marking after cooling.

Preventing f. oth on paper machines. W. E. METCALF. U. S. 1,532,597, April 7, 1925. Mech. features.

Rubber rolls for paper-making machines. R. B. ADAMS and F. R. WOODWARD. U. S. 1,563,943, Dec. 1. The surfaces of top press rolls are formed of rubber and sugar, NaCl or other H₂O-sol. substance.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Safety in the manufacture of nitric, sulfuric and mixed acids and nitrate of ammonia as used in the manufacture of explosives. S. H. KERSHAW. *Ind. Eng. Chem.* **18**, 4–9(1926).—The safety methods developed by the Hercules Powder Co. are described in considerable detail. F. C. Z.

A comparison of the theory of explosive waves with recent tests. E. JOUGUET. *Compt. rend.* **181**, 546–8(1925).—Previous calcs. of velocities of explosive waves, to compare with observed values, have used the sp. heats of Mallard and Le Chatelier. A table gives a comparison with those obtained from the Kast formula from tests by Pier and Bjerrum, the degree of dissociation being detd. by extrapolating present knowledge of dissociation of H₂O and CO₂ and assuming no residual combustion. Presence of a reversible residual combustion lowers the calcd. velocity a little. The agreement between the calcd. and the exptl. results is satisfactory for H₂ but less so for CO but the divergence is insufficient to condemn a theory evidently approx. and whose causes can be explained. The high values of abs. temp. show that the calcn. requires great extrapolation of the dissociation law and sp. heats and is, therefore, very uncertain. It is now known that the Mallard and Le Chatelier formulas rise too rapidly while perhaps that of Kast may rise too slowly. E. M. SYMMES

Shock waves and residual irreversible combustion (of explosives). E. JOUGUET. *Compt. rend.* **181**, 658-60(1925); cf. preceding abstract; Audibert, *C. A.* **18**, 3478.—When partial combustion takes place within an explosion wave, it is because the rate of reaction is enormously high; while in residual combustion the rate of reaction, though still very high, is not enormous. The transition from very high to enormous rate of reaction is doubtless continuous, but probably rapid. From a mathematical discussion J. shows that if the expansion of the gases is decreased a point is reached at which residual combustion becomes instantaneous and the explosion wave proper is formed. This is the case of the preliminary waves which, in Lafitte's expts., precede the explosion wave in a mixt. of gases fired by an elec. spark. The transformation of these waves into an explosion wave is facilitated by anything that retards expansion back of the wave front, e. g., friction against the walls, which explains why they are formed more rapidly in narrow than in large tubes. It is conceivable that a wave might have a uniform velocity, unaffected by conditions back of the wave front; but such a wave would be extremely rare, as it would follow that there must be compression of the fluid back of the wave front.

A. PAPINEAU-COUTURE

Production of colored smoke signals. A. B. RAY. *Ind. Eng. Chem.* **18**, 10-7 (1926).—Colored smokes were prepd. by volatilizing colored org. materials and the black smoke by thermal decompn. of an org. material of high C content, like anthracene. Volatilization is by a smothered combustion, with chlorates as oxidizers and cheap dyes. Special containers are required to regulate rate of burning. Fair smokes are obtained by exploding containers of rouge or ultramarine but large amts. are necessary. Gaseous reactions were unsatisfactory. Smokes from As_2S_3 or I_2 fade rapidly. Satisfactory parachute and non-parachute rocket, rifle grenade, Very pistol, hand grenade for aviators and smoke pot signals were developed.

E. M. SYMMES

Explosive. N. A. UNGER. U. S. 1,566,784, Dec. 22. An explosive which is suitable for blasting comprises NH_4NO_3 50-85, Si 10-40 and nitroglycerin (gelatinized with nitrocellulose) 1-15 parts

Propellent explosive. C. R. FRANKLIN. U. S. 1,564,549, Dec. 8. Nitrocellulose contg. about 12.6% N is mixed with a large excess of H_2O and nitroglycerin is then agitated with the mixt., the excess of H_2O is wrung out and a stabilizer such as diphenylamine and a flash-reducing compd., e. g., hydrocellulose, are added. The material is passed through heated pressure rolls, seasoned, mixed with acetone or other volatile solvent, again passed through heated rolls, cut and dried. Cf. *C. A.* **19**, 3021.

Explosive charges containing liquid oxygen or air. G. WEBER. U. S. 1,565,766, Dec. 15. Mech. features of forming cartridges in mine holes.

Detonator for liquid-oxygen explosives. C. MORR. U. S. 1,563,219, Nov. 24. Mech. features.

Blasting powder. C. D. PRATT. U. S. 1,563,924, Dec. 1. The constituents of black powder are mixed with a carbohydrate material such as starch 5-35 and a metallic chloride, e. g., NaCl 1-15%. U. S. 1,563,925 specifies a similar powder except that Na K tartrate and NH_4 oxalate or other tartrates and oxalates are used instead of chloride. U. S. 1,563,926 specifies the addn. of non-explosive substances deficient in O such as starch, paraffin and rosin, in similar explosive powders.

25—DYES AND TEXTILE CHEMISTRY

* L. A. OLNEY

Fastness of dyes on cotton and wool. G. A. SACKETT. *Textile World* **68**, 2629-31, 3221-3, 3281(1925).—An English translation of the German "Second Public Report of the Fastness Committee," *C. A.* **11**, 2963.

CHAS. E. MULLIN

Relation of Monel metal to dyeing and textile machinery. J. F. HAERRY. *Chemicals* **24**, No. 19, 23(1925).—Monel metal is advantageous for most vat, direct, acid and Cr dyes. While it does not affect most S dyes, it is severely attacked by the sulfide. It is suitable for black and most other developed colors, but is not suited for use with naphthol AS and BS colors as the traces of metal in soln. decompose the diazonium compds. very rapidly, giving poor, dull dyeings. When used for stripping with Na hyposulfite, the soln. should be kept alk.

CHAS. E. MULLIN

Method for producing white and multicolor effects on fabric dyed with sulfur colors. ARTHUR SCHEUNERT AND JOSEPH FROSSARD. *Bull. soc. ind. Mulhouse* **91**, 551-7

(1925).—Sealed notes 1775 of Oct. 18, 1907, 1794 of Dec. 16, 1907, 1799 of June 2, 1908, 1813 of March 10, 1908. *No. 1775*.—Better results were obtained by printing a resist of Mn chloride and ZnO instead of ZnSO_4 and ZnO. It is applied on the white, thoroughly dried, mercerized fabric, which is then dyed with a S dye, dissolved either in alk. hyposulfite or in Na_2S and Na_2CO_3 . Light colors are dyed cold and deep colors at 60–70°. For black and white, print the white reserve and aniline black, put through a Mather-Platt, and dye as above. To obtain red, garnet, or azo black, jig the mercerized fabric in Na naphtholate and print the diazo dyes with resist for white; to make the resist colors as concd. as possible use the double salts of the diazo dyes with ZnCl_2 or with $\text{Al}_2(\text{SO}_4)_3$, or the nitrosoamines. The reserve alone on Na naphtholate gives a perfect white. The development of the azo shade, which forms rather slowly in the acid medium, is accelerated by drying thoroughly and passing for 45–60 sec. in a Mather-Platt. *No. 1794*.—In order to get yellow, blue, violet and green, which cannot be obtained with diazo dyes, dyes were selected which are not pptd. by ZnCl_2 or Mn chloride and which can be fixed by passing 1–2 min. in a Mather-Platt. As basic dyes are nearly all pptd. by ZnCl_2 , AcOH and PhOH or resorcin was added to prevent pptn. For yellow, Nietzsky yellow with ZnCl_2 and Cr bisulfite was used; for violet, Sandoz' pure plum dissolved in PhOH with ZnCl_2 and Cr bisulfite; for blue, setocyanine dissolved in glacial AcOH and PhOH with ZnCl_2 and tannin; for green, a mixt. of Mietzky yellow and of setocyanine. All these dyes are fixed better if the fabric is treated with Na naphtholate, the alk. of the latter neutralizing the acidity of the ZnCl_2 . The white and colored resists also give good results with many dyes which are converted into sol. leuco derivs. by alk. hyposulfite, e. g., indanthrene, flavanthrene, dianthrene blue, algol blue, algol rose, thioindigo red, thioindigo scarlet. *No. 1799*.—Of the last-mentioned colors, dianthrene blue gives the best results. *No. 1813*.—Good resist colors were obtained by fixing basic colors on Zn tungstate as follows: add 100–150 g. Na tungstate to the Na naphtholate, apply to the fabric by jigging, print with a soln. of the basic colors in a mixt. of lactic acid and AcOH contg. the resist and ZnCl_2 , dry, pass twice in a Mather-Platt, dye in a Na_2S soln. of the dye, rinse, acidify and wash. **Report.** C. ZUNDEL and X. VOGT. *Ibid* 557–8—Ger. pat. 130,628 of May 30, 1901, to L. Casella & Co., covers the use of Zn, Cu, Mn, Pb or Ni salts for resists, but does not give any details as to the method of using them. Ger. pat. 215,128, of Nov. 23, 1907, to Fellmayer & Co., Schwechat, Austria, covers a process for reserving under an indigo vat, characterized by the use of manganous salts in the resist. L. Baumann and G. Thesmar published an article along similar lines (*C. A.* 2, 2623). No priority was found for the fixation of basic colors by means of Na tungstate; but Z. and V. did not obtain a very satisfactory fixation, owing to pptn. of the dyes by the ZnCl_2 .

A. PAPINEAU-COUTURE

Use of sodium silicate for printing vat dyes. EMILE ZUNDEL and LOUIS LANTZ. *Bull. soc. ind. Mulhouse* 91, 559–60(1925). Sealed Note 2088 of May 22, 1911.—A 35° Bé. soln. of Na silicate can be used instead of Na_2CO_3 or K_2CO_3 , a given alk. being thus obtained more cheaply than with the carbonates. **Report.** PIERRE BINDER. *Ibid* 560–1.—No anteriority was found. P. found the process gave good results on a small scale, but doubts if it would give satisfactory results with thin printing mixts because of the jelling of the water glass on dilm.

A. PAPINEAU-COUTURE

Dyeing silk dress fabrics. L. J. MATOS. *Dyestuffs* 26, 93–4; *Textile World* 68, 2955(1925).—Degumming and dyeing with direct and acid dyes are discussed.

CHAS. E. MULLIN

Dyeing of cotton warps. L. J. MATOS. *Am. Dyestuff Rept.* 14, 803(1925).—The prepn., bleaching and dyeing processes are described.

L. W. RIGGS

Dyeing half-wool yarn. L. J. MATOS. *Dyestuffs* 26, 150–2(1925). C. E. M.

Preparation and dyeing of cotton knit goods. H. C. ROBERTS. *Am. Dyestuff Rept.* 14, 781–3(1925).—Cotton knit goods such as are used in the rubber industry are considered in this paper. The older methods of removing waxes, oils, pigment, pectins and tannins are reviewed and the application of the newer hydrogenated hydrocarbons, known under the trade names of *tetralin* and *isomerpin*, is described. By the use of these newer agents the sepn. of impurities and dyeing may be performed in 1 operation.

L. W. RIGGS

The dyeing of acetate silk. CHAS. E. MULLIN. *Canadian Colorist & Textile Processor* 5, 260–5, 298–301(1925).—A discussion of the constitution, phys., chem., textile and general dyeing properties, manuf. and identification of acetate silk (cf. *C. A.* 19, 2748; 20, 113).

CHAS. E. MULLIN

Acetate silk—its dyes and their application. CHAS. E. MULLIN. *Am. Dyestuff Rept.* 14, 787–91(1925).—The topics considered are basic dyes on acetate silk,

celloxan, acetane, increasing the fastness of basic dyes on acetate silk, the gallocyanine dyes, the setacyl dyes and the methods of dyeing. L. W. RIGGS

Manufacture of rayon—chemical textile. S. D. KIRKPATRICK. *Chem. Met. Eng.* 32, 845-7(1925).—A general description of the du Pont Rayon Company's plant and process for the manu. of viscose rayon. CHAS. E. MULLIN

Hollow rayon filament. ANON. *Textile World* 68, 3687(1925).—*Celta* is a hollow or macaroni-shaped Swiss viscose rayon. It has a rough surface and less luster than most rayons; a warm silky feel, different from the other rayons, and a silk-like appearance in fabrics. It dyes in the same manner as viscose, which it does not quite equal in tensile strength and elasticity. CHAS. E. MULLIN

Successful methods for handling rayon. A. H. GRIMSHAW. *Textile World* 68, 2503-5, 2523, 2951-3(1925).—A study of the methods which have proven satisfactory for twisting, reeling, lacing, oiling, winding, warping, skein sizing, machine sizing, weaving, knitting, conditioning, scouring, bleaching and dyeing the various rayons. CHAS. E. MULLIN

Wherefore "artificial wool." ANON. *Textile World* 68, 3672(1925).—A general description of the properties of *sniafil*, made by the Snia-Viscosa of Italy. It is not a synthetic wool but a few of its properties resemble those of wool slightly. C. E. M.

Waterproofing of textile fabrics. T. W. WOLFSON. *Chemicals* 24, No. 19, 31-3 (1925).—A general description of the various methods, including the results obtained by the *bonanova* process. CHAS. E. MULLIN

Wool scouring and carbonizing. F. A. HAYES. *Textile World* 68, 3401-5(1925).—General. CHAS. E. MULLIN

Uniformity of finish (in textiles). TEXTUS. *Textile World* 68, 3405(1925).—The action of soaps in fulling. CHAS. E. MULLIN

Water-retaining properties of wool fabrics. B. G. B. SLOCOMBE. *Canadian Colorist & Textile Processor* 5, 270-2(1925).—The results of various expts. with hydro-extractors in the removal of H_2O from wool fabrics are given in 4 tables. Lining the extractor cage so as to allow the free passage of air and water materially increases the drying efficiency. CHAS. E. MULLIN

Chemistry and physics of the wool fiber. F. A. HAYES. *Textile World* 68, 2083-5 (1925); cf. *C. A.* 19, 3023.—A general discussion of the constitution, reactions and phys. properties of wool. CHAS. E. MULLIN

Problems relative to the washing of woollens. H. L. TIBA 3, 1021-7, 1149-53 (1925).—After briefly reviewing the various theories suggested to account for the cleansing properties of detergents, L. reviews L. Rinaldi's expts. and results on the deterative action of glue and similar colloids, which showed that : (1) for scouring raw wool glue gave a 4-5% higher yield of wool, was easier on the fiber and gave a better feel than NaOH and can be used to advantage in admixt. with soap; (2) in dyeing, glue is better than Na_2SO_4 for obtaining proper penetration and evenness of dyeing and protects the fiber with resultant increase in yield and strength of the dyed fiber; (3) felting of the wool is facilitated and accelerated by addn. of glue instead of NaOH to the soap. Starch paste also improves the deterative properties of soap, but is more difficult than glue to remove subsequently. Addn. of glucose increases the deterative properties of soap considerably and also exerts a protective action similar to that of glue.

A. PAPINEAU-COUTURE
A "rustling" dressing for cotton. CHARLES SUNDER. *Bull. soc. ind. Mulhouse* 91, 561-2(1925).—Starch dressing contg. a triglyceride (but no Na soap) can impart to cotton "rustling" properties somewhat similar to those characteristic of silk which has been slightly acidified before drying. Such a dressing can be prepd. as follows: melt 180 parts of coconut oil with 10 parts of oleic acid, let cool, add with stirring 20 parts of 10° Bé. NaOH, and finally add water with gentle stirring to 400 parts. Use about 1 l. to 100 l. of starch dressing. A. PAPINEAU-COUTURE

"Philanization." (Production of wool effects on cotton.) CHARLES SCHWARTZ. *Tiba* 3, 1129, 1131(1925).—By action of strong HNO_3 (exact concn. not stated) at 0° on cotton fibers in presence of starch, incrustants, or proteins (e. g., by action on unbleached cotton) the fibers are given a decided woolly effect, which it is extremely difficult to obtain with bleached cotton. A. PAPINEAU-COUTURE

The chemical nature of artificial silks and of hydrocellulose. ROBERT HAZARD. *Tiba* 3, 1217-21(1925).—Brief review of recent work on the subject. A. P.-C.

The use of artificial (synthetic) fatty acid esters as textile fats for textiles. WELWART. *Seifensieder Ztg.* 52, 861(1925).—Referring to P. Spiess' recent article (*Spinnerei u. Weber* No. 41) on Me and Et esters as textile fats, W. reports that they had been successfully used in 1904 and that olein and the fatty acids from rape, olive, coconut

and palm kernel oil and from S oil can be used for producing such esters. In certain woolen goods the cheaper mineral oils are used instead; they can easily be washed out again with the aid of a little "hydraphtal." P. ESCHER

Comparison of the shades of cottons of different growths when dyed together in the same bath. D. A. CLIBBENS and B. P. RIDGE. *J. Textile Inst.* **16**, 305-10T (1925).—The differences of shade cannot be ascribed to chem. differences in the bleached cottons, but must be due to some characteristic variation from growth to growth in the structure of the individual hairs. For certain growths it was found that the order of shade in simultaneous dyeing is identical with the order of wall thickness of the hairs as measured by the hair wt. per cm. of length. The fine Sea Island and Egyptian Sakel cottons dye the lightest, and the coarser American and Indian cottons the darkest shades. Abnormally thin walled immature or "dead" cotton dyes a very light shade when compared with mature cotton in the same dye bath. L. W. RIGGS

Micro-technic of textiles. F. J. HOXIE. *Textile World* **68**, 3087-9 (1925).—A brief discussion of the uses and methods of using the microscope in a textile plant. CHAS. E. MULLIN

The inside story of Ford textile experiments. D. G. WOOLF. *Textile World* **68**, 2773-5 (1925).—A general description of the linen and woolen plants. C. E. M.

Variations in yarn structure. BROMPTON. *Textile World* **68**, 2807, 2819 (1925).—A consideration of the characteristics imparted to woolen and worsted yarns by the various systems of manuf. and their effect upon the fabric. CHAS. E. MULLIN

A dictionary of stain-removal. A. CHAPLET. *Tiba* **3**, 1011-51, 1155-63 (1925).—Numerous formulas are given for removing various kinds of stains. A. P.-C.

Preparation of sodium chlorate in dye-houses. H. SUNDER. *Chimie et industrie Special No.*, 374-8 (Sept., 1925).—When NaClO_3 is not readily available it can easily be prepd. by absorbing Cl in NaOH soln. (Na_2CO_3 should not be used), with cooling, to distinct acid reaction (but not to satn.), letting stand overnight, and adding a slight excess of aq. NH_3 . When properly conducted, a practically quant. yield of NaClO_3 is obtained. Efficient means should be provided for carrying off the toxic fumes given off when the hypochlorite soln. turns acid, and especially during addn. of NH_4OH . A. PAPINEAU-COUTURE

Dyeing and tanning in relation to one another (KÜHL) **29**. Fungi dyestuffs (KÖGL, POROWSKY) **10**. Water supply for textile mills (HUBBARD) **14**.

Dyes. G. DE MONTMOLLIN and G. BONHOTE. U. S. 1,534,506, Apr. 21, 1925. Non-hydroxylated nitrodiazo compds. (e. g., those prepd. from *m*-nitroaniline, 2,4-dinitroaniline or 2,6-dichloro-4-nitroaniline) are combined with ethylbenzylamine-sulfonic acid or other aromatic monamine of the benzene series not derived from metanilic acid and substituted at the N atom by a residue contg. a benzene nucleus (only one of the components contg. a sulfonic group). The dyes formed are orange to violet blue and greenish black powders which yield on acetylcellulose, when dyed in a dil. acid or neutral bath, yellow to bluish red and brown tints of good fastness to washing and to light.

Vat dyes. H. NERESHEIMER. U. S. 1,562,468, Nov. 24. In the manuf. of a chlorinated dibenzanthrone vat dye, dibenzanthrone is treated with Fe, Sb or other chloride which is capable of being converted into a chloride of lower valence during the reaction. Trichlorobenzene may be used as a diluent.

Vat dyes containing sulfur. E. HOFFE and H. HEYNA. U. S. 1,537,928, May 12, 1925. 9-Halo-3(2)- α -naphthothiophenone derivs. are condensed with reactive α -substitution products of isatins. The dyes produced give a blue color on cotton and are of good fastness.

Monoazo dyes. K. THIESS. U. S. 1,540,664, June 2, 1925. Dyes which dye wool greenish yellow to reddish yellow fast tints correspond to the formula $\text{CHO}-\text{R}-\text{N}:\text{N}-\text{R}'$, in which R is a benzene residue, which may be substituted in any way, contg. the aldehyde group in *m*-position, and R' stands for arylpyrazolones, their derivs. and substitution products. Several examples of specific dyes are given.

Monoazo dyes. K. THIESS. U. S. 1,540,665, June 2, 1925. Monoazo dyes giving yellowish red, bluish red, and violet red to brown fast tints on wool are obtained by coupling the diazo compds. of *m*-aminobenzaldehyde and its substitution products and compds. capable of splitting off *m*-benzaldehyde with the α -naphthol-mono- and poly-sulfonic acids in which 1 H of the amino group may be replaced by alkyl, aryl or acetyl. Several examples are given. U. S. 1,540,666 relates to similar dyes in which

naphthol-2,6,8- and 1,4,7-disulfonic acids and naphtholtrisulfonic acids are used as components.

Disazo dyes. W. BERGDOLT and L. HAUCK. U. S. 1,538,373, May 19, 1925. A diazo compd. of the benzene or naphthalene series is combined with 4-methyl-2-aminobenzoic acid, further diazotized and combined with a 2-amino-5-naphthol-7-sulfonic acid compd. The dyes formed dye cotton directly violet to blue shades fast to light which by after-treatment with CuSO_4 or similar metal salts change to bluish violet to violet-blue shades of great fastness.

Diphenyldicarboxylic acid disazo dyes. R. STÜSSER. U. S. 1,538,414, May 19, 1925. Azo dyes are made from 4,4'-diaminodiphenyl-3,3'-dicarboxylic acid and 1 mol. proportion each of 2 other components (*e. g.*, *N*-phenyl-2-naphthylamine and 1-*o*-hydroxyphenyl-3-methyl-5-pyrazolone) one of which contains a group augmenting the soly. These dyes dye cotton generally yellow to orange to violet to brown shades which by an after-treatment with Cu salts generally change to deeper shades fast to light and washing.

Trisazo dyes. A. I. LASKA and A. ZITSCHER. U. S. 1,540,485, June 2, 1925. Dyes giving black-violet to black tints of good fastness to washing are obtained by combining the tetrazo compd. of a diaminoazo compd. which does not contain a sulfo group, with an arylide of 2,3-hydroxynaphthoic acid. Numerous examples are given and among the components which may be used are *m*- and *p*-nitroaniline and their derivs., such as chloronitroanilines, nitrotoluidines, nitroanisidines, nitrothioanisidines, nitronaphthylamines, the corresponding monoacyldiamines, *m*-toluidine, *p*-xylydine, *p*-cresidine, acetyl-*m*-tolylenediamine, α -naphthylamine and such of its derivs. as are adapted to combine in the 4-position.

Brown trisazo dyes. B. VOSSEN. U. S. 1,565,344, Dec. 15. Dyes adapted for use on leather are obtained by prepg. monoazo dyes from diazotized amines or their substitution products with resorcinol or its substitution products, *e. g.*, chlororesorcinol, 1,3,4-resorcylic acid and similar compds., and then coupling with a diazotized aminonaphthol or its substitution products and finally causing diazotized amines or their substitution products to react upon these products. Sulfanilic acid, picramic acid and other starting materials are specified as suitable.

Tetraisazo dyes. J. P. PENNY. U. S. 1,549,214, Aug. 11, 1925. Two mol. proportions of a diazotized aminoazo compd. (or 1 mol. proportion each of 2 different compds. of this character) are coupled with 1 mol. proportion of 5,5'-dihydroxy-2,2'-dinaphthylurea 7,7'-disulfonic acid (the symmetrical urea of 2,5-aminonaphthol-7-sulfonic acid). Aminoazo compds. are used which are derivable from a β naphthyl-aminedisulfonic acid and, as second component, a primary amine of the benzene series having a free *p* position. The dyes produce, generally, bluish red shades on cotton.

Pyrone dyes. M. WEILER. U. S. 1,532,790, Apr. 7, 1925. 2,4-Dihydroxybenzoic acid compds. or their mixts. with aromatic aldehydes substituted in the *o*-position to the CO group or such aldehydes as contain neither substituents in the *o*-position nor an OH group in the *o*- or *p* position to the CO C atom are condensed and the resulting leuco compds. are oxidized or sulfonated. Dyes are obtained which dye wool from acid baths yellow-orange to red and after chroming from red-orange to brown-red fast to alkali, fulling and potting.

Dyes of the anthraquinone series. J. BADDILEY and W. W. TATUM. U. S. 1,540,733, June 2, 1925. Dyes giving brilliant blue shades on wool are obtained by condensing diaminoanthraquinones, *e. g.*, 1,4-diaminoanthraquinone, with a carboxylic acid of an alkylene oxide, *e. g.*, phenylglycidic acid. The dyes may be used for dyeing "acetyl silk."

Sulfonated "oxy-dianthraquinonylamine" dyes. W. MIEG and H. RAEDER. U. S. 1,564,091, Dec. 1. 1,1'-Dianthraquinonyloxazinesulfonic acids substantially free from dianthraquinonylaminesulfonic acids, which may be prepd. by heating 1,1'-dianthraquinonylamine to 120–125° with fuming sulfuric acid, dye wool from an acid bath brownish violet shades. The same shades are obtained by after-chroming or by dyeing chrome-mordanted wool.

Quinonimide dyes. A. G. GREEN, K. H. SAUNDERS and E. B. ADAMS. U. S. 1,551,147, Aug. 25, 1925. Dyes of the quinonimide class derived from the general

formula $\text{C}_6\text{H}_4 \begin{array}{c} \text{N} \\ \diagup \quad \diagdown \\ \text{C}_6\text{H}_4 \end{array}$ in which A stands for N, O or S are prepd. by applying a

standard reaction for the prepn. of oxazines, thiazines and azines, to intermediates contg. at least 1 hydroxyalkyl group attached to N in turn attached to 1 of the benzene rings. Numerous detailed examples are given.

Dyes containing chromium. F. STRAUB. U. S. 1,551,073, Aug. 25, 1925. Dyes contg. Cr (such as those described in U. S. 1,480,640; C. A. 18, 909) are combined with dyes of the triarylmethane series (e. g., dyes as described in U. S. 1,387,596; C. A. 15, 4053) by heating the components together. The resulting dyes are as easily sol. as the azo dyes contg. Cr used as starting materials and yield on wool in an acid bath very level shades of good brightness.

Halogenated naphthazine dyes. W. HERZBERG, G. HOPPE and H. OILENDORF. U. S. 1,538,400, May 19, 1925. Dyes producing golden yellow colors on cotton are produced by introducing 4 atoms or less of halogen (e. g., Br) into compds. such as those of the type made by fusing 1,1',2,2'-dinaphthazine-8,8'-disulfonic acid with alkali.

Indophenol sulfur dyes. A. GORSCHKE. U. S. 1,534,518, Apr. 21, 1925. Dyes contg. S are obtained by treating with alkali polysulfides the indophenols which may be prepd. by condensation of nitrosophenols with diphenylamine derivs. having, on the one hand, at least 1 CH₃ group in *o*-position to the NH group, and, on the other hand, at least 1 free *p*-position to the same NH group, e. g., *o*-tolylphenylamine or *o,o'*-ditolylamine. These dyes form dark blue powders and dye cotton blue.

Sulfurized dyes. O. SPENGLER. U. S. 1,536,731, May 5, 1925. Dyes producing fast violet shades on cotton are obtained by sulfurizing 4-phenylamino-3,5-dichloro-4'-hydroxydiphenylamine, 1(*p*-methoxyphenylamino)-3,5 dichloro-4'-hydroxydiphenylamine or similar compds.

Bluish sulfurized indophenol-benzidine dyes. I. HAAS. U. S. 1,565,736, Dec. 15. Leuco derivs. of the indophenols obtained by condensation of nitrosophenols with carbazole in the presence of benzidine are sulfurized to produce dyes giving fast blue shades.

Cyanuric intermediates for dye manufacture. H. FRITZSCHE and P. SCHAEDEL. U. S. 1,551,095, Aug. 25, 1925. Cyanuric halides are condensed with α -naphthol to form nuclear condensation products for dye manuf. AlCl₃ or H₂SO₄ may be used as condensing agents, with or without inert solvents or diluents such as CS₂, petroleum ether, C₂H₅Cl, or PhNO₂. Numerous examples are given.

Benzanthrone derivatives. A. LÜTTRINGHAUS, H. WOLFF and H. NERESHEIMER. U. S. 1,564,423, Dec. 8. Condensation products are formed by treating a benzanthrone compd. or benzanthrone itself with an alk. condensing agent, e. g., KOH, at temps. below those at which dyes are formed. The products are *dye intermediates*.

Benzanthrone derivatives. G. KALISHER, R. MÜLLER and F. FRISTER. U. S. 1,565,229, Dec. 8. α -Naphthaleneazobenzene-*m*-carboxylic acid or its substitution products are reduced to hydrazo compds. and the latter, in acid soln., are transformed into 4,4'-diaminonaphthylphenyl-2'-carboxylic acids and these are condensed with acid condensing agents to produce benzanthrone derivs. These products constitute intermediates for production of dyes of the violanthrone and isoviolanthrone series. Several examples are given.

Dye intermediate of the anthraquinone series. G. KRÄNZLEIN, M. CORELL and R. SEDLMAYER. U. S. 1,564,584, Dec. 8. Compds. corresponding to 3,4,8,9-dibenzo-pyrenequinone (which may be substituted in various ways) are prepd. by condensation of benzanthrone with benzoyl chloride or other aromatic acid chloride.

Aromatic derivatives of cyanuric chloride (dye intermediates). H. FRITZSCHE and P. SCHAEDEL. U. S. 1,566,742, Dec. 22. New nuclear condensation products are obtained by causing 1-2 mol. proportions of α -naphthol and 2-1 mol. proportions of any other aromatic compd., adapted for yielding nuclear condensation products, to react, in any desired sequence, on one mol. proportion of a cyanuric halide. Details are given for the production of 2,4-di-*p*-hydroxynaphthyl-6-xylyl-1,3,5-triazine, 2-*p*-hydroxynaphthyl-4,6-di- β -hydroxynaphthyl-1,3,5-triazine, 2,4-di-*p*-hydroxynaphthyl-6-resoreyl-1,3,5-triazine, 2,4-di-*p*-hydroxynaphthyl-6- β -hydroxynaphthyl-1,3,5-triazine, 2,4-di-*p*-hydroxynaphthyl-6- β -methoxynaphthyl-1,3,5-triazine and 2,4-di-*p*-hydroxynaphthyl-6-anthracene-1,3,5-triazine. These compds. are in general of red or reddish color.

1-Aryl-5-pyrazolones. H. FRITZSCHE and E. REBER. U. S. 1,534,512, Apr. 21, 1925. Dye intermediates are formed by diazotization and reduction of 3-aminobenzene-1-sulfamide, 3-aminobenzene-4-methylsulfamide or other amide of a sulfonic acid of a primary aromatic amine, and condensing the hydrazone thus obtained with acetoacetic ester or oxalacetic ester or other derivs. of ketonic acids. Numerous examples are given.

Sulfaminoazo compounds. K. HEUSNER and M. SIMON. U. S. 1,532,627, April 7, 1925. The α -naphthylsulfaminic acid described by Piria (*Ann.* 78, 31 *et. seq.* (1851)) as a thionaphthamic acid is combined with various diazo compds. and the entry of the

diazo group occurs almost quantitatively in the *p*-position to the sulfamino group. Dyes are obtained in better yields than from α -naphthylamine.

Dyeing black silk piece goods. J. SEYER. U. S. 1,565,515, Dec. 15. See Brit. 219,995 (C. A. 19, 736).

Dyeing silk piece goods. J. SEYER. U. S. 1,565,516, Dec. 15. Goods weighted in the skein with a Sn compd. are treated with a Na_2HPO_4 soln. contg. a direct dye.

Dye vat and dye liquor circulating devices. J. H. THOMPSON. U. S. 1,565,037, Dec. 8.

Stencil dyeing of furs and pelts. H. M. BECHER. U. S. 1,566,066, Dec. 15.

Apparatus for dyeing wound yarns on spindles. JOHN, THOMAS and JOSEPH BRANDWOOD. U. S. 1,562,736, Nov. 24.

Apparatus for handling skeins or hanks in dyeing rooms. B. MAYOUX. U. S. 1,532,707, Apr. 7, 1925.

Apparatus for testing fastness of colors by exposure to ultra-violet rays. L. J. BUTTOLPH. U. S. 1,558,786, Oct. 27.

Artificial silk. H. DREYFUS. U. S. 1,566,384, Dec. 22. In forming artificial silk threads and filaments from cellulose derivs. such as cellulose acetate, spinning solns. are employed contg. acetone or other volatile solvent and also contg. a liquid of higher b. p. such as acetone-alc., acetyl acetone or diacetone-alc. which is a solvent of the cellulose deriv. (the use of toxic Cl derivs. being avoided), in order to regulate the solidification of the filaments and facilitate the spinning of fine deniers. Cf. C. A. 19, 404.

Recovering silk from silk crop waste. V. PIANA. U. S. 1,565,196, Dec. 8. Silk crop waste is treated in a closed chamber heated from the outside to a temp. at which the vegetable matter usually mixed with silk crop waste is rendered dry and friable. The waste is then subjected to a crushing operation and the silk is sepd. from the pulverized vegetable matter.

Weighting silk. A. PEPPER. U. S. 1,565,390, Dec. 15. Fabric is treated with SnCl_4 , then washed and treated with a soln. of Na phosphate, again washed, treated with HOAc soln., washed with cold H_2O , treated with a soln. of Pb acetate, washed and treated with a cold soln. of Na phosphate.

Viscose solutions. E. S. HUMBOLDT. U. S. 1,562,885, Nov. 24. A viscose soln. is ripened by the action of heat and the ripening is arrested by the application of a cold pptg. bath followed by redissolving of the ppt.

Fabric impervious to petroleum hydrocarbon vapors. R. E. WILSON and E. P. BROWN. U. S. 1,566,943, Dec. 22. A continuous coating of a mixt. of glue and glycerol is applied to a textile fabric and dusted with finely divided talc or other inert substance.

Linen-like finish on cotton fabrics. E. R. CLARK. U. S. 1,564,943, Dec. 8. Cotton fabric is impregnated with a viscose soln. of low alkyl., the excess soln. is removed and the cellulose is pptd. from the viscose on the fabric by the use of a pptg. bath such as dil. H_2SO_4 .

Waterproofing fibrous sheet material. T. W. MORSE. U. S. 1,563,642, Dec. 1. Immediately after forming a sheet from fibrous material on a forming cylinder an emulsion of asphalt or similar waterproofing material is deposited on the surface of the sheet and the coating and sheeted stock are united by vacuum action.

Moth-proofing wool, furs, etc. W. LOMMEL and H. MÜNZEL. U. S. 1,562,510, Nov. 24. The material is treated with pyrazolone, ethylidenephénylcarboxylic-acid-ethyl-ester hydrazone, triphenylguanidine or other compd. of the "general formula $-\text{N}(\text{R})-\text{X}:\text{Y}$, in which R represents H or a radical, X represents N or C and Y represents N, C or a nuclear radical." C_6H_6 may be used as a solvent.

Waterproofing straw hats, etc. C. J. KUNTZ and J. SIMONS. U. S. 1,566,798, Dec. 22. A pliable adhesive solid waterproofing coating is formed from nitrocellulose and sandarach gum.

Bleached and dyed furs. H. STERN, W. E. AUSTIN and I. LIEBOWITZ. U. S. 1,564,378, Dec. 8. Furs are treated with protective agents such as dil. FeSO_4 soln. to prevent harmful action by bleaching agents such as H_2O_2 .

Centrifugal machine for treating textile materials on perforated drums with liquids or gases. H. WOLFER. U. S. 1,564,503, Dec. 8.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Use of tunny oil (*Thynnus pelamys*) in the paint industry. PÉRARD AND GRIMAUD. *Chimie et industrie Special No.*, 424-6 (Sept., 1925).—A com. oil of known purity had the following consts: d_{4}^{20} 0.9338, n_D^{20} 1.4825, acidity (as oleic) 1.351%, sapon no 183, Hehner no. 94.8, sol. acids (as butyric) 0.58%, Reichert-Meissl Volny no 0.77, I no. 174.83, Ac no. 13.7, unsaponifiable 0.58%, mean mol wt. of total fatty acids 314.48, I no. of fatty acids 180.44, m p. of fatty acids 29.8°; solid fatty acids 31.0%, mean mol wt 228.31, I no. 0.7, m p 37.3°; liquid fatty acids 69.0%, mean mol wt 396.82, I no. 187.98, Ac no 88.7. The Livache test (1.0192 g Pb, 0.5788 g oil) gave a max. increase in wt. of 15.35% in 16 days, compared with 12% in 16 days for linseed oil. On exposure to air and light tunny and linseed oils gave the following results: gain in 150 days 10.60, 5.61%; wrinkles appeared in 28 and 123 days; solidified in 40 and 150 days, resp. Comparative painting tests with tunny and linseed oils showed no difference between the two.

A. PAPINEAU-COUTURE

The size of pigment particles. R. AUDUBERT AND H. RABATÉ. *Chimie et industrie Special No.*, 486-93 (Sept., 1925).—A discussion of the effects of the degree of subdivision of pigments on sp. surface, apparent d., cond., color of mixts., proportion of vehicle required, phys. stability of the paints, ease of application, covering power, thickness of the paint film, drying, adhesive power, hardness, impermeability, durability and optical properties of the dry paints.

A. PAPINEAU-COUTURE

The chemist his place in the varnish factory. L. HAMBRICK. *Can. Chem. Met.* 9, 240 2 (1925).

E. H.

Abietic acid. G. DUPONT AND R. UZAC. *Chimie et industrie Special No.*, 482-3 (Sept., 1925). Abietic acid was prepd. by boiling a soln. of rosin in alc. with HCl, and recrystg. repeatedly from alc. Rosins obtained from gum turpentine of *Pinus maritimus*, Aleppo pine, Austrian black pine (*P. laricio*), *P. longifolia* and *P. pinca* (all of known purity) gave practically identical yields of the same abietic acid, m 173°, $[\alpha]_D^{25}$ about -105°, rotatory dispersion about 1.156. Abietic acid cannot exist in rosin in the form of anhydride because rosin can be converted into abietic acid in the dry way and because rosin does not give a ppt. of the acid soap $3(C_{20}H_{30}O_2) \cdot C_{20}H_{30}O_2 \cdot Na$ as does abietic acid when treated with one-quarter of the NaOH required for complete neutralization. D. has shown (*C. A.* 15, 3093) that abietic acid is the final product of the isomerization at high temp. or under the action of strong acids of the acids constituting the gum turpentine obtained from various pines. This isomerization takes place in 2 or more stages and rosin consists of these intermediate acids, which are insomorphous with abietic acid. Rosin is, therefore, considered to be a reciprocal soln. of these acids, quite comparable to a glass which is a reciprocal soln. of isomorphous silicates. Com. isomerization can be obtained by passing a slow current of HCl gas through fused rosin at 150° for 15 min., giving a rather crude product which can be purified by recrystn. from alc. It can also be obtained by boiling an alcoholic rosin soln. with concd. HCl, neutralizing the HCl and one-quarter of the abietic acid, sepg. the liquor from the pptd. acid soap and decomp. the latter with a strong acid.

A. PAPINEAU-COUTURE

Rosin esters. P. F. LAFON. *Chimie et industrie Special No.*, 468-73 (Sept., 1925) --- Rosin cannot be used as such in paints with basic pigments because of its acid nature; but it can be used if the acid function has been blocked, by forming either metallic salts or esters. Fused metallic resinate are still too acid for use in paints and the prepn. of neutral pptd. resinates is complicated and expensive. A suitable glycerol ester is prepd. by gradually heating 100 kg. of rosin, 11 kg. glycerol and 0.5 kg. slaked lime in an Al container to about 290°. About 100 kg. of ester is obtained, with a color equiv. to water-white rosin, acidity of about 5%, harder and more brittle than rosin and with higher m p. than the latter. It can be sold at about the same price as the lower grades of copals, and possesses the advantage over gums that it is completely and easily sol. in the usual varnish solvents. The Ca resinate formed during heating catalyzes esterification. Zn resinate is a more active catalyzer, but gives an appreciable greenish color. Without catalyzer, L. could not obtain esters with less than 12.5% acidity.

A. PAPINEAU-COUTURE

Emulsion films (HOLMES) 2.

Paint. H. J. DUFFEY. U. S. 1,566,957, Dec. 22. A paint adapted for use on

wood or metal comprises a filler and pigment and waste used lubricating oil such as is obtained from engine crank cases.

Automobile body finish. W. Y. TIME. U. S. 1,565,122, Dec. 8. A priming coat comprises red lead mixed with 25% of coach japan and 50% of raw linseed oil. A second coat comprises white lead in oil mixed with 70% of boiled linseed oil and sanded. A third coat comprises white lead in oil mixed with 50% of boiled linseed oil and 50% of finishing varnish and also sanded.

Lithopone. J. L. MITCHELL. U. S. 1,565,185, Dec. 8. Lithopone is quenched in a soln. of Ba sulfide or other sol. alk. earth salt to form a coating and this coating is rendered insol. e. g., by calcining to convert the Ba sulfide into BaSO₄.

Ink. C. L. CUNNINGHAM. U. S. 1,562,544, Nov. 24. A penetrative ink adapted for use on shellac or other varnish or paint is formed from alc., diethyl phthalate, and Et ester such as Et lactate or oxalate which acts as a solvent for softening and penetrating varnish, paint or other hardened non-hygroscopic coating and coloring matter.

Transfer ink. E. GORCY. U. S. 1,564,234, Dec. 8. An ink adapted to be transferred under heat comprises mutton fat 49, black soap 14 parts and coloring substances.

Polish for varnished surfaces. B. BUHR. U. S. 1,566,576, Dec. 22. A mixt. of boiled linseed oil 16, gasoline 10 and skunk oil 2 parts

Vulcanizing oils in situ as varnishes. J. H. VAN DER MEULEN. U. S. 1,566,785, Dec. 22. Leather, artificial leather or other materials are coated with linseed oil or other vulcanizable oil and the latter is then vulcanized *in situ* by the action of S chloride vapor.

Acid-resistant shellac substitute. J. R. KUHN. U. S. 1,564,002, Dec. 1. Meta-para-cresol is treated with about 1½ times its wt. of S chloride in the presence of a hydrocarbon diluent such as C₆H₆ or toluene to form a resinous substance in soln. and the soln. is blown with heated air at a temp. below 156° (preferably about 150°) to remove the diluent and HCl. The deodorized resinous product is dissolved in an alc. solvent and a small quantity of H₃PO₄ is added to change the soln. from a brown to a yellow color.

Stove polish. M. LEVIN. U. S. 1,563,421, Dec. 1. Resin is dissolved in cold mineral oil, pulverized graphite and carbon black or other pigment is stirred into the soln. and more oil is then added to give the desired consistency.

Artificial resin compositions from naphthenates. F. ZERNIK. U. S. 1,537,572, May 12. Compns. adapted for prep. lacquers and for other purposes are obtained from naphthenates of Mg, Ca, Al, Zn, etc., mixed with each other or with other resinous substances. The naphthenic acid used as starting material is purified by distn. or otherwise and, when drying is required, is dried at temps. not exceeding 160° (to avoid discoloration).

Preventing sticking of resinous materials to molds. H. M. WEBER. U. S. 1,558,440, Oct. 20. A dusting powder comprising Al palmitate, Zn stearate or other metallic soap is applied to molds in which resinous substances such as synthetic products from PhOH and CH₂O are to be molded.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL.

Annual review in the field of fats, oils and waxes for 1923. W. HERBIG. *Z. deut. Oel-Fett-Ind.* **44**, 527-9, 544-5, 557, 572-3, 582-3, 594-6, 606-7, 620-2, 632-3, 643-5, 655-7(1924); **45**, 2-3, 18-20, 43-4, 53-5, 67, 91-3, 107-8, 123, 136-8, 153-4, 164-5, 192, 208, 219-20, 248-9, 264-6, 276-7, 290-1, 334-5, 347-8, 360-2, 374-5, 387-9, 402-3, 418-20, 430-2, 448-9, 479-80 496-8(1925).—A review under the following captions: A. Physical behavior. B. Chem. behavior. Constants. C. Analysis. D. Special analytical investigations of fats and oils. E. Investigations of individual old and new vegetable oils and fats. F. Investigations of animal fats and waxes. G₁. Technical production and applications. G₂. Refining fats. G₃. Splitting fats. G₄. Soap manufacture. G₅. Special products. Several hundred references to the literature are given in footnotes. P. ESCHER

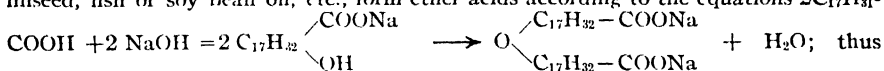
The application of the rapid iodine number method to fish oils. B. M. MARGOSCHES, I. FRIEDMANN AND K. FUCHS. *Z. deut. Oel-Fett-Ind.* **45**, 605-6(1925).—The rapid method for detg. I no., developed by the authors, gave erratic results when used for fish oils. An excess of at least 70% I soln. is necessary to obtain normal Hübl values in 5 min. With very dark oils 2-3 cc. of CCl₄ is added just before the titration

is finished. Exposure to the I soln. for longer than 5 min. leads to "super-I-values."

P. ESCHER

Method of separating saponifiable fats and oils from unsaponifiable mineral oils.

C. STIEPEL. *Seifensieder Ztg.* **52**, 949-59(1925).—The German pat. 293,167 by S. is now in industrial use. Recovered mixts. of vegetable or animal oils with mineral oils are first saponified fully with a metallic base; ZnO is excluded since its soap breaks down at high temp., the mixts. are then made anhyd. and finally distd. at 300° or above by means of indifferent vapors to sep. the mineral oil from the soaps. The resulting glycerol distills over simultaneously without essential decompn. Next the residual soap is decomposed with acid and the liberated dark fatty acids are redistd., furnishing light-colored acids of 96-97% purity. At this high temp. the highly unsatd. acids from linseed, fish or soy bean oil, etc., form ether acids according to the equations $2C_{17}H_{31}$



they lose their original character and yield acids with the following consts.: sapon. no. 193-206, acid no. 197-203, I no. 83-9

P. ESCHER

Determination of unsaponifiable matter in distillate fats. J. GROSSER. *Seifensieder Ztg.* **52**, 853-4(1925).—Attention is called to the presence of volatile products of decompn. in distd. fatty acids and in overheated fats, which in the analytical detn. of unsapon. matter are partly lost if the final drying takes place at 100°; G. dries at 60°, using gasoline of corresponding b. p. for extrn.

P. ESCHER

Deodorization of fish oils and similar fats. J. GROSSER. *Z. deut. Oel-Fett-Ind.* **45**, 622-4, 639-40(1925).—For high-grade fish oils the deodorization by hydrogenation is complete. For lower grades deodorizing the sepd. acids by means of concd. H_2SO_4 is in general use. High losses in the form of pitch residues constitute the drawback; while a detn. of the hexabromide no. gives a measure of the loss to be expected because the highly unsatd. acids are the carriers of fish odor and are removed by the H_2SO_4 . The simultaneous destruction of less satd. acids may be great, either by the use of too much acid, too high a temp., or too long a treatment; the presence of hydroxy acids also increases the loss. It is not known whether the acids with 3 or 4 double C bonds are simply removed or whether in the reaction they are converted into less satd. acids. Sandberg's method of using 10-15% H_2SO_4 at 40° avoids the undesirable side reactions of higher temps., but does not remove the highly unsatd. acids completely and the process has not come into general use.

P. ESCHER

Characteristics of fish and allied oils. A. R. LANGE. *Ind. Eng. Chem.* **18**, 9 (1926).—Phys. and chem. characteristics on a season's production of fish and allied oils are given.

E. SCHERUBEL

Tall oil. DUESBERG. *Seifensieder-Ztg.* **52**, 873-4(1925).—The following consts. for tall oil are given: source, Finland; color, orange with green fluorescence; liquid at 17°; acid no. 164.4; sapon. no. 174.9; unsapon. matter 6.05%; total org. acids 91.3, of which there are aliphatic acids 58.0% and rosin acids 32.0%. *Aliphatic acids*: I no. 100.0; sapon. no. 187.0; mean mol. wt. 298.7. *Rosin acids*: sapon. no. 169.8; mean mol. wt. 329.9. Analysis of purified tall oil: color light yellowish red; solidifies at 0°; acid no. 154.6, corresponding to 77.7% calcd. as oleic acid; sapon. no. 173.4; H_2O 0.32%; ash 0.08%; unsapon. matter 5.4%; total fatty acids 93.4%; rosin acid 37.1%.

P. ESCHER

The determination of the acid and lime stability of sulfonated oils. W. HERBIG AND H. SEYFERTH. *Z. deut. Oil-Fett-Ind.* **45**, 526-7, 548-52, 561-3, 574-6(1925).—The detailed expts. are given which led to the development of the method described in C. A. **17**, 220, and the method itself is modified by first neutralizing the soln. toward methyl orange prior to the titration for turbidity.

P. ESCHER

Continuous press for the treatment of oil seeds. ANDRÉ DUPIRE. *Chimie et industrie Special No.*, 428-30(Sept., 1925).—The chief drawback of the continuous screw press is that it gives a dark oil cake due to the heat developed during pressing, which in turn affects the quality of the oil. This has been overcome by a preliminary drying in a current of air heated to 70-80° and by cooling the rotating parts as much as possible by circulation of cold water through the shaft. This is claimed to increase the yield of oil and decrease the proportion of foots, and the preliminary air-drying carries off light husks.

A. PAPINEAU-COUTURE

Factors influencing variations in the physical and chemical constants of a given fat. S. WOLFF. *Chimie et industrie Special No.*, 431-2(Sept., 1925).—A brief discussion of the effects of climate, nature of soil and of feed, age of the animal or maturity of the grease, action of hydrolysis and oxidizing agents on animal fats.

A. P.-C.

Palm oil in French West Africa. PAUL AMMANN. *Chimie et industrie Special No.*, 433-4 (Sept., 1925).—Brief outline of possible improvements in the production of palm oil by the natives. A. PAPINEAU-COUTURE

Determination of oil in peanut oil cake. G. BRÉDON AND A. DUBOIS. *Chimie et industrie Special No.*, 437 (Sept., 1925).—The method proposed consists in detg. the I no. *via* Hübl, with Et_2O instead of CHCl_3 as solvent. A blank should be run on the extd. cake. The detn. can be run in about 2 hrs., it gives results agreeing to within a few tenths % with the ordinary extn. method, and is considered valuable for works control. It is applicable to other cakes, except those of the coprah group which have too low I nos. A. PAPINEAU-COUTURE

Autoclave-saponification and autoclaving methods. C. STIEPEL. *Z. deut. Oel-Fett-Ind.* 45, 637-9 (1925).—In 1844 Schönwald published in his "Reisetaschenbuch" an account of expts. in England on boiling soap in autoclaves for 2-3 hrs. and S. supposes that the inability of visually following the operation has probably caused abandonment of the process, but he considers success possible with present day facilities. Soaps of unsatd. acids, when exposed in alk. soln. to higher temps. and pressures, have OH groups joined at their double bonds: Na linolate with an I no. of 174 for its acid has its lowered to 83.4 after 3 hrs. in an autoclave at 270° . A table is given showing the effect of time, temp. and concn. on soap solus. which are autoclaved. References are made to the following Ger. patents on soap autoclaving: 349,593, 365,271 and 287,660 P. ESCHER

Fundamental principles of detergent action revealed by the graphite test. R. M. CHAPIN. *Ind. Eng. Chem.* 17, 1187-91 (1925).—The graphite test for detergent efficiency is shown to be valuable for investigating the fundamental principles of deflocculation and detergency. Concn.-temp. curves of various soaps are presented which afford data for a more complete theory of deflocculation and detergency than heretofore established. The data and theory cover the effect of (a) crystalloidal soap, (b) colloidal soap, (c) free fatty acids, (d) acid soap, (e) nature of fatty acid, and (f) nature of alkali. In particular it is shown that the colloidal fraction of a soap is inert as a detergent at equil. F. SCHERUBEL

Detergents and soaps. E. A. F. *Parfumerie moderne* 18, 255-60 (1925).—Brief historical notes on the development of detergents and soaps from Biblical times to the present day. A. PAPINEAU-COUTURE

The use of artificial fatty acid esters as textile fats for textiles (WEIHWART) 25.

GRÜN, ADOLF: *Analyse der Fette und Wachse. Band I—Methoden.* Berlin: Julius Springer. 575 pp. Price bound G. M. 36. Reviewed in *Ind. Eng. Chem.* 17, 1297 (1925).

THALMANN, FRIEDRICH: *Fette, Oele und Wachsarten.* 4th ed. revised. Vienna A. Hartleben. 392 pp. 72 cents. Reviewed in *Am. J. Pharm.* 97, 722 (1925).

Oxidizing oils. A. EISENSTEIN. U. S. 1,564,331, Dec. 8. Linseed or rapeseed oil or other oils with unsatd. bonds are mixed with hardened sunflower oil or other auxiliary substance capable of congealing at the oxidation temp. and the mixt. is treated with an oxidizing agent such as Mn resinate and the oxidation product is then sepd. from the auxiliary substance by liquefying the latter.

Mixing wool waste and grease. F. C. FANTZ AND E. G. RATHBONE. U. S. 1,564,306, Dec. 8. A rotary drum with internal shredding and combing teeth is used for the mixing.

Catalytic nickel. M. RANEV. U. S. 1,563,587, Dec. 1. A pulverized alloy of Ni 50 and Si 50% is treated with NaOH to convert the Si into Na silicate and the finely divided catalytic material is sepd. from the soln. It is suitable for use in *hydrogenating oils*.

28—SUGAR, STARCH AND GUM

F. W. ZERBAN

Advantages of continuous diffusion (in the beet sugar industry). Apparatus suitable for carrying it out. A. DUPIRE. *Chimie et industrie Special No.*, 619-23 (Sept., 1925).—A discussion of the defects of the ordinary diffusion process, with an outline of the Hyross-Rak, Colette and Raabe processes, and a description and discussion of the merits of the Olier continuous diffuser. A. PAPINEAU-COUTURE

Sugar beet growing in the north of Scotland. GEO. E. ESSLER. *Scottish J. Agr.* 8, 301-7(1925). K. D. JACOB

Chemistry of starch (PRINGSHEIM, *et al.*) 10.

BARDORF, C. F.: **The Story of Sugar.** Easton, Pa.: The Chem. Publishing Co. 191 pp. \$1.50. Reviewed in *Ind. Eng. Chem.* 17, 1206(1925).

PREUSS, R. E.: **Die Fabrikation des Stärkezuckers.** Leipzig: M. Jancke. Price, paper M. 14.70; limp cloth M. 16 2. Reviewed in *Intern. Sugar J.* 27, 607(1925).

WOHRZYK, OSKAR: **Auf dem Wege zur Spodiumlosen Weisszucker-Erzeugung und Raffination.** Tagesfragen aus der Zuckerindustrie. Magdeburg: Albert Rathke. Price unbound G. M. 2. Reviewed in *Intern. Sugar J.* 27, 607(1925).

Palatable beet sirup. H. W. DAHLBERG. U. S. 1,534,166, Apr. 21, 1925. Unpalatable beet sirups formed during the process of beet sugar manuf. and remaining after the cold dil. treatment of beet sugar solns. with lime are treated with com. invertase to render them palatable.

Apparatus for filtering sugar solutions, etc. W. HOEHN. U. S. 1,564,351, Dec. 8. **Soluble-starch product.** R. HALLER. U. S. 1,564,955, Dec. 8. By reaction of a chloramide, *e. g.*, *p*-toluene sulfochloramide, upon starch a product is obtained which is sol. in hot H₂O.

Treating starch with hydrochloric acid or other modifying reagents. P. A. SINGER. U. S. 1,564,979, Dec. 8. A hot liquid spray contg. starch and a small quantity of aq. HCl is projected into a highly heated reaction chamber where modification of the starch is effected while the minute starch particles are in suspension.

29—LEATHER AND GLUE

ALLEN ROGERS

General principles of leather manufacture. LOUIS MEUNIER. *Gerber* 51, 181-3 (1925).—An address. H. B. MERRILL

Sole leather manufacture. Slow tannage with fir bark. DOHOEGNE. *Halle aux Cuirs* 1925, 309-11.—A description of the process as carried out in Czechoslovakia. H. B. MERRILL

British section chrome leather analysis subcommittee. The control of chrome liquors in the one-bath chrome tanning process. D. WOODROFFE. *J. Intern. Soc. Leather Trades' Chem.* 9, 480-5(1925).—The basicity value of a chrome liquor is not a reliable guide as to its tanning properties nor does this value bear any definite relation to the pptn. figure. The *p*_H value seems to be the most likely variable controlling tanning properties. J. A. WILSON

Preparation of leather for analysis. L. BALDERSTON, *et al.* *J. Am. Leather Chem. Assoc.* 20, 583-9(1925).—General discussion. J. A. WILSON

Machine for preparing leather samples for analysis. A. C. ORTHMANN. *J. Am. Leather Chem. Assoc.* 20, 579-83(1925).—Working drawings. J. A. WILSON

Contribution to the study of the estimation of fat and water solubles in leather. A. COLIN-RUSS. *J. Intern. Soc. Leather Trades' Chem.* 9, 455-78(1925).—Attempts were made to devise methods for detg. the amts. of fat and water solubles in leather without having to make a complete extn. In making successive extns. with fat solvent or with water, when the leather had reached equil. with the solvent, it was assumed that the ratio of sol. material in the external solvent to that retained by the leather was const. The value of the const. was assumed to be characteristic of the sample of leather, but independent of the dilution. The assumption seemed to be verified in the fat extns., but complicated in the extns. with water by the hydrolysis of the leather. J. A. WILSON

Destructive action of sulfuric and hydrochloric acids upon leathers. J. A. WILSON. *Ind. Eng. Chem.* 18, 47-50(1926).—In contact with acid solns. of increasing strength, chrome leather is destroyed much more rapidly than vegetable-tanned leather. Thin sheets of leather can be made by coating the surface of chrome leather with vegetable tannin and then soaking it in 6 N H₂SO₄ which will dissolve away all except the tannin-coated film. Chrome leather has a greater capacity for combining with acid than vegetable-tanned leather. It is only the volatility of HCl that makes its presence in leather less harmful than H₂SO₄. Chrome leather is easily destroyed by either HCl

or H_2SO_4 , but more quickly by HCl in solns. stronger than 3 N and more quickly by H_2SO_4 in solns. weaker than 3 N . J. A. WILSON

The swell and shrink of upper leathers. J. A. WILSON. *Hide & Leather* 71, No. 1, 15(1926).—A table is given which shows the area changes with relative humidity of calf, kid and side leathers. J. A. WILSON

Comparative resilience of leather and rubber heels. J. A. WILSON. *J. Am. Leather Chem. Assoc.* 20, 576-9(1925).—The resilience of leather is measured by the percentage rebound of a brass plunger dropped from a definite height onto the leather backed by a resilient maple block. In a series of tests on com. healing materials, oak-tanned sole leather was most resilient (37-39%), rubber heels intermediate (20-37%), and chrome sole least resilient (17-19%). J. A. WILSON

Tests with various hide powders using a buffer solution of $p_{\text{H}} = 4.6$. J. GORDON PARKER AND J. T. TERRELL. *J. Intern. Soc. Leather Trades' Chem.* 9, 479-80(1925).—Certain discrepancies in tannin detn. found when hide powder from different sources were used can be eliminated by pretreating all hide powder with an acetate buffer soln. of $p_{\text{H}} 4.6$. J. A. WILSON

The definition of swelling and plumping of hide. P. PAWLOWITSCH. *Collegium* 1925, 583-6.—A review. I. D. CLARKE

Bacteriology of calfskin soaking. G. D. McLAUGHLIN, et al. *J. Am. Leather Chem. Assoc.* 20, 597-600(1925); cf. *C. A.* 19, 2572.—Discussion. J. A. WILSON

Some principles of depilation. G. D. McLAUGHLIN, et al. *J. Am. Leather Chem. Assoc.* 20, 590-6(1925); cf. *C. A.* 19, 2279.—Discussion. J. A. WILSON

Colloid chemistry in tanning. W. D. BANCROFT. *J. Am. Leather Chem. Assoc.* 20, 565-73(1925).—An address. J. A. WILSON

Dyeing and tanning in relation to one another. HUGO KÜHL. *Ledertech. Rundschau* 17, 153-5(1925).—Dyeing and tanning are discussed as colloidal adsorption processes. I. D. CLARKE

Report of the international committee on quantitative analysis of tanning materials. G. G. HUGONIN. *Chimie et industrie Special No.*, 513-8(Sept., 1925); cf. *C. A.* 18, 3290. Collaborative results on galls, sumach, natural and solubilized quebracho, wattle, mangrove and chestnut show that: (1) the present official method for detn. of insol. in tanning exts. by filtration through a Berkefeld filter is subject to considerable error and is not rational because substances which are of value for tanning are filtered out; (2) the sedimentation (2 hrs.) and centrifuging (20 min.) methods give consistent and practically identical results, which are lower than those by the Berkefeld filter, centrifuging being preferable because it is quicker; (3) the sedimentation and centrifuge tubes should be stoppered and the latter opened only after cooling to room temp.; (4) acidification greatly increases the insol. in natural quebracho; (5) addn. of 100 cc. of 0.01 N HCl per l. of soln. gives a p_{H} of approx. 3, except with solubilized quebracho (3.4-3.6) and mangrove (1.6-5); (6) the p_{H} of the detanned ext. is in most cases appreciably higher than the isoelec. point of hide powder ($p_{\text{H}} 4.8$), showing that hide powder No. B-11 contains an amount of alkali (probably in the form of Ca collagenate) equiv. to 16-18 cc. of 0.1 N NaOH per 6.5 g. of powder. Acidification of the soln. eliminates errors due to variations in the adsorption coeffs. of different lots of hide powder, and the increase in insol. sometimes caused by acidification is prevented by acidifying only the portion used for the detn. of tannins. A. PAPINEAU-COUTURE

Synthetic tannins: ultraviolet absorption spectra and color and precipitation reactions. A. DE LA BRUÈRE. *Chimie et industrie Special No.*, 519(Sept., 1925).—See *C. A.* 18, 3736. A. PAPINEAU-COUTURE

The fluorescence test; a new test for synthetic tannins in vegetable tanning extracts. O. GERNGROSS, N. BAN AND G. SANDOR. *Collegium* 1925, 565-72.—In ultraviolet light natural tannins in a diln. of 1:1000 show very slight or no fluorescence, while the important syntans all show a blue or violet fluorescence even in dilns. greater than 1:100,000. The fluorescence is not changed by small addns. of acid or alkali. The weak fluorescence of quebracho (*C. A.* 19, 3034) is removed by small amts. of acid or alkali. Although natural tannins decrease the fluorescence, 10-20% of syntan can almost always be detected in mixts. There was no relation between fluorescence and the Procter-Hirst test. In the discussion Noerr stated that vegetable leathers fast to light do not fluoresce while others do. I. D. CLARKE

Effect of vegetable tanning on the combination of collagen with acid. J. A. WILSON AND A. W. BEAR. *Ind. Eng. Chem.* 18, 84(1926).—An increasing degree of vegetable tannage causes a corresponding decrease in the capacity of collagen to combine with H_2SO_4 . J. A. WILSON

The astringency of vegetable tanning materials. E. CREDE. *J. Am. Leather*

Chem. Assoc. 20, 573-6(1925).—The astringency of a tan liquor is defined as the ratio of tannin as detd. by the Wilson-Kern method to tannin as detd. by the A. L. C. A. method. It is assumed that the difference in tannin values given by the 2 methods represents nonastringent tannin rather than nontannin. J. A. WILSON

Determination of free acid in vegetable-tanned leather. T. BLACKADDER, *et al.* *J. Am. Leather Chem. Assoc.* 20, 600-8(1925); cf. *C. A.* 19, 2279.—Discussion. J. A. WILSON

Tanning with quinone. H. SCHMIDT. *Ledertech. Rundschau* 17, 162-3(1925).—In quinone solns. buffered at different p_H values there was little or no tanning in 6 hrs. if the p_H was below 5. At p_H 5-12 the skins were well tanned and increased in wt. from 10 to 20%. With increasing time of tanning the max. increase in wt. changed from p_H 8-10 to p_H 5-6. Addn. of hydroquinone repressed tanning. I. D. CLARKE

Biology and prevention of salt stains. H. PERICAUD. *Cuir tech.* 14, 496-7(1925); cf. *C. A.* 19, 2423, 2885.—An address. H. B. MERRILL

Recent advances in methods of glue evaluation. W. L. JONES. *Mech. Eng.* 47, 1072-4(1925).—The difficulties of glue testing are discussed, also the standard methods of making viscosity and jelly-strength tests. Comparisons with so-called standard glues will disappear and glues will soon be described in terms of absolute viscosity in millipoises and jelly strength in g. The standard viscosity pipet, Bloom gelometer, and a curve showing the relation between viscosity and jelly strength of certain glues are given. W. H. BOYNTON

Glue for polishing metals (DIVINE) 4. Fluorescence of vegetable coloring materials (MEUNIER, BONNET) 3. Drying and conditioning leather (U. S. pat. 1,564,566) 13. Drying and oxidizing hides (U. S. pat. 1,564,565) 13. Rubber composition [as leather substitute] (U. S. pat. 1,566,247) (U. S. pat. 1,563,872) 30.

Leather for shoe soles. A. I. DUPREY. U. S. 1,562,624, Nov. 24. Shoe soles are cut from thoroughly tanned leather from which all uncombined tannin and extraneous matter have been removed. The cut soles are immersed in hot H_2O to expand the fiber of the leather and packed in boxes to permit the moisture to become evenly distributed throughout the material, then treated, under vacuum and heat, with a rubber soln. and with a 2% soln. of $S-Cl_2$, dried, washed and dried again.

Tanning composition. J. BREEDIS. U. S. 1,563,010, Nov. 24. Marrikino gum or other natural tanning material is heated with sulfite cellulose liquor in the presence of free alkali, e. g., aq. NaOH soln., until chem. reaction occurs, and the product is then acidified, to produce a substance which has better tanning properties than the constituents.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Maturation (slab) rubber. C. C. DAVIS. *Rubber Age* 18, 163(1925).—A summary and discussion of an article by Bruni and Levi (cf. *C. A.* 20, 303), including nearly all the original data. C. C. DAVIS

The spraying of rubber latex with protective colloids, particularly glue. W. CECIL DAVEY. *J. Soc. Chem. Ind.* 44, 515-7T(1925).—In expts. on the prepn. of sprayed rubber contg. glue, glue in twice its vol. of H_2O was added to NH_3 -preserved latex at 40° (1 part of glue to 3 parts of rubber) and the mixt. was sprayed in a chamber at 75°, yielding a fine white powder contg. about 1.5% H_2O . This rubber-glue mixt. (rubber 100 S 8, glue 10) was then milled with more rubber and S and the resulting mixt. (I) was cured and tested in comparison with a mixt. of the same compn. made by milling sprayed rubber, S and H_2O -softened glue (II). The stress-strain curves showed I to have lower elongations at given stresses and to have a higher breaking strength than II. Furthermore the rate of cure of I was slower than that of II, probably because of the formation of a retarding agent in the rubber-glue powder during storage. These rubber mixts. contg. glue deteriorated on standing and after several weeks they were less tough and had lower coeffs. of vulcanization than the same freshly prepd. mixts. vulcanized for the same periods. To make a suitable rubber-glue powder by spraying, at least 10% glue is necessary. Further expts. with other protective colloids showed that a powder is formed on spraying with 15% or more of casein or of Na lysal-

binat and with 5% of saponin, though the latter forms a powder which gradually coheres. Soaps have no influence. Vulcanized latex requires only about 0.5 as much protective colloid to form a powder on spraying. Thirty-nine references to patents and original articles are included.

C. C. DAVIS

An outstanding discovery in rubber compounding. MOORE AND MUNGER. *Rubber Age* 18, 164(1925).—*Catalpo* clay, a rubber compounding ingredient, differs from other clays in that it is prepd. by peptizing an ordinary clay. Because of the stability of the sol thus obtained, extraneous material may be removed to an extent not possible by the usual methods of mfg. clays. The extremely fine state of division obtained by this method renders the clay of unusual reinforcing value in rubber.

C. C. DAVIS

The Vultex process. Vulcanization of latex. PHILIP SCHIDROWITZ. *India Rubber-World* 73, 140 1(1925).—Vulcanized latex rubber (cf. Schidrowitz, C. A. 17, 1351, 2798, 3430; 18, 1589) is superior in its aging properties to vulcanized rubber prepd. by the dry process from ordinary raw rubber, whether this aging is artificial or natural. Not only has the former rubber the higher tensile strength when vulcanized, but it is much more resistant to sunlight and to a temp. of 150° F. than rubber vulcanized in the ordinary manner. This superiority holds true whether the rubbers are compared after hot or cold vulcanization. The unusual resistance to heat and light renders all kinds of goods prepd. from vulcanized latex rubber particularly suitable for use in the tropics.

C. C. DAVIS

Drying and oxidizing rubber (U. S. pat. 1,564,565) 13.

Rubber composition. B. W. ROTE. U. S. 1,563,872, Dec. 1. Cotton is satd. with a minor proportion of rubber soln., the solvent is removed and filling, pigment and vulcanizing substances are compressed into the dried mixt. of cotton and rubber and the compn. is vulcanized. It is adapted for use as a *leather substitute*.

Rubber composition. A. L. FREEDLANDER and W. G. GOODWIN. U. S. 1,565,995, Dec. 15. A compn. adapted for making molded articles comprises rubber 61³/₄ lbs., rosin oil 29 oz., (NH₄)HCO₃ 12 lbs., lime 49 oz., ethylidene-aniline 20 oz., S 18.4 lbs. and gas black 24 oz.

Rubber composition. J. M. GILLET. U. S. 1,566,247, Dec. 15. A relatively small quantity of cotton, asbestos or other fibrous material is mixed with a rubber solvent, a small quantity of rubber is dissolved in the solvent and pptd. on the fibers, SO₂ and H₂S are introduced, the fibers are strained out in matted formation and dried. The product is suitable for use as a *leather substitute* or *wall covering*.

Molding rubber articles. F. C. JONES. U. S. 1,564,310, Dec. 8. Layers of self-vulcanizing rubber-contg. solns. of different strength are poured into the space between an exterior mold and an interior core, and allowed to gel.

Incorporating rubber in non-aqueous liquids. J. M. WEISS. U. S. 1,563,410, Dec. 1. A colloidal aq. soln. of rubber (e. g., latex) is added to melted paraffin or other non-aq. liquid having a b. p. of at least 110°, the addn. being made at temps. of 110–150°.

Vulcanizing rubber. H. ORTME. U. S. 1,565,812, Dec. 15. Zn(OH)₂ is used to assist in the combination of S with rubber.

Vulcanizing rubber. S. M. CADWELL. U. S. 1,532,225, April 7, 1925. Various compds. including the group X:CSSC:X are used in vulcanization; e. g., an (O-alkyl deriv. of thiocarbonic acid disulfide, dibutoxy ester of carbonyl disulfide, thiobenzoyl disulfide, thiophenylacetyl disulfide, thioacetyl disulfide, acetyl disulfide, benzoyl disulfide, dibutylthiol ester of thiocarbonyl disulfide, dimethyldiphenylthiuram disulfide, diethyldiphenylthiuram disulfide and di-*p*-methylphenylenedimethylthiuram disulfide. Basic substances preferably are employed as accelerators with these vulcanizing materials. U. S. 1,532,226 specifies the use of compds. contg. the group CC(X)SS(X)CC, e. g., compds. in which "X" may be S and of the same type as those of the preceding pat. U. S. 1,532,227 specifies the use of Ba, Na, Pb, Zn, Li, Mg, Ca, NH₄, Fe, Hg or K alkylxanthates, alkoxy ester of K thiocarbonate, Zn dithiobenzoate, Pb dithiophenylacetate, Cd, Hg, Cu or K dithiobenzoate and a large number of similar compds. in vulcanization.

Vulcanizing rubber. S. M. CADWELL. U. S. 1,564,824, Dec. 8. Thiometal-formaldehyde or other thioaldehyde is used as an accelerator. U. S. 1,564,825 specifies the use of an alylated thioaldehyde, e. g., thiobenzaldehyde.

Superficial vulcanizing of rubber. J. B. DICKSON. U. S. 1,564,050, Dec. 1. A small quantity of a vulcanization accelerator is used with the surface portion only of

rubber articles to effect a relatively high degree of vulcanization at the surface and prevent adhesion to molds.

Apparatus for vulcanizing rubber in the form of tubing, etc. J. L. G. DYKES. U. S. 1,564,473, Dec. 8.

Rubber cement. B. P. TAYLOR. U. S. 1,566,566, Dec. 22. A compn adapted for cementing, coating, etc., is formed of latex, furfural and a "rubber stabilizer" such as a mixt of Cl derivs of $C_{10}H_8$.

Hard rubber boxes covered with wood impregnated with a phenolic condensation product. G. W. BULLEY. U. S. 1,566,815, Dec. 22. A box body of cellular hard rubber and an exterior covering of impregnated wood are united by vulcanization.

CHEMICAL ABSTRACTS

Vol. 20.

FEBRUARY 20, 1926

No. 4

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Barometric jet condensers. H. SIMONS. *Centr. Zuckerind.* **33**, 1450-1(1925) — A discussion of the advantages of counter-current operation over parallel current. For barometric counter current condensers, with H_2O at 10-15° and a vacuum of 650 mm., for an hourly condensation of (a) kg. steam the diam. of the shell in mm. should be (b): (a) 2000, (b) 600; (a) 3000, (b) 700; (a) 4000, (b) 800; (a) 5000, (b) 900; (a) 7500, (b) 1000; (a) 10,000, (b) 1100; (a) 12,500, (b) 1300; (a) 15,000, (b) 1400.

W. L. BADGER

The improved Twisselmann extraction apparatus with automatic recovery of the solvent. ANON. *Chem.-Ztg.* **49**, 902(1925), 1 cut — Cf. *C. A.* **18**, 1069. J. H. M.

A large-scale laboratory extractor. W. E. PATTERSON. *Can. Chem. Met.* **9**, 239-40(1925) — P. has designed a simple and ingenious device requiring only app. to be found in any well-equipped lab. No glass-blowing other than making bends in tubing is necessary. The material to be extd. is placed in a tubulated $CaCl_2$ jar, 2 ft. high, in which it is continuously exposed to the vapor of the solvent and subjected to an intermittent discharge of the liquid solvent. Sketch E. G. R. ARDAGH

Extraction apparatus with glass filter plates. P. H. PRAUSNITZ. *Z. angew. Chem.* **38**, 1014-5(1925) — Various types of extrn. app. are described, made by Schott (Jena) and having porous glass plates, made from pulverized glass partially sintered together, in place of thimbles of the usual types. Also in *Analyst* **50**, 440-4(1925).

WM. B. PLUMMER

Normal slide table for inorganic acids and lyes. ANON. *Chem.-Ztg.* **49**, 997(1925) — The table is so arranged that when a pointer is set at the sp. gr. of the soln. the % content is shown J. H. MOORE

The use of porcelain centrifugal tubes for chemical analysis. I. PINCUSSEN AND B. ARINSTEIN. *Chem.-Ztg.* **49**, 980-1(1925), 1 cut — Round-bottom porcelain tubes permit the ppts. to be ignited and weighed in the tubes, and are especially useful in biological work J. H. MOORE

High precision fractional distillation in the laboratory. W. A. PETERS, JR. AND THEODORE BAKER. *Ind. Eng. Chem.* **18**, 69-72(1926) — The still used was a modified Hempel type which is described in detail with illustrations. Sharper cuts were obtained than ever before in lab. stills. L. A. PRIDGEON

Calorimeter bombs of a different material. W. KOHEN. *Chem.-Ztg.* **49**, 935-6(1925) — A new steel, "Antinit," contg. 0.14% C, 0.496% Si, 16.5% Cr and a trace of Mn has been found very suitable for bombs. J. H. MOORE

A new micro-buret. OTTO DAEFERT. *Chem.-Ztg.* **49**, 917(1925), 1 cut. — Improvements in the I. Bang buret are described. J. H. MOORE

Calculation of the contents of partly filled horizontal cylinders. HACK. *Chem.-Ztg.* **49**, 936-7(1925), 3 cuts. — Cf. *C. A.* **18**, 1352. J. H. MOORE

Spiral springs of quartz. K. ŠLIUPAS. *Nature* **115**, 943(1925). — A spiral spring of quartz of four turns of about two cm. in diameter giving an extension of one cm. with 0.03 g. was made. FLORENCE N. SCHOTT

Spiral springs of quartz. C. V. BOYS. *Nature* **115**, 944(1925). — B. describes the production of a helical spring made of spun glass. FLORENCE N. SCHOTT

Spiral springs of quartz. H. G. SMITH. *Nature* **116**, 14-5(1925). — Spirals of fused quartz fibers of from 0.1 to 0.2 mm. diameter, having from 15 to 30 coils of diameter 0.5 to 1.5 cm., were prepd. in considerable number. These were used as "sorption balance" (cf. Bakr and McBain, *C. A.* **19**, 760). FLORENCE N. SCHOTT

Melting-point apparatus for several simultaneous determinations. M. SPETER. *Chem.-Ztg.* **49**, 981(1925), 1 cut. — The app. consists of a narrow glass tube, enlarged and perforated at the lower end, in which the thermometer stands. Around the top of the enlargement are several small holes through which the m. p. tubes pass, the lower

ends resting on the perforated bottom by the thermometer bulb. This tube is suspended in a larger tube contg. the heating liquid. J. H. MOORE

The decimal dropping bottle as a technical titration apparatus. C. BLACHER. *Chem.-Ztg.* **49**, 959-61(1925); 7 cuts.—The nipple of the "normal dropping bottle" is made of the proper size to give drops of 0.1 cc. of H_2O solns. Its advantages for rapid titrations, especially for the detn. of hardness in boiler feed H_2O , are enumerated, with 12 references (cf. Winter, *Apparatebau* 1923, 161). J. H. MOORE

New technical uses for the filter pump. E. A. VUILLEUMIER. *Ind. Eng. Chem.* **17**, 1278(1925).—The use of exhaust H_2O with its entrained air is recommended for purifying water contaminated with sewage, adding spreading power to insecticides applied with pumps, stirring precipitates, increasing the pleasurable sensation of a shower bath, improving the taste of drinking water, and increasing the amt. of dissolved O in aquariums. W. C. EBAUGH

Filter with continuous operation. K. W. GEISLER. *Z. Ver. deut. Ing.* **69**, 1437-41 (1925); 19 cuts.—Descriptions of the filters made by the Fullnerwerk, R. Wolf, and Fr. Gröppel. I. H. MOORE

A compressed air meter. WELISEK. *Physik. Z.* **26**, 811-6(1925).—See C. A. **19**, 3390. H. G.

A precise automatic pressure regulator. L. E. DAWSON. *J. Phys. Chem.* **29**, 1408-11(1925). The automatic pressure regulator previously described by D. (cf. C. A. **18**, 1069) has been modified to adapt it to the regulation of pressures above that of the atm. as well as those below atm. Pressures up to 50 cm. of Hg have been regulated to ± 0.1 mm. H_2O with this device. The regulator consists of some form of trap (a, j) connected by means of 2 vertical tubes of different diam. and lengths (b and c) with a reservoir of Hg (d). The regulator is connected to the tank in which the pressure is to be maintained const. through the tube (f or g), depending on whether the pressure is to be above or below atm. Its action depends upon the passage of a small, controlled quantity of air through the tube of small diam. (b). When enough Hg to uncover the lower end of the smaller tube has been forced through both tubes into the trap, air begins to pass through with the Hg. The passage of this air alters the pressure in the system. The quantity of air passing is then checked by a rise of the Hg in the reservoir (d), due to its return through the larger tube (c) under the changed pressure, thus more or less closing the end of the tube and controlling the quantity of air passing through the tube of smaller diameter. The range of pressure can be varied by altering the length of the 2 tubes, or, for small variations, by tilting the entire instrument. R. L. DODGE

Spray head for washing and absorption towers. P. MAHLO. *Gas u. Wasserfach* **68**, 791(1925).—A brief description of the app. manufd. by Adolf Ott Co. under Ger. 404,767; sketches are given. WM. B. PLUMMER

Economical pulverizing and mixing by the use of high-capacity pulverizing and mixing machines. HELMUT OSTREITER. *Chem.-Ztg.* **49**, 1018-20(1925). A general discussion, with special reference to H. Hildebrandt's new centrifugal ball mill. J. H. MOORE

The ultra-balance. FRIEDRICH HOLTZ. *Chem.-Ztg.* **49**, 916-7(1925); 1 cut.—Recent improvements are described. J. H. MOORE

New electric heater. ANON. *Chem.-Ztg.* **49**, 980(1925); 3 cuts.—The app. is for lab. use and is made by Strohleim & Co. J. H. MOORE

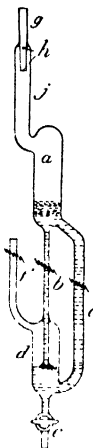
A new electric heating and fusing oven for high temperatures. H. SEIBERT. *Chem.-Ztg.* **49**, 1020(1925); 1 cut. J. H. MOORE

Almag ring mill. ANON. *Chem.-Ztg.* **49**, 997(1925). J. H. MOORE

The principles for the calculation of Venturi-meters. OTTO VON KÁLMÁN. *Siemens Z.* **5**, 473-8(1925).—A description of Venturi-meters from Die Wassermesser Fabrik der Siemens & Halske A. G., and the theory and calcus. for measuring of water, steam, gas and air. D. THUESSEN

A new potentiometer. E. MISLOWITZER. *Biochem. Z.* **159**, 68-71(1925).—A modified Poggendorff compensation potentiometer is described. This is a simple potentiometer which measures potential differences to about 0.7 mv. W. D. L.

Hydrogen-ion measurement with quinhydrone. A new double electrode in the form of a beaker. E. MISLOWITZER. *Biochem. Z.* **159**, 72-6(1925).—A vessel resembling a double-walled beaker is used to det. the p_H of solns. A soln. of known acidity is used as reference, and for it is substituted a quinhydrone soln. Many detns. of p_H may be made against the same reference electrode. W. D. L.



Measurement of the rate of flow of fluids by the rotameter. W. H. SIMMONS AND F. C. SUTTON. *Ind. Chemist* 1, 473-4(1925).—The rotameter consists of a top-shaped float contained in a tapered glass tube. The liquid to be measured in passing through the tapered tube lifts and spins the float. The spinning prevents the float touching the walls; hence there is no friction, and the height of the float adjusts itself to the flow which passes through the annular space between float and wall of tapered tube, which can be readily calibrated for any liquid. Temp. changes in liquids introduce scarcely any error, but for gases the densities (hence temp. and pressure) must be taken into account. Three types are illustrated and a no. of uses, present and proposed, discussed. E. G. R. ARDAGH

Use of methyl salicylate in a flowmeter. R. H. K. FOSTER. *Ind. Eng. Chem.* 18, 82(1925).—Certain properties of Me salicylate, such as its ability to dissolve oil or grease and its low vapor pressure, render it superior to H₂O, Hg or glycerol in a flowmeter. A design of flowmeter particularly suitable for this liquid is illustrated. C. C. DAVIS

Cylinder gage "Manoskop." ANON. *Chem.-Ztg.* 49, 979(1925); cf. C. A. 19, 1356. J. H. MOORE

Storage tank construction with the smallest quantity of material. STEIGLITZ. *Chem. App.* 12, 221 2, 229-31(1925); 6 cuts—Mathematical, with formulas for calcg. the size and material required for Fe tanks of given capacities. J. H. MOORE

Progress in the construction of tank cars. FR. BÜRK. *Chem. App.* 12, 209-11, 232 5(1925); 10 cuts. J. H. MOORE

Porcelain crucible (U. S. pat. 1,567,654) 19.

Acetylene generator. J. CHATWIN. Brit. 233,014, Jan. 24, 1924.

Thermometer. A. V. GROUPE. U. S. 1,567,321, Dec. 29.

Thermostat. L. J. GREENAWALT. U. S. 1,567,589, Dec. 29.

Thermostatic valve control device. F. W. ROBERTSHAW. U. S. 1,567,081, Dec. 29.

Radiation pyrometer. C. E. FOSTER. Brit. 233,606, Nov. 15, 1924.

Pressure gage for use with hydrogen. T. M. FINLEY. U. S. 1,567,794, Dec. 29.

Apparatus for measuring streams of steam, etc. A. GRAMBERG. U. S. 1,567,940, Dec. 29.

Distillation apparatus. K. S. NORDSTROEM. Swed. 58,555, April 15, 1925. Mech. features.

Distillation apparatus. ANDERS ELGESEM. Norw. 41,330, May 11, 1925.

Atomizer for liquids. AAGE NYROP. Danish 34,541, May 25, 1925.

Apparatus for circulating and standardizing solutions. J. F. WHITMAN. U. S. 1,568,117, Jan. 5. The app. is adapted for maintaining a uniform saline content in swimming tanks.

Apparatus for neutralizing and bleaching oils under a vacuum. E. BATAILLE. Brit. 233,345, April 30, 1924.

Filter. AKTIEBOLAGET SEPARATOR. Swed. 59,187, Aug. 5, 1925.

Filter with loose filtering material and concrete or similar foundation. W. PATERSON. Brit. 233,031, Jan. 29, 1924.

Oil filter. C. BREIER. U. S. 1,568,796, Jan. 5.

Filter for milk and other liquids. R. SELIGMAN. U. S. 1,568,001, Dec. 29.

Apparatus for producing hypochlorites or for other absorptions of gases in liquids. H. D. GOLDING, J. W. PRITCHARD and UNITED ALKALI CO., LTD. Brit. 233,490, March 21, 1924.

Apparatus for pulverizing gums. F. X. DOMENECH. Brit. 232,977, April 28, 1924.

Color-change indicator for warning of overheating of machine parts, etc. ROUSSEL ET CIE. Brit. 232,988, April 25, 1924.

Apparatus for cleaning centrifuge drums. AKTIEBOLAGET SEPARATOR. Swed. 59,475, Sept. 16, 1925.

Charging device for metallurgical and similar furnaces. F. THARALDSEN. Norw. 41,237, April 14, 1925. The feeding of a screw conveyor is regulated by shifting the feeding opening in the direction of the axis.

Rotary channel kiln combined with a smelting furnace of the electric or the blast-furnace type. PATENTAKTIEBOLAGET GROENDAL-RAMÉN. Swed. 59,401, Sept. 2, 1925.

Grid-shaped screen for X-ray apparatus. G. BUCKY. U. S. 1,567,833, Dec. 29.

Thermionic valves. EDISON SWAN ELECTRIC CO., LTD. Brit. 232,978, April 28,

1924. An incandescent cathode or auxiliary electrode is coated with Ca hydride or other compd. adapted to disintegrate gradually and produce ions which neutralize the space charge. Brit. 232,979 relates to activation of electrodes.

Thermionic valves. W. R. BULLIMORE. Brit. 233,375, Nov. 12, 1923. Filaments are formed with a base of nichrome wire, Mo, W or other refractory metal or alloy of high specific resistance and m. p. coated with a noble metal or alloy such as Pt or Pd. Details of applying the coating are given.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

A pioneer investigator. S. W. PARR. *Ind. Eng. Chem.* **18**, 948 (1926). An appreciation of the life and work of Walter Rogers Johnson, born 1794, teacher, author, investigator, first secretary American Association for the Advancement of Science (1848), educationa reformer, etc. Special emphasis is laid upon a 606-page report on coal presented to the U. S. Govt. in 1844, in which analyses, evaporative tests, sp. gr., etc., of more than 40 kinds of coal are given in detail. W. C. EBAUGH

The discovery of benzene. J. F. THORPE. *Nature* **115**, 915-7 (1925).—A sketch of Faraday's scientific life in commemoration of his discovery of benzene in 1825. F. N. S.

The discovery of benzene. E. H. TRIPP. *Nature* **115**, 909 (1925).—A statement in Lunge's "Coal Tar and Ammonia" attributing the discovery of benzene to Schlenz, is refuted. Credit for discovery of benzene is due Faraday. FLORENCE N. SCHOTT

Revision of the atomic weight of germanium. II. **The analysis of germanium tetrabromide.** G. P. BAXTER AND W. C. COOPER, JR. *J. Phys. Chem.* **29**, 1361-78 (1925); cf. *C. A.* **18**, 2272. Ge was recovered from wastes contg. $\text{Ge}(\text{OH})_4$ by double distn. of GeCl_4 with HCl , hydrolysis, and reduction with H at red heat. GeBr_4 was prepd. from Ge and Br_2 dild. with N_2 at 250°, and purified by 13 fractional distns. in a special app. in which the liquid was entirely confined in a high vacuum throughout. The first and last fractions were isolated in each distn. after the 4th, and analyzed. The last 10 at. wt. detns. were all between 72.599 and 72.609. No Si nor As could be found even in the first fractions. The analysis was made by breaking the sealed glass bulbs contg. the fractions under excess NaOH , acidifying with HNO_3 , and pptg. with AgNO_3 . The final value, 72.60, agrees with the previous work on GeCl_4 ; it is 0.1 higher than the accepted value. ALFRED W. FRANCIS

The metastability of matter and our physical "constants." ERNST COHEN. *Z. Elektrochem.* **31**, 539-42 (1925); cf. *C. A.* **18**, 1930; **19**, 1512, 1981. —In some cases errors up to 10% occur in older detns. of physical consts. because the investigated substances were mixts. JOHN T. STERN

Coördination and covalency. J. A. V. BUTLER. *Trans. Faraday Soc.* **1925**, (adv. proof).—The nature of the coordination bond is discussed. The formation of coördinated complexes cannot be due in general to the tendency of the central atom to attain the configuration of the next higher inert gas. The electrons contributed by the coördinated groups form a distinct group round the central ion. A distinction is made between (a) covalency, the mutual sharing of electrons by two atoms so as to complete already existent groups, therefore involving negative valences, and (b) coördination, the formation of new groups of electrons outside the last group represented in the ion. It is proposed to use the specific term "coordination valency" for the number of coördinated groups. It is assumed that the coordination electrons enter the main "quantum group" next to that represented in the central ion. Two factors which det. the actual coördination valences are (1) the symmetry of the force field of the central ion, and (2) a correlation between the coordination valency and the electrovalency of the ion. The constitution of the oxy acids is discussed from the same point of view.

The density at zero absolute and the total expansion for organic compounds. W. HERZ. *Z. anorg. allgem. Chem.* **149**, 230-4 (1925); cf. *C. A.* **13**, 2787; **15**, 3574; **16**, 1191, 1343.—H. has recalcd. the d. at zero abs. of 54 common org. compds., using van Laar's equations $d_0/d_k = 2/(1 + \gamma)$ and $2\gamma = 1 + 0.038 \sqrt{T_k}$, where d_0 = the d. at zero abs., d_k = the crit. d., and T_k = the crit. temp. There is also included in the table the total expansion of the compds., defined as the difference between the mol. vol. at the crit. pt. and the mol. vol. at zero abs. R. L. DODGE

The thermal expansion of a few alkali halides at low temperatures. II. F. A.

HENGLEIN AND G. HÄHNEL. *Z. physik. Chem.* **117**, 285-92(1925); cf. *C. A.* **19**, 1369.—Detns. of the sp. gr. at 0° , -79° and -184° are extended to Li and Rb and to the fluorides of Li, Na and K. The values differ slightly from those of Baxter, because the salts were crystd. from fusion and sometimes slightly decompd. The expansion coeffs. are calcd. and given in systematic tables.

JOHN T. STERN

A calculation of some characteristic constants of free ammonium. A. BALANDIN. *Z. physik. Chem.* **118**, 114-8(1925); cf. *C. A.* **18**, 3141; **19**, 2581.—On the basis of formulas previously derived, B. calcs. for the heat of formation of free NH_4 from its elements, $-17,800$ cal.; for its mol. vol., 47.9 cc.; for its d. in the solid state, 0.356 .

R. J. HAVIGHURST

Some critical constants of furfural. W. V. EVANS AND M. B. AYLESWORTH. *Ind. Eng. Chem.* **18**, 24-7(1925).—The b. p. and n_D value of highly purified furfural were found to be 161.7° (760 mm.) and 1.52608 , resp. The crit. soln. temp. curve for the system furfural- H_2O was detd., the crit. soln. temp. being 120.9° and the crit. soln. concn. 50.7% furfural. The vapor pressure curve was also detd. (for the first time) from 40° to 170.6° , viz., over the pressure range $8-966$ mm. Some of the data agree, other data disagree with earlier work by other investigators.

C. C. DAVIS

The properties of active hydrogen. K. F. BONHOEFFER. *Z. Elektrochem.* **31**, 521-2(1925).—A review of work previously given in detail (cf. *C. A.* **19**, 915, 2915).

E. R. SCHIERZ

Linear compressibility of fourteen natural crystals. P. W. BRIDGMAN. *Am. J. Sci.* **10**, 183-98(1925).—Linear compressibility was measured at 30° and 75° in the pressure range $0-12,000$ kg. cm^2 for the following natural crystals: Cubic-fluorite, magnetite, cobaltite, galena, pyrite, argentite, sphalerite; trigonal-tourmaline, quartz, calcite; tetragonal-rutile; orthorhombic-celestite; monoclinic-spodumene, crocoite. For the non-cubic crystals, linear compressibility was measured in several directions, so that cubic compressibility could be calcd. For all the crystals except quartz, the relation between pressure and change of length may be represented by a second-degree equation, the rate of change being less at higher temps. There is no observable connection between linear compressibility and crystallographic axial ratios. Above 30° and 9000 kg. cm^2 , argentite and sphalerite undergo a change, probably a polymorphic transition.

R. J. HAVIGHURST

Very thin transparent metal foils. CARL MÜLLER. *Sitzb. preuss. Akad. Wiss.* **1925**, 464-70.—Films of Ni, Au, Pt, Ag and Fe of a thickness of 0.01μ were prepd. by electrodeposition on thin metallic supports. In order to protect the film from the action of acids (used to dissolve the support) it has deposited on it a 0.01 -mm. layer of the supporting metal. Before etching then, the desired film is sandwiched between two films of readily sol. supporting metal. The etching acid does not come in contact with the film until the very end of the operation. In this way it has been possible to obtain films of Au and Ni 6 cm. in cross-section and 0.04μ thick. Films of smaller cross-section had a thickness of 0.01μ . The thickness was calcd. from the wt. and the generally accepted values of sp. gr. Under the microscope the films appeared glass-like and without structure and with but few scattered holes. The Ni films were very elastic and those of 0.04μ thickness carried a current of 0.3 amp. sq. cm. in air without being oxidized. Spectrographic measurements are given.

E. R. SCHIERZ

Crystal structure and chemical constitution. K. WEISSENBERG. *Z. Elektrochem.* **31**, 530-6(1925).—Schoenflies has shown that the whole knowledge of crystals is governed by a single hypothesis—that in every crystal the material particles build a homogeneous domain with sharp periodic discontinuities in 3 directions. W. develops this both from the geometrical (static) and the dynamical structure viewpoints, using the terms island and dynad, resp., to designate unit quanta of particles structurally equiv. and separable. Islands (or dynads) are classified in 4 types—micro, chain, net, space lattice. Only those of the micro class contain a finite no. of atoms and a finite vol. The other 3 groups contain an indefinite no. of micro units arranged according to the group name. If J_0 = vol. of a micro-island (or dynad), n = the no. of chem. mols. of the crystal substance exptly. observed in the elementary unit, and $n_R, q_{\min.}$ = the smallest no. of structurally equiv. points in the elementary unit permissible in the space group of the crystal, then $J_0 \leq n/n_R, q_{\min.}$; that is, the crystal contains in the elementary unit at least as many structurally equiv. micro-islands (or dynads) as the smallest no. of structurally equiv. point positions indicated in the elementary unit. Three tables (including elements, inorg. and org. compds.) constructed from data in Ewald's "*Kristalle und Röntgenstrahlen*" show the identity of n and $n_R, q_{\min.}$ in nearly every case.

R. H. ABORN

Determination of the structure of some simple inorganic substances. H. MARK,

W. BASCHE AND E. POHLAND. *Z. Elektrochem.* **31**, 523 (1925).—By use of the app. of Keesom and de Smedt or Simon and Simson modified to suit the properties of the substances being investigated M., B. and P. have detd. that the unit cube of CO_2 in which $a = 5.62$ A. U. contains 4 mols. The unit cell of NH_3 also contains 4 mols. The structures of B_2H_6 and C_2H_6 are very similar and differ only in the size of the unit. BaSO_4 , SrSO_4 , PbSO_4 , KMnO_4 and KClO_4 crystallize in the space group I^{h}_{16} , while CaSO_4 belongs to group I^{h}_{17} . It has not been possible to det. the structure definitely, but it is probable that the SO_4 groups are not uniformly distributed around the heavy metal but that one has a special position. E. R. SCHIERZ.

The crystal structure of primary potassium phosphate and isomorphous salts. O. HASSEL. *Z. Elektrochem.* **31**, 523 (1925). KH_2PO_4 , the corresponding NH_4 salt, and the corresponding K and NH_4 arsenates all crystallize isomorphous in tetragonal scalenohedral class. In this report only the K and NH_4 phosphates were subjected to X-ray analysis. Single crystals prepd. from slowly cooled aq. solns. were used in the rotation-diagram method employing both Cu and Ni K radiation. From measurements of specimens on the diagrams, the base edge a of the KH_2PO_4 unit was found to be 7.42 A. U., the height $c = 6.97$ A. U., and $c/a = 0.939$. For the NH_4 salt $a = 7.48$ A. U., $c = 7.56$ A. U., and $c/a = 1.01$. The unit is body-centered tetragonal contg. 4 mols. Intensity comparisons indicate the positions of the mol. components which are shown in an accompanying sketch. R. H. ABORN.

X-ray reflections from mercuric iodide. R. J. HAUGHURST. *Proc. J. Sci.* **10**, 556–8 (1925).—Powder-method photographs and ionization spectromet. measurements on single crystals were used in the study of tetragonal HgI_2 . The unit cell contains 2 mols of HgI_2 with $c = 12.349$, $a = 4.356$ A. U., and $c/a = 2.835$. The data were not sufficient to det. the a positions. R. J. HAUGHURST.

Confirmation of the presence of a non-tetrahedral carbon atom in crystals of pentaerythritol. M. L. HUGGINS AND S. B. HENDRICKS. *J. Am. Chem. Soc.* **48**, 1647 (1926).—Additional data confirming the crystal structure of pentaerythritol, $\text{C}(\text{CH}_2\text{OH})_4$, as previously reported by Mark and Weissenberg, *Chem. Abstr.* **18**, 347, have been obtained. These data verify the non-tetrahedral arrangement of atoms at the central C atom of the mol. GEORGE L. CLARK.

The crystalline structure of perovskite. G. R. LEVI AND G. NATTA. *Atti accad. Lincei* [6] **2**, 39–46 (1925).—Perovskite is cubic in angle but its phys. properties indicate it to be rhombic. X-ray study by the Debye-Scherrer method shows it to be cubic. The elementary cell is a cube 7.68 A. U. wide, contg. 8 mols. of CaTiO_3 . The Laue diagrams showed, however, that at ordinary temps. its pseudocubes are broken up into 2 rhombic forms. Other instances of such crystallographic pseudo-symmetry are cited. E. J. WITZEMANN.

An X-ray examination of some ammonia catalysts. R. W. G. WYCKOFF AND E. D. CRITTENDEN. *J. Am. Chem. Soc.* **47**, 2866 (1925).—X-ray photographs, prepd. in the usual way for powder photographs, were obtained (1) from various fused Fe oxides having compns. near to Fe_3O_4 and other richer in iron (Fe than Fe_3O_4), (2) from artificial magnetites contg. various amt. Al_2O_3 and K_2AlO_4 as promoters, and (3) from the Fe catalysts obtained by reducing the iron oxides. One function of the promoters of Al_2O_3 and K_2AlO_4 in reduced Fe oxide catalyst for the catalysis of NH_3 is suggested. The length of the edge of the unit cube a_0 of magnetite was found to be $a_0 = 8.37 \pm 0.010$ A. U. In magnetites contg. mixtures of FeO the substance occurs as a sep. phase. This phase disappears when the equiv. amt. of the promoter, Al_2O_3 , is added. The compn. of the oxide thus adjusted toward Fe_3O_4 with the formation of FeAl_2O_4 , which is apparently in solid soln. in the magnetite. The value of a_0 for magnetite contg. K_2AlO_4 differs so little from 1. for pure Fe_3O_4 that it is impossible to decide whether or not there is solid soln. of one in the other. a_0 for the α -iron obtained by the reduction of Fe_3O_4 is 2.879 ± 0.004 A. U. The size of the unit cell of Fe in the reduced material contg. the promoters differs from that of pure Fe by less than 0.1%. The presence of the composite promoter, K and Al oxides, in the reduced catalysts has been found to maintain a large surface of Fe by preventing the rapid growth of the Fe crystals. R. L. DODGE.

X-ray examination of inner structure of strained metals. IV
ained in extension.

kind of model is characterized by a certain lattice axis placed along a fixed direction, about which the rotation of the lattice takes place freely. Thus the rearrangement of the axis is linear. This kind of model may be used to represent a fiber structure regularly formed, though a slight deviation of the axis from the fiber direction may occur in the actual case. In the second kind the rearrangement of the axis of rotation is planar, being allowed to occupy any direction in an assigned region of a plane, and the lattice rotates about this axis within a certain range. In the mid position of the lattice, another axis which is perpendicular to the axis of rotation stands along the fiber direction. This kind of model may be taken for representing the fiber structure in which a particular axis of the lattice deviates from the mean fiber direction to a greater extent than the structure represented by the first kind. The X-ray examn. of α -iron plastically strained in extension, compression and torsion was worked out by taking the diffraction figures of the specimens taken from the strained metal in various directions. The patterns of extension and compression specimens were analyzed and explained by reference to the two kinds of model structures. The pattern of torsion specimens was also explained by referring to one of the models. The particulars of the model structures are as follows (coordinates refer to lattice axis more or less regularly rearranged in the axial direction of test piece): Extension, (110); rearrangement deviating, symmetry of second kind, 001 in lateral direction; compression, (111) fairly regular, first kind, compression, (100), deviating, second kind, 011 in lateral direction; torsion, (110) and (121), deviating, second kind, (111) in tangential direction. V. **The mechanism of crystal rearrangement, and the cause of strain-hardening.** *Ibid* 287-305. The crystal rearrangement as was observed in the X-ray examn. of metals, crystd. in the cubic lattice both of the face-centered and cube centered type, and strained plastically in extension, compression and torsion, is reviewed by reference to the 2 kinds of models of the crystal structure. The mechanism of the crystal rearrangement was investigated by taking the slip and rotation as the cause of distortion, and by assuming the slip direction for each kind of lattice. The structure as was to be expected from the theoretical consideration in the respective cases of the straining action, was found to conform to the exptl. results. Next the cause of the strain hardening, which cannot be explained geometrically as the direct consequence of the rearrangement, was explained by considering the nature of the slip resistance. As the result of the calcn., the slip resistance was found to depend on the crystal size, n/z , the finer the crystal, the higher the slip resistance. This agrees with the well-known fact that fine grained material is usually hard and strong. G. L. C.

The glowing of the oxides of certain metals. J. BOHM. *Z. anorg. allgem. Chem.* 149, 217-22 (1925). When pptd. Se_2O_3 , Fe_2O_3 , Cr_2O_3 , TiO_2 , ZrO_2 , Ce_2O_3 and Ta_2O_5 are heated to dull redness, the material begins to glow brightly for a short time. The temp. at which this change takes place and its extent depend on the method of prepn. of the oxide. Various explanations of this phenomenon have been advanced: allotropic transformation, increase in size of particles, and transition from amorphous to cryst. state. By Debye Scherrer X-ray spectrograms made on samples of the oxides before and after glowing B. has shown that the third explanation, the transition from the amorphous to the cryst. state, is the correct one. The explosive devitrification of certain glasses such as CuB_2O_6 , $\text{Co}_2\text{B}_2\text{O}_7$ and MnB_2O_7 on heating to 700-800° is also caused by a similar transition. The disruption of Gore's explosive Sb is another analogous phenomenon. R. L. DODGE.

Aluminium hydroxide and iron hydroxide. I. J. BOHM. *Z. anorg. allgem. Chem.* 149, 203-16 (1925). Several natural and artificial hydroxides of Al and Fe were studied by means of the Debye Scherrer X-ray spectrograms. The empirical formulas of the pure hydroxides were detd. by chem. analysis. Three cryst. hydroxides of Al occur in nature: diaspore, bauxite and hydrargillite. The various artificially prepd. hydroxides were identified by comparing their X-ray spectrograms with those of the 3 natural hydroxides. The formulas of diaspore and hydrargillite are AlOOH and $\text{Al}(\text{OH})_3$, resp. The formula of the artificial bauxite was found by analysis to be AlOOH . Al hydroxide gel, made by pptn. from cold solns., was amorphous. That prepd. by pptn. from boiling solns. gave the characteristic bauxite spectrogram. The hydroxide pptd. from alkali aluminates showed the characteristic hydrargillite spectrogram. Dialyzed Al sols. showed the bauxite spectrum, although the chemical formula was $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$. The exceptional width of the spectrum lines indicates that they are due to very small crystals of bauxite distributed through the sol. Two cryst. Fe hydroxides occur in nature, goethite and brown iron oxide, both having the formula FeOOH . Limonite, brown hematite, lepidokrokit, and xanthosiderite, all minerals commonly regarded as chem. individuals, are in reality finely cryst. goethite. Arti-

ficial. The hydroxide gels pptd. either cold or hot are amorphous. Aging of the gels results in no synthetic, cryst. hydroxide, but invariably causes dehydration to Fe_2O_3 . Artificial goethite was prepd. by digesting the gel with 2N KOH in an autoclave at 150° . R. L. D.

Collagen. R. O. HERZOG AND H. W. GONNELL. *Ber.* 58B, 2228-30(1925).—X-ray examn. was made of collagen from 6 widely varying sources, including 3 from connective tissue and 3 from cartilage. The diagrams for all except fish scales were cloudy, showing the presence of amorphous material with the cryst. In some cases digestion with trypsin soln. removed the amorphous material leaving the cryst. The cryst. component of all the collagens gave exactly the same diagram. The elastin from the neck ligament of cattle thus appears identical with collagen. The interference bands are not numerous enough to establish the cryst. system. It is clear, however, that the mol. wt. cannot be greater than about 685. Thus a mol. occupying an elementary cell of a collagen cryst. cannot contain all 13 of the amino acids found in gelatin. Most of the amino acids therefore appear to be present as the amorphous impurities. The heavy aggregates that have heretofore been called the "molecules" of such proteins as collagen are really colloidal aggregates of true mols. of comparatively low mol. wt. F. L. BROWNE

Gelatin and collagen. J. R. KATZ AND O. GERNGROSS. *Naturwissenschaften* 13, 900-3(1925).—In the X-ray diffraction spectrum obtained from dry gelatin films, prepd. with and without mechanical stress, the diffuse ring and the wide, sharp ring occurring in the unstressed material (periods of identity 4 and 2.7 A. U., resp.) changed their appearance in stressed gelatin (100% elongation). The sharp ring dissolved into two crescent-shaped parts in the direction of the stress, two broad interference spots appeared (10 A. U.) on both lateral sides of the central blackening, two diffuse elliptical spots at $5\frac{1}{2}$ A. U., no peripheral spots. This spectral diagram is in every detail analogous to that of fibrous collagen. From a theoretical standpoint this is of great importance, in that for the first time a fiber X-ray diagram has been artificially produced. Theoretical discussion is as yet withheld. B. J. C. VAN DER HOEVEN

The flow of a real gas from one vessel into another under constant volume conditions. MICHAEL ZACK. *Z. komp. u. flüssige Gase* 24, 111(1925).—Equations for consideration of the problem of gas flow between vessels are derived from van der Waals' equation of state in place of the commonly used perfect gas law. R. L. D.

The periodic crystallization of pure substances. E. S. HEDGES AND J. E. MYERS. *J. Chem. Soc.* 127, 2432-4(1925).—When 5 g. of $\text{C}_6\text{H}_5\text{COOH}$ is warmed with 12-20 cc. of an equal vol. mixt. of H_2SO_4 and EtOH and allowed to cool, crystn. in periodic, concentric spheres starts from nuclei and spreads radially throughout the vol. of the soln. The rings are as much as 1 cm. apart at first, the distance becoming progressively shorter as they spread out. The layers consist of closely packed crystals of $\text{C}_6\text{H}_5\text{COOH}$ sep'd. by spaces contg. mostly soln. with enough crystals to give rigidity to the whole mass. F. L. BROWNE

Liquid mixed crystals. ROBERT WALTER. *Ber.* 58B, 2303-10(1925).—The fact that the phenomena of cryst. liquids are exhibited by certain binary mixts. of liquids neither of the components of which in the pure state shows such properties (*C. A.* 1, 2114) does not prove that the cryst. liquid state is a matter of emulsion formation as maintained by Tammann (*Aggregatzustände*, Leipzig 1922, p. 286). The observations can be easily reconciled with the cryst. structure viewpoint if the cryst. liquid phases of the pure liquids are "latent" and not realizable because the solid phase crystallizes so easily that the liquid cannot be undercooled. Since the curve of compn. vs. m. p. II (the temp. of equil. between amorphous liquid and a solid phase) has a rough V shape, while the curve of compn. vs. m. p. I (the av. temp. of the m. p. region for the cryst. liquid-amorphous liquid) may be a straight line, it is possible for the latter curve to intersect the former, thus leaving a region of compn. of the liquid mixt. in which the cryst. liquid is no longer latent. It is shown for 12 liquid pairs that the compn.-m. p. I curve is a straight line for chem. similar liquids and that the latent m. p. I of a liquid can be obtained by extrapolation of the curve for its mixts. with a second liquid of known m. p. I. The latent m. p. I for 2 liquids having been so det'd., the compn.-m. p. I curve for their mixt. can be plotted. By this method, it is shown that the above conditions obtain for the liquid pairs studied by V. and G. and the m. p. I for each liquid is det'd. In the same way it is found that 17 liquids which have not been known previously to form cryst. liquids but whose chem. compn. indicated that they might, actually do so. F. L. BROWNE

The cause of change in physical properties when liquids are strongly dried and the influence of temperature on the rate of drying. S. B. MALI. *Z. anorg. allgem. Chem.*

149, 150-6(1925).— CCl_4 , C_6H_6 , CS_2 and $\text{C}_6\text{H}_5\text{CH}_3$ were separately dried in closed, evacuated tubes for 5 months. Samples of each liquid were dried at 2 temp. ranges 27-30° and 43-45°. Direct contact between P_2O_5 , the drying agent and the liquid was prevented, the drying taking place through the vapor phase. The vapor pressures of the dried liquids were measured, in the drying app., at temps. between 21° and 63° by a static method. In each case the vapor pressure was decreased by the drying. The decrease is due in part to a displacement of the internal equil. in the liquid. The samples dried at the higher temp. showed the greater decrease of vapor pressure. This fact is attributed to a greater drying rate at the higher temp. Preliminary measurements indicated that the surface tension of dried C_6H_6 differed appreciably from that of ordinary C_6H_6 . R. L. DODGE

Vapor pressures and miscibility of binary mixtures of liquids. K. F. HERZFELD AND W. HEITLER. *Z. Elektrochem.* 31, 536-9(1925).—Simplified theoretical derivation based upon the work of van der Waals and Dolezalek and comparison of the resulting data with exptl. values. JOHN T. STERN

Plasticity. E. C. BINGHAM. *J. Phys. Chem.* 29, 1201-4(1925).—Introduction, Defining plasticity and related properties. Cf. *C. A.* 19, 2767. E. C. B.

Plasticity of single crystals. W. P. DAVEY. *J. Phys. Chem.* 29, 1211-5(1925).—The plasticity of single crystals is not complicated by considerations of grain size but has to do with the slipping of planes of atoms upon adjacent planes. The plastic ductile and malleable metals Cu, Ag, Au, Al, etc., have face-centered cubic structures and the relatively non-plastic metals as Cr and W, have body-centered cubic structures. Based upon the at. populations in the various planes of the crystals, a variety of predictions are found to be verified. Thus a single crystal of zinc stretched beyond its elastic limit should show block-slip along the 100 planes to a very much greater extent than along the 001 planes. Impure Co should be more ductile than the pure metal. The simple cubic structure of NaCl is weak, giving no plasticity. E. C. B.

The plasticity of clay. W. D. BANCROFT AND L. E. JENKS. *J. Phys. Chem.* 29, 1215-7(1925).—Clay workers include in their definition of plasticity the property of burning to a coherent mass. If the bonding material is hydrous alumina, hydrous silica or some intermediate compn., it must maintain its gelatinizing tendency after drying in the sun, perhaps with the aid of an electrolyte or org. matter. Expts. were made with electrolytes. Non-plastic kaolin was made very plastic by 0.25% LiCl. There is no relation between the plasticity of clays and their Li content. Probably the humus plays an important part. E. C. B.

The Ostwald viscometer as a consistometer. W. H. HERSCHEL AND R. BULKLEY. *J. Phys. Chem.* 29, 1217-24(1925).—The Ostwald viscometer is the standard instrument for detg. the viscosity of rubber solns. Since these solns. are plastic, measurements should be made under several shearing stresses; hence external pressure should be applied. The equations to be used are given. E. C. B.

Plasticity in relation to gelatin. S. E. SHEPPARD. *J. Phys. Chem.* 29, 1224-32(1925).—Exptl. data are given on the plasticity and elasticity of gelatin and the conclusion is reached that the transition temp. from gel to sol. is dependent on the concn. and the method of prepn. E. C. B.

Plasticity and structure in gelatin systems. R. H. BOGUE. *J. Phys. Chem.* 29, 1233-9(1925).—Largely discussion of the definiteness of transition between sol and gel. M. p., sp. rotation, and plasticity measurements all fail to show a definite temp. The transition temp. as detd. by the plastometer depends upon the concn. and perhaps upon the p_H and the sensitivity of the instrument. E. C. B.

Plasticity as applied to viscose and artificial silk. C. S. VENABLE. *J. Phys. Chem.* 29, 1239-43(1925).—Plasticity is a fundamental property of silk. The plasticity constns. are valuable from both a technical and scientific standpoint. For an accuracy greater than 1% the variable-pressure plastometer should be used. The ripening of viscose solns. is shown to be easily controllable, by the plastometer. E. C. B.

Plasticity in relation to cellulose and cellulose derivatives. S. E. SHEPPARD AND E. K. CARVER. *J. Phys. Chem.* 29, 1244-63(1925).—Criticizing considerable work on the "apparent viscosity" of gelatin on account of the failure to use more than one shearing stress or to specify the shearing stress used, S. and C. measure the plasticities of cupraammonium cellulose solns. Small amts. of O interfere with the reproducibility of results. The plasticities of a series of solns. of nitro cotton in MeOH, show that the yield values increase with the concn. along an inflected curve. The mobilities decrease rapidly with the concn. Considering the elastic behavior of cellulose esters under both steady and alternating stresses, they note that these materials behave much more

like metals than like rubber. They conclude that fibrils are present consisting of chains of mols. held together by residual valence. E. C. B.

Plasticity of starch paste. CARL BERGQUIST. *J. Phys. Chem.* **29**, 1264-5(1925).—The chemical analysis of a starch gives little idea of the character of the paste which it will give. The commercial viscometers have to be used at too low a concn. and the starches "thin down" on running and finally they do not measure the two parameters of yield value and mobility. By following a special technic, the plastometer gives values for control purposes, obtainable in no other way. A complaint on a starch being thin can be verified, without calling on a man's personal judgment, and numerical values can be assigned to the different qualities of starch paste. A 7% commercial starch which gives a mobility of over 0.055 at 25° is not a first-grade starch. The yield values vary between 250 and 400 but are not so important as the mobility. The plasticity is not a measure of adhesiveness, which may possibly be measured by the surface tension. Pastes may be stirred at temps. over 70° without changing the yield value but there is a rapid loss in yield value at ordinary temps. which has important applications. The Bingham and Murray instrument gives values which are different from those obtained with the Bingham and Green instrument. It is believed that there is better adhesion between the paste and the glass tube in the former. E. C. B.

Some observations on the Plasticity Symposium. F. G. BREYER. *J. Phys. Chem.* **29**, 1266(1925).—Granting that plasticity is dependent on two parameters, it is confusing to say that that one substance is more plastic than another. We should agree on comparing yield values. Since adhesion, giving rise to flocculation, is most important in affecting the yield values, the use of the microscope is highly desirable in connection with plastic flow, because flocculation can be readily observed.

E. C. B.

Plasticity of dental impression compound. W. S. CROWELL AND ALBERT SAUNDERS, JR. *J. Phys. Chem.* **29**, 1267-82(1925).—Impression compd. contains stearic acid, resins, oils and talc or other filler. It must be soft enough at 55° to take the exact pattern given by the muscles of the mouth and yet be rigid at 37.5°. The crystn. of the stearic acid is used to effect the rapid changes in plasticity but the mixt. is so complex that accurate control is necessary. The measurement of the fluidity of the wax above 46° gave no difficulty, but concordant results were not obtained below this temp. Capillaries with radius of 0.15 cm. gave better results than those with much smaller bore. The yield value was apparently higher with the larger tubes, which was proved to be due to the higher shearing stress. On adding talc to wax the fluidity is lowered and zero fluidity is reached at a concn. of 19.9 vol. %. This concn. is independent of the temp. As talc is added in excess of 19.9% a finite yield value is developed. The yield value is independent of the temp. The mobility-temp. curve resembles the fluidity-temp. curve. E. C. B.

A simple plastometer for control use with dental creams. E. MONESS AND P. M. GIESY. *J. Phys. Chem.* **29**, 1282-8(1925).—The plastometer is constructed entirely of standard pipe fittings and is of the Bingham and Murray type. Channeling of the material was encountered and overcome. The resistance to flow outside of the capillary was noticed. While the Bingham and Murray method is not mathematically rigorous, it is sufficiently accurate mathematically to be within exptl. error. E. C. B.

Source of error in the mechanical analysis of sediments by continuous weighing. J. R. H. COUTTS AND E. M. CROWTHER. *Trans. Faraday Soc.* **1925** (advance proof).—The detn. of the size distribution curves of suspensions is sometimes carried out by weighing the sediment accumulating on a balance pan hung near the base of the column of suspension. This method is not beyond criticism, for the low d. of suspensions, immediately below the pan after the sedimentation has proceeded for a few minutes, inevitably sets up a flow of liquid which interferes with the free vertical fall of the particles. With the large narrow-rimmed pans hitherto used the observed yields are appreciably below the theoretical values. With the pan close to the base there is a very rapid change of yield with very small changes in the position of the pan. The extent of the disturbance varies with the size of particle and thus produces a distortion of the distribution curves. JAMES M. BELL.

Adsorption. Adsorption by coconut charcoal from alcohol-benzene and acetone-benzene mixtures. F. G. TRYHORN AND W. F. WYATT. *Trans. Faraday Soc.* **1925** (advance proof).—The charcoal was weighed into test-tubes closed by tight rubber stoppers. Over the charcoal was placed a smaller, open test-tube contg. a suitable mixt. of liquids. After 5 days at 20° the total wt. of vapors adsorbed was detd. from the increase in wt. of the charcoal. From this and the compn. of the liquids in the small tube before and after the expt. the amt. of each substance adsorbed from the vapor

by the charcoal can be computed. Adsorption isotherms for each component of mixts. of alc. and C_6H_6 and of acetone and C_6H_6 were detd. over the complete range of compns. By an analogous method measurements were made of the compn. of the vapors in equil. with mixts. of the above liquids at 20° . A comparison of the results of adsorption by charcoal from the liquid and the vapor phases supports the conclusion that an adsorbed film in equil. with a satd. vapor must be also in equil. with the liquid in contact with that vapor. Alc. is selectively adsorbed from all mixts. of alc. and C_6H_6 . From acetone- C_6H_6 mixts. acetone is selectively adsorbed from mixts. contg. up to 72 mol. % of acetone in the vapor phase. Above that value C_6H_6 is selectively adsorbed to a slight extent.

F. L. BROWNE

Transformation of water of hydration into water of adsorption by mechanical reduction of the size of crystal hydrates. TOKUTARO HAGIWARA. *Japn. J. Chem.*, **2**, 27-32(1923).—The mechanical grinding of crystals of $Al_2O_3 \cdot 3H_2O$ weakens the union of the H_2O so that it has largely the properties of H_2O of adsorption. This confirms von Veimarn (*Kolloid Z.* **4**, 198(1909), cf. *C. A.* **3**, 393). Similar results have been found with $Fe_2O_3 \cdot H_2O$.

C. J. WEST

Adhesive forces in solutions. V. The adsorption of complex compounds. NIKOLAI SHILOV and BORIS NEKRASSOV. *Z. physik. Chem.* **118**, 79-88(1925); cf. *C. A.* **16**, 2055.—The process of adsorption may be analogous to that of complex-ion formation. Forces of electrostatic nature, which govern chem. combination, may also govern adsorption. The adhesive forces may be of approx. the same magnitude as the chem. forces in complex compounds. An investigation has been made of the stability in the presence of adhesive forces of the following complex compds.: (1) double salts—schonites, $MSO_4(NH_4)_2SO_4 \cdot 6H_2O$, where M represents the bivalent Ni, Zn, Mg, Mn, Cd, Co, Fe, Cu ions, (2) metallic amino salts— $[Cu(NH_3)_4]SO_4 \cdot H_2O$, $[Cu(NH_3)_4]Cl_2 \cdot H_2O$; (3) compds. with complex ions— $[Co(NH_3)_6]Cl_3$, $[Co(NH_3)_5NO_2]Cl_2$, 1,6- and 1,2- $[Co(NH_3)_4(NO_2)_2]Cl$, $[Co(NH_3)_3(NO_2)_3]$, $Na[Co(NH_3)_2(NO_2)_4]$, $Na_3[Co(NO_2)_6]$. Activated charcoal was the adsorbent. In every case, the complex mol. was split up, and the different parts were adsorbed in different amts. The same amt. of $(NH_4)_2SO_4$ was adsorbed from each of the schonite series, but the adsorbability of the metal ions varied, in qualitative correspondence (with the exception of Mn and Cd) with the lowering of the soly. of the metal sulfate by the formation of its double ammonium salt. Probably the complex ion $[Cu(NH_3)_2]^{++}$ was adsorbed from the cupric amino compds. The complex cobaltic ions were split up by adsorption and reduced to cobaltous ions with the adsorption of $[Co(NH_3)_2]^{++}$. The excess ammonia remained in soln. as ammonium salt. From the compds. with Co in the anion, Co was more strongly adsorbed than Na. The unsymmetrical *cis*-compd. 1,2- $[Co(NH_3)_4(NO_2)_2]Cl$ was more strongly adsorbed than the isomeric *trans*-compd. The non-ionized neutral $[Co(NH_3)_3(NO_2)_3]$ was more strongly adsorbed than the analogous ionized compds. R. J. H.

Adsorption forces and their electrical nature. II. The electrical moment of the adsorbed molecule and the superficial energy of the adsorbent. BORIS ILIIN. *Phil. Mag.* **50**, 1144-6(1925); cf. *C. A.* **20**, 135.—In a former paper (*C. A.* **18**, 3508) I. developed a formula for the elec. moment (τ) of the adsorbed mol. which related it, according to his theory, with E_0 the field tension of adsorption: $\tau = (E_0/4\pi N_L)[(\epsilon-1)/\epsilon]$, where N_L is the Loschmidt const. and ϵ is the dielec. const. In the present paper E_0 is calcd. from Q the heat of adsorption of gases by charcoal (Titoff data) and by mica (Langmuir) according to the formula $E^2/8\pi = 1.1 \times 10^{10}$ erg. cm.⁻³ for charcoal, and $= 0.6 \times 10^{10}$ erg. cm.⁻³ for mica. By substituting these values in the formula for τ the following values were obtained:

		H_2	A	N_2	CO	CH_4	CO_2	C_2H_4
Charcoal	$\{ Q \text{ calcs.}$	2408	3990	4270	4860	5570	6560	7800
	$\{ \tau \times 10^{19}$	4.1	8.7	9.1	10.9	14.8	15.4	20.5
Mica	$\{ Q \text{ calcs.}$	..	1530	2390	2990	3090	..	..
	$\{ \tau \times 10^{19}$	3.0	6.4	6.6	7.9	10.8	11.2	15.0

On the assumption that the adsorbing surface per g. of charcoal is 10^5 cm.² the surface tension σ of the solid adsorbed is calcd. to be 1000 erg./cm.²

S. C. LIND

Researches on the adsorption of dissolved substances. J. BANCELIN. *J. chim. phys.* **22**, 518-21(1925).—In adsorption expts. it is difficult to obtain duplicate surface areas, even by use of insol. cryst. material, as $BaSO_4$. The purpose of the present work is to det. the relation of adsorbed material to adsorbing surface, and to verify Gibb's formula for adsorption as a function of surface tension.

ROSALIE COBB

Layer filtration, a contribution to the theory of the gas mask. WERNER MECKLENBURG. *Z. Elektrochem.* **31**, 488-95(1925).—By observing the effectiveness of the

charcoal filter of a gas mask while varying the velocity of passage of air through it; the concn. of chloropicrin in the air; the cross-section of the filter; and the surface/vol. ratio of the granules of charcoal, M . has derived an equation for detg. the effective life of a filter: $RZ = (k/v.C_0)(V-Qh)$. RZ is the time from the beginning of filtration to the time when the poisonous "gas" can just be detected in the filtered air; v is velocity of air in l. per unit time passing through the cross-section of the filter; C_0 is the amt. of gas per l. of entering air; V is the total vol. of the filter; Q is the cross-section of the filter; h is calcd. from the Nernst theory of velocity in heterogeneous reaction from the equation $h = (\delta/D.F). (\pi/\kappa Q) [\ln (C_0 - C')/(C_x - C') - (C_0/C_0C')]$, in which δ is the thickness of the layer of gas adhering to the surface of the charcoal; D is the diffusion const. of the gas in air; F is the surface of the charcoal per cc.; κQ is that portion of the cross-section of the filter not actually occupied by charcoal; C_x is that concn. of gas in air below which it is not possible to detect the gas; C' is the vapor pressure of the liquified gas in the capillaries of the charcoal expressed in parts of gas per l. of air.

E. R. SCHIERZ

The nature of the interfacial layer between an aqueous and a non-aqueous phase.

FRANCIS Usher. *Trans. Faraday Soc.* 1925 (advance proof).—A comprehensive theory of the layer which forms the boundary between an aq. liquid and an "insoluble" substance in contact with it should give an adequate explanation of 3 distinct classes of phenomena: (1) relative movement of the two phases in an elec. field and the converse production of a diff. of potential by their relative movement; (2) electrode potential and electrocapillarity; (3) stability, discharge, and flocculation of suspensions. U. gives a review of the theories relating to the region in question. As a test of these theories, expts. were made dealing with (1) the detn. of the total charge on the particles of a lyophobic suspension by neutralizing it with a measured quantity of oppositely charged ions; (2) the effect of electrolytes in modifying the surface charge. The charge per particle of radius 1.3×10^{-6} cm in a gamboge suspension which was pptd. by ferric alum, was found to be 1.45×10^{-3} e. s. u. The mobility of the particles was 1.44×10^{-4} cm./sec. at 23°. The charge calcd. from the mobility on the assumption of a Helmholtz double layer of mol dimensions is 1.7×10^{-5} e. s. u., while the assumption of a diffuse outer component of the double layer requires an even smaller charge. Flocculation expts make it clear that when the soly. product of the compd. formed from the flocculating and stabilizing ions is small, the flocculating power is detd. by it. The expts. support a theory which is adapted from those of McBain and Pauli. The surface layer of a non-aq. phase which becomes charged in contact with water or an aq. liquid consists partly or entirely of mols. of an electrolytically dissociable substance, so oriented that all the groups of one sign are directed normally from the surface toward the liquid. A small fraction of these mols. is dissociated reversibly, one kind of ion diffusing through the liquid in the neighborhood of the interface. This surface disson. theory is in harmony with facts observed in connection with the relative flocculating power of different ions, the effect of diln. of a suspension on the flocculating value of an electrolyte, the relation between mobility and size of suspended particles, and membrane equil.

R. J. HAVIGHURST

Dialysis and ultrafiltration, electrodialysis and electroultrafiltration—a comparison.

ERICH HEYMANN. *Z. physik. Chem.* 118, 65-78(1925).—The time necessary to rid a colloidal soln. of its crystalloid content by dialysis is calcd. for an ideal app. If electrodes are placed just outside the diaphragms in a dialyzing app., electrolysis and electroendosmosis also aid in drawing crystalloids from the colloidal soln. Calcn. shows that in the latter case, electrolysis is about 100 times as efficient as either dialysis or electroendosmosis in removing electrolytes from the colloidal soln. Similarly, electrolysis, if employed in an app. for ultrafiltration, will be about 10 times as efficient in the removal of electrolytes as ultrafiltration alone. *For the removal of non-electrolytes from colloidal soln., ultrafiltration is 5 to 50 times as efficient as dialysis. For the removal of a mixt. of non-ionized and ionized crystalloids from a colloidal soln., the method of electroultrafiltration is best. Exptl. observations agree qual. with the results of these calcns.

R. J. HAVIGHURST

Colloidal electrolytes. A. LOTTERMOSSER. *Collegium* 1925, 573-82.—A lecture reviewing the work of McBain and others.

I. D. CLARKE

Quantitative studies on dispersoid syntheses using P. P. von Veimarn's mechanical method. SENJI UTZINO. *Japn. J. Chem.* 2, 21-6(1923) (in German).—Data are given for the prepn. of colloidal solns. of S, Se, Te, $\text{Al}(\text{OH})_3$, BaSO_4 , Sb_2S_3 , Ag, Hg, Au and denatured protein, including the dispersion medium, the time of grinding, the av. size of the dispersed particles, concn. of the dispersed phase in the dispersion medium, color of the dispersoid soln., opalescence and max. stability. C. J. WESS

The hydrates of antimony trioxide. ARTHUR SIMON AND HEINRICH POEHLMANN. *Z. anorg. allgem. Chem.* **149**, 101-24(1925).—The purpose of this paper is definitely to establish the no. of existing antimonious acids. Solns. of tartar emetic were pptd. with HCl at 0°, 40° and 100°. The hydroxides formed contained tartaric acid and HCl adsorbed despite a thorough washing. The continuous course of the drying curves, the continuous adsorption of KOH and the vapor-pressure curves of the ppts. show that different amts. of water are being adsorbed at different temps. by the gels, because of the various sizes of the grain; but no discontinuity was observed in the curves which would indicate the formation of a definite hydrate. Freshly pptd. hydrates of Sb_2O_3 dissolve on addn. of 87% H_3PO_4 and ppt. on further addn. of the acid. The ppt. loses this property when allowed to stand for 2 hrs. or longer, but is sol. in boiling sirupy H_3PO_4 and ppts. again upon addn. of water. In contrast to the hydrates of Sb_2O_3 those of Sb_2O_5 are not coagulated by an excess of H_3PO_4 and no ppt. is formed when water is added. This behavior may be made use of for the analytical sepn. of the 2 oxides of Sb. Expts. on the displacement of water by EtOH show that the gels possess a const. vol. They have a negative charge as may be shown by electrocataphoresis. It is possible to displace the water in the hydrate completely by acetone. This, too, shows that the water in the ppt. is not chemically bound. E. K.

Hydrates and hydrogels. VII. Isomeric hydrogels of alumina. RICHARD WILLSTÄTTER, HEINRICH KRAUT AND OTTO ERBACHER. *Ber.* **58B**, 2448-58(1925); cf. C. A. **19**, 201.—When Al_2O_3 is pptd. from $\text{Al}_2(\text{SO}_4)_3$ in a slight excess of NH_4OH , washed, and dried in anhyd. acetone, a compd. contg. more water than $\text{Al}(\text{OH})_3$ is obtained. With a greater excess of NH_4OH it is possible to prep. α -monoaluminium orthohydroxide having the formula $\text{Al}(\text{OH})_3$. 100 cc. of 10% NH_4OH were poured into 600 cc. of H_2O contg. 22 g. $(\text{NH}_4)_2\text{SO}_4$ and brought to 58°. To this was added rapidly and with const. stirring 150 cc. of a soln. contg. 76.7 g. $\text{NH}_4\text{Al}(\text{SO}_4)_2$ at the same temp. The ppt. was centrifuged, washed in NH_4OH water 5 times, and dried in acetone as previously described. The freshly prepd. α -hydroxide is a white, flaky, somewhat plastic gel contg. 51.7 to 54.4% H_2O based on the Al_2O_3 (theory 52.9%). In contact with H_2O it begins to change into β -hydroxide in about $5\frac{1}{2}$ hrs., the appearance changing to a compact, yellowish, plastic gel. The β -hydroxide is believed to be a polyaluminium hydroxide, probably $\text{Al}_4\text{O}_3(\text{OH})_3 \cdot 2\text{H}_2\text{O}$. On heating with NH_3 the α -compd. loses very little H_2O but the β gives up its hydrate H_2O . The β also remains colloidal, whereas the α becomes "mineralized." The β hydroxide changes to the γ compd. on standing some months under H_2O . In the presence of NH_3 the change can be brought about in 10 days. On drying in acetone and analyzing the γ -hydroxide appears to be $\text{Al}(\text{OH})_3$, but it is so different chemically from the α that it must be considered an isomer. The α -hydroxide dissolves readily in HCl and NaOH, the β much less readily, but the γ does not dissolve in even moderately concd. HCl or NaOH. That the differences between the 3 hydroxides are due to differences in chem. compn. rather than to their colloidal nature is shown by the fact that the γ adsorbs more invertin from soln. than the β , and the β more than the α . **VIII. An alumina gel of the formula $\text{AlO} \cdot \text{OH}$.** *Ibid* 2458-62.—Al metahydroxide can be made by heating any of the 3 orthohydroxides. The α -compd. comes to the same compn. anywhere in the temp. range of 212-239°. The H_2O content is then 16.5% (17.6% theoretical for $\text{AlO} \cdot \text{OH}$). The β -compd. comes to a const. compn. in the same temp. range, but at 19.1 to 19.5% H_2O . Probably some poly-Al hydroxides are present in this case. The γ compd. comes to the H_2O content of 14.5 to 15.4% in the temp. range 242-72°, some Al_2O_3 probably being formed as well as $\text{AlO} \cdot \text{OH}$. The metahydroxide does not dissolve in moderately concd. HCl or NaOH. It is a poor adsorbent for invertase, taking up only 0.01 as much as the γ -orthohydroxide. It adsorbs *maltase* more readily than invertase, making possible the sepn. of the former from a mixt. of the 2 enzymes. **IX. Silicic acid.** RICHARD WILLSTÄTTER, HEINRICH KRAUT AND KARL LOBINGER. *Ibid* 2462-6.—The silicic acid was made either by adding SiCl_4 to 60 times its wt. of ice and H_2O or by passing a brisk stream of air through boiling SiCl_4 and thence into H_2O at 0°. The HCl formed in the reaction was largely removed by adding freshly pptd. Ag_2O . The HCl cannot be reduced below about 0.005 N without causing some Ag to go into the soln. The rest of the HCl can be removed by dialysis, but much of the SiO_2 is lost at the same time. The soln. of α -silicic acid was concd. to 5 to 7% SiO_2 by vacuum distn. at 15° in 1 hr. The soln. remained clear and fluid. When concd. to 10% SiO_2 it gelatinizes. The $3\frac{1}{2}$ to 5% solns. at 8° do not show any cloudiness with egg albumin for 2 days. More dil. solns. take still longer to form enough β -silicic acid to give a ppt. with albumin. The $3\frac{1}{2}$ % soln. remains clear for 7 days, the albumin ppt. increasing markedly as time goes on, and after 10 days the soln. gelatinizes. A 7% soln. gel-

atinizes on standing overnight, before the albumin test shows the presence of any β -silicic acid. Gels were prepd. from the solns. of α -silicic acid by pptn. with NH_4OH and NH_4Cl and drying with acetone. The H_2O content found lay between that for $\text{H}_2\text{Si}_2\text{O}_6$ and $\text{H}_4\text{Si}_2\text{O}_8$. The freshly prepd. α -silicic acid passes through dialyzing membranes very readily, but the velocity of diffusion is greatly reduced within 6 hrs. after prepn. The α -silicic acid is slightly volatile at $15\text{--}26^\circ$, small quantities passing over during vacuum distn. F. L. BROWNE

The influence of some stable colloids on the flocculation of sols and suspensions. A. BOUTARIC AND M. G. PERREAU. *Compt. rend.* **181**, 511-13(1925).—The influence of varying amts. of gum arabic, dextrin, gelatin, casein and starch on the stability toward electrolytes of the negative suspensoid sols As_2S_3 , gamboge, and mastic was detd. Starch in all proportions rendered the sols less stable. In the other cases, as the amt. of stable colloid added was increased, the sols became at first increasingly stable, then a protective action was observed, and finally at high concns. the stable sols caused coagulation without the addn. of any electrolyte. F. L. BROWNE

The influence of the time of dialysis on the aging of ferric oxide hydrosol. HANS HANDOVSKY. *Z. physik. Chem.* **117**, 432(1925).—A slightly dialyzed Fe_2O_3 hydrosol made by the method of Wintgen and Biltz (*C. A.* **18**, 1220) showed very little change in elec. cond. in 1121 days. A portion of this sol which was dialyzed for 21 days and then aged for 642 days increased in cond. markedly during the aging period. The increased cond. occurred chiefly, though not entirely, in the cond. of the dispersion medium as distinguished from that part of the cond. due to the charged particles. The aging may be due to the long time required for ions in the interior of the dispersed particles to work their way to the interface and thence into the dispersion medium. F. L. BROWNE

The coagulation of a colloidal solution by hydrogen ions. A. B. WEIR. *J. Chem. Soc.* **127**, 2245-8(1925).—The min. concn. of HCl , H_2SO_4 , AcOH , and citric acid for the coagulation of Prussian blue hydrosol was detd. and the p_{H} of the supernatant liquid examd. Coagulation took place when the p_{H} of the medium was the same, namely about 1.9, for HCl , H_2SO_4 , and citric acid. With AcOH the p_{H} was 2.3. In all cases the p_{H} of the supernatant liquid was slightly higher than that of the corresponding concn. of the acids alone, indicating that some of the acid was adsorbed by the ppt. in each case. With oxalic acid, complete pptn. does not take place until a p_{H} of 0.8-0.9 is reached. Ppts. with other acids can be reprecipitated by adding a little oxalic acid and shaking, but the ppt. with oxalic acid cannot be reprecipitated. Strong adsorption of the oxalate ion and consequent peptizing action is indicated. F. L. B.

The electroanalysis of agar. A method for the preparation of the free agar-acid. W. F. HOFFMAN AND R. A. GORTNER. *J. Biol. Chem.* **65**, 371-9(1925).—Coarsely ground, com. agar was electroanalyzed for 18 hrs. with a total elec. current of approx. 11.65 amp.-hrs. at 220 v. This procedure removes the Ca practically quant. and forms the free agar-acid. A 1% soln. of the free acid has a p_{H} of 2.475; the acid is about 56% ionized and is neutralized by NaOH below p_{H} of 4.0. The acid is apparently an acid H_2SO_4 ester, all of the S being in the form of H_2SO_4 . Sols contg. as much as 5% of the free agar-acid do not set on cooling but rigid gels are obtained on neutralization. Org. bases such as PhNH_2 and the alkaloids form salts and set to rigid gels. Possible pharmacol. uses of the agar-alkaloid salts are being investigated. The min. mol. wt. of the agar-acid is approx. 3000 and probably corresponds to the formula, $\text{R}-\text{O}-\text{SO}_2-\text{OH}$, where R is a large polysaccharide residue. This gelation of agar is the gelation of a salt and not of a complex polysaccharide. A. P. LOTHROP

The solubility of ammonium salts in ammonia. (A method for the distinguishing and separation of mono- and polybasic acids.) E. WEITZ. *Z. Elektrochem.* **31**, 546(1925).—Salts of mono-basic acids increase the aq. soly. of NH_3 (they diminish the partial pressure of NH_3), while those of polybasic acids decrease the soly. (by increasing the partial pressure of NH_3). The influence of NH_3 on the aq. soly. of NH_4 salts makes possible the distinguishing of polybasic acids and the sepn. of mono- and polybasic acids, and can be made a criterion between mono- and polybasicity. R. H. ABORN

Calcium phosgeno-aluminate: A physico-chemical study. A. F. O. GERMANN AND C. R. TIMPANY. *J. Phys. Chem.* **29**, 1423-31(1925); cf. *C. A.* **19**, 2920.—The vapor tension, d., and cond. of solns. of various strengths of CaAl_2Cl_6 , the Ca salt of phosgeno-aluminic acid, COAl_2Cl_6 , in COCl_2 were detd. at 0° and 25° for evidence as to the validity of the theory of phosgeno acids and salts. The higher cond. than that of AlCl_3 in COCl_2 was considered positive evidence. A. W. FRANCIS

Phosgeno-aluminates of sodium, strontium, and barium. A. F. O. GERMANN AND

D. M. BIROSEL. *J. Phys. Chem.* **29**, 1469-76(1925); cf. preceding abstr.—Some new phosgeno-aluminates were prepd. Their soly. in COCl_2 and the vapor pressures of these solns. were detd. The following solvates were identified: $3\text{Ba}(\text{AlCl}_4) \cdot 6\text{COCl}_2$, $\text{BaAl}_2\text{Cl}_8 \cdot \text{COCl}_2$, $5\text{SrAl}_2\text{Cl}_8 \cdot 9\text{COCl}_2$, $\text{SrAl}_2\text{Cl}_8 \cdot \text{COCl}_2$. NaAlCl_4 forms no solvate with COCl_2 at 25° . The vapor pressures of the above solvates at 25° were 625, 290, 950, 175 mm. Mol. wt. calcs. indicate 15 to 20 atoms of Sr or Na per mol. Solns. of BaAl_2Cl_8 at room temp. and SrAl_2Cl_8 at 50° sep. into 2 layers, but both have lower crit. soln. temps.

A. W. FRANCIS

Vapor-pressure lowering as a function of the degree of saturation. I. ISAAC BENCOWITZ. *J. Phys. Chem.* **29**, 1432-52(1925).—In considering the properties of solns. it is assumed that the degree of saturation, in cases of substances having a definite soly., e. g., salts in H_2O , is more fundamental than concn. as ordinarily expressed. If the soly. of a salt in H_2O at a given T is n_s g. in 100 g. H_2O , the degree of satn. of a soln. contg. n_1 g. salt in 100 g. H_2O is $S = n_1/n_s$. B. plots the log of vapor pressure lowering at const. S , i. e., $\log(\Delta p)_S = x_1$ vs. $1/T$, and obtains straight lines, so that $d \log(\Delta p)_S = x_1 / d(1/T) = \text{const.}$ Similarly, graphs of $\log(S)_{\Delta p=1}$ vs. $1/T$ yield the relation $d \log(S)_{\Delta p=1} / d(1/T) = \text{const.}$ The relation between $\log \Delta p$ and $1/T$ at various const. values of S yields a family of parallel straight lines, indicating that the slope of these lines is independent of the degree of satn. The complete relationship between Δp , T and S is given by the equation $\log \Delta p = K/T - Ka + (Ka/b) \log S$. K = slope of the $\log(\Delta p)_S = x_1$ vs. $1/T$ curves, a = reciprocal of the T at which the satd. soln. has a vapor pressure lowering of 1 mm. Hg, and b = the intercept of the $\log(S)_{\Delta p=1}$ vs. $1/T$ curve on the $\log S$ axis. For satd. solns. the equation reduces to $\log \Delta p_{\text{satd.}} = K/T - Ka$; hence $\log(\Delta p / \Delta p_{\text{satd.}}) = (Ka/b) \log S$, or the log of the ratio of the vapor pressure lowering at any 2 given degrees of satn. is independent of T . The relations have been tested for 31 salt solns. with data taken from standard sources.

F. C. KRACEK

Selective solvent action. IV. **Cryoscopy in mixed solvents.** ROBERT WRIGHT. *J. Chem. Soc.* **127**, 2334-8(1925); cf. *C. A.* **19**, 428. When a solute is added to a binary mixed solvent in only 1 of whose components it is sol., the f. p. of the constituent in which it is insol. is always raised. When the concn. of the "semi-solute" is plotted against the elevation of the f. p. a continuous curve results with a break at the point of formation of 2 liquid phases. "It thus seems evident that a semi-solute when dissolved in a mixed solvent forms solvates with the constituent in which it is sol., and as a result raises both the f. p. and the vapor pressure of the other constituent." These statements are based on a study of 4 mixed solvents with 2 to 5 semi-solutes for each one. The effect of adding a solute sol. in both constituents of a C_6H_6 -EtOH mixt. was studied for 5 solutes. Solute more sol. in alc. at first raise the f. p. of the C_6H_6 and at higher concns. depress it, while those more sol. in C_6H_6 depress the f. p. of C_6H_6 in all concns. The method is applied also to discriminate between the relative attractions of C_6H_6 and EtOH for 16 third liquids completely miscible with both. The lower members of the fatty alc. series show a greater attraction for EtOH than for C_6H_6 . Those above amyl alc. and aromatic compds. in general all seem to show a greater attraction for C_6H_6 than for EtOH.

F. L. BROWNE

Gas streams in electrolytes. A. COEHN. *Z. Elektrochem.* **31**, 552-4(1925).—In very slightly ionized electrolytes the Hittorff scheme of ionic migration no longer holds with large potential gradient at an electrode, so long as concn. changes are permitted in the neutral electrolyte. Rather there appear free space-charges. The apparent movement, which is observed as directed reflection from the electrode, depends not on any primary movement of gas bubbles, but on the primary action of the ions, of which those drawn into the immediate vicinity of a point-electrode attain a very high velocity, and thereby carry along liquid and gas bubbles.

R. H. ABORN

Ionization of trimethylethoxyammonium hydroxide, trimethylamine oxide and their derivatives. WM. A. NOYKS. *J. Am. Chem. Soc.* **47**, 3025-30(1925); cf. N. and Hibben, *C. A.* **17**, 656; Stewart and Maeser, *C. A.* **19**, 238.—The conclusion of S. and M. that $(\text{Me}_3\text{NOEt})\text{OH}$ and $(\text{Me}_3\text{NOMe})\text{OH}$ are highly ionized in aq. solns. has been confirmed and the erroneous observations of N. and H. have been corrected. Reasons are given for believing that the 5th, polar valence of NH_4 compds. is a real valence residing in the N atom and not in the group as a whole; also, for thinking that the amine oxide retains the structure $\text{Me}_3\text{N}:\ddot{\text{O}}$ in soln., the N having its usual valence of 5 (1 being polar) and O its valence of 2. The hypothesis of S. and M. that the amine oxide has the structure $\text{R}:\text{N}:\ddot{\text{O}}:\text{H}:\ddot{\text{O}}:\text{H}$ in soln. is questioned. Reasons are given for believing that the polar valence of NH_4 compds. is properly considered as a "primary

valence" and that the differences between "polar" and "non-polar" valences are differences of degree rather than of kind.

C. J. WEST

The conductivity of some acids of medium strength, in methanol and their catalytic action. HEINRICH GOLDSCHMIDT AND HARALD AARFLOT. *Z. physik. Chem.* **117**, 312-33(1925); cf. *C. A.* **19**, 1519-20.—The cond. of *trichloroacetic acid*, *trichlorobutyric acid* and *picric acid*, in MeOH and its mixts. with H₂O, are detd. by the method given previously. The affinity consts. and the degrees of dissociation are calcd. according to the theory of Bjerrum, the latter with the aid of the cond. curves of HCl, HBr and HI. Special consideration is given to the quotient k/p_H and to the anticatalytic action of H₂O in esterification. The results are given in extensive tables. J. T. S.

Hydration of ions. J. BABOROVSKY. *Chem. Listy* **19**, 297-300(1925); cf. *C. A.* **18**, 492.—From expts. by A. Wagner, V. Chudarek and J. Velsch (to be published in "Moravska prirodvedcka spolenost") B. calcs. that if H⁺ is monohydrated, the hydration of Cl⁻, Na⁺, K⁺ and Li⁺ corresponds to 6, 22-5, 10 and 35 mols. H₂O, resp.

F. C. KRACEK

The effect of variation in ionic strength on the apparent first and second dissociation constants of carbonic acid. A. BAIRD HASTINGS AND JULIUS SENDROY, JR. *J. Biol. Chem.* **65**, 445-55(1925).—The 1st and 2nd dissociation consts. of H₂CO₃ have been detd. at 38° in solns. of varying ionic strength. When extrapolated to $\mu = 0.0$, the 1st dissociation const. was found to be 4.68×10^{-7} or $p_{K_1} = 6.33$. The activity coeff. of the HCO₃ ion, γ , was found to be related to the ionic strength of the soln. from $\mu = 0.01$ to $\mu = 0.18$ according to the equation $-\log \gamma_1 = 0.5\sqrt{\mu}$. The apparent 1st dissociation const. is related to the ionic strength of the soln. according to the equation $p_{K_1}' = 6.33 - 0.5\sqrt{\mu}$. The 2nd dissociation const. of H₂CO₃ was found to be 6.03×10^{-11} or $p_{K_2} = 10.22$ at 38°. The activity coeff. of the CO₃ ion, γ_2 , was found to be related to the ionic strength of the soln. from $\mu = 0.02$ to $\mu = 0.16$ according to the equation $-\log \gamma_2 = 1.6\sqrt{\mu}$. The apparent 2nd dissociation const. is related to the ionic strength of the soln. according to the equation $p_{K_2}' = 10.22 - 1.1\sqrt{\mu}$. These results are in harmony with the theory of the behavior of strong electrolytes as elaborated by G. N. Lewis, Bronsted, and Debye and Huckel.

A. P. LOTHROP

The velocity of monomolecular reactions. D. ALEXEJEW. *Z. physik. Chem.* **118**, 119-22(1925).—On the assumption that an "activated" mol. decomposes on its first collision with another mol., and that its reaction products contain energy enough to activate only one other mol., the velocity of a first-order gaseous reaction is shown to depend upon the first power of the no. of mols. present. The mechanism of a monomol. decompn. may thus be explained without the assumption of an activation by infra-red radiation.

R. J. HAVIGHURST

The dependence of the velocity of alkaline hydrolysis on the constitution of the alcohol. II. IJENNART SMITH AND HUGO OLSSON. *Z. physik. Chem.* **118**, 99-106(1925); cf. *C. A.* **16**, 4114.—Bimol. velocity consts. have been detd. for the alk. hydrolysis of the following esters: normal, iso-, secondary and tertiary Bu acetate; primary and secondary Pr glycolate. These results, together with those previously obtained, show that the velocity of alk. hydrolysis is a constitutive property, depending upon the alkyl radical of the alc. and upon the constitution of the acid. The influence of the alc. is greater than that of the acid, a confirmation of van't Hoff's idea of the mechanism of sapon. Alk. hydrolysis and ester formation from Ac₂O and alc. show the same relation between constitution of the alc. and velocity of reaction. **III. Dependence of velocity of hydrolysis on temperature.** HUGO OLSSON. *Ibid* 107-13.—Velocities of the above reactions were measured at 0, 10, 20, 30, 40° and the temp. coeff. was found to be const. over the whole series, decreasing slowly with increasing temp.

R. J. HAVIGHURST

The thermal decomposition of nitrogen pentoxide at low pressures. H. S. HIRST AND E. K. RIDEAL. *Proc. Roy. Soc. (London)* **109A**, 526-40(1925); cf. *C. A.* **19**, 3415.—The thermal decompn. of N₂O₅ apparently satisfies the usual criteria of unimol. change. Attempts have been made to interpret the results on the hypothesis that the reaction is in reality of a more complex character. Some of these attempts are critically discussed. New measurements of the reaction velocity at 33.5° and 43.8° were made in an all-glass system. The progress of decompn. at any time was detd. by freezing out the N₂O₄ and NO₂ and measuring the O pressure by means of a Piram-Hale vacuum gage. Neither the Pt wires of the gage nor the glass walls of the app. excited any appreciable effect on the reaction rate. The initial gas pressures were varied from 0.010 to 1.280 mm. of Hg. The data point conclusively to the appearance of a disturbance in the rate of reaction when the total pressure in the reacting system falls

below 0.26 to 0.28 mm. of Hg. The observations are most readily interpreted on the assumption that a definite fraction of the activated mols. always undergoes decompn. irrespective of the pressure, but that a larger fraction (approx. 4/5 of the total) of the activated mols. only undergoes decompn. if they do not, after activation, suffer collision with other mols. during a period of about 10^{-6} sec. If collision does take place within this time, deactivation without decompn. must occur. The rate of decompn. thus increases as pressure decreases, until none of the activated mols. is deactivated by collision. According to this view, the rate of decompn. of N_2O_5 for all pressures is expressed by the equation— $dc/dt = K_1 (1 + K_2 e^{-1.04 l.P/\lambda P_\lambda}) e^{-24.700/RT} .C$, where the expression $e^{-1.04 l.P/\lambda P_\lambda}$ represents the fraction of the active mols. which have a mean free path greater than l at the pressure P . The const. k_1 is the ordinary unimol. const. at high pressures, viz., 4.98×10^{13} , with a sec. as unit of time, and k_2 is another sp. const. detd. by fixing one point on the pressure-velocity const. curve. By a suitable choice of l and k_2 the equation yields values for the velocity const. that are in good agreement with the exptl. data. The decompn. of N_2O_5 is a true unimol. reaction, proceeding at a rate given by the general equation— $dc/dt = ve (-N h\nu/RT) .C$. The mechanism of the reaction cannot involve activation by collision, nor by inflowing radiation, nor by any type of chain reaction, as has been postulated by various investigators in the past.

R. L. D.

Explosions with alkali metals. H. STAUDINGER. *Z. Elektrochem.* 31, 549-52 (1925). The alkali metals act as powerful detonators with org. halogen compds. as follows (the no. is energy in m. kg.): $\text{CH}_3\text{Cl} + \text{KNa}$, 0.15, moderately strong; $\text{CH}_2\text{Cl}_2 + \text{KNa}$, 0.002, strong; $\text{CHCl}_3 + \text{KNa}$, 0.0007, very strong; $\text{CHCl}_3 + \text{Li}$, 1.5, weak; $\text{CHCl}_3 + \text{Na}$, 0.6, moderately strong; $\text{CHCl}_3 + \text{K}$, 0.02, strong; $\text{CH}_2\text{Cl}_2 + \text{K}$, 0.06, moderately strong; $\text{CH}_2\text{Br}_2 + \text{K}$, 0.04, strong; $\text{CH}_2\text{I}_2 + \text{K}$, 0.06, strong. The reactions are considered in terms of theories of mol. formation and predictions are made as to other possible explosive reactions with inorg. halides and with compds. contg. O and S.

GEORGE L. CLARK

Distribution of pyridine between water and benzene. R. M. WOODMAN AND A. S. CORBET. *J. Chem. Soc.* 127, 2461-3.—The 3-component system, water-pyridine-benzene, is an example of a pair of partly miscible liquids. Over the range 0-6% of pyridine in the total system, the ratio of the weight percentages of this liquid in benzene and water is about 2.7 at 25°. The ratio decreases with increasing concn. of pyridine to a min. of 0.8, finally to reach unity at the crit. point. The behavior is unusual and results in a change of direction of the slope of the tie lines.

JAMES M. BELL

System, water and the nitrates and sulfates of ammonium and potassium at 25°. YUKICHI OSAKA AND RYOHEI INOUE. *Japn. J. Chem.* 2, 87-98 (1925). [In English.]—The equil. of the system $(\text{NH}_4)_2\text{SO}_4 + 2\text{KNO}_3 \rightleftharpoons 2\text{NH}_4\text{NO}_3 + \text{K}_2\text{SO}_4$ is reported at 25°. The solid phases existing in this system are all solid solns. of the following types: $(\text{NH}_4\text{K})_2\text{SO}_4$, a complete series with no gap; $(\text{NH}_4\text{K})_2(\text{NO}_3)_2$, 2 series with a gap, which extends from 15.6 to 65 mol. % of NH_4NO_3 ; they are distinguished as α - and β -series. $(\text{NH}_4\text{K})_2 0.5\text{SO}_4 \cdot 0.5(\text{NO}_3)_2$, this solid soln. extends from the double salt $(\text{NH}_4)_2 0.5\text{SO}_4 \cdot 0.5\text{NO}_3$ to the solid soln. of the approx. formula $(0.6\text{NH}_4, 0.4\text{K})_2 0.5\text{SO}_4 \cdot 0.5(\text{NO}_3)_2$. $(\text{NH}_4\text{K})_2 0.4\text{SO}_4 \cdot 0.6(\text{NO}_3)_2$, this solid soln. extends from the double salt $(\text{NH}_4)_2 0.4\text{SO}_4 \cdot 0.6(\text{NO}_3)_2$ to the solid soln. of the approx. formula $(0.865\text{NH}_4, 0.135\text{K})_2 0.4\text{SO}_4 \cdot 0.6(\text{NO}_3)_2$. The data are given in a series of tables and diagrams.

C. J. WEST

Studies upon catalytic combustion. I. The union of carbon monoxide and oxygen in contact with a gold surface. WM. A. BONE AND G. W. ANDREW. *Proc. Roy. Soc. (London)* 109A, 459-76 (1925); cf. *Trans. Roy. Soc. London (A)* 206, 1 (1906).—The catalytic combination of CO and O on a Au wire gauze (wt. 52.5 g., exposed surface about 445 sq. cm.) at about 300° and pressures below 1 atm. was studied by a static method. The gauze catalyst was placed in an all-glass app., and the section that contained the catalyst was heated in a combustion-tube furnace. A charge of mixed CO and O gas of the desired compn. was introduced and continuously circulated over the catalyst. The circulation was accomplished by an automatic Sprengel pump in such a way that the cycle included (1) satn. with H_2O at 25°, (2) passage through the heated catalyst, and (3) scrubbing with baryta water. The rate of the reaction was measured by observing the pressure decrease in the system. The gas mixts. used contained CO and O in the proportions $2\text{CO}/1\text{O}_2$, $1\text{CO}/1\text{O}_2$, and $4\text{CO}/1\text{O}_2$. The final const. rate of reaction attained with the $2\text{CO}/1\text{O}_2$ mixt. after prolonged operation was regarded as the "normal" activity and was used as the reference state to which the catalyst was always brought before a new set of conditions was investigated. A dependence of reaction rate on the presence of moisture was indicated, but not closely examd. The

rate of combination of a moist $2\text{CO}/10_2$ mixt. in contact with the Au surface in the normal state of activity at about 300° was directly proportional to the pressure of the gas mixt. The normal catalytic activity of the catalyst could be greatly diminished either (1) by cooling the catalyst down to, and keeping it for some time at, room temp. or (2) by evacuating it at the reaction temp. The reattainment of normal activity after such treatment required many hrs.' operation in the $2\text{CO}/10_2$ mixt. The activity of the catalyst could be increased by previous exposure to either CO or O at 300° . With the gas mixts. $1\text{CO}/10_2$ and $4\text{CO}/10_2$ the rate of reaction was always proportional to the partial pressure of CO. The results are best explained by assuming an "activation" of both gases through association with the surface. The activation is not confined to superficially adsorbed gas films of monomol. thickness, but extends to more deeply occluded gases. The results are critically discussed in reference to their bearing on the Langmuir (cf. *C. A.* 10, 3007) and the Taylor (cf. *C. A.* 19, 2442) theories of heterogeneous catalysis.

R. L. DODGE

Studies on catalysis by nitroamide. II. The catalysis of the simple amino bases. J. N. BRONSTED AND HANS C. DUUS. *Z. physik. Chem.* 117, 299-311(1925), cf. *C. A.* 19, 430.—The bases *aniline*, *o*-, *m*-, *p*-*toluidine* and *o*-, *m*-, *p*-*chloroaniline* are investigated in 3 series of expts. The H ion concn. of their mixtures with stoichiometrically insufficient quantities of HCl or HClO_4 is detd. electrometrically and by the method of Bredig (catalysis of the decompn. of ethyl diazo acetate) and from these detns. the base consts. are calcd. The app. and methods are described. In the same app. the catalysis const. k for the reaction $\text{NO}_2\text{NH}_2 = \text{N}_2\text{O} + \text{H}_2\text{O}$ is detd. The relation $k = G \times K_b^{0.83}$ holds between both consts., where G is a const.

JOHN T. STERN

The catalysis by alumina of the reaction between ethyl alcohol and ammonia. G. W. DORRELL. *J. Chem. Soc.* 127, 2399-407(1925).— Al_2O_3 was chosen as catalyst because it has very little dehydrogenating action on alc. Gas streams of NH_3 and of N_2 contg. EtOH vapor were mixed, preheated, and passed over the Al_2O_3 . The total amt. of NH_3 converted to amines was detd. by absorption from the emerging gases and analysis. No attempt was made to distinguish between primary, secondary and tertiary amines. The optimum temp. for the reaction is about 300° , the conversion being less at higher or lower temp. The reaction proceeds best when the speed of the gases passing over the catalyst is not too slow. The lower yields at low speeds are due to decompn. of the amines formed. The effect of using an excess of EtOH over NH_3 is to produce larger amts. of secondary and tertiary amines. EtNH_2 decomposes under the conditions of the main reaction. NH_3 is not decomposed to any measurable extent by the catalyst. Al_2O_3 adsorbs NH_3 readily and a table is given showing the relation between the amt. of NH_3 adsorbed and the time of flow of the NH_3 over the catalyst. No sign of catalytic poisoning could be detected.

F. L. BROWNE

Gallium-in-quartz thermometer graduated to 1000° . SYLVESTER BOYER. *Ind. Eng. Chem.* 17, 1252-3(1925).—In developing the thermometer described, numerous characteristics of Ga and of quartz were discovered. Thus, highly purified Ga under 2-3 microns pressure can be cooled to -15° to -20° before solidifying, but traces of Bi raise the f. p. greatly. The tendency of Ga to wet quartz is increased by Zn and by As, but not by In or by Pb. The best protective coating in etching quartz with HF was China wood oil.

C. C. DAVIS

White and black diamonds and their relation to carbon. W. A. ROTH AND W. NAESER. *Z. Elektrochem.* 31, 461-6(1925).—The heats of transformation of white diamonds to α and β graphite (41 cal./g. and 16 cal./g., resp.) are calcd. from the heats of combustion measured in a micro bomb calorimeter. These values may be in error 10% and 20%, resp. The heats of combustion are given: of diamond 7876 ± 3 cal.; α graphite 7832 cal.; β graphite 7856 cal.; carbonado (black diamond) 7884 ± 2 cal. The heat of combustion of carbonado, being higher than that of white diamond, indicates that it is composed of diamond with amorphous C (heat of combustion about 8060).

E. R. SCHIERZ

Apparent molecular heat and viscosity of solutions of naphthalene in organic solvents. NICOLAS DE KOLOSOSKII. *Bull. soc. chim. Belg.* 34, 221-31(1925).—Viscosities of solns. of C_{10}H_8 in C_6H_6 , CCl_4 , etc., have been detd. and the available sp. heat data for these solns. have been recalcd. A simplified form of K.'s general equation for the sp. heat of solns. (cf. *C. A.* 19, 3050) is applied to these data, the conclusion being reached that the apparent mol. heat of a dissolved substance is equal to its actual mol. heat plus the heat equiv. of the work done against the viscosity of the soln. during a rise in temp. of 1° .

WM. B. PLUMMER

A thermodynamic consideration of the synthetic methanol process. K. K. KELLEY. *Ind. Eng. Chem.* 18, 78(1926).—The free energy and equil. const. of the reaction

$\text{CO} + 2 \text{H}_2 = \text{CH}_3\text{OH}(\text{g})$ are calcd. at various temps. $\Delta F_{298}^0 = -10.950$, $\Delta F_{623}^0 = 0$, the working limit of the process at 100 atm. is 700°Abs . The method of calcul. is that of Lewis and Randall. Park's value for the entropy of liquid CH_3OH is assumed.

F. R. B.

The influence of mechanical processes on the variation of electrical resistance with temperature of nickel. S. DE NEGRI. *Nuovo cimento* [N. S.] 2, 275-85(1925).—The variation of elec. resistance of Ni when submitted to a process of deformation has been measured over the temp. interval of $0-600^\circ$. Ni wire was wound noninductively about a quartz tube, heated in an elec. furnace and the resistance detd. with a Wheatstone bridge arrangement. These expts. demonstrate a complete equivalence of values for a given temp. through repeated cycles of heating. Drawing causes a diminution of the ratio $(R_t - R_0)/R_0$ compared to normal Ni and is more marked the greater the degree of deformation produced. Mech. deformation does not affect the Curie point.

L. T. FAIRHALL.

Passivity of iron by dilute nitric acid. TADAYOSHI FUJIHARA. *Ind. Eng. Chem.* 18, 62-3(1926).—Dil. HNO_3 (2-10%) in alc. soln. makes Fe passive in moist air, free from CO_2 . The oxide formed is FeO . This gives with H_2O alk. $\text{Fe}(\text{OH})_2$, which forms the protective coating.

H. S. VAN KLOOSTER

Glaser's experiments and the orientation of the molecules in a magnetic field. G. BREIT. *J. Wash. Acad. Sci.* 15, 429-34(1925).—Glaser has shown that the diamagnetic susceptibilities of H_2 , N_2 and CO_2 are proportional to the pressure if that be sufficiently high or sufficiently low, but that there is a transition region in which the relation between susceptibility and pressure is non-linear. The suggestion of Glaser and Debye that this is due to the finite time required for space quantization of the mols. to be established is examd. by Breit and a no. of possibilities are investigated. The paper is highly mathematical.

W. W. STIFLER

The mechanically enforced double refraction of amorphous liquids in relation to the molecular form. D. VORLÄNDER AND ROBERT WALTER. *Z. physik. Chem.* 118, 1-30(1925); cf. *C. A.* 19, 1810.—The liquid to be investigated fills the space between 2 concentric cylinders, and is made anisotropic by a mech. force due to the rapid rotation of the inner cylinder. Measurements are given on the double refraction of 135 amorphous liquids (as distinguished from cryst. liquids and colloidal solns.). With the app. used, it was impossible to detect double refraction in liquids with viscosity less than $5(\text{H}_2\text{O} = 1)$.

R. J. HAVIGHURST

Theory of atmolysis. JITSUSABURO SAMESHIMA. *Japn. J. Chem.* 2, 33-44(1925). (In English).—A mathematical discussion with graphical representation of the equations developed.

C. J. WEST

Nicolas Siémionovitch Kurnakov: his life, his work and his school. LÉON DLOUGATCH. *Rev. métal.* 22, 650-62, 711-32(1925).—Biographical, with a review of the work accomplished by K. in the last 40 yrs.

A. PAPINEAU-COUTURE

The nitrates of Bi (PICON) 6. Determination of the configuration of geometrically isomeric C compounds (LANGSETH) 10.

BIRTWISTLE, GEORGE: **The Principles of Thermodynamics.** Cambridge: University Press. 163 pp. 7s 6d. net. Reviewed in *J. Am. Chem. Soc.* 48, 295(1926).

COUCH, JAMES F.: **A Dictionary of Chemical Terms.** New York: D. Van Nostrand Co. 214 pp. \$2.50.

MASSON, I.: **Three Centuries of Chemistry: Phases in the Growth of a Science.** London: E. Benn, Ltd. 191 pp. 10s. 6d.

SLOSSON, EDWIN E.: **Sermons of a Chemist.** New York: Harcourt, Brace & Co. 319 pp. \$2. Reviewed in *Ind. Eng. Chem.* 18, 107(1926).

Wissenschaftliche Forschungsberichte. Naturwissenschaftliche Reihe. Edited by R. E. Liesegang. Dresden and Leipzig: T. Steinkopff. Pt. XIII. **Physikalisch-Chemische Mineralogie und Petrologie.** Die Fortschritte in den Letzten zehn Jahren. By Eitel, W. 174 pp. Price, paper M. 8.; bound, M. 9.20. Pt. XIV. **Physikalische Chemie. Sect. II. Thermische und Photochemische Gleichgewichts- und Geschwindigkeitslehre.** By Benrath, A. 192 pp. Price, paper, M. 8.50; bound, M. 9.70.

International Critical Tables of Numerical Data of Physics, Chemistry and Technology. In 5 vols. Edited by Edward W. Washburn, N. Ernest Dorsey, Clarence J. West, F. R. Bichowsky and Alfons Klemenc. Washington, D. C.: National Research Council. Approximately 2500 pp. Price per set \$60 (pre-publication price \$35). Orders should be placed directly with publishers. Reviewed in *Can. Chem. Met.* 9, 44(1925).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The measurement of radioactivity. CAMILLE MATIGNON AND G. MARCHAL. *Chimie et industrie* **14**, 503-10(1925).—Detailed description of the methods of detg. radioactivity by means of α -rays, of emanation, and of γ -rays. A. P.-C.

The effect of the chemical bond on the energy of intraatomic levels. RITA BRUNETTI. *Atti accad. lincei* [6] **2**, 323-8 (1925).—A mathematical phys. paper.

E. J. WITZEMANN

Spectra and atomic structure. S. GOUDSMIT. *Physica* **5**, 281-92(1925).—A review pertaining to the validity of the Zeeman effect limitation rules of Landé and the interpretation of them by Pauli (*C. A.* **19**, 2450). Pauli's rules (quantum nos. are exclusively assigned to the electrons, each electron having an individual combination) lead to the Bohr-Stoner periodic system. A bibliography is given. B. J. C. v. D. H.

Disintegration of atomic nuclei. E. RUTHERFORD. *Nature* **115**, 493-4(1925).—A short review of recent work on the mechanism of collisions of α -particles with atomic nuclei, and the fate of the bombarding α -particles (cf. *C. A.* **17**, 3449; **18**, 2104; **19**, 1655).

FLORENCE N. SCHOTT

The triangular systems of Rutherford-Bohr in relative equilibrium. U. CRUDELI. *Nuovo cimento* [N. S.] **2**, 225-34(1925).—A mathematical treatment of these systems and derivation of the relation between charge and mass. The necessary conditions are defined for the existence of a given system in uniform rotating motion. L. T. F.

High-frequency rays of cosmic origin. R. A. MILLIKAN. *Science* **62**, 445-8 (1925).—A summarizing report on the results of the investigation of the "penetrating" cosmic radiation. Judging from the extraordinary penetrating ability (equiv. to 68 feet of water or 6 feet of lead), these rays must possess a frequency about 1000 times the mean frequency of X-rays. They are not homogeneous. Absorption calcs. show that the wave lengths range from 0.0004 A. U. to 0.00067 A. U. Upon striking matter they stimulate a softer radiation, the frequency of which is in agreement with the theory of the Compton effect. Since the most penetrating rays known hitherto, the γ -rays of Th and Ra, are produced by nuclear changes within the atom, it is assumed that the new rays are produced all through space by a similar process involving enormously greater energetic changes (about 50 times as great as in radioactive processes). The computable frequency of a radiation produced when He is formed out of H, or when an electron is captured by a positive nucleus, would correspond with the observed frequency of these rays. They might also be produced by electrons possessing the speed of light. The latter hypothesis would account for the negative charge of the earth, but is in a contrast with the quant. variation of ionization in closed vessels in various altitudes. The fact that the rays hit the earth from all directions, day and night, is explained by the transparency of matter for these extremely hard rays and the assumption that they could originate in the very distant spiral nebulae. E. K.

Self-diffusion in solid metals. G. VON HEVESY AND A. OBRUSHEVA. *Nature* **115**, 674-5(1925); cf. *C. A.* **15**, 3921.—Two thin foils, one of ordinary lead, the other with lead contg. Th B in homogeneous mixt., were pressed together *in vacuo*. The rate of self-diffusion of radioactive lead into inactive lead was measured by comparing the number of scintillations on the observing screen of the α -particles due to the diffused atoms or their successive products of disintegration with the number of scintillations produced by the active foil at the beginning of the expt. The values for 260° and 324° are 6×10^{-7} and 1.4×10^{-4} cm.² day⁻¹, resp. Values for intermediate temps. are given. The diffusion rate 2° below the m. p. is thus only 10,000 times smaller than in molten lead. The coeff. of diffusion of Th B into the crystal lattice of a single lead crystal even at a temp. just below the m. p. is less than 10^{-8} cm.² day⁻¹. Coeffs. of diffusion of two very similar metals are analogous to those obtained in self-diffusion—that of Pb in Tl at 285° being 2×10^{-8} cm.² day⁻¹. Coeffs. of diffusion of Po into Pb foils and single crystals were found to be about the same. At 310°, $D = 1.3 \times 10^{-8}$ cm.² day⁻¹. The atoms of Po thus loosen the lattice of the individual Pb crystals and diffuse as if through amorphous lead.

FLORENCE N. SCHOTT

Polymerization of acetylene under the influence of α -particles. W. MUND AND W. KOCH. *Bull. soc. chim. Belg.* **34**, 241-55(1925).—The rate of polymerization of C₂H₂ contg. approx. 5×10^{-4} % of Rn has been detd. It is found that each α -particle causes the disappearance of 4.36×10^6 mols. of C₂H₂. Since the no. of gaseous ions produced by an α -particle in C₂H₂ is 2.13×10^6 , 20.5 mols. disappear for each ion pair formed.

WM. B. PLUMMER

The determination of radium by the γ -rays. D. GIOVANNI COSTANZO. *Mem. real acad. ciencias y artes.* **19**, 147–52(1925).—The amt., x , of Ra in a sample which is in radioactive equil. is commonly detd. by comparing the ionization current produced by the γ -rays, principally from Ra C, with that produced by a standard sample contg. p g. Ra. Both the sample and the standard are placed in the same position relative to the electroscope, and this position is chosen so that the time of discharge of the electroscope for the standard, t_p , may be measured with the desired accuracy. The amt. of Ra in the unknown is, $x = p(t_p/l_x)$; and the max. precision in the value of x is attained when t_p and l_x can be detd. with a precision of the same order, i. e., when $p/x = 1$. However, this precision is not attained if x is much greater or much smaller than p . In this case, greater precision is attainable by comparing the ionization currents of x and $(x + p)$, or of p and $(x + p)$, resp. Then, $x = (p(l_{(p+x)} - (t_x - t_{(p+x)}))) / (t_x - t_{(p+x)})$, and $(p + x) = p l_p / t_{(p+x)}$, resp. Two samples contg. (1) 6.92 mg., and (2) 0.634 mg. Ra were compared by this method with deviations of 0.00 mg. and 0.000 mg. But, when (1) was compared directly with (2) as the standard, deviations of 0.62 mg. and 0.78 mg. in the value of (1) resulted; and comparison of (2) directly with (1) as the standard gave deviations of 0.013 mg. and 0.080 mg. in the value of (2). This improved method is used in the Official Lab. of Radio activity of Lisbon.

R. H. LOMBARD

Replacement of the hypothesis of unmechanical coercion by a requirement for the internal condition of every electron. G. E. UHLENBECK AND S. GOUDSMIT. *Naturwissenschaften* **13**, 953–4(1925).—One difficulty, pointed out by Heisenberg (*C. A.* **19**, 3064) remains in the explanation of the Zeeman effect according to Pauli's rules: the occurrence of a relativistic doublet in the X-ray and the alkali metal spectrum. It is now proposed to assign 4 degrees of freedom to every electron corresponding to the 4 quantum nos. (n and k and R are main, azimuthal and rotational quantum nos. resp. for the electron; the others have the usual significance). In order to explain the magnetic inactivity of the atom residue (absence of relativistic difference between light and heavy alkali metals) it is necessary to assume for the electron model that the ratio magnetic moment/mechanical moment for its own rotation has a value double that for the orbital motion. From the orientation of R relative to the orbital plane the relativistic doublets can then probably be explained (cf. Wentzel's rules, *C. A.* **19**, 2913).

B. J. C. VAN DER HOEVEN

The emission current in a triode. B. D. H. TELLEGEN. *Physica* **5**, 301–15(1925).—A method is given for the calcn. of the current to the cathode of a parallel plane triode, taking into account the space charge effect. By neglecting the space charge between grid and anode the result is greatly simplified and can then be extended to the case of cylindrical electrodes, leading to an equation previously found by Schottky.

B. J. C. VAN DER HOEVEN

The absorption of cathode rays in aluminium. B. F. J. SCHONLAND. *Nature* **115**, 497(1925).—S. attributes the difference between the results obtained by Terrill (*C. A.* **19**, 602) and his own (*C. A.* **18**, 17) in the measurement of the variation in the fraction of a beam of cathode rays transmitted by an Al foil when the velocity of the rays is varied to errors in the measurements of the fraction transmitted. F. N. S.

Effect of an alternating magnetic field on the polarization of the resonance radiation of mercury vapor. E. FERMI AND F. RASETTI. *Nature* **115**, 764(1925); cf. *C. A.* **19**, 779, 780.—F. and R. observed a strong increase of the polarization in passing from a frequency of $1.5 \times 10_6$ to one of $5 \times 10_6$, though the amplitude of the field remained const.

FLORENCE N. SCHOTT

The spark spectrum of tungsten in a helium vacuum arc. H. B. LEMON. *Nature* **115**, 802(1925); cf. *C. A.* **19**, 776.—A hot W cathode used in the operation of an arc at low pressure in pure He is capable of developing the spark spectrum of W instead of the arc spectrum. The lines make their appearance when the filament is raised to dazzling incandescence either by the thermionic bombardment of the He, or by a direct heating current, or preferably, by both. This method will enable the spark spectra of refractory metals in He vacuum arc conditions to be used with greater reliability.

FLORENCE N. SCHOTT

Multiple cathodes and the origin of canal rays. R. MAGINI. *Nuovo cimento* [*N. S.*] **2**, 235–73(1925).—M. has analyzed the appearance of cathode rays as influenced by varying degrees of rarefaction and the effect of magnetic and elec. fields. High rarefaction has but little appreciable effect upon the emission of cathode rays. Excitation of the double cathode is limited to the central part of the bundle of rays and is retarded by rarefaction. Expts. apparently indicate that the initial velocity of the cathode rays is low and that the electrons forming the track do not strike the

cathode. Every modification produced in the track of the cathode rays by magnetic or elec. fields is reflected in equal measure in the brush of canal rays. The angle of deviation of these rays increases with diminishing distance from the cathode and their direction becomes much inclined from the plane of the latter. L. T. FAIRHALL

A modified ionization chamber. ARCIERO BERNINI. *Nuovo cimento* [N. S.] **2**, 305-13(1925).—The modified ionization chamber permits measurement of ionization effects of great magnitude without any decrease of precision. L. T. FAIRHALL

A new method for the study of soft X-rays. G. K. ROLLEFSON and E. J. POTH. *Science* **62**, 497-8(1925).—A beam of electrons, having velocities uniformly distributed over the range under investigation (100-750 v.) is spread into a band by means of a magnetic field. Photographic plates exposed to such a band show sharp discontinuities when developed. The photographic emulsions contain the following elements, which have crit. potentials within the range studied: C, N and O in the gelatin; and Ag and Br as AgBr. Following are interpreted discontinuities in order from 135 to 762 v.: Br, $4_1 \rightleftharpoons 3_2$; Br M_{III}; Br M_{II}; C, K α ; Br, M_I; C K abs; Ag, $4_2 \rightleftharpoons 3_3$; Ag M_V; N K α ; Ag M_{IV}; N K abs; O K α ; O K abs; Ag $4_3 \rightleftharpoons 3_2$; Ag M_{III}; Ag M_{II}; Ag $4_2 \rightleftharpoons 3_1$; Ag M_I. GEORGE L. CLARK

Double impacts by electrons in helium. GEORGE GLOCKLER. *Nature* **115**, 909-10 (1925); cf. *C. A.* **19**, 1373. In the measurement of the critical potentials of He, Dymond finds a difference of 20.9 v. between the first and second kink in the current potential curve, and not 20.55 v. as would be expected if the first kink corresponded to electrons which have caused the transition 1S-2s (type A), and the second kink to electrons which have caused two transitions 1S-2S and 1S-2s (type B₁). Dymond assumes that in his app. the second kink is due to the transition BB. G. states reason for believing the double impacts are of the type B₁ or AA rather than BB. He attributes the difference of 0.35 v. in the two different expts. to the energy lost by elastic impacts. FLORENCE N. SCHOTT

Double impacts by electrons in helium. E. G. DYMOND. *Nature* **115**, 910(1925).—D. disagrees with Glockler's explanation (cf. preceding abstr.) that the loss of energy from elastic collisions in his type of app. can result in a sensible error in the values of the excitation potentials of He. Inspection of D's. differential curves show a max. possible error of 0.1 v. FLORENCE N. SCHOTT

The coherence of superposed X-radiations. C. G. BARKLA AND GLADYS I. MACKENZIE. *Nature* **115**, 942(1925); cf. *C. A.* **19**, 2450.—Investigation of the J phenomenon shows that two X-radiations of differing penetrating powers exhibit the J₂ discontinuity at differing filtering thicknesses of Al. These, when superposed, exhibit not two discontinuities at these thicknesses, but one discontinuity of double magnitude (i. e., unaltered relative magnitude) at a thickness between the two shown by its constituents. The discontinuity occurs at a definite absorption coeff. for the whole beam, not at a certain wave length. A long series of expts. gave a remarkably const. magnitude of these discontinuities, viz., a drop of $7.7 \pm 0.5\%$ consistently. The three discontinuities J₁, J₂ and J₃ can be shown one after the other by progressive filtering of a selected X-radiation. Each is indicated by a drop of about 10% in the intensity of the radiation as usually measured. FLORENCE N. SCHOTT

Unsteady phenomena in diffraction spectra. EBERHARD BUCHWALD. *Physik. Z.* **26**, 672-5(1925). W. F. MEGGERS

Depolarizing influence of alternating magnetic fields on resonance radiation. G. BREIT. *J. Optical Soc. Am.* **11**, 465-72(1925). W. F. MEGGERS

Spectral centroid relations for artificial daylight filters. K. S. GIBSON. *J. Optical Soc. Am.* **11**, 473-8(1925). W. F. MEGGERS

Remarks on the quantum theory of the Laue effect. M. BRONSTEIN. *Z. Physik* **32**, 886-93(1925). W. F. MEGGERS

The theory of the continuous Röntgen spectrum. M. BRONSTEIN. *Z. Physik* **32**, 881-5(1925).—The quantum-theoretical consideration of the elementary process in radiation of the continuous Röntgen spectrum leads to the conclusion that the sharp limit of the spectrum shifts toward longer waves as the angle between the Röntgen rays and the direction of the cathode rays increases. This effect is extremely small, (<0.1X.E.); its reality can be established only by very accurate measurements. W. F. MEGGERS

Spectroscopic phenomena of the high-current arc. A. S. KING. *Astrophys. J.* **62**, 238-64(1925).—The d. c. arc carrying 1000 amp. or more at about 100 v., usually between rods of small diam., gave a source of great brilliancy and somewhat explosive character, producing mainly the spectrum of the neutral atom under conditions of high excitation. The spectra studied were those of Fe from 2800 to 8400 Å. U. and selected

regions of Ti, Mg, Ca, Cu and Al. Certain lines of Na, Ga, O and N also are described. The distinctive features are an intensification of the high-temp. lines, and a strong development of widening phenomena, with dissymmetries toward red or violet which often result in distinct shifts of the emission lines. Reversals are numerous, becoming less frequent with increasing wave length, but extending into the infra-red of the Fe spectrum. Band spectra are absent in emission but may appear in absorption. A continuous spectrum appears in the ultra-violet, resembling that of the condensed spark and of exploded wires. The high-temp. and explosive action of the arc produced finely divided residues of iron and iron oxide which were examd. microscopically. The degrees of widening, usually unsymmetrical, are given for 920 Fe lines from 4250 to 8400 Å. U. This material permits a selection of lines which remain stable in the ordinary arc and are suitable for wave-length standards. As the members of a multiplet show similar widening in the high-current arc, the selection of series groups is facilitated. Energy level is indicated by the degree of dissymmetry, lines of low level being nearly symmetrical, while the lines of multiplets starting from successively higher levels show increasing susceptibility to unsymmetrical widening. The type of widening shows a close relation to the temp. classification, and for the high-temp. lines the results supplement those of electric-furnace investigations. The other spectra studied showed similar effects to those of the Fe spectrum.

W. F. MEGGERS

The infra-red spectrum of the calcium arc in vacuo. O. SANDVIK AND B. J. SPENCE. *Astrophys. J.* **62**, 265-9 (1925).—This investigation was undertaken to study the arc *in vacuo* as a source of radiation for radiometric examn. of its spectrum, to study possible differences between the spectrum of the arc *in vacuo* and at atm. pressure, and to measure the wave lengths of new lines if they were found to exist. A very steady source of radiation for radiometric observation was developed, the arc being operated with 15 amp. from 220 v., in a pressure of 1 cm. Hg. With the aid of a grating spectrometer and sensitive radiometer the spectral range 8497 Å. U. to 20673 Å. U. was investigated. The wave lengths of 30 lines, 17 of which are new, were measured with an accuracy of 1 or 2 Å. U. Comparison with the observations of Paschen and of Randall for the open arc show certain differences, mainly in intensity, between the arc *in vacuo* and at atm. pressure.

W. F. MEGGERS

Some rules of spectral structure. OTTO LAPORTE AND WM. F. MEGGERS. *J. Optical Soc. Am.* **11**, 459-64 (1925).—By dividing the "transition series" of elements between A and Cu or between Kr and Ag into two groups of 5 there is brought into evidence for elements in each column a remarkable similarity of the positions of the terms in the energy diagrams and the identity of the quantum nos. of the normal states. The *raies ultimes* are the most sensitive spectral lines for detecting chem. elements; it is a generalization that these *raies ultimes* are combinations of the lowest term with the first higher non-metastable term of the same series system, definite preference being shown for $\Delta l = -1$ even if the energy difference is somewhat larger than for other strong combinations involving the lowest term, provided that this difference is not exceptionally great so that the preference is overwhelmed by a closer combination. A resonance line results from an electron jump which involves the lowest term and gives rise to the line of greatest wave length; this line in any spectrum is a combination (usually with $\Delta l = -1$) of the lowest term with a term of the highest multiplicity in the spectrum.

W. F. MEGGERS

The fine structure of hydrogen lines. G. HANSEN. *Physik. Z.* **26**, 678-80 (1925).—The structure of H lines is the simplest observable example of relativistic fine structure and although frequently measured the earlier observations are open to objection. The measurements are repeated and special attention is given to all sources of error. Spectrum tubes contg. 0.04 mm. or less of electrolytic H were cooled in liquid air and operated with direct current. Lummer-Gehrcke plates were used to analyze H_{α} ; the photographic plates, each recording 8 or more spectral orders, were examd. by a registering photometer. The lines α , β , γ show a progressive increase in sepn. of their components as required by theory.

W. F. MEGGERS

New results of fine-structure investigation. E. GEHRCKE. *Physik. Z.* **26**, 675-7 (1925).—Without essentially changing the total width of H_{α} it is possible by altering conditions to change the relative intensities of its two main components which are sepd. by $\Delta\lambda = 0.128$ Å. U. or $\Delta\nu = 0.296$ cm⁻¹. The fine structure of the He spark line 4686 Å. U. has been re-examd. and indicates a sepn. of $\Delta\nu = 0.301$ cm⁻¹ for H, whereas Sommerfeld's theory requires $\Delta\nu = 0.365$ cm⁻¹.

W. F. MEGGERS

The flame spectra of carbon monoxide and water gas. II. F. R. WESTON. *Proc. Roy. Soc. (London)* **109A**, 523-6 (1925).—Further expts. in which flames of CO, H₂ or mixts. of the two in detd. proportions were maintained in an atm. rich in O₂

immediately in front of the slit of a spectrograph have confirmed and extended the conclusions about the mechanism of CO combustion which were set forth in the previous paper (cf. *C. A.* 19, 3427).

W. F. MEGGERS

Infra-red absorption spectra. Solutions of nitrogen pentoxide and nitrogen tetroxide in organic liquids. FARRINGTON DANIELS. *J. Am. Chem. Soc.* 47, 2856-66(1925).—A spectrometer, with Nernst lamp glowler as source and thermopile as detector, was used to det. absorption spectra between 2μ and 7μ of CCl_4 , CHCl_3 , $\text{C}_2\text{H}_2\text{Cl}_2$, $\text{C}_2\text{H}_2\text{Cl}_4$, CS_2 , CH_3NO_2 , $(\text{CH}_3)_2\text{CHBr}$, Bu_2O , and the absorption spectrum of N_2O_5 in each of these solvents was then examd. No shift of absorption max. could be detected in the different solvents. These measurements fail to confirm the predictions of the radiation hypothesis according to which the temp. coeff. of reaction velocity should permit a calcn. of the effective radiation which is supposed to cause the reaction. The absorption spectrum of N_2O_4 was detd. in each of these solvents and the absorption max. showed an appreciable shift from 5.65μ in the gas phase to 5.45 – 5.30μ in soln.

W. F. M.

The Stark effect for $\text{H}\beta$ and $\text{He } \gamma$ 4686. J. S. FOSTER. *Astrophys. J.* 62, 229-37 (1925).—This paper presents exptl. evidence in support of a suggested explanation of the appearance of certain components in Stark's analysis of $\text{H}\beta$ which are questioned by theory. With an exptl. arrangement described before (*C. A.* 19, 1814), the components of $\text{H}\beta$ under fine analysis are measured in various fields up to 47 kv./cm. Theoretically unexpected components of this line are present in one of the analyses reproduced, and absent in another. From known variations in the character of the sources and observations on He mixed with the H_2 , it is proved that the source which gave the spurious components was confused and that the applied field was not in the same direction for all atoms. Consequently the p and s components could not be sepd. completely. The most prominent of the doubtful components, $p \neq 4$, are found to be due to the very strong components $s \approx 4$. It is suggested that in the expts. by Stark the space charge may have been sufficient to cause a similar confusion. At least 3 components of the He λ 4686 line in fine analysis of the Stark effect are clear in an accompanying photograph. The observed spacings are 0.37 and 0.39 A. U., the calcd. value being 0.33 A. U. in each case. Further measurements are prevented by H_2 band lines.

W. F. MEGGERS

Further studies on the Stark effect in hydrogen. MASAZO KIUTI. *Japn. J. Physics* 4, 13-38(1925).—K has found exptl. the s -components $\Delta = \pm 5$ and ± 6 of $\text{H}\alpha$ which were predicted by Kramers from the standpoint of the principle of correspondence. The p -components $\Delta = \pm 8$, which were also predicted, seem to exist too, but with far less intensities. In the case of $\text{H}\beta$, Kiuti's observations agree with the theory of Kramers rather than with the original observation of Stark. The apparent central components both in p - and s -vibrations lie 0.5 A. U. apart on the red side of $\text{H}\beta$ and may be considered to belong to the many-lined spectrum. This point has been tested further by expts. with H_2O vapor as the discharge medium, in which the many-lined spectrum has been very weak. The 2nd-order effect of $\text{H}\gamma$ has been measured for main components up to a field strength of about 290,000 v./cm. The results roughly accord with the theory, but there cannot be overlooked a general deviation of the exptl. from the theoretical results toward the larger values. To interpret this deviation K. calcd. the 3rd-order term but the effect of this term was found to enlarge the deviation. The effect of the variability of the mass of the electron occurs in the sense favorable to the reconciliation but is not sufficiently large. As to the many-lined spectrum, 3 pairs of lines, 5055.08 and 5030.37; 4763.82 and 4740.98; 4253.30 and 4233.60, could be sorted out by their conspicuous Stark effects. The effects are interesting in that each line is accompanied by an isolated component and in that, while 2 different figures are obtained for the p - and s -vibrations in the case of the more refrangible members of the pairs, these 2 appear simultaneously both in p - and s -vibrations in the case of the less refrangible members. Some regularity in the arrangement of these lines is shown. The Stark effects of the Fulcher bands and other lines of the many-sided spectrum are given more completely than in the 1st paper.

C. J. WEST

Intensity relations of the doublets in the main series of the alkali metals. HANS JAKOB. *Naturwissenschaften* 13, 906-7(1925).—The Burger-Dorgelo rule of 2:1 intensity in the doublets of the alkali metals was confirmed on doublets $1s$ – $3p$ of K, Rb and Cs; $1s$ – $4p$ of Cs. Selective absorptive effects in the incandescent vapor were eliminated by using an oxy-hydrogen flame of only 1 cm. thickness and by low salt concns. in the flame. The error in the intensity measurements was 3%.

B. J. C. VAN DER HORVEN

Optical examination of sulfurous acid and its alkali salts: particularly potassium and ammonium pyrosulfite. R. DIETZEL AND S. GALANOS. *Z. Elektrochem.* 31,

466-74(1925).—By comparing the absorption spectra of gaseous SO_2 and solns. of SO_2 , K_2SO_3 , Na_2SO_3 , $(\text{NH}_4)_2\text{SO}_3$, NaHSO_3 , NH_4HSO_3 , $\text{K}_2\text{S}_2\text{O}_6$, and $(\text{NH}_4)_2\text{S}_2\text{O}_6$ separately in H_2O and in EtOH D. and G. detd. the equil. which exists in these solns. An aq. soln. of SO_2 contains SO_2 and $\text{SO}_2 \cdot \text{H}_2\text{O}$, which are responsible for the selective absorption, with only small quantities of H_2SO_3 or its ions. The comparatively greater absorptive power of alc. solns. of this gas is probably due to the formation of alcoholates. Aq. solns. of the alkali bisulfites indicate equil. similar to those for solns. of SO_2 . Aq. and alc. solns. of $\text{K}_2\text{S}_2\text{O}_6$ and $(\text{NH}_4)_2\text{S}_2\text{O}_6$ do not show the characteristic absorption of (S_2O_6) ion. The spectra coincide with those of the alkali bisulfites, indicating hydrolysis to the bisulfite. The change of light absorption observed in solns. of bisulfite and pyrosulfite on standing or solation and termed by its discoverer the "time phenomenon" is explained by D. and G. as a photooxidation of HSO_3 to SO_4 , H_2SO_3 , and $\text{SO}_2 \cdot \text{H}_2\text{O}$. Beer's law does not hold for aq. solns. of SO_2 , alkali bisulfites or pyrosulfites, but does obtain in alc. solns. of SO_2 and aq. solns. of Na_2SO_3 .

E. R. SCHIERZ

Physical properties of some isomeric ethylenes. J. FERRERA and VICTOR HENRI. *Compt. rend.* **181**, 548-50(1925). The ultra-violet absorption spectra of the *cis* and *trans* derivs. of $(\text{:CHCl})_2$, EtCH:CHBr , MeCH:CHBr , and CHCl:CHI were studied. These were compared with the results of other authors upon $(\text{:CHCOOH})_2$, HOOCCH:CH(Me)COOH , MeCH:CHCN , and MeCH:CHCOOH . In all but the last two systems, whose constitution is unknown, the *trans* isomer has greater absorption and higher n than the *cis*. This is taken as evidence that in these two systems, the solid crotonic acid (m. 72°) and its nitrile (m. 108°) are *trans* isomers.

A. W. FRANCIS

Luminescence of solid nitrogen and the auroral spectrum. L. VEGARD. *Nature* **115**, 837-8(1925); cf. *C. A.* **19**, 609.—V. doubts the validity of McLennan's assumption (*C. A.* **19**, 1097) that each of the 3 maxima of N_1 is to be regarded as a spectral line with a definite wave length. The maxima are moving and the band N_1 approaches the auroral line by diminution of the size of the particles.

FLORENCE N. SCHOTT

Application of fluorescence to chemistry, pharmacy and biology. RENÉ FABRE. *Bull. soc. pharm. Bordeaux* **63**, 178-99(1925).—A no. of org. substances, principally phenol derivs. and alkaloids, have been examd. with respect to their fluorescent properties. The substance was placed on an inclined stage and subjected to ultra-violet radiation filtered through a Wood's screen. The burner was enclosed in an Al envelope and the rays were focused on the substance by an optical system. In order to insure a const. intensity of light there was attached to the binding post of the lamp a watt-meter which registered 240 w. The source of comparison was standardized with respect to the white surface diffusing sunlight. It consisted of a half-watt lamp in the circuit of which was placed a voltmeter and a rheostat. This was regulated to read under 6 v. each time.

A. G. DuMEZ

Possible loss of combined nitrogen in the higher regions of the atmosphere. CAMILLE MATIGNON. *Chimie et industrie Special No.*, 328-30(Sept. 1925).—From a discussion of the results of various observers on the presence of NH_3 in the atm., M. concludes that there is a possibility of part of it reaching the stratosphere and being there decomposed into N and H by the action of ultra-violet light.

A. PAPINEAU-COUTURE

Photochemical studies. V. Certain actinoscopic reactions. A. REYCHLER. *Bull. soc. chim. Belg.* **34**, 236-41(1925); cf. *C. A.* **19**, 2304.—Solns. contg. 0.125 g. KI, 0.5 g. $\text{K}_2\text{Cr}_2\text{O}_7$, and 0.01 g. eosin per 100 cc. show no liberation of I after 3 hrs. in the dark; in weak diffused light after 40 min. the I formed was equiv. to 2.8 cc. of 1% $\text{Na}_2\text{S}_2\text{O}_3$ soln.; after 2 and 10 min., resp., in sunlight the amt. of 1% $\text{Na}_2\text{S}_2\text{O}_3$ used was 6.3 and 16.4 cc. Without either eosin or $\text{K}_2\text{Cr}_2\text{O}_7$ the mixt. forms no I in 40 min. in weak diffused light. The reaction offers a possible standard method for the detn. of actinic intensities, and its study from that standpoint is being continued.

WM. B. PLUMMER

A relation between the velocity of photochemical reactions and the dielectric constant. CHR. WINTHER. *Trans. Faraday Soc.* **1925** (advance proof).—Photochem. reaction velocity generally decreases with increasing dielectric const. This is a generalization from data on the reactions of CHI_3 oxidation and anthracene polymerization. (*Ct. C. A.* **5**, 822, 3367; Luther and Weigert, *Z. physik. Chem.* **53**, 393.)

D. S. V.

Photochemical sensitization. A. BERTHOUD. *Trans. Faraday Soc.* **1925** (advance proof).—A discussion of the different theories of photochem. sensitization.

D. S. V.

The role of water in the photosynthesis of hydrogen chloride. R. G. W. NORRISH. *Trans. Faraday Soc.* **1925** (advance proof).—N. criticizes the mechanism proposed by Coehn and Tramm to account for their exptl. results (*C. A.* **17**, 1591; **18**, 3144) on the photochem. yield of HCl as a function of the pressure of H_2O vapor. Furthermore, Cathala's interpretation of these data (*C. A.* **19**, 2915) is deemed inadequate, since the

postulated Cl atom should have a mean life of 8 sec., in contradiction to the exptl. value of 1/1000 sec. given by Bodenstein and Taylor (*C. A.* 10, 3012). Wherefore, N. has derived a new theory of the reaction, based on the assumption that the primary photochem. change $\text{Cl}_2 + h\nu \longrightarrow 2 \text{Cl}$ occurs on the vessel wall. A surface of 300 cm.^2 is completely covered with a monomol. layer of H_2O mols. when the H_2O pressure is 10^{-6} mm. If H_2O coöperates with light in the atomization of Cl_2 in some such fashion

as the equation $\text{H}_2\text{O} + \text{Cl}_2 \longrightarrow \text{H}_2\text{O} \begin{array}{c} \text{Cl} \\ \diagup \quad \diagdown \\ \text{Cl} \end{array} \longrightarrow \text{H}_2\text{O} + 2\text{Cl}$ would indicate, the cata-

lytic effect should reach a max. when the surface is completely satd. The curve obtained with the aid of this hypothesis bears a formal resemblance to the observations of C. and T. The action of NH_3 and other inhibitors is attributed to preferential absorption on this H_2O layer, and the induction period is predicted quant. This new theory does not dispense with reaction chains as such, to account for the multiple transformation elicited by a single quantum, but limits their performance to the bulk of the gas.

HOWARD R. MOORE

Photosensitivity and the mechanism of chemical reaction. H. S. TAYLOR. *Trans. Faraday Soc.* 1925 (advance proof); cf. *C. A.* 19, 3418.—The Cario and Franck effect (dissociation of H_2 mols. by collisions of the second kind with excited Hg atoms (cf. *C. A.* 17, 489; 18, 2288) is extended to a study of the hydrogenation of C_2H_4 , O_2 , CO , N_2O , CO_2 and N_2 at 0.5–1.0 atm. and at room temp. Reaction velocities estd. by decreases in pressure in the system were 30, 25, and 75 mm./hr., resp., for the first 3 reactions, in contrast to the low value of 0.05 mm./hr. obtained by C. and F. The yields obtained in these expts. are 250 to 30,000 times those formerly obtained at relatively low pressures. Thermal data are utilized in formulating probable chain mechanisms to account for the results. No reduction was obtained for NH_3 and CO_2 , but no great precautions were taken to procure pure and dry gases. The light has no effect on the C_2H_4 , CO and O_2 mols. alone, and hence simultaneous excitation of both participants is unnecessary. In the reduction of CO , HClO , together with CH_4 and polymerized hydro carbons, is formed to a considerable extent, the first instance of the photochem. synthesis of formaldehyde by collisions of the second kind. H. R. MOORE

The fundamental laws of photochemistry. IVAN PLOTNIKOV. *Trans. Faraday Soc.* 1925 (advance proof).—The Grotthus van't Hoff law $v = kA$, connecting the velocity of a photochem. reaction with the absorbed light energy, is a starting point in the formulation of the desired law. The use of this law will be enhanced by inclusion of a mechanism of quantum absorption and the functional dependence of reaction velocity on wave length. Einstein's law has no significance when the photochem. effect is expressed as a function of incident light intensities and chem. mass rather than absorbed energy.

H. R. MOORE

Some conclusions from recent work on photochemistry. D. L. CHAPMAN. *Trans. Faraday Soc.* 1925 (advance proof).—A preliminary communication of results obtained in collaboration with E. Walters on the photochem. HCl reaction. The true induction period corresponding to the mean life of a chain of active mols. is 1/40 sec., and the lower limit of the mean life of Cl_2 is 1/50 sec., in approx. agreement with Weigert and Kellermann (*C. A.* 17, 687). Light intensities were controlled with sector wheels furnishing intermittent illumination, in the manner described by Berthoud and Bellenot (*C. A.* 18, 1786). Precautions were taken to eliminate O_2 , H_2O and N_2 , which act either as positive or negative catalysts. The rate of HCl formation is proportional to the square root of the light intensity, and with small amts. of O_2 is very nearly proportional to the intensity. Einstein's law holds, therefore, under certain specified conditions. The present work does not contradict previous studies of the Chapmans on the influence of light intensity and the kinetics of the reaction (*C. A.* 18, 788, 3323), but necessitates a revision of the various chain mechanisms proposed to account for photochem. yield. Nernst's theory is invalid if the reaction is catalyzed by H_2O , since no provision is made for the occurrence of intermediate compds.; furthermore, the postulated H atoms cannot survive in an atm. devoid of moisture.

H. R. M.

The mechanism of photochemical reactions. N. R. DHAR AND B. K. MUKERJI. *Trans. Faraday Soc.* 1925 (advance proof).—A review of the field, with some attempt at unification of the various phenomena. The primary photochem. effect consists in the activation of mols. by light absorption, a process for which Einstein's law is valid. The subsequent course of the reaction is influenced by heat energy evolved and the phase condition of the reactants, and is not predicable with present knowledge. Hypotheses are advanced concerning the energy of the chem. active state, and the duration of excitation of active species for thermal and photochem. reactions in dil. sols. (cf.

C. A. 19, 3222). Collisions of the second kind explain photosensitization satisfactorily, but photo-inhibition is intrinsically more complex and demands special explanations. The inhibitors described by Anderson and Taylor (C. A. 17, 2676) prevent the direct action of ultra-violet light by forming a protective layer around the reacting H_2O_2 mols. Electron emission during the course of reaction (cf. O. W. Richardson, C. A. 16, 1703) explains the inhibiting powers of traces of substances in photochem. reactions, as well as the high quantum efficiency observed for the HCl synthesis. Thermal and photochem. reactions are not essentially disparate phenomena (cf. D. C. A. 12, 111; 15, 2028; 18, 3520). Photochem. reactions need not possess a temp. coeff. of exactly 1.0. This condition holds only when light activates most of the mols. and when no marked increase of activation is obtained with an increase of temp. H. R. M.

Confirmation of the Einstein law of the photochemical equivalent in a very simple photochemical reaction. FRITZ WEIGERT AND LOTTE BRODMANN. *Trans. Faraday Soc.* 1925 (advance proof).—The reaction selected for test was the photochem. conversion of *o*-nitrobenzaldehyde into *o*-nitrosobenzoic acid, previously investigated by Ciamician and Silber (Ber. 35, 3040) and W. and Kummerer (C. A. 7, 2565). Theoretically, the transformation of isomeric substances (cf. Warburg, C. A. 14, 1931) should fulfil the condition that the law $Q = Nh\nu$ be restricted to primary photochem. processes. Various enviroing factors, such as chem., elec., and kinetic changes, modify the result of the initial light absorption in such a way that the end product of most photochem. reactions is not a satisfactory measure of the primary process. In the present case, however, the entire change is localized within the reacting mol. and secondary processes are practically negligible. The radiation incident on acetone solus. of the aldehyde was measured with a surface bolometer standardized against a Hefner candle, and the absorbed energy calcd. from data given by Hyman (*Dissertation*, Leipzig 1924) for λ 's 436, 405 and 366 μ . The photolec. method of v. Halban and Siedentopf (C. A. 16, 2078) was used to measure the extinction coeffs. Cond. measurements afforded a direct means of estg. the yield of *o*-nitrosobenzoic acid. Einstein's law is very nearly valid, since the "efficiency ratio," $\phi/p = 1/2$, (quotient of the "effective" and "indicated" photochem. equivalents) corresponds to $2 h\nu$ per molecule transformed. The primary cause of the mol. rearrangement is assumed to be the transference of a photoelectron from the CHO to the NO_2 group. Polarized light should exert a sp. influence, since the most favorable condition for transformation occurs only when the elec. vector of the incident radiation harmonizes with the connecting direction of CHO and NO_2 groups. H. R. MOORE

The dissociation theory and photochemical thresholds. E. J. BOWEN. *Trans. Faraday Soc.* 1925 (advance proof).—Observations on the mechanism of photochem. action indicate that the primary process is the formation of an excited mol., and that dissociated fragments or monat. forms such as H, O, N are nonexistent. Nevertheless, the excited-mol. theory fails to account for the close identity between thermochem. heats of linking (heats of dissociation) and the energy increments calcd. from the lower limits of absorption bands. B. has tabulated the heats of linking of C-H, C-C, C-I, Cl-Cl, Br-Br, I-I bonds and compared them with the energies of absorption bands for compds. contg. these linkages. The good agreement obtained for the halogens suggests that these monat. forms are really active in photochem. change (cf. Bowen, C. A. 18, 3548). In most cases, however, the energies of electronic activation, corresponding to the absorption bands, were very much greater than the dissociation energies. Heats of linking represent the difference between the energy of lowest electronic orbits in free atoms and in the mols. The work on band spectra (Mecke, C. A. 17, 2994) does not indicate that electronic activation is accompanied by dissociation. Therefore, for photochem. reactions at least, absorption spectra and heats of linking are not directly related. This conclusion is borne out further by work on bi-mol. thermal reactions (decompn. of HI, N_2O , Cl_2O and the synthesis of HI from the elements). It appears impossible to associate thermal and photochem. activation energies since equiv. energy increments do not produce equiv. chem. effects. Photochem. thresholds are more apparent than real. H. R. MOORE

The radiation theory of chemical reactions. JAMES RICE. *Trans. Faraday Soc.* 1925 (advance proof).—The restricted radiation theory and collision theories alike are deficient in accounting for the velocity of a typical chem. change, such as the monomol. decompn. of N_2O_5 . The rate of activation is 10^{-6} of the exptl. value when the energy absorption is calcd. from Planck's expression for energy distribution, and 10^{-3} too small according to the collision hypothesis advocated by Thomson (C. A. 17, 3823). Lewis and Smith (C. A. 19, 3196) have shown that the radiation theory is adequate when energy absorption is active over a wide range of frequencies, and R. regards this

more probable than the effort of Christiansen and Kramers (*C. A.* 17, 2985) to retain the autonomy of collisions as the sole factor in chem. reactivity by postulating return of the energy of collisions to the mass of unchanged molecules. In this paper R. shows that the chem. data on the decompn. of N_2O_5 are satisfied entirely by the radiation theory, with the supposition that the exchange of energy between matter and light is perpetrated by an oscillator mechanism, similar to the elec. oscillator of Rayleigh (*Science Abstracts* 19A, 1141). Planck's assumption that light absorption is essentially a quantum phenomenon need not be made, since the correspondence principle is not in conflict with at. stationary states. Expressions are derived on classical grounds for the rate of energy absorption at the max., and for indices of refraction and absorption. The treatment is almost entirely mathematical.

H. R. MOORE

Note on the influence of radiation on chemical reactions. L. S. ORNSTEIN. *Trans. Faraday Soc.* 1925 (advance proof).—Lewis (*C. A.* 14, 892) has pointed out that observed temp. coeffs. of monomol. reaction, as well as the sp. reaction velocity const., are not predicted with any degree of accuracy from the radiation theory. When $h\nu$ has a radius of the order of a wave length of light, the calcd. reaction const., is approx. 10^{-10} of the observed value. However, with the use of Franck's view (*C. A.* 19, 435) that primary photochem. processes involve the formation of excited mols., and that the loss of energy is detected by the phenomena of chemi-luminescence or transference of this activation energy to other mols. in the immediate vicinity, O. has developed a mechanism leading to satisfactory values of k_0 . The validity of the equations developed is contingent on the assumption that the various stages in Franck's process are thermodynamically reversible. Calcs. are made only for the N_2O_5 decompn. (cf. preceding abstract).

H. R. MOORE

Absorption of light by solutions of electrolytes. H. VON HALBAN. *Trans. Faraday Soc.* 1925 (advance proof).—This presents the work of Halban and Ebert (cf. *C. A.* 19, 1536).

D. S. VILLARS

Photochemical reactions and methods of measuring them. IVAN PLOTNIKOV. *Trans. Faraday Soc.* 1925 (advance proof).—An address on the difficulties and complications met with in photochem. investigations.

D. S. VILLARS

The relation between quantum sensitivity and intensity of radiation. CHR. WINTNER. *Trans. Faraday Soc.* 1925 (advance proof).—The quantum sensitivity of a reaction (the factor expressing the efficiency of radiation in provoking photochem. change), is not necessarily a direct function of the amt. of energy absorbed. Thus for the deoxygenation process Warburg (*C. A.* 8, 613) has shown that the quantum sensitivity reaches the max. of 4.7 for an energy absorption of 102 (given in arbitrary units). For an energy absorption of 253, the sensitivity is 3.1. Other instances of this disparity of photochem. yield and radiation absorbed are cited. In particular, the oxidation of HI in aq. soln. studied by W. (*C. A.* 18, 1434) gives an approx. linear increase of sensitivity with progressively decreasing absorptions. The fundamental reaction involved is the oxidation of I^- by I_3^- , and it would appear that those I_3^- ions receiving 2–3 $h\nu$ are inactive in starting the process. When each I_3^- is activated by the absorption of 1 $h\nu$, max. velocity is obtained and this condition is realized with feeble intensities.

H. R. MOORE

Einstein's law of the photochemical equivalent. N. R. DHAR AND B. K. MUKERJI. *Trans. Faraday Soc.* 1925 (advance proof).—A list is given of the more important photochem. reactions with yields in mols. transformed per quantum absorbed. The reactions fall into 3 groups; namely, those showing close conformity to the $Q = Nh\nu$ law, and those with positive and negative deviations. The heat liberated in exothermic reactions is a very probable source of the large yields. If electrons or ions are emitted in the course of transformation, they should, in general, supplement the light as a source of activation. This hypothesis seems unlikely since the electrons, if liberated at speeds corresponding to thermal agitation, do not possess enough energy to activate the various mol. species. Furthermore, there is no justification for ignoring this mechanism for endothermal reactions which usually obey the law within exptl. error. Low quantum efficiencies are due to the reversion of active mols. to the normal state before transference of their excitation energy to neighboring mols.

H. R. MOORE

Elementary processes of photochemical reactions. J. FRANCK. *Trans. Faraday Soc.* 1925 (advance proof).—Photochem. changes involve preliminary excitation of the mols. and almost instantaneous conversion of this activation energy into chem. energy by collisions of the second kind or re-radiation of the energy as fluorescence. Under certain conditions this activation energy contributes to the rotation and oscillation values of a diatomic mol., as well as to the electronic system. F. seeks to define these conditions on Warburg's theory (*C. A.* 19, 435) that dissociation can be accomplished

by one elementary act of light absorption. Illustrations are given for various heteropolar and homopolar mols., and 3 general cases are noted: (1) the potential energy between the 2 atoms is decreased by a large change in oscillation energy on light absorption, (2) no change occurs in the potential energy and the oscillation quantum no. is small, (3) excitation of the electronic system is procured at the expense of a decrease in the value of the oscillation quantum no. With heteropolar mols., light absorption results in the formation of a positively charged ion, an electron and a neutral atom; for homopolar mols., resolution into 1 normal and 1 excited atom. The disruption of homopolar mols. is assumed to take place adiabatically (cf. Debye *C. A.* 15, 2226). Absorption of light by the halogens corresponding to their convergent band limits, namely λ 's 5000, 5200, 4800 Å. U. for I_2 , Br_2 and Cl_2 gives excited halogen atoms of energy 1.0, 0.5 and 0.3 v., resp. These values correspond roughly with the energy differences between the normal $2p_2$ and metastable $2p_1$ states of the halogen atoms.

H. R. MOORE

The Einstein "photochemical equivalent law." A. J. ALLMAND. *Trans. Faraday Soc.* 1925 (advance proof).—A re-examines the postulates and implications of Einstein's thermodynamic proof of the quantum equivalence law (*C. A.* 7, 1654). An extensive list of photochem. reactions and data are given. Quantum efficiencies are tabulated according to Warburg's nomenclature. Thus the values of γ in the relation $\gamma = \phi/p$ give an exptl. basis for estg. the degree of departure from theory. (p is the fundamental photochem. equivalent given by $\lambda/28470$, and denotes the no. of mols. decomposed per g. cal. of radiation absorbed; ϕ is the Einstein value.) The Einstein law states that equal chem. effects are produced for equal amts. of energy absorbed; i. e., $Q = nNh\nu = n'N'h\nu'$, where $n' > n$ and $\nu' < \nu$. However, photochem. yields are known to be a function of wave length and gas pressure, and hence the modified Warburg expression $p = (\lambda/28470) \cdot f(\lambda, P)$ is proposed. Since the secondary processes are rarely stoichiometrically equiv. to the primary (represented by higher Bohr states in the reactants), further limitations are introduced. For strict conformity to this ideal law, reactivity should be independent of temp. for a given radiation d. In general ϵ is not equal to $h\nu$, for the mean energy absorption per mol. is a function of temp. A rise of temp. produces smaller values of ϵ and higher γ 's. These deviations are probably inherent in the statistical nature of the law.

H. R. MOORE

Transformation of atoms into radiation. OTTO STERN. *Trans. Faraday Soc.* 1925 (advance proof).—Matter and energy are interconvertible. S. is interested in the transformation of radiation into matter, as well as the inverse process which accounts for the loss of wt. of stars. Thermodynamics is applicable since the calcs. are made for the equil. state. A temp. of 10^9 degrees is equiv. to an electron d. of 1 per cm^4

H. R. MOORE

A suggested mechanism for the ozone-chlorine reaction. A. J. ALLMAND. *Trans. Faraday Soc.* 1925 (advance proof).—The photosensitization of O_3 by Cl_2 is a reaction of zero order; i. e., it is independent of the concn. of O_3 deoxygenized (cf. Weigert, *Ann. Physik* 24, 243; Bonhoeffer, *C. A.* 17, 2392). A. has presented a series of equations for the kinetics of the reaction to account for this fact. The occurrence of active O_2 is a necessary stage in the mechanism, and this assumption is substantiated by the work of Norrish and Rideal (*C. A.* 19, 2301) on the photosensitive formation of H_2O in the presence of Cl_2 . O_3 is transformed to O_2 by collision with active O_2 mols. as well as with Cl_2 mols., as evinced by the reactions (1) $Cl_2 + h\nu \rightarrow Cl_2^*$, (2) $Cl_2^* + O_3 \rightarrow O_2 + \text{energy}$, (3) $Cl_2 + O_2 \rightarrow O_3$, (4) $O_2^* + O_3 \rightarrow O_2 + \text{energy}$. It

is essential in this theory that the life of Cl_2^* and O_2^* is long in comparison to the time taken by such a mol. to encounter an O_3 or O_2 mol.

H. R. MOORE

The law of photochemical equivalents and the place of the quantum theory in relation to the atomic theory and energetics. DANIEL BERTHELOT. *Trans. Faraday Soc.* 1925 (advance proof); cf. *C. A.* 5, 1705, 2024; 9, 1873.—The various forms of energy, such as thermal, elec., and radiant, are given by the product of 2 factors, the tension and capacity factors. Temp., e. m. f. and frequency are the tension factors in the above series; thermal entropy, quantity of electricity and radiant entropy the capacity factors. It follows from the principle of conservation of energy that equal quantities of these energies impart the same velocity to an electron; i. e., the relation $1/2 m v^2 = eE = sT = h\nu$ is valid. The constns. e , s , h , are the so-called invariants of capacity, the "electron," "thermon," and "radion," resp. Furthermore, a chem. reaction should serve as an index of the amt. of energy imparted to the mols., and from the doctrine

of the equivalence of energies the yield should be independent of the nature of the "activating" energy. In testing the photochem. equivalence law, irreversible and trigger actions should be excluded; moreover the photochem. potential (frequency) should be independent of temp. These predictions are verified qual. by a study of the parallelism in the tension factors producing decompn. of the H halides. HI dissociate at red glow; HBr at 700°; HCl at 1500°. The e. m. f.'s of electrolysis for the series increase in the order 0.5, 1.0, 1.4 v., and the effective photolytic frequencies are in the neighborhood of 0.4, 0.3 and 0.2 μ , resp.

H. R. MOORE

Electron affinity of the halogens. E. B. LUDLAM. *Trans. Faraday Soc.* 1925 (advance proof).—The 3 halogens show 2 continuous bands displaced to longer wave lengths with increased at wt; thus for Cl₂, Br₂ and I₂ the wave lengths of the first series are 320, 370, 430 μ , and for the second series 265, 295, 345 μ . The general theories of electron affinity are discussed (cf. Steubing *C. A.* 15, 2790; Franck, *C. A.* 16, 872; v. Angerer *C. A.* 17, 489), and it is concluded that the more ultra-violet bands do not represent a true electron affinity spectrum. Oldenburg (*C. A.* 18, 19; 19, 1988) has referred the origin of these bands for the case of I₂ to the recombination of positive and negative I ions.

H. R. MOORE

Flame spectra and chemical reactions. (MISS) C. E. BLUKER. *Trans. Faraday Soc.* 1925 (advance proof); cf. *Z. Physik* 27, 195(1924). The total intensity of each line emitted in flame spectra is composed of two parts, one due to thermal excitation and the other to energy gained from an oxidation process. For the lines of the subordinate series, the oxidation process prevails, and this can explain why the ratio of the intensities of these lines does not depend on the temp. of the flame. The lines of the principal series are due mainly to temp. excitation and possess the intensities indicated by Planck's law. The intensity for an emission in the subordinate series characterized by a change τ of the total quantum no., n , is given by $T\alpha Be^{-E/k\theta} (\tau 2n/n)^4$ where θ is a fictive temp. detd. from $10 - \log$ heat of reaction; k is the Boltzmann const. and ν is the frequency of the end term.

D. S. VILLARS

Photolysis of methylene blue, sensitized by zinc oxide. EMIL BAUR. *Trans. Faraday Soc.* 1925 (advance proof). The concept that photolysis is a mol. electrolysis is illustrated for the photolyses of acetic acid sensitized by uranyl ion, and AgNO₃ and methylene blue sensitized by ZnO. A phototrope is the isomer of a mol. after it has absorbed a quantum.

D. S. VILLARS

Physical antecedents of the photoactivity of chlorine. WILFRID TAYLOR. *Trans. Faraday Soc.* 1925 (advance proof).—T. observed no change in refractive index of Cl₂ due to activation of the mols. by light of wave lengths shorter than 4990 Å. U. Conclusion: the equil. fraction of activated mols $f = \alpha I/N\psi\beta$ is very small. (α is coeff. of selective absorption; I , the light energy crossing unit area in unit time; N , the no. of original mols; ψ the no. of collisions per unit time due to thermal agitation; and β the probability that deactivation will result from a thermal collision.) A change of the index of refraction of 4.5×10^{-8} was detectable by an interferometer method.

D. S. VILLARS

Formation of polar compounds by photochemical reactions. W. A. NOYES, JR. *Trans. Faraday Soc.* 1925 (advance proof).—The conclusions derived from results of previous work (cf. *C. A.* 18, 2288) on the acceleration of the reaction between Hg and NO₂ by light of wave lengths shorter than the photoelec. threshold of Hg are revised. The light produces an electron d. in the gas. An electron combines with NO₂ forming NO₂⁻, which combines with Hg and liberates an electron. Approx. 10⁶ mols. are formed for each electron. The velocity of reaction depends on the electron d., which is at a max. at zero potential gradient. A retarding or accelerating p. d. diminishes the electron d. and hence the velocity of reaction.

D. S. VILLARS

Becquerel effect on copper oxide electrodes. W. J. D. VAN DIJCK. *Trans. Faraday Soc.* 1925 (advance proof).—A polarizing current i , is sent through a cell Pt, CuO, N KNO₃, Pb and the p. d. of the CuO electrode with respect to the soln. is measured on the assumption that the 0.1 N calomel electrode is 0.619 v. D. then illuminates the CuO with monochromatic light and observes the change in current Δi which occurs when the p. d. of the electrode is kept the same. There is a min. + p. d. for which Δi is zero. (Cf. Goldman, *C. A.* 9, 14) and this is the same for all wave lengths between 8300 and 4490 Å. Similar results are obtained when the electrolyte used is N Zn(NO₃)₂ and N NaBrO₃. Therefore a photoelec. electron ejection from the CuO cannot explain the action. It is established that CuO is the photoactive substance but it could not be proven whether pure Cu₂O had an action or not. It is suggested that the light decomposes CuO into Cu and O₂, the former reducing the CuO to Cu₂O and the latter causing a true oxidation potential at the electrode.

D. S. VILLARS

Chemiluminescence. H. KAUTSKY. *Trans. Faraday Soc.* **1925** (advance proof).—The chemiluminescent spectrum emitted by either rhodamine B or rhodamine sulfonate adsorbed on colorless oxidation products of $\text{Si}_6\text{O}_5\text{H}_6$ when the latter are oxidized either in solu. by permanganate or dry by O_2 , is the same as the fluorescent spectrum of the adsorption compd. These dyes adsorbed on silicic acid may be oxidized by KMnO_4 but no chemiluminescence appears. The chemiluminescence is explained thus (cf. *C. A.* **16**, 2809; **17**, 2081): these derivs. of Si are built up of lamellae consisting of layers only one or two mols. thick. The energy of the oxidation is easily transferred to the adsorbed mols. which are activated thereby and which luminesce on returning to their normal state.

D. S. VILLARS

4 - ELECTROCHEMISTRY

COLIN G. FINK

An improved form of electric vacuum furnace. J. R. PARTINGTON AND N. L. ANFILOGOFF. *Trans. Faraday Soc.* **1925** (advance proof).—The authors designed an elec. vacuum furnace, similar to the Otto Ruff type but with certain mech. and elec. improvements, for studying reactions at high temps. The reacting substances are placed in a graphite crucible made of the same material as the hot tube and maintainable either in high vacuum or in an atm. of an inert or reacting gas. An historical account of the elec. vacuum furnace is included. The authors' furnace consists of a graphite tube surrounded by a radiation case and enclosed in an air-tight, H_2O -cooled, bronze casing. Construction details relating to the furnace casing, the hot tube, insulation, etc., are thoroughly described with the aid of several drawings.

A. D. SPILLMAN

Induction furnace progress. ANON. *Electrician* **95**, 620(1925).—A brief account is presented of the progress made in the development of the high-frequency furnace during the past 20 years. The investigations of G. Ribaud, which were pursued independently of those of E. F. Northrup, were further carried out by the French Compagnie Électro-Thermique in 1924. In the Northrup method the alternate charge and discharge of the condensers is effected by a stationary spark gap, whereas in the Ribaud system it is rotary. It is claimed that the latter method results in a higher power factor. At the Paris shops of the company 6 kg. of rusty flakes of electrolytic Fe were melted (1600°) in 40 min., of which 5 min. represented the time for the inspection of the charge, with a demand of 10–12 kw. at the start and a current consumption of 80–82 amp. (110 v. supply) at the end of the run.

A. D. SPILLMAN

Haglund process for the electrothermic production of alumina. T. R. HAGLUND. *Ind. Eng. Chem.* **18**, 67 8(1926).—In the H. process the impurities Fe, SiO_2 , etc., in the bauxite are reduced by C (coke or charcoal) in a continuous elec. furnace. Sufficient sulfide material is added, either as Al_2S_3 or pyrotite, to form a slag of Al_2O_3 contg. 15 to 20% of Al_2S_3 . The compn. of the charge is discussed. This slag is very fluid, has a fairly low m. p., and is easily handled. On cooling the Al_2O_3 crystallizes in the slag, the size of the crystals depending on the rate of cooling. A pig Fe contg. very little S, but all of the Si in the charge is also formed. The cold slag of Al oxide-sulfide is crushed, treated with H_2O to hydrolyze the sulfide to hydroxide and evolve H_2S . The dried residue of Al_2O_3 , $\text{Al}(\text{OH})_3$, Fe sulfide, etc., is mechanically sepd. by classifiers, jigs, etc. The impurities in a Swedish or German sample of Al_2O_3 prep'd. by the H. method are as follows: SiO_2 trace to 0.02%; TiO_2 0.18 to 0.26%; S 0.16 to 0.20%; Fe_2O_3 trace to 0.12%. Production costs are tabulated and compared to the Bayer chem. method based on German procedure at Lautawerk.

C. J. BROCKMAN

The electrolytic separation of copper. ROBERT SAXON. *Chem. News* **131**, 225–6 (1925); cf. *C. A.* **19**, 3432. A brief discussion of the deposition of Cu from solns. or suspensions of Cu pyrites, CuSO_4 , or malachite in the presence of NH_4 salts.

C. J. BROCKMAN

Change in concentration of electrolytic impurities. M. DEKAY THOMPSON. *Chem. Met. Eng.* **32**, 700(1925).—An equation is derived which gives the variation in the concn. of an impurity in an electrolyte with time, the amt. of impurity removed and the introduction of impurity being const. for each unit of time. This equation permits the calcn. of the time required to attain the equil. concn. of impurity and it is applied to Ni in Cu refining electrolytes and to the accumulation of impurities in boiler water.

G. DUBERNELL

Apparatus for the electrolytic production of dichromates, persalts, chloroform, etc. I. SHCHERBAKOV. *Z. Elektrochem.* **31**, 360–2(1925).—In the electrolysis of alkali salts, some of the free alkali which accumulates at the cathode diffuses to the anode where

it greatly interferes with anodic yields. To prevent this S. has devised the following app.: A tall beaker is the retaining vessel in which is placed a smaller porous pot contg. Hg, which is the cathode. The surface of the Hg is covered with water to decompose the amalgam as it rises to the surface of the denser Hg. To prevent the diffusion of the NaOH soln. so formed, the Hg surface must be well above the surface of the anolyte which is outside the porous pot. In the anolyte any anode whatsoever may be placed. To produce good circulation of the Hg cathode and rapidly remove the amalgam, pure Hg may be injected into the bottom of the cathode area through a funnel tube to force a more rapid rise of the lighter amalgam which may be drawn off at the top of the porous pot. This app. has been applied with increased efficiency to the prepn. of dichromates, persulfates and CHCl_3 . C. J. BROCKMAN

The microstructure of electrodeposits. ANON. *Metallwaren-Ind. u. Galvano-Tech.* **23**, 443-4, 467-8, 491-2 (1925).—The subject is reviewed. The influence of c. d., temp., movement and bath compn. are discussed and in connection with the latter complex salts, free acid and colloid addns. are taken up. It is concluded that "it follows from all these considerations that very much investigational work is still to be done before the influence of the various factors on the structure of electrodeposits can be held to be entirely explained." G. DUBPERNELL

Defective phenomena in the nickel plating of castings. ANON. *Metallwaren-Ind. u. Galvano-Tech.* **23**, 470-1 (1925).—In Ni plating castings there were sometimes spots where no electrodeposit could be produced and these spots were found to be sulfide segregations in the surface of the casting. Decreasing the sulfide content, castings of thinner cross-section, and more rapid cooling are recommended as means for avoiding this difficulty. G. DUBPERNELL

Rust-resistant nickel plating. ANON. *Metallwaren-Ind. u. Galvano-Tech.* **23**, 605-6 (1925).—Corrosion, Ni, Zn, Cu, etc., plating and the porosity of electrodeposits are discussed with special reference to the electrochemistry involved. Hot galvanizing is recommended as a preliminary to electroplating. It is followed by Cu or brass plating and then Ni plating. A bath of NiSO_4 6.8, MgSO_4 2.4, NH_4Cl 0.8, H_3BO_3 0.32 kg. and water 100 l. is recommended; for barrel plating NiSO_4 11, MgSO_4 8, NH_4Cl 0.2, $(\text{NH}_4)_2\text{SO}_4$ 2 kg. and water 100 l. are recommended. G. DUBPERNELL

Deposition of metals upon stainless steel. J. HAAS AND E. R. UNRUH. *Metal Ind. (N. Y.)* **23**, 451-2; *Metal Ind. (London)* **27**, 533-4 (1925).—Considerable difficulty is encountered if the deposition of other metals upon stainless steel is attempted for any reason. The deposits are usually badly blistered and nonadherent. Of all of the methods tried in prep., the surface for deposition a concd. HCl soln. at 60° with the object as cathode gave the best results. In using immersion dips, it was noticed that an evolution of gas was produced after a few sec. immersion. Gas evolution was most vigorous in the 20% H_2SO_4 soln. at 60° , and this dip gave the best results for immersion methods. It seemed to be necessary to destroy the surface passivity and then plate the object immediately to obtain an adhesive deposit. G. DUBPERNELL

Principles and operating conditions of chromium plating. H. E. HARING. *Chem. Met. Eng.* **32**, 692-4, 756-7; *Bur. of Standards, Letter Circular* 177; *Brass World* **21**, 395-6; *Metal Ind. (London)* **27**, 310-2 (1925); *Mon. Rev. Am. Electroplaters Soc.* **12**, (Oct., 1925).—Scratch hardness measurements recently made at the Bur. of Standards on deposits of Cr indicate that it is considerably harder than the hardest steel. In the Cr plating of printing plates a bath consisting of 250 g./l. (33 oz./gal.) of CrO_3 , 3 g./l. (0.4 oz./gal.) of $\text{Cr}_2(\text{SO}_4)_3$, 7 g./l. (1 oz./gal.) of $\text{Cr}_2\text{O}(\text{CO}_3)_2$ was used at a temp. of 40 – 50° and c. ds. 100 to 200 amp./sq. ft. (11 to 22 amp./sq. dm.). Deposits of about 0.0002 in. (0.005 mm.) of Cr were obtained under these conditions in 30–60 min. with the metal efficiency at approx. 12%. The voltage was about 7 to 9 v. Methods of analysis are outlined. The metal efficiency and the character of the deposit tend to vary erratically and H. postulates the necessity of the presence of an excess of colloidal "chromium chromate" to maintain a const. pH . The poor throwing power due to decreasing cathode efficiencies with decreasing c. ds. must be improved if Cr plating is to be utilized on recessed work. Because of passivity, work to be plated must be introduced into the bath with the current flowing. G. DUBPERNELL

Overcoming plating troubles. H. C. BERNARD. *Abrasive Ind.* **6**, 380-1 (1925).—

mixing in addition, the soln. should be allowed to stand before using as the sediment will settle on the work, causing pit marks. Another cause of pitted deposits is insufficient metal in the soln. To remedy this about

2 oz./gal. (15 g./l.) of NiSO_4 is added. A very dark rough deposit indicates too high current or "burning." If the deposit is easily cut through when buffed, not enough current was used in plating. If a CuCN bath contains too much CN and a strong current is used, a blistered or peeled deposit will result; CuCO_3 is added to remedy this. With insufficient cyanide the anodes become coated and the deposit shows a dark muddy appearance. A rough granular Cu deposit is the result of too much current. A few ounces of Na hyposulfite to each 100 gal. will brighten the deposit to a great extent. Temp. of baths, anode area and preliminary cleaning are all important factors. A muddy, streaky deposit from a brass soln. shows insufficient cyanide. A reddish shade of the deposit indicates the addn. of ZnCO_3 or $\text{Zn}(\text{CN})_2$ or NH_4OH . A pink deposit denotes too much Zn or not enough Cu in the soln. A dull grayish deposit indicates too much cyanide or too much current. Addns. to brass baths should be small and very carefully made. Ag solns. generally give very little trouble. AgCl or AgCN together with NaCN or KCN is occasionally needed to replenish them. Too much current gives a burned deposit of a dark brownish appearance. Cleaning the work well before plating is very important. Operating conditions of the Ni , Cu , brass and Ag baths are given.

G. DUBERNELL.

Measuring effects of corona on rubber (HAUSHALTER) 30. Electrolytic treatment of beetroot molasses or fermentation residues (Brit. pat. 233,196) 28.

BAIMAKOV, IU. V.: *Elektritscheskoe osashdenie metallow.* (Galvanoplastika, i pokritie metallami, nikelirowanie, serebrenie i.m.d.) (Electrolytic production of metal coatings.) (Galvanoplasty, Metal Coatings, Nickel Plating, Silver Plating, etc.) (Russian) Leningrad: Nautschnoe chimikotehnitsch. Istatelswo 1925. 188 pp. \$2.50.

DANNEEL, H.: *Electrochemie. II. Experimentelle Elektrochemie.* 3rd completely revised edition. 131 pp. Sammlung Goschen Band 253. Reviewed in *Z. angew. Chem.* 38, 1027 (1925).

TRUCHET, F.: *Appareillage des industries electrochimiques et electrometallurgiques.* Paris: Dunod. 192 pp. Fr. 32; bound Fr. 38. Reviewed in *Ind. chim.* 12, 527; *Genie civil* 87, 524 (1925).

Storage battery. W. R. EDWARDS. Brit. 233,528, May 22, 1924. Structural features.

Storage battery separator. P. E. NORRIS. U. S. 1,567,747, Dec. 29. Rubber latex is used as a binder with wood pulp, wood flour, ground cork, etc., in the manuf. of molded separators.

Electrolyte-level indicator for storage batteries. G. C. MCINTYRE and S. L. BARLOW. U. S. 1,567,376, Dec. 29.

Primary electric wet batteries with zinc electrodes. M. KNEZEVICH. U. S. 1,568,851, Jan. 5. Structural features.

Dry battery. V. YNGVE. U. S. 1,567,561, Dec. 29. Structural features.

Voltaic cell. M. E. CONRAD. U. S. 1,567,838, Dec. 29. Negative electrodes comprise a body of a depolarizing oxide, e. g., Cu oxide, impregnated with fumes of S .

Manufacture of self-burning electrodes. DET NORSKE AKTIESELSKAP FOR ELEKTROKEMISK INDUSTRI. Norw. 40,778, June 29, 1925. The ribs on the metal mantel are made from a rather difficultly fusible metal or alloy, for instance iron, whereas the mantel itself is made from another metal which will do no harm in the process, even if this metal is more easily fusible.

Applying electric current to self-burning electrodes provided with metallic reinforcement. DET NORSKE AKTIESELSKAP FOR ELEKTROKEMISK INDUSTRI. Norw. 41,363, May 18, 1925. Mech. features.

Condenser for electric zinc furnaces. F. THARALDSEN. Norw. 40,738, June 29, 1925. Mech. features.

Increasing the output of gas reactions in electric arc furnaces. NORSK HYDRO-ELEKTRISK KVAELSTOF AKTIESELSKAP. Norw. 40,221, June 29, 1925. Gas preheated by elec. arcs is introduced in the reaction zone, while colder gas is passed on the outside of the reaction zone.

Hydraulic apparatus for regulating electrodes of electric furnaces. AKT.-GES. BROWN, BOVERIE & CIE. Brit. 233,692, May 7, 1924.

Electrolytic deposition and refining of metals. E. DUHME. U. S. 1,567,791, Dec. 29. An auxiliary cathode is placed nearer the anode than the main cathode and the

auxiliary cathode is supplied with a suitable current so that it takes up most of the impurities while pure metal is deposited on the main cathode.

Electrolytic production of continuous metal sheets. J. PORZEL. U. S. 1,567,079, Dec. 29. Mech. features.

Electrodeposition of other metals on tungsten. A. S. CACHEMAILLE. Brit. 233,470, Feb. 27, 1924. W or other material is coated with a mixt. of Th and another metal such as Pb, Fe, Ni or Cu by electrodeposition from a soln. of salts of the metals contg. lactate or other org. acid radical or fluoborate, fluosilicate or the like. Details are given for coating filaments, electrodes, X-ray targets, etc.

Metallic magnesium. P. COTTRINGER and S. B. HEATH. U. S. 1,567,318, Dec. 29. A molten bath contg. $MgCl_2$ is electrolyzed and $MgCl_2$ is added to the bath adjacent the anode.

Electrothermic production of zinc. NORSK HANDELS- OG INDUSTRIELABORATORIUM A.-S. Norw. 37,835, June 29, 1925. The process is carried out in rotary, oscillatory or otherwise moved furnaces. The residues from the treated charge are removed by automatic opening and closing the space in which the residues are accumulated, this space being itself in const. motion like the furnace.

Electrothermic production of zinc. NORSK HANDELS- OG INDUSTRIELABORATORIUM A.-S. Norw. 40,212, June 29, 1925, cf. preceding abstract. The liquid Zn is removed by automatic opening and closing of the space in which it is accumulated during the process, this space being itself in const. motion like the furnace.

Condensing electrothermally produced zinc. NORSK HANDELS- OG INDUSTRIELABORATORIUM A.-S. Norw. 41,408, June 2, 1925. The condensation channels, or the connection channels between the furnace and the condenser are built in an upwardly inclined direction and are provided with a "pocket" for accumulating the condensed products.

Manufacture of ferro-chromium and other ferro-alloys. D. W. BERLIN. Swed. 59,240, Aug. 5, 1925. The raw materials are introduced in an elec. furnace in the form of electrodes in contact with the metal bath which is covered by a layer of slag. The metals are reduced as the electrodes are smelted down successively by the elec. produced heat.

Apparatus for electrolytic manufacture of copper sheets. M. A. JULLIEN. U. S. 1,567,737, Dec. 29.

Rectifying alternating current. H. G. ANDRE. Brit. 233,292, April 30, 1924. The container of a rectifier is made of Pb contg. Sb to which a Ni electrode is fixed. A Ag electrode is sepd. from the container by a glass tube and contains colloidal Ag which is in contact with the Ni electrode. Graphite may be used instead of Ag, and Si, Pb contg. Sb or other suitable materials may replace the Ni electrode.

Protecting boilers, evaporators or other metal surfaces from encrustation by use of an electric current. G. C. FREEMAN. U. S. 1,568,728, Jan. 5.

Electroplating with nickel and copper. F. M. BAKER. Brit. 233,161, May 26, 1924. Steel plates of vehicle springs or other articles are coated first with Ni, then with Cu and finally with another coat of Ni; high c. d. is used in each plating operation. Details of electrolyte compn., etc., are given.

Electroplating with zinc, copper and other metals. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 233,354, May 2, 1924. Compact and brilliant deposits are obtained by adding to the usual electrolyte either Cr sulfate or chrome alum, preferably in their green modifications. Gelose also may be used.

Electroplating iron. H. HARBECK and A. LANGLER. Swed. 58,893, June 10, 1925. A thin coat of a more electropositive metal, for instance Zn or Cd, is first applied to the iron and then the final coating of a more electronegative metal is applied.

Electric ozone generator. F. MAGRINI. Brit. 233,418, Feb. 6, 1924.

Filaments for incandescent lamps. GENERAL ELECTRIC CO., LTD. Brit. 233,294, May 3, 1924. Cryst. oxides or other substances besides metals are encased in or mixed with metals such as Cu, Ni or Fe while worked and the protecting metal is removed after the working. Refractory oxides such as thoria may be encased in a tube of W. Heat treatment to increase the size of the crystals is also described.

5—PHOTOGRAPHY

C. E. K. MEES

Dye chemistry and photochemistry. II. ŚEĐLACZEK. *Phot. Ind.* 1925, 978-9.—The properties of basic dyes in relation to their use for dye toning pictures are discussed. The formation of lakes, the adsorption of the dye by mordants, and the effect of tanning the gelatin in the picture area are explained. The relation of certain reactions to working processes is shown. M. L. DUNDON

Problems of photographic manufacture. II. R. BLOCHMANN. *Phot. Ind.* 1925, 890-1.—The recovery of solvents in raw film manuf. is discussed. One m. of normal motion picture film base weighs about 5 g. and requires about 15 g. of solvent. Acetone, EtOAc and alc.-ether mixs. are commonly used. Freezing out the vapor is satisfactory only with acetone. Liquids used to absorb the vapors are NaHSO₃ soln. (for acetone), H₂SO₄ and cresol. Recently absorbent charcoal has come into use. M. L. DUNDON

Fixing bath and fixing time. I. STRAUSS. *Phot. Ind.* 1925, 881-4.—Various factors which affect the time of fixation were studied. Tests were made with positive film and strips were hung in the soln. but not agitated. Sp. gr. tables checked were incorrect relative to the concn. of Na₂S₂O₃. Most rapid soln. took place in a soln. contg. 25-40% Na₂S₂O₃·5H₂O. NH₄Cl accelerated fixation with a concn. of Na₂S₂O₃·5H₂O below 30%. Fixation was accelerated by NaCl and retarded by NaBr, Na₂SO₄ and MgSO₄. KNO₃ had a max. accelerating effect at 1.2-1.6% but in concn. above 4.8% retarded the action. Na₂SO₃ (crystals) in neutral Na₂S₂O₃ caused turbidity at a concn. of 6% and tended to neutralize an acid bath. II. *Ibid.* 911-6.—Data show the retarding effect of KI and the accelerating effect of NH₄Cl fixation. The influence of several other salts was also tested. In practice a fixing bath is usually discarded long before the theoretical amt. of Ag is in soln. Experience showed that from 1000 m. of raw film 100-105 g. of Ag could be recovered by the sulfide method. The use of regenerated hypo is not advisable. M. L. DUNDON

Latent images produced on photographic plates immersed in water or solutions by making contact with various metals. SEITARŌ SUZUKI AND KŌGORŌ KAWADI. *Nagaoka Anniv. Vol.* 1925, 189-92; *Japn. J. Physics* 4, 12A.—Latent images are formed when the photographic plates in contact with some metallic plates are immersed in H₂O or solns. These images are made strong or weak by passing an elec. current or by increasing the contact pressure. These phenomena have been studied and a probable explanation for the formation of these latent images is offered. C. J. W.

The preparation of so-called "grainless" plates for the interference color process of Lippmann according to Dr. Hans Lehmann. RICHARD JAHR. *Phot. Ind.* 1925, 1013-4.—Complete directions are given for mixing, sensitizing and coating emulsions for the Lippmann process. M. L. DUNDON

Development in bright light. A. HÜBL. *Phot. Rund.* 62, 235-8(1925).—The amt. of desensitizing action on a photographic plate in a given soln. of a desensitizer is proportional to the amt. of liquid taken up by the gelatin. This holds whether the time of bathing or the temp. is varied. Conclusion: the desensitizer is without chem. action on the AgBr, becomes active only when the AgBr is illuminated, and need only to be in intimate contact with the Ag salt in order to decrease its sensitiveness. These conclusions are in agreement with the fact that a plate treated with a desensitizer gains sensitiveness on long washing. H. states that his conclusions are not opposed to Lippman-Cramer's oxidation theory of desensitizers. M. L. SEYMOUR

Development in bright light. The panchromatic plate. A. HÜBL. *Phot. Rund.* 62, 198-200(1925); cf. *C. A.* 19, 2305.—The ratio of the decrease in red and green sensitiveness to the decrease in blue sensitiveness effected by different desensitizers acting on plates sensitized with different dyes is investigated. Sensitizing dyes are divided into 3 classes on the basis of the amt. by which desensitizers reduce their action. The sensitiveness from isocyanines is almost completely destroyed; pinacyanol is more resistant; pinachrome violet and pinachrome blue are still more resistant. The efficiency of the desensitizers was found to be in the following order: pinakryptol yellow, pinakryptol green, phenosafranine, the first being the most powerful. H. recommends for the development of panchromatic plates in yellow light, a prebath in 1:2000 pinakryptol yellow and the addn. of 5 cc. of 1:1000 pinakryptol green for each 100 cc. of developer. M. L. SEYMOUR

Two-color cinematography by metallic toning. ANON. *Brit. J. Phot. Color Sup.* 19, 43-4(1925).—A patent specification granted to the Kelley Color Lab. of New Jersey describes a method of obtaining 2 registered superposed images in the same

sensitive layer. The first positive image is produced by controlled printing from a color negative through the film base on the under side of the emulsion, developing in an amidol developer, toning blue-green in a V toning bath and clearing in a dichromate bromide soln. After drying in the dark or by ruby light the red color image is printed on the emulsion side in the residue of the original sensitive layer. This second image is developed up in the amidol developer, fixed in 60% $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ toned in a U bath and finally fixed in a $\text{Na}_2\text{S}_2\text{O}_3$ - $\text{K}_2\text{S}_2\text{O}_8$ soln. GLENN E. MATTHEWS

Dyes and photochemistry (SEDCLACZEK) 25.

WALL, E. J.: **History of Three-Color Photography.** Boston: American Photographic Pub. Co. 747 pp. \$15.00. Reviewed in *Ind. Eng. Chem.* **18**, 107(1926).

Compensating the copying intensity of cinematographic picture films. E. LEHMANN. U. S. 1,568,511, Jan. 5 The gelatin coating of the film is impregnated with a coloring agent incapable of yielding fast colorations with the film.

Sheets or films for picture projection screens, etc. W. G. MORSE. U. S. 1,568,463, Jan. 5. Finely divided MgCO_3 mixed with linseed oil or other oil is used for making sheets or screens. Varnish, gelatin compns., etc., also may be used.

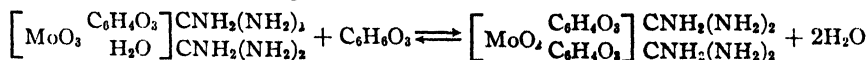
Preservative for motion picture films. J. I. CRABTREE. U. S. 1,568,658, Jan. 5 Films are treated with a bath contg. H_2O together with glycerol 1-10 and ethylene glycol 10-50% in order to maintain suppleness and prevent undue drying out.

Reproductions for book printing. D. SCHARSCHAWSKY. U. S. 1,567,333, Dec. 29. A developed Ag colloid layer is placed on a platen and treated with a dichromate or other tanning agent to prep. it for etching and use in printing.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

The coördination valence of two hydroxy groups in ortho position. I. Complexes of pyrocatechol and pyrogallol with the acids of the molybdenum group. L. FERNANDES. *Gazz. chim. ital.* **55**, 424-40(1925).—F. (C. A. **18**, 1252) has described 3 series of MoO_4 derivs. of gallic acid. Weinland has prep'd. compds. of pyrocatechol with Fe^{++} , Fe^{+++} , Al, Co and MoO_3 . F. has begun a systematic study of the complexes of this sort. In this paper those of MoO_2 , WO_3 and UO_3 with pyrocatechol (I) and pyrogallol (II) are described. The free acids of these complexes are unstable while the salts are quite stable. These complex acids are mostly weak and with alkali metals or Tl they give acid salts; with org. bases they give disubstituted well-crystd. salts. A series of salts contg. 1 mol. of the phenol and another having 2 mols. for each mol. of MoO_3 was obtained. The first contains 1 mol. H_2O but the 2nd does not. The constitution of the series is represented thus: $\left[\text{XO}_3 \begin{smallmatrix} \text{H}_2\text{O} \\ \text{Ph} \end{smallmatrix} \right]_R$ and $\left[\text{XO}_2 \begin{smallmatrix} \text{Ph} \\ \text{Ph} \end{smallmatrix} \right]_R$ where $\text{XO}_3 = \text{MoO}_3$, WO_3 , UO_3 and $\text{R} = \text{H}$, K, Na, Tl, guanidine, pyridine, etc., Ph = aromatic org. compd. contg. 2 OH groups in the *o*-position to each other. Among the compds. besides I and II that form such colored complexes are hydroxyhydroquinone, 1,2- and 2,3-naphthols, etc., also alizarin, adrenaline, pyrocatecholaldehyde. In compds. having 3 OH groups the 3rd OH does not show a coördination valence. The 1st type of compds. is obtained easily by heating and successive evapn. of solns. contg. stoichiometric amts. of the phenol and inorg. salt. The 2nd type was usually more difficult to prep. In aq. soln. compds. of the 1st type are usually obtained; a large excess of the phenol is required to give II. In EtOH soln. this excess is not required. The mass action effect of the H_2O in this reaction is visualized by the equil.:



The fact that the H_2O is only eliminated from these salts of the 1st type with difficulty indicated that it is probably H_2O of constitution. The salts of I are more stable than those of II. The alkali and NH_4 salts of *pyrogallolalquomolybdic acid* are very sol. and unstable; on evapn. of their aq. solns. sirups that could not be crystd. were obtained. A soln. of guanidine carbonate in MoO_3 gave on evapn. *guanidine molybdate* (III). III in EtOH with the calcd. amt. of II gave a red soln. which on evapn. at 50°

gave *diguandine pyrogallolaquomolybdate*, $\left[\text{MoO}_3 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_3 \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{CNH}_2(\text{NH}_2)_2$ red crystals. If H_2O is used as solvent and some MoO_3 is also added the *guanidine salt* (IV) $\left[\text{MoO}_3 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_3 \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{CNH}_2(\text{NH}_2)_2$, is obtained. An aq. soln. of IV treated with a sol. Tl salt gave a microcryst. ppt. of the corresponding *thallium salt*. On cooling a soln. contg. III and excess of II, *diguandine dipyrogallol molybdate*, $\left[\text{MoO}_2 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_3 \\ \text{C}_6\text{H}_4\text{O}_3 \end{smallmatrix} \right] \text{CNH}_2(\text{NH}_2)_2$ dark red to black crystals is sepd. The soln. of this salt with a Tl salt pptd. *thallium dipyrogallolmolybdate*. I acting on NH_4 tungstate in H_2O soln. gave on evapn. *ammonium pyrocatechol aquotungstate* (V), $\left[\text{WO}_4 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_2 \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{NH}_4$, as dark red scales. A soln. of I with K tungstate evapd. at low temps gives the corresponding *potassium salt*. If heated to boiling for a few min an unknown compd. is formed contg. no org. matter. Solns. of V with a sol. Tl salt ppt. the *thallium salt*. If an excess of I is added to the soln. of V it becomes darker and on evapn. a sirup is obtained from which crystals of *ammonium dipyrocatecholtungstate*, $\left[\text{WO}_2 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_2 \\ \text{C}_6\text{H}_4\text{O}_2 \end{smallmatrix} \right] \text{NH}_4$, were sepd. *Ammonium pyrogallolaquotungstate* was obtained like V; its soln. with TiNO_3 pptd. the *thallium salt*; the *potassium salt* was also prepd. *Ammonium dipyrogalloltungstate* is very sol. in H_2O and EtOH. The alkali and NH_4 salts of *pyrocatecholaquouranic acid* could not be crystd. Uranyl sulfate uranate with the calcd. amt. of I and then $\text{C}_5\text{H}_5\text{N}$ pptd. *pyridine pyrocatecholaquouranate*, $\left[\text{UO}_3 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_2 \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{C}_5\text{H}_5\text{N}$, as brick-red microcrystals. When a large excess of I is present *pyridine dipyrocatechol uranate*, $\left[\text{UO}_2 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_2 \\ \text{C}_6\text{H}_4\text{O}_2 \end{smallmatrix} \right] \text{C}_5\text{H}_5\text{N}$, is pptd. *Ammonium pyrogallolaquouranate*, $\left[\text{UO}_3 \begin{smallmatrix} \text{C}_6\text{H}_4\text{O}_3 \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{NH}_4$, was obtained; likewise the *pyridine* and *thallium salts*. *Pyridine dipyrogallol uranate* was prepd from uranyl sulfate, excess II and $\text{C}_5\text{H}_5\text{N}$. Also in *Atti accad. Lincei* [6], 1, 439–43 (1925). E. J. WITZEMANN

Reduction of inorganic halides. IV. The reduction of tantalum pentachloride. OTTO RUFF and FRITZ THOMAS. *Z. anorg. allgem. Chem.* 148, 1–18 (1925); cf. C. A. 16, 2456; 17, 2842—Various reduced chlorides are obtained by the method described previously. TaCl_5 reacts with H_2O in evolving the stoichiometrical equiv. of H and dissolves as green Ta oxytrichloride. Pure TaCl_3 solns. are green and stable. Pyrophor chlorides are slowly dissolved by water, quicker by alkali. Ta is formed only above 300° and may thus be sepd. from H_2TaO_4 by alkali. A product TaO_2Cl is obtained by sublimation. V. **Derivatives of tantalum trichloride.** *Ibid* 19–24.—Reply to Lindner and Feit (C. A. 18, 3154). The compd. described by L. and F. as $(\text{HTa}_3\text{Cl}_7\text{H}_2\text{O}) \cdot 3\text{H}_2\text{O}$ (chloroacid of Ta^{++}) is in reality $\text{Ta}_3^{++}\text{Cl}_7\text{O} \cdot 3\text{H}_2\text{O}$ as is shown by detn. of the H evolved by NaOH and control of the method of analysis used by L. and F.

JOHN T. STERN

Molybdovanadates. II. G. CANNERI. *Gazz. chim. ital.* 55, 390–6 (1925).—In a previous paper (C. A. 18, 1620) the importance of temp. in the formation of molybdovanadic compds. was pointed out. Two kinds of crystals were obtained. The red crystals were considered to be a series of mixed crystals; the yellow ones were thought to be definite compds. The limits of existence of both kinds were detd. at 30° . In this paper the limits of existence at 15° were detd. and both kinds of crystals were obtained by the crystn. of solns. of MoO_3 and alkali metavanadates. The red crystals were rich in V, well-formed and sol.; the colorless or yellow ones are rich in Mo, pulverulent and a little sol. The compn. is, in general, in relation with that of the solns. With KVO_3 solns. contg. 1 mol. V_2O_5 + 0.5 mol. MoO_3 red crystals contg. 14.62% MoO_3 were obtained; with 1 mol. each of V_2O_5 and MoO_3 the red crystals contained but 3.57% MoO_3 , while with 1 mol. V_2O_5 to 1.12 mol. MoO_3 they contained 0.34% MoO_3 . At higher ratios of MoO_3 yellow crystals ($4\text{K}_2\text{O} \cdot 0.6\text{MoO}_3 \cdot 3\text{V}_2\text{O}_5 \cdot 10\text{H}_2\text{O}$ and $5\text{K}_2\text{O} \cdot 10\text{MoO}_3 \cdot 4\text{V}_2\text{O}_5 \cdot 14\text{H}_2\text{O}$) rich in Mo were obtained. If it is admitted that in these solns. at least 2 different ionic groupings are present and in equil. with each other, the one belonging to the polyvanadates and the other belonging to a complex radical of the heteropoly type, it is clear that the compn. of the red crystals will not depend so much on the concn. of the compds. added as on that of the ionic groups that are formed from them. The addn. of MoO_3 or raising the temp. changes the equil. in favor of the ionic grouping belonging to the definite (yellow) compds. With the Na and NH_4 salts the change in

compn. of the red crystals is continuous. Red crystals of the Na and K salts ($1V_2O_5 + 0.5 MoO_3 + 1K_2O$ (or Na_2O)) were obtained from different portions of the same solns. Those obtained at 30° contained much more Mo than those sepd. at 15° . These were recrystd. and fractionated and gave $K_4V_6O_{17} \cdot 9H_2O$ and $Na_4V_6O_{17} \cdot 15H_2O$, resp., contg. a trace of Mo. The yellow crystals resist fractionation as long as the temp. remains unchanged. Thus $4(NH_4)_2O \cdot 3V_2O_5 \cdot 5MoO_3 \cdot 10H_2O$ remained unchanged when recrystd. a no. of times at 30° but when crystd. at 10° a different salt, $2(NH_4)_2O \cdot 2V_2O_5 \cdot 5MoO_3 \cdot 10H_2O$, was obtained. This supports the suggestion as to the inherent difference in the nature of the red and yellow crystals. Even the yellow salts show a restricted field of existence. Two NH_4 salts $2(NH_4)_2O \cdot 3MoO_3 \cdot 2V_2O_5 \cdot 8H_2O$ and $4(NH_4)_2O \cdot 6MoO_3 \cdot 2V_2O_5 \cdot 6H_2O$ and 1 Na salt ($2Na_2O \cdot 3MoO_3 \cdot V_2O_5 \cdot 10H_2O$) not described in the previous paper were obtained.

E. J. WITZEMANN

Complex sulfites and thiosulfates of the rare earths. G. CANNERY AND L. FERNANDES. *Gazz. chim. ital.* **55**, 440-53 (1925).— H_2SO_3 in forming complex metallo-sulfurous anions gives rise to 2 series of heteropoly compds.—the uranyl sulfites and the molybdosulfites—the structure of which is known and which are fully reviewed here. C. and F. wished to det. if rare earths can enter into these compds. in place of the alkali metals, although their valences are different. In the same way the substitution of these elements in cuprosulfites and cuprothiosulfites was studied. In the prepn. of the uranyl sulfites the rare earth hydroxides were suspended in the smallest possible quantity of H_2O and SO_2 passed to satn., giving the bisulfite. An aq. suspension of NH_4 pyrouanate was satd. with SO_2 , giving a limpid liquid. The 2 solns. were united and heated moderately at reduced pressure. The complex seps. as a yellow ppt. that was filtered off and washed with $EtOH$ and Et_2O . These salts are insol. in H_2O , $EtOH$ and Et_2O but sol. in dil. acids with the evolution of SO_2 . The product thus obtained failed to give a definite compd. It appeared to be a mixt. from which the constituents could not be sepd. The hydroxide and the pyrouanate were then suspended in H_2O and satd. with SO_2 and enough H_2O was added for complete soln. This was then crystd. by heating on a H_2O -bath in a current of SO_2 . These products resembled the others and had a variable compn. These results show the influence of temp. and pressure on these solns. of uranyl sulfites satd. with SO_2 and the sepn. of addn. products that vary in compn. depending on the SO_2 content and the component in excess. The successful procedure follows: the rare earth bisulfite was prepd. as before and added to an aq. soln. of UO_2SO_4 . The mixt. was allowed to crystallize by slow evapn. *in vacuo* at room temp. The product resembled those obtained before but had a const. compn. $(UO_2)_5 \cdot (SO_3)_3 R_2^{++} \cdot 15H_2O$ ($R = La, Ce, Nd, Pr$) and by analogy with the result of Kohlschütter (*Ann.* **144**, 1 (1900)) may be constituted thus: $O_5S \cdot R \cdot SO_3 \cdot UO_2 \cdot SO_3 \cdot UO_2 \cdot SO_2 \cdot UO_2 \cdot SO_3 \cdot UO_2 \cdot SO_3 \cdot UO_2 \cdot SO_3 \cdot R \cdot SO_3$. The cerium, lanthanum, praseodymium and neodymium uranyl sulfites were prepd. and analyzed. A concd. soln. of NH_4 paramolybdate was satd. with SO_2 and united with a soln. of the rare earth acetate and slowly evapd. *in vacuo*. Three fractions of crystals were obtained. The 1st fractions contained much of the rare earth while the last fraction contained little or none. No fraction obtained showed a compn. corresponding to the pure rare earth molybdosulfite and the series as a whole appeared to be miscible in the solid state with NH_4 molybdosulfite. This is thought to be an instance of *isomorphism of mass* in which the influence of the mol. as a whole predominates over the nature of the metallic element that enters into part of it. In prepg. the cuprosulfites SO_2 was passed through a suspension of $CuCO_3$ until soln. was complete. The rare earth bisulfite was prepd. as before. The solns. were mixed and evapd. at reduced pressure with slight warming. The cuprosulfites of cerium, lanthanum, praseodymium and neodymium, $XCu(SO_3)_2 \cdot 8H_2O$, were pptd. as red microcrystals, insol. in H_2O , $EtOH$ and Et_2O but sol. in acids with the evolution of SO_2 . In prepg. the cuprothiosulfates a soln. of a sol. rare earth salt and a soln. of $CuSO_4$ were satd. with $Na_2S_2O_3$ and mixed. The soln. is dild. after a time and the cuprothiosulfates of cerium, lanthanum, praseodymium, neodymium and thorium, $XCu(S_2O_3)_2 \cdot 8H_2O$, were sepd. as yellow microcrystals. The zirconium salt, $ZrCu_2(S_2O_3)_3 \cdot 30H_2O$, had a different compn. With Th and Zr it was necessary to use absolutely neutral solns. to prevent the pptn. of mixts. of hydroxides and S. In general it was found that the Ce metals combine with complex acid radicals as alk. and alk. earth bases do. This behavior conforms with the high basicity of these elements. In the cuprosulfurous and cuprothiosulfuric acid radicals, besides the alkali metals, only the Ce metals, because of their high basicity, seem capable of combining with these radicals.

E. J. WITZEMANN

Polythionates. I. The decomposition of polythionates in aqueous solution. A. KURTENACKER AND M. KAUFMANN. *Z. anorg. allgem. Chem.* **148**, 43-57 (1925);

C. A. 19, 1111, 2000 and following abstr.—The decompn. of solns. of $K_2S_2O_8$, $Na_2S_4O_8$ and $K_2S_3O_8$ with time in neutral soln. and $NHCl$ is investigated by the methods of analysis published previously. S and the ions SO_3 , S_2O_3 , SO_4 , S_3O_6 , S_4O_6 , S_5O_6 and the acidity are detd. The decompn. follows in terms of ions the reactions: $S_5O_6 \rightleftharpoons S_4O_6 + S$; $S_3O_6 + H_2O = S_2O_3 + SO_4 + 2H$; $S_2O_3 + S_3O_6 + H \rightleftharpoons S_4O_6 + HSO_3$ and in HCl soln.: $S_2O_3 + H \rightleftharpoons HSO_3 + S$. The mixt of tetra- and pentathionate is very stable. Pure tetrathionate forms penta- besides trithionate. Tri- + pentathionate do not form tetrathionate, but trithionate accelerates the establishment of the equil. $S_5O_6 \rightleftharpoons S_3O_6 + S$. IV. The action of alkali on the polythionates. *Ibid* 369–81.—The action of various concns. of $NaOH$ on solns. of tri-, tetra- and pentathionate is investigated by improved methods. The original paper must be consulted for details. J. T. S.

Polythionates. II. The influence of thiosulfate and sulfite on the stability of polythionates. A. KURTENACKER AND M. KAUFMANN. *Z. anorg. allgem. Chem.* 148, 225–31(1925), cf. preceding abstr.—The influence of sulfite and thiosulfate on the decompn. of tri-, tetra- and pentathionate was studied. The decompn. of trithionate is only little influenced, whereas a considerable acceleration takes place in the case of tetrathionate. The action of thiosulfate is here a catalytic one. Thiosulfate shows a tendency to split off S which in turn combines with tetrathionate forming pentathionate, whereas the sulfite formed from the thiosulfate, after the S has been split off, reacts with tetrathionate forming trithionate and thiosulfate. A soln. of pentathionate decomposes quickly in the presence of thiosulfate. A similar action by trithionate is produced on pentathionate. Sulfite and bisulfite reduce the stability of tetra- and pentathionate solns., thiosulfate being quickly formed. III. The action of hydrogen sulfide on polythionates. A. KURTENACKER AND M. KAUFMANN. *Ibid* 256–64.—It is known that polythionates are completely decomposed by alkali sulfides under formation of thiosulfate and free S. The authors studied the less-known reaction between the individual polythionates and H_2S . Thus trithionate reacts very slowly and thiosulfate and free S form. The latter is a decompn. product of thiosulfate produced by H -ions, the formation of which accompanies the transformation of the trithionate into the thiosulfate ion. The velocity of the reaction between tetrathionate and H_2S is greater and diminishes with increasing acidity as in the foregoing case. Pentathionate and free S and occasionally small quantities of thiosulfate are formed. Since pentathionate is formed from tetrathionate and H_2S in acid solns. it is much more stable in the presence of H_2S than tetrathionate. EMIL KLARMANN

The polysulfides and polyselenides of lithium, sodium and potassium. F. W. BERGSTROM. *J. Am. Chem. Soc.* 48, 146–51(1926).—The reactions between S and Se and solns. of Li, Na and K in liquid NH_3 have been studied and the following compds. shown to exist ($M = Li, Na$ or K) M_2S , M_2S_2 , M_2S_4 , M_2Se , M_2Se_2 , M_2Se_3 , M_2Se_4 and higher sulfides and selenides of uncertain compn. R. J. HAVIGHURST

A study of the fluorides and double fluorides of aluminium. MARTIN TOSTERUD. *J. Am. Chem. Soc.* 48, 1–5(1926)—Hydrated Al fluoride of compn. $Al_2F_6 \cdot 18H_2O$ was prepd. from Al hydrate and aq. HF . Anhyd. AlF_3 was prepd. by heating the hydrate to 200° . X-ray photographs show a transition at 115 – 120° . The compds. $4KF \cdot AlF_6$ and $4RbF \cdot AlF_6$ were prepd. in the cryst. form by subjecting the gelatinous substance to a temp. of 270° in a closed system. Two forms of the K salt, one monoclinic and the other orthorhombic, were found; the Rb salt was orthorhombic. Cond. measurements suggest the existence of an NH_4 Al fluoride and Na Al fluoride. R. J. HAVIGHURST

New methods for the preparation of sodium aurothiosulfate. K. LUCILLE MCCLUSKEY and LILLIAN EICHELBERGER. *J. Am. Chem. Soc.* 48, 136–9(1926).— $Na_3Au(S_2O_3)_2$ was prepd. by 2 methods: (1) $CsAuCl_4 + 4Na_2S_2O_3 = Na_3Au(S_2O_3)_2 + Na_2S_4O_6 + 3NaCl + CsCl$; (2) $NaAuCl_2 + 2Na_2S_2O_3 = Na_3Au(S_2O_3)_2 + 2NaCl$. The Au is present in the univalent state. $Na_3Au(S_2O_3)_2$ may be preserved for months if covered with anhyd. ether and kept in the dark in a refrigerator. R. J. HAVIGHURST

The nitrates of bismuth. PICON. *Bull. soc. chim.* 37, 1365–75(1925).—The basic nitrates of Bi are studied especially as regards compn. and dehydration. The observations of Graham, Gladstone, Ditte, Yvon, Rutten, Ruge and Becker are reviewed and the inaccuracy of the usual methods for the detn. of water and HNO_3 is pointed out. The methods of Heintz (*J. prakt. Chem.* 45, 105(1848)) are recommended. The total water can be obtained only by decompn. by heat in the presence of Cu and a desiccant. Vacuum treatment in the presence of Na or P_2O_5 is not effective. The nitrate may be found volumetrically by $FeSO_4$ – $KMnO_4$ titrations before and after oxidation of the $FeSO_4$ by boiling with the nitrate in question. Conclusions: At 100° in a current of O_2 or in an oven, const. wt. does not obtain after 2 months. At the same

temp. but with boiling water, after several exhaustions, $(\text{NO}_3)_2\text{Bi}_4\text{O}_6 \cdot \text{H}_2\text{O}$ may be prepd. At 260° in a current of O_2 , the anhyd. $\text{N}_2\text{O}_5 \cdot 2\text{Bi}_2\text{O}_3$ obtained after 15 days. At 375° in the same gas current, const. wt. results slowly giving $(\text{NO}_3)_2\text{Bi}_4\text{O}_{14}$. At 425° the salt changes completely to yellow, anhyd. Bi_2O_3 . These results differ from the general statement that the anhyd. oxide obtains at 260° . Also in *Compt. rend.* **181**, 516-8 (1925). P. B. PLACE

The hydrolysis of sulfur monochloride. H. L. OLIN. *J. Am. Chem. Soc.* **48**, 167-8 (1926).—The primary reaction is $\text{S}_2\text{Cl}_2 + 2\text{H}_2\text{O} = 2\text{HCl} + \text{H}_2\text{S} + \text{SO}_2$. The existence of H_2S as a product of the reaction has been overlooked by most of the previous investigators. The structure of S_2Cl_2 is probably $\text{S} = \text{S} < \text{Cl}_2$, not $\text{Cl}-\text{S}-\text{S}-\text{Cl}$. R. J. HAVIGHURST

Mercury helide: a correction. J. J. MANLEY. *Nature* **115**, 917 (1925); cf. C. A. **19**, 1827.—The correct analysis of mercury helide showed 21.079 parts by weight of Hg combined with 4.18 parts by weight of He, giving the simplest formula $\text{HgHe}_{1.0}$, not HgHe . FLORENCE N. SCHOTT

The hydrates of Sb_2O_3 (SIMON, POEHLMANN) **2**.

7- ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Phenolphthalein as an indicator for the determination of phosphoric acid by titration of ammonium phosphomolybdate. P. NYSENS. *Bull. soc. chim. Belg.* **34**, 232-6 (1925).—In a brief discussion it is shown that as a result of the large amt. of MoO_3 as compared to the NH_3 and P_2O_5 present, the error introduced into the total titration by the incomplete reaction of the latter 2 substances with alkali, with phenolphthalein as indicator, is less than 1.3%. WM. B. PLUMMER

Advances in the field of metal analysis in 1924. TH. DÖRING. *Chem.-Ztg.* **49**, 1009-12, 1030-3, 1037-40, 1045-8, 1061-4, 1072-3 (1925). E. J. C.

A new confirmatory test for aluminium. H. W. ESTILL AND R. L. NUGENT. *J. Am. Chem. Soc.* **48**, 168-9 (1926).—Dissolve the supposed ppt. of $\text{Al}(\text{OH})_3$ in 6 N H_2SO_4 . Add a little water and enough alkanet root tincture to make the soln. ruby red. Add 6 N NH_4OH until the red soln. changes to blue and 5 cc. in excess. In 5 min. a royal purple lake will rise to the surface and its vol. in cc. is roughly equal to the mg. of Al present. Lakes with other gels appear to be distinguishable from it. W. T. H.

The electrometric determination of tellurium in the presence of ferric iron, selenium and copper. W. T. SCHRENCK AND B. L. BROWNING. *J. Am. Chem. Soc.* **48**, 139-40 (1926).—Te can be oxidized from the quadrivalent to hexivalent state by means of $\text{K}_2\text{Cr}_2\text{O}_7$ and the excess of the latter can be detd. quickly and accurately by electrometric titration with FeSO_4 . W. T. H.

Contributions to the study of ruthenium. IX. Solubility of ruthenium in hypochlorite solutions and an attempt to utilize the reaction for the quantitative determination of the metal. JAS. L. HOWE AND F. N. MERCER. *J. Am. Chem. Soc.* **47**, 2926-32 (1925); cf. C. A. **20**, 344.—Finely divided Ru and its compds. are completely sol. in solns. of alkali hypochlorites and may thus be scpd. from other Pt metals except Os. If an excess of alkali is present, ruthenates are formed; if no excess alkali is present some RuO_4 is formed. From a soln. of K_2RuO_4 , after treatment with Cl, RuO_4 can be completely distd. No satisfactory method was found to ppt. Ru quantitatively in weighable form from RuO_4 . M. O. LAMAR

New procedure for the identification and estimation of cobalt by spectroscopy and chromoscopy. GEORGES DENIGÈS. *Bull. soc. pharm. Bordeaux* **63**, 161-5 (1925).—**Identification of Co.**—Pour into a test-tube 5 cc. of HCl and add 0.1 cc. of a soln. of Co salt contg. 2 g. of Co^{++} per l. A blue color will develop immediately and a direct vision spectroscopy will show clearly the characteristic absorption bands. A blue tint will still be perceptible in a dilution 4 times as great, but the limit for a clear cut spectrum is 0.02 mg. per cc. The absorption bands of the spectrum are not interfered with by the presence of Cu^{++} , Fe^{+++} or Ni^{++} , but if it is desired to bring out the blue color in solns. contg. Cu^{++} and Fe^{+++} , the latter two must be reduced by the addition of SnCl_2 . **Estimation.**—The solns. must be compared with standards on which the following notes are given. An ammoniacal soln. of CuSO_4 contg. 0.20 g. of Cu^{++} per l. has the same intensity of blue as a CoCl_2 soln. contg. 0.04 g. of Co^{++} per l. The tint is not the same, but it

can be made so by the careful addition of $K_2Cr_2O_4$. A soln. contg. 4 g. of Cu^{++} per l. has practically the same tint as a soln. contg. 100 times less of the cation Co^{++} (0.04 g. per l.) dissolved in HCl. A mixt. in the proper proportions of ammoniacal $CuSO_4$ and $K_2Cr_2O_4$ has the same tint as that given by salts of Ni in HCl soln. to which variable quantities of Co^{++} have been added. A. G. DUMÉZ.

Error introduced by the presence of bismuth in the colorimetric determination of iron in minimum: colorimetric method for its determination. H. HEINRICH AND M. HERTSCH. *Glastechnische Ber.* **2**, 112-5(1924); *Chimie et industrie* **14**, 696(1925). In the colorimetric detn. of Fe in Pb_3O_4 by NH_4CNS , there is often obtained a reddish yellow coloration, due to the presence of Bi which, in dil. HCl soln., turns yellow on addn. of NH_4CNS . The Bi can be removed with H_2S without carrying down any Fe with the Bi_2S_3 . The Fe can also be detd. without removal of the Bi by addn. of 5-10 cc. concd. HCl (for 10 g. of Pb_3O_4), which discharges the yellow coloration. The Bi can be detd. colorimetrically as follows: dissolve the Bi_2S_3 ppt. in a little dil. HNO_3 , ppt. with NH_3 , filter, redissolve in a little dil. H_2SO_4 , transfer to a Nessler tube, in a 2nd Nessler tube introduce an equal vol. of dil. H_2SO_4 , add 50 or 100 cc. of 20% NH_4CNS to each tube, and add standard Bi soln. (1 cc. = 0.0002 g. Bi_2O_3) to the 2nd tube until the colors in the 2 tubes are equal. A distinct yellow is obtained with 0.00005 g. Bi_2O_3 in presence of 100 cc. NH_4CNS . A. PAPINEAU-COUTURE.

The detection and estimation of traces of carbon disulfide in small gas volumes. W. J. HUFF. *J. Am. Chem. Soc.* **48**, 81-7(1926).—The method described is capable of detecting 0.02 mg. of CS_2 in 100 cc. of gas mixt. The method was developed from a study of the procedure of Harding and Doran which is suitable for larger quantities of CS_2 and like it depends upon the formation of Cu xanthate: the excess of Cu is detd. iodometrically. W. T. H.

Electrometric titration of alkaloids and the reaction of alkaloid salts. I. M. KOLTHOFF. *Pharm. Weekblad* **62**, 1287-93(1925).—A discussion of the electrometric titration of alkaloids by the cond. method and by the potentiometric method with H, Hg-HgO, quinhydrone and air electrodes. A table of 49 org. bases, mostly alkaloids, is given with their dissociation consts. and the p_H values of 0.01 mol. solns. of their neutral and basic salts. From these data the proper selection of indicator for the titration of a given alkaloid may be easily made. A. W. DOX.

The action of sulfites and of bisulfites on aldehydes and on ketones and its application to the determination of these compounds. GIOVANNI ROMEO AND ELENA D'AMICO. *Ann. chim. applicata* **15**, 320-30(1925).—The method is based on the formation of neutral addn. products of aldehydes or of ketones with sulfites and bisulfites (cf. Tieman, *Ber.* **31**, 3297; Romeo, *C. A.* **13**, 844). *e. g.*, $PhCH:CHCHO + NaHSO_3 + Na_2SO_3 + H_2O \longrightarrow PhCH_2CH(SO_3Na)CH(OH)SO_3Na + NaOH$ and then $NaOH + NaHSO_3 \longrightarrow Na_2SO_3 + H_2O$. *Reagent.*—Add to 400 g. of $Na_2SO_3 \cdot 7H_2O$ in 1000 cc. of H_2O enough satd. $KHSO_3$ soln. (about 160 cc.) to impart an acidity such that 25 cc. is neutralized by about 20 cc. of 0.5 N NaOH (4 drops of 2% rosolic acid as indicator), and heat some hrs. at 100°. *Procedure.*—(1) Titrate 50 cc. of this reagent in the presence of 8 drops of 2% alc. rosolic acid. (2) Neutralize any acidity present in the sample (1-2 g.) with 0.5 N NaOH (using 8 drops of rosolic acid), add 50 cc. of reagent, agitate continually and let stand cold if the sample is sol. or maintain heat if insol. (45 min. for aldehydes, 4-5 hrs. for ketones), cool and titrate the excess acidity with 0.5 N NaOH. Subtract the no. of cc. of 0.5 N NaOH for the last titration from that of the sulfite soln. alone. The difference d corresponds to the quantity of $NaHSO_3$ reacting with the aldehyde or ketone. Then $(100 de)/p$, where e is the wt. of aldehyde or ketone corresponding to 1 cc. of 0.5 N $NaHSO_3$ soln. and p is the wt. of sample, is the % aldehyde or ketone in the sample. Two solns. of $PhCH:CHCHO$ in xylene contg. 66.06% and 50.75% analyzed 65.21 and 50.08%, resp., the low values being in part due to impurities in the $PhCH:CHCHO$ samples. Likewise 2 xylene solns. of pulegone contg. 63.94 and 41.59 analyzed 62.19 and 41.91%, resp. In general the method is preferable to that of Burgess (cf. *Analyst* **29**, 78(1904)). It is not, however, applicable to all compds., for ketones react more slowly than aldehydes and the presence of tertiary or quaternary C adjacent to the CO group retards or even prevents the formation of the hydrosulfone. On the other hand, a Me group on the CO group favors its formation. $PhCHO$ gives low results, perhaps because of the presence of polymers. Menthone does not react and carvone only very slowly, $PhCH:CHCHO$ reacts very rapidly, but pulegone requires 4-5 hrs. for completion. C. C. DAVIS.

Gasometric method for the determination of acetic anhydride. F. L. WHITFORD. *J. Am. Chem. Soc.* **47**, 2939-40(1925).— C_4H_8N is satd. with CO and CO_2 , an excess of $(CO_2H)_2$ added and weighed amts. of Ac_2O are dropped in. The evolution of gas is com-

plete in 15 min. The gas is calcd. into terms of Ac_2O on the basis that 1 mol. Ac_2O gives 1 mol. CO and 1 mol. CO_2 . The method is accurate to within 0.1–0.2%.

C. J. W.

Allen's Commercial Organic Analysis. Vol. IV. 5th ed. revised and enlarged. Edited by S. S. Sadtler, E. C. Lathrop and C. A. Mitchell. Philadelphia: P. Blakiston's Son & Co. 648 pp. \$7.50.

CAMPBELL, F. H.: Elementary Qualitative and Volumetric Analysis. London: Macmillan & Co., Ltd.; Melbourne: Melbourne University Press. 99 pp. 6s. 6d. Reviewed in *Chem. News* 131, 350(1925).

Detecting oxygen. A. H. MAUDE. U. S. 1,567,534, Dec. 29. A reagent such as a soln. of K stannite and indigo carmine is placed within a sealed evacuated receptacle having a capillary inlet adapted to be broken to allow gases to enter the receptacle.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Osmiridium in Tasmania. A. M. REID. *Bull. Tasmania Geol. Survey* No. 32 (1921); *Mineralog. Abstracts* 2, 422.—A detailed account of the occurrences, with analyses.

J. F. SCHAIRES

The structure of sperrylite. W. F. DE JONG. *Physica* 5, 292–301(1925).—From Debye-Scherrer measurements on PtAs_2 crystals de J. found $a_0 = 5.92$ Å. U. For sp. gr. 10.602, the unit cube contains 4 Pt atoms and 8As atoms. Unless *a priori* it is assumed that the 4Pt atoms are equiv. and also the 8As atoms, it is impossible to derive the structural type. If this is assumed, there is dyakisdodecahedral symmetry (T_h^6), pyrite structure, with the parameter $u = 0.38$. For the smallest distance Pt-As is then found 2.47 Å. U; As-As 2.46 Å. U (Ramsdell, in the article abstracted in *C. A.* 19, 3447, obtained the same structure, with $a_0 = 5.91$.) B. J. C. VAN DER HOEVEN

Two new forms of quartz in petrosiliceous porphyrys: lamellar quartz and granular quartz spheruliths. A. DEMAY. *Compt. rend.* 181, 676 8(1925).—A lithologic study.

L. W. RIGGS

Color and other changes in the flaked surfaces of flint. J. R. MOIR. *Science Progress* 20, 249–55(1925).—A description and discussion of patination of flint.

JOSEPH S. HEPBURN

Identity of fibrous limonite with goethite. R. GAUBERT. *Compt. rend.* 181, 869–72(1925); cf. Posnjak and Merwin, *C. A.* 13, 1439.—A micro-optical study led to the conclusion that the fibrous limonites examd. were impure goethite.

L. W. R.

Magnesite and kammererite from Low's mine (Line Pit), Cecil County, Maryland. E. V. SHANNON. *J. Wash. Acad. Sci.* 15, 434–8(1925).—A specimen collected on the dump of the mine gave on analysis: MgCO_3 96.26, CaCO_3 2.50, FeCO_3 0.58, insol. and SiO_2 0.28, sum 99.62%. The magnesite appears to be a product of hydrothermal solns. rather than surface weathering, downward-percolating carbonated solns. of meteoric H_2O . Minute quantities of deweylite, which may account for the SiO_2 in the analysis, are deposited in the cavities of the magnesite. Kammererite from Low's Mine was ground and freed in part from chromite and magnesite by means of heavy liquids. Analysis of the partly purified mineral gave: SiO_2 32.28, Al_2O_3 10.64, Fe_2O_3 1.04, Cr_2O_3 2.74, FeO 0.96, CaO 0.06, MgO 38.14, H_2O above 120° 14.84, H_2O below 120° none, sum 100.70%.

L. W. RIGGS

Contributions to the knowledge of the minerals of Yugoslavia. Z. LORKOVIĆ. *Magazine Croatian Nat. Sci. Soc., Zagreb* 35, 17–20(1923); *Mineralog. Abstracts* 2, 430.—Analyses of magnesite and opal are included.

J. F. S.

Studies in the feldspar group. A. N. WINCHELL. *J. Geology* 33, 714–27(1925).—A discussion of the relations between optic properties and compn. in the apparently continuous series KAlSi_3O_8 – $\text{NaAlSi}_3\text{O}_8$ and KAlSi_3O_8 – $\text{BaAl}_2\text{Si}_2\text{O}_8$, with notes on the classification of the plagioclases.

W. F. HUNT

Chemical investigations of Japanese minerals containing rarer elements. IV. Analyses of zircon, xenotime and allanite from Ishikawa, Iwaki Province. KENJIRO KIMURA. *Japn. J. Chem.* 2, 73–9(1925); cf. *C. A.* 19, 2008.—[In English.] Zircon and xenotime almost always occur associated or intermingled with each other; they were, therefore, sepd. mechanically. Zircon contains traces of MgO , CaO , MnO ; Al_2O_3 .

0.25%; Fe_2O_3 , 0.95; rare earths, 3.79; SiO_2 , 32.40; ZrO_2 , 58.71; UO_2 , 1.06; P_2O_5 , 1.31; (Cb, Ta) $_2\text{O}_5$, trace; ignition loss, 2.1. The spectrum analysis of the SiO_2 portion showed the lines of Ba and Pb; the ZrO_2 portion showed the principal lines of Ti; the rare earths showed the lines of Yt as predominating, while those of Sc, Nd, Gd, Dy, Er, Yb and Lu were also observed. This mineral is assumed to be an isomorphous mixt. of zirconia, silica and urania, contg. xenotime and silicates of the rare earths as a solid soln. *Xenotime* occurs at Ishikawa often in radial aggregates which resemble chrysanthemum flowers; analysis showed: CaO 0.35, Al_2O_3 0.48, Fe_2O_3 0.23, rare earths 37.37, SiO_2 12.49, ZrO_2 19.84, UO_2 1.92, P_2O_5 23.87, (Cb, Ta) $_2\text{O}_5$ 0.44, ignition loss 2.35%. The spectral analysis resembles that of zircon. This mineral is, therefore, a mixt. of zircon and xenotime. Analysis of an unknown mineral with d. about 3.6, hardness 5.5-6, luster resinous and streak gray, showed it to be *allanite*, which thus also occurs in Ishikawa. **V. Analyses of fergusonite from Hagata, hagatalite from Hagata and oyamalite from Oyama, Iyo Province.** *Ibid* 81-5. The compn. of *fergusonite* from Hagata is practically the same as that reported for Naegi. *Hagatalite* occurs in small crystals 1-5 mm. in diam., imbedded in biotite, yellowish gray, brownish gray or gray, with streak gray. Its hardness is about 7.5, d. 4.4, and it is brittle; a preliminary analysis on 0.2 g. showed: MgO 0.2, CaO 0.3, Fe_2O_3 2.3, Al_2O_3 2.8, rare earths 13.1, UO_2 trace, ThO_2 1.5, ZrO_2 42.0, SiO_2 29.7, (Cb, Ta) $_2\text{O}_5$ 2.7, loss on ignition 5.5%. Spectrum analysis of the rare earth fraction showed the presence of Sc, Yt, Nd, Gd, Dy, Er and Yb; the Yt lines are predominant. This mineral is a variety of zircon. *Oyamalite* resembles naegite and occurs imbedded in feldspar; it is dark green or brown, with streak yellowish or white; its hardness is about 7.5 and d. 4.1. Preliminary analysis of 0.1 g. gave: MgO 0.8, CaO 0.6, Fe_2O_3 0.6, Al_2O_3 2.0, rare earths 17.7, ThO_2 0.6, ZrO_2 40.9, SiO_2 25.7, P_2O_5 7.6, loss on ignition 3.5%. Spectrum analysis showed in the rare earths fraction the presence of Yt, Nd, Gd, Dy, Er and Yb, the Yt lines being predominant. This mineral is also a variety of zircon but is characterized by its high P content.

C. J. WEST

Epidote from Monte Rosso di Verra, Monte Rosso group. TULLIO CARPANESE. *Atti accad. Lincei* [6] 2, 276, 319-55(1925).—An optical and chemical study

H. J. WITZEMANN

Graphical operations with four independent variables. I. S. FEDOROV. *Bull. Acad. Sci. Russie* [6] 12, 615-21(1918); *Mineralog. Abstracts* 2, 425. Simple and general representation of points in 4-dimensional space on a plane by means of vectors. *Tourmaline* is worked out as an example, and the conclusion is that the chem. formula of Penfield and Foote (1899) is correct

J. F. S.

The fundamental minerals of the tourmaline group; symbols for systems of four components. I. S. FEDOROV. *Bull. Acad. Sci. Russie* [6] 12, 1891-1904(1918); *Mineralog. Abstracts* 2, 425.—The compn. of tourmaline may be expressed by the mixing of 2 fundamental mols. (cf. preceding abstract).

J. F. S.

Chlorite of the marundites of the Transvaal. J. ORCEL. *Compt. rend.* 181, 795-7(1925); cf. C. A. 17, 2516.—A sample, free of corundum, from Rainbow Camp, southeast of Leydsdorp, contained: SiO_2 27.48, TiO_2 0.12, Al_2O_3 24.00, Fe_2O_3 0.57, FeO 9.42, MgO 26.57, MnO 0.12, CaO 0.15, H_2O at 110° 0.12, $\text{H}_2\text{O} + 12.04$, sum 100.59%. This analysis compared with those of chlorites from North Carolina and Madagascar indicate that they belong to a group of *grochaultites* or *Mg prochlorites* with little Fe.

L. W. RIGGS

The origin of clays. C. W. PARMELEE. *Brass World* 21, 435-6(1925). C. G. F.

Clay material of the quaternary muds. A. DEMOLON. *Compt. rend.* 181, 673-5(1925); cf. C. A. 19, 2868.—The loss of water from samples dried to const. wt. at 100°, then subjected to higher temps., was as follows: at 200° for 1 hr. kaolinite 0, clay material 6.4%, synthetic ferric silicate 9.0, limonite (all) 14.7; at 500° the first 3 minerals had lost 2.33, 10.48 and 11.65% of their water, which was the entire amt. in the ferric silicate and within 0.3% of the entire amt. in clay material. A temp. of 600° was needed to remove practically all the water from kaolinite. On shaking the clay material with standardized lime water, 5.28% of the CaO was absorbed. Kaolin washed with dil. HCl and treated the same way absorbed only 0.25%. The clay material after the removal of the Ca ion allows an exchange of the K ion of KCl with the Al ion. This does not take place with kaolinite. These facts place the aluminosilicate of the clay material, analogous to the marine clays, in the zeolitic silicates with kaolin nucleus and lead to sharply distinguishing kaolinite from kaolin.

L. W. RIGGS

Contributions to the knowledge of the minerals of Jugoslavia. F. TUČAN. *Beograd Izv.* 1922, 193-8; *Mineralog. Abstracts* 2, 429.—Crystals of titanite and hornblende are described and an analysis of *amphibole-asbestos* is included.

J. F. S.

A eucrite meteorite which fell in the Upper Volta region, West Africa, June 27, 1924. A. LACROIX. *Compt. rend.* **181**, 745-9(1925).—This meteorite, which may be called *Bereba eucrite* α , closely resembles the meteorite *Jonzac eucrite* β in chem. compn. Analysis by Raoult gave: SiO_2 48.48, Al_2O_3 12.25, Fe_2O_3 0.30, FeO 18.49, MgO 6.50, CaO 11.22, Na_2O 0.15, K_2O 0.22, TiO_2 0.60, P_2O_5 0.12, $\text{H}_2\text{O} + 0.15$, $\text{H}_2\text{O} - 0.18$, MnO 0.25, Cr_2O_3 0.88, Fe 0.36, S 0.21, sum 100.36%. L. W. RIGGS

Quinquennial review of the mineral production of India for the years 1919 to 1923. DIRECTOR AND SENIOR OFFICERS OF GEOL. SURVEY INDIA. *Records Geol. Survey India* **57**, 1-398(1925).—A summary of mineral production, geological and chem. work, with production curves. J. F. S.

A new locality for manganese. T. S. WALLACE. *Trans. Edinburgh Geol. Soc.* **11**, 135-7(1923); *Mineralog. Abstracts* **2**, 464.—A Mn-bearing rock showing 30% MnO_2 was found near Clava, Niarn. The av. ore is low grade. J. F. S.

Genesis of the great pyritic mass in the Huelva region, Spain. A. DEMAY. *Compt. rend.* **181**, 797-9(1925).—The porphyritic boundary of the Zarza with its numerous spherulites and its amorphous material in which the pyritic matter is scattered and fused shows even at the middle of the deposit the substitution of S in the porphyritic materials. L. W. RIGGS

Notes on the occurrence of bauxite in Pojana-Ruszká and southern Bihar. P. ROZLOZNIK. *Ann. Rept. Hungarian Geol. Survey* 1917-19, 261-2 (1923); *Mineralog. Abstracts* **2**, 454.—Occurrences are described and analyses given. J. F. S.

Mica, its properties, application and distribution in Russia. I. U. GINZBURG. *Matter on Natural Productive Forces of Russia*, No. **34** (1920); *Mineralog. Abstracts* **2**, 465.—Analyses and dielectric strengths of micas are given. J. F. S.

Composition of the ash from the eruption on June 12, 1925, of the volcano Acatenango, Guatemala. A. GUTRIER AND H. BRINTZINGER. *Z. anorg. allgem. Chem.* **148**, 141-4(1925).—The ash consists of a gray powder which under the microscope shows an abundance of crystals and much glassy material of various colors. The crystals are of plagioclase, augite and olivine. Chem. analysis of the dry ash gave: SiO_2 60.45, P_2O_5 0.09, TiO_2 0.48, Al_2O_3 19.72, $\text{FeO} + \text{Fe}_2\text{O}_3$ 6.02, CaO 6.38, MgO 0.79, K_2O 0.83, Na_2O 5.17, SrO 0.07. The av. moisture content of the ash was 1.29%. This compn. closely resembles that of volcanic dust found 60 miles from the Santa Maria volcano, Guatemala, Oct. 25, 1902 (cf. Allen, U. S. Geol. Survey, *Bull.* **228**, 273(1903)). L. W. RIGGS

Eruption of Santorin volcano. Morphologic characters. CONST. A. KÉNANAS. *Compt. rend.* **181**, 518-20(1925).—A description of the rapid formation of a dome is given. **Explosive phenomena during the eruption of Santorin volcano.** *Ibid.* 563-5.—The explosions during the formation of the dome are attended by the escape of ashes, incandescent rock and large amts. of H_2O vapor. Combustible gases are evolved as shown by yellow and bluish green flames. The odors of SO_2 and H_2S are observed in the vicinity of the dome. L. W. RIGGS

Igneous geology of the Burntisland district. D. A. ALLAN. *Trans. Roy. Soc. Edinburgh* **53**, III, 479-502(1924).—Analysis of 3 basalts, one dolerite and one picrite indicates their intimate constitutional relationship, and lends strong support to the view that they were derived from one parent magma. L. W. RIGGS

The diabase of the mountains of Saint Croix. J. MOROZEWICZ. *Bull. Serv. Geol. Pologne* **3**, 1-14(1925); *Mineralog. Abstracts* **2**, 433.—Analyses of plagioclase, augite and diabase are given. J. F. S.

A criticism of the application of the theory of assimilation to the Sudbury sheet. T. C. PHERMISTER. *J. Geology* **33**, 819-24(1925).—Field evidence—such as the absence of xenoliths and abnormal rock types—does not confirm the view of G. W. Bain that the norite has assimilated an amt. of rock equiv. to $\frac{2}{3}$ of its original vol. A direct contrast is drawn by comparison with the norite of Aberdeenshire which does show assimilation by a gabbroid rock. W. F. HUNT

The amount of assimilation by the Sudbury norite sheet. N. L. BOWEN. *J. Geology* **33**, 825-9(1925).—Instead of assimilation of extraneous material to explain the salic material added, the same result might be expected by the addition of a siliceous member of the same differentiation series with 68-69% SiO_2 . W. F. HUNT

Carbonate dikes of the Premier Diamond Mine, Transvaal. R. A. DALY. *J. Geology* **33**, 659-84(1925).—These dikes, from 8 to 600 cm. in thickness, are composed of CaCO_3 , $\text{Mg}(\text{OH})_2$ and MgCO_3 and are considered magmatic in origin. The carbonate magma have been derived from heated and dissociated dolomite at depths to which water, serpentine and Fe oxide from the blue ground were added. Expts. with the dike material show its fusion temp. to be below 950° , so that the temp. of the carbonate melt may have been considerably below 900° . W. F. HUNT

The differentiation of sedimentary carbonate rocks. M. RÓZSA. *Kali* 19, 378–83, 406(1925); cf. *C. A.* 19, 2012.—Analyses and mineralogical characteristics of various rocks of this type are given and typical deposits are briefly discussed. WM. B. P.

Report of the laboratory work for 1914–19. Z. SZINYER-MERSE. *Magyar Kir. Földtani Intézet évi Jelentése*, 1917–19, 285–98(1923); *Mineralog. Abstracts* 2, 463.—Analyses of clays, soils, rocks, ores and waters are included. J. F. S.

Aluminium hydroxide and iron hydroxide (BÖHM) 2. The crystalline structure of perovskite (LEVI, NATTA) 2. Linear compressibility of fourteen natural crystals (BRIDGMAN) 2.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Michel Alexandrovitch Pavlov. LÉON DLOUGATCH. *Rev. métal.* 22, 694–5(1925).—Biographical notes with a brief list of his more important articles. A. P.-C.

Selective flotation at Timber Butte. E. H. ROBIE. *Eng. Mining J.-Press* 120, 685–9(1925).—A résumé of results obtained in efforts to sep. Zn and Pb in complex ores. Mill equipment and a conventional flow sheet are shown, and the Na_2S and NaCN methods of differential flotation discussed. Metallurgical results are governed largely by smelting contracts and other economic considerations. W. H. BOYNTON

Analyzing concentrates graphically. HERBERT ROSE. *Eng. Mining J.-Press* 120, 565–8(1925).—Charts are devised for 3 types of concentrates, whereby the complete mineral constitution of any given set of assays may be read off directly. The types are $\text{CuFeS}_2\text{-FeS}_2$; $\text{Cu}_2\text{S-FeS}_2$; and PbS-ZnS-FeS_2 . The nomographic or alignment chart is preferable to the ordinary coördinate chart. The purpose of the charts is to facilitate quick interpretation of lab. analyses. They are of special value with screen tests. W. H. BOYNTON

Agglomeration of ores at the Seraing (Belgium) plant of the Etablissements John Cockerill. A. COUSIN. *Rev. métal.* 22, 697–702(1925).—A detailed description of the tunnel kiln devised by the Cockerill Co. and in operation at Seraing for the agglomeration of Fe ore for blast-furnace treatment, of its method of operation and of its merits. A. PAPINEAU-COUTURE

The Dwight and Lloyd process for the agglomeration of ore fines. SCHNEIDER & CIE. *Rev. métal.* 22, 703–10(1925).—A detailed description of the installation at the Henri-Paul plant at Montchanin, Saône-et-Loire (France). A. P.-C.

The German nickel industry. H. SIMMICH. *Z. angew. Chem.* 38, 1181–6(1925). E. H.

Treatment in the wet way of sulfurous copper ores. A. MAKOVETSKY. *Messenger technico-économique russe* Nos. 8–9, 660(Aug.–Sept., 1924); *Rev. métal.* 22 (Abstracts), 426(1925).—By treatment of mixed Cu ores with 30–80% H_2SO_4 contg. a proportion of N oxides similar to that permissible in the manuf. of H_2SO_4 , decomn. of the ore starts at about 100°, the N oxides acting as O carriers to the Cu-Fe-S complex, but the pyrites is not attacked. According to the compn. of the complex the solns. obtained contain 1–3 parts of Cu for 2–1 parts Fe and may be treated for the production of $\text{CuSO}_4\cdot 5\text{H}_2\text{O}$ or electrolyzed for production of Cu. A. PAPINEAU-COUTURE

Constitution of mats: copper mats. A. GLAZUNOV. *Chimie et industrie Special* No., 260–2(Sept., 1925).—After giving Meissner's diagram for the ternary system Cu + Fe + S, which considers only the simplest case, G. traces the ternary diagram according to previously published work on the binary systems Cu + S, Fe + S and Cu + Fe. From a discussion of this diagram and of the mechanism of roasting in the light of the diagram G. proposes 50% Cu_2S (approx. 40% Cu) should be the limit between rich and poor mats. A. PAPINEAU-COUTURE

Zinc compounds at high temperatures. W. GEO. WARING. *Mining & Met.* 6, 610–3(1925).—Various methods for the recovery of Zn and other elements from complex sulfide ores by volatilization and subsequent selective condensation are reviewed. Fuming by high-temp. oxidation in conjunction with the ammonium carbonate treatment of the fume gives a cheap, practical method for recovery of all important elements. ALBERT THOMAS FELLOWS

Cyclone dust collectors for recovering zinc oxide. W. C. SMITH. *Eng. Mining J.-Press* 120, 817–9(1925).—Details are given of the design and operation of a cyclone

dust collector which is placed just ahead of the baghouse, whereby 40–68% of the Zn oxide is removed. There is apparently a direct relation between the efficiency of the collector and the vol. of the gas being handled. The oxide burden also has a bearing on the efficiency. Results show that complete removal of dust or fume from metallurgical gases by cyclone separators is improbable. Their use is justified: (1) when heavy dust burden of gases can be reduced thereby, permitting an installation of a smaller and less expensive secondary collector, as a baghouse or Cottrell precipitator; and (2) when a large amt. of cooling surface is required for the gases. W. H. BOYNTON

Relation of ferrous metals. I, II. J. E. FLETCHER. *Foundry* 53, 878–81, 890, 929–33(1925).—A description of the effects of remelting pig iron and the structure relation between the cast, wrought or malleable iron or the steel and the original pig iron. Too little attention has been paid to the homogeneity of pig iron. In the 3 types of pneumatic furnaces, the slags play an important part in controlling not only the compn. of the metal by the thermochem. reactions between the constituents of the metal and the slags, but by phys. conditions, as mobile fluids act as absorbers of certain undesirable migratory constituents such as sulfides and gases and by virtue of their heat cond. or resistivity may aid or resist heat flow from the fuel or heating gases to the metal in contact. Graphs show the ruling types of slags in the transitions from metastable to stable neutral compns. The S content rises rapidly in proportion to the no. of times the metal is remelted and to the amt. of scrap in the mix. Curves indicate the approx. no. of remelts required to reach a point where further remelts do not add much S to the cast products. The max. S content is reached more rapidly as the % of scrap in cupola charges increases. By the same means, the influence of the proportion of scrap on grain growth in the metal cast from similarly remelted pig and scrap mixts. is capable of detn. The oxidation of Fe, Si and Mn can be traced progressively in relation to the no. of remeltings and the pig and scrap proportions in the charges. W. H. BOYNTON

May it be practicable to produce crude iron directly from sulfidic ore? G. N. KIRSEBOM. *Teknisk Ukeblad* 72, 260–1(1925).—Theoretically it is possible to carry out the process in the 3 following steps. (1) FeS_2 is treated with Cl gas, giving in FeCl_2 and S. With an ore contg. 40% S the temp. obtained simply by the heat of reaction should approach 700°. If NaCl is added and some extra heat is applied a fluid fusion is obtained contg. FeCl_2 , NaCl and some ZnCl_2 and CuCl . The S is recovered completely. (2) The FeCl_2 is reduced with C at about 1200° with addn. of CaO. CuCl and ZnCl_2 are evapd. and may be recovered. The heat may be applied electrically. (3) According to expts. made by Solvay and others about 66% of the Cl can be regenerated by heating the CaCl_2 with SiO_2 and O to 15–1600°. NaCl can be recovered from the residue and be used again. Also it might be practicable to regain almost the total necessary amt. of Cl by treating the chloride mixt. with Al silicate in the form of roasted clay or feldspar, at the same time gaining a corresponding amt. of Al_2O_3 in a very cheap way, which may be refined for the manuf. of Al. C. A. ROBARK

Differences in open-hearth boils. H. D. HIBBARD. *Iron Age* 116, 1511–3(1925).—Open-hearth boils are classified according to the degree and violence. The boil is really effervescence and indicates the amt. of free oxide of Fe in the slag, the higher the oxide the harder the boil. Consideration is given of the characters and uses of the 10 recognized types of boils. The 2 succeeding articles cover each degree of boil and its significance and then certain particular cases. W. H. BOYNTON

Ten types of open-hearth boils. H. D. HIBBARD. *Iron Age* 116, 1605–6(1925); cf. preceding abstract.—The boils are grouped from dead bath to Talbot reaction. Five are discussed. W. H. B.

Open-hearth boils of high vigor. H. D. HIBBARD. *Iron Age* 116, 1671–2(1925); cf. 2 preceding abstracts.—Decarburizing effects and the Talbot reaction, effervescing steels and Martin and Siemens processes are included in the last 5 types. The boils considered in this classification are those of ordinary methods and do not include those in which slag is run off and a new slag made. W. H. B.

Waste-heat boilers in steel mills. F. H. WILLCOX AND J. C. HAYES. *Iron Age* 116, 1516–20(1925).—An abstract. Fire-tube boilers lend themselves better to waste heat uses than water-tube boilers, because: water circulation need not be rapid, less space is required and the loose scale falls to the bottom. Because of the low and steady rate of evapn. higher solids are permissible in the water. Installation costs are lower. The water must be carefully treated. A few installations are discussed and some types are illus. Gas-engine waste-heat recovery is more advanced in Europe than in the U. S. Intimate gas scrubbing is important in all cases. There should be a high rate of heat transfer and a low draft loss. Each depends on the mass velocity which is wt. of gas in lbs./hr. divided by the area of gas passage in sq. ft. W. H. BOYNTON

Time of pouring large ingots. J. H. HRUSKA. *Iron Age* **116**, 1305-6(1925).—Knowledge of the relation of time of pouring to temp. is a basis for fundamental improvement in the quality of steel. A time study of various ingots is made. "Time of pouring" is defined as the no. of min. from the first metal in the mold to the moment when the mold is filled to the sinkhead. Curves show the av. time of pouring for large steel ingots to insure best results. The temp. may be regulated so that even a "hot" steel can be poured "colder" by giving a lower speed of pouring. The exact relation of time and pouring temp. and the practical application in making ingot steel will probably be one of the fundamental improvements in quality of forging steel. W. H. B.

Bad castings and furnace scrap. H. H. HOPKINS. *Iron Age* **116**, 1252-3(1925).—The evils attributed to the use of scrap are probably overrated. W. H. BOYNTON

Metallurgy and the chemistry of the solid state. C. H. DESCH. *Chem. Age* (London) **13**, Metall. section, 17-9(1925).—An address describing the progress made in the metallography of pure metals and alloys. H. S. v. K.

Effect of temperature on metals and alloys in the notched-bar impact test. R. H. GREAVES AND J. A. JONES. *J. Inst. Metals* (1925) (advance proof), 17 pp.—Using a Charpy testing machine, G. and J. made notched-bar tests on a number of non-ferrous metals and alloys (Pb, Al, Cu, Sn, Zn, Monel metal, coinage bronze, different brasses, Al bronzes and duralumin). Test pieces were placed in baths or a furnace and kept at const temp. for 30 min and immediately broken. The temp. range was from -80 to 1000°. Curves give the relation between impact figures and temp. These show that when phase changes occur usually a max. or min. is found. Moreover, inflections when found do not necessarily imply a change of phase. The results seem to indicate that a high notched-bar impact figure coincides with good rolling properties. Maxima were found at the hot rolling temps of Zn (150°), Pb-free 70-30 brass (800°), 60-40 brass (715°), Al bronze (about 550°) and duralumin (400°). If such a connection exists there must be an intermediate range of temps. within which behavior on rolling should be worse than it is either at higher or lower temp. Comparative tests of the Charpy and Izod instruments showed that for accurate measurements the first named is preferable. H. S. v. K.

The speed of cementation of copper as a function of temperature. T. PECZALSKI AND A. LAUNFRT. *Compt. rend.* **179**, 887-90(1924).—The optimum temp. for cementation of Cu by Fe in KCl and similar salts is 900°. Temp. and time are the controlling factors. W. A. MUDGE

Cementation of metals by means of volatile salts. THADÉE PECZALSKI. *Compt. rend.* **181**, 463-5(1925); cf. *C. A.* **18**, 3135; **19**, 2022; and preceding abstract.—Cementation of metals by means of salts is more rapid when the salts are volatile at the temp. of the expts., as shown by results obtained with CrCl₃ and NiCl₂ heated in contact with Cu and Fe at 800° for 3-15 hrs. A. PAPINEAU-COUTURE

Cementation of ferrous alloys by chromium. J. LAISSUS. *Compt. rend.* **180**, 2040-3(1925).—Samples of Fe and steel were embedded in powdered ferrochromium (60% Cr and 0.29% C) and heated while protected from the furnace atm. In an ordinary case-hardening steel the following structural zones were found with the microscope. Farthest from the surface was a layer of solid soln. without pearlite, its thickness increasing with temp. up to about 1100°; next was a eutectic zone; and at the surface a brilliant coating, probably Cr carbide, formed above 1000° and increasing with time. The rate of formation of the solid soln. is given by the formula: reciprocal of time = $2.9 \times 10^{-5} \times (1.00695 \text{ raised to a power equal to the abs. temp.})$. Ten-hr. tests with electrolytic Fe and steel of 0.15, 0.40 and 0.85% C, resp., showed that at 1200° the thickness of the brilliant external coating varied inversely as the C content of the steel. At 1000° it was found only on the 0.40 and 0.85% C steels. With the ordinary case-hardening steel and ferrochromiums of different C content, this layer was thickest with the alloy of lowest C, but the thickness of the solid soln. at 1000° increased with the C content of the alloy. When exposed to an oxidizing atm. at 1000°, the plain steel and steel cemented at 1000° oxidized badly in 2 hrs., but steel cemented at 1200° oxidized very little in 37 hrs. The latter also showed good resistance to HNO₃. It is concluded that to obtain good resistance to oxidation or HNO₃, the cementation must be performed above 1100° so as to obtain the brilliant external coating. G. F. C.

Metallurgical developments in the valve and fitting industry. V. T. MALCOLM. *Mech. Eng.* **47**, 1141-3(1925). W. H. BOYNTON

Effects of cold hardening and of quenching on the elastic properties of various metals and alloys. A. PORTEVIN AND P. CHEVENARD. *Compt. rend.* **181**, 716-8(1925).—Modifications in the thermal and mechanical treatment of metals causes relatively small variations (less than 20%) in the modulus of torsion, but the internal fric-

tion, as measured by the decrement, can vary in a 3:1 ratio. This property is of importance for parts subjected to rapidly alternating stresses. A. P.-C.

The viscosity of some alloys when hot. J. COURNOT AND K. SASAGAWA. *Compt. rend.* **181**, 661-2 (1925).—The viscosity limit of a metal at a given temp. is defined as the limiting load below which the metal shows no elongation. Tests were run on various metals (wires 1 mm. in diameter) in an app. allowing of keeping the load const. in spite of the reduction in cross section of the wire and automatically registering the time-elongation curve. At 600°, the following increases in load (in kg. per mm.²) were required to pass from the viscosity limit to a rate of flow of 16×10^{-4} mm. per hr. with test wires 100 mm. long. mild steel 4.2-5.2, semi-mild steel 4.3-5.6, high-speed steel 14.0-19.0, Fe-Ni-Cr alloy (63% Ni, 11% Cr) 32.0-36.0, Si-Cr steel (2% Si, 12% Cr) 30-35.5. The following viscosity limits were found:

Temperature	350°	400°	450°	500°	550°	600°	700°	800°	850°
Mild Steel	31	20	—	8	—	4	—	—	—
Semi-mild Steel	32	21	—	9	—	4	1	—	—
High-speed Steel	—	—	49	30	—	14	7	2	—
Ni-Cr-Fe Alloy	—	—	—	—	42	32	17	7	3
S-Cr-steel	—	—	—	60	45	30	8	1	—

If the curves were plotted and produced, they would cut the resp. tensile-strength curves at the maxima which are present in the latter at temps. of 300-500° according to the nature of the steels, which explains the fall in tensile strengths above these temps.

A. PAPINEAU-COUTURE

The system lead-antimony. II. R. S. DEAN, W. E. HUDSON AND M. F. FOGLER. *Ind. Eng. Chem.* **17**, 1216-7 (1925); cf. *C. A.* **17**, 2813. —The solid soly. of Sb in Pb is 2.45% at the eutectic temp. and 0.8% (or less) at room temp. Alloys contg. more than 0.8% when quenched from elevated temps., age-harden at room temp., as indicated by increase in tensile strength. This behavior is similar to that of duralumin and can be explained in like manner.

H. S. VAN KLOOSTER

Influence of pouring temperature and mold temperature on the properties of a lead-base antifriction alloy. O. W. ELLIS. *J. Inst. Metals* **1925** (advance proof), 18 pp.—E. and his co workers studied the effect of chem. compn., pouring temp. and mold temp. on the micro structure, resistance to compression and hardness in Pb-base bearing metals. Preliminary investigation showed that replacement of Pb by Sb increased the compressive stress and the hardness. Replacing $1\frac{1}{2}\%$ Sn by Cu, E. found that the resistance to compression increased while the hardness scarcely changed. In the final expts. 2 alloys were used contg., resp., 83.1% Pb, 12.1% Sb, 4.8% Sn and 82.5% Pb, 11% Sb, 5.5% Sn, 1% Cu. The pouring temps. varied from 300° to 500°, while the mold was kept at 0°, 100° and 200°. The results obtained were: (1) mold temps. affect the properties referred to much more than pouring temps.; (2) for a given temp. of mold a rise in the pouring temp. causes an increase in the size of the cubical γ -crystals and a coarsening of the matrix; (3) an increase in pouring temp. has less effect on segregation than increase of mold temp.; (4) addn. of Cu has a pronounced effect on the microstructure; (5) the second alloy (1% Cu) shows an intermetallic reaction in the liquid state at 334°.

H. S. VAN KLOOSTER

Hot tensile strength of some copper alloys. M. SAUVAGEOT. *Chimie et industrie Special No.*, 263-76 (Sept., 1925).—The app. and method used are described in detail. Results obtained on Cu, cupro-Mn (4 and 6%), Al bronze (6 and 9%), cupro-Ni (6 and 14%), special brass (Al 3.15, Ni 1.45%) and ordinary bronze at temps. up to 1000°, with various rates of application of the load are tabulated, plotted and commented. The results are not considered sufficiently numerous to warrant drawing general conclusions; but they indicate that the Cu alloys which show best retention of tensile strength at high temps. are solid solns. (cupro-Mn, cupro-Ni) of metals with high m. p. Best results may perhaps be obtained by combining the addn. of Ni and Mn, and perhaps also of small quantities of Fe and Al. The results clearly show the importance of the rate of application of the load. Bibliography of 13 references.

A. PAPINEAU-COUTURE

The effect of low-temperature heating on the release on internal stress in brass tubes. R. J. ANDERSON AND E. G. FAHLMAN. *Engineering* **120**, 754-6, 784-6 (1925).—See *C. A.* **19**, 3457.

H. G.

High temperature-tensile curve, (a) effect of rate of heating, (b) tensile curves of some brasses. D. H. INGALL. *J. Inst. Metals* **1925** (advance proof), 12 pp.—This is a continuation of previous work (cf. *C. A.* **19**, 962) on the effect of rate of heating on the

change in tensile strength with increase of temp. Soft annealed wires of Ag, Al and Cu were subjected to a definite load, which was maintained while the wire was heated in an elec. furnace until it broke. The rates of heating were 3°, 8° and 20° per min. The same type of tensile strength-temp. curve was obtained as previously except that for lower rates of heating the wires break at lower temps. and that a larger number of smaller loops are present. D. thinks that the straight-line portion of the curves is very important to engineers and that beyond the critical inflection loop ending the straight-line portion the material may creep or flow even under small loads. Tensile strength-temp. curves are given for a number of brasses, contg. from 2.6 to 38.34% Zn. Even as little as 2% Zn introduces a second loop in the curve, which is believed to be due to space lattice distortion caused by the introduction of Zn atoms in the Cu lattice. From his curves I. concludes that brasses contg. about 88% Cu or more than 97% or less than 75% will be suitable at 250°. Brasses with about 93 and 80% Cu will resist temps. only up to 200°. These temps. are low and explain why brass used as blades in a turbine rapidly breaks down.

H. S. VAN KLOOSTER

Constitution of copper-zinc alloys containing 45 to 65% of copper. MARIE L. V. GAYLER. *J. Inst. Metals* 1925 (advance proof), 10 pp.—From a careful microscopic study of well-annealed Cu-Zn alloys contg. 47–65% Cu the following conclusions are drawn: the transformation taking place at temps. varying from 446° to 467° is not due to a eutectoid transformation of β into a mixt. of $\alpha + \gamma$. At 446° between approx. 61 and 54% Cu there is the equil. α , β and β' . Above the line $\alpha + \beta$ coexist, below $\alpha + \beta'$. From 54 to 50% Cu and at temps. varying from 446° to 467°, β changes to β' . G. draws a dotted (hypothetical) line below which β' exists. The area between this line and the full drawn line above which β exists represents $\beta + \beta'$ in equil. No change in structure could be detected by quenching from the β -field or the β' -field. Ten photomicrographs and 3 tables are included in the article.

H. S. v. K.

The β -transformations in copper-zinc alloys. J. L. HAUGHTON AND W. T. GRIFFITHS. *J. Inst. Metals* 1925 (advance proof), 9 pp.—The authors have studied the changes of elec. resistance with the temp. for a number of Cu-Zn alloys contg. 62.7–45.7% Cu. The alloys were cast in the dimensions $7 \times 1 \times 1.5$ in., placed in a tubular furnace kept at uniform temp. and the relation between temp. and resistivity automatically registered. The results are in good agreement with the data obtained by Gayler (preceding abstract) and the diagram drawn is very much like Gayler's. There is a horizontal transition line at 453° extending from 62.7% Cu to 54.5%. The change from β to β' takes place at temps. varying from 453° to 470° between the limits 54.5% Cu and 50.5%. From 50.5% Cu to 45.7% Cu (the lowest Cu-contents of the alloys investigated) the transition temp. is 470° (coexistence of β , β' and γ). At room temp. the limits of the β' area are 53.5% Cu and 50%, differing slightly from those existing at temps. between 450° and 470°.

H. S. v. K.

α -Phase boundary in the copper-zinc system. D. STOCKDALE. *J. Inst. Metals* 1925 (advance proof).—As a result of slow diffusion previous workers invariably reported the max. soly. of Sn in Cu in the solid state as too low. Only recently it was found that the soly. was at least 15%. S. redetd. the position of the solidus by slowly heating to the quenching temp., annealing for 2 hr., followed by quenching in water and microscopic examn. Summarizing the results, S. finds that the solidus line extends from the m. p. of pure Cu to a point where the fields of α , $\alpha + \text{liq.}$ and $\alpha + \beta$ meet at 13.3% Sn and 799°. There is another triple point at 15.3% Sn and 590° where the areas of α , $\alpha + \beta$ and $\alpha + \beta'$ meet. A third triple point at 16% Sn and 518° (coexistence of α , β' and δ) marks the extreme limit of soly. of Sn in Cu in solid solution.

H. S. v. K.

Constitution of alloys of aluminium, copper and zinc. D. HANSON AND MARIE L. V. GAYLER. *J. Inst. Metals* 1925 (advance proof), 45 pp.—This work was undertaken (1) to confirm or disprove the existence of the non-variant points 0_1 , 0_2 , 0_3 , 0_4 and 0_5 as found by Jareš (cf. C. A. 13, 2178) and (2) to clear up the discrepancy in the results of Jareš and of Haughton and Bingham (cf. C. A. 15, 2817) with regard to the 0_4 point. Thermal curves were taken of alloys whose Cu content was const. (varying in each series in steps of 5% from 0 to 25%) and whose Al contents varied in steps of 5% from 0–100%. In addn. to the thermal work a detailed study of photomicrographs of well-annealed and slowly cooled samples was undertaken. The results of J. with regard to the 0_1 , 0_2 , 0_3 and 0_4 points were confirmed. The point 0_5 lies apparently outside the field investigated by H. and G., although J. gives its Cu content as 23%. Complete diagrams are given for each of the 5 series of alloys. Indicating the solid soln. rich in Zn by Zn and that rich in CuZn₄ by CuZn₄, the authors find that at the non-variant point 0_5 the following reaction takes place: $\text{liq.} + \text{CuAl} \rightleftharpoons \beta + \text{CuZn}_4$.

Two more non-variant points at which changes in the solid state take place were discovered: α_8 (compn. 9% Cu, 9% Al) at 265°, reaction: $\beta + \text{CuZn} \rightleftharpoons \text{CuAl} + \text{Zn}$ and α_7 (compn. 24% Cu, 21% Zn) at 270°, reaction: $\beta + \text{CuAl}_2 \rightleftharpoons \text{CuAl} + \text{Al}$. The β -transformation of the AlZn system is depressed by the addn. of Cu until the presence of CuAl causes it to take place at 245°.

H. S. VAN KLOOSTER

Physical properties of the copper-cadmium alloys rich in cadmium. C. H. M. JENKINS. *J. Inst. Metals* 1925 (advance proof), 8 pp.—Alloys of Cd and Cu contg. from 0 to 5% Cu (those between 5 and 70% Cu are brittle and useless) were made up in the cast, in the rolled and in the rolled and annealed states. These were tested for density, tensile strength, elongation, hardness, elec. resistance and microstructure. Addn. of 3% Cu raises the tensile strength of pure Cd in the cast state from 5.4 tons/sq. in. to 9.6 tons, while the elongation falls from 50 to 5%. The Brinell hardness increases from 25.5 to 41.5. When more than 3% Cu is added the tensile strength does not materially increase and the elongation becomes very small as a result of the presence of a large proportion of a brittle phase (CuCd)₃.

H. S. v. K.

Properties of some aluminium alloys. HARRY HYMAN. *J. Inst. Metals* 1925 (advance proof), 21 pp.—The object of the expts. was the prepn. of Al alloys which would give good mech. tests when cast in sand molds and at the same time resist atm. and salt-spray conditions. In previous researches too much stress has been placed on mech. tests for chill cast alloys. The quaternary alloys selected were the result more of practical than of theoretical considerations. They were made up by dissolving an alloy of 75% Cu, 15% Ni and 10% Fe and an intermediate alloy or hardener contg. 50% Al, 37.5% Cu, 7.5% Ni and 5% Fe in the required amts. in Al. The alloys used contained about 94% Al, 3.0% Cu, 0.6% Ni, 0.8% Si. In one set of expts. the Fe content was varied from 0.76% to 2.91%. A gradual improvement of mech. properties was noticed up to about 2% Fe. A suitable alloy, which is also reliable under alternating conditions of stress and withstands corrosion in air and sea-spray successfully, had the compn. 93.88% Al, 2.89% Cu, 0.62% Ni, 1.75% Fe, 0.1% Mg and 0.76% Si. In another set of expts. the Mg content of this alloy was varied from 0.1 to 1.03%. An increase of Mg content to 0.5% produces an alloy which responds readily to heat treatment.

H. S. v. K.

Aluminium-silicon alloys (Alpax). A. PETIT. *Compt. rend.* 181, 718-9(1925).—Optimum results were obtained by refining with 0.5-1.0% Na at 775°, and casting at 675° with as rapid cooling as possible, the effects of the Na (up to 1%) being inversely as the rate of cooling. Only part of the Na is used up in the refining proper, the remainder forming a ternary constituent with the Al and Si. None of the special metals tried (K, Ca, Mg, Ce, Zn, Cu, Sb, Ni, Co, Bi, Mn, Sn, Fe, Cd, Pb, 50% CuMg, CuP (15% P)) could replace refining with Na, and addn. of the latter should be made immediately after addn. of the special metal. Even traces of Fe are objectionable. Addn. of other metals (except 2-5% of Cu, Mg, CuMg and MgZn) had little effect. The Brinell hardness, shearing strength, deflection and resiliency after addn. of 2-5% Mg, CuMg and MgZn are tabulated and compared with those of ordinary Alpax. They are affected by heat treatment, especially when sand molds are used, the cooling effects of chill molds being sufficient to harden the alloy. Annealing at 400° for 1 hr. and quenching at 500° decrease the hardness. Aging at ordinary temp. hardens the alloys by pptn. of Mg_2Si or Al_2Cu , as with duralumin; max. hardening is obtained after about 70 hrs.; tempering at 100° accelerates the hardening, but the temp. should not be raised above 125-50° so as not to reduce the hardness.

A. PAPINEAU-COUTURE

Notes on the iron-nickel and iron-cobalt equilibrium diagrams. L. GRENET. *J. Iron and Steel Inst.* 1925 (advance proof), 9 pp.—G. makes a no. of suggestions regarding the diagrams Fe-Ni and Fe-Co, illustrated by some simple exptl. analogies. It might be possible that the α - and the γ -areas are sep'd. by a loop-shaped area in which α and γ are in equil.

H. S. VAN K.

The equilibrium diagram of the iron-carbon-nickel system. TSUTOM KASE. *Sci. Repts. Tohoku Imp. Univ.* 14, 173-217(1925).—Thermal and magnetic analyses, hardness tests, and microscopic exams. are reported for the Fe-Ni system, and the binary equil. diagram is concluded to be of the solid-soln. type. The A_3 change falls steadily with increasing Ni content down to -190° at 35% Ni and occurs in a temp. interval rather than at a point. Ni dissolves C up to 0.55%, forming a eutectic with C at 1318° and 2.22% C. Ni_3C is very unstable and cannot be detected with the microscope. The ternary diagram was worked out and is described and illustrated by a sketch of a model. Photomicrographs of typical structures are also shown. For etching specimens with over 25% Ni either strong HNO_3 or hot HCl was used. No ternary eutectic was found. A binary eutectic contains 4.3% C with no Ni and de-

creasing C down to 0.3% with increasing Ni up to 30%. Cementite occurs in the ternary alloys with 0 to about 30% Ni, with over 0.1% C. With increasing Ni, the A_1 transformation is lowered and is difficult to detect with over 10% Ni, but is almost independent of the C content. With increasing Ni, the A_2 and A_3 points are rapidly lowered and the C content at the eutectoid point decreases down to 0.3% at about 35% Ni. Six plates of curves accompany this paper. G. F. C.

Effect of low manganese contents on the strength of nickel steels. P. DEJEAN. *Chimie et industrie Special No.*, 277-9 (Sept., 1925). —D. shows that, within the range of 0.1–0.5% Mn: (1) with a given C content, the proportion of Ni to which the Mn is equiv. increases with decrease in the Ni content; (2) with a given Ni content, the action of the Mn increases fairly rapidly with increase in C content, attains a max. and then decreases, the max. for various Ni contents occurring at lower C contents as the Ni increases. A. PAPINEAU-COUTURE

Dendritic segregation in iron-carbon alloys. ALBERT SAUVÉUR and V. N. KRIVOBOK. *J. Iron and Steel Inst. (London)* 1925 (advance proof), 6 pp.—A microscopic study was made of the structure of pure electrolytic Fe, melted *in vacuo* and in air. Since no pearlite was found in the sample which on analysis contained 0.06% C, it is inferred that α -ferrite takes up at least 0.06% C in solid soln. In the sample melted in air, Le Chatelier's Cu-reagent failed to show dendritic structure, hence oxygen cannot produce dendritic segregation. On the other hand, the introduction of either P or C, or both together, into Fe results in persistent dendritic segregation. H. S. VAN KLOOSTER

Chromium-iron equilibrium in carbides recovered from annealed 2.23% chromium steels. E. D. CAMPBELL and J. F. ROSS. *J. Iron and Steel Inst. (London)* 1925 (advance proof), 11 pp.—The authors detd. the atomic ratios of Cr, Fe and Mn in the carbides recovered from annealed steels having practically the same ratios of Cr, Mn and Fe, but varying C content. The Cr and Mn contents were 2.23 and 0.24%. The Fe content was around 96%, while the C content varied from 0.36 to 1.62%. The carbides were recovered electrolytically in a soln. contg. 40 cc. of concd. HCl in 1 l. From the data obtained by analyzing the carbides a graph is prepd. giving the atomic percentages of Fe, Cr and Mn as a function of the % C present in the steel. With increase of C, the Fe increases from 70.13 to 90.02%. The Cr decreases from 28.86 to 9.37% and the Mn from 1.01 to 0.60%. A comparison was made of the soly. in α -Fe of the carbides of a Cr steel and those of a pure C steel, both having 0.45% C and both annealed at the same rate. The result was that for the Cr steel the soly. was about 6 times that of the C steel. H. S. VAN KLOOSTER

Effect of other elements upon migration of carbon in steel. E. G. MAHIN, R. C. SPENCER and C. R. HAYNER. *Proc. Indiana Acad. Sci.* 34, 177-80 (1925).—This paper is introductory to an extensive investigation into the influence of other elements on the rate of carburization and C migration. Short discussions of the nature of gray and of malleable Fe and of the case-carburizing process are first given. Rods of ingot Fe were driven into holes in gray and malleable Fe and the samples then heated for 5 hrs. from 750° to 950°. The diffusion of the C was studied with the microscope. The cementation was more rapid from the gray Fe. The expts. are considered to prove that solid C can dissolve in and migrate through Fe. The difference in effect from the 2 kinds of Fe is considered due to differences in C, Mn, or Si content. Further expts. showed that increasing the amt. of silicide or of ferromanganese in a carburizing mixt. of gray Fe drillings increased the tendency of Fe to absorb C. G. F. C.

The formation of martensite in carbon steels. KÔTARÔ HONDA. *Sci. Repts. Tohoku Imp. Univ.* 14, 165-72 (1925).—The A_1 transformation consists of, first, the change of γ -Fe dissolving C into α -Fe dissolving C and second, the change of the latter into ferrite and Fe₃C. During rapid cooling the first change occurs below 300° and the second change cannot occur on account of viscosity at low temp. Thus martensite is obtained. If the second change partly takes place, troostite results. The first change can occur even at low temp., so it is difficult to retain austenite in plain C steels, but this is not true of alloy steels. The C atoms in martensite probably take positions in the center of the face of an elementary cube of the Fe space lattice, causing local distortion and acting like diagonal supporters in the lattice. The position of the C atoms cannot be found with X-rays because of their arbitrary distribution. Ni atoms may act in the same way as C atoms under certain conditions. The diffusion of the X-ray spectrum lines of martensite is explained by the irregular distortion of different parts of the lattice by internal stress and the assumption of very fine crystals is not necessary. G. F. C.

Equilibrium at high temperatures in the iron-carbon-silicon system. M. L. BECKER. *J. Iron and Steel Inst.* 1925 (advance proof), 14 pp; *Engineering* 120,

412-3.—B. has carburized in an elec. tube furnace at temps. varying from 800° to 1100° Armeo Fe, and 3 Fe-Si alloys (C contents 0.1% or less) contg. 1.33, 2.54 and 4.22% Si, resp. The cementing medium was powder obtained from graphite electrodes (99% C). From the carburization curves (% C against time in hrs.) it is seen that most of the C is taken up in the first 40 hrs., the increase for the period from 150 to 300 hrs. being very small. For pure Fe the amts. of C taken up at different temps. agree with those of previous workers above 940°, below this temp., B.'s values are lower. At 900° no C is dissolved. From the isotherms showing the % of C as a function of Si-percentage, it appears that, as Si increases, the soly. of C at const. temp. between 1100 and 940° decreases, the temp. itself having the smaller effect, the higher the Si content. Below 940° the soly. drops rapidly to 0% C, probably around 920°. B. concludes that the graphite-ferrite eutectoid is formed at about 900° and that it contains only 0.05% C.

H. S. VAN KLOOSTER

Heat treatment of steel dies. C. S. SMITH. *Iron Age* 116, 608-810(1925).—Detailed directions, based entirely upon practical experience, are given for the oil-hardening treatment of non-shrinkable and water-hardening steels.

The annealing of electrolytic iron in a vacuum. R. HUGUES. *Compt. rend.* 180, 2043-5(1925).—The evolution of gas and the variations in structure, magnetic and mech. properties of electrolytic Fe were studied under different conditions of heating in a furnace constructed so that the heating element and inner muffle were enclosed in an outer water-cooled tube within which a vacuum of 2 mm. was maintained. For a const. period of 2 hrs., the vol. of gas evolved increased steadily with temp. With const. temp., the vol. evolved increased with time to a max. and then decreased to zero. The sample treated 6 hrs. at 730° gave 30 cc. of gas, or 1.5 times its own vol. This gas was CO₂ 6%, CO 34%, H 50% and hydrocarbons 3%. The curves of magnetic properties, given in a diagram, show more rapid variation than is obtained by heating in an oxidizing atm. The variations in hardness and other mech. properties show the effect of the loss of occluded gas as well as recrystn., the changes commencing at lower temps. and being more gradual than in the normal atm. For metallographic study, repolishing of vacuum-annealed specimens was not necessary. Also in *Rev. métal.* 22, 764-75(1925).

G. F. C.

Influence of strain and of heat on the hardness of iron and steel. ALBERT SAUVEUR AND D. C. LEE. *J. Iron and Steel Inst.* 1925 (advance proof), 7 pp; *Engineering* 120, 433. The authors have performed some interesting expts. on the tensile strength and Brinell hardness of pure Fe and steels (contg. 0.1, 0.3, 0.5, 0.75 and 1.25% C) at temps. between 20° and 600°. The tensile strength slightly decreases around 100° and then rises to a max. at the blue-heat range (between 250° and 400°). Similar results are obtained for the hardness except for the min. around 100°, which is absent in Fe and low-C steels. The increase in strength and hardness in the blue-heat range is ascribed to a strengthening and hardening of the ferrite. The effect of strain on hardness was investigated by testing the hardness near the broken ends of test pieces ruptured at various temps. The hardness is increased the higher the temp. at which the strain occurred, being max. after straining in the blue-heat range. Straining at temps. between 580° and 680° decreases the hardness. This range may be considered the dividing line between hot and cold working. Finally test pieces broken at room temp. were cut in several sections and tested for hardness both in the strained condition and after heating to different temps. The result is a further increase in hardness, with a max. after heating to blue heat. To soften the strained material it is necessary to heat Fe above 425°, 0.1% C steel above 500° and 0.5% C steel above 600°.

H. S. VAN KLOOSTER

A study of the correlation of the remanent magnetism and specific resistance of some pure iron-carbon alloys. I. D. CAMPBELL. *Trans. Faraday Soc.* 1925 (advance proof).—Thirteen test bars were prepd., one of purest electrolytic Fe vacuum-annealed, and 12 of pure Fe with varying C content from 0.05 to 1.50%. These were annealed and hardened in various ways. The specific resistances were measured at 25° between knife edges in the usual way and the remanent magnetism and other magnetic properties were measured by means of a delicate magnetic balance. The specific resistance increases almost proportionally to the C content. The magnetic resistance increases more slowly than the specific resistance up to the eutectoid concn., but more rapidly in hypereutectoid samples. The internal magneto-motive potential increases rapidly with carbide concn. up to 0.6%, after which there is little or no further increase.

S. K. ALLISON

Mechanical and magnetic hardness. K. HEINDLHOFFER. *Iron Age* 116, 606-8 (1925). Alternating-current magnetic readings were taken on a large number of hardened ball-bearing rings, most of which had been heat-treated in quantity production

according to standard shop practice. The method adopted employed a circular current in the ring, with a const. magnetizing current, balanced search coils and only one phase used. The magnetic readings were correlated with mechanical hardness readings detd. by the Rockwell and scleroscope methods. In the av. case, a simple correlation was found to exist within the hardness range investigated. This correlation was greatly improved by taking the mean of six Rockwell readings per ring instead of one. A satisfactory agreement was shown when the two methods of testing were compared on four different lots of fifty rings each which had been given differing heat treatment. Similar results were obtained in the investigation of dented and otherwise defective rings returned to the manufacturer.

D. F. MCFARLAND

Natural water corrosion and hydrogen-ion concentration. J. R. BAYLIS. *Chem. Met. Eng.* 32, 874-5 (1925).—The solubility of iron in alk. natural waters is low (0.1 p. p. m. at a p_H of 8.5) and such waters form an impervious coating of iron oxide in pipping. Pits are covered by tubercles contg. solns. at a p_H of 6.0 and rich in SO_4^{--} and Cl^- .

E. L. CHAPPELL

Carbon dioxide in corrosion of iron. T. FUJIMARA. *Chem. Met. Eng.* 32, 810-11 (1925).—Polished pure iron etched with 5% HNO_3 in alc. remained bright for 15 days under CO_2 -free water, while similar specimens, unetched, rust in 10 min. It is concluded that CO_2 acts in the corrosion process to remove the protective film of $Fe(OH)_2$ at the metal surface.

E. L. CHAPPELL

Influence of metallic elements on the corrosion of iron and steel. YUHATIRÔ UTIDA AND MAKOTO SAITÔ. *Sci. Repts. Tokoku Imp. Univ.* 14, No. 3, 295-312 (1925); [in English].—The authors studied the effect of Ni, Cr, Si, Cu, Mn and W on the corrosion of Fe and steel. The samples were prepd. by casting pure Fe alloyed with the above metals in a metallic mold. The cast alloys were cut in rods 4-5 cm. long and 5 mm. in diam. The clean, polished rods were immersed for 24 hrs. at room temp. in beakers contg. 10% HNO_3 , 10% HCl , 10% H_2SO_4 and the loss of wt. was recorded. Oxidation at high temp. was measured by placing the specimens for one hr. in an elec. furnace at 1100° and recording the increase in wt. The acids used corroded the samples in different degrees. For instance Fe contg. 14% Cr is not attacked by HNO_3 , but is easily corroded by HCl of the same concn. Increasing amts. of Ni, Si and W decrease the corroding action of the acids and the oxidation in air at 1100° . Addn. of Mn always increases the corrosion. Cu increases the attack by HNO_3 , while HCl and H_2SO_4 affect the Cu alloys little or not at all. The combined effect of two metals on the corrosion of Fe and steel gave curious results. While Fe contg. Cr is easily corroded by HCl and Fe contg. Ni very little, the combined effect of both produces alloys highly resistant to HCl and to H_2SO_4 . For steels the best results in HCl were obtained when the C contents varied between 0.1 and 0.7% and in H_2SO_4 when 0.3% C was present. Mixed acids corrode the alloys to a greater extent than the pure acids. An alloy contg. 0.4% C, 20% Cr and 8% Ni, resembling Krupp's rustless steel V₂A, has the best corrosion-resisting properties, both in the pure and in the mixed acids.

H. S. v. K.

The corrosion of tanks containing fused nitrate baths. M. SAUVAGEOT. *Chimie et industrie Special No.*, 280-2 (Sept., 1925).— $NaNO_3$ - KNO_3 baths, frequently used for tempering steels and especially for annealing and hardening Al alloys, attack mild steel from about 500° , the rate of corrosion gradually increasing because of decompn. of the bath with formation of nitrites and liberation of free alkali. A 4:1 KNO_3 - $NaNO_3$ mixt., formerly recommended for quenching light alloys, attacks mild steel even more rapidly than 1:1 $NaNO_3$ - KNO_3 . Chrome steels with high Cr contents resist corrosion up to 650° ; but are not practical because of their cost and difficulty of working. Gray Fe, though less resistant than chrome steels, is far superior to mild steel, especially if the bath is not heated much higher than 500° .

A. PAPINEAU-COUTURE

Action of sodium chloride solutions on ferrous metals. RENÉ GIRARD. *Compt. rend.* 181, 552-5 (1925).—Tests on the corrosion of cast iron and steel immersed in 20-g.-per-l. $NaCl$ solns. showed that: when the soln. is not aerated both the Fe and steel lose wt. steadily and at approx. the same rate; in aerated soln. the steel loses in wt. somewhat more slowly than in non-aerated soln., while with cast iron the oxidation products adhere to the metal and form a protective coating.

A. PAPINEAU-COUTURE

Flue explosions (HAMILTON) 21. Economizes fuel in tinning (FISKE) 21. X-ray examination of inner structure of strained metals (ONO) 2. Use of slag accumulations in industry (ELLERSIEK) 20.

JONES, WM. R.: **Tin Fields of the World.** London: Mining Publications, Ltd. 30s. Reviewed in *Mining J.-Press* 120, 995 (1925).

Treating cupriferous molybdenum ore. NORSKE MOLYBDAENPRODUKTER A.-S. Norw. 41,615, July 13, 1925. After the ore is concd. by flotation the coarser material is screened under a spray of water at high pressure.

Condensing zinc and cadmium. T. GJERSTAD. Norw. 41,476, June 15, 1925. The gas mixt. from a metallurgical furnace is given a spinning rotation by introducing it with a great velocity in tangential direction into the lower part of a vertical cylindrical or conical condenser through one or more slits built tangentially in the circuit of the condenser.

Vanadium from iron ore. D. W. BERLIN. Swed. 58,887, June 10, 1925. The ore is reduced by smelting and the slag is removed. The liquid metal is refined with metallic oxides in such a way that a slag high in V is obtained, from which the V is reduced in the form of ferrovanadium.

Copper from ores. T. J. TAPLIN, W. G. PERKINS AND METALS PRODUCTION, LTD. Brit. 233,029, Jan. 29, 1924. In treating oxidized Cu ore by heating in a reducing gas to render it amenable to leaching with an ammoniacal solvent (as described in Brit. 185,242; C. A. 17, 53), the material is cooled from the reduction temp. in N, CO₂ or other reducing or inert gas, *e. g.* down to 100° or lower.

Desulfurizing and concentrating sulfide iron ores. W. S. MILLAR. U. S. 1,567,378, Dec. 29. Commuted Fe sulfide ore is subjected to the action of SO₂ in a muffle or other furnace, gas contg. steam and at least 50% SO₂, being used. The ore is continually agitated and the temp. is progressively raised but does not exceed 950°. Surface fusion of the ore is thus avoided and Fe₃O₄ is formed.

Iron and sulfur from sulfide ores. H. CONDER. U. S. 1,567,916, Dec. 29. The crushed ore is heated in a closed retort and H is brought into contact with it to reduce the sulfide to FeS. S is recovered from the H₂S produced and the FeS is treated with HCl to form FeCl₂ and H₂S. FeCl₃ and Fe are formed from the FeCl₂ (in diaphragm cells).

Reducing ores and producing cement. A. FERGUSON. U. S. 1,567,934, Dec. 29. A vortex of reducing gases is formed above melting temp. and Fe oxide ore or other finely divided ore is fed in a cloud to the vortex zone. Reduced metal is deposited by centrifugal force on a surrounding wall and collected by gravity in a receptacle below the vortex zone.

Recovery of gold by amalgamation. C. C. HAMILL. U. S. 1,568,276, Jan. 5. A base plate for amalgamation may be formed of Cu and is covered with a mixt. of Hg and Ag filings which produce a rough surface.

Recovering copper from ores. J. W. NEILL. U. S. 1,568,461, Jan. 5. A Cu-bearing soln. formed by treating Cu ore with acid is brought into contact with an aggregate comprising coke and Fe and the resulting product contg. coke and Cu is smelted.

Uranium. R. W. MOORE. U. S. 1,568,685, Jan. 5. In sepg. U from less fusible impurities the metal is fused under inert conditions (*e. g.*, in A) and the fused metal is withdrawn from the less fusible associated material.

Production of volatile metals. H. G. FLODIN AND E. G. T. GUSTAFSSON. Swed. 59,721, Oct. 20, 1925. The finely ground ore contg. one or more sulfides of volatile metals and perhaps other metal sulfides is mixed intimately with metallic Fe in finely pulverized state, for instance spongy iron, pig iron or ferro-alloys, and the mixt. is pressed to briquets, if necessary with a suitable binder. The briquets are heated to such a temp. that the volatile metals will give off their S content to the Fe and are distd. off and taken care of in usual ways. The method is especially suitable to complex zinc ores. Cf. C. A. 19, 2630.

Recovering tin from tinned scrap iron. REYMERSHOLMS GAMLA INDUSTRI A.-B. Swed. 59,566, Sept. 30, 1925. The material is treated with a soln. of CuSO₄ contg. chlorides of alkali or alk. earth metals or both. These latter substances also may be added before or during the process, directly or in the form of other compds. which will form such chlorides when brought together.

Treating metalliferous waste. W. VOOS. Brit. 233,247, Oct. 30, 1924. Brass ashes or slags or similar wastes in the form of dust, sand or sludge, are leached with acid, NH₃ soln. or other reagent which will free them from oxide and the residue is subjected to mech. sepn. to recover free metal.

Ore crusher. J. W. ERICSSON. Swed. 58,857, June 3, 1925.

Open-hearth furnace for chemical and metallurgical operations. A. HELFENSTEIN. Brit. 233,540, June 2, 1924.

Treating zinc powder in a moving container. F. THARALDSEN. Norw. 41,381, May 25, 1925. The container is provided with projections which act upon the pulverulent mass while the container is in motion.

Iron refining. MATHIESON ALKALI WORKS. Brit. 232,963, April 23, 1924. Scrap Fe or other cast Fe is desulfurized by treating the molten metal with soda ash, potash, CaO , BaCO_3 , or MgCO_3 , alone or mixed with CaCO_3 . An app. is described.

"Rustless iron." F. M. BECKET. U. S. 1,567,898, Dec. 29. In making a corrosion-resisting Cr alloy, a low-C metal contg. over 5% Cr and over 40% Si is produced under elec. furnace conditions, and the product is then treated with an oxide such as Cr oxide to oxidize the Si.

Tempering iron articles. HJALMAR LOEFQUISTS ELEKTRISKA A.-B. Swed. 58,967, June 25, 1925. The articles are elec. heated in a closed chamber and cooled by gases or liquids introduced into the chamber, which also exclude the air.

Dephosphorizing iron and steel. I. M. SCOTT and S. PEACOCK. U. S. 1,568,186, Jan. 5. In removing P from Fe and steel, there is added to the molten metal, in a basic open-hearth process, CaCrO_4 , Cr_2O_3 or other O-carrying compds. contg. combined Cr sufficient to dephosphorize a substantial portion of the Fe phosphide present in the mass.

Briquets for treating iron, etc. D. H. CROSSER. U. S. 1,568,271, Jan. 5. Briquets for refining or alloying Fe are formed of finely divided "modifying elements" such as Ni, ferro-Mn, ferro-Si, ferro-Cr and Al disseminated throughout a ceramic binder, *e. g.*, clay.

Silicon manganese chromium steel. AVESTA JERNVERKS A.-B. Swed. 58,966, July 1, 1925. Fe-Mn is added in the Martin furnace immediately before the steel is discharged. The steel is tapped into a large ladle and is here alloyed with Fe-Si and Fe-Cr, which are previously reduced and decarbonized in an elec. furnace.

Steel for railway rails. H. J. FORCE. U. S. 1,568,822, Jan. 5. Rails are made from steel contg. C 0.30-0.85, Mn 1.15-1.90, P not over 0.05, and Si not over 0.30%.

Heat treatment of steel. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 232,970, April 26, 1924. Decarbonization of steel during heat treatment with reducing gases such as H is prevented by coating the steel with Cu, brass or other Cu-contg. metal. The coating may be applied electrolytically or as a separable shell.

Coating steel, etc., with nickel or applying other metal coatings. J. A. SMITH. U. S. 1,567,625 Dec. 29. Articles of steel or other metal to be coated are provided with an intermediate layer of a metal such as Zn, Sn, Cd or Ag having a relatively low m. p. and with an overlying layer of another metal, *e. g.*, Ni, of higher m. p. than the intermediate layer. The article and coating is then heated (to about 315° with steel articles coated with Zn and Ni) to effect an alloying of the metal of the intermediate coating with the metal of the article, without effecting any substantial alloying of the outer layer.

Alloy for metallurgical carbonizing boxes. C. E. MACQUIGG. U. S. 1,568,174, Jan. 5. Carbonizing boxes are formed of an oxidation-resisting alloy contg. Fe, Ni or Co together with Cr 20% or more and Cu 5-7%.

Bearing metals (alloys). J. KARAFIAT. U. S. 1,568,224, Jan. 5. Alloys for bearings are formed of Sn 20-52, Pb 28-68, Sb 12-20% and small quantities of Hg, Bi or Cd.

Nickel copper alloy. J. W. LEHR. U. S. 1,567,066, Dec. 29. A non-corrodible alloy adapted for pipes, valves, etc. comprises Ni 20-40, Sn 1-6, Pb 1-8% and the remainder of Cu, and contains no Zn. Cf. C. A. 19, 2806.

Chemical treatment of articles of low-carbon chromium alloys. AKTIEBOLAGET FERROLEGERINGAR. Swed. 59,171, July 29, 1925. The surfaces are freed from adhering oxides by mech. or electrolytic treatment or by treating with dil. mineral acids, H_2SO_4 or HCl . The articles are then exposed to the action of the dry hydrate of some suitable oxidic acid or a mixt. of such hydrates, for instance concd. H_2SO_4 or H_3PO_4 or both.

Alloy for soldering aluminium. E. D. SCHWALM. U. S. 1,567,396, Dec. 29. An Al solder is prepd. by fusing Cu 15, and Sn 80, with Na 5 parts and then introducing Zn 5 parts.

Selective case-hardening. C. G. WHINFREY. U. S. 1,567,632, Dec. 29. A compn. for use in selective case-hardening comprises fireclay 60, Na silicate 75, kaolin 26, borax 1 and a thinner such as NaOH 3-12 parts which is capable of removing grease and oil from the article treated. This compn. may be used as a C-resisting paint.

Impact test for indentation and hardness. A. L. HAAS. Brit. 233,205, July 31, 1924. Mech. features.

Annealing steel sheets. J. T. HAY. U. S. 1,567,143, Dec. 29. Sheets of chrome steel for annealing are heated in an oxidizing atm. to form a sol. scale on them which may be removed by pickling.

Steel-casting apparatus. D. LARNER. U. S. 1,568,854, Jan. 5. Molten metal is protected from the air while flowing from a ladle to molds.

Pulverizing aluminium or other metals in contact with lubricants. HARTSTOFF-METALL AKT.-GES. HAMETAG. Brit. 232,993, April 28, 1924. If olive oil is added to Al, substantially spherical particles are obtained; with an admixt. of paraffin leaf-shaped Al particles are formed.

Forming continuous soft metal bars from lead or other molten metals. B. S. ELROD and W. HECOR. U. S. 1,567,363, Dec. 29. Mech. features.

Melting metals by a flame from pulverized coal or other solid fuel. W. C. WILLIAMS. U. S. 1,567,219, Dec. 29.

Coating for protecting iron molds. D. H. MELOCHE. U. S. 1,568,234, Jan. 5. A coating compn. is formed of fireclay or other inert refractory compn. mixed with lampblack and with a small proportion of sol. silicate which serves merely as a binder. Cf. C. A. 20, 37.

"Soldering solution." C. B. HULL. U. S. 1,568,669, Jan. 5. A mixt. formed from Sb_2O_3 , HCl , ZnCl_2 and glycerol and H_2O is used.

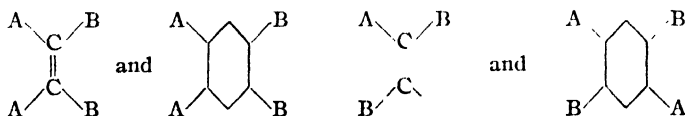
Protecting copper tubes and fittings from corrosion. F. VON WURSTENBERGER. Brit. 233,648, May 8, 1924. Finely divided metals such as Fe, Zn and Al, which are electropositive to Cu, are added to elec. conductive water which comes into contact with Cu tubes, fittings, etc.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

One hundred years of benzene. HELMUT WOLTER. *Gas u. Wasserfach.* 68, 778 (1925). A brief historical discussion. WM B. PLUMMER

Determination of the configuration of geometrically isomeric carbon compounds. A. LANGSETH. *Z. physik. Chem.* 118, 49-64 (1925).—L. draws comparisons between the phys. properties of compds. of the type



with special reference to the m. p., although the b. p., d., n , M_D , soly. in H_2O , dissoc. const. and heat of combustion are considered where such data are available. In general the *trans*-compds. of each series (aliphatic and aromatic) have a higher m. p. than the *cis*-compds. There appears to be no general rule relating the other properties. There appears to be a similar relation in N compds., though the data available are not sufficient thoroughly to test the idea.

Marine animal oils, squalene and spinacene. EMILE ANDRÉ AND HENRI CANAL. *Compt. rend.* 181, 612-4 (1925).—Analysis of the liver oils of *Cetorhinus maximus* (I) and of *Scymnus licha* (II) gave the opportunity to det. whether squalene found by Tsujimoto in I (cf. C. A. 10, 2989; 14, 360) and spinacene found by Chapman in II (cf. C. A. 11, 1420; 12, 1766) are identical compds. The oil of I contained an unsatd. hydrocarbon product which formed 2 *HCl* salts, $\text{C}_{28}\text{H}_{46} \cdot 6\text{HCl}$ and $\text{C}_{30}\text{H}_{50} \cdot 6\text{HCl}$, m. 107-8° and 144-5°, resp. The oil of II likewise contained a hydrocarbon product which yielded 2 *HCl* salts, $\text{C}_{30}\text{H}_{50} \cdot 6\text{HCl}$ and $\text{C}_{31}\text{H}_{52} \cdot 6\text{HCl}$, m. 107-8° and 143-5°, resp. In each case the compd. with the lower m. p. was the more sol. in Me_2CO . On mixing the 2 *HCl* salts which m. 107-8°, the m. p. did not change, in spite of their having different chem. compns. On the contrary the 2 *HCl* salts which m. 143-5° gave a mixt. which m. 139-40°. The results indicate in general that spinacene and squalene are not definite compds. C. J. WEST

Ketopropenes. ATHEY KERNER. *Maryland Acad. Sci. Bull.* 5, No. 2, 10-2 (1925).—A brief general review of properties. About 15 references are given. C. J. WEST

Derivatives of acetyleneglycerol, $\text{HC} : \text{CCH}(\text{OH})\text{CH}(\text{OH})\text{CH}_2\text{OH}$. R. LESPIRAU. *Compt. rend.* 181, 557-8 (1925).—If $\text{HC} : \text{CCH}(\text{OH})\text{CH}_2\text{ClCH}_2\text{Cl}$ (cf. C. A. 19, 813) is treated with dry KOH in Et_2O , the usual method followed in such reactions, an amorphous yellow powder, of high mol. wt. (462 by cryoscopy), contg. Cl and giving a red-brown soln. in HOAc, is formed. But by agitating in the cold with excess 10% aq. KOH *acetyleneepichlorohydrin* $\text{HC} : \text{CCH}(\text{OH})\text{CH}_2\text{Cl}$, is obtained in 85% yield,

liquid, b_{20} 58–60°, d_{20} 1.1592, n_D 1.472, α 28.14° (theoretical 27.60), forms ppts. with the usual reagents of C_2H_2 derivs. On standing several days at 100° with distd. H_2O *acetylene monochlorohydrin* $HC:CCH(OH)CH(OH)CH_2Cl$, is formed, viscous liquid, b_{16} 131–2°, d_{16} 1.289, n_D 1.504, α 30.90° (theoretical 31.22), gives a ppt. with alc. $AgNO_3$ but not with $NH_3 \cdot CuCl$. This compd. gives with $NaOMe$ *acetylenemonomethylin*, $HC:CCH(OH)CH(OH)CH_2OMe$, liquid, b_5 100°, d_{17} 1.120, n_D 1.4720, α 32.56° (theoretical 32.53), gives a ppt. with alc. $AgNO_3$ but not with $NH_3 \cdot CuCl$. These compds. as well as $HC:CCH(OH)CH_2OH$, etc., convert powd. $CuCl$ in suspension in a little H_2O into a yellow powder. Since it is a general characteristic of true acetylenic compds., this reaction with moist $CuCl$ may be utilized to distinguish such compds. particularly since they do not all form ppts. with $NH_3 \cdot CuCl$. C. C. DAVIS

General method of preparation of ethers. J. B. SENDERENS. *Compt. rend.* **181**, 700(1925).—A correction (cf. C. A. **19**, 815). The b. p. of $(Me_2CHCH_2)_2O$ should read 122–4° and not 102–4°. Cf. C. A. **20**, 361. C. C. DAVIS

Substitution by halogen of the hydroxyl in secondary alcohols. P. A. LEVENE AND L. A. MIKESKA. *J. Biol. Chem.* **65**, 507–13(1925).—Although McKenzie and Clough (ref. not given) found that the action of $SOCl_2$ on $MePhCHOH$ was not accompanied by a change of rotation, L. and M. (C. A. **18**, 2494) and McKenzie and Tudhope (C. A. **19**, 814) found that the sign of rotation was changed when $SOCl_2$ reacted with $Me(C_6H_{11})CHOH$. The present study is an attempt to establish in which case the Walden inversion has taken place. *iso*-BuMeCHOH, from Me_2CHCH_2CHO and $MeMgI$, was resolved by conversion into the *H* phthalate (Pickard and Kenyon, C. A. **2**, 993) and recrystd. many times as the brucine salt, the *d*-form sepg. first if the crystn. is interrupted in time; *d*-isobutylmethylcarbinyl *H* phthalate, $[\alpha]_D^{20}$ 51.8°; *d*-isobutylmethylcarbinol, $[\alpha]_D^{20}$ 22.4°; when slowly distd. twice with 4 parts HI (b. 126°) it yields the *iodide*, $[\alpha]_D^{20}$ –18.1°. A portion of the *l*-*iso*-BuMeCHOH (*I*), $[\alpha]_D^{20}$ 7.6°, failed to react when added to $SOCl_2$, but with 0.72 part of C_6H_5N it reacted when $SOCl_2$ was added, first below 50° and at the end of the reaction at 50° for 3 hrs.; the portion of the crude chloride b. 108–14° showed $[\alpha]_D^{20}$ 20.4°. $PhCH_2PhCHOH$ was converted into the cryst. *H* phthalate, whose quinine salt crystd. from $MeAc$ and was extd. with hot $MeAc$ to remove the *l*-salt and recrystd. several times from alc., yielding after decompn. the *d*-phthalate, m. 123°, $[\alpha]_D^{20}$ 25.1°; the *l*-phthalate shows $[\alpha]_D^{20}$ –20°; *d*-benzylphenylcarbinol, m. 64°, $[\alpha]_D^{20}$ 18.5°; a portion with $[\alpha]_D^{20}$ 16.7°, treated in $CHCl_3$ with PCl_5 , gave *l*-benzylphenylchloromethane, $[\alpha]_D^{20}$ –2.1°; a sample of the *l*-carbinol, $[\alpha]_D^{20}$ –9.4°, added to $SOCl_2$, and finally heated under a reflux for 20 min., gave *d*-benzylphenylchloromethane, $[\alpha]_D^{20}$ 7.4°, solidifies below 0°, decomps. above 50° into HCl and $(PhCH)_2$. Like *I*, $MeEtCHOH$ reacts with $SOCl_2$ only in the presence of C_6H_5N and on warming the mixt., the reaction in both cases occurring with reversal of the sign of rotation, but with more racemization than in the cases in which $SOCl_2$ reacts easily. The results show no essential difference in the halogen acids, $SOCl_2$, or PCl_5 , as regards the Walden inversion. M. HEIDELBERGER

Oxidation of secondary mercaptans into corresponding sulfonic acids. P. A. LEVENE AND L. A. MIKESKA. *J. Biol. Chem.* **65**, 515–8(1925); cf. C. A. **18**, 2494; **19**, 1130, 1245. *l*-*iso*-BuMeCHI ($[\alpha]_D^{20}$ –18.1° and –18.6°), heated in 2 expts. at 60–5° with 2 mols. alc. KSH for 5 hrs., gave *2*-mercaptoisohexane, $[\alpha]_D^{20}$ 6.0° and 21.2° resp., variable degrees of racemization having taken place; 5 g., heated under a reflux for 1.5 hrs. with 8 cc. concd. HNO_3 and 2 cc. H_2O , then treated with a little H_2O and evapd. almost dry, repeating until all HNO_3 was removed, and adding excess $BaCO_3$, gave the *Ba* salt of *2*-isohexanesulfonic acid, $[\alpha]_D^{20}$ –4.9° in H_2O (c 10.6); after addn. of HCl , $[\alpha]_D$ of the free acid is –6.7°. Similarly, *l*- $PhCH_2PhCHCl$, $[\alpha]_D^{20}$ –10.7°, with 3 mols. alc. KSH, gave the mercaptan, $[\alpha]_D^{20}$ 8.6°, slowly decomps. above 50° to H_2S and $(PhCH)_2$; oxidized in $MeAc$ with $KMnO_4$ it yielded after removal of the $MeAc$ an oil which was not investigated, and in the aq. layer the partially cryst. *Ba* salt of *1,1*-*di*-phenylethylsulfonic acid, $[\alpha]_D$ –54.0°; after addn. of HCl $[\alpha]_D$ becomes –36.4°. Thus in the cases below in which the changes $RR'CHOH \rightarrow RR'CHCl \rightarrow RR'CHSH \rightarrow RR'CHSO_3H$ have been followed ($RR' = MeC_6H_{11}$, $MeEt$, *iso*-BuMe and $PhCH_2Ph$) the rotations have had the signs $\pm \rightarrow \mp \rightarrow \pm \rightarrow \mp$. Since the differences in polarity between the OH and Cl groups are qual. similar to those between the SH and SO_3H groups, it is concluded that the same configurational relationships exist between the members of these pairs, and that in the cases investi-

gated the alcs. are configurationally related to the halides of opposite rotation, and enantiomorphously related to those of the same rotation. The case of MePhCHOH (see preceding abstr.) will be studied.

M. HEIDELBERGER

β, β', β'' -Triaminotriethylamine and its complex metallic compounds. F. G. MANN AND W. J. POPE. *Proc. Roy. Soc. (London)* 109A, 444-58 (1925).— β, β', β'' -Triaminotriethylamine (I) is prepd. from $\text{C}_6\text{H}_4(\text{CO})_2\text{NCH}_2\text{CH}_2\text{Br}$ and NH_3 by a method based on that of Ristenpart. It may act as a triamine or a tetramine and acts exclusively tetraacidic in its coordination compds. with metals. Two series of coordination compds. have been prepd. and these as derivs. of PtCl_2 and PtCl_4 fall strictly into line with the requirements of Werner's theory. The following derivs. are described. Triaminoethylamine dihydride monohydrochloride, I.2HIHCl ; tricarbamidotriethylamine, $\text{N}(\text{C}_2\text{H}_4\text{NHCONH}_2)_3$, m. 167-8°; triaminotriethylamine trihydrochloride chloraurate, I.3HCl.3AuCl_3 ; tetrahydrochloride chloraurate, I.4HCl.2AuCl_3 , m. 187-9° (decompn.); mercurichloride, I.3HCl.5HgCl_2 , m. 202-4° (decompn.); trihydrochloride rhodochloride $\text{2I.6HCl.3RhCl}_2.6\text{H}_2\text{O}$, m. 280°; tetrahydrochloride rhodochloride I.4HCl.2RhCl_2 ; tetrahydrochloride ruthenochloride $\text{I.4HCl.2RuCl}_3.2\text{H}_2\text{O}$; trihydrochloride platinumchloride $\text{2I.6HCl.3PtCl}_2.3\text{H}_2\text{O}$; trihydrochloride platinumchloride $\text{2I.6HCl.3PtCl}_4.10\text{H}_2\text{O}$, m. 280° (decompn.); tetrahydrochloride platinumchloride, $\text{I.4HCl.2PtCl}_4.10\text{H}_2\text{O}$, m. 271-3° (with decompn.); dichlorotriaminotriethylamine-platinic dichloride, $[\text{Cl}_2\text{PtI}]\text{Cl}_2$, m. 263-6° (decompn.) dichlorotriaminotriethylamine-platinic diiodide, $[\text{Cl}_2\text{PtI}]\text{I}_2$, m. 233-7° (decompn.) dichlorotriaminotriethylamine-platinic platinumchloride, $[\text{Cl}_2\text{PtI}]\text{PtCl}_6.\text{H}_2\text{O}$, m. 287-8° (decompn.); dichlorotriaminotriethylamineplatinic platinocyanide, $[\text{Cl}_2\text{PtI}]\text{Pt}(\text{CN})_4$; triaminotriethylamineplatinous platinumchloride, $[\text{PtI}]\text{PtCl}_4$, m. 270-5°; triaminotriethylamineplatinous diiodide, $[\text{PtI}]\text{I}_2$, m. 267-9° (decompn.).

REYNOLD C. FUSON

The trithioacetaldehydes and the mechanism of their rearrangement. EMIL FROMM AND LEON ENGLER. *Ber.* 58B, 1916-24 (1925).—Mann and Pope (*C. A.* 17, 2558) by the action of S_2Cl_2 or SCl_2 on α -trithioacetaldehyde (α -I), m. 101°, obtained $(\text{MeCHCl})_2\text{S}$ (II), which with NaOH , Ag_2O , Ag_2S or H_2S gave a cryst. product, m. 81°; this they believed to be identical with Marckwald's (*Ber.* 19, 2378 (1886)) and Poleck's and Thummel's (*Ber.* 22, 2871 (1889)) γ -I, and in proof of its purity they state that it can be prepd. in various ways and that its m. p. changes neither on sublimation nor on crystn. from Me_2CO . As, however, the existence of 3 isomeric I would render untenable the theory as to the stereoisomerism of the I proposed by Baumann and Fromm (*Ber.* 24, 1457 (1891)), who found that the γ -I of Marckwald and of Poleck and Thummel is only an impure α -I and yields pure α -I on crystn. from Me_2CO , F. and E. have again taken up the study of the I. They for the 1st time have succeeded in obtaining unmistakably different α - and β -derivs. (iodides and sulfoxides) of I. α -I with I gives a stable diiodide (α -III) and β -I a less stable isomer (β -III), each of which with AgOAc regenerates the original I. The reaction can be used to detect α - and β -I in mixts.; from such mixts. the α -I can even for the most part be recovered quite pure by converting it into the diiodide and then treating it with AgOAc , but in the case of the β -I this is not always possible because the β -III is much more sol. and when any α -I is present it comes down as α -III with the β -III. α -I with the calcd. amt. of perhydrol in AcOH gives a trisulfoxide (α -IV), m. 184°, while β -I yields an isomer (β -IV), m. 153°; a mixt. of the two m. 120-35°. The only reducing agent which converts the IV back into I is concd. HI which at the same time exerts a rearranging action, so that both α - and β -IV yield β -I; likewise further oxidation of both IV yields the same trisulfone. Attempts to prep. a III from the so-called γ -I gave pure α -III, and similarly oxidation with H_2O_2 gave pure α -IV. Contrary to Mann's and Pope's statement, their " γ -I" can be sepd. by very cautious fractional crystn. from Me_2CO into 2 substances, viz. α - and β -I. Expts. with artificial mixts. of these 2 compds. showed that a mixt. contg. 2 parts α - to 1 part β -I yields a sublimate m. 78-80°. To obtain such a mixt. it is not necessary to follow the roundabout way used in prepg. the supposed γ -I; it is sufficient merely to treat HCl solns. of AcH with H_2S . These results show that there are in reality only 2 forms of I. The labile I are converted by exhaustive oxidation into the sulfones of the stable forms, and likewise the labile I are rearranged by small amts. of I or MeI into the stable I. It can easily be shown by means of models that this rearrangement cannot be explained by assuming addn. of the reagent (I or MeI) with rupture of the I ring at one point, followed by splitting off of the addendum and reclosure of the ring in a different direction; the rearrangement requires the assumption of a demolition of the whole ring structure and its reconstruction in a different configuration. Such a demolition and reconstruction doubtless occurs in the prepn. of II from I and of I from II. II can be obtained from β - just as well as from α -I with S_2Cl_2 or SCl_2 , and since it can

readily be converted into α -I, this for the 1st time makes it possible to obtain a labile from a stable form. Both trimol. I, therefore, with S_2Cl_2 or SCl_2 give the monomol. II (demolition of the ring) which with H_2S or similar reagents forms the trimol. α -I (reconstruction of the ring). Both IV, boiled with KOH and concd. somewhat in a vacuum desiccator, yield the same *disulfoxide sulfide*, $MeCH_2S.CHMe.SO\ CHMe.SO$,

turns brown above 220° , m. 255° (decompn.), which is converted by HI into β -I and by $KMnO_4$ or H_2O_2 into the trisulfone, while weak reducing or oxidizing agents do not attack it. α -III (4.5 g. from 3 g. α -I and 4.2 g. I in a little Et_2O), red, m. $76-8^\circ$. β -III, from β -I and I in AcOH, red-brown, loses I in the air or *in vacuo*. C. A. R.

Influence of phosphates on the oxidation of butyric acid with hydrogen peroxide. E. J. WITZEMANN. *J. Am. Chem. Soc.* **48**, 202-8 (1926).— $PrCO_2H$ in the presence of enough KOH to neutralize it is oxidized by H_2O_2 in the presence of di- and mono-alkali phosphates. In the presence of monoalkali phosphate the oxidation is slower and there is perhaps a somewhat larger relative production of Me_2CO than with the dialkali phosphates. In the presence of dialkali phosphates the oxidation is much faster and Me_2CO , AcOH and CO_2 are the products isolated when the oxidation of the acid is complete. The AcOH obtained in the 1 case recorded was 37% of that corresponding to complete oxidation of the acid to AcOH and CO_2 . This formation of AcOH is thought to be the result of oxidation of the acid at the α -C atoms (see following abstrs.).

C. J. WEST

Simultaneous oxidation of glucose and butyric acid. E. J. WITZEMANN. *J. Am. Chem. Soc.* **48**, 208-11 (1926).—When glucose and $PrCO_2K$ are oxidized simultaneously with H_2O_2 in the presence of phosphates, the oxidation of the K salt is not influenced by the presence of glucose; it is more quickly oxidized than glucose; the glucose exercises no antiketogenic effect like that observed in the organism. C. J. W.

Oxidation of α - and β -hydroxybutyric acids with hydrogen peroxide. E. J. WITZEMANN. *J. Am. Chem. Soc.* **48**, 211-22 (1926); cf. preceding abstrs.—The oxidation of α - (I) and β -hydroxybutyric acids (II) with H_2O_2 in the presence of phosphates and with $KMnO_4$ in the presence and absence of alkali, was studied in order to interpret results on the oxidation of $PrCO_2H$ previously described. I is more easily oxidized under all conditions tested than II, as well as the chem. related $AcCH_2CO_2H$ and Me_2CO . Unlike $MeCH(OH)CO_2H$, which reacts almost entirely with $KMnO_4$ in the absence of alkali to give AcOH, CO_2 and H_2O , I in only 1 expt. underwent oxidation, giving $EtCO_2H$ and CO_2 in sufficient amts. so that its presence among the other products could be proved. Generally, so much AcOH was formed that no evidence of the formation of $EtCO_2H$ was obtained. With H_2O_2 in the absence of phosphates no evidence of $EtCO_2H$ formation from I could be obtained. Oxidation to AcOH and CO_2 took place according to the reaction: $I + 5O = AcOH + 2CO_2 + 2H_2O$ at room temp. in the absence of alkali. II was oxidized with $KMnO_4$ with a measurable velocity only in the presence of an excess of alkali. It was not appreciably oxidized with H_2O_2 in the presence of phosphates. The results with alk. $KMnO_4$ correspond closely to the reaction: $II + 5O = AcOH + 2CO_2 + 2H_2O$. Former expts. on the oxidation of Me_2CO with $KMnO_4$ showed that, in the oxidative breakdown of $MeCOCO_2H$ which is an intermediate in the oxidation of Me_2CO , $MeCH(OH)CO_2H$ and $CH_3(CH_2OH)_2$, there is a shift from a loss of 1 C atom as CO_2 , by the C chain, to a loss of 2 C atoms as $(CO_2H)_2$, on increasing the concn. of alkali in the soln. and a corresponding diminution of the production of AcOH. This change is definitely associated with the formation of isopyruvic acid by the shifting of a H atom in the Me group of $MeCOCO_2H$. A corresponding enolization is thought to be involved in the oxidation of I and II when the chain is shortened by 2 C atoms. The greater lability of the H on the CH_2 group in $EtCOCO_2H$ accounts for the greater tendency of this intermediate to enolize and consequently lose 2 C atoms rather than 1, as it is commonly thought to do. The results give definite chem. grounds based on expts., as closely analogous to biol. conditions as is so far possible, for considering α -HO and α -CO fatty acids as normal intermediates in oxidative metabolism. Such a suggestion harmonizes general chem. experience with biol. observation and sets the "acetone bodies" in a separate compartment both chem. and biol. The "acetone bodies" are known to be burned in the organism with relatively great difficulty and have now been shown to be difficultly oxidized chem. in comparison with other possible intermediates, that have now been shown to explain the known facts of fat oxidation equally well. These expts. do not reveal how glucose burning in the organism can prevent the formation or complete the oxidation of the "acetone bodies."

C. J. WEST

Configurational relationship between β -hydroxybutyric acid and lactic acid. P. A. LEVENE AND H. L. HALLER. *Science* **62**, 356 (1925); cf. *C. A.* **19**, 3253.—*l*- β -Hydroxy-

butyric acid is configurationally related to *l*-propyleneglycol; *i. e.*, the asym. C atoms in these 2 substances have the same configuration when they rotate polarized light in the same direction. Reduction of Et lactate with Na and EtOH gives a glycol, which rotates in the same direction as the original free lactic acid; the same relationship holds here. Lactic acid with $[\alpha]_D^{20}$ 0.7° gave an Et ester with $[\alpha]_D^{20}$ -2.5° and a glycol with $[\alpha]_D^{20}$ 0.6°.

C. J. WEST

Decomposition of esters of secondary alcohols. A. MAHLE. *Caoutchouc & gutta-percha* 22, 12937 9(1925). It has already been shown (*Compt. rend.* 152, 669 (1912); 154, 49, 175(1913)) that esters of primary alcs. and monobasic acids decomp. in the presence of catalysts (oxides), the products varying with the oxide used. Similar expts. are now described which deal with the decompn. of esters of secondary alcs. and mono-basic acids, including $\text{MeCO}_2\text{CHMe}_2$ (I), $\text{MeCO}_2\text{CHMeEt}$ (II), $\text{MeCO}_2\text{CHMePr}$ (III), $\text{PhCO}_2\text{CHMe}_2$ (IV) and $\text{EtCO}_2\text{CHMeEt}$ (V). Action with Al_2O_3 —I at 360° formed a gaseous mixt. contg. in %: CO_2 12, C_3H_8 80, H 12 [does not add to 100—ANSTR.] with a liquid composed of H_2O , Me_2CO , HOAc and undecompd. I, indicating that the alc. function is more completely attacked than the acid and that Al_2O_3 has the same effect as TiO_2 with primary alcs. III at 380° was relatively stable and only partial decompn. occurred. The small vol. of gas formed contained 34% CO_2 and 60% pentene and the liquid condensate more pentene, Me_2CO , HOAc and undecompd. III. Action with ThO_2 —II at 380° gave a large vol. of gas contg. in %: CO_2 + H_2O 52, C_3H_8 47, H 1 and a liquid composed of Me_2CO , EtCH(OH)Me and undecompd. II, indicating an action similar to that of ThO_2 with primary alcs. III gave a gas contg. in %: CO_2 72, pentene 25 and H 3 and a liquid contg. a large amt. of pentene, PrCH(OH)Me and undecompd. III. The small amt. of H probably arose from decompn. of a small amt. of butanol to EtMeCO , which was difficult to identify because of its similarity to Me_2CO . IV at 400° decompd to MeCH_2CH_2 and BzOH . Action of TiO_2 —I at 370° formed a gas contg. in %: CO_2 18, propylene 64, H 8 and a liquid contg. Me_2CO , HOAc and undecompd. I. The chief reaction was probably: $\text{I} \rightarrow \text{HOAc} + \text{C}_3\text{H}_8$, followed by partial decompn. of the HOAc to Me_2CO . II at 400° decompd. in a similar way, the gas contg. 40% CO_2 and 50% butylene and the liquid a large amt. of HOAc, a small amt. of Me_2CO , undecompd. II and dissolved butylene. The evolution of gas from III was very slow, the gas contg. 55% CO_2 and 30% pentene and the liquid a large amt. of HOAc a little MeAc and dissolved pentene. V at 380° gave a gas contg. 18% CO_2 and 78% C_3H_8 and a liquid contg. a large amt. (about 1/3 of the product) of EtCO_2H and a small amt. of propylene. Below 400° then, the action with TiO_2 is predominantly $\text{RCOOC}_n\text{H}_{2n+1} \rightarrow \text{RCO}_2\text{H} + \text{C}_n\text{H}_{2n}$. Some RCO_2H then decomp. thus: $2\text{RCO}_2\text{H} \rightarrow \text{R}_2\text{CO} + \text{CO}_2 + \text{H}_2\text{O}$, this last reaction becoming more extensive with increase in temp. With all 3 catalysts the reactions are in general similar below 400° to those with primary alcs., in that the products vary with the catalyst, but above 400° the reaction products decomp. in turn, the acids into ketones and the alcs. into ethylene hydrocarbons.

C. C. DAVIS

Synthesis of *N*-methylputrescine and of putrescine. H. W. DUDLEY AND W. V. THORPE. *Biochem. J.* 19, 845-9(1925).— δ -Iodo- (and δ -bromo)butylamine can be benzoylated almost quant., the $\text{I(CH}_2)_4\text{NHBz}$ so obtained being converted to monobenzo-*N*-methylputrescine, $\text{BzNH(CH}_2)_4\text{NHMe}$, by the action of MeNH_2 , the free base, $\text{H}_2\text{N(CH}_2)_4\text{NHMe}$, being obtained by hydrolysis with HCl. By using NH_3 in place of MeNH_2 putrescine can be prepd.

BENJAMIN HARROW

Numerical values of the optical rotation of methylated gluconic acids and their salts. P. A. LEVENE AND G. M. MEYER. *J. Biol. Chem.* 65, 535-44(1925).—As in all the α -OH and NH_2 acids in which the allocation of the OH (or NH_2) group is the same as that on carbon 2 of gulonic acid, the present work shows that in the methylated gluconic series, the rotations of the free acids are to the left of those of their metallic salts. Benzylidenemethylglucoside, prepd. by a slight modification of the method of Irvine and Scott (*C. A.* 7, 2383), was converted into the 2,3-di-Me deriv. and this hydrolyzed to 2,3-dimethylglucose; the crude product, oxidized with Br until it no longer reduced Fehling soln., yielded 2,3-dimethylgluconic lactone, $[\alpha]_D^{20}$ 58.5° in aq. alc.; for the α of the Na salt, 0.4 g. was heated at 80-90° for several hrs. with 2.5 cc. *N* NaOH and made up to 5 cc. with H_2O , $[\alpha]_D^{20}$ 44.1°; 4 cc. of this soln., cooled with ice-alc., neutralized with 2.25 cc. *N* HCl, and made up to 10 cc., gave $[\alpha]_D^{20}$ of the free acid as 22.5°; after 24 hrs. $[\alpha]_D^{20}$ showed lactonization to be almost complete. This procedure was used for the detn. of α in the Na salts and free acids below. Monoacetoneglucose, with Me_2SO_4 and 30% NaOH, gave 3,5,6-trimethylmonoacetoneglucose, b_D 110°, n_D^{23}

1.44914; after hydrolysis the crude trimethylglucose yielded 3,5,6-trimethylgluconic lactone, b_1 155°, initial $[\alpha]_D^{20}$ in aq. alc., 44.1°, after 24 hrs., 39.8°; $[\alpha]_D^{20}$ of the Na salt, 24.0°; acid, $[\alpha]_D^0$ -6.3° after 24 hrs., 5.4°. 2,3,5-Trimethylgluconic lactone, b_{0-14} 142°, $[\alpha]_D$ in aq. alc. 90.8°, after 24 hrs., 55.0°; Na salt, $[\alpha]_D^{20}$ 64.4°; acid, $[\alpha]_D^0$ 19.3°, after 24 hrs., 23.5°. Tetramethylgluconic lactone, b_{0-8} 128°, $[\alpha]_D^{20}$ in aq. alc., 106.1°, after 24 hrs., 52.2°; Na salt, $[\alpha]_D^{20}$ 76.4°; acid, $[\alpha]_D^0$ 43.0°, after 24 hrs., 49.5°. Ca gluconate, with Me_2SO_4 and NaOH, then 3 methylations with $MeI-Ag_2O$, hydrolysis, and further treatment with $Me_2SO_4-Ag_2O$, followed by acidification and extn. with Et_2O , gave pentamethylgluconic acid, b_1 155°, $[\alpha]_D^{20}$ in H_2O , 22.5°; Na salt, $[\alpha]_D$ 53.7°. From these values it is calcd. that the changes in $[M]_D$ of gluconic acid due to methylation of carbons 2, 3, 4, 5 and 6 are, resp., 134.88°, -63.02°, -50.46°, 55.16° and 39.14°. That structural rigidity explains the fact that the salts of the 2,5-anhydro-sugar acids show the same $[M]_D$ as the acids is also supported by these results, since in some of the cases the 2 and 5 H atoms have also been substituted. M. HEIDELBERGER

Composition of pectin: a preliminary report on the determination of galacturonic acid in pectin. W. H. DORE. *J. Am. Chem. Soc.* **48**, 232-6 (1926).—A modification of the Lefèvre-Tollens method for glucuronic acid has been applied to the detn. of galacturonic acid in pectic substances. The same samples were extd. with 70% EtOH and the furfural yields of the residues were detd. Comparison of the results by the 2 methods show that apparently no simple relation exists between the galacturonic acid and furfural yield so obtained. A possible interpretation of the data is discussed with reference to Nanji, Paton and Ling's hexa-ring structure for the basal unit of pectic substances (*C. A.* **19**, 2327). C. J. WEST

Anode phenomena in the electrolysis of potassium ethyl malonate. J. B. ROBERTSON. *J. Chem. Soc.* **127**, 2057-67 (1925); cf. Gibson, *C. A.* **19**, 1406.—From a study of the anode potential, the current, and the compn. of the gases evolved in unit time during the electrolysis of N solns. of $EtO_2CCH_2CO_2K$ with various electrodes and with gradually increasing applied e. m. f., R. confirms the view that the synthesis of $(CH_2CO_2Et)_2$ at the anode is the result of the electrolytic oxidation of 2 mols. of $EtO_2CCH_2CO_2H$. With anodes of polished Pt the synthetic reaction occurs only when the anode has acquired a potential of 2.3-2.4 v (H standard). Gray Pt behaves similarly. With anodes of platinized Pt and Au, there is no synthesis, but above 3.3 v. complete oxidation takes place in the former case, while even above 6 v. there is little oxidation in the latter case. It is shown that there is complete oxidation of a portion of the electrolyte with all the anode materials used even at very low potentials. This is small for platinized Pt and Au but considerable for smooth and gray Pt. With Au anodes a peculiar instability is observed between 5.0 and 6.2 v., which is attributed to the formation of an unstable oxide of Au. R. E. GIBSON

Stereochemical studies. VIII. Optically active α,α' -dibromoadipic acids. BROR HOLMBERG AND EMIL MÜLLER. *Ber.* **58B**, 1601-4 (1925); cf. *C. A.* **20**, 372.—Two optically inactive α,α' -dibromoadipic acids, m. 193° and 139°, resp. have been known: for some time and controversy as to which was the *meso*- and which the *dl*-form has existed. H. and M. show that the higher melting acid cannot be resolved into optically active components, whereas the lower melting acid may be resolved, by progressive formation of the salt with *l*-MeCHPhNH₂, recrystn. and recovery of the acid with HCl, into *d*- α,α' -dibromoadipic acid, $[\alpha]_D^{180}$ 66.3°, m. 151-3°, and the *l*-isomer, $[\alpha]_D^{180}$ -65.1°, m. 151-3°. Hence the lower melting acid is the *dl*-form. From a soln. of 0.1818 g. *l*-form and 0.1785 g. *d*-form in ether a *dl*-acid, m. 143-4°, crystd. out. R. E. GIBSON

Some ether-substituted derivatives of diethyl malonate and barbituric acid. A. J. HILL AND DEW. T. KEACH. *J. Am. Chem. Soc.* **48**, 257-62 (1926).—*Bu* chloromethyl ether, b_{760} 134°; *iso-Bu* deriv., b_{760} 120-1°; *benzyl* deriv., b_{40} 125°; the yields were 37, 35 and 77%, resp. The following substituted *Et* malonates were prepd.: Methoxy-methyl, b_8 95-100°; *bismethoxymethyl*, b_8 120-30°; *ethylmethoxymethyl*, b_{18} 125-6°, 69% yield; *ethylethoxymethyl*, b_{13} 120-1°, 74%; *Et propoxymethyl*, b_{16} 135-40°, 50%; *ethylbutoxymethyl*, b_{8-9} 133°, 50%; *ethyl isobutoxymethyl*, b_{9-10} 135°, 56%; *ethylbenzyloxymethyl*, b_{10-11} 190-2°, 56%; *propoxymethyl*, b_{2-3} 107-8°, 21%; *bisethoxymethyl*, b_{7-8} 123-5°, 25%; *bispropoxymethyl*, b_{2-3} 124-5°, 21%. These derivs. condense normally with $CO(NH_2)_2$, giving the following 5,5-barbituric acid derivs.: *ethylmethoxymethyl*, m. 184°, 35% yield; *ethylethoxymethyl*, m. 166°, 37%; *ethylpropoxymethyl*, m. 174°, 48%; *ethylbutoxymethyl*, m. 135°, 45%; *ethylisobutoxymethyl*, m. 177°, 56%; *ethylbenzyloxymethyl*, m. 139-40°, 33%; *bis[ethoxymethyl]*, m. 201-3°, 63%; *bis[propoxymethyl]*,

m. 187°, 44%; 5-propoxymethyl, m. 163-5°, 44%; 5,5-ethylethoxymethylthio, m. 147°, 88%.

C. J. WEST

Manufacture of calcium citrate and citric acid from lime juice. F. H. S. WARNEFORD AND F. HARDY. *Ind. Eng. Chem.* **17**, 1283-6(1925).—Citric acid from crude Ca citrate is dark in color, as a result of atm. oxidation of phlobatannins in the com. product. The amt of phlobatannins retained by the crude citrate may be reduced by pptg. the lime juice cold with a thin cream prepd. from finely ground CaO, contg. enough alkali to neutralize the acid and then raising the temp. to boiling before filtration. Perfectly colorless citric acid may be obtained by neutralizing the defecated juice to p_H 3.8 with Na_2CO_3 , boiling with 1% Norit, filtering and pptg. as the Ca salt. T. S. C.

Labile prussic acid or isohydrocyanic acid. C. J. ENKLAAR. *Rec. trav. chim.* **44**, 889-90(1925).—(In German). In a previous paper (*C. A.* **18**, 1780) E. described the prepn. of a labile HCN from $AgCN + H_2S$ or better from KCN. The labile acid is characterized by a methylmercury deriv., m. 58°, that was previously described. It has now been prepd. from other CN compds. 0.3 g. $Na_4Fe(CN)_6$ in H_2O was treated drop by drop with concd. H_2SO_4 until the soln. smelled distinctly of HCN. The gas 1st evolved gives the compd. $MeHgCN$, m. 80-5°. After cooling CO was passed through the mixt. and on warming almost pure iso-HCN was evolved. Its $MeHgCN$ compd. m. 65-7°. 2 g. $Hg(CN)_2$ in 30 cc. H_2O was treated with insufficient H_2S and gave almost pure iso-HCN. $Pd(CN)_2$ in KCN soln. with a relatively small amt. of H_2S gave a mixt. of the 2 forms of HCN. $Cd(CN)_2$ and $Pb(CN)_2$ treated similarly gave only the stable HCN. Pure dry HCN contg. only stable HCN (by test) was distd. with H_2O and then appeared to contain 2.5% of the iso-HCN. E. J. WITZEMANN

The formation of symmetrical trimethylguanidine by amino displacement. MARTIN SCHENCK. *Z. physiol. Chem.* **150**, 121-32(1925).—*sym*-Trimethylguanidine (I) was prepd. from ICN, guanidine, mono- and dimethylguanidine, resp., by treatment with $MeNH_2$. In all these reactions it is believed that each successive methylation occurs through the intermediate formation of a methylated $C(NH_2)_4$ as an addn. product, followed by splitting out of NH_3 until the final product is I. With more highly methylated guanidines, the treatment with $MeNH_2$ displaces a Me_2NH and the product is I. Although I has not yet been found in nature the possibility still exists that it may be of biol. importance. For isolation the most suitable procedure would be the sepn. of the HI salt which is difficultly sol. in EtOH. A. W. DOX

Preparation of l-arabinose from mesquite gum. ERNEST ANDERSON AND LILA SANDS. *Ind. Eng. Chem.* **17**, 1257-8(1925).—l-Arabinose is readily prepd. by hydrolyzing mesquite gum for 3 hrs. at 80° with 6 times its wt. of 4% H_2SO_4 . After removing the acid with $Ba(OH)_2$, the neutral soln. is concd., the salts are pptd. with EtOH and the alc. soln. of the sugars is concd. and crystd. The m. p. is 140-55°. The yield of cryst. sugar is 27-36% on the gum, the greatest yield being obtained by recovering more arabinose by extn. of the salt ppt. with MeOH. It may be recrystd. from H_2O , dil. EtOH or glacial HOAc. Fermentation by yeast of the hydrolyzed gum did not increase the yield. C. C. DAVIS

Oxidation of d-glucose by air in calcium hydroxide solution. M. H. POWER AND F. W. UPSON. *J. Am. Chem. Soc.* **48**, 195-202(1926).—Of 100 g. of d-glucose dissolved in 10 l. of satd. $Ca(OH)_2$ soln., 95 g. was oxidized in 236 hrs. The products, on the basis of 100 g. oxidized, were 4.87 g. CO_2 , 23.1 g. volatile acids (as HCO_2H) and 84.9 g. non-volatile acids. The non-volatile acids gave 14.7 g. crude d-arabonic phenylhydrazide, 6 g. of high melting, EtOH-insol. brucine salt (brucine d-erythronate); 19.8 g. EtOH-sol. brucine salts (contg. some l-glyceric acid); 6.37 g. hydrates and 1.3 g. dried Ca glycolate and 4.1 g. $(CO_2H)_2$. The non-volatile fraction consisted largely of unidentified HO acids, the C_3 and C_4 acids occurring in such small amts. that their identification could not be sharp. The amts. of d-arabonic and glycolic acids actually present in the mix. were probably much greater than the reported values. d-Fructose under the same conditions gave 4.28 g. CO_2 and 9.1 g. $(CO_2H)_2$ per 100 g. C. J. WEST

Atmospheric oxidation. I. The oxidation of glucose and related substances in the presence of sodium ferropyrrophosphate. H. A. SPOEHR AND J. H. C. SMITH. *J. Am. Chem. Soc.* **48**, 236-48(1926); cf. *C. A.* **19**, 2676.—Na ferropyrrophosphate (I), which acts as a catalyst in the oxidation of carbohydrates and HO acids with air, is easily oxidized by atm. O. One mechanism by which the oxidation may be carried on is through the reversibility of the reaction: catalyst oxidized = catalyst reduced —e. A study of the electronic reversibility of the catalyst indicated unit electronic change, which agrees with the formula for I, $Na_2FeP_2O_7$ and for the ferri deriv., $NaFeP_2O_7$. It was not possible to obtain pure cryst. preps. of these compds. The catalyst is not

colloidal and gives none of the characteristic tests for Fe. Carbohydrates are oxidized whether the ferro or ferri compd. is initially present. HCO_2H is not oxidized with the ferri compd. Only such compds. as can reduce the ferri compd. are capable of the catalytic oxidation. Apparently this is associated with the degree of dissociation of the hexoses brought about by the phosphates. The rate of oxidation of a no. of org. acids was studied. The rates of reduction of the ferri compd. by glucose, fructose and mannitol also were studied. Low concns. of KCN (0.0025 *M*) accelerate the rate of oxidation; Pt has no effect. The rate of oxidation of glucose by air in this system is not influenced by insulin.

C. J. WEST

Relations between rotatory power and structure in the sugar group. XI. The related rotations of amylobiose, amylotriose and glucose. C. S. HUDSON, H. PRINGSHEIM AND J. LEBOWITZ. *J. Am. Chem. Soc.* **48**, 288–91 (1926); cf. *C. A.* **19**, 2476.—The application of the van't Hoff hypothesis of optical superposition to the structural formulas that have been proposed for amylobiose and amylotriose by Pringsheim leads to a simple numerical relation among the mol rotations of glucose, amylobiose and amylotriose. The rotation of α -amylobiose octaacetate is 122° (CHCl_3) and for α -amylotriose hendecaacetate, 128° (CHCl_3); both were amorphous. The above relation holds for the rotations of the sugars themselves and for those of their acetates. While this agreement with Pringsheim's structures does not necessarily prove their correctness, it supports the chem. evidence adduced by P.

C. J. WEST

This sugar from yeast. P. A. LEVENE AND H. SOBOTKA. *J. Biol. Chem.* **65**, 551–4 (1925).—The sugar of the adenine nucleoside discovered in "zymin" by Mandel and Dunham (*C. A.* **6**, 2241), considered to be a new ketohexose by L. (*C. A.* **18**, 2500), and shown to contain S by Suzuki, Odake and Mori (*C. A.* **19**, 1867), has now been studied further. The sirupy sugar (I) showed $[\alpha]_D^{25} +41.9^\circ$ in MeOH; SMe, 24.3%, calcd. for $\text{C}_6\text{H}_{12}\text{O}_4\text{S}$, 26.1%, the detn. being made according to Kirpal and Buln (*C. A.* **8**, 2163). *Tri. Ac. deriv.* (II), from Ac_2O and $\text{C}_6\text{H}_5\text{N}$, $b_D^{25} +170^\circ$. The previously described *p*-bromophenylosazone (I, *loc. cit.*) is still formed after exposure of I to excess Br for 96 hrs., excluding the aldehydic structure given by S, O. and M. in their 4 alternative formulas, also the presence of $-\text{SH}$. This, together with the formation of II, excludes 3 of the 4 on other grounds. The choice is considered restricted to $\text{HOCH}_2\text{C}(\text{OH})\text{CHSMe}.\text{CHOH}.\text{CH}_2\text{O}$ or $\text{HOCH}_2\text{C}(\text{OH})\text{CHOMe}.\text{CHOH}.\text{CH}_2\text{S}$, with

the substituent group possibly on carbon 1 instead

M. HEIDELBERGER

Formation of *d*-sorbose and *d*-gulose by oxidation of *d*-sorbitol with bromine water. H. W. TALEN. *Rec. trav. chim.* **44**, 891–3 (1925).—(In English.) Votoček and Lukeš (*C. A.* **19**, 2933) oxidized *d*-sorbitol to a mixt. of 4 isomeric hexoses, which were converted into the 2 possible phenylosazones and sepd. by their differential soly. in Me_2CO . T. has repeated the oxidation and removed the *d*-glucose and *d*-fructose by alc. fermentation of the mixt. The *d*-gulose and *d*-sorbose that remain unfermented were converted into the phenylosazone as described by V. and L. and identified as *d*-gulose (and *d*-sorbose) phenylosazone.

E. J. WITZEMANN

The absorbing power of nitrocellulose for gases. DOMENICO COSTA. *Gazz. chim. ital.* **55**, 540–8 (1925).—Recently C. showed that the absorbing power of starch for some gases (*C. A.* **18**, 3175) is much greater than that of cellulose (Oddo, *C. A.* **14**, 1529) under the same conditions. A sample of nitrocellulose (I) contg. 12.95% N and corresponding to a decanitrocellulose was used after drying 24 hrs. at 50° and 1 hr. at 90° . The volumetric app. of Oddo (*l. c.*) was used. Under the action of dry NH_3 I first becomes yellow and then darkens, becoming brown-black with the evolution of heat. The mol. of I is demolished without, however, giving rise to H_2O or gaseous products. From the results it is concluded that the nitric esters of cellulose, $\text{C}_{24}\text{H}_{18}\text{O}_8(\text{ONO}_2)_{10}(\text{OH})_2$, fix NH_3 at first in proportions corresponding to 1 mol. of NH_3 for each ONO_2 group present. The NH_3 absorbed combines with the ONO_2 groups, forming the true salt of NH_4 with consequent denitration and dehydrogenation of I and decompn. of the cellulose complex. The NH_4NO_3 thus formed absorbs more NH_3 in the proportion of 2 mols. for 1 of NH_4NO_3 . Dry HCl displaces the ONO_2 groups in I completely and gives products free from N, sol. in H_2O , that reduce Fehling soln. and are optically active. This reaction and its products are to be described in another paper. 100 g. I absorbs 12.67 g. SO_2 in 144 hrs. 100 g. I absorbs 1.0016 g. CO_2 in 96 hrs. H_2 and O_2 are not adsorbed by I in appreciable proportions.

E. J. WITZEMANN

Naphthenic acids. VI. Naphthenic acids derived from Nishiyama petroleum. YOSHIO TANAKA AND SHOICHIRO NAGAI. *J. Faculty Eng. Tokyo Imp. Univ.* **16**, 171–81 (1925); cf. *C. A.* **19**, 1136.—The crude petroleum acids employed were obtained by acidifying the waste lyes produced in the refining of kerosene distillate (41.5°Bé.)

and gas oil or "neutral oil" distillate (33.2° Bé.) of Nishiyama (Niigata prefecture) origin, in yields of 0.02 and 0.15% by vol. of these distillates, resp. The proximate analysis of the crude acids, the crude naphthenic acids, the pure mixed acids and distn. products are given. These acids, as compared with those of Kurokawa origin, show about the same distn. range and the neutralization values of the corresponding fractions are also very similar but the d. of the fractions of the former are much lower than those of the latter, showing that the acids from these different sources contain different isomers. After 25 systematic fractional distns of the Me esters there were obtained 4 main fractions. There are given for the acids b_{8-9-10} , d_4^{15} , d_4^{20} , n_{15}^{15} , n_{20}^{20} , neutralization value, M_D ; for the esters b_{8-9-10} , $b_{76.0}$, d_4^{15} , n_{15}^{15} , sapon. value, M_P : *Dodecanaphthenic acid*, 168–70°, 0.9712, 0.9681, 1.4697, 1.4678, 279.4, 56.92; *Me ester*, 127–9°, 265–6° 0.9412, 1.4579, 265.9, 61.19, *tridecanaphthenic acid*, 177–9°, 0.9736, 0.9704, 1.4727, 1.4708, 267.3, 61.13; *Me ester*, 136–8° 277 8°, 0.9443, 1.4612, 244.3, 56.30; *tetradecanaphthenic acid*, 186 8°, 0.9762, 0.9732, 1.4759, 1.4740, 248.6, 65.49; *Me ester*, 145.5–7.5°, 289–90°, 0.9191, 1.4647, 236.5, 69.92; *pentadecanaphthenic acid*, 194.7°, 0.9776, 0.9744, 1.4784, 1.4765, 232, 69.63; *Me ester*, 155 7°, 300–1°, 0.9501, 1.4672, 221, 74.54. The same main constituents were isolated from both naphthenic acids derived from the 2 distillates.

C. J. WEST

The doctrine of intramolecular oppositions and the directing of substituents in benzene. II. D. VORLANDER. *Ber.* 58B, 1893–914(1925); cf. *C. A.* 13, 2348.—

Since the positive N in the quaternary ammonium residue $\text{--NMe}_3^+\text{X}^-$ on C_6H_6 directs a 2nd substituent on nitration or bromination to the *m*-position, such residues as --NO_2^+ , $\text{--CO}_2\text{H}^+$, --CO^+ , $\text{--SO}_3\text{H}^+$, which have erroneously been considered as negative, are really positive with respect to their point of union and, like ammonium, act on the benzene C through a positive element (N, C, S). In the present paper are presented further new exptl. data on the behavior of positively and negatively substituted C_6H_6 derivs. PhIO and PhIO_2 are reduced by concd. HNO_3 to PhI with formation of *p*- and *o*- $\text{O}_2\text{N--C}_6\text{H}_4\text{I}$. If the formation of the reducing HNO_2 is prevented by the addn. of urea nitrate, PhIO_2 is difficultly attacked by concd. HNO_3 , indicating that the I of the IO_2 group is positively attached to the C_6H_6 . Ph_2INO_3 gives (*m*- $\text{O}_2\text{NC}_6\text{H}_4$) $_2\text{INO}_3$ (I), identical with the product obtained from *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{IO}_2$ and *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{IO}$ with Ag_2O and decompd by boiling dil. alkalis into *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ and *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{I}$ with possibly traces of *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ but no *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ at all. The plurivalent I in diphenyliodonium salts is in its whole atomistic structure positive as well towards the anion as towards both C_6H_6 nuclei. Nitration of PhPh_4 has hitherto given no useful results; there is formed a peculiar cherry-red soln in the $\text{KNO}_3\text{--H}_2\text{SO}_4$ mixt and pouring into H_2O gives besides much PhNO_2 (also some *m*- $\text{C}_6\text{H}_4(\text{NO}_2)_2$) a brown flocculent substance which deflagrates on heating. $\text{Ph}_2\text{Ph}(\text{NO}_3)_2$, however, yields the well-crystd. colorless (*m*- $\text{O}_2\text{NC}_6\text{H}_4$) $_2\text{Ph}(\text{NO}_3)_2$ (II), which explodes on heating and with Br at 100° gives *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{Br}$ and PhBr_2 . The *Pb*, like the I in the iodonium salts, has an equally positive action on both *Ph* residues. Likewise, $\text{Ph}_3\text{Bi}(\text{NO}_3)_2$ yields a cryst. tri-*m*- NO_2 (III). On the other hand, SiPh_4 and SnPh_4 yield chiefly *p*-compds., which, unfortunately, are not as homogeneous and well-crystd. as the *Pb* and *Bi* derivs. The products obtained from Ph_3COH show such peculiar behavior that it is doubtful whether they are normal nitration products; they are amorphous brownish substances which cannot be made to cryst. under any conditions and, after exhaustive treatment with HNO_3 , have approx. the N content of a ($\text{O}_2\text{NC}_6\text{H}_4$) $_3\text{COH}$; all attempts to det. the position of the NO_2 groups have thus far failed. Ph_3CCN gives an amorphous tri-*p*- NO_2 deriv. (IV), lac-like or glassy when cold; the *p*-position of the NO_2 groups is established by conversion into parafuchsin and by the identity of the tri- NH_2 (V) deriv. with Muller's hydrocyanopararosaniline (*Z. Chem.* 2, 2(1866)). The CN group in Ph_3CCN , not present as an anion, therefore imparts no positive or cationic properties to the carbinol C atom. The lac-like consistency of Ph_3C derivs. is due to their dissymmetry; such substances remain permanently in a supercooled amorphous state and are at the same time monomol. The solns. of the ($\text{O}_2\text{NC}_6\text{H}_4$) $_3\text{CCN}$ are hardly colloidal and produce the calcd. raising of the b. p. From all the results hitherto reported, the following law can be derived: An element combined with 2, 3 and 4 C_6H_6 nuclei directs new substituents in these C_6H_6 nuclei equally positively or equally negatively. The pyridinium N in phenylpyridinium salts directs an entering NO_2 group to the *m*-position of the *Ph* residue; the structure of the *m*-nitrophenylpyridinium nitrate (VI) obtained was established by

synthesizing the 3 isomers from C_6H_5N , $BrCN$ and the three $O_2NC_6H_4NH_2$. The behavior of *N*-phenylpyridinium bromide on bromination also points to the strong positive action of the N on the Ph. *N*-Phenylpyridone (VII), in which, according to the structure assigned to it, the N might act as an amine (formation of *o*- and *p*-compds.) or an ammonium deriv. (formation of *m*-derivs.) gives a well-crystd. mono- NO_2 deriv. whose structure could not be detd. by cleavage; it is not identical with that synthesized from chelidonic acid and *m*- $O_2NC_6H_4NH_2$ and as the corresponding *o*- and *p*-compds. could not be satisfactorily synthesized in the same way (probably on account of the too feebly aminic properties of the corresponding $O_2NC_6H_4NH_2$), the product of nitration was reduced to the amine, diazotized and coupled with $PhOH$; the resulting *hydroxyazo dye* (VIII) yielded a monotropic cryst.-liquid acetate and an enantiotropic cryst.-liquid benzoate, thus indicating that the NO_2 group is in the *p*-position, a conclusion confirmed by conversion of the NH_2 deriv. into *chlorophenylpyridone*, m. 105° , and identification of the latter with the product obtained from chelidonic acid and *p*- $ClC_6H_4NH_2$. VII, therefore, in spite of the presence of an excess of concd. HNO_3 , is nitrated not as an NH_4 salt but as free pyridone, presumably in the form of an amine in which the N is negative to the Ph. Its great resistance towards HNO_3 shows, however, that in the soln. it is present chiefly as an NH_4 salt. The valence angle on the N is apparently quite different in VII and *N*-phenylpyridinium, for the *p*- NO_2 compds. of the latter yield no cryst.-liquid derivs. In methylpyridinium methosulfate the C_6H_5N nucleus remained unattacked in all attempts at bromination or nitration under the most varied conditions at 100° . The tertiary *p*- $PhC_6H_4NMe_2$ reacts in the *p'*-position with neither HNO_2 nor aryldiazonium salts; the quaternary *p*- $PhC_6H_4NMe_3NO_3$ takes up on nitration a NO_2 group in the *p'*-position, like *p*- $PhC_6H_4NO_2$, i. e., NO_2 has the same influence as NMe_3 . *p*-Amino-*p'*-dimethylaminobiphenyl (unsym-dimethylbenzidine) (IX) gives no methylene blue reaction with $FeCl_3 \cdot H_2S$; the orange-brownish *p*-benzenazo-*p'*-amino-biphenyl (X) gives with concd. H_2SO_4 a red soln., to be sure, but is decolorized by dil. acids (the mono-HCl salt is pale yellow), while the orange-yellow *p*-biphenylazo-*N*-dimethylaniline (XI) normally forms a dark violet mono-HCl salt and a red-violet soln. with concd. H_2SO_4 . Only in respect to the decolorization of adducts is there an analogy between Ph_3 and simple C_6H_6 derivs., insofar as the orange red *p*,*p'*- $O_2NC_6H_4C_6H_4NH_2$ or *p*,*p'*- $O_2NC_6H_4C_6H_4NMe_2$ are decolorized by acids just like *p*- $O_2NC_6H_4NH_2$, *p*- $O_2NC_6H_4NMe_2$, *p*- $O_2NC_6H_4NHCH_2Ph$, etc. *Bis*-*m*-nitrodiphenylodinium nitrate (I) (10–1 g. from 10 g. Ph_2INO_3 in 45 g. HNO_3 (d. 1.52) and 40 g. concd. H_2SO_4 kept 15 min. at $15\text{--}20^\circ$), m. 194° ; iodide, yellowish, m. $142\text{--}4^\circ$ with formation of *m*- $O_2NC_6H_4I$, becomes darker yellow on standing in the light and then m. 130° ; chloride, m. 209° ; perchlorate, m. 188° , explodes over a free flame; picrate, yellow, m. about 191° . *Bis*-*m*-nitrophenyllead dinitrate (II) (3.5 g. crude g. crystd. product from 4 g. $Ph_3Pb(NO_3)_3$ heated 3–4 hrs. at 100° with HNO_3 (d. 1.51)), explodes about 210° . *Tris*-*m*-nitrophenylbismuth dinitrate (III) (1.5 g. from 2.5 g. triphenylbismuth dinitrate, deflagrates about 130° (obtained by repeatedly evap. the dibromide with HNO_3 (d. 1.3) on the H_2O bath), allowed to stand 20–4 hrs. in fuming HNO_3 (d. 1.52)), yellowish white, deflagrates about 145° , decompd. by boiling H_2O or hot alc., gives *m*- $O_2NC_6H_4Br$ with Br water after 3 days at room temp. or 2–3 hrs. at 100° . $Si(C_6H_4NO_2)_4$ (Polis, Ber. 19, 1016(1886)) with Br water and a few drops of Br heated 30–40 hrs. at 100° gives *p*- $O_2NC_6H_4Br$. Likewise, tetranitrotetraphenyllin, from $SnPh_4$ in fuming HNO_3 -concd. H_2SO_4 at $\sim 5^\circ$ to 0° , flocculent gray or brown ppt., deflagrates above 350° , gives *p*- $O_2NC_6H_4Br$ with Br water and Br at 100° . *Tris*-*p*-nitrophenylacetoneitrile (IV), from Ph_3CCN and fuming HNO_3 at 15° , m. $210\text{--}20^\circ$, mol. wt. in boiling C_6H_6 358–64, shows no fluorescence in Me_2CO or C_6H_6 and the solns. exhibit no colloidal properties under the ultramicroscope; tri- NH_2 deriv. (V), from IV with $SnCl_2 \cdot HCl$ or alc. $(NH_4)_2S$, gradually becomes brownish on heating, reddish at about 250° , sinters 265° , m. $280\text{--}90^\circ$, shows in Me_2CO and C_6H_6 under the ultramicroscope a fluorescence band, forms a strongly colloidal soln. in aq. HCl , is converted back into Ph_3CCN by diazotization and reduction with Cu ; its Ac deriv. seps. from the colloidal solns., which show blue fluorescence, as a hard transparent lac softening at $70\text{--}130^\circ$; the yellow compd. of V with anisaldehyde can likewise not be crystd. and the product of the decompn. of its diazonium sulfate (presumably $(p\text{-}HOC_6H_4)_3CCN$) is amorphous and sol. in alkalis; coupling of the diazonium chloride with $PhOH$ in $NaOH$ yields a rust-brown flocculent hydroxyazo compd., probably $(HOC_6H_4N_2C_6H_4)_3CCN$, softens about 170° , forms a viscous liquid around 210° , gives a strongly colloidal red-brown soln. in Me_2CO . The solid HCl salt of V heated to $170\text{--}220^\circ$ gives parafuchsin (not a trace is formed by boiling an HCl soln.) with evolution of HCN ; the reaction is not complete until after 16 hrs. at about 200° ; V. believes that it is only the HCl salt which undergoes decompn. while

the free V resulting from hydrolysis is not attacked. *N*-Phenylpyridinium nitrate, from the chloride repeatedly evapd. with HNO_3 (d. 1.3), yellowish white, m. 126° , is quickly decompd. by alkalis; 5 g. heated 6–12 hrs. at 100° with fuming HCl gives 3.5 g. crude or 1.8 g. recrystd. VI, yellowish or nearly colorless, turns brown and sinters about 195° , m. $204-8^\circ$, decomp. above the m. p., is somewhat more stable towards cold alkalis than the original $\text{C}_6\text{H}_5\text{NPhNO}_3$; chloride- HgCl_2 compd., m. $165-8^\circ$; tribromide, $\text{C}_6\text{H}_5\text{N}(\text{C}_6\text{H}_4\text{NO}_2)_2\text{Br}_3$, orange-yellow, m. about 117° (the non-nitrated perbromide, m. $111-3^\circ$); amino bromide perbromide, brown-yellow, m. $172-5^\circ$. *p*-Isomer of VI (15 g. from 55 g. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ with $\text{C}_6\text{H}_5\text{N}$ and BrCN), slightly yellowish, m. $174-7^\circ$; chloride; perbromide, m. about 165° ; picrate, yellow, m. 117° ; perchlorate, m. about 176° (the salts are at once colored dark violet-brown or black by alkalis); amino nitrate, begins to m. 200° , decomp. 210° , sol. in H_2O with yellow color, at once colored yellow to brown by alkalis, followed by sepn. of black flocks which are turned red by HCl ; picrate, m. $158-61^\circ$; chloride- HCl , becomes discolored and decomp. above 190° , sol. in H_2O with yellow color and completely decolorized by dil. HCl , gives a violet soln. with Fe^{+++} salts, green, then blue, with H_2S and FeCl_3 , yields red and brown azo dyes when diazotized and coupled with 2 naphthol, PhOH or PhNMe_2 . *p*-Ethoxyphenylpyridinium salts, prepd. by the methods of Zincke (*Ann.* 333, 330(1901)) and König (*J. prakt. Chem.* 69, 130(1904)): HgCl_2 ; chloride, needles with 1 or 0.5 H_2O from $\text{EtOH-Et}_2\text{O}$, m. 118° ; perchlorate, m. 131° ; picrate, yellow, m. 139° ; bromide (H_2O). *o*-Isomer of VI, yellowish, m. $182-6^\circ$ (decompn.); bromide perbromide, m. $90-3^\circ$; chloride- HgCl_2 compd., yellowish, m. about 190° . VII ($2\text{H}_2\text{O}$), m. 101° or, anhyd., 127° , forms with acids salts quite stable towards H_2O and solvents; chloride (H_2O), m. about 192° ; the yellowish nitrate, m. 88° , and the perchlorate, m. 164° , also seem to contain H_2O of crystn.; picrate, yellow, m. 193° ; HgCl_2 compd., m. about 118° . VII seps unchanged from boiling KOH . Refluxed 2–3 hrs. or evapd. to dryness with 50 cc. HNO_3 (d. 1.51), 10 g. VII gives 12.7 g. *p*- NO_2 nitrate, yellow needles with H_2O , m. 146° ; perchlorate, m. about 245° ; picrate, yellow, m. about $190-2^\circ$; free *p*-nitrophenylpyridone, faintly yellowish needles with H_2O , m. 202° ; *p*- NH_2 deriv. (3.5 g. from 6 g. of the NO_2 compd. with $\text{SnCl}_2\text{-AcOH}$), m. $260-70^\circ$ (decompn.), yields an azo dye with 2-naphthol. VIII, brown; acetate, orange, m. about 250° (decompn.); benzoate, orange-yellow, 1st m. p. about 263° , 2nd about 250° . *p*-Hydroxyphenylpyridone, from the NH_2 compd. by diazotization and decompn. in dil. HCl , lemon-yellow, decomp. above 200° , sol. in alkalis with yellow color, reprecip. by acids, gives a brown color with FeCl_3 ; owing to the formation of tars it could not be methylated or ethylated; the *Et* ether (XII), obtained in about 20% yield from chelidonic acid and *p*- $\text{EtOC}_6\text{H}_4\text{NH}_2$ at $130-70^\circ$, m. $154-6^\circ$, forms a perchlorate, m. 195° . Chelidonic acid (4.6 g.) refluxed 2 hrs. with 2 mols. *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ in H_2O gives chelidonic *m*-nitrophenylamide which at $160-80^\circ$ yields 1.2 g. *m*-nitrophenylpyridone, yellowish, m. about 210° ; perchlorate, m. around 176° ; picrate, yellow, m. about 175° . *N*-Phenyl- γ -chloropyridinium chloride (2.1 g. from 3 g. VII with SOCl_2 at $130-40^\circ$), crystals with $2\text{H}_2\text{O}$, sinters 83° , m. about 116° , soon forms a brown resin with cold NaOH ; HgCl_2 compd., m. about 180° ; perchlorate, m. 210° ; picrate, yellow, m. $155-8^\circ$; tribromide, yellow, m. 137° . Phenylpyridinium salts exert on frogs the characteristic curare action (paralysis of the motor nerves and death owing to stoppage of the respiration); VII was too little sol. to permit of testing its pharmacol. action but XII in 1% soln. in 0.01 and 0.02 g. doses produces complete paralysis in 15 min., without any previous observable stimulation, *i. e.*, it does not possess the specific curare action of quaternary NH_4 compds. Biphenyl-*p*-trimethylammonium bromide, obtained almost quant. from *p*- $\text{PhC}_6\text{H}_4\text{NH}_2$ in H_2O suspension on the H_2O bath turbined with excess of Me_3SO_4 and K_2CO_3 until dissolved, acidified with AcOH and treated cold with KBr , sinters 210° , m. 222° (decompn.), is neither nitrated nor nitrosated in acid soln. by HNO_3 ; tribromide, golden yellow, m. about 188° (decompn.), converted into the bromide by long boiling with H_2O ; iodide, sinters 208° , m. about 220° (decompn.); picrate, yellow, m. about 310° (decompn.); perchlorate, decomp. above 300° , deflagrates on rapid heating; nitrate, sinters 230° , m. about 255° (decompn.) gives with fuming HNO_3 below 70° about 20% of the *p*-nitro nitrate, sinters and reddens 212° , m. about 235° (decompn.); tribromide, yellow, m. about 198° (decompn.); bromide, sinters about 165° , m. around 243° (decompn.); iodide, m. about 246° (decompn.), becomes yellow on drying; picrate, yellow, decomp. about 200° (weak deflagration). The nitro bromide (6 g.) heated to $240-60^\circ$ gives 0.5 g. *p*-nitro-*p*-dimethylaminobiphenyl (XIII), yellow-red, m. about 244° , sol. in dil. mineral acids almost without color, identical with the product obtained by methylating *p*'- $\text{O}_2\text{NC}_6\text{H}_4\text{C}_6\text{H}_4\text{NH}_2$ (XIV) with alk. Me_3SO_4 ; it slowly reacts with NaNO_2 in acid soln. with formation of a dark orange di- NO_2 deriv. (presumably *p*',*m*,*p*- $\text{O}_2\text{NC}_6\text{H}_4\text{C}_6\text{H}_3(\text{NO}_2)_2\text{NMe}_2$), m. 134° .

IX (0.2 g. from 3 g. of the NO_2 compd. with SnCl_2 -alc. HCl), m. about 146° , sol. in dil. HCl or H_2SO_4 , gradually becomes green and brown in the air or with K_2CrO_4 and FeCl_3 ; *HCl* salt, flocculent ppt. becoming gelatinous; *benzylidene deriv.*, $\text{PhCH}:\text{NC}_6\text{H}_4\text{C}_6\text{H}_4\text{NMe}_2$, yellow leaflets, enantiotropic cryst.-liquid, 1st m. p. 192° , 2nd 183° ; *p*-toluylidene deriv., yellow, m. ps. 248° , 218° ; *p*-anisylidene deriv., orange, m. ps. $> 270^\circ$, 208° . *Tetramethyl-p,p'*-diaminoazobiphenyl, from **XIII** with Zn dust and hot alc. KOH, followed by oxidation of the hydrazo compd. with air, red, m. about 315° , gives with concd. H_2SO_4 a red, with fuming HCl a dark brown, with dil acids a yellow-brown color; *HCl* salt, brownish. *p*-Nitrobiphenyl-*p'*-azobenzene (from 2 g. **XIV** and PhNO in AcOH), light brown, m. 180° , indistinctly cryst.-liquid, little changed by dil. acids, forms a red soln. in concd. H_2SO_4 , converted in hot alc. suspension by concd. NH_4OH and H_2S and subsequent treatment with air into **X**, m. around 178° (decompn.), not cryst.-liquid on the 1st fusion but the supercooled melt on somewhat higher heating becomes enantiotropically cryst. liquid, turning red; it forms a faintly yellow sulfate with dil. H_2SO_4 ; *benzylidene deriv.*, orange, enantiotropic cryst.-liquid, m. ps. 188° , 171° (decompn.); *p*-anisylidene deriv., orange-red, enantiotropic cryst.-liquid, m. ps. $> 192^\circ$, 173° (decompn.). **XI**, from *p*- $\text{PhC}_6\text{H}_4\text{NH}_2$ by diazotization and copulation with PhNH_2 , sinters 195° , m. 208° , is not cryst.-liquid. *p*-Biphenylhydroxylamine, m. $132-4^\circ$, soon becomes yellow in the air and changes into $(p\text{-PhC}_6\text{H}_4\text{N})_2$, reduces Fehling soln. *p*-Nitrosobiphenyl, obtained in very small amt, together with $(\text{PhC}_6\text{H}_4)_2\text{N}_2\text{O}$, from the $\text{PhC}_6\text{H}_4\text{NHOH}$ with $\text{K}_2\text{Cr}_2\text{O}_7$ in cold 10% H_2SO_4 , yellow-green, m. 84° to a green liquid, has a quinone-like odor, dissolves in alc with green-yellow color. $(p\text{-PhC}_6\text{H}_4\text{N})_2$, from $\text{PhC}_6\text{H}_4\text{NO}$ and $\text{H}_2\text{NC}_6\text{H}_4\text{Ph}$ in boiling alc., orange-red, m. 250° , monotropic cryst.-liquid. $(p\text{-PhC}_6\text{H}_4)_2\text{N}_2\text{O}$, m. 206° , monotropic cryst.-liquid. *Diazoaminobiphenyl*, from $\text{PhC}_6\text{H}_4\text{N}_2\text{Cl}$ and $\text{H}_2\text{NC}_6\text{H}_4\text{Ph}$ in AcOH - NaOAc , yellow, m. 147° , non-cryst. liquid, insol. in dil. acids and unchanged in color. C. A. R.

Aldehydes and ethylene oxide in the Friedel-Crafts synthesis. ALFRED SCHAAER-SCHMIDT, L. HERMANN and B. SZEMZO. *Ber.* **58B**, 1914-6(1925).—From 53 g. BzH in cold C_6H_6 treated in the course of 45 min. with 150 g. AlCl_3 and then heated 2 hrs. at 40° and 3 hrs. at 60° with frequent shaking were obtained CH_2Ph_2 , 21% CHPh_3 and 30% anthracene (**I**). FeCl_3 instead of AlCl_3 gave 30% CHPh_3 and 6% **I**. *iso*- BuCHO with AlCl_3 gave an oil, b. $296-9^\circ$, whose yellow color, d. and mol. refraction indicated with certainty the presence of $\text{Me}_2\text{C}(\text{H})\text{C}(\text{H})\text{CPh}_2$, although the satd compd., b. 297° , was also without doubt present. Ethylene oxide vapor, mixed with HCl gas, passed into $\text{AlCl}_3\text{-C}_6\text{H}_6$ gave 1% $\text{PhCH}_2\text{CH}_2\text{OH}$ and 40% $(\text{PhCH}_2)_2$. C. A. R.

Action of bromine upon caffeine (and) method of preparation of bromotheophylline. Y. YOSHITOMI. *J. Pharm. Soc. Japan No.* **524**, 884-8(1925).—The method of chlorination of caffeine was applied to bromocaffeine. Neither Fischer and Ach's 7,8-dichlorocaffeine synthesis under ordinary pressures, with various catalysts nor F. and A.'s method in the sealed tube (*Ber.* **39**, 429) gave 7,8-dibromocaffeine. The F. and A. 3,8-dichlorocaffeine synthesis (*Ber.* **39**, 426) in the sealed tube also failed to give 3,8-dibromocaffeine or bromoparaxanthine from bromocaffeine. Every indication of reaction between Br and bromocaffeine always resulted in the rupture of the purine nucleus. The prepn. of bromotheophylline is given as follows: 10 g. of theophylline, 80 g. PhNO_2 , and 20 g. dry CCl_4 are stirred and 10 g. dried Br dissolved in PhNO_2 is added drop by drop. The mixt. is then heated for 2 hrs. at 110° . When the excess Br and HBr are removed by air and H_2O , and the reagents by steam, white crystals, m. 322° , and analyzing for bromotheophylline are formed. S. T.

Some homologs of true phenylpropine. L. BERT, P. CH. DORIER and R. LAMY. *Compt. rend.* **181**, 555-6(1925).— $\text{CH}_2\text{C}(\text{H})\text{CH}:\text{CHCl}$ and RMgX forms $\text{RCH}_2\text{CH}:\text{CHCl}$ (cf. C. A. **19**, 2644), which on treatment with NaNH_2 gives $\text{RCH}_2\text{C}:\text{CNa}$, the latter on acidification then forming $\text{RCH}_2\text{C}:\text{CH}$. Based on these reactions and by the method of Bourgel (C. A. **19**, 3476) improved by mech. agitation at $110-20^\circ$, the following previously unknown compds. were prepd. The data give the b. p., d_4^{20} , d_4^{25} , n_D^{20} , $[(n^2-1)M]/[(n^2+2)d]$ and theoretical R_m resp.: *phenylbutine*, 83, 0.928, 0.918, 1.518, 42.91, 42.78; *o*-methylphenylpropine, 80, 0.951, 0.940, 1.532, 42.85, 42.78; *p*-methylphenylpropine, 83, 0.958, 0.947, 1.533, 42.48, 42.78; *m*-xylol-4-propine, 95, 0.952, 0.941, 1.534, 47.56, 47.40; *p*-xylol-2-propine, 98, 0.951, 0.939, 1.531, 47.44, 47.40; *p*-isopropylphenylpropine, 101, 0.933, 0.924, 1.523, 52.23, 52.02; *carvacrylpropine*, 115, 0.929, 0.919, 1.525, 57.35, 56.63. The yields were about 75%. They were all colorless liquids, turning yellow in time, with a tendency to foam and with a penetrating odor. With alc. AgNO_3 they formed white ppts. and with $\text{NH}_3\text{-CuCl}$, yellow solids which were decompd. by cold concd. HCl . C. C. DAVIS.

The decomposition constants of organic complexes. H. LEY, R. GRAU and W.

EMMERICH. *Ber.* 58B, 1765-75(1925); cf. *C. A.* 15, 2428.—In the complex compds. of $C_6H_5(NO_2)_3$ (I) and $PhNMe_2$ (II) or its homologs the introduction of Me or other groups into the *o*-positions produces anomalous color changes (see abstr. quoted). In a dissociating solvent, $CHCl_3$, the same is observed; the soln. of the *p*- $MeC_6H_4NMe_2$ (III) complex is reddish violet, that of the *o*-isomer (IV) complex is yellow. To det. quant. the colors of the complexes their decompn. const., k , in soln. must be known. If in a soln. of the complex, A_nN_m , C_A , C_N , C_{ANm} , are the concns., in mols./l. of amine, nitro compd. and undecompd. complex, resp., $k = (C_N^m C_A^n) / C_{ANm}$. Methods for detg. k were investigated: (1) by observing the changes in soly. in a heterogeneous system in which I constituted the solid phase and $CHCl_3$ solns. of II, III or IV the liquid phase. It was assumed throughout that $n = m = 1$. $C_N =$ soly. of I in $CHCl_3$, $C'_N =$ soly. of I in $CHCl_3$ soln. of amine concn. C'_A . Then $k = (C_N C'_A) / (C'_N - C_N) - C_N$. Expts. made at 17.5° . C_N 0.2877. For complexes I-II and I-III the values of k were of the same order, 0.69 and 0.57, resp. With I-IV $C'_N - C_N$ was negative so it was impossible to calc. k . Similar effects were observed with 1,3,4- and 1,3,2-dimethylxylinines. All are compds. whose absorption spectra are abnormal. It is concluded that in the case of *o*-compds there is both a soly. effect and a very small complex formation. This anomaly of the *o*-substitution does not occur with primary amines. (2) *Photometric detns.* showed that Beer's law did not apply to solns. of the complexes, thus confirming the supposition of decompn. in soln. The very small absorption of the decompn. products made it possible to take ϵ , the decadic extinction coeff., as a measure of the concn. of undecompd. complex (C_{AN}). $C_{AN} = \epsilon_1(1-x)/\epsilon_2 = \epsilon_1\gamma$, where x is the degree of decompn. of a standard soln. of equal concns of amine and nitro compd., calcd with the aid of the law of mass action from the ratio of ϵ ϵ' , the extinction coeff. of the standard soln. when the amine concn. is increased n -fold and ϵ_1 is the extinction of the unknown at diln. v . Hence $k = [(C_A - \epsilon_1\gamma)(C_N - \epsilon_1\gamma)] / \epsilon_1\gamma$. For the I-II complex $k = 0.55$, for the I-IV complex k varies from 3.03 to 3.82. The authors consider this value too low and indicate factors which may vitiate the results. The photometric measurements are interpreted as confirming the assumption that the complexes are built of equal nos. of mols. of nitro compd. and amine. (3) *Observations of the raising of the b. p. of $CHCl_3$* by the complexes give for I-II $k = 0.2$, I-III $k = 0.28$, and I-IV $k = 0.3$. The authors conclude after discussion that this method is no good. Taking for the decompn. const. of I-II and I-III 0.7 and 0.6, resp., the max. mol. extinction of the undissociated complexes (at $1/\lambda = 2050$) is 1050 and 1300. The value for I-IV can only be obtained with much uncertainty. Curves giving the relation of the mol. extinction to $1/\lambda$ follow the usual course through a max. with I-II and I-III but there is no max. in the curve for I-IV. Thus in these complexes there is very considerable absorption and it is concluded that the electrons in the chromophore group are very much loosened. What the chromophore is, cannot be exactly stated but it is supposed that there is an equalization of affinity between the nitro groups and the double bonds (*Lückenbindungen*) of the C_6H_6 nucleus of the amine component, which results in a diminished satn. of some other atom, perhaps the N of the NO_2 groups. The peculiar behavior of the *o*-Me compds. in comparison with the others is not due to their basic characters. The dissociation const. of 4 amines were detd. from data on hydrolysis of HCl salts and acetates and new cond. data. $PhNMe_2$, $k_b = 1.47 \times 10^{-9}$, $PhNH_2$, $k_b = 2.70 \times 10^{-8}$, *o*- $MeC_6H_4NMe_2$, $k_b = 1.08 \times 10^{-8}$, *p*-isomer, $k_b = 4.19 \times 10^{-9}$. The NMe_2 group does not take part directly in complex formation, but only insofar as its presence loosens the bonds in the C_6H_6 nucleus and hence permits stronger union with the nitro compd. Me and other space-filling groups tend to reduce this loosening of the C_6H_6 bonds.

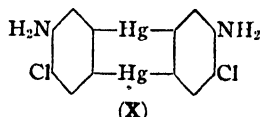
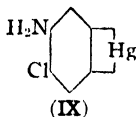
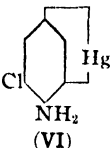
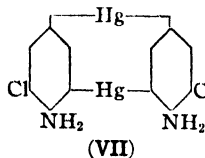
R. E. GIBSON

The action of the Grignard reagent on amino acids. VI. *Fusion cleavage of amino alcohols.* FRITZ BETTZICHE AND ALFRED EHRLICH. *Z. physiol. Chem.* 150, 191-6(1925); cf. *C. A.* 19, 3254.—The amino tert. alcs., prepd. by the Grignard reagent, undergo cleavage into ketone and amine when heated in a sealed tube with H_2O at comparatively high temps. (120-200°). $PhCH(NH_2)CPh_2OH$ gave $PhCH_2NH_2$ and $BzPh$; $PhCH(NH_2)C(CH_2Ph)_2OH$ gave $(PhCH_2)_2CO$ and $PhCH_2NH_2$; $H_2NCH_2CPh_2OH$ gave $BzPh$ and $MeNH_2$; $H_2NCH_2C(CH_2Ph)_2OH$ gave $(PhCH_2)_2CO$ and $MeNH_2$. The same products were also obtained in smaller yield by heating the amino alcs. in the dry state at 150-80°. VII. *Deamination of 2-amino-1,1-dibenzyl-1-ethanols.* *Ibid.* 197-201.—The removal of NH_2 from $RCH(NH_2)C(CH_2Ph)_2OH$ by the action of HNO_2 is accompanied by migration of CH_2Ph from the adjacent C, in a manner analogous to that previously demonstrated for the corresponding Ph_2 derivs. $H_2NCH_2C(CH_2Ph)_2(OH)$ gave 93.8% of *benzyl phenethyl ketone* b_{11} 206° (decompn.); *oxime m.*

120°. 2-Methyl-2-amino-1,1-dibenzyl-1-ethanol, m. 96.5°, prep'd. in 86.3% yield from alanine ester-HCl and MgPhCH_2Br , gave 30% of benzylmethylcarbinyl benzyl ketone, b₂₅ 210–2°. $\text{PhCH}(\text{NH}_2)\text{C}(\text{CH}_2\text{Ph})_2\text{OH}$ gave 78.87% of phenylbenzylcarbinyl benzyl ketone, m. 77–8°. $\text{PhCH}_2\text{CH}(\text{NH}_2)\text{C}(\text{CH}_2\text{Ph})_2\text{OH}$ gave 83.33% of dibenzylcarbinyl benzyl ketone, m. 62–4°.

A. W. DOX

The action of mercuric acetate on *o*-chloroaniline. L. VECCHIOTTI AND A. MICHETTI. *Gazz. chim. ital.* 55, 372–84 (1925); cf. C. A. 19, 49. By the action of $\text{Hg}(\text{OAc})_2$ on *o*- $\text{ClC}_6\text{H}_4\text{NH}_2$ 4 mercuriated compds. are formed the constitutions of 3 of which were det'd. To 32 g. $\text{Hg}(\text{OAc})_2$ in 300 cc 33% EtOH + a few cc. of AcOH was added 13 g. *o*- $\text{C}_6\text{H}_4\text{NH}_2$ in EtOH . After 48 hrs. a white ppt. was filtered off, dissolved in NH_4OH in the presence of NH_4OAc and reprecip'd. by neutralizing the soln. with AcOH . The monoacetatomercuri-*o*-chloroaniline 2,4- $\text{Cl}(\text{AcOHg})\text{C}_6\text{H}_3\text{NH}_2$ (I), thus obtained m. 134°. I was dissolved in 50% KOH and after 24 hrs. H_2O was added. The monomercuri-*o*-chloroaniline hydroxide ppt'd. does not m. but decomp. 205°. I allowed to react with excess coned. HCl sep'd. in 24 hrs. monomercuri-*o*-chloroaniline chloride that does not m. but decomp. 174°. I with Ac_2O on the H_2O bath gave the *Ac* deriv. (II) of I. I digested 24 hrs. with an excess of 50% $\text{Na}_2\text{S}_2\text{O}_3$ gave 4-monomercuri-*bi*-*o*-chloroaniline [$4,3\text{-Cl}(\text{H-N})\text{C}_6\text{H}_3$] $_{\text{2}}\text{Hg}$ (III), m. 138°. 10 g. II in glacial AcOH with the calcd. amt. of CaCl_2 was treated with Cl gas until the ppt first formed dissolved. NaCl was added to salt out the 2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{NHAc}$ (m. 143°), formed, thus proving the constitution of I. From the mother liquors from I was sep'd. an isomer, $\text{C}_8\text{H}_6\text{O}_2\text{NClHg}$, yellowish, m. 143°, of which the constitution was not det'd. because of the lack of material. To 32 g. $\text{Hg}(\text{OAc})_2$ in 100 cc. of H_2O was added 13 g. *o*- $\text{ClC}_6\text{H}_4\text{NH}_2$ and a resin was formed that was filtered off. The filtrate became gelatinous after a time. This was boiled after adding a little AcOH and sep'd. white α -biacetatomercuri-*o*-chloroaniline, 2,4,6- $\text{Cl}(\text{AcOHg})_2\text{C}_6\text{H}_2\text{NH}_2$ (IV), that does not m. but decomp. at 220°. IV treated with 50% KOH for 24 hrs. was dild. with H_2O and sep'd. yellow α -bimercuri-*o*-chloroaniline hydroxide. IV with coned. HCl gives the corresponding chloride, $\text{C}_8\text{H}_4\text{NCl}_2\text{Hg}_2$, which does not m. but decomp. at 190°. IV with Ac_2O gave the *Ac* deriv. (V), $\text{C}_{12}\text{H}_{12}\text{O}_5\text{NClHg}_2$, m. 230°. 4.5 g. V in glacial AcOH with 0.74 g. CaCl_2 in EtOH gave a white ppt. of the chloride of the *Ac* deriv., $\text{C}_8\text{H}_6\text{ONClHg}_2$, decomp. 276°. IV was treated in the cold with 50% $\text{Na}_2\text{S}_2\text{O}_3$ for a long time and gave 4,6-monomercuri-2-chloroaniline (VI) or 4,6-bimercuri-*bi*-*o*-chloroaniline (VII) that decomp. at 200°. V in glacial AcOH with the calcd. amt. of CaCl_2 gave a white ppt. that was decomp'd. with Cl . On adding H_2O and NaCl , 2,4,6- $\text{Cl}_3\text{C}_6\text{H}_2\text{NHAc}$, m. 201°, was sep'd. To 96 g. $\text{Hg}(\text{OAc})_2$ in 900 cc 66% EtOH with a little AcOH was added 13 g. *o*- $\text{NH}_2\text{C}_6\text{H}_4\text{Cl}$ in EtOH . After a time there sep'd. a white ppt. of β biacetatomercuri-*o*-chloroaniline (VIII), m. 232°, which is different from IV. A tri-Hg deriv. was not obtained. VIII with Ac_2O gave the *Ac* deriv., $\text{C}_{12}\text{H}_{12}\text{O}_5\text{NClHg}_2$, m. 230°. VIII with 50% $\text{Na}_2\text{S}_2\text{O}_3$ gave after digestion for 24 hrs. 4,5-monomercuri-2-chloroaniline (IX) or 4,5-bimercuri-*bi*-*o*-chloroaniline (X), decomp. 160°. VIII in glacial AcOH with the calcd. amt. of CaCl_2 gave a ppt. which was decomp'd. with Cl . On dilg. and adding NaCl 2,4,5- $\text{Cl}_3\text{C}_6\text{H}_2\text{NHAc}$, m. 185°, was sep'd., thus proving the constitution of VIII.



E. J. WITZEMANN

The nitration of symmetrical arylalkylureas. L. C. E. KNIPHORST. *Rec. trav. chim.* 44, 693–727 (1925) (In English).—Earlier work on the nitration of urea and its derivs. is reviewed. By coupling EtNCO with PhNH_2 and some of its derivs. substituted in the nucleus (*o*- and *p*- $\text{ClC}_6\text{H}_4\text{NH}_2$, *o*- and *p*-toluidine and *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$) some new sym-arylethylureas were prep'd. These were nitrated with an excess of abs. HNO_3 . PhNHCONHEt (I) with an excess of abs. HNO_3 with cooling gives α -2,4-dinitrophenyl- β , β -ethylnitrourea (II), 2,4- $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{NHCONHEtNO}_2$, decomp. about 64°. The -NEtNO_2 group in II is mobile and by the action of H_2O , MeOH , EtOH , NH_3 , MeNH_2 , PhNH_2 , *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, NH_2NH_2 and PhNHNH_2 can be replaced by the groups -OH , -OMe , -OEt , -NH_2 , -NHMe , -NHPh , $\text{-NHC}_6\text{H}_4\text{Me}(p)$, -NHNH_2 and -NHNHPh , resp., giving besides HNEtNO_2 in each case the following compds. ROH ($\text{R} = 2,4\text{-(NO}_2)_2\text{C}_6\text{H}_3\text{NHCO}$), ROMe , ROEt , RNH_2 , RNHMe , RNHPh , $\text{RNHC}_6\text{H}_4\text{Me}$,

RNHNH_2 and RNHNHPh , resp. Previous instances of this reaction with NH_2NH_2 and PhNHNH_2 were not known. I with excess abs. HNO_3 and concd. H_2SO_4 gives easily α -2,4,6-trinitrophenyl- β , β -ethylnitrourea (**III**), decomp. 60 – 105° . It is remarkable that here 3 NO_2 groups are easily introduced into the nucleus with $\text{HNO}_3 + \text{H}_2\text{SO}_4$, while Reudler (C. A. 8, 2373) found that with phenylurea only 2 NO_2 groups are introduced with $\text{HNO}_3 + \text{H}_2\text{SO}_4$. From this it is concluded that the Et group attached to the β -N atom exerts an influence on substitution in the Ph group. The observation of R. was repeated and the result confirmed. The $-\text{NHNO}_2$ group in **III** is easily replaceable by $-\text{OH}$, $-\text{OEt}$ and $-\text{NH}_2$. $p\text{-RC}_6\text{H}_4\text{NHCONHEt}$ ($\text{R} = \text{Me}, \text{Cl}, \text{Br}$) with abs. HNO_3 give α ,4-methyl-, decomp. 110° , α ,4-chloro-, decomp. 60° and α ,4-bromo-2,6-dinitrophenyl- β , β -ethylnitrourea, decomp. 100 – 5° , resp. These compds. have analogous constitution and properties to **II**. $o\text{-MeC}_6\text{H}_4\text{NHCONHEt}$ with excess abs. HNO_3 gives mainly α ,2-methyl-4,6-dinitrophenyl- β , β -ethylnitrourea (**IV**), m. 90° (decompn.). The derivs. of $o\text{-MeC}_6\text{H}_4\text{NH}_2$ were difficult to nitrate in the nucleus so that even on treatment with abs. $\text{HNO}_3 + \text{H}_2\text{SO}_4$ besides **IV** small quantities of mono-nitrated by-products were always present. $o\text{-ClC}_6\text{H}_4\text{NHCONHPh}$ (**V**) with an excess abs. HNO_3 gives α -2-chloro-4,6-dinitrophenyl- β , β -ethylnitrourea, decomp. 50 – 90° . In this case lower nitration products were not present as in the formation of **IV**. It is remarkable that while in the nitration of **V** 2 NO_2 groups are easily introduced 2,4,6- $\text{Cl}(\text{O}_2\text{N})_2\text{-C}_6\text{H}_2\text{NHAc}$ (**VI**) cannot be prep. by the nitration of $o\text{-ClC}_6\text{H}_4\text{NHAc}$ even with abs. $\text{HNO}_3 + \text{concd. H}_2\text{SO}_4$. However, **VI** can easily be obtained by acetylation of 2,4,6- $\text{Cl}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{NH}_2$ (obtained by chlorinating 2,4- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{NH}_2$) with the calcd. amt. of $\text{Ac}_2\text{O} + \text{H}_2\text{SO}_4$ (trace). PhNHCONHEt with 3 mols. of $\text{EtNO}_3 + \text{H}_2\text{SO}_4$ gave only α -2,4-dinitrophenyl- β -methylurea. If a large excess of abs. HNO_3 is used α -2,4-dinitrophenyl- β , β -methylnitrourea is formed, while with an excess of abs. HNO_3 and concd. H_2SO_4 α -2,4,6-trinitrophenyl- β , β -methylnitrourea is produced. Also $p\text{-MeC}_6\text{H}_4\text{NHCONHMe}$ with excess abs. HNO_3 easily gave α -4-methyl-2,6-dinitrophenyl- β , β -methylnitrourea. With PhNHCSNH_2 and $p\text{-MeC}_6\text{H}_4\text{NHCSNHMe}$ (**VII**) nitration takes place in the Ph group and at the same time the $>\text{C}=\text{S}$ group is oxidized to $>\text{C}=\text{O}$ so that the same products are formed as in the nitration of the corresponding ureas. Under the influence of the reduction products formed from the HNO_3 , rapid decompn. of the nitroamides formed occurs. This was especially the case with **VII**. In all cases investigated the group $-\text{NRNO}_2$ in the sym-arylalkylnitroureas mentioned was easily replaced by $-\text{OH}$, $-\text{OMe}$, $-\text{OEt}$, $-\text{NH}_2$, $-\text{NHPh}$, $-\text{NHNH}_2$ and $-\text{NHNHPh}$. The arylureas obtained by treating the compds., ArNH.CO.NRNO_2 with abs. EtOH-NH_3 in the cold appear to behave very differently on heating with $\text{NH}_3\text{-EtOH}$ to 100° . While the mononitroureobenzoic acids, $\text{HO}_2\text{C}(\text{NO}_2)\text{C}_6\text{H}_4\text{NHCONH}_2$ from their formation from the dinitroureobenzoic acids of Griess, $\text{HO}_2\text{C}(\text{NO}_2)\text{C}_6\text{H}_3\text{NHCONHNO}_2$, on heating 0.5 hr. with aq. NH_3 are fairly stable, Reudler found that from 2,4- $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{NHCONHNO}_2$ only 2,4- $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{NH}_2$ was produced by heating with aq. NH_3 . Thus 2,4-dinitrophenylurea, which he obtained by treating 2,4-dinitrophenyl- β -nitrourea in ethereal suspension with NH_3 , appears to be unstable towards aq. NH_3 . All the arylureas obtained in this work are unstable towards aq. NH_3 and many even were more or less quickly decompd. with the formation of the corresponding aniline deriv. by heating to 100° with abs. EtOH-NH_3 .

E. J. WITZEMANN

Acetyldiphenylamine from ketenes. CHARLES D. HURD. *J. Am. Chem. Soc.* 48, 291 (1926).—Contrary to the statement of van Alphen (C. A. 19, 1253) ketene reacts with Ph_2NH in ice-cold Et_2O , giving 33% of the Ac deriv.; if the reaction flask is not cooled, the yield is about 8%.

C. J. WEST

Monophenyltetraaminobenzene and some of its derivatives. F. KEHRMANN AND (Miss) L. STANOVÉVITCH. *Helvetica Chim. Acta* 8, 663–8 (1925).—3- $\text{ClC}_6\text{H}_4\text{NHAc}$, added to 1 part HNO_3 (d. 1.52) and 3 parts H_2SO_4 at 0° , gives 4,6-dinitro-3-chloroacetanilide, yellow, m. 136° , identified as the free amine (Nietzke and Schedler, *Ber.* 30, 1666 (1897)); boiled with 5 mols. PhNH_2 it yields 2,4-dinitro-5-acetaminodiphenylamine, orange, m. 233.5° , which, heated below 80° with H_2SO_4 (2:1) until dissolved, gives 2,4-dinitro-5-amminodiphenylamine, sulfonation occurring at higher temps., orange, m. 205° (undoubtedly a misprint for 205° —ABSTR.); with Sn, concd. HCl , and a little alc. it yields the monophenyltetraaminobenzene, isolated after decompn. of the double Sn salt as the tri- HCl salt (**I**), sensitive to air and light. With phenanthrenequinone in 90% alc. on the H_2O bath **I** gives both the azine, which was not obtained pure and the phenazonium compd., dissolved after addn. of H_2O and NaOH by extg. the bases with 15–20% HOAc ; nitrate, red needles with green metallic luster, sol. in hot H_2O with a red color, in H_2SO_4 with a red color (tetra-acid salt), passing on diln. successively through violet and bluish green to red; chloride; chloroplatinate, dark red; perchlorate, red, with

green metallic luster. I also yields both possible products with $(\text{PhCO})_2$ in alc. contg. a little dil. HCl, the *phenazonium compd.* predominating and crystg. as the *chloride*, pptd. completely with Et_2O , and purified by extn. with boiling H_2O , brick-red, with green reflex, has a bitter taste; *chloroplatinate*, brick-red; *perchlorate*, dark orange, sol. in H_2SO_4 with a reddish violet color. I and 1,2,4,5- $(\text{PhNH})_2\text{C}_6\text{H}_2(\text{:O})_2$ condense to give 4 different substances, whose study has not been completed, and only 1 of which is the expected induline.

M. IIIDELBERGER

A reaction between phenylhydrazine and mercuric acetate. L. VECCHIOTTI AND A. CAPODACQUA. *Gazz. chim. ital.* **55**, 369-71 (1925).—Fischer (*Ann.* **190**, 99) treated PhNHNH_2 in H_2SO_4 with yellow HgO and obtained diazobenzeneimide and diazobenzene sulfate. With PhNHNH_2 in Et_2O yellow HgO gave rise to N_2 and HgPh_2 (Fischer, *Ann.* **199**, 332). To 32 g. $\text{Hg}(\text{OAc})_2$ in 100 cc. H_2O were added 7 g. PhNHNH_2 . A green-brown ppt. mixed with drops of Hg was formed. After a time this ppt. was filtered off, washed with H_2O , dried and boiled with C_6H_6 . This soln. on cooling sepd. the Hg salt of diazoaminobenzene (I), $(\text{PhN}\cdot\text{NNPh})_2\text{Hg}$, gold-yellow, m. 232° (Ciusa, Pestalozza, *C. A.* **5**, 3106). The residue insol. in C_6H_6 was found to be HgOAc . The course of the reaction was not detd. experimentally but probably PhNHNH_2 is oxidized, giving PhNH_2 and $\text{PhN}\cdot\text{NPh}$; these 2 compds. copulate, giving $\text{PhN}\cdot\text{NNHPh}$, which reacts with $\text{Hg}(\text{OAc})_2$, giving I.

E. J. WITZEMANN

Rearrangement of hydroxamic acids isomeric with triphenylacetohydroxamic acid. L. W. JONES AND F. B. ROOT. *J. Am. Chem. Soc.* **48**, 181-95 (1926).—The benzohydroxyl-benzohydroxamic acids undergo rearrangement with great difficulty, which is in marked contrast to the ease of rearrangement of triphenylacetohydroxamic acid. Since they contain a radical (benzohydroxyphenyl) which is isomeric with Ph_2C , the radical found in triphenylacetohydroxamic acid, it is conclusively shown that the mass of the radical is not the factor that det. the ease of rearrangement in reactions of the Lossen-Hofmann-Curtius type. Therefore, the ease of rearrangement seems to be related in some way to the tendency of the radical to exist as a free radical. *p*-Benzohydroxylbenzohydroxamic acid (I), $(\text{Ph}\cdot\text{CH})\text{C}_6\text{H}_4\text{CONHOH}$, m. $156-7^\circ$, in 3 g. yield from 5 g. of the acid chloride and NH_4OH ; *Bz deriv.* insol in warm alkali, mol. wt. in camphor, 386, 420; *K salt*, puffs at 91° ; boiling with H_2O 0.5 hr. gives quant. *sym-di-p*-benzohydroxylphenylurea (II), m. $262-3^\circ$; the rearrangement in EtOH required heating in a sealed tube at 100° and gave some II (0.08 g. from 0.4 g. *K salt*) and 0.28 g. *p*-benzohydroxylphenylurethane (III), m. 103° . The *Na salt*, decomp. 109° , becomes turbid when the aq. soln. is boiled. *Ag salt*, decomp. about 190° , darkens slowly in the light. *Ac deriv.* of I, m. $157-8^\circ$ (quant. yield); *K salt*, decomp. 130° and rearranges like that of the *Bz deriv.*; *Na salt*, decomp. 140° ; *Ag salt*, darkens 150° , decomp. 200° . *p*-Benzohydroxylbenzamide, m. 149° (quant. yield); with 3.3 equivs. of Br and EtONa there results 53% of III. *p*-Benzohydroxylphenyl isocyanate, which was not isolated, gives with *p*-benzohydroxylaniline II. *Hydroxylammonium o*-benzohydroxylbenzoate, m. $146-8^\circ$ (decompn.); decompn. by heating at 150° gave only the free acid but no hydroxamic acid. NH_4OH and MeONa react very slowly with the Me ester. SOCl_2 and the acid give 9-phenyl-9-chloroanthrone, m. 164° . In CHCl_3 , SOCl_2 gives the *o*-benzohydroxylbenzoyl chloride, pale yellow, m. 85° , which, with NH_4OH gives *o*-benzohydroxylbenzohydroxamic acid, m. $177-8^\circ$ (decompn.); at 180° it decomp., giving *sym-di-o*-benzohydroxylphenylurea (IV), m. 196° , which was synthesized from COCl_2 and *o*- $\text{Ph}_2\text{CHC}_6\text{H}_4\text{NH}_2$. *o*-Benzohydroxylbenzamide, m. $129-30^\circ$; the anilide m. $152-3^\circ$; oxidation of the amide with Cr_2O_3 gives diphenylphthalide. The *Bz deriv.* of the acid, m. $118-20^\circ$ and gives IV when heated with KOH for 2 hrs. The *K salt* darkened slightly at 200° ; in boiling H_2O it slowly rearranges to IV. *Ag salt*, darkens above 210° . *m*-Benzohydroxylbenzoic acid, m. 179° , from the amine through the nitrile.

C. J. WEST

Chemotherapy of antimonial compounds in kala-azar infection. XV. Further observations on certain derivatives of *p*-aminobenzenestibonic acid. U. N. BRAHMACHARI AND JUDHISTHIR DAS. *Indian J. Med. Research* **13**, 17-9 (1925); cf. *C. A.* **19**, 2707.—Four compds. are prepd.: (1) To 500 cc. cold aq. (2%) *p*- $\text{AcNHC}_6\text{H}_4\text{SbO}(\text{ONa})_2$ is added 140 cc. NaOCl (= 2 g. Cl) and stirred vigorously 0.5 hr. Add AcOH in excess, stir in cold and after 1 hr. filter. Collect the ppt.; dissolve in excess NH_4OH ; reppt. with dil. AcOH and wash the ppt. with water. Dissolve in NaOH , neutralize with dil. AcOH , filter and con. The ppt. formed by adding abs. alc. is chlorostibaceticin, $\text{C}_8\text{H}_9\text{O}_6\text{NCISbNa}$. (2) Pure *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{SbO}_3\text{H}_2$ is dissolved in the least quantity of NH_4OH , neutralized with dil. AcOH and pptd. with abs. alc. The ppt. is NH_4 stibamine, $\text{C}_{18}\text{H}_{23}\text{O}_7\text{N}_4\text{Sb}_3$. (3) 8 g. stibamine is dissolved in 40 cc. glucose soln. (= 6 g.), heated at 60° for 2 hrs. filtered and concd.; pptd. with abs. alc., washed 2 times with EtOH - H_2O (4:1) and then with abs. alc. The ppt. is glucose-stibamine, a yellowish powder,

very easily sol. in water. (4) Combination of NH_4 stibamine and glucose by the same procedure as (3) yields glucose- NH_4 stibamine.

FRANCES KRASNOW

Chemotherapy of antimonial compounds in kala-azar infection. XVII. Further details of the preparation of urea stibamine. U. N. BRAHMACHARI. *Indian J. Med. Research* **13**, 111-2(1925); cf. *C. A.* **20**, 450. $p\text{-H}_2\text{NC}_6\text{H}_4\text{NHAc}$ (1 mol) is added to well-cooled H_2SO_4 (1.5 mols) of 1000 cc. water. The mixt. is diazotized, added to a Na antimonate soln. and rapidly cooled to 0° . The greater portion of the alkali is neutralized with dil. H_2SO_4 and the last traces by satn. with CO_2 . The soln. is filtered and $p\text{-AcNHC}_6\text{H}_4\text{SbO}_3\text{Na}_2$ is pptd. by NaCl satn. The aq. soln. of the ppt. is satd. with CO_2 , filtered and treated with dil. HCl. $\text{AcNHC}_6\text{H}_4\text{SbO}_3\text{H}_2$ is pptd. This product is heated with 5% aq. NaOH (10 parts) until a ppt. forms on the addn. of dil. HCl and dissolves in excess. Addn. of dil. AcOH to the cooled soln. ppts. $\text{H}_2\text{NC}_6\text{H}_4\text{-SbO}_3\text{H}_2$. The latter, suspended in water, dissolves on the addn. of urea. The resulting soln. is filtered, concd., cooled and mixed with alc. Urea stibamine is pptd.

FRANCES KRASNOW

Selenium organic compounds. VI. Bromine, sulfo and mercury derivatives of 2,4-diphenylselenophene and experiments with some related compounds. M. T. ROBERT AND C. N. ANDERSEN. *J. Am. Chem. Soc.* **48**, 223-31(1926), cf. *C. A.* **19**, 1863. Attempts to prep. 2-methyl and 2,4-dimethylselenophene failed. 2,5-Selenoxene and $o\text{-C}_6\text{H}_4(\text{CO})_2\text{O}$ are condensed by AlCl_3 in CS_2 , giving 7% of *phthalylselenoxene*, pale yellow m. 155.5° (all m. ps. are cor.), giving with concd. H_2SO_4 a deep red color. In the prepn. of 2,4-diphenylselenophene (I), a temp. of $235\text{--}40^\circ$ for 20 hrs. increased the yield from 30 to 90%. 3,5-Dimethyl-2,4-diphenylthiophene, m. 163.8° , gives a yellow color with HNO_3 and a yellowish brown color with H_2SO_4 . The corresponding fusion with Se gave no cryst. products. *Butyrophenone anil*, pale yellow, b_p $198\text{--}202^\circ$ (60% yield); with S at $200\text{--}20^\circ$ for 8 hrs., there results 3,5-diethyl-2,4-diphenylthiophene(?), m. 286° . I (5 g.) and 10 g. of Br in glacial AcOH at room temp. give 80% of a *di-Br deriv.*, m. 86.7° ; 1.5 g. I in AcOH contg. a very small amt. of I and 10 g. Br, kept in the dark 48 hrs. at room temp., give 36% of a *tri-Br deriv.*, pale straw color, m. 126.7° . MeI and Na give a *compd.* $\text{C}_{17}\text{H}_{11}\text{BrSe}$, m. 139.8° . In boiling EtOH in direct sunlight there results a *tetra-Br deriv.*, m. 176.5° , in 30% yield. I *tetrakisulfonic acid*, m. above 300° , in very poor yield from I and ClSO_3H . 5-Bromomercuri deriv. of I, m. 215° , in 50% yield from I and HgBr_2 in EtOH contg. AcONa; boiled with PhMe it gives I and HgBr_2 ; the 5-I *deriv.*, m. 176° , reddens rapidly in the light (30% yield); the 5-cyano *deriv.*, m. 256.4° (50% yield from the 5-Cl *deriv.* and NaCN). Mercuribis-[2,4-diphenylselenophenone-5], pale gray, m. 236.7° .

C. J. WEST

Beckmann rearrangement involving optically active radicals. L. W. JONES AND E. S. WALLIS. *J. Am. Chem. Soc.* **48**, 169-81(1926).—*Me d-benzylmethylacetate*, $[\alpha]_D^{20}$ 26.75° (100 mm. tube). A mixed *l-ester* showed a rotation of -12.66° . *d-Benzylmethylacetohydroxamic acid*, m. 121.5° , $[\alpha]_D^{20}$ 63.2° (1.2817 g. in 50 cc. EtOH), from the *Me ester* and free NH_2OH ; the *dl-acid*, m. 124.4° ; the mixed *l-form*, m. $118.5\text{--}20^\circ$, $[\alpha]_D^{20}$ -31.1° . After 12 weeks, these acids showed no appreciable racemization. The *Bz ester* of the *dl-acid*, m. $119\text{--}20^\circ$; of the *d-acid*, m. 116° , $[\alpha]_D^{20}$ 54.5° (1.0054 g. in 50 cc. EtOH); of the mixed *l-acid*, $114\text{--}6^\circ$, $[\alpha]_D^{20}$ -25.3° . Warming with dil. NaOH causes rearrangement. The K salt, which ppts. from $\text{Et}_2\text{O-EtOH}$ at -12° and may be dried *in vacuo*, puffs when exposed to the air and spontaneously rearranges. *sym-Dibenzylmethylmethylurea* (I), m. 199° . The product from the optically active ester showed no appreciable rotation in EtOH; it is possible that racemization occurred during its formation, in which heating to $80\text{--}90^\circ$ is required. *d-Benzylmethylacetazide*, unstable liquid, decomps. slowly at about 10° , in a 50-mm. tube at 5° gave a rotation of 30.77° ; in H_2O the isocyanate first formed is hydrolyzed to I. In C_6H_6 there results the *d-isocyanate*, b_p 82° , α 28.75° at 20° (50 mm. tube); $[\alpha]_D^{20}$ 52.5° (0.9433 g. in 50 cc. C_6H_6); the completeness of the rearrangement is 97%. *d-Benzylmethylmethylurea*, m. 136° , $[\alpha]_D^{20}$ 10.7° (1.870 g. in 50 cc. Me_2CO); the *dl-deriv.* m. 149° ; a mixt. of 5% *dl-* and 95% *d-urea* m. 133° . The *d-isocyanate* and concd. HCl give *d-benzylmethylmethylamine-HCl*, m. 147° , $[\alpha]_D^{20}$ 16.6° (1.20 g. in 25 cc. H_2O). The velocity of rearrangement of benzylmethylacetazide at 35° corresponds to that of a unimol. reaction; $k_{35} = 0.01178$.

C. J. WEST

Glucosides of chalcones. G. BARGELLINI AND P. LEONE. *Atti accad. Lincei* [6], **2**, 35-9(1925).—In a previous paper (*C. A.* **9**, 1317) a method was described for the prepn. of glucosides of hydroxychalcones by the action of substituted acetophenones on

the glucoside of salicylic acid (I). The chalcone glucosides described in this paper were obtained by condensing aromatic aldehydes with *p*-hydroxyacetophenone glucide (picein) (II). Fruitless attempts were also made to condense I with II. II was obtained according to Mauthner (*C. A.* 8, 1097) by the action of aq. NaOH on a mixt. of $p\text{-HOC}_6\text{H}_4\text{COMe}$ and β -acetobromoglucose in Me_2CO ; the product (III) sapond. with $\text{Ba}(\text{OH})_2$ gives II, m. 193–4°, identical with that obtained from *Pinus picea* by Tanret (*Bull. soc. chim.* [3] 19, 944(1894)). In the condensation B. and L. preferred to use the *tetraacetyl picein* (III) rather than II. To a mixt. of 0.45 g. BzH , 2 g. III and 25 cc. EtOH 5 cc. 40% NaOH was added drop by drop. III slowly dissolved and after 12 hrs. the soln. was acidified with dil. HCl. 4'-Hydroxychalcone glucoside, $\text{PhCH:CHCOC}_6\text{H}_4\text{OC}_6\text{H}_{11}\text{O}_6$, was pptd. and crystd. from EtOH, yellow, m. 195°. III condensed in the same way with anisaldehyde gave 4'-hydroxy-4-methoxychalcone glucoside, yellow, m. 183°; with vanillin 4,4'-dihydroxy-3-methoxychalcone glucoside, golden, m. 193°; with piperonal 4'-hydroxy-3,4-methylenedioxychalcone glucoside, yellow, m. 181°; with furfural under the same conditions *fural-p*-hydroxyacetophenone glucoside, gold crystals from dil. EtOH contg. 1 H_2O of crystn.; with PhCH:CHCHO cinnamylidene-*p*-hydroxyacetophenone glucoside, m. 185°.

E. J. WITZEMANN

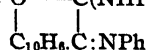
Isomeric esters of *p*-phenoxybenzoylacrylic acid. GRACE P. RICE, *J. Am. Chem. Soc.* 48, 269–74(1926); cf. *C. A.* 19, 3369.—*Me p*-phenoxybenzoylpropionate, b_{16} 252°, m. 59°, in 91% yield by satg. the MeOH soln. of the acid with HCl; *Et ester*, b_{16} 255°. Bromination followed by the removal of HBr gave the unsatd. esters. *Me p*-phenoxybenzoylacrylate (I), yellow, m. 93°; *Et ester* (II), yellow, m. 46° (*dibromide*, m. 78° (decompn.)). The free acid, yellow, m. 121°; bromination in AcOH at 0° gives a *dibromide*, m. 156° (decompn.); in CHCl_3 a *dibromide*, m. 116–9°. A satd. C_6H_6 soln. of I, exposed to sunlight for 3 weeks, gave the colorless form (III), m. 83°; in dil. soln. the change is incomplete; III in C_6H_6 contg. a trace of I is completely changed to I. When the powd. I is exposed to light in a thin layer, there results a polymer, $\text{C}_{34}\text{H}_{28}\text{O}_8$, m. 167°, mol. wt. in CHCl_3 , 561, 568. II in C_6H_6 likewise gives a colorless isomer, liquid; the reverse transformation takes place in the presence of I. The free acid in C_6H_6 was unchanged after an exposure of 4 weeks. The solid acid on exposure did not give an isomer, but decompd. III is transformed into I by concd. HCl in 3 hrs. The acid hydrolysis of the yellow esters is discussed. α -Hydroxy-*p*-phenoxybenzoylpropionic acid(?), m. 120°. III or I in MeOH and 2 equivs. of $\text{H}_2\text{NCONHNH}_2\cdot\text{HCl}$ with AcONa give α -semicarbazidomethyl *p*-phenoxybenzoylacrylate, m. 184°. The *Et deriv.*, m. 178°. I and 1 equiv. of $\text{H}_2\text{NCONHNH}_2$ give the isomeric semicarbazones, pale yellow, m. 141° and 150°. II gives the semicarbazones, m. 156° and 85°.

C. J. WEST

Hydroxyamino acids. I. FRITZ BETTIECHE, *Z. physiol. Chem.* 150, 177–90 (1925).—Acid cleavage of β -hydroxy- α -amino acids yields an α -keto acid, whereas alkali cleavage gives an aldehyde and glycine, which may then undergo condensation into an amino alc. Thus, serine when refluxed with 15% H_2SO_4 splits off NH_3 with formation of AcCO_2H , which was identified by its phenylhydrazone. β -Phenylserine gave PhCH_2CHO , $\text{PhCH}_2\text{COCO}_2\text{H}$ and $\beta\text{-C}_{10}\text{H}_7\text{Ph}$ (I). By heating in a bomb tube at 160–70° the yield of I was increased to 65%. This, however, is a secondary reaction representing a simple condensation of 2 PhCH_2CHO with loss of 2 H_2O . By refluxing phenylserine with 10% NaOH a decompn. into BzH and glycine first occurs and then the 2 products react to form the benzal deriv. of 1,2-diphenyl-2-amino-1-ethanol. *N*-Toluenesulfo-phenylserine, m. 191–2°, was prepd. by shaking phenylserine, $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ and NaOH and treatment of the sepd. Na salt with HCl. It is much more resistant to acid and alkali cleavage than is phenylserine.

A. W. DOX

The isonitriles. XII. Reaction between phenylisonitrile and α -naphthol. MARIO PASSERINI, *Gazz. chim. ital.* 55, 555–9(1925).—In preceding papers (*C. A.* 18, 1661, 3187; 19, 828, 829) the reaction between β -naphthol and aromatic isonitriles was described and interpreted. When α -naphthol (I) is used the corresponding 1-hydroxy-2-naphthylglyoxal is not formed but a more complex compd., 3-anil-2-dianilino-6,7-benzocumarandione $\text{O}—\text{C}(\text{NHPh})_2$ (II), m. 220° (decompn.). 6.5 g. I + 8.5 g.



PhNC in 10 cc. C_6H_6 were refluxed on the H_2O bath for 80–90 hrs.; 6 g. of II sepd. A small amt. of $\text{CO}(\text{NHPh})_2$ and another unidentified compd. are formed. 4.5 g. II was suspended in 20 cc. concd. HCl and boiled a few mins. A yellow ppt. of 1-hydroxy-2-naphthylglyoxylic acid (III), m. 147–9° (decompn.) was obtained. The soln. of III was neutralized with NH_4OH , BaCl_2 was added; the Ba salt was obtained as a yellow ppt. II sapond. in boiling HCl-EtOH pptd. the *Et ester* of III, yellow, 69–70°. 0.5 g. of III in 2 cc. AcOH was heated with a few drops of 30% H_2O on the H_2O -bath. CO_2 was

evolved and on cooling 1,2-C₁₀H₆(OH)CO₂H acid, m. 191–2° having the other known properties of this acid, sepd.

E. J. WITZEMANN

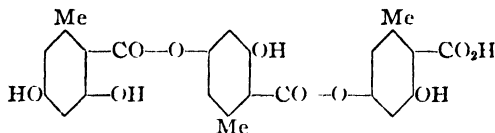
Reactions of ethyl aminocinnamates with bromine. H. W. UNDERWOOD, JR. AND E. L. KOCHMANN. *J. Am. Chem. Soc.* **48**, 254–7 (1926).—Nitration of cinnamic acid gives 17 and 43% of the *o*- and *p*-NO₂ derivs. Reduction of Et *o*-, *m*-, and *p*-nitrocinnamates gives 45, 60 and 53% of the corresponding NH₂ acids. Treatment of the *o*-ester with 8 and with 2 atoms of Br per mol. of ester yields a compd. contg. 4 atoms Br, 2 of which are apparently in the side chain. Upon reaction with an amt. of Br sufficient to sat. the double bond and to replace all sensitive H atoms in the ring, the *m*-ester is transformed into a compd. in which 5 atoms of Br are present; 2 of these are in the side chain. The use of 1 mol. of Br for 1 of ester yields a tri-Br deriv., in which all three halogen atoms are aromatic. Apparently substitution in the ring precedes addn. in the double bond. The *p*-ester, treated with an excess of Br, gives a compd. with 3 atoms Br, only 1 of which is in the side chain. It may be assumed that Br first enters the ring and that the HBr thus formed adds to the aliphatic unsatd linkage. If 2 atoms Br for 1 mol ester are employed, a tarry mixt. is secured. The compd. C₁₁H₁₁O₂NBr₄, m. 251–3°, light yellow; *perbromide*, dark red, m. 235–9°; compd., C₁₁H₁₀O₂NBr₅, from *m*-ester, m. 145°; compd. C₁₁H₁₀O₂NBr₃, m. 110°; the compd. C₁₁H₁₀O₂NBr₃, from the *p*-ester, m. 112.5°.

C. J. WEST

Syntheses in organic chemistry with radiant energy. I. The photosynthesis of α -phenyl- β -diphenyllactic acid. REMO DE FAZI. *Atti accad. Lincei* [6] **6**, 266–9 (1925).—Paternò and Chieffi (*C. A.* **5**, 2632) found on exposing Ph₂CO + PhCH₂CO₂H in C₆H₆ to sunlight for 5 months that benzopinacol (I) and triphenyllactic acid (II) are formed. Later de F. (*C. A.* **9**, 3063) found that I is α -phenyl- β -diphenyllactic acid (III). In opening the tubes after exposure to light de F. always found pressure due to CO₂. De F. noted that after a time the quantity of I + III sepd. did not increase further in 2 months and thought that equil. phenomena were involved. The tubes were opened to release the CO₂, the solid was filtered off and on sealing and exposing them to light again additional I + III sepd. in the course of a month. From the 2nd filtrate unchanged Ph₂CO and PhCH₂CO₂H were recovered as well as some PhCH₂CO₂CH₂Ph and some resin. Additional expts. have been set up in such a way as to absorb the CO₂ formed but these require much time and in the meantime a tentative interpretation of the reactions involved is here given.

E. J. WITZEMANN

Lichen substances. I. Gyrophoric acid. Y. ASAHINA AND N. KUTANI. *J. Pharm. Soc. Japan*, No. **519**, 423–9 (1925).—Analyses of gyrophoric acid (I) are given. According to Hesse (*J. prakt. Chem.* [2] **58**, 475 (1898)), I dried at 100° has the compn. C₂₆H₃₄O₇ and is an isomer of laccaric acid. H. later gave C₂₆H₃₄O₁₄ for I, basing his revision on b. p. detns. of I in Me₂CO. On account of the insoly. of I, A. and K. methylated I with CH₃N₂ and detd. its mol. wt. in PhOH. The result shows that even the Me deriv. of I has a mol. wt. of 500, far smaller than that of free I (639) if H. is correct. The air-dried substance, when dried *in vacuo* with toluene vapor, loses 1 mol. H₂O. The final substance contains C 61.44%, H 4.92%; and the Me deriv. has C 64.6%, H 6.18% and MeO 28%. From this and the chem. properties detd. by previous investigators, I must have the compn. C₂₄H₂₀O₁₀, and must be the tripeptide of orsellic acid,



Those plants in Japan which contain I and allied acids are *Gyrophora esculenta*. Miyoshi (0.43%); *Gyrophora proboscidea* L. (2.3% of the dry plant); *Lobaria pulmonaria* L. (0.2–0.5%).

S. T.

β -Phenylcoumarins. G. BARGELLINI. *Atti accad. Lincei* [6] **2**, 32–5 (1925).—Earlier methods of prepg. β -phenylcoumarins (I) (*C. A.* **5**, 3805) were improved by Sonn (*C. A.* **13**, 582) who obtained I from the action of nitriles of benzoylactic acids with phenols in the presence of HCl gas. E. v. Meyer (*J. prakt. Chem.* [2] **67**, 342 (1903)) had considered the products to be flavones but S. found them to be I. In this way S. prepd. 4,6-dihydroxy-4'-methoxy- β -phenylcoumarin (II). B. repeated this prepn. by S.'s method in order to obtain 4,6,4'-trihydroxy- β -phenylcoumarin (III) (HO)₂C₆H₂O.CO.CH:CC₆H₄OH, and some of its derivs. II was demethylated

by heating it with concd. HI or even with HBr + glacial AcOH. After boiling 4–5

hrs. the product was thrown into very dil. H_2SO_4 and sepd. **III**, yellow, m. $285-8^\circ$ (decompn.). **III** heated with $\text{Ac}_2\text{O} + \text{NaOAc}$ gave 4,6,4'-triacetoxy- β -phenylcoumarin, m. $185-7^\circ$. **II** was treated in MeOH with a slight excess of Me_2SO_4 and gradually with NaOH soln. in excess. The mixt. was dild. with H_2O , the MeOH was distd. off and on adding HCl gave 4,6,4'-trimethoxy- β -phenylcoumarin, m. $249-51^\circ$. **III** when heated with concd. KOH is sapond., giving $p\text{-HOC}_6\text{H}_4\text{CO}_2\text{H}$ and phloroglucinol, which are also produced under the same conditions from apigenin (trihydroxyflavone), campherol (trihydroxyflavonal) and by vitexin, durasantalol, sacuranetin, etc., of natural origin but of unknown constitution. E. J. WITZEMANN

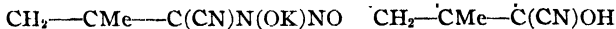
α,β -Diphenylcoumarins. G. BARGELLINI. *Atti accad. Lincei* [6] 2, 178-82 (1925).—As is known *o* hydroxy aldehydes condense with NaOAc in the presence of Ac_2O giving coumarins; the corresponding benzophenones give β -phenylcoumarins (B. and Leonardi, *C. A.* 5, 3805). Just as *o*- $\text{HOC}_6\text{H}_4\text{CHO}$ condenses with $\text{PhCH}_2\text{CO}_2\text{H}$ giving α -phenylcoumarin (Ogialoro, *Gazz. chim. ital.* 9, 128 (1879)) so other substituted α -phenylcoumarins were obtained by the same method. To complete this work on α - and β -substituted coumarins B. studied the products obtained from *o*-HO substituted benzophenones (I) by which substituted α,β -diphenylcoumarins were obtained. Equimol. amts. of I + $\text{PhCH}_2\text{CO}_2\text{H}$ were heated 30 hrs. with 5 times their combined wt. of Ac_2O on a sand bath and then thrown into H_2O . In this way from 2,4-(HO) $_2\text{C}_6\text{H}_3\text{COPh}$ the *Ac* deriv. of α,β -diphenyl-4-hydroxycoumarin (**II**), ye. lowish, m. 220° , was obtained. This was sapond. at room temp. by concd. H_2SO_4 , giving free **II**, m. 290° . With 2,3,4-(HO) $_3\text{C}_6\text{H}_2\text{COPh}$ the *di-Ac* deriv. of α,β -diphenyl-3,4-dihydroxycoumarin (**III**), m. 255° (decompn.), was obtained; on sapon. **III**, m. $271-3^\circ$, was sepd. With 2,4,6-(HO) $_3\text{C}_6\text{H}_2\text{COPh}$ the *di-Ac* deriv. of α,β -diphenyl-4,6-dihydroxycoumarin (**IV**), m. 190° , was formed; this on sapon. gave **IV**, m. $260-5^\circ$. With 2,4,4'-(HO) $_3\text{C}_6\text{H}_3\text{COC}_6\text{H}_4\text{OMe}$ the *Ac* deriv. of α -phenyl- β -*p*-methoxyphenyl-4-hydroxycoumarin (**V**), m. $220-2^\circ$, was formed; this on sapon. gave **V**, m. 255° (decompn.). E. J. WITZEMANN

α -Phenyl- β -methylcoumarins. G. BARGELLINI. *Atti accad. Lincei* [6] 2, 261-6 (1925). In this paper the reaction described in the preceding abstr was extended to *o*-HO substituted acetophenones. B. believes that the reaction mechanism is analogous to that involved in the Ph_2CO derivs. and that α -phenyl- β -methylcoumarins (**I**) are formed. But the possibility that they are α -benzylchromones (**II**) cannot be excluded *a priori*. The yield of **I** is not high and the tar that is always formed, which is sol. in EtOH, may consist of chromones. The products isolated are thought to be **I** since their Me ethers are sol. in hot dil. alkalies and are reprecipitated unchanged by acids and this is not true of **II**. In another paper other reasons for considering these compds. as coumarins will be given. $\text{PhCH}_2\text{CO}_2\text{Na} + 2,4\text{-(HO)}_2\text{C}_6\text{H}_3\text{COMe}$ and Ac_2O were heated 30 hrs. and gave the *Ac* deriv. of α -phenyl- β -methyl-4-hydroxycoumarin (**III**), m. $180-2^\circ$; this, sapond. with concd. H_2SO_4 , gave **III**, m. 225° . **III** with BzCl gave the *Bz* deriv. **III** with $\text{Me}_2\text{SO}_4 + \text{NaOH}$ gave the *Me* ether (**IV**), m. $101-2^\circ$. Phenol condensed with $\text{PhCH}_2\text{CO}_2\text{H}$ gave **IV** also. 2,5-(HO) $_2\text{C}_6\text{H}_3\text{COMe}$ treated as above gave the *Ac* deriv. of α -phenyl- β -methyl-5-hydroxycoumarin (**V**), m. $170-3^\circ$; this sapond. gave **V**, m. 248° ; with Me_2SO_4 **V** gave the *Me* ether, m. $150-1^\circ$. Treated as above 2,3,4-(HO) $_3\text{C}_6\text{H}_2\text{COMe}$ gave the *di-Ac* deriv. of α -phenyl- β -methyl-3,4-dihydroxycoumarin (**VI**), m. $207-8^\circ$; this sapond. gave **VI** (decompn.), begins at 265° , m. 274° . With Me_2SO_4 **VI** gave the *di-Me* ether, m. $166-8^\circ$. 1,2- $\text{C}_{10}\text{H}_7(\text{OH})\text{Ac}$ (obtained by condensing α -naphthol with AcOH in the presence of ZnCl_2) treated as above gave α -phenyl- β -methyl-naphthocoumarin, m. $215-6^\circ$. E. J. WITZEMANN

Camphor group. I. Y. MURAYAMA. *J. Pharm. Soc. Japan*, No. 524, 882-4 (1925).—(a) Prepn. of camphor from turpentine oil (with K. OTSUKA). Two brands of the American oil were distd. over Na and portions b. $158-61^\circ$ were taken. Brand A had $d_{15} 0.8644$, $\alpha - 6.40^\circ$; Brand B, $d_{15} 0.8610$, $\alpha 9.20^\circ$. The oil was treated with anhyd. $\text{H}_2\text{C}_2\text{O}_4$ in the presence of FeCl_3 as a catalyst; the resulting ester was sapond. The yield of the crude borneol was 25%. The purified borneol from A had $[\alpha]_D^{16} -10.00$, and that from B $+10.00$. When these *d*- and *l*-borneols are oxidized with fuming HNO_3 , *d*- and *l*-camphor are obtained. The yield is 90%. (b) Prepn. of camphor from camphane-2-carboxylic acid (with S. TANAKA). 10 g. of camphane-2-carboxylic acid dissolved in a slight excess of dil. alkali were slowly mixed with 30 g. KMnO_4 and warmed on a water bath. On sublimation, there is obtained a white cryst. substance m. 175° , identified as camphor by its semicarbazone, m. 235° . S. T.

Reaction of potassium cyanide with the pernitroso derivatives. MARIO PASSERINI. *Gazz. chim. ital.* 55, 559-67 (1925); cf. also *C. A.* 19, 3087.—Five g. pernitrosocamphor in 15 cc. EtOH with 1.5 g. KCN in 15 cc. H_2O was boiled under a condenser for 20

min. The EtOH was largely evapd. and the *K* salt of 6-cyanocamphor-6-nitrosohydroxylamine (I) sepd. I in H₂O with dil. H₂SO₄ with dil. H₂SO₄ pptd. a colorless compd. which



(I)

(II)

decomps. at 85°, evolving N₂O and giving *camphor cyanohydrin* (II), m. 209-10°. II heated with a little concd. HCl dissolved quickly and then sepd. the corresponding *amide*, m. 198°. The HCl soln. was also boiled 80 hrs., dild. with H₂O and extd. with Et₂O. On evapg. the Et₂O a cryst. mass of 2 isomeric acids was obtained. This dissolved in hot C₆H₆ sepd. an *acid* C₁₁H₁₆O₂, m. 157-8°. The mother liquors were evapd. and the residue was crystd. from petroleum ether and gave an *acid*, m. 90-2°. II boiled with 10 times its wt. of 40% H₂SO₄ 6-7 hrs. gave a mixt. that on cooling solidified. Extd. with Et₂O and then crystd. from petroleum ether an *acid*, C₁₁H₁₆O₂, m. 137-8°, was obtained. The residue from the petroleum ether was distd. with steam 5 times and gave an *acid*, C₁₁H₁₆O₂, m. 108-10°. The constitution of these 4 acids has not been detd. 4.5 g. of pernitrosolenchone in 9 cc. EtOH with 2 g. KCN in 4.5 cc. H₂O were boiled 20 min. etc., as with I and gave after adding H₂O + dil. H₂SO₄ 6-cyanofenchane-6-nitrosohydroxylamine (III), decomps. 83-4°, gives a *Ag* salt, C₁₁H₁₆O₂N₃Ag. At 83-4° III loses N₂O, giving *fenchone cyanohydrin* (IV). This is composed of 2 compds., of which I is slowly dissolved and slowly sepd. from petroleum ether, while the other is quickly dissolved and quickly sepd. The latter m. 166-8°, [α]_D¹⁰ 5.15.12°, is considered to be IV; the other m. 100-2°, [α]_D¹⁰ 50.49°, is the isomer. 3 g. of the form, m. 166-8°, in 20 cc. of a satd. soln. of HCl gas in Et₂O was allowed to stand 3 days; crystals of an *amide*, C₁₁H₁₉O₂N, m. 170-2°, sepd. The isomer, m. 100-2°, was treated similarly and gave an *amide*, C₁₁H₁₉O₂N, m. 116-7°. These amides are sapond. by hot KOH, giving NH₃ and acids not yet isolated. E. J. W.

o-Hydroxybenzoyl-*o*-tetrachlorobenzoic acid, isophenoltetrachlorophthalein and some of their derivatives. W. R. ORNDORFF AND THEOPHILUS PARSONS. *J. Am. Chem. Soc.* **48**, 283-8(1926).—Tetrachlorophthalic anhydride and PhOH are condensed by AlCl₃ to give 82% of *o*-hydroxybenzoyl-*o*-tetrachlorophthalic acid (I), m. 210°; *di*-Ac deriv., m. 168°; the concd. H₂SO₄ soln. is bright orange. Heated with 30% NaOH for 1 hr., there results 5,6,7-trichloroxanthone-8-carboxylic acid, m. 262-5° (gas evolution); the concd. H₂SO₄ soln. is greenish yellow; the presence of the CO₂H group was demonstrated by the formation of a *Ba* and a *Na* salt. I and PhOH with SnCl₄ give 74% isophenoltetrachlorophthalein (II), m. 293°, sol. in concd. H₂SO₄ with a deep red color, which fades to a pale lemon-yellow on standing; alk. solns. are purple; the *p*_H value at the end point (reddish violet) is 9.2. Phenoltetrachlorophthalein, m. 307°. A by-product in the prepn. of II is tetrachlorofluoran, m. 298° (decompn). II *di*-Ac deriv., m. 189°; *di*-Bz deriv., m. 245° (red soln. in concd. H₂SO₄, by which it is sapond.); *di*-Me ether, m. 183° (the concd. H₂SO₄ soln., from which it is pptd. unchanged by H₂O) is deep blood-red). C. J. WEST

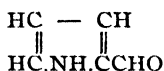
Tetrahydrofurfural (correction). HELMUTH SCHREIBLER, FRANZ SOTSCHKE AND H. FRIESE. *Ber.* **58B**, 1961(1925); cf. *C. A.* **19**, 278.—Measurements on larger amts. of the above substance have given the following consts.: *d*₂₀²⁰ 1.0749, *d*₄²⁰ 1.0727, *n*_D 1.43415, 1.43658, 1.44173 for α, D and β at 20°, *E*_D -0.32, -0.31, -0.33, 2.6% for α, D, β and β-α. C. A. R.

Iodinated pyrrole derivatives and their behavior with nitric acid. A. PIERONI AND DINO NOCENTINI. *Gazz. chim. ital.* **55**, 348-61(1925).—In prep. the I compds. described a general method was developed. The compd. to be iodinated, generally the bi-CO₂H compd., was dissolved in a large excess of concd. Na₂CO₃. To the clear cold soln. the calcd. amt. of 1.0 *N* I-KI was added. The mono-I derivs. remain in soln. while the small amts. of di-I derivs. formed are inso. and are sepd. by filtration. The mono-I compd. is then sepd. by adding AcOH or dil. H₂SO₄. The di-I derivs. are pptd. at once on adding the calcd. amt. of I₂. The I compds. thus obtained are recrystd. from MeOH or EtOH. 18 g. α,β-dimethylpyrrole-α,β-dicarboxylic acid + 2 g. Na₂CO₃ in enough H₂O to give a clear soln. were treated with 46 cc. 1.0 *N* I-KI. The red ppt. of α,β-dimethyl-α,β-diiodopyrrole, crystd. from warm Et₂O, decomps. 65°. 1 g. Et α,β-dimethylpyrrolecarboxylate was dissolved in a little H₂O with 0.8 g. KOH, 150 cc. H₂O was then added and then 10 cc. 1.0 *N* I-KI drop by drop. α,β-Dimethyl-β-

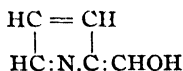
carbethoxy- α -monoiodopyrrole, IC: CMe.C(CO₂Et):CMe.NH, m. 148°, was pptd. and

crystd. from MeOH; this compd. does not react with KOH and when suspended in dil. EtOH gives an intensely red color with FeCl₃ on the H₂O bath. α,α' -Dimethylpyrrole- β,β' -dicarboxylic acid (I) dissolved in excess conc. KOH soln. treated drop by drop with I-KI soln. pptd. α,α' -dimethyl- β,β' -diiodopyrrole (II), m. 134°. 0.5 II in AcOH was treated drop by drop with 3 cc. concd. HNO₃ in AcOH, with cooling. After a few min. the mixt. was poured into H₂O and a yellow-brown amorphous ppt. was formed, from which a definite product could not be isolated. 0.5 g. I in 20 cc. 20% Na₂CO₃ was treated with 5 cc. I-KI. The di-I compd. was filtered off. 20% H₂SO₄ added to the filtrate pptd. α,α' -dimethylpyrrole- β,β' -monoiodocarboxylic acid (III), m. 162° (decompn.). 1 g. III was added gradually to 2-3 cc. concd. HNO₃; after standing the mixt. was thrown into H₂O, the acid was nearly neutralized with Na₂CO₃, and the soln. was extd. with Et₂O. The latter on evapn. gave a compd., silky needles, m. 125°. The di-I₂ ester of I in glacial AcOH with HNO₃ gave a compd. m. 167-8°. These compds. are to be studied further. 0.8 g. phenyl- α,α' -dimethylpyrrole- β,β' -dicarboxylic acid (IV) in a slight excess of concd. KOH with 7 cc. I-KI pptd. phenyl- α,α' -dimethyl- β,β' -diiodopyrrole (V), m. 115°. On nitrating V in AcOH with HNO₃ an amorphous product of unknown constitution was obtained. 2.5 g. IV in excess 20% Na₂CO₃ with the calcd. amt. of I-KI gave phenyl- α,α' -dimethylpyrrole- β,β' -monoiodocarboxylic acid (VI), m. 175°. If VI is purified by dissolving it in Na₂CO₃ and pptg. the cold soln. with dil. H₂SO₄ the product obtained in 190° (decompn.). VI in MeOH with AgNO₃ and a few drops of NH₄OH ppts the Ag salt, which is sol. in excess of NH₄OH. Acetylpyrrole in Na₂CO₃ with the calcd. amt. of I-KI gives 2 products: diiodoacetylpyrrole (VII), m. 168°, and triiodoacetylpyrrole (VIII), m. 202°. VII and VIII were sep'd. by their diverse soly. in EtOH, the latter being the less sol. VII with excess I₂ gives CIII₃ and a trace of VIII. Neither reacts with *p*-bromophenylazoxycarboxamide under normal conditions. 0.4 g. VIII added gradually to 5 cc. concd. HNO₃ gave after neutralizing with Na₂CO₃, extg. with Et₂O, etc., a nitro compd. contg. I. VIII in EtOH-H₂O with Na₂CO₃ reacts with NH₄OH.HCl when boiled 12 hrs. under a condenser. On dilg. the soln. with H₂O and evapg. the EtOH a cryst. compd., m. 172° (decompn.) was obtained. 5 g. IV was added gradually to 30 cc. concd. HNO₃ with cooling; after 15 mins. the mixt. was poured on ice and H₂O was added gradually. Phenyl- α,α' -dimethyl- β,β' -dinilropyrrole, m. 205°, sep'd. α,α' -Dimethylpyrrole- β,β' -dicarboxylic acid on nitration gave a product, m. 115°, of unknown constitution. E. J. W.

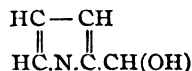
The constitution of pyrrolealdehyde. G. RASTELLI AND A. MINGOZZI. *Gazz. chim. ital.* **55**, 549-51(1925).—Pyrrolealdehyde (I) is unusual in that it is stable in air and does not give the characteristic reactions of aldehydes such as that with benzenesulfohydroxamic acid, while its *N*-Me deriv. is oxidizable by air and gives the characteristic reactions. For these and other reasons a constitution is assigned to I that is quite different from that of the common pyrrole derivs. The 3 formulas considered were II, III and IV, of which III is the most probable. The constitution of I was studied spectro-



(II)



(III)



(IV)

graphically. Pyrrole (Hartley, Dobbie, *J. Chem. Soc.* **81**, I, 929(1902)) and the aldehyde group (Stewart and Baly, *J. Chem. Soc.*, **89**, I, 489(1899)) both show a continuous absorption spectrum and so if I is a true aldehyde it should show a continuous spectrum. Likewise the group N.C.C: in IV would not have a discontinuous spectrum, while that

of the hydroxymethylene group in III is discontinuous. The data conform with formula III and indicate that II and III are in equil. with the equil. well over toward the side of III.

E. J. WITZEMANN

An acridine synthesis from 4,5-benzocoumarandione and aniline. KARL SAFTIEN. *Ber.* **58B**, 1958-60(1925); cf. Fries and Pusch. *C. A.* **19**, 2046.—From 0.01 mol. 4,5-benzocoumarandione (I) heated 15 sec. to boiling in 0.05 mol. PhNH₂ and, after cooling, poured into an excess of dil. HCl is obtained almost quant. 2-hydroxynaphthoyl-1-formanilide anil, HOC₁₀H₆C(:NPh)CONHPh, light yellow, m. around 175°, 2 g. of which, boiled 15 sec. in 10 cc. Ac₂O, gives 1.4 g. 4,5-benzocoumarandione 3-anil, red, m. 182°, quite stable towards aq. NaOH, decompd. by boiling AcOH. 7,8-Benzocacridine-9-carboxylic acid, obtained in 75% yield from 0.01 mol. I boiled 1 hr. in 50 cc. AcOE

with 0.02 mol. PhNH_2 , yellow, m. 284° , easily sol. in alkalis and soda, sol. in concd. H_2SO_4 with yellow color but no fluorescence, loses CO_2 above its m. p. and gives β -chrysidine, m. 131° . **1,2,7,8-Dibenzoacridine-9-carboxylic acid**, from **I** and $2\text{-C}_{10}\text{H}_7\text{NH}_2$ in 85% yield, m. 260° , changing into the acridine, m. 216° . **2-Methoxy-7,8-benzoacridine-9-carboxylic acid**, from $p\text{-MeOC}_6\text{H}_4\text{NH}_2$, yellow, m. 286° (decompn.), forming **2-methoxy-7,8-benzoacridine**, yellowish white, m. 157° . **2-Acetamido-7,8-benzoacridine-9-carboxylic acid**, from $p\text{-AcNHC}_6\text{H}_4\text{NH}_2$, dark yellow, m. 292° , losing CO_2 and forming the acridine, m. 275° (Ullmann, *Friedlander* 6, 461, gives 255°). C. A. R.

Catalysts for the synthesis of indoles according to Fischer. A. KORACZYNSKI AND L. KIERZEK. *Gazz. chim. ital* 55, 361-9 (1925). -After having detd. that PhNHNH_2 decomps. at 150° in the presence of small amts. of Ni, Co or Cu powder and of salts like CoCl_2 , NiCl_2 , CrCl_3 and UCl_6 , K. and K. extended their expts. to derivs. of PhNHNH_2 (mainly phenylhydrazones). Fischer synthesized derivs. of indole by decompn. of phenylhydrazones by fusion with ZnCl_2 or heating with HCl . K. and K. have found that Ni, Co and Cu powder and CoCl_2 , NiCl_2 and many other salts catalyze the same decompn. Arbusov (*C. A.* 4, 3218) observed that this reaction is brought about by Cu halides. K. and K. have studied the action of NiCl_2 especially and compared its action with that of ZnCl_2 and CuCl_2 . The interpretation of this reaction given by Reddell (*C. A.* 6, 1597) and Hollins (*C. A.* 16, 2862) is not considered satisfactory, while that of G. and R. Robinson (*C. A.* 12, 2313, 18, 2161) is simpler and satisfactory. The p -substituted phenylhydrazones do not give rise to indoles but undergo a profound decompn. This conforms with results of Bamberger and Sternicki (*Ber* 25, 1307 (1893)) and of Bltz and Sieden (*Ann* 324, 310 (1902)). PhNHNH_2 was heated to $150\text{--}70^\circ$ with 10% of its wt. of anhyd. NiCl_2 , CoCl_2 and ZnCl_2 and powd. Cu, Fe, Ni, Co, Zn, Al, W, Ti, U and Mo. NH_3 was formed and in the distillate C_6H_6 , PhNH_2 and tar were found. The metals were less active in this decompn. than the salts and also showed a graded effect. The decompn. of the phenylhydrazones of MeCOPh , EtClO and MeCOEt was accomplished with 2% NiCl_2 at 230° and gave 2-phenyl-, 2-methyl- and 2,3-dimethylindole in yields of 60-65%. These bases were treated with an equimol. amt. of picryl chloride + the calcd. amt. of Na_2CO_3 and refluxed on a H_2O bath. After 0.5 hr. they were filtered and on standing sepd. **picryl-2-methylindole**, red needles, m. 110° , and **picryl-2,3-dimethylindole**, red, m. $133\text{--}4^\circ$. 5 g. PhNHNH_2 + 7 g. $p\text{-MeOC}_6\text{H}_4\text{COMe}$ (Cheron and Zemanos, *Compt rend* 133, 742 (1900)), heated 5 min. sepd. on cooling ***p*-methoxyacetophenone phenylhydrazone (I)**, m. 142° , decmps. in light and air. 9 g. **I** + 0.1 g. NiCl_2 were heated 0.5 hr. at $230\text{--}40^\circ$ and dissolved in C_6H_6 , treated with animal C filtered and on standing sepd. **2-*p*-methoxyphenylindole**, m. $228\text{--}9^\circ$. ***p*-Methoxyacetophenone *p*-bromophenylhydrazone**, m. 154° , was prepd. like **I** and when heated with NiCl_2 decompd. profoundly at $154\text{--}60^\circ$. **Acetophenone *p*-methoxyphenylhydrazone**, b_{16-20} $180\text{--}90^\circ$, m. $63\text{--}4^\circ$, on heating with NiCl_2 gives **2-phenyl-5-methoxyindole**. ***p*-Methoxyacetophenone *p*-methoxyphenylhydrazone**, m. $162\text{--}3^\circ$, heated with 4% NiCl_2 at 170° gives NH_3 and **2-*p*-methoxyphenyl-5-methoxyindole**, browns 204° , m. $213\text{--}4^\circ$. 5 g. $p\text{-HOCC}_6\text{H}_4\text{CMe:NNHPh}$ + 0.1 g. NiCl_2 heated at 240° and extd. with Et_2O in a Soxhlet extractor gave **2-*p*-hydroxyphenylindole (II)**, m. 70° . 1.73 g. **II** + 2 g. CO(NHPh)_2 were boiled in dry $\text{C}_6\text{H}_5\text{N}$ for 2 hrs. The mixt. thrown into H_2O sepd. an amorphous compd., $\text{C}_{17}\text{H}_{20}\text{N}_2\text{O}_2$, m. 65° . 13 g. enanthal phenylhydrazone + 0.15 g. Ni + 0.15 g. NiCl_2 were heated at $220\text{--}30^\circ$ for 30 mins. From this ***8*-pentylindole** was sepd. by a method that is described; its *picrate* was obtained, m. $91\text{--}2^\circ$. ***p*-Hydroxydibromoacetophenone *p*-bromophenylhydrazone**, m. 180° , undergoes profound decompn. when heated with Ni.

E. J. WITZEMANN

New azo combinations with diacetosuccinic ester and the Bülow synthesis of substituted pyrazoles. C. BÜLOW AND K. BAUR. *Ber.* 58B, 1926-32 (1925); cf. *Ber.* 33, 262 (1900); Dimroth, *C. A.* 3, 439. -- ***Di-Et [acetyl-*p*-phenylenediamine-azo]diacetosuccinate***, $\text{RN:NCAc(CO}_2\text{Et)CHAcCO}_2\text{Et}$ (**I**, $\text{R} = \text{AcNHC}_6\text{H}_4$), from diazotized $p\text{-AcNHC}_6\text{H}_4\text{NH}_2$ in HCl with $(\text{CHAcCO}_2\text{Et})_2$ and NaOAc in cold aq. alc., m. 134° , does not give the Bülow reaction, is easily converted by long standing in alc., by boiling in dil. alc. or AcOH or by fusion into ***di-Et 5-methyl-1-[*p*-acetylaminophenyl]pyrazole-3,4-dicarboxylate*** (best prepd. by treating the original coupling mixt. directly with steam), m. 158° , which is hydrolyzed by boiling alc. KOH to the free acid, m. 264° (decompn.), can be titrated very accurately, is not pptd. by AcOH from aq. solns. of the *di-K* salt; the ***1-p*-aminophenyl acid**, from the above ester with 1:1 HCl , m. 276° (decompn.), is distinctly amphoteric; although it forms no solid HCl salt, its suspensions in mineral acids yield clear diazo solns. (**II**) which under suitable conditions can be coupled with keto-enol desmotropes of the type of $\text{AcCH}_2\text{CO}_2\text{Et}$, yielding with $\text{AcCH}_2\text{CO}_2\text{Et}$ itself ***Et[5-methylpyrazole-3,4-dicarboxy-1-*p*-aniline-azo]acetoacetate***,

EtO₂CCHAcN:NC₆H₄N $\begin{cases} N = CCO_2H \\ CMe: CCO_2H \end{cases}$, yellow, m. 215-6° (decompn.), and with

AcCH₂CONHPh the corresponding *acetoacetanilide*, decomps. about 266°, which cannot be titrated and whose C₆H₅N salt in H₂O gives ppts with metallic salts. *Di-Et [5-methylpyrazole-3,4-dicarboxy-1-p-aniline-azo]acetonedicarboxylate*, from II and CO-(CH₂CO₂Et)₂, yellow hydrated leaflets (1 or 2H₂O), m. anhyd. around 140°, yields with alkalis needles, decomp. 265°, contg. 49.12, 49.23% C, 3.89% H and 13.40% N. *p*-AcNHC₆H₄NH₂, m. 195-6°, is obtained in 57% yield from 25.2 g. com. distd. (C₆H₄-NH₂)₂ and 14 g. Ac₂O in CHCl₃ in the cold. *Di-Et [N-monoacetylbenzidine-azo]diacetosuccinate*, m. 163° (decompn.), does not give the Bulow reaction. *Di-Et 5-methyl-1-[p-acetylaminodiphenyl]pyrazole-3,4-dicarboxylate*, m. 168°; free acid, m. 285° (decompn.); *K II salt*, decomp. 325°; *di-K salt*; *1-p-aminodiphenyl acid*, m. 287° (decompn.). *Tetra-Et diacetosuccinate[azobenzidine-azo]diacetosuccinate*, from tetrazotized (C₆H₄NH₂)₂ and (CHAcCO₂Et)₂, faintly yellow, m. 152° (decompn.), does not give the Bulow reaction. *Tetra-Et 1-p-di-phenylbis-[5-methylpyrazole-3,4-dicarboxylate]*, m. 141°; free acid, m. 302° (decompn.); *tetra-K salt*; *di-K salt*, does not change up to 350°. C. A. R.

New syntheses of nitrogenated heterocyclic nuclei. I. Pyrazolecarboxylic acids through dehydrocondensation of the aldehyde hydrazones with acetoacetic ester. GAETANO MINUNNI WITH G. LAZZARINI AND S. D'URSO. *Gazz. chim. ital.* **55**, 502-39 (1925).—The 1st twenty pages of this paper are devoted to a systematic review of all the general methods that have been devised for the synthesis of pyrazolecarboxylic acids (I), under 19 headings. A practical method of general application was lacking until it was learned that aldehyde hydrazones and AcCH₂CO₂Et interact at 120-35° with ZnCl₂ to give pyrazolecarboxylic acids. Gas is evolved during the reaction. Since ZnCl₂ has a pronounced resinifying action on the hydrazones it is necessary to reduce the time of heating as much as possible. To 10 g. of dry hydrazone in a 50-cc. flask provided with an air condenser is added a slight excess of AcCH₂CO₂Et and then 0.1-0.2 g. fused ZnCl₂. The mass is heated in a paraffin bath with agitation. When gas evolution is complete an equal vol. of EtOH is added to the warm oily mass. A mass of crystals is formed which is filtered off after some hrs. The ester of I obtained is recrystd. from EtOH. The best yields are obtained when the hydrazone resists the resinifying action of ZnCl₂ and when the ester formed is little sol. in EtOH. When these conditions do not exist the oily mass is poured into EtOH as before, and the EtOH is distd. The residue is distd. with steam to remove unchanged AcCH₂CO₂Et. The ester of I is then extd. with hot ligroin or 50% EtOH. On cooling, these solns. sep. a little tar which is filtered off. Later the cryst. ester of I seps. When the compd. cannot be isolated in this way the crude product is sapond. at once, in the hope of obtaining free I in the cryst. form, by heating with 10% EtOH-KOH or with concd. H₂SO₄. The alk. soln. is dild. with H₂O, filtered and extd. with Et₂O to eliminate the impurities. This soln. is acidified with dil. HCl and the free acid (I) pptd. is crystd. from a suitable solvent. If H₂SO₄ was used, the mixt. is poured into much H₂O and the I pptd. is filtered off, dissolved in Na₂CO₃, filtered, repptd. with dil. HCl and crystd. as before. The following compds. were prepd. in this way. From the phenylhydrazone of enanthal. *3-enanthyl-1-phenyl-5-methylpyrazole-4-carboxylic acids*, m. 100-1°; Et ester, uncrystallizable. From BzH *3-phenyl*, m. 194°; Et ester, m. 105°. From *m*-O₂NC₆H₄CHO, *3-[m-nitrophenyl]*, m. 207-8°; Et ester C₁₉H₁₇O₄N₃, m. 105.5-6.5°. *3-[p-nitro]isomer*, m. 209.5-210°; Et ester, C₁₉H₁₇O₄N₃, m. 107-8°. From *o*-HOOC₆H₄CHO *1-phenyl-3-[o-hydroxyphenyl]-5-methylpyrazole-4-carboxylic acid lactone* or *1-phenyl-5-methylpyrazocoumarin*, m. 182-3°, giving in KOH-EtOH *1-phenyl-3-[o-hydroxyphenyl]-5-methylpyrazole-4-carboxylic acid*, m. 160° (decompn.). From *p*-MeOC₆H₄CHO, *3-anisyl*, m. 177-8°; Et ester, C₂₀H₂₀O₄N₂, m. 88-9°. From piperonal, *3-piperonyl*, m. 203-4°; Et ester, m. 97-8°. From *p*-MeC₆H₄NHN:CHPh, *1-[p-tolyl]-3-phenyl-5-methylpyrazole-4-carboxylic acid*, m. 202-3°; Et ester, C₂₀H₂₀O₄N₂, m. 94-5°. The results given in this paper and those obtained with BzCH₂CO₂Et (described in a subsequent paper) show that the dehydrocondensation of the β-ketonic acid esters with the hydrazones of aromatic aldehydes gives a new general convenient method for the synthesis of a large no. of I. The compds. formed in this way are identical with those obtained by the action of NH₂NH₂ on alkylidene- and benzylidene-acetoacetic esters and isomers of these that NH₂NH₂ also gives with acylacetoacetic esters. But these two reactions discovered by Knorr (*Ann.* **238**, 137 (1887)); Knorr and Duden, *Ber.* **26**, 111 (1893)) depend on almost inaccessible compds. while the compds. used in the new synthesis are easily available. The resinifying action of ZnCl₂ in certain instances is a difficulty that remains to be overcome.

E. J. WITZEMANN

Thiazoles. VIII. The condensation of *o*-aminophenyl mercaptan and *o*-aminophenyl disulfide with acid chlorides, anhydrides and esters. M. T. BOGERT AND ARTHUR STULL. *J. Am. Chem. Soc.* **48**, 248-54 (1926); cf. *C. A.* **20**, 386.—*Et oxanilate o-disulfide*, light yellow, m. 104° (all m. ps. cor.), in 68% yield from (CO₂Et)₂ and (o-H₂NC₆H₄)₂S₂; coned. NH₄OH gives 93% of *oxanilamide o-disulfide*, m. 240° (decompn.); PhNH₂ at 150° gives 49% of *oxanilide o-disulfide*, m. 229-30°. Reduction by EtONa gives benzothiazole-2-carboxylic acid in 60% yield. *o*-H₂NC₆H₄SH and (COCl)₂ give bis-2,2'-benzothiazolyl (oxalamidothiophenol), m. 300.5°. *Succinanilic acid o-disulfide*, sinters 155-8°, m. 167.8°, 28% yield. *Glutaranilic acid deriv.*, m. 155-6°, decomp. 160-1° (91% yield). *Camphoranilic acid deriv.*, greenish yellow, m. 229° (40% yield). *Malcanilic acid deriv.*, yellow, m. 200-1° (97% yield). *o*-Phthalimido-phenyl *o-disulfide*, m. 219° (85% yield), it is hydrolyzed by 10% EtOH-KOH on warming. 2,2'-[*p*-Phenylene]bisbenzothiazole, m. 263°, in 62% yield from *o*-H₂NC₆H₄SH and *p*-C₆H₄(COCl)₂. *Pyromucylanilide o-disulfide*, yellow, m. 160.5° (66% yield); reduction gives 82% of 2-*α*-furylbenzothiazole, also obtained in 75% yield from *o*-H₂NC₆H₄SH and pyromucyl chloride. *α*-Thenoylanilide *o-disulfide*, pale yellow, m. 154° (67% yield); reduction gives 56% of 2-*α*-thienylbenzothiazole, m. 99.5°, whose tea-rose or geranium odor is more pronounced than that of 2-phenylbenzothiazole itself.

C. J. WEST

Reactions of the formamidines. XI. The 2-thio-4-thiazolidones. F. B. DAINES AND SILAS I. DAVIS. *Kansas Univ. Sci. Bull.* **15**, 265-70 (1924); cf. *C. A.* **17**, 543; **14**, 1667.—The 2-thio-4-thiazolidones have been found to react with substituted formamidines to form derivs. of the type $\text{S.CS.NH.CO.C} \begin{smallmatrix} \text{---} \\ \text{---} \end{smallmatrix} \text{CHNHR}$ and with aldehydes to

from compds. of the type $\text{S.CS.NH.CO.C} \begin{smallmatrix} \text{---} \\ \text{---} \end{smallmatrix} \text{CHR}$ When 2-thio-4-thiazolidone (I) (cf.

Nencki, *J. prakt. Chem.* [2] **16**, 4 (1877)) and diphenylformamidine (II) in kerosene are heated at 120° for 1 hr and recrystd. from alc., yellow needles of 2-thio-5-anilino-methylene-4-thiazolidone (III), S.CS.NH.CO.C. CHNHPh, are obtained in 46% yield, m.

248° and sol. in NaOH. 2-Thio-3-phenyl-4-thiazolidone (IV) (from NH₄ phenyldithiocarbonate and ClCH₂CO₂Na) and II gave 2-thio-3-phenyl-5-anilino-methylene-4-thiazolidone (V), m. 247°. V is decompd by alc. KOH and forms a hydrazone(?), m. 215°. 2-Thio-3-phenyl-5-*α*-naphthylaminomethylene-4-thiazolidone from the correspondingly substituted thiazolidone and formamidine in 36% yield, m. 279°. 2-Thio-3-*p*-tolyl-5-anilino-4-thiazolidone, prep'd. like IV, m. 235°. Di-*p*-amylformamidine and IV gave 2-thio-3-phenyl-5-*p*-methoxyanilinomethylene-4-thiazolidone, m. 158-60°. When treated with PhCH₂Cl in dil. NaOH, the benzaldehyde and cinnamaldehyde condensation products of I gave 2-benzylthio-5-benzal-4-thiazolidone, S.C(SCH₂Ph).N.CO.C:CHPh,

m. 123°, and 2-benzylthio-5-cinnamal-4-thiazolidone, m. 143°, in 96% and 88% yields, resp. When III is heated with EtI in alc. KOH 2-ethylthio-5-anilinomethylene-4-thiazolidone, S.C(SEt).N.CO.C:CHNHPh, m. 175°, is obtained; III and PhCH₂Cl

in NaOH gave quant. 2-benzylthio-5-anilinomethylene-4-thiazolidone, m. 221-3°.

N. A. LANGE

Strophanthin. VIII. The carbonyl group of strophanthidin. W. A. JACOBS AND A. M. COLLINS. *J. Biol. Chem.* **65**, 491-505 (1925).—Dissolved in *N* NaOH, dild. to 0.3 *N*, and oxidized at 10° with KMnO₄ (slightly > 1 mol. O₂), dihydrostrophanthidin (I) (*C. A.* **19**, 1281) yields with dil. HCl a lactone acid, C₂₃H₃₄O₇ (II), platelets with 2H₂O, froths 132-3°. [α]_D²⁸ 47° in MeOH; on further oxidation with KMnO₄ it does not yield a keto acid like that obtained by analogous reactions from strophanthidin (III) itself (cf. *C. A.* **18**, 2169). II may also be prep'd. from I and KMnO₄ in MeAc; in coned. HCl at 0° for 20 min. followed by diln. with H₂O and filtration from an amorphous impurity, it slowly deposits the dilactone C₂₃H₃₂O₈ (IV), leaflets with 0.5 H₂O, m. 232-4°, [α]_D²⁸ 84° in MeOH, the 2nd lactone group sapon. with greater difficulty than the 1st. By the same method the lactone acid C₂₃H₃₂O₇ (V), previously considered C₂₂H₃₀O₇ (*C. A.* **18**, 2169) and prep'd. from III and KMnO₄ in MeAc, yields a dilactone C₂₃H₃₀O₈ (VI), crystals with 1 H₂O, m. 235-6°, [α]_D²⁷ 100° in MeOH, reduces Tollens soln. in dil. C₆H₅N. IV and VI were thus obtained instead of analogs of dianhydrostrophanthidin (VII). Pseudostrophanthidin (VIII) (*loc. cit.*) is scarcely acted on in MeAc by KMnO₄ but in HOAc with CrO₃ soln. prep'd. according to Kiliani (*C. A.* **7**, 1717) it yielded on diln. a keto dilactone C₂₃H₂₈O₈ (IX), m. 285° (decompn.).

$[\alpha]_D^{28} +93^\circ$ in C_6H_5N , also formed from VI; *oxime*, m. with gas evolution above 285° . With CrO_3 by the above method VII yields chiefly a *dilactone* $C_{23}H_{26}O_4$ (X), m. $253-4^\circ$, $[\alpha]_D^{28} -178^\circ$ in $CHCl_3$, reduces Tollens soln.; also shows an active H with $MeMgI$, probably owing to the grouping $\text{C}=\text{C}-\text{CH}_2-\text{CO}$, freed from the very small amt. of

accompanying *lactone acid* $C_{23}H_{28}O_5$ (XI) by digestion with dil. aq. NH_3 . XI m. 268° (gas evolution), $[\alpha]_D^{25} -100^\circ$, also obtained as chief product (with no X), from VII and $KMnO_4$ in MeAc, leaflets with 1 H_2O , m. $272-4^\circ$ (gas evolution), $[\alpha]_D^{25} -102^\circ$ in alc. Boiled in aq. alc. 0.05 N NaOH for 2 hrs., freed from alc., and acidified, X gives the dibasic acid $C_{23}H_{30}O_6$, m. $249-51^\circ$ (gas evolution) (sometimes $242-3^\circ$). In AcOH with Pd and II X yields the *tetrahydro lactone* $C_{23}H_{30}O_4$, m. $275-7^\circ$, $[\alpha]_D^{28} 3^\circ$ in $CHCl_3$, slowly reduces Tollens reagent in dil. C_6H_5N , showing the unsatd. lactone grouping to be unreduced; only 1 of the lactone groups is sapond. under the conditions used for X; the other is opened by N NaOH. With very carefully purified X and carefully prepd. Pd black a 3rd mol. of H_2 could slowly be introduced with reduction of the double bond originally present in III, the resulting *hexahydro lactone* $C_{23}H_{32}O_4$, m. $265-7^\circ$ to a turbid liquid, which clears somewhat higher; $[\alpha]_D^{25} 14^\circ$ in $CHCl_3$, does not reduce Tollens soln.; 1 lactone group sapons. readily. It is thus shown that in the oxidation of these compds. the point of attack is not the double bonds, but the CO group, which occurs as an aldehyde. In VII this may react in the oxidic or lactol form. VIII is the lactol form of III, since no oxime is formed. With CrO_3 it is oxidized directly to the lactone IX, a sec.-OH being also oxidized to CO, and since IX is also formed from VI, an OH previously considered tertiary in III must now be treated as sec. CrO_3 and $KMnO_4$ are thus shown to oxidize specifically the lactol and aldehydic forms, resp.

M. HEIDELBERGER

Complex salts of quinoline, metallic chlorides, water and hydrogen chloride. WM. M. DEHN. *J. Am. Chem. Soc.* **48**, 275-7(1926).—Quinoline(Q), metallic salts, HCl and H_2O may form, according to the literature, 15 different types of complex salts, although the types are not all definitely established. In the effort to obtain salts of the type $2Q.MX_n.2HX.2H_2O$, 1 mol. equiv. or more of Q in concd. HCl was treated with 1 mol. equiv. of the metallic chloride, the mixt. heated until a clear soln. was obtained and then allowed to cryst. *Diquinoline hydrochloride-CuCl_2*, dichromate-colored, softens 90° , m. 110° ; *CoCl_2*, dark blue, m. 118° (the dried salt softens 125° and m. 155°); *NiCl_2*, yellow, coloring green at 125° , does not m. 250° ; *CaCl_2*, very sol. needles; *ZnCl_2*, m. 119° ; *SrCl_2*, hygroscopic needles, does not m. 250° . *Q hydrochloride-PbCl_2*, silvery needles, does not m. 250° ; *FeCl_3* gives a similar salt. *Di-Q hydrochloride-CdCl_2*, needles, does not m. 250° . *Q hydrochloride-AsCl_3*, with $2H_2O$, softens 120° , m. 145° . The *SbCl_3* compd., m. 198° ; *BiCl_3* compd., m. 212° . The *MnCl_2* compd., with 1 H_2O , needles, does not m. 250° .

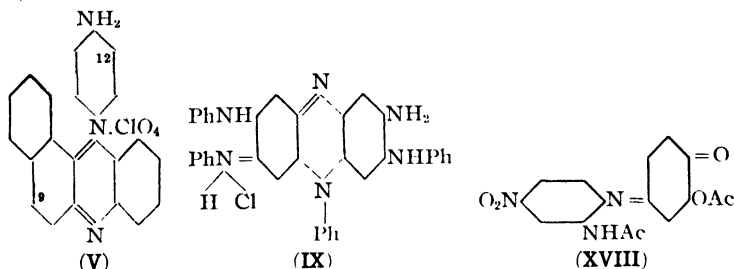
C. J. WEST

Complex salts of quinoline, mercuric halides, water and hydrohalogen acids. WM. M. DEHN. *J. Am. Chem. Soc.* **48**, 277-82(1926); cf. preceding abstr.—Complex double salts involving halogen, quinoline (Q) and Hg conform to 6 types for Cl, 8 types for Br and 5 types for I. Their prepn. involves definite conditions and is largely influenced by the sp. affinities of the resp. halides. Type I, *Q.HgCl_2*, m. 223.5° ; *Q.HgBr_2*, m. 204° ; *Q.HgI_2*, m. 168° . Type II, *Q.HBr.HgBr_2*, m. 121° , obtained by dehydration of the dihydrate; *Q.HI.HgI_2*, yellow, m. 147° (heating with H_2O gives $2Q.HI.HgI_2$ and HgI_2). Type IV, *Q.HBr.HgBr_2.2H_2O*, softens 100° , m. 118° , becomes opaque in the air. Type V, *2Q.HgCl_2*, best prepd. by heating $HgCl_2$ and more than 2 mol. equivs. of Q on the H_2O bath, also from *Q.HgCl_2* and Q or from $HgCl$ and excess Q, softens 145° , m. above 200° , decomp. during the heating into *Q.HgCl_2* and Q. *2Q.HgBr_2*, softens 145° , m. 185° ; *2Q.HgI_2*, light yellow, softens 145° , m. 154° . Type VI, *2Q.HgCl_2.HCl*, m. 142° , prepd. from *Q.HgCl_2* and *Q.HCl* in EtOH or MeCN, from compds. of type VIII or IX with Q; *2Q.HgBr_2.HBr*, m. 147° ; *2Q.HgI_2.HI*, yellow, m. 106° . Type VII, *2Q.HCl.HgCl_2*, softens 95° , m. 130° , from 2 mols. *Q.HCl* and 1 of $HgCl_2$ in anhyd. solvents or by dehydrating compds. of type VIII; about 2 g. dissolves in 1 l. of boiling Me_2CO ; hot H_2O gives a compd. of type I; concd. HCl gives a compd. of type VIII; *2Q.HBr.HgBr_2*, soften at 70° and m. 118° ; *2QHI.HgI_2*, yellow, softens 110° , m. 160° ; it melts in hot H_2O and gives a mixt. of *QHI.HgI_2* and unchanged material. Type VIII, *2Q.HgCl_2.2HCl.2H_2O*, m. 91° ; the *bromide* softens below 100° , m. 120° ; the *iodide* could not be prepd. Type IX, *2QHCl.3HgCl_2*, m. 160° , from the components in hot MeCN; boiling H_2O gives a compd. of type I; concd. HCl, type VIII; *Q.HCl*, type VII; Q, type VI; HCl in Me_2CO , type VII; *2QHBr.3HgBr_2*, m. 145° .

C. J. WEST

Quinone-imide dyes. VIII. The 18th isomer of rosinduline. F. KEHRMANN

AND L. LISTWA. *Helvetica Chim. Acta* **8**, 655-61 (1925); cf. *C. A.* **19**, 644.—Of the 26 possible mono- NH_2 derivs. of phenylnaphthophenazonium (I) and isophenylnaphthophenazonium (II) the 18th, an NH_2 deriv. of II, has now been prepd. $\beta\text{-C}_{10}\text{H}_8(\text{:O})_2$ (III) and 2,4'-($\text{H}_2\text{NC}_6\text{H}_4$) $_2\text{NH}\cdot\text{H}_2\text{SO}_4$ in a little dil. H_2SO_4 at room temp. for 4 days, filtered from a brown by-product, and pptd. with HClO_4 , give a mixt. in which the II deriv. preponderates. Dried and heated on the H_2O bath with Ac_2O , pptd. with HClO_4 and fractionally recrystd. from alc. the more sol. *acetylisorosinduline-18 perchlorate*, $\text{C}_{24}\text{H}_{17}\text{ON}_3\cdot\text{HClO}_4$ (IV), forms orange-red needles, sol. in H_2SO_4 with dark brown-red color, gives a blue deriv. when heated with PhNH_2 and $\text{PhNH}_2\cdot\text{HCl}$, whereas the I analog gives a red product; *chloroplatinate*, brick-red. Heated 1 hr. on the H_2O bath with 50% H_2SO_4 , IV yields *isorosinduline-18 perchlorate* (V) after neutralizing and adding NaClO_4 , dark red-brown, sol. in H_2SO_4 with a dirty red color; the diacid salts give orange solns. Since a 19th isomer could not be prepd. directly from III and 2,3'-($\text{H}_2\text{NC}_6\text{H}_4$) $_2\text{NH}$ (VI), the 4-AcNH deriv. of III and VI 2HCl were heated in alc. 24 hrs. at 40-50°,



depositing *9-acetamino-12-aminophenylnaphthophenazonium chloride* (VII) brown; *chloroplatinate*, dark red; *perchlorate*, brown-red, sol. in H_2SO_4 with a brownish violet-red color; the salts give a blue color with PhNH_2 and $\text{PhNH}_2\cdot\text{HCl}$. The mother liquors from the chloride contain a small amt. of the I deriv. VII, let stand 12 hrs. dissolved in just enough of a soln. of 2 vols. H_2SO_4 to 1 H_2O , dild. with a little H_2O , and warmed on the H_2O bath until dark green and a test turns blue on further dildn. and neutralization, then dild. with 5 vols. H_2O and neutralized with solid Na_2CO_3 , gives the *9,12-diamino sulfate*, dark blue; *chloride* (VIII), difficultly sol. in H_2O with a dull violet color; *perchlorate*, dark violet crystals from alc.; *nitrate*, blue-black. Solns. of the diacid salts are green, while the color in concd. H_2SO_4 is dark brown-red. Ac_2O and VIII at room temp. give the *9-amino-12-acetamino chloride*, dark green, sol. in H_2O with a violet-blue color; *perchlorate*, sol. in H_2SO_4 with a brown-red color. Salts of the last 3 compds., heated on the H_2O bath with Ac_2O and NaOAc give the *9,12-diacetamino deriv.*; *perchlorate*, dark brick-red needles from alc., sol. in H_2O with an orange-red color, in H_2SO_4 with a dark bluish red shade. IX. **Total synthesis of induline 6 B.** F. KEHRMANN AND (MISS) I. STANOYEVITCH *Ibid* 661-3 —1,2,4,5-(PhNH) $_2\text{C}_6\text{H}_2(\text{:O})_2$ and 1,3,4,6-(PhNH) $_2\text{C}_6\text{H}_2(\text{NH}_2)_2\cdot 2\text{HCl}$, boiled in alc. until the initially red soln. becomes dark blue, form an *induline* (IX) with a golden reflex, sol. in H_2SO_4 with a violet color; boiled with 2 parts $\text{PhNH}_2\cdot\text{HCl}$ and 10 of PhNH_2 , the -NH_2 is replaced by PhNH- and NH_4Cl sublimes, induline 6 B sepg. on cooling, as bronze crystals identical with that prepd. by K. and Klopfenstein (*C. A.* **18**, 1288). X. **Amino azines derived from naphthalene.** F. KEHRMANN AND J. SAFAR. *Ibid* 668-76. With the consent of Panizzone-Favre, who recently found (*Researches on the synthesis of 2-nitro-1,4-naphthoquinone*, Milan) 4,1,2-AcNHC $_{10}\text{H}_6(\text{NH}_2)_2$ (X) to be oxidizable by the air and to condense with phenanthrenequinone to form an azine (XI), the study of XI was continued (with C. T. HUGUENIN) and the reactions of X were studied in detail. XI, heated on the H_2O bath with H_2SO_4 (2:1), gives the red *sulfate* of the orange *aminoazine*, m. 309-16°, the yellow solns. of which in org. solvents fluoresce bluish green and which is sol. in H_2SO_4 with a red-violet color. In 50% HOAc at the b. p. for a moment X and (PhCO) $_2$ give the *acetaminoazine* $\text{C}_{26}\text{H}_{19}\text{ON}_3$, yellow, m. 245°, sol. with a faint blue-violet fluorescence, in H_2SO_4 with a fuchsin-red color; with Me_2SO_4 it gives an azonium base, analyzed as the orange *chloroplatinate*; *aminoazine sulfate*, red; *base*, yellow, m. 245° (its solns. fluoresce blue-green); the triacid salt in concd. H_2SO_4 is fuchsin-red, a little H_2O giving the olive-green color of the diacid salt, much H_2O the eosin-red of the mono-salt. When a current of air is passed for several days through a soln. of X in 125 parts 50% HOAc contg. a few drops dil. aq. FeCl_3 the sym. (XII) and unsym. (XIII) azines are formed, tan-yellow microcrystals, insol. in H_2O and org. solvents, sol. in H_2SO_4 with a dark blue color; after

sapong, and drying the mixt., boiling alc. extd. a small amt. of what was probably the amino deriv. of **XIII**, dark brown crystals, while most of the residue, apparently the amine corresponding to **XII**, formed brick-red crystals from PhNO_2 ; with weakly fuming H_2SO_4 it gives the violet color of the tetra-acid salt, changing through green to the fuchsin-red of the di-salt on addn. of water and to the bluish tan of the mono-salt on partial neutralization. The mixt. of **XII** and **XIII** was also synthesized from **X** in 50% HOAc and the 4-AcNH deriv. of **III** in HOAc on the H_2O bath. **X** and the 3-AcNH deriv. of **III** gave a similar mixt. from which the more sol. *diacetamino-azine* $\text{C}_{14}\text{H}_{18}\text{O}_2\text{N}_4$ (assumed to be the unsym. compd.) was extd. in small amt. by boiling alc., yellow, sol. in fuming H_2SO_4 with a dark blue color; the *sym. analog*, yellow, is sol. in fuming H_2SO_4 with a brown-violet color; the *diamino compds.* obtained on sapon. are orange and dark orange, resp. The colors of the various salts are given. **X** and 1,2,1,5-(HO) $_2\text{C}_6\text{H}_2$ -(O) $_2$ gave the *acetaminodihydroxy-azine*, $\text{C}_{14}\text{H}_{13}\text{O}_5\text{N}_4$, pale yellow, turns reddish at 100° , sol. with a yellow color in dil. NaOH, gives a fuchsin-red with H_2SO_4 . **X** and the 4-HO deriv. of **III** give a mixt. of the sym. and unsym. azines, dark orange; sapon. with boiling alc. HCl gives an insol. *amino-azine di-HCl salt*, $\text{C}_{10}\text{H}_7\text{ON}_2 \cdot 2\text{HCl}$, dark orange; the more sol. *hydro- isomer* crystals, on concn. of the alc. filtrate. **XI. Derivatives of phenazine.** F. KEHRMANN AND E. HAENNY. *Ibid* 676–85. An attempted continuation of the prepn. of analogs of industrially important anthraquinone derivs (cf. K and Cherpillod, *C. A.* 19, 643). 3,4-(H_2N) $_2\text{C}_6\text{H}_3\text{NO}_2$ and 3,4-(O) $_2\text{C}_6\text{H}_3\text{OH}$ in HOAc for 12 hrs. yield at least 5 different substances. The ppt. (**A**) is sep'd and the remainder pptd. by diln. and neutralization (**B**). 3.3 g. **A** in 40 cc. Ac_2O , treated with ZnCl_2 until dissolved, deposits 3-nitro-6-acetoxyphenazine (**XIV**), lemon-yellow, m. 211° ; after several hrs. in 2:1 H_2SO_4 , diln. and partial neutralization yield the dark orange 3-nitro-6-hydroxyphenazine, sol. in alkalis with a mauve color, in H_2SO_4 the color in thin layers is green, violet in thicker layers, and purplish red in deep layers. When **XIV** is dissolved in 50 parts hot HOAc, pptd. in finely divided form by rapid cooling, and treated with Zn dust until intensely violet, diln. with a little H_2O ppts. the *dihydro deriv.*, violet black needles; if the Zn is added until the color is red and then enough H_2O to dissolve the $\text{Zn}(\text{OAc})_2$ the violet color returns and a little Zn is again added until an intense red develops, when excess NaHCO_3 is quickly dropped in and 3-amino-6-acetoxyphenazine ppts., orange, with a greenish metallic luster, m. 201° , gives the same color reactions as 3- $\text{H}_2\text{NC}_6\text{H}_3(\text{N})_2\text{C}_6\text{H}_4$; if aq. NH_3 is used above instead of NaHCO_3 the crude 3-amino-6-hydroxy deriv. seps. exposed to the air in dil. HCl soln. the HCl salt ppts.; this with Ac_2O and ZnCl_2 gives 3-acetamino-6-acetoxyphenazine (**XV**), purified by extn. with boiling C_2H_5 , yellow, m. 258° , sol. in H_2SO_4 with a yellow-brown color and elimination of the OAc group; boiled withalc. HCl it gives the *HCl salt*, red, of 3- $\text{H}_2\text{NC}_6\text{H}_3(\text{N})_2\text{C}_6\text{H}_3\text{OH}$ (–6) (**XVI**) (Nietzki and Almenraeder, *Ber.* 28, 2963 (1895)); *chloroplatinate*, blood-red. Heated in H_2O with addn. of NaOH until dissolved, **XV** yields with HOAc 3-acetamino-6-hydroxyphenazine, straw-yellow, turns brick-red at 110° , sol. in dil. alkalis with a red-orange color. **XVI** and 10% aq. H_2SO_4 at $210\text{--}20^\circ$ for 2 hrs. give 3,6-dihydroxyphenazine, yellow, sol. in dil. alkalis with an intense yellow color, sol. in H_2SO_4 with a yellowish red color, purified through the *diacetate*, yellow, m. 224° . **B**, acetylated as was **A**, but with as little Ac_2O as possible, deposits what is undoubtedly 3-nitro-7-acetoxyphenazine (**XVIi**), yellow, m. $224\text{--}7^\circ$; 3-nitro-7-hydroxyphenazine, red-brown, sol. in alkalis with a Bordeaux-red color, shows dichroism in H_2SO_4 ; *dihydro deriv.*, violet-black; 3-acetamino-7-acetoxyphenazine, yellow, m. 249° , sol. in alc. with green fluorescence; 3-acetamino-7-hydroxyphenazine, brown, with a slight brassy reflex, red-orange in H_2O or dil. alkalis, dichroic in H_2SO_4 ; 3-amino-7-hydroxyphenazine, red-brown, slightly sol. in H_2O with a red color, dichroic in H_2SO_4 . The filtrate from **XVII** is dild. with H_2O and the ppt. dried, extd. with PhH , and gray flocks pptd. with a little petroleum ether. The filtrate, evapd. in the air, gives a mixt. of **XVII** and brown crystals, sep'd. mech., the latter finally yielding an *acetaminoacetoxyanilide*, $\text{C}_{16}\text{H}_{13}\text{O}_6\text{N}_4$, probably **XVIII**, yellow, m. 206° , sol. in H_2SO_4 with a brown-red color; *aminohydroxyanilide*, brick-red, sol. in dil. alkalis with a blood-red, in H_2SO_4 with yellow color, yields with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ an *azine*, sol. in H_2SO_4 with a green color.

M. HEIDELBERGER

Alkaloids of colombo root. III. Constitution of columbamine and of jatrorrhizine. ERNST SPÄTH AND ROBERT DUSCHINSKY. *Ber.* 58B, 1939–46 (1925); cf. *C. A.* 17, 1239.—Assuming that Feist's detn. of the no. of MeO groups (4) in his tetrahydrocolumbamine (**I**) (*C. A.* 13, 1453) is correct, I should be identical with tetrahydrocolumbamine (**II**) and as a matter of fact the m. ps. of the 2 bases and of some of their derivs. agree perfectly; F. himself has recently communicated to S. and D. that his supposed columbamine consisted chiefly of palmatine and it is suggested that the name columbamine be temporarily abandoned and held in reserve for any new alkaloid which may later be

nitroveratryldihydroisoquinoline, $\text{O}_2\text{N}(\text{MeO})_2\text{C}_6\text{H}_3\text{CH}_2\text{C}:\text{N}.\text{CH}_2.\text{CH}_2.\text{C}_6\text{H}_4$ (II), with

various dehydrating agents (P_2O_5 , POCl_3 , PCl_5 , Al_2Cl_6). On the other hand, homoveratroylphenylethylamine (III), m. 111.5° , produces veratryldihydroisoquinoline (IV), m. 138° , on heating with POCl_3 , in xylene (sulfate of IV, m. 124° , *N*-methosulfate, m. 240° , methiodide, m. 198°), nitration of which gives 2,4,5- $\text{O}_2\text{N}(\text{MeO})_2\text{C}_6\text{H}_3\text{CH}_2\text{C}:\text{N}.\text{CH}_2.\text{CH}_2.\text{C}_6\text{H}_4$ (V), which on oxidation goes over to *s*-*o*-nitroveratrumic acid,

m. 192° . Homoveratroylpiperonylethylamine (VI), m. 136° , gives a HCl salt m. 207° , methiodide m. 225° , methochloride m. 137° . Nitration of 3,4-dihydro-6,7-methylene-dioxy-1-veratryliso-quinoline (VII), gives a mixt. of isomeric nitro derivs. which cannot be sepd. Homoveratrumyl chloride and piperonylethylamine give homoveratroylpiperonylethanamide, $(\text{MeO})_2\text{C}_6\text{H}_3\text{CH}_2\text{CONHCH}_2\text{CH}(\text{OH})\text{C}_6\text{H}_3\text{O}_2\text{CH}_2$ (VIII), m. 91° , which with POCl_3 goes over to veratryldihydronorhydrastinine (IX), m. 130° . By nitration of IX, is obtained a mononitro deriv., yellow, m. 228° ; HCl salt, m. 244° ; *N*-methosulfate, m. 210° . S. T.

The preparation of pure digitonin, and the accompanying saponins of digitals seed. A. WINDAUS. *Z. physiol. Chem.* **150**, 205–10 (1925).—Com. digitonin contains 70–80% digitonin, 10–20% gitonin and 5–15% of other saponins. Purification by Kiliani's method gives a beautifully cryst. product but this is contaminated with gitonin. A sepn. may be effected by pptn. from H_2O by means of Et_2O ; the digitonin comes down much more rapidly than the gitonin, and 2 or 3 pptns. give a pure product. Oxidation of the crude digitogenin with CrO_3 gave a diketone, $\text{C}_{26}\text{H}_{35}\text{O}_4$, m. 228° (dioxime, decomps. $250\text{--}4^\circ$), and a monoketone, $\text{C}_{26}\text{H}_{35}\text{O}_3$, m. $204\text{--}5^\circ$. A. W. DEX

Salicin. I. Exceptional rotations of the halotetraacetyl derivatives of salicin. A new synthesis of salicin. ALFONS KUNZ. *J. Am. Chem. Soc.* **48**, 262–8 (1926).—Acetylation of salicin with Ac_2O and $\text{C}_6\text{H}_5\text{N}$ gives practically quant. the penta-Ac deriv. (I), m. 130° ; MeONa gives pure salicin. I (50 g.) in 150 cc. CHCl_3 with 100 cc. 40% HBr gives 82% of tetraacetylsalicin bromide, $[\alpha]_D^{24.5} 42.7^\circ$ (0.9717 g. in 100 cc. CHCl_3); Ag_2CO_3 suspension in dil. Me_2CO gives 71% of tetraacetylsalicin (II), m. 126° , $[\alpha]_D^{25} -15.9^\circ$ (0.9949 g. in 100 cc. CHCl_3). Acetylation gives I. II and PCl_5 gives the chloride, m. 160° , $[\alpha]_D^{23.5} 11.5^\circ$ (1.0014 g. in 100 cc. CHCl_3). I and HI in CHCl_3 -chloride, m. 160° , $[\alpha]_D^{23.5} 11.5^\circ$ (1.0014 g. in 100 cc. CHCl_3). I and HI in CHCl_3 -chloride give 66% of II iodide. Reduction of either the chloride, bromide or iodide with Zn in 50% AcOH gives 76% of tetraacetyl- β -*o*-cresylglucoside, m. 141° , $[\alpha]_D^{25} -25.4^\circ$, which is deacetylated to β -*o*-cresylglucoside, the yield from the original salicin being about 60%, thus furnishing the best method for prep. this compd. Br in abs. CHCl_3 at -20° , exposed to sunlight converts this into tetraacetylsalicin bromide, from which salicin may be obtained in the usual manner, thus giving a synthesis of salicin from β -*o*-cresyl glucoside. The halogen derivs. show *d*-rotation in contrast with the *l*-rotation of the other compds.; the increase in rotation with increasing halogen wt. is exceptional, since this is a known property of the α -glucosides. C. J. WEST

The brasilin and hematoxylin question. IV. Methoxychromonols and the Schall-Dralle degradation product of brasilin. P. PFEIFFER, H. OBERLIN AND E. KONERMANN. *Ber.* **58B**, 1947–58 (1925); cf. *C. A.* **18**, 2158.—Preliminary attempts to demethylate 7-methoxychromonol (I) to the 7-HO compd. (II) (the Schall-Dralle degradation product of brasilin) having failed (on account of lack of sufficient material), 7-methoxychromone was demethylated with fuming HBr to the 7-HO compd. (III), whose Ac deriv. was hydrogenated catalytically by the Willstätter method to 7-aceloxychromanone (IV), which was easily hydrolyzed to the 7-hydroxychromanone (V). It was not found possible, however, to nitrosate V either by the alk. or the acid method with AmONO , nor could it be condensed with *p*- $\text{ONC}_6\text{H}_4\text{NMe}_2$. With $\text{MeOC}_6\text{H}_4\text{CHO}$, it readily condenses to the 3-4'-methoxybenzal deriv. (VI), which, again, however, does not give the expected II on ozonization. After these failures, recourse was again had to demethylation of I, working with larger amts. and using fuming HBr instead of HI, and from 0.07 g. I boiled 2.5 hrs. with HBr was obtained 0.04 g. II, identical with the S.-D. degradation product of brasilin. The 6- and 8-isomers of I were synthesized by condensing *p*- and *o*- $\text{HOC}_6\text{H}_4\text{OMe}$, resp., with $\text{ClCH}_2\text{CH}_2\text{CO}_2\text{H}$, nitrosating the resulting chromanones with AmONO and KOEt in alc. and boiling the isonitroso compds. a short time in dil. $\text{H}_2\text{SO}_4\text{-AcOH}$. 7,8-Dimethoxychromonol (VII), which bears to hematoxylin the same relation which II does to brasilin, was similarly synthesized from 2,3-($\text{MeO})_2\text{-C}_6\text{H}_3\text{OH}$. III (yield, 76%), m. $215\text{--}6^\circ$; acetate, m. $94\text{--}5^\circ$ (yield, 74%). IV (yield, 74%), m. $94\text{--}5^\circ$. V (yield, 91%), almost colorless, with a tinge of brown, m. $147\text{--}8^\circ$, easily sol. in dil. alkalis and aq. NH_4OH , converted by alk. Me_2SO_4 into the Me ether,

m. 53.5-4.7°; *oxime*, crystals with 1 H₂O, m. 97-8°, easily sol. in alkalis and aq. NH₄OH. VI (yield, 73% crude or 41% pure product), green-yellow, m. 215-6°, easily sol. in dil. alkalis and aq. NH₄OH, shows deep red halochromism in concd. H₂SO₄; *acetate* (yield quant.), light yellow, m. 123-4°, sol. in concd. H₂SO₄ with deep red color. II, faintly brownish, m. 270-1° (decompn.). β -[*p*-Methoxyphenoxy]propionic acid (0.5 g. from 2 g. *p*-MeOC₆H₄OH), m. 110.5°, easily sol. in aq. alkalis, gives with PCl₅ in boiling C₆H₆ and then, after cooling, with AlCl₃ 71%, 6-methoxychromanone, m. 49°; *oxime*, m. 119°; easily sol. in aq. alkalis; *semicarbazone*, m. 229.5°; 3-isonitroso deriv. (1.1 g. from 2 g. of the chromanone), faintly yellow, m. 145°, easily sol. in aq. alkalis and NH₄OH, 0.1 g. of this yields 0.05-0.06 g. 6-methoxychromanol, yellowish, m. 170°, sol. in hot aq. alkalis with faintly yellow color and reprecipitated by acids in a white form gradually becoming yellowish. β -[*o*-Methoxyphenoxy]propionic acid (10.5-2.5 g. from 25 g. guaiacol), m. 135-6°, easily sol. in aq. alkalis; 2 g. yields 0.65 g. 8-methoxychromanone, m. 89.5°, whose *oxime*, m. 145-6°, *semicarbazone*, m. 232°, and 3-isonitroso deriv. (0.8 g. from 2.5 g. of the chromanone), yellowish, m. 163° (decompn.). 8-Methoxychromanol, faintly yellowish, m. 182-3°, partially subliming, sol. in hot aq. alkalis with faint yellow color. β -[*o,m*-Dimethoxyphenoxy]propionic acid (3.5 g. from 10 g. (MeO)₂C₆H₃OH), m. 101.5°; 10 g. yields 3.1-3.8 g. 7,8-dimethoxychromanone, m. 101°, insol. in aq. alkalis, whose 3-isonitroso deriv. (0.35 g. from 1 g. of the chromanone), faintly yellowish, decomps. 170°, easily sol. in aq. NH₄OH, yields 64% of VII, m. 174-5° (decompn.), sol. in hot aq. alkalis and NH₄OH with yellow color. C. A. R.

Efficiency of photosynthesis by *Chlorella*. E. Q. ADAMS. *J. Am. Chem. Soc.* **48**, 292-4 (1926).—The structure of chlorophyll *a* and *b* is such that it would be expected to absorb simultaneously 2 quanta of red light. The energy of the 4 quanta so absorbed, 174.4 cal./mol., is sufficient to cause the chlorophyll to pass through a cycle of 4 reactions, the outcome of which is the conversion of 1 mol. of CO₂ and 3 mols. of H₂O into 2 of H₂O₂ and 1 of HCHO, for which 171.0 cal./mol. is required. Since 6 mols. of HCHO are required to produce 1 mol. of glucose, whose heat of combustion (dissolved) is 674 cal./mol., the max. possible efficiency of glucose production is 61.4%; Warburg and Negelein (*C. A.* **18**, 1316) found for the mean efficiency of *Chlorella*, using red light, 59%, and the highest single value, 63.5%. The formula for *b*-chlorophyll, C₅₅H₇₂O₆N₄Mg, agrees within the usual limits of org. quant. analysis with the formula C₅₅H₇₀O₆N₄Mg, assigned to it by Willstätter. C. J. WEST

Dissociation constants of plant nucleotides and nucleosides and their relation to nucleic acid structure. P. A. LEVENE AND H. S. SIMMS. *J. Biol. Chem.* **65**, 519-34 (1925).—In addn. to the acid and basic groups of the pyrimidine and purine "bases" there should be 8 ionizable H atoms on the PO₄ groups in yeast nucleic acid according to Jones' original structure, 6 according to his later views, and only 5 according to L.'s formula. Since the total no. of ionizable groups could not be detd. by direct titration, the no. of groups which should dissociate within a given *p*_H range was calcd. for each of the structures, and the actual values were then detd. exptly. Numerous tables and curves expressing the results are given. In the nucleotides the *p*_K' values for the PO₄ groups are a little lower than the 1st and 2nd *p*_K values of H₃PO₄, i. e., 2.0 and 6.8. Except in the case of the guanine derivs. the NH₂ groups are alike and have consts. close to that of PhNH₂ (*p*_K = 4.7), while the consts. of the 1st OH groups, except in the cytosine derivs., are like that of PhOH (*p*_K = 10). In the case of nucleic acid the results are expressed in terms of the *p*₀' values, where the G' values are found by treating the titration data as if the solns. contained equiv. amts. of monobasic acids. Methods of calcn. are given. It is shown that for thymus nucleic acid there is only 1 *p*₀ value in the range *p*_H 4.5 to 9, which agrees with L.'s structure, since only differences in the "sec."-PO₄ groups are involved. The data of Thomas and Dox (*C. A.* **19**, 1854) are also held to support this structure, rather than that of J. as T. and D. had concluded. The values obtained with yeast nucleic acid were unsatisfactory. M. H.

Bromolecithins. I. Fractionation of brominated soy-bean lecithins. P. A. LEVENE AND I. P. ROLF. *J. Biol. Chem.* **65**, 545-9 (1925).—Soy-bean lecithin, purified according to C. A. **19**, 1130, in 10 parts gasoline (b. 40-50°), and Br₂ in 5 parts gasoline, at a temp. < -5° on addn. of Br₂ until no longer decolorized, pptd. a crude bromolecithin mixt. (I). A portion was boiled 8 hrs. with 10 parts 10% HCl and the dried acids were extd. with gasoline. The insol. portion sepd. hexabromostearic acid from hot MeOH, while the filtrate yielded the tetra-Br acid, purified through the Pb salt. I, taken up in Et₂O and let stand at 0°, deposited a light yellow amorphous powder, corresponding to a hexabromostearylstearyllecithin, coalesces on warming to room temp. The Et₂O-sol. fraction, pptd. by gasoline and again purified as above, gave a shiny, buttery mass corresponding roughly to a tetrabromostearylstearyllecithin. The nature

of the satd. acids will be studied further. The results lend support to the view that the lecithins as isolated from animal and plant tissues are mixts. of individual lecithins each contg. 2 fatty acids.

M. HEIDELBERGER

A non-tetrahedral C atom in crystals of pentaerythritol (HUGGINS, HENDRICKS) 2. The relation between sweet taste and constitution of chemical compounds (HERZOG) 11A. Physical properties of some isomeric ethylenes (ERRERA, HENRI) 3.

Die Methoden der Organischen Chemie. Vol. II. 3rd ed. revised and enlarged. Edited by J. Houben. Leipzig: G. Thieme. 1431 pp. Price, paper. R. M. 75; bound, R. M. 85. Cf. C. A. 19, 2345.

MACARDLE, DONALD W.: **The Use of Solvents in Synthetic Organic Chemistry.** New York. D. Van Nostrand Co. 224 pp. \$3.50.

Acetylenation of organic substances. L. G. BOURGOIN. U. S. 1,567,785, Dec. 29. Fatty substances and glycerol or other substances susceptible of combination with C_2H_2 are treated with CaC_2 which is decomposed with H_2O or steam to produce C_2H_2 for the reaction, *e. g.*, in the formation of an elec. insulating material for molding.

Absolute propyl alcohol. J. A. STEFFENS. U. S. 1,568,349, Jan. 5. A ternary mixt. is formed by adding to aq. propyl alc. a third liquid such as C_6H_6 which is miscible with the $PrOH$ but substantially immiscible with H_2O . The mixt. is subjected to distn. to evolve a ternary const.-b. p. mixt. and leave abs. $PrOH$ as a residue. A portion of the evolved distillate is refluxed to the top of the rectifier and the remainder of the distillate is condensed and allowed to sep. into 2 layers. The upper layer, which is the richer in the added liquid, is returned to liquid undergoing distn. and rectified $PrOH$ from the lower layer is also returned.

Lead alkyls. B. MEAD. U. S. 1,567,159, Dec. 29. Pb is placed in contact with an aq. emulsion of EtI or other alkyl halide (which may contain casein) and the reaction mass thus formed is subjected to reduction, *e. g.*, by electrolysis, to produce, finally, Et_4Pb or the like.

Urea. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norw. 39,744, June 29, 1925. Urea is produced from NH_3 and CO_2 by passing CO_2 over ammoniates at an increased temp.

Finely crystalline urea. WARGOENS AKTIEBOLAG. Swed. 59,319, Aug. 19, 1925. A soln. of urea is evapd. to at most 10% of water. The mass obtained is molded into blocks and after solidification may be crushed.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The crystallization and specific rotation of ovalbumin and an attempt to crystallize lactalbumin. C. W. CHAPMAN. *Can. Chem. Met.* 9, 268-70 (1925).—By adjusting the final pH (by means of "10% acetic acid") to between 4.7 and 5.1 (approx. the isoelec. point) a good crop of crystals of ovalbumin may be readily obtained. The crystals are centrifuged, dissolved in the least quantity of distd. water, any coagulum is filtered off, and satd. $(NH_4)_2SO_4$ added till a permanent cloudiness appears. The yield in each case was about 80%. The purified crystals have a sp. rotation of -30.68° . Lactalbumin did not crystallize when subjected to the same procedure. E. G. R. A.

Action of emulsin on amygdalin. L. ROSENTHALER. *Arch. Pharm.* 263, 563-6 (1925).—The cleavage of amygdalin by the action of emulsin is believed to take place in the following stages: amygdalin ($C_{20}H_{27}NO_{11}$) + H_2O = mandelic nitril glucoside ($C_{14}H_{17}NO_6$) + glucose ($C_6H_{12}O_6$) and $C_{14}H_{17}NO_6$ + H_2O = C_6H_5CHO + HCN + $C_6H_{12}O_6$. W. O. E.

Vitali test as applied to a decomposing dog stomach. TH. SABALITSCHKA AND W. BOLDT. *Pharm. Ztg.* 70, 1650-1 (1925).—A case is cited in which a substance, yielding by the Vitali test a red-violet color, was isolated from a decomposing dog stomach. W. O. E.

The laws governing monomolecular reactions (enzyme reactions—catalytic re-

actions). L. AMBARD. *J. chim. phys.* **22**, 402-12(1925).—Sugar inversion by acids and other catalytic reactions do not obey the simple kinetic formula postulated by the mass action law, because the latter takes into account only the no. of collisions between the enzyme and the substrate mols. $\varphi = k(C_1C_2)$, where φ is the reaction velocity, C_1 the catalyst concn., C_2 the substrate concn. The other detg. and hitherto neglected factors are: (1) the concn. of the activator (anion or cation), (2) the adsorption of the enzyme by the substrate, which introduces C_2 once more into the equation, (3) the elementary reaction velocity. The latter is defined as the no. of substrate mols. transformed by the enzyme in the time unit and is based on the assumption that this transformation requires time and that therefore only a limited no. of elementary reactions can take place, when C_1 is very low as compared with C_2 ; hence the lack of proportionality between φ and C_2 at high C_2 , when C_1 is kept const. All peculiar features of many catalytic reactions are explained by this theory, which is supported by exptl. proof. It was found by expts. not recorded in the paper that the role of the activator in the amylolysis of starch or glycogen is to fix the amylase on the substrate. The activator is therefore called amboceptor. The curve representing the relation between φ and the concn. of the amboceptor has a max. followed by a flat portion, the position of the max. varying with the nature of the activating anion. The max. is interpreted as the point at which the entire catalyst is fixed on the substrate. The role of adsorption in catalysis was established by a defixation expt. Rice starch which has acquired a high amylolytic power by centrifuging with NaCl-saliva was treated with glycogen solns. of different concns. The amylase was detached from the starch by the glycogen in proportion to the concn. of the latter, the defixation curve presenting all features of an adsorption curve. The hydrolysis of glycogen of different concns. with the same amt. of amylase-activator showed that the reaction velocity was proportional to the product of C_2 and the defixation power characteristic for this concn. In the acid hydrolysis of sugars H^+ is at the same time amboceptor and catalyst. The satu. phenomenon which is peculiar to enzyme reactions because of the eventual fixation of the entire catalyst is not encountered in this case. φ can grow continuously with C_2 since very likely only a small proportion of the available H^+ is actually engaged in catalysis and new H^+ can be gradually supplied by progressive dissociation. M. J.

The relation between sweet taste and constitution of chemical compounds. WALTHER HERZOG. *Oesterr. Chem.-Ztg* **28**, 143-6, 152 4(1925).—A review of the literature with numerous references. H. believes that we are far from understanding the relations especially in the aromatic series. MARY JACOBSEN.

The blood pigment and some porphyrins. HANS FISCHER. *Z. angew. Chem.* **38**, 981-8(1925).—A review of the research in this field and of the chem. and biol. relations established up to the present time. Especial reference is made to porphyrinuria, which is considered to be a reversion to an atavistic type of pigment formation. The presence of coproporphyrin in yeasts and the feathers of turaceous and the conversion by yeasts of blood pigment to ooporphyrin suggest that coproporphyrin is an evolutionary stage of hemin and that both may be formed from some common precursor, probably ooporphyrin. The great likeness of yeast metabolism to that of higher animals on one hand and their great plant-like assimilating power on the other make yeasts appear as the link between the animal and plant kingdom. Chlorophyll, therefore, like hemin may be produced from coproporphyrin or its precursor, ooporphyrin. M. J.

Experiments on contraction of white connective tissue fibers. C. J. TIDMARSH AND JOHN TAIT. *Quart. J. Exptl. Physiol.* **15**, 367-76(1925).—Heat contraction of mouse-tail tendon produces localized swellings. When contraction is at its height the whole tendon is swollen. In solns. of $CaCl_2$, the higher the concn. of salt the lower the temp. at which the tendon contracts; with 48% $CaCl_2$ the tendon contracts at 0° . Similar effects are obtained in $BaCl_2$ solns.; 36% $BaCl_2$ gives contraction at 38° . In both cases the relation between concn. and temp. is linear. FRANCES KRASNOW.

The influence of oxygen tension upon the biological oxidation process. R. J. HAMBURGER AND A. V. SZENT-GYÖRGYI. *Biochem. Z.* **157**, 298-302(1925); cf. *C. A.* **19**, 3497.—Finely minced and washed diaphragm muscle of swine is placed in a phosphate soln. in a special respirometer. *p*-Phenylenediamine is then added, and the rate of O consumption measured. The rate is independent of O pressure. W. D. L.

Purification of oxynitrile and some of its properties. E. NORDEFELDT. *Biochem. Z.* **159**, 1-35(1925); cf. *C. A.* **17**, 3515.—The enzyme in emulsin which causes the formation of active mandelonitrile from $PhCHO$ and HCN is called oxynitrile. It is best prepd. by an alk. extn. of mandels, followed by an acid extn. of the alk. ext. The acid soln. is then pptd. with Me_2CO and the ppt. used as the enzyme prepn. Dialysis, fractional pptn. with acids, adsorption on alumina, colloidal $Fe(OH)_3$, and kaolin,

and pptn. with $\text{Pb}(\text{OAc})_2$ and tannin are all tried as means of purification of the enzyme. It is not inactivated by toluene, by acids to $p_H = 3.0$ and by alkalis to $p_H = 11.0$, but is destroyed by heat at about 75° . The kinetics of the enzymic reaction is studied.

W. D. LANGLEY

Influence of neutral salts upon the acid binding of gelatin. J. CSAPÓ. *Biochem. Z.* 159, 53-7(1925).—To det. whether NaCl and other Na salts repress the hydrolysis of protein- Cl , the p_H of gelatin solns. contg. known amts. of HCl and Na salts were compared with the p_H of these same amts. of acid and salt in H_2O alone. The difference in c_H between the 2 solns. gave the amt. of bound acid. Several salts of Na , e. g., iodide and nitrate, increased the acid-binding power of the gelatin, while the sulfate decreased it. In 0.02 to $0.03\ N$ H_2SO_4 , the acid binding of the gelatin was less than in HCl of the same concn. Cations increased the acid binding in the order $\text{K} < \text{Na} < \text{Ba} < \text{Ca}$.

W. D. L.

The proteins of blood. I. H. HUECK. *Biochem. Z.* 159, 89-106(1925). H. seeks to det. whether or not the various proteins of blood are really different. The protein in native serum is higher in concn. by 0.026% than in defibrinated serum. If serum stands for several hrs., the protein concns. at different levels in the soln. are not the same. The n of expressed serum increases with time. No such variation is observed with whole blood serum and plasma serum. The detns. of albumin and globulin may not give abs. but only relative values.

W. D. L.

Nephelometric investigation of fermentative protein hydrolysis. V. KINETICS of peptic hydrolysis of serum albumin. P. RONA AND H. KLEINMANN. *Biochem. Z.* 159, 146-74(1925); cf. *C. A.* 19, 3101.—The k value for the velocity of the action of pepsin on serum albumin indicates the reaction to be of the second order. It is proportional to the concn. of enzyme as well as to that of the substrate. On the acid side of the optimum H-ion concn., k decreases, probably because of some effect of the acidity upon the enzyme. Between $\text{H-ion} = 4.17 \times 10^{-3}$ and 1.7×10^{-3} the rate of hydrolysis is nearly directly proportional to the H-ion . No effect due to the presence of hydrolysis products could be detd. The temp. coeff. for the reaction is 1.9, measured from 30 to 40° .

W. D. L.

The pK' of the Henderson-Hasselbalch equation for hydron concentration of serum. G. E. CULLEN, H. R. KEELER AND H. W. ROBINSON. *J. col. Chem.* 66, 301-22(1925).—The soln., $0.01\ N$ HCl in $0.09\ N$ KCl , should preferably be used as a standard of reference in detg. the hydron concn. of blood or serum with the value of 2.04 at 38° . The temp. difference between 38° and 20° is $+0.01\ p_H$. pK'_{38° detd. on 15 pathol. human sera gives an av. of 6.095 (CO_2 soly. coeffs. of Bohr and Boek used in the calcn.). pK'_{20° for the same sera is 6.183 . The values for pK' for dog sera agree with those for human sera. There is no evidence that the nature of the disease, possible salt content variation, protein variation, or p_H itself significantly affect these values. The temp. coeff. for pK' is -0.005 per 1° . The temp. coeff. for the CO_2 -combining capacity of human sepd. serum at const. $[\text{H}_2\text{CO}_3]$ and at const. p_H are calcd. as $(d[\text{BHC}_3]/dt^\circ)/[n_2\text{CO}_3] = -0.10\ \text{mM per } 1^\circ$ and $(d[\text{BHCO}_3]/dt^\circ)/p_H = -0.14\ \text{mM per } 1^\circ$.

A. P. LOTHROP

The solubility of tertiary calcium phosphate in cerebrospinal fluid. L. EMMETT HOLT, JR. *J. Biol. Chem.* 66, 23-8(1925); cf. *C. A.* 19, 3275.— $\text{Ca}_3(\text{PO}_4)_2$ is far less sol. in cerebrospinal fluid than in blood serum but both are normally supersatd. with it. The greater soly. in blood serum and the higher concns. of Ca and PO_4 ions can be explained on the basis of the electrostatic effects of the polyvalent protein ions of the serum which diminish the activity coeffs. of the inorg. ions there, thus making it possible for a high stoichiometric concn. to coexist with a comparatively low activity.

A. P. LOTHROP

Electroendosmosis through mammalian serous membranes. II. Comparison of hydrogen-ion reversal points with acetate and with citrate-phosphate buffers. S. MUND. *J. Gen. Physiol.* 9, 73-9(1925); cf. *C. A.* 19, 1435.—The H-ion reversal point values with acetate buffer are about $0.25\ p_H$ higher (more alk.) for fat membranes and almost $0.5\ p_H$ higher for lean membranes than those for citrate-phosphate buffers. The acetate values probably correspond more closely to the true H-ion reversal points. The reversal points are characteristic for a given membrane and species of mammal. No difference between living and postmortem membranes was noted in respect of the H-ion reversal point.

CHAS. H. RICHARDSON

The inactivation of trypsin by X-rays. H. CLARK AND J. H. NORTHROP. *J. Gen. Physiol.* 9, 87-96(1925).—The effect of soft X-rays on trypsin in soln. parallels the effect brought about by spontaneous heat inactivation. The free or active pepsin is entirely or largely affected. Under radiation of const. intensity, inactivation follows the simple

exponential law, indicating a unimol. reaction. The amt. of ionization required to inactivate trypsin to half value in these expts. and in those of Hussey and Thompson (*C. A.* 17, 2590, 3681) who employed β rays from Ra, B and C, are in close agreement. The effect is a function of ionization. Inactivation of free pepsin seems to result from elec. neutralization of the pepsin ion by the addn. of one electron. C. H. R.

Some consequences of the theory of membrane equilibria. D. I. HITCHCOCK. *J. Gen. Physiol.* 9, 97-109(1925).—"In applying Donnan's theory of membrane equil. to systems where the non-diffusible ion is furnished by a weak acid, base or ampholyte, certain new relations have been derived. Equations have been deduced which give the ion ratio and the apparent osmotic pressure as functions of the concn. and ionization const. of the weak electrolyte, and of the H-ion concn. in its soln. The conditions for max. values of these 2 properties have been formulated. It is pointed out that the progressive addn. of acid to a system contg. a non-diffusible weak base should not cause the value of the membrane potential to rise, pass through a max., and fall, but should only cause it to diminish. It is shown that the theory predicts slight differences in the effect of salts on the ion ratio in such systems, the effect increasing with the valence of the cation." C. H. R.

Bioluminescence. J. W. FRENCH. *Nature* 115, 944(1925).--While unrolling some insulating tape F. observed along the line of sepn. a band of green light, which he shows is not due to any elec. charge which might have been imparted during the initial winding of the roll. The phenomenon is undoubtedly one of mechanical luminescence and the emission of light is apparently the result of the sudden extension and possible rupture of the tenacious, viscous threads into which the adhesive material is drawn. F. suggests that the light of a bioluminous character emitted, for example by the glow-worm, may be the result of a sudden longitudinal extension of the gelatinous luminous cells or their granular contents. FLORENCE N. SCHOTT

Elasticity of protein solutions. HANS NETTER. *Arch. ges. Physiol.* (Pflüger's) 210, 450-61(1925).—The viscosity anomalies of certain protein solns. in zones of lower pressure are brought into connection with their tendency to gelatinize and their dependence upon ionic and non-conducting media is considered. G. H. S.

Further studies on living membranes. ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) 210, 527-44(1925); cf. *C. A.* 19, 854.—The opposing surfaces of living membranes are the sites of different ion concns. Thus in the frog skin the H-ion concn. in the vicinity of the outer side is greater than that on the inner side. In the frog lung the region of the inner side is more acid than that of the outer side. The Cl-ion concn. shows in each case the reverse relation. If H or OH ions are introduced into the membrane sac by the injection of moderately rapidly permeating acids or bases, the H ions pass toward the outside, the OH ions toward the inner side. In other words, for H and OH ions under the given conditions there is an irreciprocal permeability. If NaCl is introduced, there occurs, as Cl migrates to the inner side, the previously described irreciprocal permeability for NaCl, *i. e.*, permeability only from outside to within. To dead membranes these observations do not apply. The one-sided concn. of definite ions in the normal membrane, and particularly that observed after the artificial administration of such ions to the membrane, is to be explained as a polarizing ion-concn. change. As for reductions and oxidations, detd. by the elec. structure in the membranes, corresponding to Nathansohn's electrolytic respiration theory, with the living membrane no abs. deductions can be drawn, although it appears that the locus of strongest reduction is definitely on the outer side of the frog skin and on the inner side of the frog lung. There is no reason to think that the opposite sides represent the regions of oxidation. After destruction of the elec. structure through mincing the fermentative reductions are augmented, while those processes dependent upon structure disappear. After the death of the membrane reduction can no longer be detected. G. H. S.

Adsorption of glucose by bovine blood corpuscles. HANS HAUSLER. *Arch. ges. Physiol.* (Pflüger's) 210, 557-60(1925).—There is no qual. difference in the glucose-adsorbing ability of bovine and of human blood cells. But bovine blood cells take up glucose only when the concn. in the surrounding fluid does not exceed 0.5%. With human cells the limiting concn. of the surrounding fluid is higher. The cells behave differently in that human blood corpuscles swell when in a glucose soln., from which they do not adsorb glucose, while bovine corpuscles do not. This argues against the assumption that the mechanism of the inhibition is the same in both instances. G. H. S.

Action of gastric lipase in homologous and heterologous wheys. M. LANDSBERGER. *Z. Kinderheilk.* 39, 665-7(1925).—L. found that splitting of tributyrin by the

gastric lipase of infants proceeds much more quickly in whey from human milk than in that of cow milk, as had been detd. by Davidsohn. Colloidal substances, and not ionic conditions, are responsible for this difference, since in protein-free wheys the process occurs with the same speed. G. H. S.

The enzymic action of plasma. H. v. EULER. *Naturwissenschaften* 13, 938-9 (1925).—E.'s "double affinity theory" (that splitting enzymes have affinity for and bind simultaneously the two cleavage products) is applied to cell plasma. The cleavage products remain attached to the enzymically acting plasma and are for that reason in a highly active state, able to take part in further decompn. or synthetic processes. The action of enzymic plasma, therefore, is not limited to activation of just one particular reaction but rather to that of all reactions in which the primary cleavage products can take part. B. J. C. VAN DER HOEVEN

The high molecular state of proteins and the synthesis of protein-like piperazine derivatives. M. BERGMANN. *Naturwissenschaften* 13, 1045 50(1925).—A lecture, reviewing the present situation and recent work of B., Mückeley and Kann (C. A. 20, 381). B. J. C. VAN DER HOEVEN

Digestive enzymes of an insect. H. S. SWINGLE. *Ohio J. Sci.* 25, 209-18(1925).—Two methods were used: (1) grinding the tissues in 30% glycerol and testing for enzymes macrochemically; (2) testing the contents of the intestinal tract microchemically. Method (1) showed amylase in the salivary gland; maltase, invertase, and lipase in the foregut, gastric ceca, mid gut; trypsin and erepsin in gastric ceca and mid gut; lactase and pepsin were not demonstrable. Method (2) showed amylase, invertase, trypsin and erepsin in contents of the foregut, mid gut and hind gut; maltase and lipase in the contents of foregut and mid gut; lactase and pepsin were not demonstrable. J. J. W.

The effect of certain bases on the action of enzymes. H. HULPIEU. *Univ. of Oklahoma, Studies* No. 21, 22-6(1925).—The effect of various bases (hydroxides of Na, K, Ca, Ba and Sr and atropine) on the activity of pepsin and of 2 amylases was studied, with a view to deducing evidence for the enzymic nature of cell division and other cell phenomena. J. J. WILLAMAN

Collagen (HERZOG, GONELL) 2. Gelatin and collagen (KATZ, GERNGROSS) 2. Application of fluorescence to chemistry, pharmacy and biology (FABRE) 3.

MICHAELIS, L. and PARSONS, T. R.: **Practical Physical and Colloid Chemistry for Students of Medicine and Biology.** Cambridge: W. Heffer & Sons, Ltd. 195 pp. 7s. 6d.

Tabulae Biologicae. Vol. I. Reine und physiologische Physik, physikalische Chemie und biologische Anwendungen. Edited by C. Oppenheimer and L. Pincussen. Berlin: W. Junk. 522 pp. Reviewed in *Ind. Eng. Chem.* 18, 107(1926).

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Surgical method in the physiology of digestion. Description of the most important operations on the digestive system. W. N. BOLDYREFF. *Ergebnisse Physiol.* 24, 399-444(1925).—The description includes the method of procedure in salivary (parotid, submaxillary and sublingual), esophageal, gastric, pancreatic, Thiry-Vella, colon, bile, Eck's, tracheal and ureteral fistulae in dogs and crop fistula on roosters. The procedure for the extirpation of the pancreas, liver and thyroid is given as well as some operative technic on the brain and spinal cord. H. J. DRUEL, JR.

A simple modification of Folin's urea determination. J. ELLINGHAUS. *Z. physiol. Chem.* 150, 211-4(1925).—The permutite-urease method can be much shortened by detg. 1st the preformed NH_3 , then in a 2nd sample the preformed NH_3 + the NH_3 liberated by urease, and deducting the 1st detn. Another advantage of the modification is that no turbidity results when the Nessler reagent is added. A. W. DOX

Observations on the estimation of the acid elements in the gastric juice. A. LABAT. *Bull. soc. pharm. Bordeaux* 63, 172-7(1925).—L. has compared the results obtained for free HCl and org. acids in the gastric juice, using the clinical method proposed by Tofer-Linossier as modified by Michaelis, with those found by using the more exact method of Braun, known also as the Hehner and Seemann method. These results are presented in tabular form. They show that the Michaelis modification gives figures which accord more closely with those obtained by the Braun method than those obtained by the original Tofer-Linossier method. The adoption of the Michaelis modification is, therefore, recommended for clinical work. A. G. DUMÉZ

Estimation of fat in blood. C. P. STEWART AND A. C. WHITE. *Biochem. J.* 19,

840-4(1925).—Two cc. blood are added to 30 cc. alc.-ether mixt. (3 parts alc. to 1 part ether) in a 50-cc. flask, the mixt. brought to the b. p., cooled, and made up to 50 cc. with alc.-ether. It is mixed, allowed to settle and 25 cc. of the supernatant liquid withdrawn for analysis. The total fatty acids of the blood are estd. by sapon. with NaOH and titrating the excess alkali with acid; the micro-buret described by Rehberg (*C. A.* 19, 2148) is used.

BENJAMIN HARROW

New hydrolysis product from elastin. RUDOLF ENGELAND. *Biochem. J.* 19, 850-2(1925).—Elastin was hydrolyzed with HCl, the product treated with phosphotungstic acid, the ppt. washed with 5% H_2SO_4 , treated with $\text{Pb}(\text{OH})_2$, washed and treated with $\text{Ba}(\text{OH})_2$. The Pb was removed with H_2S , the filtrate concd., boiled with $\text{Cu}(\text{OH})_2$, filtered, the filtrate concd. and treated with MeOH to turbidity. After it had stood several days at 0° the ppt. was washed with ice water, suspended in H_2O and treated with H_2S to remove Cu. In concn. the filtrate gave white needles; they were recrystd. from dil. MeOH. The analysis suggests the formula $\text{C}_{16}\text{H}_{22}\text{O}_6\text{N}_2$; the analysis of the Cu salt ($\text{C}_{16}\text{H}_{22}\text{O}_6\text{N}_2\text{Cu}$), however, suggests a compd. contg. 16 C atoms. E. names the substance *hyphasmine* (from the Greek word, "the tissue").

BENJAMIN HARROW

Observations upon the preparation and standardization of the ovarian hormone. FRANK DICKENS, E. C. DODDS AND SAMSON WRIGHT. *Biochem. J.* 19, 853-9(1925).—The minced tissues (pigs' ovaries) were extd. with twice their wt. of alc., stirred, the mixt. was pressed in a hard press through jean (cotton cloth) and the solid material extd. in a Soxhlet app. with alc. for 6-9 hrs. The alc. exts. were combined and filtered through Chardin papers. The filtrate was evapd. almost to dryness *in vacuo* and the residue taken up with a small quantity of alc. and filtered. On standing, a ppt. of fats and cholesterol sepd., which was removed by filtration. The soln. was again taken down to dryness, the residue dissolved in ether, and twice its vol. of acetone was added. The pptd. lipins were filtered off, and the solid material was again dissolved in ether and reprecipd. with acetone. This process was repeated several times. The filtrates were combined and evapd. to dryness. The residue was dissolved in alc. and some cholesterol removed by freezing. By repeating this process, most of the cholesterol can be removed. The active material is obtained by distg. off the alc. *in vacuo*. Unlike Allen, Doisy, etc. (*C. A.* 17, 3532), neither from the liquor folliculi nor from the human placenta could large yields of the hormone be obtained. The hormone is sol. in alc., ether, acetone and olive oil. It can be heated to 200° without loss of activity but withstands sapon. only to a limited extent. Ovarian exts. were standardized by the method of Allen and Doisy—by detg. the min. quantity which will bring about artificial estrus in ovariectomized animals. Rats were used. The exts., dissolved in olive oil or suspended in weak bicarbonate soln., were injected subcutaneously. If the ext. was active, estrus appeared sometimes after 24 hrs. and usually within 36 hrs. of the time of injection. Administration by mouth proved ineffective. The substance inhibits the blood-sugar reducing action of insulin.

BENJAMIN HARROW

Note on the work of Felix Schmieder "On the efficiency-coefficients of phosphores." S. I. VAVILOV. *Ann. Physik* 78, 112(1925).—Controversy over the interpretation of V's results (cf. Vavilov, *Z. Physik* 32, 236(1925); Schmieder, *C. A.* 20, 18). R. J. H.

Coloration of Negri bodies. D. CAMPANACCI. *Sperimentale* 79, 665-7(1925).—Acid fuchsin in dil. HOAc is used as the 1st stain, followed by "indacocarmine" in satd. aq. picric acid.

M. HEIDELBERGER

Technic for the demonstration of spermatozoa. BERTHOLD MUELLER. *Deut. Z. ges. ger. Med.* 6, 384-91(1925).—When the staining method for identification fails, it is recommended that the suspicious material be well macerated in distd. water for 24 hrs. To prevent bacterial action on the spermatozoa, 1 part of HgCl_2 is added to 4 parts of maceration mixt. This mixt. is centrifuged and the sediment again examd. With the Florence reaction a ppt. is obtained even in a 1 to 35 diln. (water). The air-dried macerated mixt. may be stained according to May-Grünwald, G. Strassmann or with Fe hematoxylin.

FRANCES KRASNOW

Microscopic technic for hair study. HEINZ KOCKEL. *Deut. Z. ges. ger. Med.* 6, 381-3(1925).

FRANCES KRASNOW

Quantitative estimation of minute amounts of urea. J. T. WEARN AND A. N. RICHARDS. *J. Biol. Chem.* 66, 275-80(1925).—An adaptation of the existing methods of estg. urea is described which makes possible the measurement of amts. of N in the form of NH_3 or urea of the order of 0.0005 mg., within a probable error of 10%. The essentials of the method consist in hydrolysis of the urea by heating with acid at 160°, the simultaneous nesslerization of the hydrolysis mixt. and a known $(\text{NH}_4)_2\text{SO}_4$ soln.

under identical conditions and quant. comparison of the intensities of color produced by a diln. method. The original must be consulted for the details. A. P. L.

Simple method of choline determination in blood. OTTO HIESCH. *Arch. ges. Physiol.* (Pflüger's) **209**, 779-80(1925).—A modification of the Reid Hunt method. G. H. S.

Composition of blood serum and its significance for the action of toxins. IV. **Method of determination of cholesterol in blood serum.** HANS HANDOVSKY AND KARL LOHMANN. *Arch. ges. Physiol.* (Pflüger's) **210**, 59-62(1925); cf. *C. A.* **20**, 623.—Technical details of the methods employed for the detn. of free cholesterol and cholesterol esters. G. H. S.

The use of porcelain centrifugal tubes for chemical analysis (PINCUSSEN, ARINSTEIN) 1.

C—BACTERIOLOGY

A. K. BALLS

Laboratory pure culture apparatus. F. M. HILDEBRANDT. *Ind. Eng. Chem.* **17**, 1279(1925).—The app. offers a means of keeping a large vol. of nutrient medium contg. active organisms in such a way that the liquid may easily be withdrawn and can be replenished with fresh sterile nutrient. The app. can thus be maintained in continuous operation. It is suitable for acclimatizing organisms to various solns. and is also adaptable to anaerobic conditions. C. C. DAVIS

"Black yeasts" (*Zygonemata nigra* and a variable *Torula*). ERNST PRIBRAM. *Ergebnisse Physiol.* **24**, 95-106(1925) H. J. DEUEL, JR.

Significance of calcium for the genus *Citromyces*. S. J. KUSNETZOV. *Biochem. Z.* **157**, 339-49(1925).—The optimum p_H for the growth of *Citromyces* is 5.5. $(NH_4)_2SO_4$ serves best as a source of N. With $Ca(NO_3)_2$ in place of $(NH_4)_2SO_4$, the yields of citric acid are much lower on account of the toxicity of the Ca ion. Mg in place of Ca is less toxic and the yields of citric acid are higher. W. D. L.

The chemistry of the action of arsphenamine in vitro and in vivo. J. SCHUMACHER. *Biochem. Z.* **157**, 438-58(1925).—When yeast, under various conditions, is treated with arsphenamine, followed by treatment with Ag salts and alkali, the extent of combination of the arsphenamine with the components of the yeast cells is indicated by the intensity of coloration produced. Spirochetes bind arsphenamine base. The Ehrlich arsenoceptor is the lipoprotein of spirochetes and the action of the As is due to its depriving the cell of O. W. D. L.

Action of ter- and quinequevalent arsenic preparations. J. SCHUMACHER. *Biochem. Z.* **157**, 456-8(1925).—Tervalent As compds. are not acidic and are more sol in lipoids than the quinequevalent compds. Therefore, they are electively attached by the lipoproteins of spirochetes. W. D. L.

Effect of freezing and thawing on the bacteriophage. E. S. SANDERSON. *Science* **62**, 377(1925).—A bacteriophage active for *Staph. muscae* Glaser, and another, lytic for a human strain of *Bact. coli* were used. Heating at 60° for 45 min. inactivated the former, but only partially destroyed the latter. The lytic titers of the 2 were very const. One cc. quantities of the phages were frozen and rapidly thawed from 10 to 20 times (a CO_2 microtome being used to produce cold), yet their titers never varied from non-frozen portions used as controls. By contrast, samples of a 34-hr. old bouillon culture of *Bact. coli* lost 86 and 94% of its numbers after 10 and 15 freezings, resp. Apparently the bacteriophage is something other than a viable organism, unless it is an exception to the general rule that repeated freezing and thawing are injurious to living cells. L. W. RIGGS

The fixation of atmospheric nitrogen by yeast as a function of the hydrogen-ion concentration. E. I. FULMER AND L. M. CHRISTENSEN. *J. Phys. Chem.* **29**, 1415-8(1925).—The growth of yeast on synthetic media with atm. N as the sole source of that element has been found to be a function of the p_H . In order to obtain quant. results of the N fixation in these media an addn. of bios as growth stimulant was found advisable. In the present work cane molasses was used as the source of bios in an amt. of 6 g. per 100 cc. synthetic agar medium, and further 0.5 g. dipotassium phosphate acting as buffer. The yeast used came originally from a Fleischmann yeast cake. The p_H adjustment was made after sterilization in a special app. to obviate any changes that might take place during this operation. After inoculation the flasks were sealed with paraffin and furnished with a capillary vent for pressure equalization. Incubation took place at 30°. At specified intervals the flasks were examd. and analyzed. In a table given in the paper it will be seen that the medium, according to the method

of analysis used, lost N in the beginning and that the actual gain did not appear until after 6-8 weeks. It is also notable that the max. gain takes place at the same p_H in which there is a max. loss. The following hypothesis is advanced by the authors. Yeast is known to be rich in ring N compds. and in the early stage of growth these may be converted into compds. not determinable by the usual methods. Later in the growth a transformation into determinable N occurs. The fact that several investigators have failed to observe any N fixation under these conditions is probably due to this time element. The present data show conclusively that the fixation of N by yeast at 30° is a function of the p_H , there being 2 optimal concns., one at p_H 6.0 and the other at p_H 7.9, the latter being the more potent. D. THURSEN

Comparative studies of the action of the pneumococcus on bile acids and unsaturated fatty acids, found in bile in the form of soaps. ANTHONY KOZLOWSKI. *J. Exptl. Med.* **42**, 453-63(1925).—Ox bile contains the soaps of unsatd. higher fatty acids not only with 1 but also with 2 and more double bonds, in a diln. of about 1:600. These substances, when isolated from bile, exert an antiseptic action on the pneumococcus in a diln. of approx. 1:50,000 and kill the organism in a diln. of 1:5000 in approx. 1 hr. As their action is, then, about 100 times stronger than that of the conjugated bile acids, their presence in bile should be considered, whereas hitherto it has been entirely overlooked not only by bacteriologists but by physiologists as well. Since the soaps of unsatd. fatty acids do dissolve the pneumococcus cell in broth culture, Neufeld's conclusion is no longer valid. The method of isolation of the fatty acids is described. C. J. WEST

Soluble specific substance of a strain of Friedländer's bacillus. I. MICHAEL HEIDELBERGER, W. F. GOEBEL AND O. T. AVERY. *J. Exptl. Med.* **42**, 701-7(1925).—The E strain of Friedländer's bacillus yields, on fractionation, a N-free polysaccharide with sp. properties of the order possessed by the sol. sp. substances of the 3 fixed types of pneumococcus. It is a strong acid with an equiv. value of about 685, sparingly sol. in H₂O after drying, but yielding sol. alkali salts. The sp. optical rotation is 100°. The polysaccharide itself is nonreducing, but on hydrolysis with mineral acid yields reducing sugars among which glucose has been shown to be present. II. **Chemical and immunological relationships of pneumococcus Type II and of a strain of Friedländer's bacillus.** O. T. AVERY, M. HEIDELBERGER AND W. F. GOEBEL. *Ibid* 709-25.—The chem. and immunological properties of the sol. sp. substances of a strain of Friedländer's bacillus and pneumococcus type II are described and correlated and the serological and antigenic similarity of these biologically unrelated organisms is discussed as an example of heterogenetic specificity among bacteria. C. J. WEST

Soluble specific substance of pneumococcus. III. M. HEIDELBERGER, W. F. GOEBEL AND O. T. AVERY. *J. Exptl. Med.* **42**, 727-45(1925); cf. *C. A.* **18**, 3203.—The sol. sp. substance of Type II pneumococcus is apparently a weakly acidic, N-free polysaccharide made up chiefly of glucose units. Its acid equiv. is about 1250 and the sp. optical rotation is about 74°. It is not pptd. by Ba(OH)₂ or heavy metal salts with the exception of basic Pb(OAc)₂ and U compds. It reacts at a diln. of 1:5,000,000 with Type II antipneumococcus serum but does not ppt. Type I and Type III antisera at a concn. of 1:400. The substance is converted by Ac₂O and C₆H₅N into a very sparingly sol. tri-Ac deriv. The Type III sol. substance is also a N-free polysaccharide, has an acid equiv. of about 340 and is made up not only of glucose units but also those of either glucuronic acid or a deriv. Its sp. optical rotation is about -33°. It is pptd. by Ba(OH)₂ in excess and by heavy metal salts and is also rendered insol. by the addn. of concd. HCl. In as high a diln. as 1:6,000,000 it still reacts with Type III antipneumococcus serum. The Type I sol. sp. substance also appears to be a sugar deriv. but differs from the other 2 substances in its lower % of sugar liberated on hydrolysis and in contg. N as an apparent essential component. It is a strong acid and a weak base, is very sparingly sol. at its isoelec. point, which lies at about p_H 4 and rotates the plane of polarized light about 300° to the right. In spite of a N content of 5% the substance gives none of the usual protein color tests. One-half of the N is liberated on treatment with HNO₃ and reducing sugars appear at the same time, while the sp. reaction vanishes. Under the same conditions the Type II and III substances are unaffected by HNO₃. The substance gives the color reaction for glucuronic acid but yields mucic acid on oxidation, indicating a relationship of galactose. It appears that in this substance a N sugar deriv. is linked to galacturonic acid through the reducing group of the latter. The Type I substance is pptd. by Ba(OH)₂ in excess, by heavy metal salts and by phosphotungstic acid. In the sp. precipitin reaction with homologous Type I antipneumococcus serum it can be detected in dilns. as great as 1:6,000,000 while at a concn. of 1:400 it gives a faint cloud with Type III antiserum.

These substances differ from the starch-glycogen group of carbohydrates in giving no color with I and in their resistance to the ordinary carbohydrate-splitting enzymes.

C. J. WEST

The "mouldy rot" disease of *Hevea brasiliensis* in Malaya (SOUTH, SHARPLES) 30.

THOMAS, STANLEY: **Bacteriology.** A Textbook on Fundamentals. New York: McGraw-Hill Book Co., Inc. 201 pp. \$2.50. Reviewed in *Am. J. Public Health* 15, 910(1925).

D—BOTANY

B. M. DUGGAR

Physical and chemical factors in the growth of asparagus. E. B. WORKING. Univ. Arizona Agr. Expt. Sta., *Tech. Bull.* 5, 124 pp., 14 figs(1925).—The 3 external factors of greatest importance in the growth rate of the young shoots are the temp., moisture content and the salt balance of the soil. Increase of growth rate was always found with increasing temps. up to the highest which occurred during the expts.; but temp. cannot be considered a limiting factor, as an improvement in the salt balance of the soil induces more rapid growth at the same temps. The addn. of Na salts in medium or low concn. improved the salt balance of the soils and nutrient solns. used. The amino acids present in the young stalk are favorable to high imbibitional swelling of a protoplasm contg. a high % of pentosan. A bibliography is appended. P. R. D.

Experiments with "finger and toe" disease of swedes. T. WHITEHEAD. *Welsh J. Agr.* 1, 176-84(1925).—The av. compn. of 4 varieties of swede roots was as follows:

Variety	Dry matter	Total sugar in roots	Sugar in juice	
			Reducing sugar	Cane sugar
Magnum Bonum	8.8	5.47	5.35	0.31
Danish, 25	10.6	5.86	5.80	0.29
Danish, 4	11.1	6.25	6.20	0.29
Yellow turnip	8.5	3.32	3.30	0.15

K. D. JACOB

Some nitrogenous constituents of the juice of the alfalfa plant. VI. **Asparagine and amino acids in alfalfa.** H. B. VICKERY. *J. Biol. Chem.* 65, 657-64(1925); cf. *C. A.* 18, 3407; 19, 3514.—Asparagine, aspartic acid, tyrosine, phenylalanine, serine, leucine, valine and alanine have been isolated from alfalfa juice. The aspartic acid obtained after hydrolysis probably represents asparagine. At least 55% of the amino N of the amino-acid fraction is accounted for as asparagine and the aspartic acid found after hydrolysis indicates that more of this substance is present. Although no other amide has yet been found, it is probable that other substances yielding NH_3 on mild acid hydrolysis are present in alfalfa juice. Serine and alanine have not been previously reported as occurring in plant juices; they were definitely identified as α -naphthyl-hydantoic acid derivs.

A. P. LOTHROP

Carbo- and nitrogen transformations in the decomposition of cellulose by filamentous fungi. H. HEUKLEKIAN AND S. A. WAKSMAN. *J. Biol. Chem.* 66, 323-42 (1925).—"The C and N transformations in the decompn. of cellulose by 2 typical soil fungi, a *Trichoderma* and a *Penicillium*, have been studied. It has been found that cellulose (in the form of filter paper) is completely decompd. by these organisms, giving CO_2 as the only waste product. No intermediary products are left in the medium. A considerable part of the C is reassimilated by these organisms and built into protoplasm. These results have been obtained both in a direct and an indirect way. It has been conclusively shown that the C evolved as CO_2 and the C assimilated by the fungi account for nearly all of the C of the cellulose decompd. The divergencies are small and are due to exptl. error. The C and N assimilated show a definite relationship to one another. The organisms prefer NH_3 to nitrate as a source of N. This is assimilated and transformed into microbial protoplasm. A direct correlation is thus found between the amt. of cellulose decompd. and the amt. of N transformed into an insol. org. form. In the decompn. of cellulose the only residual substance is thus found to be the fungus protoplasm. Of course the synthesized fungus mycelium will be further decompd. in normal soils by other microorganisms, resulting in the liberation of N in an available form."

A. P. LOTHROP

The nitrogen constituents of celery plants in health and disease. G. H. COONS AND L. J. KLOTZ. *J. Agr. Research* 31, 287-300(1925).—Celery leaves affected with *Cercospora apii* and *Septoria apii* have a lower percentage of total N in the diseased

than in the healthy tissue. Nitrites are present in the diseased material. A comparison of the nitrogenous compds. present showed in percent of total N more NH_4 , humin and protein in the diseased than in the healthy tissue and less acid amide, non-protein, basic and hydrolyzable N. The results are thought to be best explained as due to the decompn. of the host by the parasite in a simple food relation. W. H. R.

Copper in the legumes. I. HIRANO AND R. MIKUMO. *J. Pharm. Soc. Japan* No. 525, 992-4 (1925).—The Cu content of various legumes and its distribution between seed coat and embryo were estd. by a colorimetric method after the sample is ashed and the Cu is converted to the NH_4 Cu complex. The results are given in mg. of Cu in 1 kg. of dried samples as follows: soy beans 15.896; *Phaseolus mungo* L. (var. *subtilibata*, Ir and Sav.) 5.855; green peas 2.687, red peas 5.291; *Vicia faba* L. 8.024; black beans 12.156, *Phaseolus vulgaris* L. 6.183, "toramame" 6.183; peanut 6.778; and "sodefuri mame" 2.051. The seed coats contain 30-40% of the total Cu in legumes. S. T.

Efficiency of photosynthesis of *Chlorella* (ADAMS) 10.

E - NUTRITION

PHILIP B. HAWK

Avitaminosis, receptivity to infection, and virulence of microorganisms. G. PETRAGNANI. *Rend. adunanze dell' accad. med.-fis. fiorentina; Sperimentale* 79, 951-7 (1925).—Attenuated anthrax cultures do not increase in virulence when injected into pigeons in avitaminosis or when grown in their blood. The lowered resistance to bacterial invaders of animals in avitaminosis is attributed to a depressed cellular functioning. Setti's conclusions (*C. A.* 17, 819), opposed to these, are criticized. M. H.

The behavior of fat in the blood of children during a prolonged fast. L. SPOLVERINI AND A. VANELLI. *Pediatrics (Riv.)* 33, 1253-63 (1925).—The serum of normal children from 6 months to 2 years old was observed in the dark field and the fat droplets were counted, the children being kept first on a normal diet and then for 50-60 hrs. on sweetened barley coffee. A period of fat-free diet was in some cases interposed between normal diet and fast. Unlike the sugar content the fat content of the blood shows considerable variations, mainly in connection with the ingestion of food. During the first 24-36 hrs. (nurslings) and 48-55 hrs. (weaned children) the fat content suffered a sudden drop and finally disappeared completely. A noticeable, often marked lipemia followed, which unlike digestive lipemia was characterized by the prevalence of large and medium sized fat droplets and was apparently due to the mobilization of depot fat. The fasting lipemia appeared in nurslings much sooner than in weaned children and was more pronounced and const. The tolerance of all children to the fast was a very good one. MARY JACOBSEN

Nitrogen metabolism in nutritional disturbances. IVO NASSO. *Pediatrics (Riv.)* 33, 1264-78 (1925).—Nurslings fed on evapd. milk were studied. In normal infants the relative values of excreted N hardly differed from those of breast-fed children. Apparently the latter retain less N, since the N content of evapd. milk is higher than that of cow or woman's milk. The somewhat higher NH_3 and lower urea N as compared with that of the adult may indicate that the infantile organism tends to neutralize its acids with NH_3 . Acute dyspepsia showed only a slight deviation from normal. In chronic disturbances there was in one case a considerably reduced retention of N, increased excretion in the feces and normal rates in the urine, while another case presented N deficit and increased excretion of N in the feces and of NH_3 in the urine. MARY JACOBSEN

Alimentary and adrenaline glucemia in the new born. LUIGI AURICCHIO. *Pediatrics (Riv.)* 33, 1274-8 (1925).—The blood of the new born contains glucose previous to any food ingestion, the content being about the same as that in the adult. Ingestion of glucose caused an increase of 50-100%, first noticeable after 15 min. The max. is reached in 30 min.; the decrease begins after 1 hr. with the return to normal after 2 hrs. An adrenaline injection doubled the sugar content in 15 min. The decrease began only after 2 hrs. MARY JACOBSEN

Vitamins. V. Storage of vitamin A by young white rats after feeding horse-flesh to the mother during pregnancy and afterwards. A. SCHEUNERT AND A. J. CANDELIN. *Biochem. Z.* 159, 83-8 (1925); cf. *C. A.* 19, 2841.—The litters of rats which have not been deprived of vitamin A have stored enough of this vitamin to produce normal growth for about 30 days after weaning. Vitamin A is present in lean horse meat. W. D. L.

Changes in the intestinal flora of rats on a calcium-deficient diet. R. E. HOFF-

STADT AND S. J. JOHNSON. *Am. J. Hyg.* **5**, 709-23(1925).—A diet in which low Ca was the limiting factor, but derived chiefly from natural foodstuffs (white flour, oat meal, lean beef, beans, potatoes and apples) and the same diet to which 1.5% CaCO_3 was added, were fed to white rats and the intestinal picture was studied. On the low Ca diet, constipation was observed as evidenced by dryness and change of color of feces and painful defecation. There was also noted a low aerobic bacterial count, but no relation was evident between types of organisms, aerobic and anerobic, present and the clinical condition of the animals. On autopsy the small intestine showed loss of elasticity and thinness of the wall, which was considered to be the chief contributing factor in the intestinal stasis.

H. B. LEWIS

The chemistry of proteins and its relation to nutrition. D. B. JONES. *Am. J. Pub. Health* **15**, 953-7(1925).—Review concerned particularly with the question of the essential amino acids.

H. B. LEWIS

Vitamins in canned foods. IV. Green peas. W. H. EDDY, E. F. KOHMAN AND V. CARLSSON. *Ind. Eng. Chem.* **18**, 85-9(1926).—Fresh green peas are relatively rich in vitamins A, B and C, but no evidence was obtained of the presence of the anti-rachitic vitamin. Small peas contain more A and C, and less B than large peas. Cooking or canning did not affect the A or B content, and canning is less destructive to C than kettle cooking, probably because of exclusion of O in canning. Blanching is relatively more destructive than processing. Reheating canned peas in an open kettle after removal from the can does not materially affect the content of C. Canned peas have at least half the value of butter as sources of A, are richer than milk, tomatoes or oranges in B, and nearly as rich as oranges or tomatoes in C. The protective dose of canned peas for guinea pigs is as 3-5 g. compared with 1.5-3 g. of orange juice, and 2.5-3 g. of tomato. For the detn. of comparative values the methods of Sherman were used.

H. B. LEWIS

Technic for studying vitamin B. A. H. SMITH, G. R. COWGILL AND HILDA M. CROLL. *J. Biol. Chem.* **66**, 15-21(1925).—When exptl. animals used in studying vitamin B are prevented from eating their feces definitely increased daily dosage of the vitamin-bearing material is required for normal growth. The rate of decline after withdrawing the source of vitamin B is more rapid when animals are confined in false-bottom cages and more speedy failure of very young rats on vitamin B-free diets occurs under these conditions. The animal-feeding method of testing for vitamin B can only give accurate *absolute* results for a given product when the exptl. animal is prevented from conserving his supply of this food factor by coprophagy. Frequent thorough cleaning of the cages is also necessary and more clear-cut exptl. results are obtained if each animal is caged separately. The animal-feeding method in the old style cage possesses value if only *comparative* results not highly quant. in character are desired. These observations confirm those of Steenbock, Sell and Nelson (*C. A.* **17**, 2305) and are not in accord with those of McCollum, Simmonds and Becker (*C. A.* **19**, 2066).

A. P. LOTHROP

The determination of cystine by means of feeding experiments. H. C. SHERMAN AND ELLA WOODS. *J. Biol. Chem.* **66**, 29-36(1925).—The basal diet in which the growth-limiting factor is cystine was as follows: whole milk powder 16.7, cod-liver oil 1.0, dried brewers' yeast 1.65, salt mixt. 1.65, starch 79%. "When carefully standardized young rats are fed this basal diet, with and without graded addns. of cystine, it is possible to det. a direct linear or arithmetical relationship between the added cystine fed and the added growth thereby induced, up to an added gain of at least 10 g. in an exptl. period of 6 weeks, induced by the addn. of 0.025% of cystine to the basal diet, and probably up to 0.04% added cystine with an added gain of 17 g. Parallel expts. with graded addns. of casein to the same basal diet gave correspondingly graded responses in the growth rate.* Within the range of growth increase in which the response to added cystine was in arithmetical proportion to its amt., it is believed that the response to the added casein may be interpreted as a measure of the cystine (or cystine plus nutritionally equiv. S-contg. radicals) furnished by the casein. Thus interpreted, the results would indicate that casein contains not less than 1.3% nor more than 2.5% of cystine, or that approx. $\frac{3}{8}$ to $\frac{1}{4}$ of the total S in casein is in the form of cystine or of cystine plus other S-contg. radicals which are interchangeable with cystine in nutrition. The lower limit of the range of the possible % of cystine in casein thus indicated by these feeding expts. is higher than the proportion of cystine obtained from casein *in vitro* by present analytical methods. With the development of a suitable basal diet for each, it should be possible to apply the same general principle to the quant. detn. of other nutritionally essential amino acids." A. P. LOTHROP

Soft pork studies. I. Formation of fat in the pig on a ration moderately low in fat.

N. R. ELLIS AND O. G. HANKINS. *J. Biol. Chem.* **66**, 101-22(1925).—"The progressive hardening of hogs on a ration contg. a moderately low amt. of softening fat such as is found in corn is accounted for as follows: The change from a soft fat as found in young, immature hogs to a hard fat in older, mature hogs was accompanied by an increased rate of fat deposition. This increased rate of fat deposition caused a widening of the ratio of body fat derived from carbohydrate and protein (hard) to that derived from ingested fat (soft). The change in the compn. of the body fat resulted in a decrease in the I no. and n and an increase in the m. p. The effects on the proportions of the fatty acids were an increase in the % of total satd. acids and a decrease in the % of linolic acid with the % of oleic acid remaining nearly const." A. P. LOTHROP

The antirachitic value of irradiated cholesterol and phytosterol. IV. Factors influencing its biological activity. A. F. HESS, MILDRED WEINSTOCK AND ELIZABETH SHERMAN. *J. Biol. Chem.* **66**, 145-60(1925); cf. *C. A.* **19**, 2068, 2972-3.—"Irradiated vegetable oil maintains its acquired antirachitic potency for at least a year and dried milk for at least 3 months. Activated cholesterol loses its potency much more readily; most rapidly when kept in the dry state, less quickly when kept in H_2O and slowly when stored in oil. Prolonged intense irradiation destroys the antirachitic properties of activated cholesterol which cannot be regained by subsequent exposure to ultra-violet light. The process is not reversible. Cholesterol can be activated in an atm. of N_2 . It does not lose its potency when subjected to a partial vacuum. Furthermore no difference was found, by means of combustion, between the O content of the non-irradiated cholesterol and that irradiated 1 hr. Recrystn. of irradiated cholesterol brings about a loss of its activity, the successive fractions possessing diminishing antirachitic value. Irradiation of these deactivated fractions brought about incomplete activation in 3 fractions and no activation in the 4th. Activated cholesterol does not suffer a loss of potency by prolonged contact with Me_2CO , $CHCl_3$, or C_6H_6 . The cholesterol extd. from egg yolk or from bone marrow has no antirachitic value."

A. P. LOTHROP

Studies on the mineral requirement of swine: The effect of common salt and charcoal, sodium sulfate and calcium phosphate on the growth of pigs. P. L. CAVILLERO. *Philippine Agr.* **14**, 373-8(1925).—"Four groups of 4 pigs each were fed the same basic ration. Lot 1 was the control and received no mineral matter except that naturally occurring in the feed. The other lots all received NaCl and charcoal and in addn. lot 3 received Na_2SO_4 and lot 4 $Ca_3(PO_4)_2$. There was no material difference in the amt. of food consumed or gain in wt. made by lots 1, 2 and 3. The animals fed $Ca_3(PO_4)_2$ made an av. gain in wt. 34% greater than that of any other group. The controls laid on more fat in proportion than the others. The latter and especially lot 4, had larger and longer bones, better appetites, longer and coarser hair, were more active and less infected with parasites."

A. L. MEHRING

Physical and chemical properties of biosterin (a name given to fat-sol. A) and its physiological significance. K. TAKAHASHI, Z. NAKAMIYA, K. KAWAKAMI AND T. KITASATO. *Sci. Papers Inst. Phys. Chem. Research* **3**, 81-148(1925).—"Cod-liver oil which was potent in vitamin A was treated as previously described (cf. *C. A.* **17**, 1984) and crude biosterin was obtained. This was purified by extn. with petrole ether and MeOH and the product was called refined biosterin (II). It had the compn. C 81.07, H 11.14, sp. gr. 0.9572, n_D^{20} 1.5676. Further attempts to purify (II) by its different solubilities in solvents failed, whereupon it was crystd. from its soln. in acetone by cooling below -60° by means of a mixt. of CO_2 and H_2O . The product (III) had nearly the same properties and consts. as (II). The refined product (II) was then distd. in a special flask in an oil bath, about one half of the sample going over at $147-150^\circ$ under a pressure of 0.02 to 0.03 mm. and at a temp. of about 180° of the bath. The portion which distd. below 190° was fractionally distd. when 30 to 40% of the original sample was obtained at $147-150^\circ$. This substance gave consts. similar to those of (II) and had the growth-producing properties of vitamin A, showing that vitamin A can be distd. A substance similar to biosterin in its chem., phys. and physiol. properties was obtained from spinach. Biosterin resembles the carotinoids. It affects a dry photographic plate to a much greater degree than do the drying oils or terpenes. The reason for this activity is obscure. Biosterin dissolves in the usual org. solvents and in the fatty oils but is insol. in water. Its soly. in 90% MeOH or EtOH or petrole ether distinguishes it from carotin and xanthophyll. It is readily adsorbed from its solns. by fuller's earth or animal charcoal. Its empirical formula is given as $C_{27}H_{44}O_2$. Biosterin gives several color reactions, the most important of which is an indigo blue color when to its $CHCl_3$ soln. concd. H_2SO_4 is added. This color soon changes to a dark brown. Biosterin which has lost its vitamin efficacy gives a red color with H_2SO_4 . I absorption and Br

addn. products show its unsatd. character. Biosterin can be hydrogenated by the use of Pt black as the catalyst. When kept in air in a desiccator for a long time it gained O, gave a red color with H_2SO_4 and lost its efficacy upon the animal. It forms an acetate and benzoate, also a digitonide with digitonin. Much work was reported on the effects of feeding normal and supernormal doses of biosterin to dogs and other animals.

L. W. RIGGS

Relation of the hypophysis to carbohydrate metabolism. TUMIO FUKUI. *Arch. ges. Physiol.* (Pflüger's) **210**, 427-31(1925).—The injection of hypophysis preps. exerted no noteworthy effect upon the carbohydrate content of the liver of rats on a normal diet. Hypophysis ext. given simultaneously with thyroid preps. did not modify the characteristic loss of the liver carbohydrates due to the latter. G. H. S.

Antirachitic effect of the "unsaponifiable portion" of cod-liver oil. H. BEHRENDT. *Z. Kinderheilk.* **39**, 619-27(1925).—The unsaponifiable portion of cod-liver oil administered to 12 rachitic children caused improvement in 11, as detd. by clin. conditions, röntgenological examn. and blood chem. tests. G. H. S.

Percentage distribution of the caloric values of foodstuffs as to protein, fat and carbohydrates. CLEMENS PIQUET and RICHARD WAGNER. *Z. Kinderheilk.* **40**, 26-45 (1925).—Tabulated data on 542 substances. G. H. S.

Vitamin C content of cow milk and the effect of different pasteurization procedures. W. BLUMENBERG. *Z. Kinderheilk.* **40**, 177-96(1925).—The amt. of C vitamin is small. Pasteurization reduces, sterilization destroys, the antiscorbutic property. Heating for 30 min. at 63° is more destructive than heating at 85° for 15 min. G. H. S.

Significance of cow milk whey in the origin of acute diarrheal nutritional disturbances in infants. IV. Whey and lactase. HEINRICH DAVIDSOHN. *Z. Kinderheilk.* **40**, 251-8(1925); cf. *C. A.* **19**, 1446. —Compared with a lactose-water soln., whey retards sugar splitting. Dilm. of the whey content to $\frac{1}{3}$ converts the inhibition into a favoring action. Protein-free whey markedly favors the splitting as compared to protein-contg. whey, and somewhat as compared to a lactose soln. Dilm. of the protein-free whey to $\frac{1}{3}$ causes no material change in the velocity of the reaction. A lactose-water soln. contg. whey albumin shows a much slower lactose splitting than does a lactose-water soln. alone and it is somewhat slower than in whole whey. Thus, the lactose splitting is inhibited by the presence of whey salts, *i. e.*, the non-colloidal constituents of the whey. After dilm. to $\frac{1}{3}$ the effect of the latter outweighs the retarding effect of the albumins. Casein (lactana) in low concns. (0.5-1%) favors, in higher concns. (3%) is of questionable advantage to the process. Protein-free whey + lactana favors the reaction much more than a lactose soln. with the same amt. of lactana. The clinically observed fact that protein-free whey and casein are more harmful to the conduct of intestinal activity than lactose-water and casein is not explained by the above facts.

V. Whey and blood sugar. KLAUS KEILMANN. *Ibid* 259-67.—Study of the blood sugar curves after the administration of lactana and lactose in (a) whey, (b) protein-free whey, and (c) water showed that with (a) there occurred a significant retardation of the hyperglucemia, which was not to be referred to the period of stay in the stomach or to the course of the lactose splitting, but to a dominating inhibition of the absorptive activity of the intestinal mucosa. This inhibition proceeds from the whey proteins, in conjunction with the protein-free whey residue. In itself the whey protein is entirely without influence, but when with protein-free whey, after a prompt rise in the blood-sugar curve similar to that occurring with sugar-water, there is a slow and irregular return to the initial value. Since this action vanishes after dialysis of the protein-free whey, it is obviously associated with dialyzable substances.

VI. Sugar absorption with human milk, with undiluted and diluted cow milk, and with protein milk. KLAUS KEILMANN and FLORA ROSENBUHD. *Ibid* 268-71.—Sugar absorption occurs quickly and its curve falls abruptly with human milk, resembling that characteristic of aq. sugar solns. With whole milk there is a delay in sugar absorption, resembling that noted with whey. Dilm. of the milk to $\frac{1}{3}$ removes this delay. With protein milk, or with a whey content of but 50%, the sugar absorption was more rapid than with whole whey, but slower than with human milk, sugar-water solns., or with greater dilns. Apparently absorption is delayed in severe dystrophies and dyspeptic conditions. The conformity of the blood sugar curves with human milk and aq. sugar solns., as compared with that with cow milk, would not imply any sp. stimulation of the absorptive process by the natural food, but indicates rather that in the cow milk the whey is inhibitory.

VII. Whey and retention in the stomach. W. BLOCK and F. KOENIGSBERGER. *Ibid* 272-4.—With water the retention in the stomach is some 27 to 48% shorter than with whey.

VIII. Whey and lactosuria. ERNST BERNHARD. *Ibid* 275-6.—Whey renders

the intestinal mucosa permeable for lactose. **IX. Conclusion.** H. FINKELSTEIN. *Ibid* 277-80.—A summary of the above series of papers. G. H. S.

Effect of feeding cod-liver oil to cows as regards the vitamin content of the milk. RICHARD WAGNER AND HANS WIMBERGER. *Z. Kinderheilk.* **40**, 295-308(1925).—The milk of cows, which were fed large doses of cod-liver oil for 7 months, had no detectable curative effect on rickets in infants. The content in vitamin A, as well as the anti-rachitic value of the milk, as detd. by tests in rats, was higher than normal to but an insignificant extent. G. H. S.

F—PHYSIOLOGY

ANDREW HUNTER

Action of splenic extracts on the movements of the digestive tract. C. MAZZANTI. *Sperimentale* **79**, 741-62(1925).—Fresh exts. which have not autolyzed or been exposed to acids or bases show a hypertonic action on the smooth musculature of the intestine only in high concns., indicating the absence of a peristaltic hormone in the secretion. M. HEIDELBERGER

Fat content of the lungs of new-born infants. C. COCCHI. *Rend. adunanza dell'accad. med-fis. fiorentina; Sperimentale* **79**, 961-6(1925).—The amt. found diminishes rapidly after the initiation of the respiratory function, and is also less in premature infants. A table is given. Averages are: for full-term infants who have not respired fatty acids 9.7%, cholesterol and unsaponifiable matter 1.7%; for full term infants who have respired 4.6 and 1.4%, resp. Analyses were also made in the case of new-born rabbits, the values varying in the same sense. The theory is thus supported that the fat of high caloric value is used for purposes of energy in the lung itself where it is needed before food is ingested. M. HEIDELBERGER

Sedimentation and Rouleaux formation. I. ERIC PONDER. *Quart. J. Exptl. Physiol.* **15**, 235-52(1925).—Human red cells lose their discoid form and become spherical (Gauchian change) in isotonic NaCl soln., Ringer's soln., Fleisch's soln., Brinkmann's fluid and isotonic citrate soln. These changes are probably due to variations in surface tension. The cells return to the discoid form on the addn. of a small quantity of serum. NH_4 oxalate prevents the formation of the spherical form. The equation for the sedimentation rate of the spherical form is given. The velocity is const. during the first 24 hrs.; with increase in time the rate decreases. Similar results were obtained with cells of the ellipsical form (birds, reptiles, amphibia and fishes). Sedimentation varies directly with the temp. Concn. does not affect sedimentation to any appreciable extent. Length and diam. of tube (except in casts of very narrow tubes) do not influence the sedimentation of cells in saline. FRANCES KRASNOW

Note on the appearance of mammalian erythrocytes under dark ground illumination. W. G. MILLAR. *Quart. J. Exptl. Physiol.* **15**, 253-7(1925).—No sign of internal structure can be seen in the human cells. There are 2 forms of crenation. Cells, after the Gauchian change, show an irregular granularity of the surface. Cells immediately before hemolysis assume a spherical form. The remains of the cells hemolyzed by saponin show the wrinkled appearance of collapsed bladders. FRANCES KRASNOW

Some technical points important for the study of the metabolism of rabbits. V. KORENCHESKII. *Quart. J. Exptl. Physiol.* **15**, 259-61(1925).—Discussion. F. K.

The pancreas of teleostean fishes and the source of insulin. SWALE VINCENT, E. C. DODDS AND F. DICKENS. *Quart. J. Exptl. Physiol.* **15**, 313-7(1925).—The authors show "that pancreatic tissue derived from teleostean fishes contains a certain amt. of islet tissue and it therefore seems that the source of insulin remains undecided. A yield corresponding to that obtained from mammalian pancreas was extd. from zymogenous tissue of a teleostean pancreas, even though the material collected under this head inevitably contained a great deal that was not pancreas at all." F. K.

The active principles of the posterior lobe of the pituitary body. WALTER SCHLAPP. *Quart. J. Exptl. Physiol.* **15**, 327-47(1925).—"When the depressor-free exts. of the posterior lobe of the pituitary body are boiled with dil. HCl, the oxytocic, pressor and melanophore responses evoked by them are destroyed slowly and simultaneously. By treating depressor-free exts. with *N*-butyl alc. it is possible to sep. a fraction into which the greater part of the oxytocic activity has passed." During treatment with H-S in suitable concns. of Pb acetate, all the active pressor and melanophore substances are adsorbed on the PbS ppts. to a much greater extent than the oxytocic principle. The expts provide no positive proof that the pressor and melanophore responses are due to distinct substances. FRANCES KRASNOW

Distribution of iodine in the decomposition products of the thyroid gland. N.

ABELLES AND H. POPPER. *Biochem. Z.* **159**, 126-9(1925).—A thyroid prepn. (I = 0.25%) is hydrolyzed with 10% H_2SO_4 . Of the I present, 33% is in the acid-insol. residue and it all may be extd. by EtOH . If hydrolysis occurs in the presence of HCHO only 4.4% of the I in the acid-insol. residue is extd. by EtOH . When HCl is used in place of H_2SO_4 , 13.6% of the I remains undissolved, and in presence of HCHO , 21.4%. Hydrolysis with NaOH leaves from 28.5 to 18.8% of the I undissolved. W. D. L.

Carbohydrate utilization. I. Rate of disappearance of *d*-glucose from the blood. VINCENT DU VIGNEAUD AND W. G. KARR. *J. Biol. Chem.* **66**, 281-300(1925).—Fasting invariably decreases the rate of glucose disappearance from the blood in a normal rabbit following a hyperglucemia from glucose ingestion, the longer the fast the greater the reduction in the rate of disappearance. Similar results are obtained when the glucose is injected intravenously. This fact offers very definite evidence that in the decreased tolerance due to fasting the rate of disappearance from the blood is involved and not the absorption of glucose from the intestine. The rate of the reduction of the hyperglucemia after fasting is markedly influenced by the sp. foodstuffs; feeding protein with or 4 hrs. before the glucose test meal has little or no influence on the blood sugar curve but greatly increases the rate if given 18 hrs. previously; fat fed 18 hrs. before the glucose ingestion decreases the rate while glucose itself slightly increases it. Adrenaline given 18 hrs. previous to the test meal increases the rate while morphine does not, although both produce hyperglucemia; this indicates that a previous hyperglucemia is not the only stimulating factor. A decreased rate is observed on giving a test meal immediately after an insulin hypoglucemia has returned to normal. NaHCO_3 administered during a fast prevents the decrease in the rate of disappearance of blood sugar but detns. of the blood p_{H} and CO_2 capacity indicates that acidosis is not the predominant factor in causing this change during a fast. The exptl. data emphasize greatly the importance of carefully controlling the diet, period of fasting and medication before performing the customary sugar tolerance test used in clinical diagnosis.

A. P. LOTHROP

The influence of pregnancy upon the lipoids of the blood. MARGARET TYLER AND F. P. UNDERHILL. *J. Biol. Chem.* **66**, 1-13(1925). The total Et_2O ext. of whole blood in pregnant women is higher than the non pregnant values as early as the 3rd month and there is an increase from then till term; the av. value at term in 11 cases was roughly 50% higher than the non-pregnant values and 30% higher than the value at 3 months. Cholesterol, cholesterol esters and lecithin increase gradually, each being roughly $\frac{1}{3}$ higher at term than at 3 months. The relation of cholesterol esters to total cholesterol remains fairly const. but the esters form a larger proportion than in non-pregnant women. The relation of lecithin to cholesterol remains fairly const. and is within normal limits continuously. During the first 2 weeks of the puerperium the values for the Et_2O ext. and for the individual lipoids of whole blood remain high. A. P. L.

The effect of changes in the circulation on carbohydrate utilization. F. A. CAJORI, C. Y. CROUTER AND RALPH PEMBERTON. *J. Biol. Chem.* **66**, 89-100(1925).—An exaggerated and prolonged hyperglucemia can be induced in many subjects by interfering with the blood supply to large muscle masses through elevation of the legs and one arm. The rate at which sugar is removed from the blood can, therefore, be changed by a procedure which is purely mech.; the chem. processes do not seem to be involved and elevation of the legs for 45-50 min. has no effect on the fasting blood sugar level. Purely mech. factors (the condition of blood supply and blood flow in the tissues) should be taken into consideration in interpreting the nature of a low sugar tolerance test.

A. P. LOTHROP

The properties and composition of oocytin. II. G. W. CLARK AND P. W. SHARP. *J. Biol. Chem.* **66**, 123-31(1925); cf. *C. A.* **12**, 1970.—"Oocytin is present in the blood of the following mammals: beef (bull, ox, cow and calf), sheep (lamb, wether), pig, dog, horse, chicken and turkey (gobbler and hen). It therefore seems probable that oocytin is present in the blood of all mammals. Long standing of serum (approx. 15 months) at low temp. (4°) has no appreciable effect upon the yield of oocytin or upon the potency of the substance in forming fertilization membranes. Both the age and sex of the animal may influence the yield and membrane-forming properties of the oocytin obtained; that prepd. from old animals is more potent than that from young animals of the same species and larger yields are obtained from female blood. Oocytin is probably not present in appreciable amts. in the body transudates. Membrane formation can be induced by thymus, salmon sperm and yeast nucleic acids but these substances are much less effective in this respect than oocytin. From work with fowl blood it seems probable that the source of oocytin is nuclear material derived from the red cells rather than from the leucocytes as suggested by Robertson."

A. P. LOTHROP

Further studies on the parathyroid hormone. II. J. B. COLLIP AND E. P. CLARK. *J. Biol. Chem.* **66**, 133-7(1925); cf. *C. A.* **19**, 2076, 2520, 3523.—A detailed method for the purification of the parathyroid hormone is described; extrn. is made with hot 5% HCl followed by salting out of the active substance with NaCl and several isoelec. pptns. The material behaves as a fairly well-characterized substance of protein nature with properties similar in many ways to those of insulin. It contains 15.5% of N and also some S and Fe but no P. It has a sharp isoelec. point at p_H 4.8. It is pptd. from acid soln. by half satn. with $(NH_4)_2SO_4$ and gives the common protein tests. Its physiol. activity is destroyed by boiling for 1 hr. with either 10% HCl or 5% NaOH and by the action of pepsin and trypsin. It does not dialyze through collodion membranes and is removed from soln. by Norit and H_2WO_4 . No change in properties could be detected after 10 repptns. The purified substance is sol. to the extent of 0.1% in abs. alc. A. P. LOTHROP

The influence of *l*-hydroxystearic acid on acidosis. R. WEST AND ETHEL M. BENEDICT. *J. Biol. Chem.* **66**, 139-44(1925).—The investigation was undertaken to det. whether or not an even C fatty acid with a negative group attached to one of the even C atoms (α , γ , ϵ , etc.) would yield acetone in the body. *l*-Hydroxystearic acid ethyl ester, m. 44° , was chosen as it can be readily homogenized to a cream with skimmed milk and is from 75 to 85% absorbed. When fed to normal subjects in ketosis a reduction of the ketosis resulted in all cases. No significant change in the N excretion occurred. While the excretion of acetone bodies became less, the total org. acids fell but little or not at all, suggesting that the material fed was probably being oxidized to some other acid than acetoacetic and its derivs. A. P. LOTHROP

The concentration of chlorides in the glomerular urine of frogs. J. T. WEARN AND A. N. RICHARDS. *J. Biol. Chem.* **66**, 247-73(1925).—The nephelometric method of Richards for the estn. of minute quantities of Cl has been adapted for the detn. of the Cl concn. of glomerular urine, the modification permitting its detection in concns. lower than 1×10^{-7} . "Comparison of the Cl concns. of glomerular and bladder urines simultaneously eliminated by frogs in 13 expts. under various conditions confirms the qual. evidence previously advanced in proof of glomerular elimination and tubular reabsorption of Cl. The figures show that Cl is absorbed at a faster rate than H_2O , even when plasma Cl is more than double its normal value as a result of injection of NaCl. In 10 of 13 expts. the plasma Cl concn. was also detd. In all but one of these, glomerular Cl was higher than plasma Cl. In 7, the difference amounted to more than 15% of the latter; in 4, more than 28%. Conceding the possibility of errors of technic amounting to 10%, we are forced to conclude that the filtration theory, as at present defined, is not adequate to explain our results. If subsequent work shall confirm these, it is clear that the processes concerned in glomerular filtration require further study." A. P. LOTHROP

Physiological ontogeny. A. Chicken embryos. II. Catabolism. Chemical changes in fertile eggs during incubation. Selection of standard methods. H. A. MURRAY JR. *J. Gen. Physiol.* **9**, 1-37(1925).—Loss of H_2O from the hen egg during incubation is a function of the humidity of the atm. surrounding the egg. The factors influencing the humidity are: circulation of the air, atm. temp., thickness and area of egg shell and conditions within the egg, the most important of which probably is the amt. of heat produced by the embryo. The latter factor assumes importance only after the 3rd. or 4th. day of incubation. A formula is given for calcg. the surface area of the egg. The egg shell loses wt. during incubation; near the end of the embryonic cycle this loss seems to parallel the wt. of the embryo. A loss of solid matter occurs during incubation, about 98% of the material oxidized being fat. On the basis of chem. analysis, the CO_2 produced is assumed to be derived from the oxidation of fat. The total solids fats and protein in the whole egg during incubation have been calcd. from the exptl. data. III. **Weight and growth rate as functions of age.** *Ibid* 39-48.—The av. wt. of chicken embryos between 5 and 19 days old may be expressed by the formula: $W = Kt^{2.6}$, where $K = 0.668$. The velocity of growth (% increase in mass) is inversely proportional to embryonal age. The product of velocity and time is a const. (3.6). The negative acceleration of growth also decreases with age. C. H. R.

The fixity of basal metabolism. F. G. BENEDICT AND ELIZABETH E. CROFTS. *Proc. Nat. Acad. Sci.* **11**, 585-8(1925).—"The expression 'basal metabolism' is used to denote the energy production of man during complete muscular repose and 12 hrs. after the last meal." One man and 7 women (college students) served as subjects. The basal metabolism was measured, first, after the subject had rested quietly in bed during the night, well covered. The subject then rose, went through the regular routine of bathing and dressing, walked 10 min. in the open air, returned to the lab.,

climbed 3 flights of stairs and while still clothed lay on a bed 30 min, covered with a light blanket, when the basal metabolism was again measured. These measurements were repeated from 3 to 9 days with each subject. Skin temp. at 16 points on the body surface and the pulse rates were noted. The difference between the figures of the first and second measurements of basal metabolism was slight and indicates that with normal persons, prolonged rest in bed prior to measurements in the morning is unnecessary provided the usual half-hour rest period is insisted upon. Wide variations in skin temp. show the absence of a correlation between heat production and heat loss. The basal metabolism on any given day is fixed with a remarkable constancy.

L. W. RIGGS

Hemolysis studies. I. Mechanism of hemolysis by hydrogen and hydroxy ions.

RUDOLF MOND. *Arch. ges. Physiol.* (Pflüger's) 208, 574-94(1925); cf. *C. A.* 20, 443.—It must be assumed that the hemoglobin is present within the limiting plasma membrane in the substance of the red cell and that for agents to be hemolytic the normal impermeability of this membrane for the pigment must be altered. But if the hemolytic agent causes a change in the state of the hemoglobin of such a nature that the particles of hemoglobin become increased in size through aggregation or that they enter into a firm union with the colloids of the interior of the cell, hemolysis will be impeded despite the fact that the permeability of the membrane may be increased. Heat-coagulated hemoglobin, on the alk. side of its isoelec. point, is sol. in warm dil. alc., a characteristic which extends to an even higher degree to globin. With the latter even at the isoelec. point and on the acid side heat coagula are sol., although rather more slowly. In all instances, with cooling the process is reversible. The stroma of the blood cell has an isoelec. point on the acid side, the position of which varies, according to the salt concn. and the nature of the ions, between p_H 5.5 and 3.0. As the p_H leaves the isoelec. point, becoming alk., the vol. of the stroma increases and finally a soln. takes place. If these properties of the structural substance can be transmitted to the colloid of the plasma membrane it would be expected that with an approach to the isoelec. point an increasing flocculation would occur, leading to a loss in cohesion in the plasma membrane, so that with the extreme increase in permeability the hemoglobin would pass out. While a pronounced swelling may not entail a permeability of the plasma membrane for hemoglobin, the soln. of the colloid leads to a destruction of the membrane and thus to hemolysis. Expt. confirms this hypothesis. A slight increase in the H-ion concn. beyond the neutral point leads to the outpouring of hemoglobin, while on the alk. side there is a broad zone of resistance. From expts. involving time relationships it is clear that the changes in the stroma extend to the membrane colloids. The flocculation occurring in the neighborhood of the isoelec. point proceeds much more rapidly than does the dissolution associated with swelling, consequently hemolysis through the action of acids takes place much more rapidly than does that following treatment with alkalis. The shift in the point at which hemolysis begins to the acid side caused by increasing the salt concn. is due to a change in the isoelec. point of the stroma. In order to explain the differences in the resistance of blood cells to acids and alkalis it is necessary to consider the changes in vol. caused by the H and OH ions and the effect of the consequent increase or decrease on the internal substances of the blood cell which have osmotic properties. AcOH and NH_3 , which penetrate the interior of the blood cells, behave much as do HCl and NaOH, the greatest difference in effect being that the NH_3 -treated cells hemolyze more rapidly. The changes in dispersion of the colloids of the plasma membrane take place so quickly that at a given p_H no difference in the behavior of AcOH and of HCl can be detected. In hemolysis with alc. and with ether the max. resistance occurs at the neutral point. In its effects on the blood cell the activity of saponin increases in proportion as the p_H is reduced. G. H. S.

Composition of blood serum and its significance for the action of toxins. I. Introduction. HANS HANDOVSKY. *Arch. ges. Physiol.* (Pflüger's) 210, 35-49(1925).—Introducing the following papers with a statement of the problems under consideration, viz., the relation of the proteins of normal sera to each other; the inter-relationship of the proteins in experimentally modified sera; the relation of the proteins to cholesterol and the phosphatides; and the importance of the state of the cholesterol of the serum as regards the tonic action of the latter for the isolated intestine of the cat. **II. Characterization of the protein fractions of normal sera through viscosity.** PAUL BOSSE AND HANS HANDOVSKY. *Ibid* 50-55.—Detns. made on bovine sera showed the protein relationships to be euglobulin : pseudoglobulin : albumin = 18 : 23 : 59. Thus a serum with 6.68% protein would have 3.91% of albumin + 1.54% of pseudoglobulin + 1.2% of euglobulin. The viscosity of a normal serum is an additive property of the individual protein fractions. **III. Effect of ether on serum.** PAUL BOSSE. *Ibid* 56-8.—Studies

on the relationship between the cholesterol and the proteins of sera render it essential to det. what effect Et_2O has on the protein constituents, and data are given indicating that it alters the pptn. reaction of the albumin by MgSO_4 , the amt. precipitable usually showing a progressive diminution as the extn. is continued; while the amt. of precipitable globulin may show a variable reaction, occasionally increasing progressively during the extn., but more commonly being lower after a short period of extn. and then increasing somewhat. **V. The state of the cholesterol in the blood serum.** HANS HANDOVSKY, KARL LOHMANN AND PAUL BOSSE. *Ibid* 63-9; cf. *C. A.* 20, 613. —In normal beef serum about 25% of the cholesterol is combined with globulin, the remainder being in association with the phosphatides. The intensity of the union, as detd. by shaking out with Et_2O , is dependent upon the salt and water content of the serum. The intensity with which the cholesterol of the serum is bound is of significance for its physiol. action. G. H. S.

Importance of inorganic ions for the contractility of smooth muscles; frog stomach. WALTER HEYMANN. *Arch. ges. Physiol.* (Pflüger's) 210, 187-208(1925).—Alkalies, as chlorides, in isotonic concns. may be arranged, in accord with their paralyzing action on the contractility of smooth muscle, in the series $\text{Na} < \text{Cs} < \text{Rb} < \text{K} < \text{NH}_4 < \text{Li}$. Frog stomach preps. show no sp. K paralysis; indeed Li seems to be the most active ion; in these points this muscle reveals effects quite distinct from those of striated muscle. As regards the action of the anions and the cations of the alk. earths the stomach preps. behave much as does skeletal muscle. The condition for the occurrence of ion action is primarily detd. by the contraction process. Swelling and contractility of the stomach strips are to a high degree independent of each other; there is no connection between the effect of salts in swelling and on contractility. From an isotonic cane sugar soln. cane sugar passes into the muscle, and the K content of the muscle is diminished up to about 50%. In K-poor salt solns. the prepn. loses K, without causing any material damage to contractility. The quant. relationships between the cane sugar intake and the K yield are not modified by multiple contractions. Holding the muscle, without stimulation, in an isotonic cane sugar soln. contg. 0.02 CaCl_2 scarcely modifies contractility, in spite of the sugar intake and the loss in K, but a single contraction in the sugar soln. is sufficient to damage the stomach muscle and render it irreversible. The onset of paralysis in Ca-free Ringer soln. is dependent on the contraction process. The smooth muscle cell of the frog stomach is permeable for Ca, its Ca content being in equil. with the Ca concn. of the surrounding fluid. G. H. S.

Effect of kidney substances on the heart and vessels. W. W. PETROWSKY. *Arch. ges. Physiol.* (Pflüger's) 210, 294-9(1925).—Ringer-Locke soln. which has passed through the kidney contains substances which significantly increase heart activity and possess vasoconstricting properties. These substances are thermostable and pass through the Berkefeld candle. G. H. S.

Choline as the hormone of intestinal motility. X. Choline content of the muscularis and the mucosa of the small intestine. H. SAWASAKI. *Arch. ges. Physiol.* (Pflüger's) 210, 322-33(1925); cf. Abderhalden and Paffrath, *C. A.* 19, 1910.—By using the same wt. of muscularis and mucosa-submucosa of the cat small intestine the amts. of choline to dialyze out within 1 hr. from the 2 tissues were in a ratio of 75:100. Occasionally the same amt. was derived from both tissues; in 1 instance the muscularis dialysate contained the greater amt. The choline of the intestinal musculature is not derived from postmortem decompn. processes in the mucosa. The total amt. of choline, derived through 1 hr. dialysis of 100 g. of cat tissue, is 1.6-4.3 mg. From 100 g. of rabbit tissue the amt. is 3-4 mg. G. H. S.

Notes on Sawasaki's paper: "Choline as the hormone of intestinal motility. X." EMIL ABDERHALDEN AND HANS PAFFRATH. *Arch. ges. Physiol.* (Pflüger's) 210, 620-2(1925); cf. preceding abstr. It is pointed out wherein the methods employed and results obtained by Sawasaki differ from those recorded by the authors. The difficulty of making direct comparisons under these circumstances is emphasized. G. H. S.

Blood coagulation. II. The time law. SUSUMU TSUNOO. *Arch. ges. Physiol.* (Pflüger's) 210, 334-42(1925); cf. *C. A.* 19, 324. —In the coagulation of oxalate plasma by thrombin derived from serum-casein, Fuld's time law is valid only within narrow limits, as is also the case for the Madsen-Walburn formula. In the coagulation of pure fibrinogen by thrombin the latter formula holds within a more limited range than does Fuld's time law. **III. Cataphoretic experiments with thrombin.** *Ibid* 343-50.—The reaction for the transport of thrombin derived from casein is p_H 4.5, for Alex. Schmidt's thrombin between p_H 5.0 and 5.7. The transfer of the thrombin is independent of the admixed proteins. G. H. S.

Carbohydrate loss of the liver in hyperthyroidized rats: Estimation of thyroid

preparations. TOMIO FUKUI. *Arch. ges. Physiol.* (Pflüger's) **210**, 410-26(1925).—Feeding with thyroid substance itself or with a no. of thyroid preps. causes a loss in the total carbohydrate of the liver of rats. The method of estg. the potency of thyroid preps. is based on the above fact. Thyroid feeding does not modify the carbohydrate content of the muscle, but upon the liver the effect persists for some days after the feeding is stopped. No parallelism between the activity in this direction and the I content of the preps. could be detected, although certain preps. with but little I proved to be inactive. Injections of Na had no effect on this carbohydrate loss of the liver. With iodallacid, an I-contg. protein compd., a definite reduction in liver carbohydrate occurred, but the I content of an effective dose of this prep. was many times that of the active dose of the thyroid preps. G H S

Heat regulation. VIII. **Reduction in water output through the skin by reducing the fluid intake.** ERICH SCHLÜTER. *Arch. ges. Physiol.* (Pflüger's) **210**, 432-5(1925).—With inadequate water intake the output of water through the skin is diminished. Disturbances in heat regulation may occur in summer with its higher temps. and increased bodily activity if the intake of water is inadequate for an abundant formation of sweat. G. H. S.

Ionic antagonism in hemolysis. D. ALPERN. *Arch. ges. Physiol.* (Pflüger's) **210**, 442-9(1925).—NaCl and KCl, like NaCl and CaCl₂, when mixed in the proper proportions inhibit hemolysis to a greater degree than do solns. of the salts singly. This antagonistic effect is directly dependent upon the H-ion concn. of the material in which the red blood cells are suspended, in such a way that in all cases with a slight departure from the neutral point on the acid side or by an approximation to the isoelec. point of the surface plasma colloid this effect immediately disappears. The antagonism between Na and K is most evident at a neutral reaction. It vanishes in a weakly alk. reaction, only to appear again as the OH concn. is still further increased. The optimum relation between Na and K is displaced in a strong alk. reaction, to the advantage of the K. The greatest antagonistic action between Na and Ca is manifested, in a weakly alk. reaction, rather than at the neutral point. As the OH concn. is further increased the antagonism disappears and does not reappear as is the case with Na and K. KCl and CaCl₂, mixed in different proportions, show no definite antagonism at any of the H-ion concns. studied. Likewise, the admixture of 2 anions failed to reveal an antagonistic effect. G. H. S.

General cellular physiology. IV. **Neutrality regulation by erythrocytes and musculature. The permeability problem.** ERNST GEI Horn AND KURT WEIDLING. *Arch. ges. Physiol.* (Pflüger's) **210**, 492-513(1925); cf. *C. A.* **19**, 2846.—Changes in the neutralization velocity in the red blood cell do not follow variations in the time or temp. of the expt. except in alk. solns. The neutrality regulation of the red cell is independent of the compn. of the nutritive soln. from either the chem. or physico-chem. point of view. The replacement of NaCl by other cations (Ca) is without effect. Adrenaline is also ineffective. It is assumed that this condition is detd. by the small vol. of the blood cell, since diffusion processes can proceed so quickly that variations in the velocity of the neutralization cannot be detected. Reactions with gelatin support this hypothesis, for if the gelatin is finely pulverized variations in the duration of the expt. and in the temp. do not alter neutrality; but if gelatin plates 0.2 mm. in thickness are used, the neutralization increases with time and with temp. On the contrary, the magnitude of the neutrality regulation is dependent: (1) on the p_H of the soln., in that the further this is removed from the neutral point on either side, the more is the p_H shifted by the blood cells; and, (2) by internal conditions, since by aging the neutrality regulation is strengthened. With muscle the neutralization of the soln. is based on a slowly progressing process of diffusion, which increases with time and temp. Neutralization velocity is dependent upon the conditions of the colloidal limiting layers. It is inhibited in increasing degree according to the series $Li < Na < K, Ca$. By adrenaline and choline it is reduced; by a hypertonicity of the soln., or by elec. stimulation of the muscle, it is increased. In small doses narcotics reduce it; in high concns., which lead to an irreversible paralysis, it is increased. If the soln. in which the muscle is found is repeatedly changed the neutrality regulation is more pronounced than if the muscle is allowed to remain for the same length of time in the same fluid. Here it is probable that with the modification in the limiting layers of the muscle, there is an increased diffusion velocity and especially a favoring of neutrality regulation. G. H. S.

Occurrence of two different types of glucose disappearance in human blood corpuscles and their inter-relationship. HANS HÄUSLER. *Arch. ges. Physiol.* (Pflüger's) **210**, 561-5(1925).—When the glucose of the surrounding fluid amounts to between

0.2 and 1.0% human blood cells adsorb approx. the same percentage of the glucose. A certain part of the adsorbed glucose disappears from the whole blood instantly, and this "initial disappearance" is the smaller as the amt. of glucose adsorbed is less. The glucolysis is the smaller, when the initial disappearance is the greater and *vice versa*. In contrast to the glucolysis the initial disappearance is instantaneous and is instantly completed. It also takes place at room temp. The susceptibility to NaF and to oxalate has a relationship to the glucolysis. G. H. S.

Extension and loading of skeletal muscle in acetylcholine contraction and in tetany. OSCAR WYSS. *Arch. ges. Physiol.* (Pflüger's) **210**, 586-97(1925).—The max. acetylcholine contracture attains a shortening of an av. of 11% of the resting length of the muscle, the extension of the resting length requiring a tension of some 40 g. For maximal tetany the corresponding values amount to 32% and 400 g. For acetylcholine contraction the max. shortening is about 3 times less and the tension some 10 times less than the corresponding values in max. tetany. Acetylcholine contraction and submaximal tetany of the same degree of shortening require about the same amt. of tension and under favorable conditions the extension curves closely parallel each other. G. H. S.

Formation of ammonia in infants. M. LANDSBERGER. *Z. Kinderheilk.* **39**, 586-96(1925).— NH_3 formation is increased by fermentative processes occurring in the colon, and very frequently, but not always, the actual and potential urinary acidity is increased. G. H. S.

Excretion of organic acids in the urine of infants. M. LANDSBERGER. *Z. Kinderheilk.* **39**, 597-607(1925).—The excretion of org. acids is very definitely connected with the protein content of the nourishment; the injection of human milk only causes the urine to contain less than does human milk and plasmon or artificial feeding. The higher acid excretion when on a cow milk diet may be due to the higher protein content or to the compn of the milk. According to the present conception fat is to be considered as the most important acid former which in rickets leads to a marked increase in the org. acids in the urine. Concn. or diln. has no effect on the excretion of org. acids. G. H. S.

Effect of ions on diuresis in infants. I. FREUDENBERG. *Z. Kinderheilk.* **39**, 608-12(1925).—The anions phosphate, chloride and bicarbonate have a marked effect on diuresis, phosphate causing a definite retention, bicarbonate a pronounced increased excretion, and chloride holding an intermediate position. The cation K has diuretic properties. H ions and OH ions modify diuresis in that acidosis causes increased output; alkalosis causes retention. The effects of altering the reaction of the urine upon the urinary output are simple reactions. G. H. S.

G—PATHOLOGY

H. GIDEON WELLS

The capacity to oxidize carbohydrate as determined by the respiratory quotient. H. B. RICHARDSON. *Ergebnisse Physiol.* **24**, 588-93(1925).—The ability of the organism to oxidize carbohydrate is better detd. by observation of the respiratory quotient than by the glucose tolerance test or by following the blood sugar after glucose ingestion. On administration of carbohydrate to a normal man there is a prompt rise in the respiratory quotient to the level of unity while no change over the prevailing respiratory quotient occurs when glucose is given to a patient in diabetic coma. However, in a patient with exophthalmic goiter and one with renal diabetes both of whom had a glucosuria, there was a prompt oxidation of ingested glucose, indicating that the glucosuria of these 2 diseases has no necessary relation to diabetes melitus. H. J. D., Jr.

Hemolysin in malaria. WALTER KIKUTH. *Arch. Schiffs-Tropen Hyg.* **29**, 560-4 (1925).—Contrary to existing views, K. finds no hemolysin in the blood from malaria patients. FRANCES KRASNOW

The immunological properties of alcohol-soluble vegetable proteins. J. H. LAWIS AND H. GIDEON WELLS. *J. Biol. Chem.* **66**, 37-48(1925).—"Immunological study of the alc.-sol. proteins from certain cereal grains indicate that they fall into 2 classes. Gliadin from wheat and rye and the prolamines from durum, einkorn, emmer and spelt, of the genus *Triticum*, seem to be very closely related, according to tests by means of both the complement-fixation and the anaphylaxis reaction. The alc.-sol. proteins from common maize, from kafir corn and from teosinte were found to be closely related to one another, but not to the alc.-sol. proteins of the *Triticum* group. These results agree with observations made by Gortner and Hofmann that the chem. properties of these alc.-sol. proteins indicate the existence of a 'wheat group' and a

'corn group' of prolamines, the members of each group being chem. similar to each other, as they have been found to be immunologically." A. P. LOTHROP

Clinical calorimetry. XXXIX. Exercise and the respiratory quotient in diabetes. H. B. RICHARDSON AND S. Z. LEVINE. *J. Biol. Chem.* 66, 161-83(1925); cf. C. A. 19, 2237.—Six diabetics and 2 controls were studied in the post-absorptive state after exercising lightly for about 30 min. The respiratory quotient was depressed below the basal level in the exercising diabetic individuals, indicating that the diabetic, by reason of the fundamental defect of the disease, is unable to increase the oxidation of carbohydrate to the same extent as fat. This inability was not caused by a lack of available carbohydrate as the patients having the highest blood sugar showed the least oxidation of carbohydrate on exercising. "From a review of the available evidence the conclusion is drawn that fat can be oxidized in the mammalian organism without previous preliminary conversion into carbohydrate." A. P. LOTHROP

Ochronosis. Report of a case with associated disease of the adrenals. W. C. HUNTER. *Ann. Clin. Med.* 4, 250-9(1925). JOHN T. MYERS

Calcium deficiency in asthma, hay-fever and allied conditions. G. T. BROWN AND O. B. HUNTER. *Ann. Clin. Med.* 4, 299-306(1925).—Many cases of asthma, hay-fever, eczema, etc. have a definite Ca deficiency. This can be remedied by feeding Ca lactate, thyroid, or parathyroid; or by the quartz lamp. This is an aid to protein desensitization. JOHN T. MYERS

Non-specific stimulation of a natural antibody. T. J. MACKIE. *J. Hyg.* 24, 176-88(1925).—The natural hemolytic antibody of the rabbit for sheep blood is quite const. Successive large bleedings may increase the antibody content but small bleedings have no effect. The increase is less than that following injection of homologous or even heterophile antigen. JOHN T. MYERS

The effect of hemorrhage on the hemolytic titer of the serum of rabbits. J. MILLS. *J. Path. Bact.* 28, 579-89(1925).—Repeated bleedings caused a fall in hemolysin content of the blood with a subsequent rise. JOHN T. MYERS

Complement fixation with bilharzia. I. The lipoidal nature of cercarial antigen as used in the complement-fixation test for mammalian bilharziosis. N. H. FAIRLEY. *J. Path. Bact.* 28, 591-607(1925).—The % of alc. by vol. in an antigen made by extg. fresh cercarial infested livers of snails was 96.65%. Its residuc failed to give the biuret Hopkins-Cole, ninhydrin, or Millon reactions for protein. Powdered cercarial livers extd. with abs. alc. gave an antigen effective at a diln. of 1 to 600. Treatment with dry acetone and subsequent extn. with abs. alc. gave a highly specific antigen. The syphilitic antigenic property could be dild. out. The antigenic factor was practically completely removed by repeated extn. with alc. Apparently the antigen is a lipid, not a protein. JOHN T. MYERS

Liver necrosis and cirrhosis produced experimentally by coal tar. J. DAVIDSON. *J. Path. Bact.* 28, 621-6(1925).—Coal tar applied to the ears of rabbits or injected subcutaneously in ethereal soln. causes necrosis of liver cells. The acute stages resemble acute yellow atrophy and the chronic condition resembles atrophic cirrhosis. This suggests that acute and subacute yellow atrophy and atrophic cirrhosis are stages in the same process. The regenerated tissue is still susceptible to the irritant. The arrangement of the regenerated tissue is irregular and in some instances adenomatous. JOHN T. MYERS

The pathogeny of rickets. LÉON BLUM, MAURICE DELAVILLE AND VAN CAULAERT. *Pressu médicale* 33, 801(1925); *Bull. soc. hyg. aliment.* 13, 462; cf. C. A. 19, 1159.—The normal course of ossification is related to an acid-basic equil., with basic predominance, as it exists in normal subjects. Displacement of the equil. towards acidity involves ossification troubles (by change in the reaction of the proteic colloids). Seric hypophosphatemia is considered to be a consequence of acidosis: the excess of CO₂ in the blood causes part of the P in the blood plasma to pass into the red globules. If the acidotic trouble occurs while the bones are still in the course of development, it results in rickets owing to lack of ossification of the osteoc tissue and resorption of the bony tissue already formed; if it occurs in adults with completely formed skeleton, there is a decalcification of the bony tissue (osteomalacia). A. PAPINEAU-COUTURE

Effect of electrically charged dyes on the agglutination and on the formation of agglutinins. P. SZRÖP. *Magyar Orvosi Archivum* 26, 393-8(1925).—Dyes with positive elec. charges cause an increase and the same with negative charges cause a decrease of the agglutinating titer of immune serums. These factors have effects exactly opposite to the above mentioned upon the formation of agglutinins. Effect of radium α -rays upon the titer of agglutinating serums. *Ibid* 399-400.—Serums treated with Ra α -

rays show an increase of the agglutinating titer, probably by increasing the positive charge of the agglutinins.

L. W. RIGGS

Stalagmometry in connection with liver function. F. SOMMER. *Arch. expl. Path. Pharm.* 109, 50-63(1925).—While stalagmometric results based on detn. on urine and on serum must be considered to lack specificity, it is certain that the surface tension of the serum is depressed somewhat in proportion to the degree of disturbance in liver function. In mild or only moderately severe cases the reduction in the drop no. of the serum is due primarily to the bile acids. Here, stalagmometry permits an estn. of the degree of the cholemia. In severe cases with a more outspoken derangement in liver function the serum shows a considerably reduced surface tension the cause of which must be referred to other factors as well (pathol. protein decompn.). Tests of the surface tension changes may serve to differentiate cases of cholemic icterus from cases with damage to the parenchyma.

G. H. S.

Calcium-ion concentration of the blood in puerperal eclampsia. RICHARD V. BODÓ AND STEPHAN LIEBMAN. *Arch. expl. Path. Pharm.* 109, 178-84(1925).—As regards action on the frog heart the sera of eclamptics behaved just as does sera taken during normal pregnancies.

G. H. S.

Chemical study of the specific elements of tuberculin. I. J. HOWARD MUELLER. *J. Exptl. Med.* 43, 1-8(1926); cf. *C. A.* 19, 1736.—The sp. precipitin reaction and the skin reaction given by old tuberculin are attributable to 2 sep. substances present in the material. The cause of the reaction first mentioned is a non-protein gum. The cause of the skin reaction is probably but not surely a protein. Methods which have been suggested for the standardization of tuberculin by precipitin or complement fixation reactions should be revised. II. **The preparation of residue antigen from old tuberculin.** *Ibid.* 9-12.—A non-protein gum has been isolated from broth filtrates of human tubercle bacilli grown on a simple medium. It fixes complement and ppts. in high dilution in the presence of homologous immune sera, but fails to give a skin test in tuberculous animals. The prepn. and some of the chem. properties of the substance are described.

C. J. WEST

Production of albuminuria by renal vasoconstriction in animals and in man. ISAAC STARR. *J. Exptl. Med.* 43, 31-51(1926).—Transient albuminuria follows the infusion of small doses of adrenaline into rabbits, if prolonged over several minutes. Agents causing renal vasoconstriction also cause transient albuminuria in anesthetized, eviscerated dogs. Cats eliminate albumin after having been frightened or enraged. The drug, ephedrine, which commonly causes renal vasoconstriction in animals, has been tested in man. Transient albuminuria followed its administration, in those cases in which signs of renal vasoconstriction appeared; it did not in those cases in which such signs were lacking. Ephedrine is not intrinsically injurious to the kidneys.

C. J. WEST

Stability of the acid-base equilibrium of the blood in pregnant animals. WM. DEB. MACNIDER. *J. Exptl. Med.* 43, 53-9(1926).—The acid-base equil. of the blood as indicated by detns. of the reserve alkali of the blood remains const. in non-pregnant animals at different age periods. This does not imply that the acid-base balance of such animals at different age periods is a stable balance. In pregnant animals of the same age periods as the control animals there may develop an instability of this equil. which is either associated with the occurrence of a renal injury and which may be looked upon as a retention phenomenon, or arises independently of such an injury. In this latter group of animals the disturbance in the equil. increases in frequency and is earlier in its appearance in the gestation period as the age of the organism increases. In old and in senile pregnant animals some physiol. mechanism other than of the kidney becomes unable to stabilize the acid-base equil. of the blood with the result that as the pregnancy advances this physiol. state of the organism (gestation) becomes pathol.

C. J. WEST

H—PHARMACOLOGY

ALFRED N. RICHARDS

General pathology of poisoning by war gases. A. LUSTIG. *Sperimentale* 79, 847-69(1925).

M. HEIDELBERGER

Chemical excitability of the cerebellar cortex. G. SIMONELLI. *Rend. d. adunanze dell'accad. med. fis. fiorentina; Sperimentale* 79, 901-6(1925).—A discussion of the asymmetry produced by application of strychnine sulfate to a portion of the *crus primum* of cats decerebrated above the thalamus.

M. HEIDELBERGER

The effect of X-rays on the irritability of muscles in the frog. I. KUSENER. *J.*

Gen. Physiol. 9, 55-61(1925).—Frog muscle which has been exposed to X-rays maintains its irritability better than non-exposed muscle as shown by its response to smaller elec. stimuli. C. H. R.

Clinical study of quinidine therapy. H. H. RIECKER. *Am. J. Med. Sci.* 170, 205-12(1925).—Normal rhythm was restored in 79% of 52 cases of auricular fibrillation. G. H. S.

Pharmacology of body position and the labyrinthine reflex. XIX. Morphine. ERNST JOEL AND FRITZ ARNDTS. *Arch. ges. Physiol.* (Pflüger's) 210, 280-93(1925); cf. *C. A.* 20, 456.—Doses of morphine of 0.1-0.2 mg./kg. cause a stage of light narcosis, which represents only a phase of the complete intoxication picture. In thalamus animals (both cats and rabbits) morphine in doses which do not disturb coördination in the slightest in the intact animal cause restlessness and strychnine-like reflex convulsions. Thalamus rabbits are about 10 times as susceptible to morphine as are intact rabbits. In cats there occurs as a distinctive feature a simultaneous morphine rigor. If the mid-brain is removed from either cats or rabbits, doses of morphine which cause convulsions in thalamus animals cause no changes aside from a tendency to increased activity. Only after large doses do decerebrate animals show convulsions. These are independent of the respiration, since, as in thalamus cats, they are not prevented by artificial respirations. G. H. S.

Humoral transmissibility of heart-nerve action. IX. Camphor and the vagus. E. NAVRATIL. *Arch. ges. Physiol.* (Pflüger's) 210, 550-6(1925).—The initial effect of camphor, or camphor in small doses, increases the irritability of the vagus, while large doses are inhibitory. G. H. S.

I—ZOOLOGY

R. A. GORTNER

Biochemistry of the wild silk-moth, *Dictyoploca japonica*, Moore. I. Chemical development in the growth of the wild silk-moth. OSAMU SHINODA. *Mem. Coll. Sci. Kyoto Imp. Univ.* (reprint) 9A, No. 3, 225-35(1925).—Chestnut leaves during growth show a decrease in the content of water, total N, ether- and water-sol. constituents and ash and an increase in the water-sol. N, polysaccharides and fiber material. Unlike *Bombyx mori* the caterpillars of *Dictyoploca japonica* fed on these leaves show a fairly const. N content, perhaps on account of the lesser development of the silk glands. After cocooning the N unexpectedly rises from 1.2 to 10.4%. The relative shortness of the larval stage and consequently of the gonadal development during this period may account for the relatively slight glycogen metabolism. The sudden decrease of water-sol. matter at the onset of pupation may be related to the fat metabolism.

MARY JACOBSEN

Studies on the comparative physiology of contractile tissues. I. The action of electrolytes on invertebrate muscle. L. T. HOGREN. *Quart. J. Exptl. Physiol.* 15, 263-312(1925).—The heart of the crustacean behaves towards Ca in a manner some what different from that described for *Limulus*. The removal of Ca in the absence of K leads to systolic standstill and excess Ca leads to diastolic stoppage, both effects being rapidly and completely reversible. Excess K at first excites and then depresses as in amphibian skeletal muscle. A slight increase has the same effect as increasing the Na/Ca ratio. Rb action closely resembles K but Cs has very little effect on the cardiac rhythm of *Homarus*. Stoppage of the heart due to excess K or Ca is accompanied by cessation of elec. response. Mg and Sr, in sufficient quantity, produce standstill, but it is impossible to maintain the beat when either is substituted for Ca. Ba has the opposite effect. Acidity of the medium produces primarily an increase in diastolic tone which appears to be independent of the lipid soly. of the acid used. The nail (*Helix*) and pecten heart is affected by small increases in K in a similar manner to other types of plain muscle. K removal does not produce tonic contraction as in the mammalian plain muscle. *Helix* and pecten hearts beat for a considerable time in K absence. Behavior of *Helix* to Ca is like that of the crustacean; the reverse is true of pecten. The acidity effects in *Helix* depend on the K/Ca ratio (possibly Na/Ca). The response of the surviving crop of *Aplysia* and *Helix* to changes in the Ca/K ratio of the medium is like that of the heart of *Helix*. Mg addn. resembles Ca in depressing the musculature tone of the *Aplysia* crop. Sr has the opposite effect and resembles Ba. Response of *Aplysia* crop to K, Rb and Cs is similar to mammalian preps. Both *Aplysia* and *Helix* crop are less sensitive to H ion than mammalian plain muscle. Good bibliography.

FRANCES KRASNOW

Temperature characteristic for locomotor activity in tent caterpillars. W. J.

CROZIER AND T. B. STIER. *J. Gen. Physiol.* **9**, 49-54(1925).—The frequency of abdominal peristaltic locomotor waves in *Malacosoma americana* larvae during vertical ascension is controlled by temp. according to Arrhenius' equation. The const. $\mu = 12,200$ is in quant. agreement with that obtained for other non-respiratory rhythmic neuromuscular movements among arthropods. C. H. R.

Temperature and the mechanism of locomotion in Paramecium. O. GLASER. *J. Gen. Physiol.* **9**, 115-21(1925); cf. C. A. **19**, 1871.—Rate of locomotion in *Paramecium* is governed by temp. according to Arrhenius' formula. Above 15° , $\mu = 8000$; below this temp. the value for μ is probably 16,000. A theoretical interpretation, in terms of a catenary series, is given. C. H. R.

Heat production of eggs of *Arbacia punctulata* during fertilization and early cleavage. C. G. ROGERS AND K. S. COLE. *Biol. Bull. Marine Biol. Lab.* **49**, 338-52(1925).—The rate of heat production at the instant of fertilization is 10 to 12 times that of the unfertilized egg. After fertilization the rate of heat production decreases constantly for 20 min. when it reaches about 65% of its fertilization value, and remains const. until the first cleavage at about 50 min. after fertilization. At the first cleavage the rate drops suddenly by more than 10% and then remains const. until the eggs are in the 8-celled stage, which is as far as the work has been carried. The rate of heat production of the unfertilized eggs is about 0.08 cal. per hr. per million eggs, and that of fertilized eggs about 0.52 cal. per hr. per million eggs after the 1-celled stage. It is suggested that the heat evolution occurring immediately upon fertilization is the result of an oxidative process which takes place chiefly in the cortex of the egg and which leads to the elevation of the fertilization membrane. L. W. RIGGS

Physiological studies on hibernation in the potato beetle, *Leptinotarsa decemlineata* Say. D. E. FINK. *Biol. Bull. Marine Biol. Lab.* **49**, 381-404(1925).—Beetles fed on non-solanaceous foods do not hibernate but die of starvation. Respiratory metabolism detns. show that the O consumption of beetles fed on tubers or fruit of solanaceous plants is less than that of beetles fed on foliage. A reduced CO_2 output occurs throughout the progress of hibernation. Prepn. for hibernation follows a period of extensive feeding and consists in an accumulation of fat and the loss of water. The elimination of waste products from the digestive tract is checked and the metabolic activity is lowered. The greatest depletion of fat and the lowest respiratory quotient occur during the first few months of hibernation. There appears to be a parallelism between a rapid depletion of reserve food and a low quotient. Recovery appears to vary inversely as the time of hibernation. Actual contact with water seems necessary to restore the water content before feeding is possible. Catalase activity of hibernating beetles is greatly reduced as compared with that of active beetles. There appears to be a correlation between reduced catalase activity and diminished respiratory metabolism in hibernating and starving animals. L. W. RIGGS

Feeding reactions and digestion in the coral polyp *Astrangia danae* with notes on its symbiosis with zoöxanthellae. H. BOSCHMA. *Biol. Bull. Marine Biol. Lab.* **49**, 407-35(1925).—Four reactions are noted: muscular action of the tentacles, muscular action of the central part of the oral disk, secretion of mucus by the oral disk and ciliary action of the stomodeum. The reaction of the food vacuoles in the digestive region of the mesenteric filaments immediately after feeding is acid; after about 2 days the reaction changes to alk. In this alk. period in all probability digestion takes place. Beside intracellular digestion a secretion of a digestive fluid (a trypsin-like enzyme) occurs. In the polyps of *Astrangia* which contain zoöxanthellae in their endoderm these unicellular algae furnish part of the normal food of the polyps. These algae are digested in the mesenteric filaments. L. W. RIGGS

A study of the secretion of the silk worm by aid of filtered ultra-violet rays (Wood's light). A. POLICARD AND A. PAILLOT. *Compt. rend.* **181**, 378-80(1925).—Silk worms during the 4th and 5th days of the 5th age of larval life, or when about ready to spin cocoons, show remarkable fluorescence under Wood's light. A large no. of facts relating to this phenomenon are recorded, but its exact cause remains obscure. Poorly nourished larvae or those in physiologic discomfort show little or no fluorescence, consequently the fluorescent test may be employed to select vigorous larvae, particularly for reproductive purposes. L. W. RIGGS

The relative toxicity of the arsenates of Ca [to insects] (HENDRICKS, *et al.*) **15**.

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

The calcium oxide content of some Philippine foods. F. T. ADRIANO AND E. J. TAVANLAR. *Philippine Agr.* 14, 347-58(1925).—Nearly all foods commonly used in the Philippines were analyzed for CaO, H₂O and ash. Averages obtained from 2 to 18 detns. on each material are tabulated.

Unification in the control of foodstuffs from the industrial viewpoint. NEUBAUER. *Chem.-Ztg.* 49, 893(1925).—N. suggests unified official control in Germany instead of the four present agencies in the supervision of industry. For food chemists a 5-year course with 1/2 year of law and 1 year of factory practice and for officials four years of chemistry with two years of factory practice are recommended.

Chemistry of bread. Some New Zealand wheat-flours and fermentation. W. L. M. DEARSLEY. *New Zealand J. Sci. Tech.* 8, 34-8(1925).—Analysis and baking tests of 5 strains of New Zealand wheat support the conception that an ideal flour is that which possesses a high proportion of gluten and which, on doughing, will produce in its dough a p_H as near 5 as possible and show that: the dough possessing the higher initial p_H ferments more slowly than that with a lower one; though color is partly dependent on the fat content of the flour, the "quality" of the fermentation is the chief detg. factor of color and texture of the loaf; the vol. of the loaf is the outcome of its H₂O-absorption capacity; losses of wt. in the loaf on keeping and in the dough on baking are due to loss of H₂O, which loss is apparently greatest, on the whole, from that loaf whose flour contains gluten of poorer quality.

Lactose determination in bread. W. SCHUT AND L. E. DEN DOOREN DE JONG. *Chem. Weekblad* 22, 518-20(1925).—The Dutch official method for the detn. of milk in milk bread consists of a detn. of fat. The latter, however, can be due to adulteration with butter. In a series of expts. the lactose detn. by the fermentation method of Kluyver gave reliable results. By a suitable choice of yeasts the total monoses are detd. in 1 sample of the aq. ext. of bread, while in another all monoses except lactose are fermented. The difference represents the lactose.

Identification of bleached flour. E. ARBENZ. *Mitt. Lebensm. Hyg.* 16, 200-1(1925).—The reaction of Griess-v. Ilosvay is recommended. Prepn. of the reagent and its application are described.

Can conservative pasteurization be ascertained by testing for cow milk diastase (amylase)? W. WEDEMANN. *Z. Fleisch und Milchhyg.* 35, 301; *Arb. Reichsgesundheitsamtes* 56, 359-62(1925).—Conservative pasteurization of milk consists of 0.5 hrs. heating to 60-63°. The absence of diastase in a milk does not necessarily indicate previous pasteurization since diastase is destroyed by 0.5 hr. heating to 56° and greatly reduced in its activity by exposure to 53-54°.

Some factors concerning the "partial neutralization" of cream for buttermaking. B. A. STIRITZ AND H. A. REUHE. *J. Dairy Sci.* 8, 459-85(1925).—The effect of various limes, soda ash and NaHCO₃ in neutralizing cream was studied on the quality, fresh and on storage for 30, 60 and 90 days, of the resulting butter, and on the fat losses in the buttermilk. Cream was neutralized at 32-38° to 0.2% acid, then pasteurized by holding 15 min. at 71°, then churned. Lime suspensions of 10-25% and soda ash and bicarbonate solns. of 5-20% were used. The weakest solns. gave the best butter and least fat loss, also better than unneutralized controls. The time required for neutralization was 1-2 min. for the soda, 4-5 min. for straight limes and 10-15 min. for magnesia limes. Loss of butterfat was greatest with soda ash, av. with NaHCO₃, still less with limes, and least with magnesia limes. *Reduction of acidity on pasteurization was 0.02-0.03% with limes, 0.05-0.06% with magnesia limes, and 0.07-0.075% with soda. Soda ash butter scored high fresh but deteriorated more rapidly. NaHCO₃ gave a bicarbonate flavor and magnesia limes a flat flavor. There was not much difference between individual neutralizers but mixts. of 2 or more scored off.

Keeping quality of sweet cream butter as affected by temperature of pasteurization of the cream. WM. WHITE AND G. R. CAMPBELL. *J. Dairy Sci.* 8, 497-9(1925).—In 116 churnings of sweet cream butter, cream was pasteurized for 25 min. at 63°, for 30 min. at 63°, 65.5° and 68°, and for 30 min. rising from 63° to 68°. Samples of the butter were stored at -18° for 7 1/2 to 9 months. "Scores of the butter after storage indicate the keeping quality was not influenced by these temps. of pasteurization of the cream."

The effect of homogenization, condensation and variations in the fat content of a

milk upon the keeping quality of its milk powder. G. E. HOLM, G. R. GREENBANK AND E. F. DEYSHER. *J. Dairy Sci.* **8**, 515-22 (1925).—Fresh, cooled milk samples were standardized for fat, pasteurized at 60–65° for 30 min. and spray dried. The powder of approx. equal moistures was sealed in cans and stored at room temp. The cans were opened at intervals up to 5 months and either smelled for tallowness or tested for the time required to absorb O at 70°. Condensing and homogenizing both favored keeping qualities. Condensing probably removes volatile substances which are catalysts. Fat not covered by protein (CCl₄ ext.) increased with the fat content of the powders and decreased the keeping qualities. As the fat content of the powders increased so the keeping qualities diminished.

F. L. SEYMOUR-JONES

Relation between the gold number of gelatin and its value in the ice cream mix. H. C. MOORE, W. B. COMBS AND C. D. DAHLE. *J. Dairy Sci.* **8**, 500-11 (1925).—Six samples of gelatin were tested for gold no., pH, ash and moisture content, bacterial count, swelling strength, soly., gel strength (Burke method), jelly value and viscosity. No relationship existed between gold no. and the other tests, nor between gel strength and amt. of gelatin to be used. Ice cream contg. gelatin retained air longer. The amt. of gelatin to be used is best judged by a standing up test at room temp.

F. L. SEYMOUR-JONES

Simplified method of determination of coconut butter in margarine. S. H. BERTRAM, J. P. K. VAN DER STEUR AND F. VERHAGEN. *Chem. Weekblad* **22**, 549-50 (1925).—While pptg. the Mg salts stir with an electrically driven stirrer and continue at 70–80° for 10 min. after pptn. The MgSO₄ soln. can be run in at once. A few min. standing at 20° is sufficient.

MARY JACOBSEN

The composition of the milk of cows in heat. J. STERN. *Z. Nahr. Genussm.* **50**, 225-7 (1925). Analyses are given of the milk of 12 cows of various breeds during and after heat. The figures show that there would be no suspicion of diln., rather in some cases there is an increase in % of fat and a decrease in the amt. of milk.

WILLIAM J. HUSA

Drying industry. IV. The manufacture and drying of blood and slaughter house by-products. MAX WINCKEL. *Chem.-Ztg.* **49**, 957-8 (1925); cf. *C. A.* **19**, 1915.—The following products are handled: *whole blood, coagulum* (whole blood coagulated), *defibrinated blood, blood serum, fibrin, blood residue*. In the cool season of the year, fresh whole blood is worked up as *black pudding*, any excess being dried. For fertilizer and fodder, the blood is defibrinated and coagulated by heating with the addn. of small quantities of AcOH. The coagulum is transferred to a vessel in which the coagulated albumin remains and the liquid flows off. The coagulated material is then dried in a *barrel or drum drier* with the addn. of sawdust or peat if it is to be used for fertilizer or straw or hay if it is to be used for fodder. For sepn. of serum the blood is placed in large vessels and the serum drawn off at the bottom. This seps into 2 layers on standing, the upper layer clear (*Serum I*), and the lower more or less red colored (*Serum II*). The colored residue is mixed with H₂O and again sepd., a very dark product (*Serum III*) being obtained. Centrifuges are sometimes used. Dr. Steinitzer of Osterwieck has patented a machine which produces nearly 100% yield of high-grade serum. Turpentine oil or a mixt. of AcOH and H₂SO₄ is used for clarification. Blood serum is used as a com. article in the form of small cryst. plates, obtained by drying on glass or enamel plates in a *Horden or canal drier*. Serum albumin or blood albumin is used in large quantities in print works and dye houses as an insol. binder for colors, in the photographic industry, as a clarifying agent, and as a substitute for casein. Blood which has not been coagulated but has been defibrinated can also be used for making dried blood, and this type is used in the arts. It is dried in a vacuum drier. The fibrin albumin produced by defibrination is used for making *peplone* and is dried in a vacuum drier. Other slaughter house products are the various glands: *thyroid, ovaries, pancreas, testes*, etc., all used in the pharmaceutical industry. In former times the organs contg. these glands were removed, salted or treated with preservatives and perhaps held for weeks. Now the fresh organs are finely pulverized and dried in a vacuum drum, none of the constituents of the glands being destroyed and none of the therapeutic properties lost. There is also the *digestive tract*, rich in digestive enzymes and making valuable addns. to fodder used for calves and young pigs. About 10% of this material is added to the fodder, the whole placed in a silo and allowed to ferment at 40° for 36 hrs. It is then dried below 65° in a vacuum or drum drier.

H. STOERTZ

Refractometry as an aid in research on fruit juices. HANNS ECKART. *Z. Nahr. Genussm.* **50**, 196-204 (1925).—Refractometry offers a means of detecting added H₂O in fruit juices. Since a low refraction may be the result of fermentation, a low reading must be confirmed by an alc. detn.

WILLIAM J. HUSA

A new reagent for tannic acid in fermented vinegar. G. REIF. *Z. Nahr. Genussm.* 50, 192-5(1925).—The reagent consists of 3 g. of Na tungstate, 2 g. of Na phosphate and 0.05 g. of molybdic acid dissolved in 25 g. of water by gentle warming, the soln. being cooled and neutralized to litmus by concd. HNO_3 . To 10 cc. of vinegar is added 0.5 cc. of 10% HCl and 1 cc. of the reagent. The mixt. is heated to boiling and then allowed to stand at room temp. In presence of tannic acid a violet color appears, reaching max. intensity after about 2 hrs. The test is sensitive to 1 part of tannic acid in 500,000.

WILLIAM J. HUSA

The direct and indirect determination of dry residue and the determination of sugar in vinegar. G. REIF. *Z. Nahr. Genussm.* 50, 181-92(1925).—The indirect method of Lehmann and Gerum (cf. *C. A.* 6, 1940) gives unobjectionable results for fermented vinegars, especially for wine, apple, raspberry and malt vinegars. For detn. of sugar it is advantageous to use the iodometric method (cf. *C. A.* 17, 512).

W. J. H.

Cacao beans and cacao products. HEINRICH FINCKE. *Z. Nahr. Genussm.* 50, 205-20(1925); cf. *C. A.* 19, 684.—Numerous analyses of cacao beans and various cacao products are presented and discussed. Adulteration of cacao butter with the fat of the shells or embryo may be detected by the resulting high acid no.

WILLIAM J. HUSA

The dispersion of powdered egg yolk. ROSALIE M. COBB AND F. S. HUNT. *J. Am. Leather Chem. Assoc.* 21, 18-22(1926).—Powd. egg yolk can be worked up into an emulsion with water as good as that of liquid egg yolk used in fat liquoring provided enough alkali is incorporated to bring the p_H value to 8.6. The use of an alk. preservative for powd. egg yolk is suggested.

J. A. WILSON

The testing and judging of desiccated eggs in regard to spoilage. A. SCHMID. *Mitt. Lebensm. Hyg.* 16, 137-43(1925).—Egg powders that have a degree of acidity (detd. according to Kottsdorfer) of over 40 are considered to be unfit for consumption. S. discusses the possibility of the breaking down of the proteins, which also would tend to increase the acidity, besides free fatty acids from the ether ext. Danger of toxicity through bacterial action need not be feared so much, as the moisture content is usually rather low, being 4-6% and at the most 8%. S. recommends, besides detn. of the total fat and albumin, a detn. of sol. albumin. A modification of the Kottsdorfer method by Sudendorf and Penndorf is given. A high acidity is the first and most important indication of decompn., and should not be allowed in products to be sold.

J. C. J.

Yeast contamination as a source of explosion in chocolate-coated candies. D. B. SCHUTT. *Sci. Agr.* 6, 118-9(1925).—Bursting of chocolates was caused by the growth of yeasts, the source of which was a wooden barrel used to hold the excess filler until required for dipping. The trouble was controlled by installing vessels capable of being sterilized between the batches.

L. W. RIGGS

The method of Auerbach and Bodlander for the differentiation between honey and artificial honey. WILHELM MÜLLER. *Mitt. Lebensm. Hyg.* 16, 198-200(1925).—The ratio between the fructose and glucose is of such a variable nature, that it cannot serve as a criterion for the differentiation between real and artificial honey, as A. and B. claim. Results of analysis of 50 samples of honey are tabulated and given.

J. C. J.

Use of olive oil cake in horse rations. R. DUVAUCHELLE. *Bull. mat. grasses* No 4, 101-4(1925).—A 20-days' test with 1 horse and 2 mules indicated that 1 kg. of oats can be replaced by 1.2 kg. of a mixt. of equal vols. of olive oil press cake and of bran. The animals do not take the fresh cake, either alone or in admixt. with grain, and it should be air dried for 48 hrs. and then broken up to pass through a square-meshed sieve (2 meshes per cm.). The cake used contained H_2O 13, crude fiber 22.1, crude protein 6.9, ash 6.3, fat 8, N-free ext. 43.7%. It should be mixed with a substance rich in protein to compensate for the decrease in the latter when changing from grain to oil cake.

A. PAPINEAU-COUTURE

Filter for milk (U. S. pat. 1,568,001) 1.

COX, HENRY EDWARD: **Chemical Analysis of Foods.** Philadelphia: P. Blakiston's Son & Co. 323 pp. \$5.

Food product formed from fresh kola extract and lactose. A. CHALAS and E. CHALAS (NÉE BUTLER). *Brit.* 233,695, May 7, 1924. After the destruction of the oxides by heat or otherwise, kola ext. (preferably a soft hydroalcoholic ext.) is treated with boiling H_2O and powd. lactose is added and the mixt. stirred. It may be dried and formed into granules or tablets for use in aq. beverages such as coffee or tea or in broths.

Food from compressed and desiccated water hyacinth plants. J. H. LEFRWICE. U. S. 1,568,339, Jan. 5. A food which is suitable for cattle is prepd. by expressing

portion of the H_2O from water hyacinth plants, further reducing the moisture content sufficiently to avoid decompn., and comminuting the desiccated product.

Toasted flake "breakfast food." G. F. HUMPHREY. U. S. 1,568,162, Jan. 5. Pulp of apples or other fruit pulp is mixed with sugar, yeast and a cereal such as wheat flour, baked, subdivided and flaked and toasted.

Preventing discoloration of canned goods. T. W. MORGAN and W. W. MURRAY. U. S. 1,567,163, Dec. 29. The inner surface of a container for foods which may be formed of Sn plate is provided with a coating of lacquer contg. an insol. compd. of Zn or Cd or other insol. compd. or compds. of a metal forming sulfides which are not dark colored.

Vitaminized margarin. SMOERFABRIKKEN FLORA, A.-S. Norw. 41,688, July 27, 1925. Cod-liver oil to be added to margarine is first treated to cover the unpleasant taste, for instance, by emulsification and application of aromatic substances.

Apparatus for aerating, pasteurizing and cooling milk and cream. J. M. W. KITCHEN. U. S. 1,567,274, Dec. 29.

Apparatus for manufacturing sweetened, condensed milk. BROEDRENE GRAM. Danish 34,851, Aug. 10, 1925. The evaporator and the condenser work continuously in a closed system with complete exclusion of air. The app. is provided with an automatic shaking device.

Vacuum evaporator for milk and similar materials. N. J. NIELSEN. Danish 34,923, Aug. 17, 1925. Mech. features.

Pasteurizing apparatus. SILKEBORG MASKINFABRIK, ZEUTHEN & LARSEN. Danish 34,563 and 34,578, June 2, 1925. Mech. features.

Slow-pasteurizing apparatus. BROEDRENE GRAM. Danish 34,798, July 27, 1925.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Colloid chemistry of technical froths or foams. W. CLAYTON. *Ind. Chemist* 1, 489-91(1925).—Following an exposition of the general principles of frothing, C. discusses briefly (1) technical foams (milk froth, whipped cream, beer and beverages and firefoam), (2) froth and evapn., (3) priming of boilers (C. appears to employ "priming" and "foaming" synonymously), (4) flotation. E. G. R. ARDAGH

Advances in steam technology, especially very high-pressure steam and its industrial use. JOSSE. *Centr. Zuckerind.* 33, 1355-41(1925).—A lecture. Discussion. *Ibid* 1365-9, 1423, 1450. W. I. BADGER

Recovery and use of waste products. I. J. B. C. KERSHAW. *Ind. Chemist* 1, 434-7(1925).—Attention is drawn to the following losses in industry and their prevention or mitigation: waste fuel and waste heat: chimney losses, radiation and convection losses, unburned fuel, heat losses in elec. power generation, heat losses with exhaust steam. II. The chemical industries. *Ibid* 492-4.—Materials wasted are: arsenical wastes, Se, Tl, Ca compds., liquid chem. wastes and waste gases. 9 illustrations. E. G. R. ARDAGH

Layout and design of chemical plants on a philosophical basis. CROSBY FIELD. *Chem. Met. Eng.* 32, 794-9(1925).—"There is a philosophy underlying the growth of each industrial plant. The specific application of this philosophy to the problem in hand should result in an 'ideal' general plan.* * * *The ideal general plan can best be outlined by first making a schematic diagram showing the relation of all storage and mfg. operations and the materials concerned therewith and then clothing this diagram. This schematic diagram* * * *is similar to the kinematic diagram underlying the general plan of a machine. These assertions have been illustrated by application to a number of different plants, from a simple one to a very complex one." W. C. E.

Carbon dioxide as an index of fatigue. W. N. POLAKOP. *Mech. Eng.* 47, 1043-6(1925).—Earlier workers have shown that net CO_2 exhalation increases with the increase of pulmonary ventilation that follows exertion. P. detd. per cent CO_2 in the exhaled air of two firemen working under closely observed conditions. CO_2 was detd. by alkali absorption every 30 min. in a simple, portable app. Max. CO_2 in exhalation is an index of full load on the muscles; decrease of CO_2 content in spite of continued work indicates overload and is a signal of fatigue; age and size of the worker influence CO_2 content; peaks in CO_2 curve follow exertions; training of workers considerably reduces CO_2 exhalation for the same release of productive work. C. M. SALLS

Gas hazards in street manholes. S. H. KATZ, E. G. MEYER AND J. J. BLOOMFIELD. *Bur. Mines, Repts. of Investigations* No. 2710, 22 pp.(1925).—The atm. in 15 manholes in Pittsburgh and 23 in Phila. were analyzed by means of the Haldane app.

(0.03% CO minimum), hoolamite indicator (0.07% CO minimum), and PdCl_2 test papers (0.25% CO minimum). The carbon in the hoolamite indicator should be renewed after about 100 tests. CO is the principal gas found in manholes, although others also were found. Explosive mixts. were found in 3 holes. App. for testing for explosive gases in manholes is described. Out of 23 samples, 8 had more than 0.1% CO, and one had 4.7% CO. Preventive measures include the hosemask, self-contained oxygen breathing app., universal gas mask, lifeline and a knowledge of the modified Schaeffer prone pressure method of artificial respiration. Ventilation by means of a hand-operated rotary blower, similar to a forge blower, with a 4-inch canvas pipe delivering air at the bottom of the hole is recommended. C. M. SALLS

Calcium and tuberculosis—a thesis in hygiene comprehending the influence of an inspired dust on a specific infection of the lungs. MIRIAM S. ISZARD. *J. Ind. Hyg.* 7, 505–30 (1925).—Physiol. expts. on 54 rabbits show that $\text{Ca}(\text{OH})_2$ dust is not harmful, in fact it is probably beneficial in aiding the removal of silica particles. Tuberculous development was retarded slightly but not prevented by inhaling $\text{Ca}(\text{OH})_2$ dust 6 hrs. daily in concn. of 25 mg. per 100 cu ft. The industrial hygiene of gypsum, cement, marble, granite, clay, coal, limestone, iron oxide, emery, glass, sandstone, flint and cyanamide is reviewed. C. M. SALLS

Silicosis among miners. R. R. SAYERS. *Bur. Mines, Tech. Paper* 372, 24 pp.; *Chem. News* 131, 353–4 (1925)—Silicosis is a lung disease due to breathing very fine rock dust. Rock dust high in free silica is most injurious. Silica dust is somewhat sol. in water and in weakly alk. liquids similar to body fluids. It is thought that silica dust by its sharp-edged and needlelike particles injures the lung tissue mechanically, or that, being sol. in water and weakly alk. liquids, it injures lung tissue by its poisonous action. For detg. the amount of dust in the air the sugar-tube method, the konimeter (Kotze and Australian modification), and the impinger are chiefly used in the mining industry in the United States. Photographs of each app. are shown. The elimination of silicosis depends on preventing the formation of dust by wet mining methods, the use of sprays and water blasts to lay the dust after blasting, good mechanical ventilation, and physical examm. of all miners. C. M. SALLS

Treatment of burns caused by acid or alkali. W. H. HINKEL. *Nation's Health* 7, 828–30 (1925)—First remove the acid or alkali by copious application of water, warm if possible. When the last trace of superficial acid has been washed away, apply mild neutralizing substances, ointments, etc. The medical treatment of severe burns is discussed. Acid fumes affect the lungs, not the blood. Valves encased in lead boxes, regular inspection of tanks, properly constructed and maintained fume lines, adequate ventilation, working companions, and showers are recommended. C. M. SALLS

Efficiency of the oxygen-carbon dioxide treatment of carbon monoxide poisoning. C. K. DRINKER. *Am. Gas. Assoc. Monthly* 7, 761–74 (1925); *J. Ind. Hyg.* 7, 539–58 (1925); 8, 50 (1926).—Conclusions concerning the 5% CO_2 -95% O_2 treatment are: (a) The inhalation treatment is exceedingly valuable in mild gassing, relieving or preventing the occurrence of headache, nausea, etc.; (b) in serious cases, the patient revives rapidly and thoroughly; (c) it is practicable to use the inhalation treatment with prone pressure artificial respiration when breathing has ceased. C. M. SALLS

Gas mask for protection in air against all gases, vapors and smokes. A. C. FIELDNER, S. H. KATZ, H. W. FREVERT AND E. G. MEITER. *Bur. Mines, Repts. of Investigations* No. 2719, 10 pp. (1925).—The type "N" or all-service mask is designed for protection in air against all gases, vapors and smokes. The physical and chemical tests conducted upon it, the protective principles involved, the construction of the essential elements of the canister and attachments, and the uses and limitations of the mask are discussed. Poisonous materials are eliminated as follows: (1) acid gases by chem. combination with caustite, a NaOH prepn.; (2) org. vapors by adsorption in activated charcoal, either plain or impregnated with CuSO_4 ; (3) NH_3 by adsorption in the charcoal and chem. combination with CuSO_4 ; (4) smokes, dusts and mists by filtering action of cotton wool; (5) CO by oxidation with O of air through catalytic effect of hopcalite, a CuO-MnO_2 mixt.; (6) H_2O vapor by fused CaCl_2 . A timer, moved by the impulses of the air stream during inhalation, makes one revolution in 2 hrs. of normal breathing, and indicates that a new canister should be attached. Methods and results of (a) chem., and (b) actual service tests are reported, and the use of the mask is approved for "respiratory protection in mine atmospheres where flame safety lamps are burning, and * * * above ground in air that contains acid vapors, organic vapors, or carbon monoxide not exceeding 2% by vol., ammonia not exceeding 3%, and in smokes, dusts and mists; or not exceeding 2% of total poisonous gases when more than one gas is present."

W. C. EBAUGH

The physical and chemical basis of industrial aspirators. H. ENGELHARD. *Z. Elektrochem.* 31, 590-3(1925).—The harmful particles to be filtered from the inhaled air must reach the wall of the filtering medium during the $\frac{1}{10}$ -1 sec. that they remain in the filter, and must be mechanically or physically held or changed to a harmless substance. The necessary thickness of the filter may be detd. by calcg. the Brownian movement of the particles. Colloidal dusts give special difficulty which is somewhat overcome by the use of several filters. Mists require greater filter surface than smokes. Highly adsorptive charcoal is most efficient for removing noxious gases. If out of concn. C_a the adsorption layer removes dC_1 of undesirable element, the filter will be satisfactory if $C_a - dC_1 - dC_2 \dots$ falls below the lowest analytical trace of that element, usually about $1 \times 10^{-6}\%$ by vol.

High-voltage insulation. J. B. WHITEHEAD. *Elec. World* 87, 31(1926).—Review of progress during 1925. ROSALIE M. COBB
C. G. F.

Calculation of the contents of partly filled horizontal cylinders (HACK) 1. Acetylation of organic substances (U. S. pat. 1,567,785) 10.

AUB, JOSEPH C., MINOT, A. S., FAIRHALL, LAWRENCE T. AND REZNIKOFF, PAUL: **Lead Poisoning.** Baltimore: The Williams & Wilkins Co. \$4.

WEYMAN, G.: **The Design and Arrangement of Chemical Plant in Relation to Its Economic Control.** London: E. Benn, Ltd. 140 pp. 6s. Reviewed in *Ind. Chemist* 1, 502(1925).

Rectifying system for separating constituents of gaseous mixtures. G. I. E. PLATAT. *Brit.* 232,986, April 26, 1924. Rectifying columns for sepn. of constituents of hydrogenated coal gas or other gaseous mixts. contg. H, hydrocarbons, etc., are combined with a rectifying column in which liquid N is obtained from air on the upper plates by a condenser. The liquid N is employed as rectifying liquid for the mixts. under treatment. Numerous details of procedure are described.

Destructive distillation. C. E. RIEMER. *Swed.* 59,073, July 15, 1925. Solid or liquid org. substances are heated directly by means of circulating indifferent gases, preferably under pressure, in exchangeable gas-tight retorts resting on cars transportable on rails, the retorts being coupled exchangeably in parallel or in succession in a system of pipe-channels between a common heating app., for instance, a recuperator, and a common condenser connected with the heating channels of the recuperator through a scrubber and a fan.

Ammonia absorption apparatus for use in refrigeration. C. SENSSENBRENNER. U. S. 1,568,476, Jan. 5. An app. is described which is adapted to serve alternately as a generator and as an absorber.

Electric insulating material. A. I. LABBE. U. S. 1,567,277, Dec. 29. Slaked lime (substantially free from magnesia) 40 is mixed with port. cement 50 and sand 10 parts and molded to form insulators for resisting high voltages.

Heat-insulation. F. L. PILLIOD. U. S. 1,568,415, Jan. 5. A felted mass or sheet of long fibers of amosite interspersed with about an equal weight of short fibers of asbestos is impregnated with Na silicate.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

The rate of deoxygenation of polluted waters. E. J. THERIAULT. *Proc. Am. Soc. Civil Eng.* 51, 1819-28(1925).—Samples of Ohio-River water were incubated at 9°, 20° and 30° and the rate of deoxygenation was observed. The rate is very uniform during the first nine or ten days, a marked acceleration occurring after sixteen days. The first stage is due to oxidation of carbonaceous matter; the second marks the beginning of nitrification. The results conform well with Phelps formula: $x = L(1 - 10^{-Kt})$, in which x = oxygen absorbed in t days; L = total oxygen absorbed in the first stage; K = a const. The oxidation of nitrogenous matter is probably complete at 40-50 days. Continued absorption is due to oxidation of cellulose-like material. The different stages of deoxygenation make necessary a knowledge of the history of the sample in the proper interpretation of lab. results. From the 5-day oxygen-demand values, the av. *per capita* oxygen requirement in several cities considered is about 51.1 g. per day. B. H. P.

Bacterial pollution and natural purification in the Ohio and Illinois rivers. J. K.

HOSKINS. *Proc. Am. Soc. Civil Eng.* 51, 1843-55(1925).—The quantity unit for expressing bacterial concn. is defined as the product of the discharge of 1 cu. ft. per sec. and a concn. of 1000 bacteria per cc. The no. of units of a given stream then equals the product of discharge in sec. ft. and bacteria per cc. divided by 1000. Tables and graphs show bacterial pollution in quantity units per capita for Cincinnati, Louisville, Peoria and Chicago. Seasonal changes vary from 25% of the yearly total in Jan. to 225% in June. Bacterial concn. can be computed from population \times quantity units per capita \div by thousands of sec. ft. Tables of computed and observed values for the 4 cities show good agreement. Bacterial decrease in relation to time of flow is fairly regular; it is affected by temp., original concn. and other factors. Tables are given. B. H. P.

A review of the work of the United States Public Health Service in investigations of stream pollution. W. H. FROST. *Proc. Am. Soc. Civil Eng.* 51, 1810-7(1925); *U S Pub. Health Repts.* 41, 75-85 (1926). BEN H. PETERSON

The trend of purification plant design and operation. WELLINGTON DONALDSON. *Engr. & Contr.* 64, 371-76(1924).—The tendency has been toward greater flexibility of operation and adequate metering of water flows, master venturi meters being usually provided either at the input or output. Aeration for removal of odors and iron is being used by an increasing number of plants. Preliminary sedimentation before the application of the coagulant has proved advantageous for plants handling very muddy waters. There is no remarkable improvement in coagulation basin design but there have been improvements in cleaning arrangements. Dry-feeding devices are gaining popularity. Perforated pipe is leading in popularity for rapid sand filter under-drains. The use of air wash in addition to water wash is almost obsolete. There is great diversity in design of auxiliary filter equipment. Practically all sterilization is now done with liquid chlorine. C. C. RUCHHOFF

Modern British practice in water softening. IV. Lime cream and soda ash plants (Kennicott, Lassen-Hjort, Paterson and Porter). D. BROWNLIE. *Ind. Chemist* 1, 495-500(1925); cf. *C. A.* 19, 3553. E. G. R. ARDAGH

The use of zeolites to soften water by filtration. H. W. TERRY. *Paper* 62, 766-8(1925).—Tables and charts are given which can be used to calc. the filter diam. and the depth of zeolite required to soften a given vol. of water of known hardness. D. B. DILL

The use of lime for treating public water supplies to prevent corrosion and "red water." J. R. BAYLIS. *Rock Products* 28, No. 18, 59-60(1925). R. WILSON

Lime treatment of water for the manufacture of raw water ice. A. S. BEHRMAN. *Rock Products* 28, No. 18, 57-8(1925). RAYMOND WILSON

A sensitive biological indicator for the chemical condition of inland water. AUGUST THIENEMANN. *Naturwissenschaften* 13, 868-9(1925).—It has been observed that the very common waterflea, *Gammarus pulex*, only lives in those waters that have a relatively high O content, combined with a rapid O replenishment; it is sensitive to all inorg. pollution and to decaying org. material. Even more sensitive test objects for the quality of water are the epizoic protozoa, *Spirochona gemmipara* and *Dendrocomeles paradoxus*, occurring on the "Kiemenblättchen" of *Gammarus*. They are relatively resistant to temp. changes but do not appear when appreciable NaCl, acids or org. pollution is present, even when the flea itself is unharmed. B. J. C. VAN DER HOEVEN

Difficulties encountered in purifying small quantities of boiler feed water. G. PARIS. *Chimie et industrie Special No.*, 143(Sept., 1925).—The $\text{CaO-Na}_2\text{CO}_3$ process can hardly give good results with a flow of less than 5 tons an hr. Processes using the addn. of a dissolved reagent can give good results with flows down to 600 l. an hr. Zeolite processes give good results with flows of less than 500 l. per hr. A. P.-C.

Sewage experimental work investigations. WILLEM RUDOLFS. *Can. Eng.* 49, 103-5(1925).—The results obtained when a reconstructed Imhoff tank was seeded with sludge and put into operation are compared with the operating results of an old tank. Although it took only 4 weeks for the bacterial population in the liquor of the new tank to become as great as in the old tank the results did not come up to expectations. The reason for this seemed to be that the relation between the incoming sewage and the ripe sludge was incorrect. Bacteria increase when a tank is operating and decrease when it is resting. The bacterial activities vary with the seasonal temp. but this effect may be overbalanced by the manipulation of the tank. The results of an expt. on fresh solids digestion in a stoppered bottle are given and discussed. C. C. R.

Buchner system for the disposal of household sewage. K. BUCHNER. *Gesundh. Ing.* 48, 618-9(1925).—A description with illustrations of a small disposal tank for household sewage. The settling compartment is of 250 l. capacity and is divided into 2 compartments. The septic chamber is of 500 l. capacity, circular in shape, with a

sloping bottom. Sludge is removed by a pipe leading to the center of the chamber. This chamber is to be emptied 3 times a year, when filled at a rate of 50 l. per week. With sludge estd. at 0.15 l. per person per day, this tank is designed for approx. 30 persons, and costs 800-1600 marks.

MARTIN E. FLENTJE

Sewage-disposal problems in Kansas. ERNEST BOYCE. *Munic. County Engr.* 69, 41-4(1925).—A general discussion.

C. C. R.

The glass-covered sludge-drying bed. W. S. COULTER. *Munic. County Engr.* 69, 57-60(1925).—The hotbed and greenhouse types of covered sludge-drying beds are described. Partition walls so that fresh sludge may be sepd. from partly dried sludge, proper ventilation and protection of the glass with wire screen for small plants are discussed.

C. C. R.

The rate of atmospheric reaeration of sewage polluted streams. H. W. STREETER. *Proc. Am. Soc. Civil Eng.* 51, 1829-42(1925).—The principal source of reaeration is absorption from the atm. In the Ohio-River studies this was found to follow the law, (1) $\log(D/D_0) = -K_2t$; in which D_0 is the initial oxygen deficit, D is deficit at time t and K_2 is a const. of reaeration which is governed by $K_2 - cV^n \times H^{-2}$, in which v is velocity, H is depth and c and n are consts. The rate is accelerated at higher temps. Reaeration is measured by combining this expression with the deoxygenation equation, (2) $\log(L/L_0) = -K_1T$, in which L_0 is oxygen absorbed in the first stage, L the oxygen requirement for time T and K_1 is the coeff. of deoxygenation, giving (3) $D = (K_1L_0/K_2 - K_1)(10^{-K_1t} - 10^{-K_2t}) + D_0 \times 10^{-K_2t}$. In the curves of equations (2) and (3) the difference at time t is a measure of the reaeration. Data are given and curves shown for calcd. and observed results.

BEN H. PETERSON

Recovery of gas in sewage disposal. SIERP. *Gas u. Wasserfach* 68, 773-6(1925).—The settling and decompn. tanks are covered so as to permit the collection of the gas evolved during the decompn. of the sewage. At an av. temp. of 12.5° the gas production is 3 cu.m./year/individual (in the sewage collection area), the compn. of the gas being CO₂ 15-20%, CH₄ 75-85%, N₂ 0-5%, this being an av. for a series of decompn. chambers. Photographs and diagrams of plants are given.

WM. B. PLUMMER

Feed-water deaeration increases plant economy. J. R. McDERMET. *Power Plant Eng.* 29, 1268(1925).—Deaeration reduces corrosion, making possible the use of economizers and extra high boilers, and the protection of turbines.

K. C. BEESON

The "Firstbrunnen," a new modification of the Imhoff tank. F. SCHIMRIGK. *Gesundh. Ing.* 48, 261-3(1925).—A modified Imhoff tank with ridged, radial settling troughs is described. This type of tank takes up less space and gives better results. Numerous drawings and illustrations are given.

MARTIN E. FLENTJE

German community baths and swimming pools. C. WOLFF. *Gesundh. Ing.* 48, 273-6(1925).—Descriptive.

MARTIN E. FLENTJE

Operation of swimming pools. W. WEICHARDT AND O. ULSAMER. *Gesundh. Ing.* 48, 283-5(1925).—Purification of pool water with Cl₂ and filters is practiced in Germany. W. and U. advise an excess of Cl₂ at all times, and a bacterial count resembling that of drinking water. Results are given for a pool water at Nürnberg.

MARTIN E. FLENTJE

The decimal dropping bottle [for the determination of hardness in boiler feed water] (BLACHER) 1. Apparatus for circulating and standardizing solutions (U. S. pat. 1,568,117) 1.

BÖTTGER, P.: Neuere Volksbäder. Berlin: Deutschen Gesellschaft für Volksbäder. 56 pages, 38 illustrations. Reviewed in *Gesundh. Ing.* 48, 541(1925).

GROH: Wasserversorgung und Brunnenbau. Berlin: Laubsch and Everth. 173 pages. M. 5.50. Reviewed in *Gesundh. Ing.* 48, 270(1925).

Thermostatically controlled electric water purifier. F. KRAEMER. U. S. 1,567,-186, Dec. 29.

Filter with base-exchanging filtering material. DET NORDISKE NATROLITH A.-S. Danish 34,904, Aug. 12, 1925. When the material has lost its efficiency it is quickly and thoroughly regenerated by treating it with a 10% soln. of NaCl at a temp. of 80-100° for not more than 1 hr.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Clay as soil colloids. A. F. JOSEPH. *Soil Science* 20, 89-94(1925).—By repeated extn. of the colloidal material from clay by means of a supercentrifuge practically the whole of the clay fraction can be obtained in colloidal condition. Several clays were investigated in this manner. A close correlation was found between the chem. compn. of clays and certain of their phys. and chem. properties. In general the higher the mol. ratio of SiO_2 to Al_2O_3 the more intense are all colloidal properties. R. B.

The chief factors which influence the heat of wetting of soil colloids. G. J. BOUYOUCOS. *Soil Science* 19, 477-82(1925).—Soil colloids lose their capacity to evolve heat on wetting after strong ignition. By grinding the ignited residue B. claims to have increased the sp. surface to approx. the original value and concludes that the heat of wetting is due to the phys. condition of the surface rather than the extent of surface. The active surface is referred to as hydrated, rough, porous and felt-like, the inactive as smooth and vitrified. Chem. compn. has an appreciable effect, especially the SiO_2 :- Al_2O_3 + Fe_2O_3 ratio. The higher the ratio in general the greater the heat of wetting. The heat of wetting is considered due to the change of the H_2O from a liquid to a semi-solid state; this is due to the strong attractive power of the solid phase; this force is considered both chem. and physical. R. BRADFELD

Heat of wetting of soils dried at different temperatures and the force at which soils absorb water. G. J. BOUYOUCOS. *Soil Science* 20, 67-72(1925); cf. *C. A.* 19, 2097.—Drying soils at 50° , 75° and 140° for 24 hrs. caused the heat of wetting to increase rapidly up to 107° and became practically const. above this point. Soils dried at 107° gave heat of wetting values from 293.7 to 1004.0% greater than the same soils dried only to 50° . The amt. of H_2O causing the heat of wetting is small, 1.40-12.10% and of this total the small fraction driven off last at 107° is responsible for the major portion. The expulsion of 0.719% H_2O at 107° raised the temp. of 125 g. of H_2O in 100 g. of soil over 3.28° which is 50% above that at the drying temp. of 75° . If heat of wetting is due merely to the compression of the H_2O the soils must exert an adsorption force equiv. to 156,200 atm. in the case of a muck. RICHARD BRADFELD

Some moisture relations of soils. M. M. MCCOOL AND A. W. WEIDEMANN. *Soil Science* 20, 243-7(1925).—When 5 g. of dry muck soils were treated with 60 cc. *N* KCl soln., filtered and the K content in an aliquot of the filtrate was detd. it was found to be higher than the original soln. This "negative absorption" of K was considered due to the fact that H_2O was absorbed more rapidly than KCl from the solns. used. In a second series of expts. sucrose solns. were used with even more striking results. With org. soils dried at room temp., 55° and 100° the amt. of H_2O absorbed varied from 16.9 to 20.29%, 23.64 to 29.95% and 26.10 to 35.84%, resp. The amt. of H_2O removed from sucrose solns. by various horizons of mineral soils varied from 1.9 to 6.5%, extd. colloids from 2.3 to 15.8% and fuller's earth 12.4%. R. B.

Colloidal behavior of soils and soil fertility. I. Suction force of soils as an index of their colloid content. J. S. JOFFE AND H. C. MCLEAN. *Soil Science* 20, 169-75 (1925).—The "suction force of soils" is estd. by imbedding a porcelain filter filled with H_2O in the soil and measuring the rise of Hg in a manometer attached to the top of the filter. Quartz sand gave a vacuum of only 1.2 cm.; loam soils ranged from 10 to 32 cm. while one clay gave a value of 40 cm. The effect of fertilizer treatments can be measured by this method. Lime depresses the suction force. It is claimed that this method may be used for estg. the colloid content of soils. R. BRADFELD

The influence of several factors on the reaction of the soil. F. W. BOBKO AND D. W. DRUSCHININ. *Z. Pflanzenernähr. Düngung* 5A, 345-69(1925).—The proportion of soil to water influenced the H-ion concn. of soil suspensions very slightly. The H-ion concn. of unlimed soils decreased slightly with increase in the amt. of water; while limed soils gave opposite results. With limed soils the p_{H} in the soil solns. was higher than in the water exts.; with unlimed soils the p_{H} was lower in the solns. than in the water exts. The higher the alky. (by titration) of soil exts., the higher the p_{H} . The H-ion concn. of a no. of fractions of leaching taken one after the other was about const. The H-ion concn. calcd. from the amt. of free CO_2 and HCO_3^- in the exts. or, after removal of the free CO_2 , from the HCO_3^- and CO_3^{--} agreed with the observed results. The p_{H} of all unlimed soils, humus soils and torf disagreed with results calcd. from such analyses and formulas. In exts. of humus-contg. soils the divergence was correlated with increased humus content of these exts. Conclusion: In such soils there are present acids with a larger dissociation const. than CO_2 , i. e., org. acids. R. M. BARNETTE

Plant growth on acid soils. HANNIS KIRSTE. *Z. Pflanzenernähr. Düngung* **5A**, 129-94(1925).—On the basis of the theories of Kappan and his school relative to the nature of soil acidity, the author made numerous expts. to ascertain the effect of "hydrolytic" and "exchange" acidity on the growth of different plants. He suggests dividing the plants into 2 groups according to their sensitivity to "exchange" acidity. Barley, turnip, luzerne, red clover, mustard, garden bean, wheat and peas are classed as sensitive to "exchange" acidity, while oats, serradella, corn, potatoes and lupine are classed as resistant to "exchange" acidity. Numerous ramifications of the relationship of the "exchange" acidity to plant growth, and the correction of this condition with CaCO_3 are given.

R. M. BARNETTE

The aluminium content of the soil solution and its relation to soil reaction and plant growth. O. C. MAGISTAD. *Soil Science* **20**, 181-225(1925).—An extensive investigation of the relation of acidity to plant growth both with and without sol. Al. The solubilities of Al in H_2O , nutrient soln., and soil solns. at varying p_{H} values were detd. To avoid copptn. of Ca as $\text{Ca}_3(\text{PO}_4)_2$ the Al was sepd. as AlPO_4 at p_{H} 5. Al was practically insol. between p_{H} 4.7 and 8. The curves for Al soly. in nutrient solns. and in soils when superimposed upon the Al- p_{H} soly. curve practically coincided at all points. Hence it is possible to predict the Al content of a soil soln. if its p_{H} value is known by referring to the soly. curve. At acidities greater than p_{H} 5 all crops except alfalfa suffered both H^+ ion and Al toxicity. Alfalfa died at these acidities whether Al was present or not. At acidities slightly above p_{H} 5 alfalfa, red clover, rye and oats suffered little or no Al toxicity. While corn, barley, and soy beans suffered appreciably. Since most natural soils fall within the range p_{H} 5-7, the beneficial effects of CaCO_3 for clover, alfalfa, oats and rye result from a decrease in acidity and not a decrease in sol. Al. With corn and barley over the same range acidity both factors are operative while with soy beans the Al seems to play the predominating role. Strongly alk. soils contain appreciable amts. of sol. Al which may be a factor in the toxicity. The addn. of Al increased the Al content of the crop and tended in some cases to decrease the Fe content. An extensive bibliography is appended.

A modified respiration apparatus for plant and soil studies.

R. BRADFIELD

Soil Science **19**, 411-5(1925).—The app. consists of two bell jars of the same kind of glass, 8 in. in diam. and 14 in. deep, connected edge to edge by a heavy rubber band. The lower jar is filled with soil to a depth of 8 in. and placed in a pot partially filled with sand, which serves as a convenient support. The upper jar is fitted with a No. 9 stopper with one glass tube leading to an air pump and the other to the CO_2 -absorbing reagents. The rubber band connection is superior to the usual wax seal because it is not affected by temp. changes. No trouble was experienced in recovering NH_3 introduced in the app.

R. BRADFIELD

Investigation of soil unproductivity (Verhagerung). F. KNICKMANN and M. HELBIG. *Z. Pflanzenernähr. Düngung* **5A**, 209-48(1925).—"Hager-humus" and "hager-soils" are described as occurring on the south and west sides of mountains, being due to the intensive action of sun and wind. A comparison of this soil, difficult of reclamation, with a normal soil of about the same relative position but lying on the north, as to phys. and chem. properties, was made. Both soils were derived from the same gneiss. The "hager-soil" was richer in humus, and had a higher water capacity. Analyses showed a like distribution of the particles in both surface and subsoil. The "hager-soil," while the normal soil showed an increase in the finer fractions (U. face of the soil. From analyses of HCl exts., K. and H. conclude that there was a strong increase in the "hager" profile and that the "hager-soil" might be likened to an "arid" soil while the normal soil was a "humid" soil. The larger amt. of alkali, together with the location of the "hager-soil," indicated a more intensive action of the sun (i. e., increased evapn.). The "hager-humus" of this abnormal soil was less sol. in HCl, indicating a lesser degree of decompn., while its higher soly. in NH_4Cl indicated a higher colloid soly. N in the "hager-humus" was less than in the normal. The correlation between mol. proportions and reaction (as shown by Ganssen) does not hold for these humus-contg. soils, while the proportions of lime to humus showed a correlation with the reaction of the soils.

R. M. BARNETTE

A comparative investigation of the determination of the phosphoric acid requirement of the soil. M. J. VAN DER SPIJ. *Z. Pflanzenernähr. Düngung* **5A**, 249-54(1925).—From comparative vegetation and chem. studies of 15 soils, the $\frac{1}{2}\%$ acid method was found preferable to other methods for the detn. of the requirement of a soil for P_2O_5 .

R. M. BARNETTE

The lime requirement of the soil. IV. The practical application of soil re-

studies. O. ARRHENIUS. *Z. Pflanzenernähr. Düngung* **5A**, 195-9(1925); cf. *C. A.* **19**, 3139.—The value of a systematic study of the reaction (H-ion concn. of soil suspensions) of soils and methods for mapping such results together with the application of the data for the culture of plants best suited to a given reaction are given. General rules for the alteration of the reaction of different soil types with marl are indicated. R. M. B.

The influence of liming, temperature, and compaction on the movement of soluble salts in soils. I. C. WHETING. *Soil Science* **19**, 459-66(1925); cf. *C. A.* **19**, 2098.—Dry soil (100 g.) + 2 g. of the finely powdered salt were thoroughly mixed, placed in a small glass tube 20×35 cm. and brought to optimum H_2O content. The tube was filled with the same soil at the same H_2O content but without added salt. Both ends of the tube were sealed with paraffin and the movement of salt was detd. at intervals by the f.-p. method. When $0.01 N Ca(OH)_2$ was used to moisten the soil instead of H_2O a more rapid distribution of KCl and $NaNO_3$ was noted. $CaH_4(PO_4)_2$ showed no movement. Salt movement was very slow near the f. p. but was rapid at 65° . Degree of compaction had no appreciable influence upon the rate of salt movement at the H_2O content used. R. BRADFIELD

Easily soluble calcium of soils as an indicator of their response to liming. J. R. FLEETWOOD. *Soil Science* **19**, 441-58(1925).—None of the usual lab. lime requirement methods gives a satisfactory index of a soil's response to lime applications in the field. In this study soils with known response to liming were selected from expt. fields in Mo., Iowa, Ill., Ohio and Ky. and the amts. of Ca dissolved from a 1.2 g. oven-dry sample by 600 cc. $0.04 N H_2CO_3$ detd. p_H values and Truog acidity values also are given. A much closer correlation was found between sol. Ca and field response to liming than either p_H value or Truog acidity. In general the relation between fertility and lime response was fair; in the exceptional cases the sol. Ca content proved a better index. R. BRADFIELD

The absorption of phosphate by Pasteur-Chamberlain filters. F. W. PARKER. *Soil Science* **20**, 149-58(1925).—New Pasteur-Chamberlain filters when treated with cold H_2O yielded solns. contg. as much as 0.392 p. p. m. of phosphate, hot water extn. as much as 0.94 p. p. m. in the first portions of filtrate. This amt. is larger than that found in many soil exts. New filters did not absorb an appreciable amt. of P from dil. P solns. but filters which had been used for prep. soil exts. absorbed considerable, apparently because of the colloidal soil material retained in the filter. Washing the used filters with hot 1:1 HCl, and then igniting reduced but did not destroy the absorptive capacity of the filters for P. The coeruleo-molybdate method was used for the P detns. and proved satisfactory. R. BRADFIELD

Distribution of nitrogen in the podsol profile. G. EDGINGTON AND J. R. ADAMS. *Soil Science* **20**, 177-9(1925).—Five fairly typical podsol profiles from New Hampshire were examd. for N, acidity and moisture equiv. The dark brown A horizon being rich in org. matter was highest in N, 1.40-2.00%, and had the highest moisture equiv., 101-190; the leached A_2 horizon was gray in color, N varied from 0.051 to a 133% and moisture equiv. from 11.2 to 26.8%. The zone of accumulation B was brown in color, N 0.279-0.426, moisture equiv. 33-79% while the parent material, horizon C, was in most cases yellow-brown in color, N 0.055-0.219 and moisture equiv. 13.1-48.1%. Variations in p_H value were small but were in general lower in the A_2 horizon. R. BRADFIELD

Inoculating soil with Azotobacter. P. L. GAINEY. *Soil Science* **20**, 73-87(1925).—Small plot field studies on the effect of inoculation of 2 *Azotobacter*-free acid soils furnish further evidence that: (1) the introduction of *Azotobacter* into soils which normally do not contain them is without effect in establishing a permanent flora; (2) if the acidity is reduced to p_H values above 6 by the addn. of basic materials like $CaCO_3$ an *Azotobacter* flora can be established by inoculation; (3) if the acidity of such soils rises in time to p_H values lower than 6 the organisms will disappear; (4) the N-fixing ability as measured by culturing in a mannite medium of a soil normally devoid of *Azotobacter* can be markedly increased by inoculation with this organism. RICHARD BRADFIELD

The carbon dioxide content of the soil air as a factor in the absorption of inorganic elements by plants. F. W. PARKER. *Soil Science* **20**, 39-44(1925).—The CO_2 content of the soil air was maintained at 3 levels by (1) removal by aspiration, (2) untreated, (3) CO_2 added at the rate of 1 g. per jar per day. In the first expt. rape, oats and clover were grown in a poor Norfolk sandy loam soil which received NH_4NO_3 but no other fertilizer. Dry wt. of tops, ash, Ca and P were detd. The variation of the CO_2 content had no appreciable effect except with oats. The ash content of this crop was materially increased apparently because of an increased absorption of SiO_2 . In a second series cpts. cowpeas and sorghum were grown with and without applications of acid and phosphate, the CO_2 treatments remaining the same as in the first series. The

CO₂ content of the air had no appreciable influence in either case. Yields were increased by the P treatments, rock phosphate being equal to acid phosphate with sorghum. The availability of the former was not influenced noticeably by the CO₂ treatments.

RICHARD BRADFIELD

The availability of nitrogen in nitrate of soda, ammonium sulfate and dried blood when the amounts of phosphoric acid and potash are varied. A. W. BLAIR AND A. L. PRINCE. *Soil Science* 19, 467-76(1925).—A continuation of the work previously reported (*C. A.* 18, 2937) on the effect of varying K and P upon the availability of N applied as NaNO₃, (NH₄)₂SO₄ and dried blood. Doubling and tripling the standard amt. of P did not change the yield of rape and buckwheat while doubling the normal rate of K depressed the yield of rape. The N content of the crops was not appreciably affected by either the high P or K treatments. NaNO₃ gave the largest yields and the highest N recovery in the first crop (rape) while dried blood gave the largest yield with the residual crop of buckwheat.

R. BRADFIELD

Biochemical effects of gypsum on Iowa soils. W. B. BOLLEN. *Soil Science* 19, 417-40(1925).—Gypsum had practically no effect on the no. of soil organisms developing on agar plates, nitrification, sulfonation, or the lime requirement of the soil. S markedly increased the sulfofying power of the soil. Crop growth, especially alfalfa, was materially increased by both S and gypsum. The effect of the gypsum is believed to be due largely to SO₄ supplied. One soil having its *p_H* value reduced to 3.23 by S applications supported a heavy growth of *Penicillium luteum*, which has the power of oxidizing S. This highly acid soil had also the greatest nitrifying power of the series. Increased yields of alfalfa were obtained by gypsum applications. In nearly every case gypsum-treated plots seemed to stand the drought better than the checks.

R. B.

Effect of straw on accumulation of nitrates and crop growth. T. L. MARTIN. *Soil Science* 20, 159-64(1925).—In general wheat straw treatments caused a decline in the nitrate in the soil in 3 series of pot expts. The larger the application of straw the greater was the decline in soil nitrate for a 4 month period. Crop yields were depressed in proportion with nitrate. After the straw had been allowed to decompose for 12 months its depressive influence disappeared.

R. BRADFIELD

The effect of potash fertilization on the yield of our most economically important plants. R. LEONHARDS. *Kali* 19, 413-7(1925).—Statistics are given of German potash consumption, and the various available forms of potash are economically discussed from the standpoint of transportation. Increased returns (crop and monetary) from potash fertilization of beets, potatoes and corn, under various conditions, are shown by tabulations.

WM. B. PLUMMER

The estimation of "polysulfide" sulfur in spray materials. WM. GOODWIN AND H. MARTIN. *J. Agr. Sci.* 15, 96-105(1925).—The method of R. M. Chapin was critically examd. and, with slight modifications to increase rapidity and ease of manipulation, is recommended for routine work in the examn. of S spray materials. The modified method is carried out as follows: Add 25 cc. of the diluted spray material (1:25 for liquid and 1:50 for solids) to a mixt. of 10 cc. ammoniacal ZnCl₂ (50 g. ZnCl₂ dissolved in 500 cc. H₂O, with 125 cc. NH₄OH, sp. gr. 0.90 and 50 g. NH₄Cl, dil. to 1000 cc.) and 35 cc. cryst. Na₂SO₃ in a 300 cc. conical flask. The Na₂SO₃ must be freshly prepd. Place the flask on a steam bath at full heat for 45 min. and at 10, 20, 30 and 40 min. intervals shake well, washing down the sides of the flask with boiling H₂O. At 45 min. remove from the steam bath, add 30 cc. 10% crystd. SnCl₂, let stand 5 min. and filter into a 500 cc. flask, using a good grade of filter paper not larger than 12.5 cm. Wash well with hot H₂O, until at least 200 cc. have passed the filter, cool, make up to vol. To 50 cc. portions add 1 drop of methyl red (0.2% in 95% alc.) and 10% C₆H₅O₆ from a buret to slight acidity. Titrate with 0.05 N I, using starch as an indicator. Correct for thiosulfate S by the official A. O. A. C. methods, except C₆H₅O₆ is used in lieu of HCl. Working with the quantities herein specified, if *X* be the figure of the polysulfide titration and *Y* that of the thiosulfate titration, then *X*-(*Y*/5) gives the true polysulfide titration which if less than 35 (the no. of cc. of Na₂SO₃ used) indicates that an excess of Na₂SO₃ is present.

R. B. DEEMER

Calcium cyanide fumigation. S. N. GORÉ. *Indian J. Med. Research* 13, 287-99 (1925).—"The use of Ca(CN)₂ for the generation of HCN for fumigation purposes is much simpler and more convenient than a mixt. of H₂SO₄ and KCN or NaCN. The mere exposure of Ca(CN)₂ to the air results in the evolution of HCN in an hour and a half." Air-tight spaces are necessary. Under this condition 1 oz. Ca(CN)₂ per 100 cu. ft. provides a lethal concn. attained in 1½ hrs. and maintained for 4 hrs.

F. K.

The relative toxicity of the arsenates of calcium (to insects). S. B. HENDRICKS, A. M. BACOT AND H. C. YOUNG. *Ind. Eng. Chem.* 18, 50-1(1926).—The av. longevity

and the ratio of As_2O_5 in the body to that in the feces were satisfactory criteria of toxicity for arsenicals in the system $\text{CaO}-\text{As}_2\text{O}_5-\text{H}_2\text{O}$ when fed to grasshoppers (*Melanoplus femur-rubrum*). The toxicity of Ca arsenates decreases with increase in the mol. ratio $\text{CaO}:\text{As}_2\text{O}_5$ in combination, but is not greatly affected by $\text{Ca}(\text{OH})_2$ in the presence of $\text{Ca}_3(\text{AsO}_4)_2 \cdot \text{H}_2\text{O}$. The basic Ca arsenates have a const. toxicity for the cotton boll weevil (*Anthonomus grandis*) which is lower than that for the acid Ca arsenates.

CHAS. H. RICHARDSON

Leaf diseases of Hevea. I. C. H. WRIGHT. *India Rubber J.* 70, 1027-9, 1145-7 (1925).—Descriptive, including the current use of chemicals as combative agents. Several metallic salts other than CuSO_4 are highly toxic to fungi, and as a particularly effective fungicide it is suggested to use a mixt. contg. CuSO_4 2, $\text{Al}_2(\text{SO}_4)_3$ 2, NiSO_4 1, lime 5 lbs. in 50 gals. of H_2O . Other suggestions include a combination of $\text{Ca}_3(\text{AsO}_4)_2$ and lime-S mixts., NaF and CaF_2 . Methods of prepn. of the more effective solns. are described in detail.

C. C. DAVIS

A study of the methods of combating the "olive fly" (*Dacus oleae*) in Portugal. A. F. DE SEABRA. *Bull. mat. grasses* No. 4, 93-100 (1925).—An outline of the work recently organized for the control of the "olive fly." The work is not sufficiently far advanced to report any results

A. PAPINEAU-COUTURE

The fight against the "olive fly" (*Dacus oleae*) at Cenia (Spain). ANON. *Bol. mens. olivi cultura* No. 71, 476 (1924); *Bull. mat. grasses* No. 4, 100 (1925).—Spraying expts. with the usual molasses-Na arsenate mixt., with Bordeaux mixt. and with Na arsenate gave very promising results, only 0-0.3% of the fruit from the sprayed trees being attacked, while in neighboring olive groves 50-90% of the fruit were attacked according to the variety of olives. With 0.25% of arsenate some of the trees were slightly burned, but none was with 0.15%

A. PAPINEAU-COUTURE

GREAVES, JOSEPH E. and GREAVES, ETHELYN O.: **Bacteria in Relation to Soil Fertility.** New York: D. Van Nostrand Co. 239 pp. \$2.50. Reviewed in *Ind. Eng. Chem.* 18, 106 (1926).

Fertilizers. P. T. AXELSEN. U. S. 1,567,408, Dec. 29 Fertilizers in solid pulverulent condition are passed under pressure between smooth rotating surfaces to form them into thin, polished sheaves which may be stored without coalescing into lumps.

Fertilizer from calcium cyanamide. NORSK HYDRO-ELEKTRISK KVAELSTOF-AKTIESELSKAP. Norw. 41,802, Aug. 31, 1925 Com. CaCN_2 is treated with moist urea nitrate at a temp. between 50° and 80° ; by this procedure the CaCN_2 is converted into urea

Calcium cyanamide. STOCKHOLMS SUPERFOSFATFABRIKS A.-B. Swed. 59,148, July 29, 1925. The reaction between CaC_2 and N is carried out in a furnace having the shape of a rotating body with the least possible outside surface in proportion to the vol., for instance, an ellipsoid.

Insecticide and fungicide. H. P. BASSETT and M. R. ISAACS. U. S. 1,568,044, Jan. 5. A compn. adapted for spraying or dusting comprises Ca diarsenate 70, CaO 30 and casein 3 parts.

Fungicide and insecticide. O. F. HEDENBURG. U. S. 1,568,455, Jan. 5. Bordeaux mixt. and Pb arsenate are mixed with dextrin, casein and a sol. chromate to obtain a deflocculating and adhesive effect and produce a compn. adapted for use with H_2O as a spray.

Plant spray. C. F. DILLER. U. S. 1,568,445, Jan. 5. A compn. adapted for spraying on tobacco, roses or other plants comprises a suspension of dried plant bacterial enzyme and chromatin granule products, in H_2O , Bordeaux mixt. or other suitable liquid vehicle.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The wines of Canton Wallis during 1923 and 1924. ANON. *Mitt. Lebensm. Hyg.* 16, 203-4 (1925).—The max., min. and av. results of analyses of a large number of white and red wines of the 1923 and 1924 vintages are tabulated.

J. C. J.

The detection of watering in wines. C. A. GRAU. *Rev. Facultad Ciencias* 3, No. 2, 133-42 (1925).—Ten % or less of water betrays itself only by the presence of

nitrate. For the detection a soln. of 0.002 g. diphenylamine in 100 cc. concd. H_2SO_4 is recommended. The com. yellowish product is more sensitive than the c. p. one.

MARY JACOBSEN

Sensitiveness of the taste towards sulfurous acid in wines. P. BALAVOINE. *Mitt. Lebensm. Hyg.* **16**, 133-6(1925).—A discussion of the use of SO_2 as gas or in liquid form in the wine industry. A short résumé of the literature on the subject is given, including max. amts. recommended by different authorities. B. has detd. the free and total SO_2 in different wines, including for each a description of the taste, and has given his results in tabulated form

J. C. JURRIENS

The determination of diastase in malt extracts. SEELIGMANN. *Chem.-Ztg.* **49**, 943(1925).—A substance has a diastatic power of 1000 Pollak units if 1 g. is able, in $1\frac{1}{2}$ hr., to produce at a temp. of 40° 1 g. maltose from a 3% arrowroot starch soln. The Pollak unit is detd. as follows: 20 g. malt ext. are made up to 200 g. with H_2O , the ext. is filtered and an aliquot is taken. The 3% arrowroot soln. is prepd. by suspending 7.5 g. in 250 cc. boiling H_2O and heating until the material gelatinizes, cooling to 40° and adding the malt ext., and shaking frequently during digestion. The diastatic action is stopped by adding 3 cc. of 10% NaOH and cooling to room temp. The vol. is then made to 300 cc. and the soln. is shaken and titrated with 25 cc. Fehling's soln., diluted with 25-50 cc. H_2O , while heating to boiling. The titration is completed when the supernatant fluid has a weak yellow color. The titer of Fehling's soln. is detd. by reducing pure maltose. If 25 cc. Fehling's soln. are equiv. to 185.5 mg. maltose and 25 cc. Fehling's soln. decolorized 31 cc. of the arrowroot soln., then 300 cc. arrowroot soln. with 0.4 g. malt ext. would yield 1793 mg. maltose, and 1 g. malt ext. would have converted 4482.5 mg. maltose. From this amt. the maltose already in the malt should be deducted and the remainder may be expressed in Pollak units.

C. N. FREY

Electrolytic treatment of beetroot molasses or fermentation residues (Brit. pat. 233,196) **28**.

"Vitamin malt preparation." O. STINER, A. HAUSWIRTH and A. GAMS. U. S. 1,568,196, Jan. 5. An amylaceous material such as chestnut meal is saccharified with ground fresh green malt and H_2O in the presence of citric acid, tartaric acid or other non-toxic "polybasic" org. acid, in sufficient quantity to make the reaction feebly acid to "congo," and at temps. below 60° .

Wort. AKTIEBOLAGET SEPARATOR. Brit. 233,321, May 5, 1924. Solid or slimy residues remaining after extn. of wort are treated with H_2O to produce a dild. wort from which the residues are sepd. centrifugally. This process may be repeated and the very dil. wort obtained may be used instead of H_2O in the first treatment.

Filtering vessel for yeast manufacture. SVENSKA JÄSTFABRIKS AKTIEBOLAGET. Swed. 58,961, June 25, 1925. Mech. features

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Researches on the root of *Gentiana lutea* L., which grows wild on the slopes of Gennargentu (Sardinia). R. BINAGHI AND P. FALQUI. *Ann. chim. applicata* **15**, 386-96(1925).—The botany has been fully described by Moris (*Flora Sarda* **3**, 71 (1858-9)). The active principle of the root was extd. by the method of Tanret (cf. *Thesis*, July 20, 1905) in modified form, since a survey of various methods pointed to this as the most systematic and complete. The root after being dried in air at room temp. and pulverized gave in %: H_2O 13.78, ash 6.21, EtOH ext. 52.00. The ash was straw-colored and the EtOH ext. (extd. at 60°) red-brown, the latter giving with H_2O a clear soln. with green opalescence. Fresh root was then pulverized, digested 5 times with 95% EtOH at room temp., the ext. evapd. *in vacuo*, the residue extd. with cold petr.-ether, and evapd., which left a yellow-red oily residue (I) weighing 3.4% of the root. The residue insol. in petr.-ether was extd. with cold H_2O , which left an amorphous yellow product (II) weighing 0.5% of the root. The red-brown aq. filtrate after concn. to a sirup was completely sol. in cold 95% EtOH. After evapn. *in vacuo* this was extd. with boiling EtOAc, which gave a red-brown soln. (III) and a yellow-brown residue (IV). I contained fats and cholesterol, II resins insol. in H_2O , III the greater part of the glucosides and IV the sugars. Sapon. of I with alc. KOH and extn. with Et $_2$ O after removal of EtOH and diln. with H_2O gave a wax which crystd. in silky needles from abs.

EtOH, m. 142–3°, insol. in H₂O and sol. in CHCl₃, CS₂, C₆H₆, petr.-ether, vegetable oils and glycerol, giving positive Liebermann-Burchard (cf. *Ber.* 18 (1875) and Sal-kowski (*Z. anal. Chem.* 11, 44) reactions, $[\alpha]_D^{20}$ –29.4° (in CHCl₃), the m. p. and rotation values approaching the gentiosterine of Tanret. **III** after evapn. *in vacuo* deposited a cryst. product (V), leaving a liquid insol. in EtOH (VI). Analysis and various reactions proved V to be gentiopierin, which was further confirmed by hydrolysis to be gentiogenine and glucose. Extn. of the mother-liquor of the gentiopierin, crystn. by abs. EtOH, pptn. as tannate in satd. MgSO₄ soln., the ppt. decompd. by Ca(OH)₂ and crystd. from boiling abs. EtOH gave gentimarine (cf. Tanret, *loc. cit.*) blackens FeCl₃ and reduces Fehling soln. From the EtOAc mother liquor gentine was also recovered (also discovered by Tanret), in 274–5°, $[\alpha]_D^{20}$ + 33.93°, turned FeCl₃ green-black, sol. in cold HNO₃ with green color which became yellow orange with excess KOH, reduced Fehling soln. **VI** was evapd. *in vacuo*, extd. successively with petr.-ether, Et₂O, CHCl₃, H₂O and EtOH. Petr.-ether yielded traces of gentiosterine and fats; Et₂O and CHCl₃ each extd. gentine which was pptd. by petr.-ether; H₂O pptd. more resins and finally EtOH extd. more gentine. The latter was a S-yellow color, giving silky hygroscopic needles from 95% EtOH, m. 266.7°, almost insol. in Et₂O or H₂O, extremely sol. in concd. EtOH, in cold alkalis (lemon yellow color), in H₂SO₄ (yellow-orange color), and in hot HNO₃ (green color changing to chrome yellow), turned FeCl₃ a green color. **IV** on evapn. and extn. with boiling 95% EtOH and digestion for 8 days and further extn. with EtOH gave gentianose, m. 207–9°, $[\alpha]_D^{20}$ 31.74°. The EtOH mother liquors yielded sucrose. Steam distn. of fresh root gave 1% of a yellow-brown oil with an unpleasant odor somewhat like cinnamon oil, which on continued breathing produced nausea (cf. Planché, *Bull. pharm.* 6, 551(1814)). The high % of extractives and of gentiopierin and gentialtheisides, and their ease of extn. by this new procedure suggest the possible *economic value of this root in medicine*. Forty-four references to similar work, many of them old, are included.

C. C. DAVIS

Odor and chemical constitution in the benzothiazole group. M. T. BOGERT and ARTHUR STULL. *Am. Perfumer* 20, 453(1925) — Unoxidized org. S. compds. sufficiently volatile to have any odor at all almost invariably possess a disagreeable one. An exception to this apparent rule is seen in 2-phenylbenzothiazole or "Rosenkörper" of Hofmann. A similar odor is noted in compds. arising from the replacement of the 2-phenyl group by 2-*p*-tolyl, α -furyl or α -thienyl. All 3 melt within a range of 15° and possess the characteristic tea rose or geranium-like odor in greater or less degree. The introduction of vanillyl and piperonyl leads to compds. having a very weak sweet odor recalling faintly that of the initial aldehydes. *p*-Phenylenebisbenzothiazole is, on the other hand, practically odorless.

W. O. F.

Phytochemical notes. 1. ROSENTHALER *Arch. Pharm.* 263, 561–3(1925) — 1. Mannitol in jalap root. An aq. ext. of the coarsely powd. root was definitely shown to contain mannitol in relatively small quantity. 2. Sucrose in belladonna root. An alc. ext. of the root yielded sucrose m. 185–6° and $[\alpha]_D$ 66.5°. 3. Glucoside of HCN from the bark of *Pirus aucuparia* Gärtner. Bark from the trunk contg. 30.7 mg. % HCN yielded on extn. with EtOAc and CHCl₃ too few crystals for the exact recognition of the glucoside, but the mother liquor therefrom has the enzymic index *via* Bourquelot of 560, a value corresponding fairly well with that for mandelonitrile glucoside, namely 517. This view was confirmed by isolation of *l*-mandelic acid from a portion of the mother liquor after treatment with fuming HCl. 4. Occurrence of HCN glucoside in *Achillea millefolium* L. The presence of a glucoside of BzH.HCN was shown, but its exact nature was not detd. 5. Occurrence of HCN in *Chloris petraea*. The presence of HCN, as also of AcMe, was shown in this South African grass.

W. O. F.

Essential oil of manuka (*Leptospermum scoparium*). ROY GARDNER *J. Soc. Chem. Ind.* 44, 528–30T(1925) — The av. yield of oil from the leaves and twigs grown in N. Zealand was 0.4%. The approx. compn. is considered to be leptospermol 3%, terpene 1%, citronellyl cinnamate 6%, acetate, butyrate, etc., of (?) sesquiterpene alc. 14.5%, non-volatile matter 5%, sesquiterpene (by difference) 70.5%. Leptospermol is shown to be a monobasic acid. The sesquiterpene resembles eudesmene in phys. characters and color tests, but gives only a monohydrochloride, whereas eudesmene yields a dihydrochloride.

W. O. F.

Japanese mint oil. W. H. SIMMONS. *Perfumery Essent. Oil Rec.* 16, 378(1925). — Considerable variation exists in the quality of Japanese dementholized mint oil not only between different brands but also between different shipments of the same brand, as much as 7 or 8% being observed. Generally speaking, it is found that as the d. goes

down so the total menthol content falls, a d. much under 0.900 almost invariably corresponding with a menthol content under 50%. The optical rotation of these oils rarely falls below -27° . Adulteration of Japanese mint oil is again rife, a particularly bad example contg. up to 45% petroleum.

Vetivert oil. ANON. *Perfumery Essent. (Oil Rec. 16, 371-2(1925).*—Among the factors considered are cultivation of the grass, extn. of the oil, yield and quality of the oil and phys. characters. A sample of the Java-grown product had d_{15}^{20} 1.017, $[\alpha]_D^{20}$ $42^\circ(?)$, n_{20} 1.524, acid no. 16, ester no. 14, soly. in 80% alc. 1:1. The best vetivert oil of Java has a clear tea color and sweet aroma slightly resembling sandalwood.

Examination of quinine salts for secondary alkaloids. A. DEER, JR. *Pharm. Monatshefte 6, 185-7(1925).*—A simplification of the Ger. Pharm. procedure was notably for quinine sulfate, as follows: In a 100 cc. Erlenmeyer flask dissolve 1 g. of the sample in 40 cc. of H_2O by boiling, close with a stopper and cool quickly with vigorous shaking, then after the addn. of 5 g. of K_2SO_4 shake often for a half hour at 20° (in a H_2O bath), filter through a pledget of cotton, transfer a 20 cc. aliquot of the filtrate to a dry beaker, add 5 cc. of H_2O and 1 drop of 20% NaOH soln. Neither immediately nor later should any turbidity or ppt. appear.

Lemon oil. A. GAWALOWSKI *Pharm. Monatshefte 6, 188(1925).*—Lemon oil contains as its main component (about 90% and more) limonene, citral (about 6%) and in addn. camphene, terpinene, sesquiterpene, terpineol, geraniol, etc. The varying d. (0.857 to 0.863) and m. p. (around 20°), notably also the optical activity (between 57° and 65°), are characteristic of different lemon oils. In this connection attention is directed to eucalyptus and camphor oils (notably their constituents and phys. properties) on account of certain relationships to the possible use of lemon and eucalyptus oils as raw materials in camphor synthesis.

Strontian as reagent for arsphenamine and neoarsphenamine. ALFRED HIRSCH. *Pharm. Ztg 70, 1703(1925).*—A reply to criticisms of Kollé, Bauer and Leupold (cf. C. A. 20, 261).

Decomposability of atropine sulfate. J. BODNAR AND JOHANN FERENCZY. *Arch. Pharm. 263, 566 70(1925).*—Examn. of the aurates and platinites resulting from the treatment of atropine sulfate in aq. soln. indicates a decompn. of this salt to some extent into tropine sulfate and tropic acid, a fact worthy of consideration in applying sterilized atropine sulfate in pharmacol. practice. Atropine nitrate and phosphate are stable under like treatment.

Oleum ferratum concentratum. ERIC WINBERG. *Pharm. Zentralhalle 66, 783-5(1925).*—A procedure is outlined for the prepn. of this product, official in several foreign pharmacopœias, and also a method for detg. the Fe component.

A study of the extraction of opium alkaloids. M. GRABOWSKA AND ST. WEIL. *Bull. trav. inst. pharm. Etat No. 2, 3-36(1925)* (In Polish).—Unripe, unscarified poppy heads were dried at room temp., ground and percolated with 70% alc. contg. AcOH. The percolate was concd. at $47-49^\circ$ and the alkaloids were isolated by the usual methods. The temp. never exceeded 49° . One kg. poppy heads dried at 100° yielded 0.8078 g. morphine and 1.027-1.3403 g. of the other alkaloids, while their proportion was found by other authors to be 1:0.5 to 1:0.9. The authors assume that the original content of the various alkaloids or their mother substances is altered by the action of enzymes and chemicals during storage and extn. The yields obtained by this procedure are not satisfactory, but do not discourage further work on the utilization of the European poppy.

Preparation of iodized oil with 10, 20 and 25% of iodine. MARIA CLOTILDE BIANCHI. *Giorn. farm. chim. 74, 249-51(1925).*—The reaction product of 20 g. I with 30 cc. eucalyptus oil is heated 30 min. in the autoclave to 120° with 180 g. almond or sesame oil. The reddish yellow oil, d_4^{20} 0.980-0.985, contains 10% I and 13.95% eucalyptol. It is perfectly stable and can be given orally or subcutaneously without any ill effect. 20-25% I may be introduced by means of a corresponding quantity of eucalyptol.

Application of fluorescence to chemistry, pharmacy and biology (FABRE) 3. Cr soap (U. S. pat. 1,567,049) 27.

The Pharmacopeia of the United States. 10th Decennial Revision. Prepared by Comm. of Revision and published by the Board of Trustees. Philadelphia and London: J. B. Lippincott Co. 626 pp. \$4.00 (20s.).

POUCHER, W. A.: *Perfumes, Cosmetics and Soaps, with Special Reference to Synthetics. Vol. I. Dictionary of Raw Materials.* 2nd ed. revised. London: Chapman & Hall, Ltd. 304 pp. 16s. Reviewed in *Perfumery Essent. Oil Record* **16**, 417(1925).

WAGNER, ALFRED: *The Volatile Oils.* Leipzig: Max Jancke. 206 pp. M. 7.35. Reviewed in *Perfumery Essent. Oil Record* **16**, 418(1925).

Formamide. R. WIETZEL. U. S. 1,567,312, Dec. 29. An alkyl formate, *e. g.*, Me formate, is treated with NH_3 under pressure to produce formamide.

Vaccines. E. TOENNIESSEN. Brit. 233,377, Nov. 14, 1923. See U. S. 1,514,681 (C. A. **19**, 153).

Remedy for pyorrhea. C. W. MONROE. U. S. 1,567,971, Dec. 29. The gums and affected parts are treated with a soln. contg. NaI and pepsin or a similar enzyme.

Remedy for hemorrhoids. J. KATO. U. S. 1,567,847, Dec. 29. An elec. colloid of metallic Mg is mixed with glycerol, olive oil, liquid paraffin or other inert innocuous oily liquid.

Curing tobacco. A. C. BUENSOD. U. S. 1,568,316, Jan. 5. Tobacco, arranged in rows, is treated with currents of air of a temp. of $35-43^\circ$ and a relative humidity of 70-75% until substantially all the food in the tobacco cells has been consumed. Cf. C. A. **19**, 2390

18 -ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Methods for making sulfuric acid. ANON. *Chem. Eng. Mining Rev.* **18**, 11-3 (1925).—An elementary article describing acid plants of Central Mine and Broken Hill Proprietary Mine, Australia. F. C. Z.

Metallic corrosion in concentrated phosphoric acid. FULLER CLARKSON and H. C. HETHERINGTON. *Chem. Met. Eng.* **32**, 811(1925).—Tests of Pb, Duriron, Monel metal, tank-car steel and Al in concd. cold H_3PO_4 and concd. hot $(\text{NH}_4)_3\text{PO}_4$ show that the manuf. of ammonium phosphate can be carried out in a lead-lined wooden tank, with an NH_3 inlet pipe of Monel metal. Tanks and tank cars should be lead-lined, or wood.

E. L. CHAPPELL

Utilization of sulfate obtained as by-product in the manufacture of dichromate. N. F. YUSHKEVICH and I. N. SHOKIN. *J. Chem. Ind. (Russia)* **1**, 33-5(May-June, 1925).—In the manuf. of $\text{Na}_2\text{Cr}_2\text{O}_7$ by reaction of Na_2CrO_4 with H_2SO_4 , anhyd. Na_2SO_4 obtained as a by-product is contaminated with $\text{Na}_2\text{Cr}_2\text{O}_7$ and hence cannot be used. The authors undertook to find a means of purifying this product for glass manufacture. They found that on passing SO_2 through an aqueous soln. of the impure sulfate, the dichromate is reduced thus: $\text{Na}_2\text{Cr}_2\text{O}_7 + 4\text{SO}_2 = \text{Cr}_2(\text{SO}_4)_3 + \text{Na}_2\text{SO}_3$. By subsequent treatment with NaOH , Cr is pptd. and can be filtered off and utilized. Na_2SO_4 remaining in the soln. is sufficiently pure to be used in the glass industry. B. NELSON

Utilizing carbide residue. J. J. MURPHY. *Chem. Met. Eng.* **32**, 800(1925).—Residues from C_2H_2 generators have been used successfully for making lime mortars, causticizing soda liquors, making bleach, in beet sugar defecation, etc. Only when large quantities of the residues are available does it pay to dry and ship the $\text{Ca}(\text{OH})_2$ any great distance. Local markets, however, can usually take all residues produced.

W. C. EBAUGH

Carbon tetrachloride as a fire-extinguishing agent. J. VOIGT. *Chem.-Ztg.* **49**, 937(1925).—V. regrets the propaganda against CCl_4 which has been based on its tendency to form COCl_2 under conditions of use, since this is seldom dangerous under existing conditions, and suggests counter-propaganda.

WM. B. PLUMMER

A modern English lime works. R. P. BROWN. *Rock Products* **28**, No. 25, 29-34 (1925).

RAYMOND WILSON

Carbon monoxide in lime-kiln gases. P. G. GALABUTSKI. *Zapiski* **1924**, 15; *Centr. Zuckerind.* **33**, 1477-8(1925).—A discussion of the reactions by which CO may be formed in the lime kiln. For a kiln burning 50,000 kg. stone per day with a coke consumption of 5000 kg. 1% CO in the gas means a coke consumption of 5500 kg. per day.

W. L. BADGER

Storage and transportation of bromine in metal containers. L. HACKSPILL and RUFFIN. *Chimie et industrie Special No.*, 326-7(Sept., 1925).—Pure dry Br (b. 59°) slightly attacks mild steel (0.12% C) and electrolytic Fe to form a thin film of FeBr_3 ,

which protects the metal against further attack. Pure Br vapor has a similar but much slower action. Of the impurities generally present in Br, C has no action, H_2O causes the formation of a hydrated bromide which does not adhere to the metal, and H_2SO_4 dissolves the $FeBr_3$ to form $Fe_2(SO_4)_3$. Zn is attacked even less than Fe, probably because the $ZnBr_2$ film is more adherent and less porous. H_2O can be removed from Br by Fe filings, which react to form hydrated $FeBr_3$, from which the Br is subsequently recovered. Storage and transportation of Br in Fe might be inadvisable when the Br is to be used in the prepn. of certain org. compds. in which a trace of Fe can be harmful.

A. PAPINEAU-COUTURE

X-ray examination of some NH_3 catalysts (WYCKOFF, CRITTENDEN) 2. S from sulfide ores (U. S. pat. 1,567,916) **9.** Apparatus for producing hypochlorites (Brit. pat. 233,490) **1.** Hydrocarbons and cyanides (U. S. pat. 1,567,241) **21.**

PARTINGTON, J. R.: **The Alkali Industry.** 2nd ed. revised and enlarged. London: Baillière, Tindall & Cox. 344 pp. 12s. 6d. Reviewed in *Ind. Chemist* **1**, 502; *Chem. Age* **13**, 493 (1925).

Concentrating dilute nitrous gases. NORSK HYDRO-ELEKTRISK KVAELSTOF-AKTIESELSKAP. Norw. 41,742, Aug. 17, 1925; Brit. 231,078, May 15, 1924. The gases are absorbed in a soln. of alkali phosphate. The resulting salt mixt. is heated to such a high temp. that the N is sepd. in the form of nitrous gases with regeneration of the alkali phosphate.

Hydrocyanic acid and cyanides. BADISCHE ANILIN & SODA FABRIK. Brit. 233,080, Feb. 19, 1924. HCN is formed by passing formamide or NH_4 formate or their mixt. with a diluent gas over dehydration catalysts (other than those described in Brit. 220,771; C. A. **19**, 707). Bauxite poor in Fe or a product prepd. by applying a paste of Mn carbonate to granulated bauxite and reducing with H or CH_3OH vapor may be used as the catalyst. NH_4 may be used with the reaction mixt. to form NH_4CN and production of other cyanides also is described.

Evaporating to dryness solutions of alkali cyanides. STOCKHOLMS SUPERFOSFATFABRIKS A.-B. Swed. 59,652, Oct. 21, 1925. The soln. is subjected to a sudden evapn. in finely divided state *in vacuo* at a temp. above the sapon. temp. of the alkali cyanides; they are thus obtained free from water of crystn.

Removing free carbon from commercial cyanamide and other metal cyanamides and cyanides. STOCKHOLMS SUPERFOSFATFABRIKS A.-B. Swed. 58,560, April 15, 1925. The materials are at normal, reduced or increased pressure subjected to the action of oxygen or air preferably mixed with other gases inert to C, at such a temp. that the C is oxidized while the N compds. are chiefly left intact.

Ammonia synthesis. I. CASALE. Brit. 233,040, Jan. 31, 1924. In NH_3 synthesis, electrolytically obtained O is used, alone or mixed with air, for the gasification of fuel, and, in admixt. with air, for the combustion of the gaseous products, to yield a gas which, after removal of CO_2 consists of N.

Basic lead sulfate. EAGLE PITCHER LEAD CO. Brit. 233,188, June 26, 1924. Molten Pb (preferably free from Zn) is atomized together with compressed air and gas or other fuel so that a long flame is formed. SO_2 is admitted to the flame and the compn. of the basic Pb sulfate produced is regulated by controlling the proportion of the SO_2 .

Soluble alkali silicates. NORSK HYDRO-ELEKTRISK KVAELSTOF-AKTIESELSKAP. Norw. 41,452, June 15, 1925. Compds. of alkali, N and O are mixed with hydrated SiO_2 and heated to a temp. below the m. p. of the mass.

Anhydrous magnesium chloride. P. COTTRINGER and W. R. COLLINGS. U. S. 1,567,317, Dec. 29, 1925. A film of $MgCl_2 \cdot 6H_2O$ soln. is heated on the surface of a rotating drum which is interiorly heated and the film on opposite sides of the drum is exposed to currents of combustion gases of different temps. After drying, the film is removed from the drum. Cf. C. A. **20**, 97.

Aluminium sulfate. R. MOLDENKE and W. SCHUMACHER. U. S. 1,567,610, Dec. 29, 1925. Bauxite, kaolin, clay or other suitable aluminous material is exposed while heated, to the action of H_2SO_4 vapors, and air is introduced to oxidize the Fe in the material so that it will not be appreciably acted on by the H_2SO_4 .

Sodium thiosulfate. F. RUSBERG. U. S. 1,567,755, Dec. 29, 1925. A soln. contg. Na sulfide and Na sulfite is treated with a gas contg. 32% SO_2 by vol.

Granulating sodium sulfide, bisulfate, etc. CHEMISCHE FABRIKEN KUNHEIM & Co., A.-G. Brit. 233,316, May 1, 1924. Substances such as Na sulfide, $NaHSO_4$ or caustic alkalies are allowed to fall as molten drops on to surfaces (of metal, ebonite,

celluloid, etc., treated with vaseline to prevent adhesion) maintained below the m. p. of the substance.

Aluminium chloride. G. L. PRICHARD and H. HENDERSON. U. S. 1,568,181, Jan. 5. A mixt. comprising bauxite and coke or other aluminous material and C is tumbled down a reaction zone, *e. g.* in a vertical, baffled heating chamber, and Cl is passed in counter-current contact with the mixt. to form AlCl_3 , which is removed from the reaction zone in vapor form and condensed. Cf. *C. A.* 19, 707.

Recovery of aluminium chloride from oily residues. A. M. McAFEE. U. S. 1,568,171, Jan. 5. Oily residues contg. AlCl_3 are heated sufficiently to volatilize the AlCl_3 and a "minimal" partial pressure of AlCl_3 vapors in contact with the residue is maintained. Cf. *C. A.* 19, 726, 1773.

Separating potassium compounds from aluminium compounds. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norw. 41,581, July 6, 1925. The substances are converted into nitrates and these are treated with HNO_3 . KNO_3 is dissolved but only very little of the $\text{Al}(\text{NO}_3)_3$.

Manufacture of phosphorus and aluminates or alumina. E. COLLETT. Norw. 41,453, June 15, 1925. Raw phosphates are heated with carbon. To bind the CaO present in the raw phosphate materials contg. Al_2O_3 are added, such as bauxite, China clay, common clay or similar substance. The aluminate produced can be worked to alumina.

Apparatus for production of hypochlorites and chlorates. M. WILDERMAN. U. S. 1,568,787, Jan. 5.

Removing sulfur from gas. J. W. COBB and H. J. HODSMAN. Brit. 233,011, Jan. 4, 1924. Partial removal of H_2S from gas is effected by passing the gas (contg. sufficient O) over hot Fe oxide or the like, maintained at a temp. sufficiently high that free S is carried along by the gas, and NH_3 is utilized to remove any SO_2 formed. Residual H_2S may be removed by a cold oxide purifier.

Decolorizing carbon. SVENSKA SOCKERFABRIKS A.-B. Swed. 59,741, Oct. 27, 1925. Org. substances are carbonized in the presence of water-absorbing salts, acids or bases with positive heat of soln. The water-absorbing substance is produced during the carbonization process by smelting or by distn. In the former case the materials are preferably distributed in a thin layer on wire netting or other perforated support in order that the salts, etc., can easily run off.

Polymerized styrene and its homologs. NAUGATUCK CHEMICAL CO. Brit. 233,649, May 7, 1924. A vitreous product which can be cut with a knife is prepd. by polymerizing a mixt. contg. styrene or its homologs to obtain the ordinary resinous polymerization product, depolymerizing this product by dry distn., purifying the product and again polymerizing. A homogeneous mass of polymerized styrene or its homologs is obtained by adding styrene or its homologs to a mass of pieces or powder of the polymer and polymerizing by heating to 180° for 3 hrs. (or for a shorter time under pressure). A powd. polymerized product may be obtained by emulsifying styrene or its homologs with NH_3 soln. and oleic, stearic, palmitic or similar acids. The emulsion is heated to 140° for 12-24 hrs. and may be mixed with gelatin, gum arabic, agar agar, starch, etc. The polymerized product is pptd. by the addn. of MeOH, EtOH, acetone, H_2SO_4 , HOAc, BaCl_2 or any agent which coagulates rubber latex. The product is dried and may be mixed with pigments such as ZnO , CdS or HgS and compressed in a mold.

Tightening and filling composition. M. PERSSON. Swed. 58,819, June 3, 1925. Glue is dissolved in water or milk with a small addn. of AcOH. To the soln. are added mineral and metal salts which form crystals contg. water of crystn. A drying oil is added to the mixt. and pulverized wood and stone to a thick paste and finally MgO and optionally some pigment; the mass is worked to a homogeneous mixt.

Molding sawdust, waste paper, paper pulp, asbestos waste, etc., under heat and pressure. N. C. F. JENSEN. Brit. 233,026, Jan. 28, 1924. Only small quantities of binder (*e. g.* shellac 1-2 1/2%) are used.

Cleaning condensers, pipe systems and radiators. S. GARBARINO. Brit. 233,632, Jan. 21, 1925. Incrustation deposits are removed by use of a soln. formed of H_2O 86.5, HCl 12, CuSO_4 1 and a 25% Na_2SO_4 or NaHSO_4 soln. 1/2 part.

Enamel-cleaning composition. C. W. DRES. U. S. 1,568,323, Jan. 5. HOAc 5, "ammonia" 12.5, pulverized rotten stone 25 and H_2O 57.5%.

Imitation horn. INTERNATIONALE GALALITH-GESELLSCHAFT. Hoff & Co. Brit. 233,181, June 19, 1924. Small quantities of alkylated amines, balsams or other fat solvents which are not readily volatilized are added as clarifying agents to casein compns. which are moistened with a small quantity of aq. liquid and molded under heat and pressure.

Detergent. B. L. BLATT. U. S. 1,567,902, Dec. 29. A compn. for cleaning and "renovating" painted or varnished surfaces comprises Na phosphate 30, Na borate 68 and glue 2%.

Detergent. C. H. EMARY. Brit. 233,280, Jan. 28, 1925. A compn. for cleaning and polishing metals, painted or varnished surfaces, etc., is prepd. by mixing powd. KOH and $(\text{NH}_4)_2\text{CO}_3$ with cold palm oil.

Combined lime-kiln and gas-producer operation. BRITISH AND FOREIGN LIME & POWER CORPORATION, LTD. and T. A. REID. Brit. 233,137, May 3, 1924. In a plant for the production of gaseous fuel from lime-kiln gases, in which a lime kiln burning limestone, dolomite or magnesite is worked in connection with 2 gas producers (each operated alternately as a producer and as a converter for transforming CO_2 into CO), the hot gases from the producer acting as a converter are passed through a retort contg. bituminous coal or other carbonaceous material.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

Formation of mullite from cyanite, andalusite and sillimanite. J. W. GREIG. *Am. J. Sci.* [5] 11, 1-26 (1926) - See *C. A.* 19, 3151. H. G.

Life of blast furnace linings. M. C. BOOZE. *Iron Age* 116, 1446 (1925). - Changes in operating conditions such as the liberal use of cooling plates generally lengthen the service of silica brick and other refractories for blast furnaces and coke ovens. Red or brownish spots in silica bricks may be burned out under proper atm. conditions.

W. H. BOYNTON.

The plasticity of clay (BANCROFT, JENKS) 2.

Glasses and enamels. GENERAL ELECTRIC CO., LTD. Brit. 233,295, Oct. 14, 1924. The glasses and enamels described in Brit. 223,837 (*C. A.* 19, 1183) are made more resistant to chem. action by increasing the SiO_2 content. The B_2O_3 content is decreased at the same time, to maintain the desired low m. p., and the alk. oxides are preferably replaced in part at least by other oxides such as those of Zn, Mg, Ca, Ba or Li which reduce the coeff. of expansion. The products may comprise: PbO 1, ZnO (or Al_2O_3 , CaO , MgO or BaO) 0.04-0.15, SiO_2 0.3-0.6, Li_2O (or Na_2O or K_2O) 0.04-0.15, Ba_2O_3 0.23-0.35 and coloring oxide 0-0.1 parts. Fluorides such as CaF_2 may be used for producing opaque enamels and refractory oxides and salts of metals may be added.

Furnace for annealing glassware. P. Q. WILLIAMS. Brit. 233,402, Feb. 4, 1924.

Gas-fired recuperative glass furnace with two separate melting chambers in alternating use. O. E. W. WIDLUND. Swed. 59,562, Sept. 30, 1925.

"Modeling clay." E. E. SNOOK. U. S. 1,568,098, Jan. 5. A modeling compn. comprises gelatin glue 8 oz., H_2O 11.5 oz., boiled linseed oil 8 oz., "titanox" 1 lb., bolted whiting 6 lbs., 1 oz., chrome yellow 3 oz. and Me salicylate $\frac{1}{2}$ oz.

"Antislip" tile. F. J. TONE. U. S. 1,567,091, Dec. 29. The tread surface of a burned tile is formed with embedded clusters of abrasive grains, previously bonded by ceramic material, e. g., feldspar and kaolin, fired at 1350° .

Molding press for manufacturing bricks of a porous structure, especially from blast-furnace slag. AKTIEBOLAGET ARCUS. Swed. 59,696, Oct. 13, 1925.

Kiln for burning brick, pottery, etc. W. SIMKIN and E. EVANS (trading as PERFECT KILN Co.). Brit. 233,033, Jan. 30, 1924. •

Porcelain crucible. A. KÖNIG. U. S. 1,567,654, Dec. 29. The bottoms of porcelain crucibles are formed from finely porous material which is melted together with the porcelain and serves to produce a bottom adapted for filtration in chem. analysis.

Refractory material. S. J. LUBOWSKY. U. S. 1,567,445, Dec. 29. Calcined rutile with its particles sintered together is used for making bricks, muffles, crucibles or other refractory chemical-resisting articles.

Crystalline alumina for use as an abrasive. C. J. BROCKBANK. U. S. 1,568,873, Jan. 5. An aluminous ore such as bauxite is fused with a reducing agent, e. g., coke and Fe, and H_3BO_3 and the fused Al_2O_3 is sepd. from the reduction products.

Abrasive disks. H. C. MARTIN. U. S. 1,567,071, Dec. 29. Grains of abrasive material are mixed with shellac in the proportions of about 9:1, the mixt. is spread in a mold upon a backing such as cloth or paper and the material is heated and compressed

to effect agglomeration but leave a porosity of at least about 30% and then baked. Cf. C. A. 19, 1763.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Modern quick-hardening cements. C. T. STEPHENS. *Commonwealth Engineer* 13, 89-91 (1925).—S. gives a short general discussion of high-alumina cements and rapid-hardening port. cements. Differences in compn., manuf. and strength of resulting products are stated. A few estimates upon cost and some information concerning the use of these products in buildings, roads and concrete pipes, are included. L. B. M.

Results of tests with alcement Lafarge. A. P. R. LUND. *Teknisk Ukeblad* 72, 324-7, 335-40, 350-2 (1925).—Alcement, manuf. by the S. t. c. A. me des Chaux & Ciments de Lafarge et du Teil, France, had the following compn.: SiO_2 8.68, insol. 3.49, Al_2O_3 and TiO_2 41.53, FeO 6.38, CaO 40.96, MgO 0.69, SO_3 0.07, hygroscopic water 0.05, and increase in wt. on ignition 0.44%. It was compared with a portland cement of normal compn. The setting properties of the alcement were normal. Notwithstanding an increase in temp. of 15° the setting time was not reduced noticeably even with an initial temp. of water and air of 25° or even 30° . The soundness was satisfactory. The hardening of the alcement was extremely quick. The major part of the ultimate strength was reached in 24 hrs. After 28 days the tensile strengths of the two sand mortars were nearly alike, only with a 10% difference in favor of the alcement, but the crushing strength of the latter was nearly twice that of the portland cement mortar. In concrete the superiority in crushing strength of the alcement was still greater. Humic acids in the sand have only a small influence upon the quality of this mortar. It was very resistant to fire and frost, but less so to rapid cooling in water from a temp. of 1100° . Alcement mortars showed slightly greater resistance to wear. Large test specimens of concrete and reinforced concrete from the two cements all proved great and general superiority of the alcement. C. A. ROBARK

Plastic magnesia. O. C. RALSTON, R. D. PIKE, AND L. H. DUSCHAK. *Bur. Mines, Bull.* 236, 107 pp (1925). Plastic magnesia is defined as a caustic magnesia adaptable to forming Mg oxychloride cement when mixed with a MgCl_2 soln. of proper consistency. Full discussion includes: the constitution of Mg cements, the rate of thermal decompn. of natural MgCO_3 and CaCO_3 , calcination of magnesite for plastic magnesia, methods of judging the quality, recarbonating free lime in burnt magnesia and dolomite, the effect of exposure on plastic magnesia, and the behavior of SiO_2 during the burning of magnesia. W. H. BOYNTON

Jointless (magnesium oxychloride) floors. P. W. BARNETT AND B. BAKEWELL. *Dept. Sci. Ind. Res. Building Res., Bull. No. 1*, 26 pp (1925).—The use of Mg oxychloride cements in flooring compns. is discussed. A description of the constituent materials, methods of mixing and laying, and specifications, is given. A new oxychloride cement is described in which FeCl_2 is substituted for MgCl_2 . This cement is less corrosive than the magnesia-magnesium chloride cements. L. B. M.

Copper as a building material. ANON. *Apparatebau* 37, 326-7 (1925).—Its suitability for roofing is stressed. J. H. MOORE

Use of slag accumulations in industry. KURT ELLERSIEK. *Feuerungstechnik* 13, 245-8 (1925).—To utilize the slag from blast furnaces, cupolas, or furnaces as a building material, in Germany the slag is often ground fine, mixed with water and powd. CaO , pressed, and hardened in steam under pressure, as in the sand-lime brick process. By a new process not yet perfected, a sufficiently basic slag may be used without CaO , the pressed brick being exposed to gases contg. CO_2 , such as blast-furnace gas. E. W. T.

A new impregnating process for mine timbers. E. R. BESEMFELDER. *Braunkohle* 24, 778-82 (1925).—All operations are carried out in a cylinder jacketed for steam heating and for cooling. After charging and heating up, all H_2O is removed from the wood by passing through the cylinder the vapors of an org. liquid such as C_6H_6 , CHCl_3 , CCl_4 , etc.; when H_2O is no longer present in the condensate (from the condenser attached to the cylinder), the cylinder is closed off and cooled; this produces a vacuum within the cells of the wood (which is still warm), while most of the org. liquid condenses on the cold cylinder walls, collects at the bottom, and is pumped out. The cylinder still being under some vacuum, the impregnating fluid is slowly introduced until no more is taken up; this fluid may consist of crude paraffin or montan wax dissolved in some org. liquid. After draining out the excess the cylinder is again heated and steam is passed through

until the solvent used for the impregnating agent has been completely removed and recovered, leaving the wood impregnated throughout with the solid paraffin, etc.

WM. B. PLUMMER

Notes on the antiseptic treatment of Assam timbers for railway sleepers. J. H. WARR AND S. KAMESAM. *Indian Forest Records* 11, 283-388(1925).—To det. the relative economic cost of treatment with various antiseptics, batches of sleepers of 7 different tree species were treated with pure coal-tar creosote, and mixts. of the latter with petroleum, analyses of which are given in the appendix. The method and cost of treatment, the conclusions drawn from the exptl. findings as also the recommendations made are given in detail.

W. O. E.

Determining the penetration of metallic salts in treated wood by means of Röntgen rays. CARL SCHANTZ. *Z. angew. Chem.* 38, 1014 5(1925).—S. takes exception to Moll's conclusions (cf. *C. A.* 19, 3578), claiming that with wood sections 200 mm. and over X-rays will show HgCl_2 penetration beyond the limits shown by the $(\text{NH}_4)_2\text{S}$ stain test.

ALFRED L. KAMMERER

Reducing ores and producing cement (U. S. pat. 1,567,934) 9.

Aluminous cement. U. B. VOISIN. Brit. 233,698, May 6, 1924. Equal vols. of medium hydraulic lime or limestone and bauxite are ground, mixed, briquetted and burnt at 1200-1500° for 12 hrs. to obtain a hard-grinding black clinker which after grinding sets in 2-3 hrs. By employing fat lime and slowing down the burning, a cement is obtained which sets almost immediately.

"Antislip" surface. F. J. TONE and M. L. HARTMANN. U. S. 1,567,772, Dec. 29. Grains of SiC_2 , cryst. Al_2O_3 or other abrasive material for "antislip" floor or tread surfaces are provided with a roughening coating, e. g., of ceramic material or cement.

Imitation marble, etc. MARYLE PRODUCTS, LTD AND A. N. SVANDALSFLONA. Brit. 233,446, Feb. 14, 1924. A thin coating of a mixt. of cement, dissolved casein and H_2O is applied to a smooth, polished or other molding surface and a backing layer of similar compn. admixed with sand or other filler is applied.

Light insulating material for use in building construction. P. MARPILLERO, L. LORENZETTI and I. MARZOLA. U. S. 1,567,663, Dec. 29. Straw, bagasse, wood shavings or other fibrous vegetable material is treated with a soln. of a Mg salt or Na silicate or other fireproofing substance, mixed while still damp with MgO and port. cement or other cementitious material, and allowed to set in molds without compression.

Impregnating wood. AKTIEBOLAGET FURNOS. Swed. 59,162, July 29, 1925. The impregnating agent is applied in exceedingly high dispersion through a spreader with flat slit.

Wood-impregnating agent. SLIPERS AKTIEBOLAGET. Swed. 59,082, July 15, 1925. Non-viscous resin alone or together with peat or wood tar is dissolved in non-viscous mineral oils or hydrocarbons of high b. p.

Apparatus for impregnating wooden articles. J. V. HOLMER. Swed. 59,455, Sept. 16, 1925. The materials resting upon a belt conveyor pass by a spraying mechanism through which the impregnating agent is applied. By means of an automatic opening and stopping device the spreader is kept in function only during the passage of wood to be treated.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Sardinian fuels, with special reference to the fuels of the Gonnesa basin (Iglesias). R. BINAGHI AND D. ROMOLI-VENTURI. *Ann. chim. applicata* 15, 397-410(1925); cf. *Resoc. Assoc. Min. Sarda* 30, Mar. 3, 1925.—Expts. both on a lab. and on an industrial scale showed that the coal of the Gonnesa basin can be subjected to low-temp. distn. with high yields and economical utilization of all by-products. Different methods from those of Levi and Padovani (*C. A.* 19, 2265) must, however, be employed, for the results in their case were less successful with the same fuel. By low-temp. distn. with catalytic decompn. of the tar and compression of the gas, it was possible to obtain a high yield of excellent primary tar and a coke completely agglomerated, of normal calorific power, contg. 21.5% ash and 6.5% S (mostly incombustible). These promising results agree with those just published by Rodriguez (*Resoc. Assoc. Min. Sarda* Apr. 19, 1925). The large scale expts. were carried out by the Benzonaphthene patented

process (no reference) which is continuous and which can be so controlled that relatively const. yields of any desired products can be maintained. The coal analyzed in %: H_2O 5.75, ash 12.25, volatile 23.25, fixed C 58.65, coke 70.90, N 1.80, calorific power 6524, tar 13.57, aq. NH_3 7.03, gas 5.80. On an industrial scale the % yields were: total tar 11, aq. NH_3 6, coke 70, gas 13, petr.-ether (25–90°) 1.1, benzine (35–150°) 2.2, benzine (100–200°) 0.8, lamp oil (130–250°) 2.2, liquid lubricating oil 4.0, thick lubricating oil 0.5. The basin contains approx. 50,000,000 tons of coal (cf. Taricco, *Boll. Geol.* 49, No. 9 (1922–3); *Boll. Assoc. Min.* 6, No. 5–6, 303 (1924); cf. C. A. 18, 3582), and is one of the most important in Italy. Numerous references to old and little known works are included. C. C. DAVIS

Glasgow and solid smokeless fuel. ANON. *Ind. Chemist* 1, 481–8 (1925).—An illustrated article describing the Glasgow Gas Corp'n.'s recently erected plant for making low-temp. coke by the Maclaurin process. Five producers, internally heated, each having a through-put of 20 tons of coal per day are in operation. From 1 long ton of coal in the present small plant the products are 11 cwt. smokeless fuel, 16 imp. gals. of oil, 16 lbs. $(NH_4)_2SO_4$ and 69 therms of gas. F. G. R. ARDAGH

Pulverized fuel in European plants. C. H. S. TUPHOLME. *Power Plant Eng.* 29, 635 (1925).—British and French power plant engineers are finding that good pulverized coal systems approach the maximum efficiency of combustion. K. C. B.

Economizes fuel in tinning. R. A. FISKIE. *Iron Age* 116, 1665–8 (1925).—A saving of 3.52 lbs. (1.6 kg.) of coal per base box of tin plate is effected at the Standard Tin Plate Co., Canonsburg, Pa., by using producer-gas equipment. The quality and quantity are also improved. Coarse coal alone is used. Low velocities are obtained in the gas flues and gas leaks are avoided. The general plan is illus. W. H. B.

Synthetic motor fuels. R. FURNESS. *Ind. Chemist* 1, 475–80 (1925).—From the point of view of cost of production in competition with gasoline as motor fuel, F. discusses at some length the following processes: (1) alc. by fermentation, (2) synthetic CH_3OH , (3) CH_3OH from CH_4 , (4) synthol, (5) synthetic C_6H_6 , (6) synthetic C_2H_5OH from C_2H_4 , (7) the same from carbide. Much information regarding conditions, yields and costs for each of the above is given. Gasoline will continue to dominate the liquid motor fuel market for such time as its present price is maintained. Synthetic CH_3OH and liquid fuels produced by some simple, catalytic gas reactions are its most likely competitors. Fermentation alc., synthetic C_2H_5OH either from C_2H_2 or C_2H_4 , and synthetic C_6H_6 cannot hope to compete with gasoline. F. G. R. ARDAGH

The fuel oil situation as it affects gas company operation in California. W. M. BERRY AND C. C. BROWN. *Ind. Eng. Chem.* 18, 83–4 (1926).—The economic factors affecting the production of oil gas in Calif. and Ore. are discussed. Capital investments to date total over \$152,000,000. The price of the fuel oil (16° to 18° Bé.) has increased from 70¢ to \$1.65 per bbl. in the past 10 years. This is partly offset by recent improvements in gas making: high-grade briquettes made from the C which is a by-product of the oil-gas process and the recovery of benzene from the gas. The perfection of the liquid purification process for removing H_2S and the recovery of the S in a very pure state have permitted the use of higher S oils for gas making. The Calif. utilities companies and the U. S. Bur. Mines have started a cooperative investigation to det. the value for gas-making purposes of the sub-bituminous and lignite coals of N. Calif. and neighboring states. W. W. HODGE

Equilibrium boiling points. W. A. WHATMOUGH. *Ind. Eng. Chem.* 18, 43–5 (1926).—A sketch and description of the equil. b. p. app. are given. The procedure is outlined together with a table of results, tabibus gasoline being used. With rates of distn. from 10 to 45 cc. per min. the observed equil. b. ps. should not vary more than $\pm 1^\circ$. From 250 cc. to 1 l. of the liquid fuels were used for making the detns. Table II gives the equil. b. ps. and approx. percentages Engler fractionation point at equil. b. ps. for 11 gasolines, 5 kerosenes, 6 motor benzenes, and 10 power alcs. and mixts. These data indicate that the 80 to 85% point on the Engler distn. curve is correct as regards equil. b. ps. of kerosenes and American gasolines; the 60 to 70% is more usual for the more volatile gasolines used in the British Isles; the aromatics range from 60 to 85%; azeotropic admixtures contg. alc. show extreme variation between 50 and 90% in a single series. A set of Engler distn. curves of gasoline-alc. mixts. is given and the significance of the general shapes and of the changes in directions of the curves is discussed. U. S. A. cracked distillates and East Indian aromatic fuels ordinarily of little value because not sprayable become equally effective, in a dry gas carburetor, to gasoline at the usual mixt. temps. (40° to 60°) on reducing equil. b. ps. with the aid of alc. W. prefers the actual detn. of equil. b. ps. at approx. atm. pressure to accepting the 85% point on an Engler distn. curve, as the best indication of the manifold distribution

characteristics and guide to the volatility of a fuel under the variable running conditions of a road motor. W. W. HODGE

The adsorption of gas by solid combustibles during drying. R. VONDRÁČEK AND B. HLAVICA. *Bull. soc. chim.* **37**, 1310-20(1925).—Various solid fuels were dried in a U-tube at 105° in currents of various gases, the H₂O evolved being detd. by a CaCl₂ tube. The H₂O recovered (expressed as % of original wt.) minus the observed loss in wt. represents, when positive, an adsorption of gas, and when negative means that the gas passed during drying is less adsorbed than the gas originally adsorbed on the fuel. This difference for the various fuels and, resp., N₂, H₂, air and CO₂, was as follows: lignite, -0.09, -0.17, +0.20, +0.76; non-coking coal, -0.11, -0.20, +0.49, +1.59; gas coal, +0.01, -0.03, +0.14, +0.75; semi-coke (from lignite at 500°), +0.05, -0.43, +0.23, +4.87. The rate of exchange of adsorbed gases is shown by the fact that a sample of semi-coke weighing 1.454 g. after drying and cooling in CO₂ came to equil. at 1.4258 g. in dry air within 60 min., similarly a sample weighing 1.3387 g. after drying and cooling in H₂ came to equil. in air at 1.3442 g. within 45 min. WM. B. P.

Combustion calculations. A. B. HELBIG. *Z. Ver. deut. Ing.* **69**, 1323-4(1925).—A discussion of such calcs., and a formula for calcg. the heat of combustion of fuels (cf. C. A. **19**, 2120). WM. B. P.

Flue explosions. E. H. HAMILTON. *Mining & Met.* **6**, 539(1925).—H. believes explosions in flues from smeltering units are due to the presence of too much unroasted pyrite in the charge. Preliminary results are tabulated on an attempt to det. whether certain pyrite ores are more apt. than others to cause explosions. W. H. B.

Coal deposits and industry of Russia during and after the World War. ALFRED FABER. *Tier* **23**, 530-1(1925).—A brief discussion, no actual statistics being given. WM. B. PLUMMER

Analyses of Alberta coals. EDGAR STANSFIELD, R. T. HOLLIES AND WM. P. CAMPBELL. *Sci. Ind. Research Council of Alberta Rept. No. 14*, 9-63(1925).—Typical, max. and min. analyses (proximate only) are given for the coals from each of 62 districts which are located and described by various maps. The limits between which these coals vary is represented by the following analyses (as mined): Crowsnest area, District A, coking, H₂O 2.1%, ash 16.2, volatile matter 23.1, fixed C 58.6, S 0.5, gross heating value 12,400 B.t.u./lb., Castor area, District A, non-coking, H₂O 24.4%, ash 5.9, volatile matter 30.2, fixed C 39.5, S 0.3, gross heating value 8,840 B.t.u./lb. Most of the coals from the various districts resemble the latter example more closely than the former. Maps of the whole area (Alberta) are given showing lines of equal calorific value and lines of equal % H₂O for the various deposits. WM. B. PLUMMER

Coal liquefaction. FRIEDRICH BERGIUS. *Z. Ver. deut. Ing.* **69**, 1313-20, 1359-62 (1925).—A general discussion of the B. process for liquefaction of coal by heating with H under pressure. The yields of oil and solid residue are given for approx. 120 lab. tests (2 l. bomb) on various coals. The effect of pressure on the process is shown by the following 3 tests: starting pressure (cold) 100 atm., yield of solid residue 11.5%; 75 atm., 17.2%; 50 atm., coking but no liquefaction; evidently the starting pressure should be as high as possible. The optimum operating temp. for most coals is 450-80°. The influence of the coal ash on the process is obscure but is being studied. The distribution of O, N and S in the process and its products is briefly discussed. The gas yield is 15-25% by wt. of raw coal and consists mainly of CH₄ and homologs. In large-scale continuous operation the yields per 1000 kg. raw coal (6% ash) are 445 kg. oil, 210 kg. gas, 75 kg. H₂O, 5 kg. NH₃, 15 kg. losses and 350 kg. of solid residue contg. oil and C, by the coking of which further yields of 80 kg. oil, 25 kg. gas, and 240 kg. coke are obtained. Schematic plant diagrams, flow sheets, and photographs of a com. plant are given. The H supply (5% of raw coal by wt.) may best be obtained by decomposing with steam approx. 0.5 of the gas made in the process; the H need not be over 80% pure so that the gas made during the last part of the coking period in ordinary coke ovens may be used directly. In the continuous com. process pressures of 120-150 atm. are used, the reaction chamber being jacketed and externally heated by hot inert gases (to prevent local overheating) suitably recirculated and recuperated. WM. B. P.

Chemistry of combustion of pulverized coal. S. C. MARTEN. *Power Plant Eng.* **29**, 1091(1925).—Conditions of air supply for economic combustion are: (1) The gaseous constituent must be perfectly mixed with the proper amt. of air. (2) A blast of air should impinge continually on the solid particle until its combustion is completed. K. C. BERSON

Atomized coal system of non-ferrous melting. R. BLACK AND C. L. SHAFER. *Metal Ind.* (N. Y.) **23**, 403-4(1925).—Atomized coal system is a name applied to the use of specially prepd. bituminous coal for melting non-ferrous metals (crucible type

furnace). All the coal must pass a 200-mesh screen. The prepn., burning, theory of the practice, the type of furnace used, cost of atomizing and melting, and the burning installation are described.

W. H. BOYNTON

Distillation of coal and tar by metal baths. PROCKAT. *Z. Ver. deut. Ing.* 69, 1417(1925).—A brief description of the Piron-Caracristi coal distn. process, and the T. I. C., Blümner and Graefe-v. Walther tar distn. processes, all of which use molten metal baths as the heating agent.

WM. B. PLUMMER

Some tests on a two-stroke cycle oil-engine. E. A. ALLCUT. *Proc. Inst. Mech. Eng.* 1925, 849-909.—A detailed discussion and full data of tests on a two-stroke heavy oil engine rated at 25 brake h. p., having crank case compression, hot bulb ignition, 1 vertical cylinder 9.5 in. diam. with 11 in. stroke. Thermal efficiencies based on brake h. p. in the various tests were 19.50-21.83%, based on indicated h. p. 24.79-26.87%.

WM. B. PLUMMER

The possible use of Philippine coals for liquid fuel. V. G. LAVA. *Philippine J. Sci.* 28, 193-204(1925).—Since certain low-grade Philippine coals tend to disintegrate and crumble on storage the present exhaustive study of their utilization as *colloidal fuels* has been carried out. Results are given for 4 coals of which those for Gotas coal only will be reported here, the other results being similar; this coal had 3.16% moisture, 24.08% volatile combustible matter, 61.12% fixed C and 11.64% ash. The crude oil used in the tests had a viscosity of 64.4 sec. Saybolt Universal at 26° and a C residue of 1.82%. The soap used for prepg. the oil emulsions was prepd. from 100 g. of coconut oil by sapon. with 425.6 cc. of 0.1 N alkali, added after sapon. to 500 cc., both Na and K soaps being used. The procedure was to add the oil slowly to the desired amt. of soap soln. with const. mech. stirring, and then to add 54 parts by wt. of the emulsion to 46 parts of the coal which had been ground to pass 200 mesh; addn. of the coal to the emulsion caused breaking and rapid settling. Relative stabilities are illustrated by the following: % K soap in emulsion (before addn. to coal), 4.5, 3.6, 2.5, 1.5; % H₂O, 13.9, 10.9, 7.7, 4.0; life of emulsion alone, days, 90, 90, 49, 2; life of suspension, after addn. to coal, days, 120, 120, 120, 2. With the Na soap, % soap 4.2, 3.3, 2.35, 1.2; % H₂O, 14.2, 11.2, 7.8, 4.1; life of emulsion alone, days, 90, 60, 3, 0.5; life of suspension, after addn. to coal, days, 120, 120, 120, 1. The above suspensions, except in each case the one contg. the lowest % soap and H₂O, were "easy to stir." The viscosity of the suspension prepd. from the emulsion contg. 4.2% Na soap is given as 2.75 Engler hrs. at 28-9°. In general the lower the % H₂O the greater the viscosity and the less the stability, while the greater the % soap the greater are both the viscosity and the stability. The observed calorific values (B. t. u./lb.) were: oil, 10620; coal, 7266; for the various suspensions as above prepd., 8100-8700. Some differences were noted between the coals used, those having the higher % volatile matter giving the less stable suspensions. The suspensions as prepd. were in general suitable for com. utilization. Expts. were preformed, but not reported, on the use of tar as a stabilizing agent for coal-oil emulsions.

WM. B. PLUMMER

The economics of coal carbonization in rotary retorts. M. DOLCH. *Brennstoff-Chem.* 6, 285-90(1925).—D. severely criticizes a previous article by Roser (C. A. 19, 2874). He finds that retort capacities actually found by R. through tests are only 72 to 86% of the 120 ton per day claimed by the latter in his general statement. R. ests. mfg. cost at 9.50 M. per ton and the values of the products at 11.60 M. D. ests. that the former may reach 12.50 M. He calcs. heating costs at 1.39, 1.60 and 0.78 M. per ton from R.'s data for bituminous coal, cannel and brown coal, resp., whereas R.'s figures are 2.00, 1.50 and 2.00. He also considers R.'s value for semi-coke (1.75 M.) per ton of raw coal too low and 4.80 for the gas too high. E. ROSER. *Ibid* 290-1.—R. replies that: 1. Test figures given should not be taken for the calcn. of the best working capacities. 2. Brown coal is not charged raw—with 53% moisture as assumed by D.—but previously dried by waste heat. Cost figures are based on the dried material. 3. The main object of retorting is production of hydrocarbons and cheap semi-coke usable as powd. fuel without further expensive treatment. M. DOLCH. *Ibid* 291.—D. does not consider that R. has adequately answered his criticism. J. D. DAVIS

The hydraulic process for recovery of peat. G. STADNIKOV. *Brennstoff-Chem.* 6, 271-7(1925).—This process, introduced by R. Klasson and V. Kirpichnikoff, has been operated for several years at Ussk in Russia and at Schwaneburg in Germany. It consists in disintegrating the peat bog with water streams—300 lb. pressure—pumping out with centrifugals and spreading through pipes on drying fields to form a layer 20 cm. thick. In this furrows are cut, for efficient drying, by a special tractor-driven roller. A single unit of the plant will recover 20,000 to 30,000 tons of air-dried peat per year. The process effects a saving of about 40% of cost of production of air-dried peat and the

product contained less ash than that of older processes. Draining and drying of the moist peat is now facilitated by coagulation with Fe hydroxide soln.—1 vol. Fe soln. contg. 0.04% Fe to 2 vols. peat. The coagulated air-dried product is best de-watered by pressure with addn. of dry peat powder—the Madruck process. J. D. DAVIS

A colorimetric method for determination of the degree of humification of peat. G. STADNIKOV AND S. MEHL. *Brennstoff-Chem.* **6**, 317-22(1925).—The method consists in comparison of a 2% Na_2CO_3 soln. of the humic acids from peat in a colorimeter with a standard humic acid soln. prepd. from peat. For prepn. of the standard peat is first extd. with C_6H_6 to remove resins, then heated for 2 hrs. on the water bath with 2% soda soln. Dissolved humic acids are filtered off and pptd. with HCl. This ppt. is filtered, washed and preserved as a paste to which 0.2% salicylic acid is added to prevent fungus growth. Standard humic acid soln. is prepd. by dissolving the paste in 20% soda soln. and dilg. so that 1 l. contains 0.2 g. dry humic acid. The sample of peat for the test is treated with an excess of 2% soda soln. for 24 hrs. with frequent shaking, quickly filtered and compared with the standard. The effect of time and temp. on treatment with Na_2CO_3 and concn. of Na_2CO_3 is detd. The method gives lower results than the oxidation and direct weighing methods, but it is rapid and has some tech. application. J. D. DAVIS

High-pressure inclined tube boilers for wood, peat, or brown coal firing. H. F. LICHT. *Braunkohle* **24**, 799-803(1925).—Installations for each case are briefly described, drawings being given in some detail. WM. B. PLUMMER

Recovery and utilization of natural gas in Siebenbürgen. H. LININGER. *Z. österr. Ver. Gas- u. Wasserfach.* **65**, 184-91(1925).—The gas from this district (now Roumanian) consists almost entirely of CH_4 , a typical analysis being 99.0% CH_4 , 0.4 O_2 , 0.1 H_2 , 0.2 N_2 . The gas strata are 70-400 m. deep, the rock pressures being 20-30 atm. The area producing in 1913 was 516 sq. km., the production of the largest well being 800,000 cu. m./day. A brief discussion is given of methods of drilling, capping, reducing and distributing and of burners and combustion methods used. WM. B. PLUMMER

Report of the Fuel Research Board for the period ended 31st December 1924. R. T. THRELFALL, et al. *Dept. Sci. Ind. Research* **1925**, 71 pp.—Plans, photographs, etc., of H. M. Fuel Research Station (Greenwich) are given; also a bibliography of official publications and of those of individual members of the staff. Investigations performed there and elsewhere (all previously reported) on steaming in vertical gas retorts with and without oil injection, low-temp. carbonization in continuous vertical and horizontal externally heated retorts, benzene and alcohol as motor fuels, peat utilization, and other miscellaneous problems are briefly discussed and significant data summarized. WM. B. PLUMMER

Concordant nomenclature for technical (heating) gases. ANON. *Z. angew. Chem.* **38**, 925-9(1925).—A tabular grouping of manufactured heating gases is given, divided into groups, classes and sub-classes. The more important cases are further discussed and defined in the text. WM. B. PLUMMER

Composition and utilization of (mineral) coal gas. HEINRICH HOCK. *Z. angew. Chem.* **38**, 915-7(1925).—Gas yield and compn. from 5 German mineral coals carbonized on a com. scale in rotary retorts at 600° are given. A typical set of results follows: Hardenburg coal 5.0% H_2O , the coal dried at 110° having ash 12.0%, volatile matter 33.0%, S 1.3%, heating value 7000 kg. cal./kg.; gas yield 94 cu. m./1000 kg. or 7.7% by wt.; gas compn. CO 7.5, $\text{CO}_2 + \text{H}_2\text{S}$ 5.8, O_2 0.4, H_2 23.5, CH_4 45.3, C_2H_6 and homologs 6.4, "light oils" 2.0, olefins 4.4 and N_2 4.7%. WM. B. PLUMMER

The presence of iodine in water gas. HENRIK MOHORČIČ. *Chem.-Ztg.* **49**, 925 (1925).—The observation has been made that when HCl is spilled on hot Cu gauzes used in the lab. as supports over gas burners, an evolution of reddish fumes and smell of I are caused. It is therefore concluded that the water gas used (made from a brown coal) contains I. WM. B. PLUMMER

The evaluation of hot and cold producer gas from brown or mineral coals on the basis of the index number. HERMANN BECKER. *Braunkohle* **24**, 793-9(1925).—The index no. is the heating value/kg. flue gases, both being taken per unit of fuel gas. Extensive tabulations, etc., are given. Conclusion: The resp. values of cold producer gas from brown coal, mineral (bituminous) coal, and brown coal briquettes stand in the ratios of 1:1.05:1.15. Factors entering into the question of hot vs. cold gas for various purposes are briefly discussed. WM. B. PLUMMER

The determination of methane and hydrogen in illuminating gas. WILHELM STEUER. *Chem.-Ztg.* **49**, 901-2(1925).—Attempts were made to oxidize first $\text{CO} + \text{H}_2$ and finally CH_4 (after CO_2 , illuminants and O_2 had been previously removed) by

the use of a Pt or Pd catalyst first at 150° and finally at a red heat. Expts. showed, however, that the temp. necessary completely to oxidize the CO was so high that some CH₄ was attacked. The method finally outlined is therefore to remove the CO as usual, add O, oxidize the H by the Pt at 150°, det. the contraction, and finally oxidize the CH₄ at a red heat. The oxidations are carried out in a gas-heated SiO₂ capillary contg. a short piece of Pt wire.

WM. B. PLUMMER

Use of oxygen in gas producers—experiments give affirmative answers to queries propounded by L. J. Willien. A. H. WHITE AND H. G. CHAMBERLIN. *Am. Gas Assoc. Monthly* 7, 757-60(1925).—A description of expts. carried out in a lab. app. consisting of a vertical 2.5 in. diam. coke-filled furnace 36 in. high, with windings for elec. heating and suitably insulated. The furnace was heated to equil. at the max. temp. which the windings would stand (1800-2000° F.), when O steam mixts. were passed in while the elec. heating was maintained. Results of a representative run follow: av temp in bottom of coke 1927° F., steam admitted 0.202 lb/cu. ft. gas, steam decomposed 42%, av. depth of coke bed 25 in., O admitted 0.175 cu. ft./min., gas make 3.84 cu. ft./cu. ft. O or 19.8 cu. ft./sq. ft./min., heating value 242 B. t. u./cu. ft. gas compn. CO₂ 23.1, O₂ 0.2, CO 26.7, H 41.3, CH₄ 1.1, N₂ 4.5%. In so small an app. the use of elec. heating to eliminate radiation losses is necessary, but this limits the temp. used to under 2000° F., the effect of this low temp. and of the shallow fuel bed being shown in the high CO₂ content of the gas. The temp. in the bottom of the coke bed was lowered to 1609° F. by the use of 0.233 lb. steam/cu. ft. gas (steam 34% decomposed) and to 1206° F. by the use of 0.275 lb. (28% decomposed). This shows conclusively (cf. C. A. 19, 1485) that the temp. is readily controllable by steam during gasification with O. [ABSTR.—The H₂O decomposed as detd. from the O balance, calcd. from the O consumption and gas compn. as stated, is 0.01 lb./cu. ft. gas, whereas the value given is 0.085 lb./cu. ft. Some question may therefore be raised as to the correctness of the steam consumptions reported.]

WM. B. PLUMMER

Why not gas motors again? FR. SCHAFER. *Gas u. Wasserfach* 68, 783-6(1925).—Cost comparisons of elec., gas and Diesel engines are given in which the gas engines show up very favorably.

WM. B. PLUMMER

Production of neutral ammonium sulfate in gas works. D. STAVORINUS. *Gas u. Wasserfach* 68, 776-8(1925).—Neutral (NH₄)₂SO₄ may be obtained by running the saturators slightly alk., by washing the salt (as ordinarily prepd.) with H₂O or dil. NH₃ soln., by treating the salt with gaseous NH₃ or by mixing with it a small quantity of some alk. solid substance. Of these the first method involves too much danger of discoloration by Prussian blue formation, the best method being to wash the salt with dil. aq. NH₃. The salt being at a temp. of not over 60°, 180 kg. is whizzed in an ordinary centrifugal drier until dry, when 13 l. of 0.3% aq. NH₃ is sprayed over it. The wash liquor is returned to the NH₃ saturators.

WM. B. PLUMMER

Economies of the reverse blast. A. C. HOWARD. *Am. Gas Assoc. Monthly* 7, 579-84(1925).—This operating procedure is intended primarily for use with bituminous coal in water gas sets. The latter part of the air blast is reversed, being sent down through the superheater, up through the carburetor, and down through the generator fire. The CO in the reversed blast gases leaving the bottom of the generator is higher than in the ordinary blast gases, so that the gases may be sent directly to the wash box. No blow run is used, the division of the rest of the cycle being normal. Advantages claimed for the process are higher av. fire temp. and lower max. fire temp. at the end of the blast, improvement of clinkering conditions, removal of C deposits in the carburetor during the reverse blast, increase of set capacity, decreased generator fuel, and the elimination of the hot valve, reversing valves being installed in the double inlet tar batter. Since the bottom of the generator must be direct-connected to the tar batter there is, however, the danger of introducing air into the cold finished gas if the valves in this line leak during the up blast.

WM. B. PLUMMER

How can unused heat be made useful by means of work? J. KAISER. *Z. Bayer. Rev.-V.* 27, Nos. 20-2(1923); *Feuerungstechnik* 13, 162-3.---The heat-pump can make available heat otherwise lost in flue gases, vapors from drying ovens, waste warm water, etc. The relative merits of CO₂, NH₃, SO₂, Et₂O, EtOH, and H₂O as working substances are considered. The best working substance depends on the temp. range to be employed. Calcs. are given to show that the app. would be of practicable size.

E. W. T.

The tar quest

economic situation requiring the use of low-grade solid fuels, the high tar yield from them is being down to motor fuels, rather than as a process whose chief economic advantage lies in these high yields of tars of high tar acid content.

W. B. PLUMMER

Chemical composition of the tar obtained by distillation of coal from Lupeni (Roumania). E. GEORGACIOPOL. *Bul. soc. române de stiinte* **27**, 37-49(1924).—The compn. of the coal in question is closer to that of lignites than of bituminous coals. The compn. and yields of the *volatile hydrocarbons* and tar obtained on distn. and of the by-products which can be extd. from them are given in detail. A. P.-C.

Determination of primary tar yield by the aluminium retort assay. H. BROCHE. *Brennstoff-Chem.* **6**, 292-4(1925).—Incomplete recovery of water from the (tar + water) distillate by older methods has led to high results for tar. B. recommends the xylene distn. method used by Erdmann (*Z. angew. Chem.* **27**, 52(1914)) for water detn. as accurate to 99.5%. The distillate from the retort is caught in a 300 cc. Jrlenmeyer flask cooled in ice. After collection 200 cc. xylene is added, the flask is connected to a vertical condenser and the xylene is distd. into a 150 cc. measuring tube with a thin stem graduated in 0.01 cc. The stem is calibrated and a correction is applied for meniscus depressions at the water-xylene interface. J. D. DAVIS

Tar recovery in brown coal producer plants. E. F. GIESELER. *Chem.-Ztg.* **49**, 934 5(1925).—A brief discussion of the factors detg. the economic desirability of tar recovery in producer plants. WM. B. PLUMMER

The volatile matter given off by semi-coke at various temperatures. H. TROPSCH AND E. DITTRICH. *Brennstoff Chem.* **6**, 301 3(1925).—Coke samples were prepd. in the Fischer Al retort, max. temp. 500°. These were outgassed both *in vacuo* and at atm. pressure at 500-1000°. In both cases max. gas evolution was observed at 700°. Volumetrically the gas was largely H₂; unsatd. hydrocarbons were absent; satd. hydrocarbons were present in appreciable amts., the highest yields of the higher homologs resulting from outgasing *in vacuo*. Above 900° no hydrocarbons were obtained. The compn. of the volatile products (% by weight at 500° to 1000°) was CO₂ 8.9, O₂ 1.1, CO 13.5, H₂ 14.1, C_nH_{n+2} 9.3, N₂ 11.1, NH₃ 3.0, H₂O 36.0. J. D. DAVIS

Gas coke for domestic firing. RIEDL. *Feuerungstechnik* **14**, 19(1925).—R. announces a new domestic stove for gas coke, characterized by an iron fire-box, air-cooled to prevent clinker, and having openings for secondary air, together with a baffle to aid in mixing the secondary air with the CO. ERNEST W. THIELE

Pulverized-coke-breeze firing. H. W. BROOKS. *Blast Furnace & Steel Plant* **13**, 493-4, 502(1925); cf. *C. A.* **19**, 3369. —A discussion. The difficulties of pulverized C are bridging the gap between the temp. of burning C (450°) and the ignition point of CO (643°), and the abrasiveness of the fuel. B. discusses the cost of pulverizing and shows the cross section of a boiler furnace designed to burn coke breeze in combination with a gas fuel. The decision regarding the use of coke breeze is dependent upon the character and quantity available, and upon economic conditions. By means of tumbler tests the pulverizer maintenance cost may be predicted with reasonable certainty. W. H. BOYNTON

Thermal decomposition of cellulose under hydrogenation conditions (BOWEN, et al.) **23**. **Explosivity of brown coal dust (WEISS)** **24**. **Catalytic combustion (I) union of CO and O in contact with a Au surface (BONE, ANDREW)** **2**. **Combined lime kiln and gas producer operation (Brit. pat. 233,137)** **18**. **Rectifying system for separating constituents of gaseous mixtures (Brit. pat. 232,986)** **13**.

MILES, W. M.: **The Chemistry of Power Plant.** London: E. Benn, Ltd. 144 pp. 6s. Reviewed in *Ind. Chemist* **1**, 502(1925).

Fuel. G. E. RICE and E. J. JOHNSTON. *Brit.* **233,248**, Nov. 3, 1924. Fuel blocks are formed with a core comprising coal dust, CaCO₃, MgCO₃ or other Mg. compd. and sea water, an inner coating of the same ingredients except that the coal dust is omitted, and an outer coating of the same ingredients with the addn. of ground spent oil shale and a crude petroleum jelly.

Fuel mixtures. T. H. BUTLER, F. J. W. POPHAM, J. C. MANN and H. W. ROBINSON. U. S. 1,567,235, Dec. 29. In prepg. homogeneous mixts. of pitch and petroleum residue, the pitch is heated substantially above its m. p. to facilitate mixing.

Motor fuel. L. DE FLOREZ. U. S. reissue 16,239, Dec. 29. See original pat. No. 1,437,045 (*C. A.* **17**, 870).

Use of hydrogen and kerosene together as fuel for aircraft engines, etc. AIRSHIP GUARANTEE CO., LTD. AND C. D. BURNEY. *Brit.* **233,023**, Jan. 26, 1924.

Fuel briquets. F. E. HOBSON. *Brit.* **233,463**, Feb. 22, 1924. Mech. features of

forming scored bars from mixts. such as distd. coal residue 67, distd. sawdust residue 23 and asphaltic binder 10%.

Coking fuel briquets. WOODALL-DUCKHAM (1920), LTD. AND A. M. DUCKHAM. Brit. 233,508, April 25, 1924. Fuel briquets formed of blended coal and which do not tend to soften or swell are carbonized in a continuous vertical retort at high temp. Pitch may be used as a binder and recovered for re-use by volatilization.

Drying coal or other materials by combustion gases. M. D. JONES. U. S. 1,568, -738, Jan. 5.

Gas production. H. O. LOEBELL. Brit. 233,038, Jan. 31, 1924. A mixt. of water gas and coal gas is produced by maintaining a high-temp. zone in the lower portion of the fuel column of a gas producer by blasting air through it downwardly, burning the blast gases in regenerators and passing steam from the regenerators up through the heated zone and the water gas generated through the fuel column in the upper part of the producer, which is preferably charged with a mixt. of coal and coke. Numerous details of procedure are described.

Gasifying and carbonizing coal, etc. H. MACAUX. U. S. 1,567,967, Dec. 29. Finely divided coal or similar material is continuously insufflated into chambers previously heated to redness, and there is simultaneously injected into these chambers a H-contg. gas in such proportion that the partial tension of the H is constantly maintained at a higher degree than the tension which would result from the dissociation of the hydrocarbons contained in the coal and disengaged by its pyrolytic decompn. Gases produced are removed without allowing them to traverse a layer of red hot coke.

Hydrocarbons and cyanides. J. C. CLANCY. U. S. 1,567,241, Dec. 29. Comminuted coal, sawdust, peat, bitumen, lignite or other carbonaceous material is destructively distd. in contact with molten NaCN or other alkali metal cyanide. Volatile reaction products are collected and the distn. residues are subjected to a cyanide-forming reaction to regenerate cyanide decomposed in the distn. and form additional cyanide.

Treating coal tar. K. W. NIELSEN. Danish 35,094, Sept. 21, 1925. The content of bitumen, the resistance to the action of air and the viscosity are all increased by treating with air under heating in the presence of HNO_3 and nitrogen oxides.

Fractional distillation of tar oil or similar materials. A. M. DUCKHAM and J. S. MORGAN. U. S. 1,568,886, Jan. 5. The material is caused to pass between a solid surface such as a revolving drum immersed in molten metal, e. g., molten Pb, and the surface of the molten metal itself. This treatment is repeated, with the residue, at diff. temps.

Still for tar, crude petroleum, etc. J. L. MAJOR and B. TAYLOR. Brit. 233,419, Feb. 7, 1924.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The estimation of water in oils and fats. W. M. SEABER. *Ind. Chemist* 1, 469-72 (1925).—The usual difficulties encountered are discussed, followed by a short description of many well-known methods. S's method is a modification of Dean's and Stark's distn. method for moisture in petroleum products. The sample is placed in a 150 cc. flask provided with a dropping funnel and an inverted U-shaped delivery tube connected at the other end to a U tube immersed in a beaker of cold water. The condenser U tube has a bulb of approx. 20-25 cc. blown at the bottom of the U and contains somewhat more than enough Na_2CO_3 to take up all the H_2O distd. from the sample (the min. amt. is 6 pts. by wt. to 1 pt. of H_2O). Run 10 cc. of dry xylene into the flask contg. the sample and start distn. slowly at first, then faster. Add 5 cc. more xylene and finally a further 10 cc. Shake the U tube to allow Na_2CO_3 to come in contact with any water, carefully pour off the xylene and add about 10 cc. of light petroleum ether. Repeat 3 times and finally drain off the ether as completely as possible. Place the tube with legs horizontal and one leg vertically above the other so that as the ether vaporizes it will flow out of the lower leg. Maintain the temp. at 35° to 45° for 30 to 45 min., and then weigh. If the day is unusually humid or dry it is advisable to run a blank. A no. of detns. are recorded and a cut of the app. is shown. E. G. R. A.

Analysis of transformer oils. SVERRE LAUNY. *Tids. Kemi Bergv.* 5, 196-203, 213-5(1925).—Various methods in use are briefly mentioned and the B. B. C. method (used by the Brown Boveri Companie) is described in detail. Expts. show that the

results usually do not agree within reasonable limits; this depends on the nature of the surface of the employed Cu. Results which agreed well were obtained by using strips of Cu sheet reduced in alc., washed in alc. and stored in benzene until use. The values of the tensile strength of the cotton-thread differ widely in the same oil and the detn. is of questionable value. Standard specifications for testing transformer oils suggested by the Union of Norw. Electricity Works are outlined and criticized. The Hepar sulfur test is not sufficiently sharp, oils contg. 0.015-0.016% S giving a negative test. It was proved that the S content depends on the refining method. Alkali-blue 6B is not a good indicator for detg. org. acids; thymolphthalein is better. In darker, used oils it is recommended to dil. with an equal amt. of a mixt. of equal parts of ether and alc. or a mixt. of benzene 2 and alc. 1 part. Then 2 sep. layers are obtained, the color change being observed in the upper alc. layer. When the tar no. is detd. the O should be dried and preheated to 55°. Cu as a catalyst in this oxidation may give unreliable results.

C. A. ROBAK

Laboratory distillation of petroleum. H. G. VESPER. *Ind. Eng. Chem.* **18**, 64-7 (1926).—A lab. method for evaluating the yields of refinery products of desired properties is presented. Data for crude petroleum from southern Cal. are presented. Since the control is based on temp. rather than on gravities, it is likely that with minor changes the method could be used with other crude petroleum. The crude is first topped (vapor temp. of 500° F) in any convenient still. The distillate is redistd. to det. gasoline and burning-oil, and the "tar" distd. *in vacuo* in order to det. lubricating distillates.

W. F. FARAGHER

Development of a standard Canadian laboratory distillation method for examination of oil shale. I, II. R. E. GILMORE AND A. A. SWINNERTON. *Can. Chem. Met.* **9**, 215-9, 235-9 (1925).—An av. good New Brunswick shale yielding around 30 Imp. gals. per ton was distd. in 5 different retorts: (1) The cross retort (sketch) in electrically heated Pb bath, capacity 3500 g. (2) Small field assay retort (sketch), capacity 350 g., with and without steam, heated by (a) gas burner, (b) elec. furnace. (3) Large field assay retort, capacity 1000 g., ditto, ditto. (4) Horizontal tube retort, capacity 1000 g., in gas muffle furnace. (5) Scotch tube (Bailey) method on 450 g. sample using long, open tube heated in gas furnace. All 5 app. are fully described, the methods of heating set forth and the results obtained tabulated. In each of the 5 methods the % of spent shale, oil, aq. distillate, gas and loss are recorded. The oil was fractionated, the B. t. u. of the gas detd., and a proximate analysis made of the spent shale. The small field retort (2) gave the highest oil yields (32 Imp. gals.); the lowest were given by (4) and (5) (28 and 29 Imp. gals., resp.). Steam did not materially affect the yield of oil in (2), but in (3) the yield increased by about 1 Imp. gal. per ton. In both cases steam increased the yield of heavy oils and decreased that of light oils, in each case by about 2 Imp. gals. per ton. More work should be done before a definite selection of a stand. lab. retort is made. G. and S., however, favor (3) tentatively. E. G. R. A.

Complementary notes on C. Căndea's paper on the oxidation of petroleum. GH. ALBESCU. *Bul. chim. soc. române de stiinte* **27**, 65-72 (1924); cf. Căndea, *C. A.* **18**, 3472.—Polemical, based mainly on the contention that C.'s method of detg. aromatic hydrocarbons is not a quant. method and consequently his results are of very doubtful value and contradictory.

A. PAPINEAU-COUTURE

Latent heats of vaporization of distillates from paraffin-base petroleum. E. H. LESLIE, J. C. GONIESSE, T. W. LEGATSKI AND L. H. JAGROWSKI. *Ind. Eng. Chem.* **18**, 45-6 (1926).—Close fractions from Cabin Creek, W. Va., crude were used. The distn. was effected by an electrically heated resistor; precautions against refluxing were taken. Heat loss from the vacuum-jacketed flask was detd. by distg. liquids of known latent heats that covered the temp. range 80.8-193.1°. For the fractions b. up to 220°, the accuracy of the values is thought to be ± 2 cal. per g. Tables and curves are presented. The exptl. values are lower than published data calcd. by using Trouton's rule.

W. F. FARAGHER

Evaporation losses of gasoline in the refinery. LUDWIG SCHMIDT. *Bur. Mines, Repts. of Investigations* No. **2721**, 16 pp. (1925).—Results are shown of the detn. of evapn. losses in a typical Mid-Continent refinery at different stages of refining. They were as follows: (1) run-down tanks, 1.8%; (2) treating (agitators), 0.5%; (3) filling tank cars, 0.5%; (4) storage, 2.5%; (5) miscellaneous handling, 1.0%. Several curves and tables are shown.

W. H. BOYNTON

Separation and purification of naphthenic acids. L. GURVICH. *Brennstoff-Chem.* **6**, 322-3 (1925).—The old method of sepn. of the acids from their Na soaps with H_2SO_4 leads to formation of worthless Na_2SO_4 . If SO_2 is substituted for H_2SO_4 , the resulting Na_2SO_3 may be readily causticized with lime with recovery of Na as NaOH. Sepn.

takes place easily at 70° with 60% of SO_3 theoretically required. This leaves 40% of the soap still undecomposed which is not a disadvantage in soap mfg. Complete decompn. of the soaps requires a very large (230%) excess of SO_3 . The usual method for purification of petroleum oils based on simple washing with concd. H_2SO_4 will not apply to naphthenic acids since a homogeneous mixt. from which there is no sepn. of tar contg. acid is formed. If 12% fuming H_2SO_4 is added to the raw acid, followed after the reactions are complete by 20% water, satisfactory sepn. of acid tars takes place. J. D. DAVIS

Recovery of sodium plumbite in the oil industry. A. KINSM. *Chem. Met. Eng.* 32, 873-4 (1925).—A patented process and a plant (U. S. patent No. 1,525,301 issued to K.) that recovers more than 99% of the lead used in the sweetening of gasoline and 75-80% of the caustic soda are described briefly. W. F. FARAGHER

Lubricants and lubrication. JAMES DUGUID. *Mech. Eng.* 47, 887-94 (1925).—An address, covering the general subject in a not highly technical way. W. F. F.

Chemical composition of the tar obtained by distillation of coal from Lupeni (Roumania) (GEORGEACOPOL) 21. Equilibrium boiling points (WHATMOUGH) 21. The fuel oil situation as it affects gas company operation in California (BERRY, BROWN) 21. Naphthenic acids (TANAKA, NAGAI) 10. Still for crude petroleum (Brit. pat. 233,419) 21. Oil filter (U. S. pat. 1,568,796) 1. Apparatus for neutralizing and bleaching oils under a vacuum (Brit. pat. 233,345) 1.

DUMESNY AND NOYER: *L'industrie chimique des bois. Leurs dérivés et extraits industriels. Pt. I: La distillation du bois. Pt. II: Fabrication d'extraits divers.* Paris: Gauthier-Villars et Cie. 432 pp. Fr. 25.

LILLEY, ERNEST RAYMOND: *The Oil Industry.* New York: D. Van Nostrand Co. 558 pp. \$6.

Purifying oils. SHARPLES SPECIALTY Co. Brit. 233,334, April 29, 1924. Oil contg. sludge or sludge-forming or emulsion-forming substances (e. g., used lubricating oil) are treated with H_2O and subjected to centrifugal sepn.

Purifying oils. AKTIEBOLAGET SEPARATOR. Swed. 59,250, Aug. 15, 1925. The oil is mixed with water and the mixt. is stirred and passed through a centrifuge by which the water and the major part of the impurities are sepd. and then through a filter removing the remaining impurities.

Refining hydrocarbon oils. J. C. MORRELL. U. S. 1,568,904, Jan. 5. The oil (e. g., cracked distillate) is separately treated with H_2SO_4 and with NaOH contg. PhO , and, subsequently, with SO_2 .

Distilling petroleum. A. R. EARL and T. W. REEVES. U. S. 1,567,429, Dec. 29. Oil is heated under pressure by use of steam, released from pressure and passed into an expansion zone where part of the oil vaporizes. Vapors thus formed are conducted away and fractionally condensed. Unvaporized oil is withdrawn and further heated without permitting vaporization and the heated oil is passed into an expansion zone maintained at subatm. pressure where vaporization of light products is permitted and the vapors of these are withdrawn and condensed. The unvaporized oil is withdrawn from this expansion zone and heated by direct contact with superheated steam while maintained under sufficient pressure to prevent vaporization of the oil. The pressure of the oil is then released and the heated oil is passed into an expansion zone under subatm. pressure to form additional vapors which are condensed and recovered.

Gasoline. W. F. DOWNS. U. S. 1,568,812, Jan. 5. Vapors from hydrocarbon oils having a b. p. below 260°, of varying compn. with respect to H:C ratio and condition of satn., are condensed in the presence of a porous mass comprising metallic chlorides such as AlCl_3 , SiO_2 and graphite and the condensate is continuously withdrawn. U. S. 1,568,813 specifies purifying hydrocarbon oils by filtering them through a heated filter bed contg. chlorides such as AlCl_3 maintained below the b. p. of the oil and also below the vaporizing point of the chloride.

Cracking hydrocarbon oils. F. B. KOONTZ. U. S. 1,567,062, Dec. 29. A stream of oil is conducted through a cracking zone heated to cracking temp. The highly heated oil is discharged into a sepg. chamber where carbonaceous residue is deposited and where the temp. is sufficiently high to effect evapn. of liquid of low b. p. from the residue. The carbonaceous residue is removed from the sepg. chamber as it accumulates and is discharged from the app. and vapors from the sepg. chamber are led upwardly at such a low velocity as to permit pptn. of carbonaceous material from the rising vapors. The relatively clean vapors are subjected to reflux condensing to condense about 70%

of the vapors and the remaining vapors are separately condensed. Heated fresh charging stock is supplied in a proportion of less than one-third the quantity of the reflux condensate and this mixt. is pumped to the cracking zone.

Cracking and hydrogenating oils, etc. G. W. WALLACE. Brit. 233,395, Feb. 1, 1924. Shale oil, petroleum oil, naphthalene oils, anthracene oils or the like are atomized (optionally with steam or hydrogenating gases) in proximity to a flame in the upper part of the reaction chamber which may be filled with refractory material (optionally treated with a catalyst). The materials pass downwardly through the refractory filling and cracking or hydrogenation may be effected either under increased or reduced pressure.

Separating condensable hydrocarbon vapors from gases. J. C. SWAN. U. S. 1,568,028, Dec. 29. The gas is passed through a column of Hg or other liquid the temp. of which is maintained below the condensing temp. of the component to be sepd., *e. g.*, condensable hydrocarbons from natural gas, by circulating a refrigerating liquid through a refrigerating plant and in heat-exchange relation to both the interior and exterior of the column.

Distilling and blending hydrocarbons. D. L. NEWTON. U. S. 1,567,457-8, Dec. 29. An absorbing medium contg. hydrocarbons absorbed from casinghead gas is subjected to a partial distn. and conducted through a series of chambers successively in one direction. Steam is mixed with the distd. vapors and the resulting mixt. is conducted under pressure through the chambers in the opposite direction in an app. somewhat resembling a usual column still. Distd. hydrocarbons are blended to form a com. "stabilized" gasoline.

"Converting" hydrocarbon oils. J. H. ADAMS. U. S. 1,568,016, Dec. 29. Oil is subjected to direct contact with an elec. resistor immersed in the oil and heated electrically to a cracking temp. and is maintained under superatm. pressure during the treatment.

Recovering values from acid sludge. H. T. BENNETT, G. B. MURPHY and L. G. STORY. U. S. 1,568,261, Jan. 5. Acid sludge contg. asphalt-like substances, such as is obtained by treating petroleum oils with H_2SO_4 , is treated with a solvent contg. alc. and C_6H_6 or a similar coal tar deriv. After sepg. the soln. thus formed and distg. the solvent, a product remains which is of asphaltic character, adapted for use as a *paint*.

Regulating gas pressures at oil wells. R. CONRADER. U. S. 1,567,183, Dec. 29. A pressure is maintained on the well, sufficient gas for local operation is draw off and the excess is delivered to a sep. low pressure line.

Oil still. J. PRIMROSE. U. S. 1,568,182, Jan. 5. Oil to be cracked flows through a bank of heated tubes. Cf. C. A. 20, 501.

Separator for gas, oil, water and sand. G. A. WILSON and R. W. EDENS. U. S. 1,567,313, Dec. 29.

Apparatus for cracking hydrocarbon oils. C. P. DURBS. U. S. 1,568,400, Jan. 5. The app. comprises an elongated heating coil, an enlarged reaction chamber, dephlegmator, connections for refluxing, etc.

Apparatus for distilling and cracking hydrocarbon oils. F. C. VAN DE WATER and F. R. SUNDERMAN. U. S. 1,567,212, Dec. 29. Vapors from a drum still are passed through a cracking tube located beneath the still and which is protected from undue heating by a surrounding air jacket and a sheath of protective material.

Apparatus for separating and extracting mineral oils from oily sand, bitumen from oily chalk, oily slate, coal, etc., by the use of hot water. H. PRELLER. U. S. 1,567,983, Dec. 29.

Filter for reclaiming crank-case oil and other mineral oils and animal fats. J. V. APABLASA. U. S. 1,567,989, Dec. 29.

Steam-heated still for evaporative distillation of petroleum. D. L. NEWTON. U. S. 1,567,455, Dec. 29.

Absorption tower adapted for recovering gasoline from natural gas. D. L. NEWTON. U. S. 1,567,456, Dec. 29.

Lubricant for use as a "cup grease." A. B. HUTTON. U. S. 1,568,606, Jan. 5. Petroleum jelly 8, white lead 4, graphite 0.5, S 0.5, linseed oil 1 and tallow 2 parts.

Filter for lubricating oil, etc. J. V. APABLASA. U. S. 1,567,990, Dec. 29.

Hardened asphalt products. N. A. F. LIDVALL and P. A. WESSBLAD. Swed. 59,754, Oct. 27, 1925. Genuine or artificial asphalt is mixed with sulfur and a soln. of raw or vulcanized rubber in such proportions that the amt. of asphalt is at least 3 times that of rubber. The solvent is evapd. and the mixt. is hardened or vulcanized by heating.

Bituminous emulsions. L. KIRSCHBRAUN. U. S. 1,567,061, Dec. 29. A non-

adhesive emulsion is prepd. from adhesive bituminous material, H_2O , an emulsifying agent such as colloidal clay and a flocculating agent, *e. g.*, $Al_2(SO_4)_3$ or Na acid phosphate.

Bituminous emulsions. L. S. VAN WESTRUM. Brit. 233,371, Nov. 8, 1923. Emulsions which may be used cold as binders for paving materials, etc., and also for waterproofing are formed by the sapon. by NaOH, KOH or other alkali of asphalt, tar or mixts. contg. them together with linseed or other drying oils. Rapeseed oil or other non-drying oil may be added to retard the drying of the product.

Bituminous emulsions. H. A. MACKAY. Brit. 233,430, Feb. 8, 1924. Emulsions suitable for use in paving, manuf. of briquets or for waterproofing are prepd. by mixing Mexican asphalt or tar or other naturally liquid or melted bituminous material with a small proportion of an emulsifying agent comprising cholesterol and adding hot H_2O . Oleic acid and NaOH may be used as emulsifying materials. Cf. C. A. 20, 283.

Apparatus for destructive distillation of bituminous materials. PATENTAKTIEBOLAGET GROENDAL-RAMÉN. Swed. 58,777, May 27, 1925. An inclined rotary furnace with refractory lining contains several longitudinal channels open at either end. These channels contain the material to be treated; they operate as sep. retorts and are built in such a way that the hot distn. products pass on all sides of them and at the same time hot indifferent gas passes through the channels.

Pure betulinal from birch-bark. J. R. KOEHLER. Swed. 59,290, Aug. 19, 1925. Betulinol, together with certain impurities, is extd. by means of a solvent in which the org. bases occurring in the bark are insol. The soln. is treated with an org. base or a salt of such base and a weak acid, by which treatment the impurities are converted into compds. insol. or difficultly sol. Pure betulinal is recovered from the remaining soln. by crystn. or evapn.

Jacketed retort for carbonizing wood, etc. R. MALBAY. Brit. 233,335, May 5, 1924.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The thermal decomposition of cellulose under hydrogenation conditions. A. R. BOWEN, H. G. SHATWELL AND A. W. NASH. *J. Soc. Chem. Ind.* 44, 507-11T, 526T (1925).—Samples of cotton cellulose were treated with H_2 under pressure of about 40 atm. at temps. from 420 to 440° in 2 and 3 successive 4-hr. periods. The runs were made without catalysts, and also in the presence of NiO, pptd. on the fibers as the oxalate, and V_2O_5 and $Fe(VO_3)_3$, impregnated in the fibers as $Fe(VO_3)_3$ and NH_4VO_3 . Without catalysts the cellulose absorbed no H_2 , showing no hydrogenation had occurred. The residue consisted mainly of a coke-like residue, H_2O and CO_2 , with only small quantities of light oil, $CHCl_3$ -sol. tar and gases. With NiO considerable H_2 was absorbed, hydrogenation having taken place. An increase in amts. of light oil and $CHCl_3$ -sol. tar resulted. With V_2O_5 and $Fe(VO_3)_3$ as catalysts practically no hydrogenation occurred. Comparison of oils obtained from cellulose and 4 British coals, after treatment with H_2 , showed them very similar in properties and, in a lesser degree, in chem. compn. The evidence supports the theory of coal formation from cellulose. Destructive distn. of cellulose with and without the catalysts showed the catalysts, especially NiO, exerted considerable influence on carbonization as by their use an increase in evolved gas and coke residue resulted.

W. H. SWANSON

Depolymerization or dispersion of cellulose? R. O. HERZOG AND D. KRÜGER. *Naturwissenschaften* 13, 1040-2(1925).—Expts. are discussed bearing on the subject, whether the constituent parts of cellulose are held together by chem. valence or by cohesive forces. Cellulose crystals can be transformed into cryst. nitro and Ac derivs.; of these colloidal solns. can be made contg. per particle as many cellulose building stones as the original cellulose crystal. From diffusion expts. it was found that acetylcellulose disperses in acetone when the diam. of the particles is less than 20μ , in $AcOEt$ 5μ , in epichlorohydrin 35μ . Cellulose soaked in 17% NaOH, squeezed out and exposed to air, showed a continually decreasing particle diam.; if, however, the cellulose was left in the alkali the diam. at first fell rapidly, then increased slightly to a const. value (in 2 hrs.) of about 8.5μ . This may indicate a chemically sp. action of the O_2 . No definite conclusions are offered.

B. J. C. VAN DER HORVEN

Remarks on Heuser's paper on the depolymerization of cellulose. KURT HESS. *Z. Elektrochem.* 31, 613-4(1925); cf. C. A. 20, 110.—Since Hess has shown that Me

cellulose such as that prep'd. by Heuser is a mixt. of several products (*C. A.* **18**, 1384), Heuser is not justified in estg. the degree of depolymerization by detg. the mol. wt. of the methylated product. Hess points out that conditions are further complicated by the increase in mol. wt. of methylated cellulose with time, but states that he will later publish data from purified material whose mol. wt. is const. ROSALIE M. COBB

Cellulose. XVI. Crystallized acetylcelluloses. 2. KURT HESS, GUIDO SCHULTZE AND ERNST MESSMER. *Ann.* **444**, 266 87(1925); cf. *C. A.* **19**, 3161.—Crude cellulose acetate was prep'd. by Ost's modification of the German pat. 252,706 (*C. A.* **13**, 2760), extd. with and recovered from Me_2CO and purified according to the Biehengrum method (German pat. 254,385) by heating for 2 hrs. at 65–70° with C_6H_6 - EtOH (1:1), filtering the hot soln. and allowing the filtrates to cool gradually. The results of 40 such fractional pptns. have been tabulated, an individual sample of cellulose acetate being used. The initial treatment of 50 g. of the crude (Me_2CO sol.) acetate mixt., which was heated with 300 cc. of solvents at 65°, filtered and cooled to 30°, yielded 1.55 g. of ppt. The residue remaining insol. at 65° was then reheated with a fresh EtOH - C_6H_6 mixt. and the fractionation continued. The 20th prepn. of cellulose acetate obtained in several parallel series of such purifications was compared and subjected to further study. In general these prepn.s, which approach the *diacetate*, but which may not be homogeneous, are distinctly cryst. $[\alpha]_D^{25}$ ($\text{EtOH}-\text{CHCl}_3$) -1.79° to -7.89° , yielding 51.6–53.9% AcOH and readily convertible, on reacylation in the presence of ZnCl_2 , into the pure triacetate (yielding 62.2–62.8% AcOH , $[\alpha]_D$ CHCl_3 -19.8° to -19.95°). The more sol. portions of the 1st 15 fractionations (*i. e.*, those sol. at 65–70°, but sepg. at 30–45°) were combined and recrystd. from C_6H_6 alc. (I). A similar treatment was accorded the combined sol. portions of fractions 21–40 (II). The most insol. portion (III) (*i. e.*, the material crystg. from alc.- C_6H_6 at 50° after the 40th fractional pptn.) was also isolated and compared with the original Me_2CO -sol. acetate mixt. (IV). The % AcOH , $[\alpha]_D^{17}$ in CHCl_3 alc., and $[\alpha]_D^{17}$ in $\text{C}_6\text{H}_5\text{N}$ of I, II, III, and IV are, resp.: 52.78, 52.11, 52.68, and 53.05; -1.03° , -1.01° , -3.41° , and -5.44° ; -22.03° , -21.42° , -18.93° , -23.82° . The η_{inh} of I, II, III and IV are, resp., 0.0232, 0.0323, 0.344, 0.0269. Sapon. of I, II and III with NaOH in MeOH , followed by measurements of $[\alpha]_D$ in standardized cuprammonium solns., showed remarkable agreement with the $[\alpha]_D$ of pure cellulose in cuprammonium solns. of identical concns. These data point to the fact that the ultimate cellulose unit remains intact after sapon. of the cryst. acetates. The solubilities of I, II and III in 2 *N* NaOH show differences, I being the most sol. The thickness of matting (*Dichte der Verfilzung*) of the different cryst. prepn.s. appears responsible for the differences in phys. properties. Systematic fractionation of 50 g. of IV was also effected by repeated extn. with successive 500 cc. portions of CHCl_3 in a Clausnitzer extn. app.; 13 such extns. yielded fractions showing similar properties (51.5–53.0% AcOH , $[\alpha]_D^{18}$ (in CHCl_3 -alc.) -3.2° to -6.2°). These prepn.s. on sapon. invariably gave rise to cellulose (as indicated by $[\alpha]_D$ of the cuprammonium solns.). Even after 13 extns., however, nearly 40 g. of material remained insol. in CHCl_3 ($[\alpha]_D^{18}$ in CHCl_3 -alc. -4.53° ; yielding 50.11% AcOH). The conditions for crystn. of the acetates depend on the presence or absence of contaminating sugars (formed as degradation products), on the concns. of the solns., the rate of cooling, and the nature of the solvents. Normally 6 pptns. from C_6H_6 -alc. are required before prepn.s. show definite double refraction. However, the conditions of crystn. are not sharply defined. In one case a distinctly cryst. ppt. on attempted recrystn. from 50 parts of a C_6H_6 -alc. mixt. gave an amorphous ppt. Rapid cooling inhibits crystn., although ppts. obtained in this way may crystallize on standing. Cryst. products may also be obtained from AcOEt and (after long standing) from CHCl_3 . Photomicrographs of acetate crystals are given. The crystals show the remarkable property of swelling (inhibition) prior to soln. Pure cellulose triacetate may also be crystd. but details of its prepn. are not given. **XVII. Characterization of preparations of cellulose.** KURT HESS, ERNST MESSMER AND NOAH IJUBITSCH. *Ibid* 287–327.—Since the $[\alpha]_D$ of cellulose cuprammonium solns. depends directly on the concns. of Cu and cellulose in soln. and on the formation of a complex of high $[\alpha]_D$, the detn. of the rotation curves of such solns. offers a means of showing the similarity or dissimilarity of celluloses of different botanical origin or obtained in different industrial operations. The cellulose-cuprammonium rotation curve is markedly different from the rotation curves of cuprammonium solns. of the amyloses, lichenin, acetone-glucose and methylcellulose, and is presumably quite characteristic (cf. *C. A.* **18**, 1384) for cellulose solns. H., M. and L. find that carefully purified spruce wood cellulose, Egyptian and American

cotton, and ramie cellulose give identical rotation curves in cuprammonium and therefore contain the identical cellulose unit. This is also true for mercerized and unmercerized cotton linters, initially purified by E. Schmidt's ClO_2 method. Apparently mercerized cellulose is less readily sol. in cuprammonium than is unmercerized cellulose and these solns. show a higher viscosity than do similar solns. of unmercerized material. (This is contrary to the commonly accepted point of view—ABSTR.). Cuprammonium solns. of "cuprammonium silk," and of the alkali-sol. and alkali-insol. fractions of such silk are practically identical with those of pure cotton. The artificial fiber is, therefore, physically non-homogeneous with the cellulose units intact. Rotation curves of viscose silk solns. show the same general shape as those of cellulose but some of the $[\alpha]$ values are 2.5% lower. These slight deviations are presumably due to small quantities of impurities. The curves of "hydro-cellulose" and "celloextrin" in cuprammonium also suggest those of pure cellulose, although they show marked deviation from the norm, which might be expected from cellulose mixed with degradation or conversion products (like isocellobiose). These deviations may be as high as 7% with hydrocellulose, and 21% with the celloextrins. Despite these deviations, however, the presence of the typical cellulose unit is not obscured and wide-spread degradation is not indicated. Rotation curves and complete tabulated data are given. Various celluloses in cuprammonium soln., which show identical rotation curves, may show markedly different viscosities. Cuprammonium solns. free from cellulose contg. 10 N NH_3 (and 20 millimols NaOH and 5 millimols $\text{Cu}(\text{OH})_2$ in every 100 cc.) showed η^{20} 0.0129. In similar solns. American cotton gave η^{20} 0.798; Egyptian cotton 0.078; another unmercerized cotton 0.0328, this identical sample (after mercerization) 0.0361, wood cellulose 0.496 and ramie fiber 0.0583.

LOUIS E. WISE

Stability of nitrocellulose. J. DUCLAUX. *Rev. gén. colloïdes* 3, 257-63(1925) — The samples used were all sol. in Et_2O -alc. They were made homogeneous by dissolving in $(\text{CH}_3)_2\text{CO}$, pptn. by H_2O , redissolving in various solvents, flowing on glass plates and drying under various conditions. Stability tests were made by heating the film at 100 or 110°, weighing to det. loss of wt., dissolving in $(\text{CH}_3)_2\text{CO}$ to a 2% concn. and detg. viscosity at 25°. A previous study (*C. A.* 15, 3393) showed that concordant results were obtained both by loss of wt. and viscosity reduction detns. The latter is preferable because of elimination of errors from incomplete evapn. of solvent, hygroscopic H_2O and slow diffusion of products of decompn. through the film if thick. It was found that stability was not a function of chem. compn. alone because films of various thickness made from the same soln. of a rather unstable nitrocellulose gave widely differing losses in wt. A given nitrocellulose gives films of varying d. when deposited from different solvents, proving differences in internal structure. A mixt. of Et_2O -alc. as solvent does not give a const. state of film because of changes in solvent during evapn., but when a single solvent is used such as isobutyl formate or mesityl oxide this is not the case and here films are obtained of the same stability irrespective of thickness. Equal stability was obtained by using a mixt. of high- and low-boiling solvents because the former remain after all the latter have gone. While stability depends largely upon chem. compn. the phys. state can alter stability in the ratio of 1:6. The variations in phys. structure are accompanied by changes in d. E. M. SYMMES

Georgia and Alabama clays as fillers. W. M. WEIGEL. *Bur. of Mines, Tech. Paper* 343, 34 pp.(1925); cf. *C. A.* 19, 1792.—Tests of clays from the Alabama and Georgia districts showed practically all of a large no. of samples to be suitable as fillers for paper when compared with the English and American clays commonly used. The properties considered in these tests were grit, whiteness or color, and retention. Analyses and descriptions of tests for use as rubber and paint fillers and oil cloth covering are also included.

W. H. SWANSON

Jelutong or pontianac rubber resin as a sizing agent. J. S. REMINGTON. *Ind. Chemist* 1, 467-8(1925).—Jelutong contains from 35.75 to 49% of resin in which there are 2 constituents, α and β . The probable formula for both is $\text{C}_{20}\text{H}_{40}\text{OH}$. R. gives many of the properties of both constituents. Trials to use them as a size for paper were unsuccessful. Mixing the resin with American rosin as follows gave a usable size: American rosin 1000, Jelutong resin 1000, caustic soda (80° Tw.) 700 lbs., water as much as possible, with 100 parts of pulp to 4 parts of the total resins. E. G. R. A.

Present status of lignine research. C. KELLIN. *Svensk Kem. Tids.* 37, 209-19 (1925).—A review to which is appended a bibliography of 138 titles referred to in the text and 52 additional titles subsequent to 1923.

A. R. ROSE

Plasticity in relation to cellulose and cellulose derivatives (SHEPPARD. CARVER) 2.

Sulfite cellulose. A. PEERTZ. Brit. 233,318, April 30, 1924. In producing cellulose by the bisulfite process, requisite reduction of pressure, whenever the desired maximum pressure is exceeded, is effected by discharging a portion of the liquor from the boiler, the upper valve being used only for discharging the air present. A saving in high-pressure steam is thus effected.

Cellulose carboxylates. SOC. DE STEARINERIE ET SAVONNERIE DE LYON and P. BERTHON. Brit. 233,263, Nov. 28, 1924. The process for the prepn. of cellulose esters of the higher fatty acids described in Brit. 201,510 (*C. A.* 18, 469) is modified by using as a diluent, during the esterification of the hydrocellulose, toluene, xylene or homologs.

Chlorinating sulfite liquor. A. SCHMIDT. U. S. 1,567,395, Dec. 29. Sulfite liquor is first treated with Cl gas and the resulting material is then further treated with nascent Cl, formed, *e. g.*, by use of chlorate and HCl. The product thus obtained is suitable for use in *tanning or resin substitutes*.

Recovering lye from disintegrated cellulosic materials. G. MOSEBACH. U. S. 1,567,668, Dec. 29. Straw or a similar substance is heated to about 70° with undil. lye while being stirred, the lye is squeezed out, and the compressed material is treated with hot H₂O at about 70°, stirred, and the hot H₂O contg. about 10% of the lye used is squeezed out and re-used for the prepn. of fresh lye.

Apparatus for hydrating or beating cellulosic fibers. H. JACKSON, LTD. and H. JACKSON. Brit. 233,501, April 10, 1924.

Nitrocellulose emulsions. T. WHITELSEY. Brit. 233,367, Nov. 6, 1922. A colloidal soln. of nitrocellulose in AmOAc or other solvent is emulsified with H₂O or other liquid which is not a solvent of the nitrocellulose and which may contain Na oleate or gelatin or other emulsifying agent.

Recovering valuable substances from waste gas from soda furnaces in sulfate cellulose factories. O. NORDSTROEM and A. MOERCH. Swed. 59,691, Oct. 13, 1925. The gases are filtered by passing through a drying shaft filled with raw chips which take up solid and condensable substances from the gas and at the same time are dried by the hot gases. The chips are afterwards charged into the boilers without removal of the absorbed substances.

Evaporating sulfite cellulose waste liquor. H. A. E. NILSSON. Swed. 58,778, May 27, 1925. The vapors which are compressed and used for heating purposes in the app. are treated with absorbents before they are compressed in order to remove the acid components and so reduce their corroding effect on the metallic parts of the compressor and app.

Alcohol from sulfite cellulose waste liquor. J. H. WALLIN. Swed. 58,822, June 3, 1925. The waste liquor is neutralized, in full or in part, by means of lime previously used for dehydrating the spirit. The alc. retained in the lime is not removed before the lime is used for the neutralization.

Charging cellulose boilers. P. A. FRESK. Swed. 59,300, Aug. 19, 1925. The chips are introduced into the boiler by a current of air assisted by a vacuum produced in the boiler.

Combining rubber with paper pulp. E. HOPKINSON and E. P. ROSE. U. S. 1,567,646, Dec. 29. Pulp, *e. g.*, kraft paper pulp, is mixed with rubber latex, and the mixt. is agglomerated, further mixed and the rubber is coagulated. The product is adapted for making continuous sheets.

Ornamenting surfaces of paper, cardboard, etc. M. A. TURNER. U. S. 1,568,108, Jan. 5. A coating of corn starch mixed with sufficient liquid to form a viscous mixt. is applied in varying thickness, followed by the application of a coloring pigment while the first coating is still in viscous condition. When dried the coating is substantially flat but presents an embossed appearance.

Dyeing paper pulp. A. G. TEMPERLEY, J. THOMAS and SCOTTISH DYES, LTD. Brit. 233,382, Dec. 12, 1923. Pulp is dyed with 1-amino-2-methyl-, 1-methylamino-, 1,4-diamino-, 1-amino-4-hydroxy-, 1-chloro-5-aminoanthraquinone or other aminoanthraquinone compd. of like character. Resin size, alum and china clay may be added to the pulp as usual.

Paper fibers easily sizeable. CENTRALGRUPPENS EMISSIONSAKTIEBOLAG. Swed. 59,580, Oct. 7, 1925. The fibers are washed and treated with free alkali or an alk. soln. of such a concn. that those substances which are harmful to the size are extd. without dissolving any resin.

Paper machine. W. LJUNGSTROEM. Swed. 59,579, Oct. 7, 1925. Mech. features. Cf. *C. A.* 19, 1497.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Analysis of explosives. A new apparatus for the test at 135°. PEDRO T. VIGNAU AND JERONIMO ANGLI. *Rev. facultad ciencias* 3, No. 2, 51-3(1925)—A closed bath 20 X 80 X 15 cm. is provided with 2 Liebig reflux condensers and 21 tubes arranged in 1 row for the samples and the thermometer. The water from the condensers enters a small tank above the app. which affords protection from fire. All parts are made of Cu.

MARY JACOBSEN

The Waltham Abbey test in the testing of cordite powders. PEDRO T. VIGNAU AND ROGELIO T. BABUGLIA. *Rev. facultad ciencias* 3, No. 2, 47-50(1925).—Without proper precautions the method of Waltham Abbey may give variations as high as 50 hrs. Satisfactory results were obtained in thousands of samples when scrupulous cleanliness, abs. absence of moisture and uniform heating were observed and the powder was ground without development of heat. The Ag coat on the inside of the app. is superfluous and interferes with the proper inspection of the cleanliness and dryness of the app.

MARY JACOBSEN

Rifle and artillery guncotton from "Letea" brand wood cellulose. GH. PANDELE. *Bul. chim. soc. române de stiinta* 27, 79 128(1924) (in Roumanian); reprint 60 pp., 19 25, [in French]—Bleached sulfite pulp from the Letea mill (Roumania), having ash 0.42, fats and waxes 0.22%, Cl trace, when in the form of a very light (13 g. per sq. m.), porous, creped sheet (such as are used in prepg. surgical dressings), is nitrated more rapidly than cotton, but the powders obtained have a lower N content and a higher soly. than cotton powders and retain much more acid. When nitrated with an acid of suitable compn. (the exact compn. is a state secret), with about the same amt. of acid and the same temp. as for cotton, Letea sulfite gives rifle powder with 13 10% N and 20 50% soly., and an artillery powder with 12.75% N and 89% soly. They can be stabilized in about 25 hrs., as compared with 60 hrs. for cotton powders, and with all stability tests give better results than the cotton powders. The powders prepd. from the sulfite are not mixts. of different nitrocelluloses more or less highly nitrated, as are the cotton powders, and consequently they are more homogeneous and stable than the latter, and they give uniform ballistic results without any variation in the pressure. On treatment with EtOH there is no loss of nitrocellulose, and only about half as much EtOH and Et₂O is required to work up the powder as for cotton powders.

A. PAPINEAU-COUTURE

Mixtures of explosive nitrates. Reply to chemists of the Bureau of Mines of Pittsburgh. MICHELE GIUA. *Gazz. Chim. ital.* 55, 422-4(1925).—G. again calls the attention of Taylor and Rinkenbach (*C. A.* 17, 879, 880, 3100) and of Bell (*C. A.* 17, 3125) to his work on the system TNT-tetryl (*C. A.* 9, 2089, 3362; 10, 1175, 1176; 11, 1547).

E. J. WITZEMANN

Explosivity of brown-coal dust. WEISS. *Braunkohle* 24, 782-3(1925); cf. *C. A.* 19, 2565.—Observations on the gain in weight (by oxidation) of dry coal samples confirm those on the effect of moisture in reducing the explosivity of brown-coal dust.

WM. B. PLUMMER

BEYERSDORFER, PAUL: **Staub-Explosionen.** Dresden and Leipzig: Theodor Steinkopff. 125 pp. Price, paper M. 5.50; bound, M. 7.

PASCAL, P.: **Explosifs, poudres, gaz de combat.** Paris: Librairie Scientifique J. Hermann. 296 pp. Fr. 35. Reviewed in *Chemistry and Industry* 44, 1132(1925).

Explosive. T. L. DAVIS. U. S. 1,568,502, Jan. 5. Hexanitrocarbanilide is used in "booster" charges or otherwise as an explosive.

Nitrate conglomerates for use in explosives. W. M. DEHN. U. S. 1,568,324, Jan. 5. Conglomerates of NH₄NO₃ and NaNO₃ are formed by heating the salts to form sludges and then rapidly cooling them.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Advances in the chemistry of dyes in 1924. FRITZ MAYER. *Chem.-Ztg.* 49, 949-51, 970-2, 985-7, 1001-3, 1025-6, 1029-30(1925).

E. J. C.

Surveys of recent progress in the dyeing, printing and allied industries. I. Tex-

tile fibers. **Artificial silk.** J. HUEBNER. *J. Soc. Dyers Colourists* **41**, 387-401 (1925).—In this review an attempt has been made to collect all the work, including patents, which has been published on the above-named subject during the period 1914-1925. About 350 papers are noted with abstracts averaging 5 or 6 lines each. L. W. RIGGS

Dyes and photochemistry. I. SEDLACZEK. *Phot. Ind.* **1925**, 950.—In a general discussion of the principles of dyeing and the textile industry various terms such as substantive dye, indirect dye, pigment dye, mordant, lake, etc., are explained. Examples of mordants for acid and for basic dyes are given. M. L. DUNDON

Importance of the synthetic dyestuffs industry. JOSEPH TURNER. *J. Soc. Dyers Colourists* **41**, 384-7 (1925).—An address.. L. W. RIGGS

How dyes are made. MAX MUSPRATT. *J. Soc. Dyers Colourists* **41**, 401-3 (1925).—An address. L. W. RIGGS

Comparative study of azo dyes made with H acid and acetyl-H acid. W. W. LEWERS AND ALEXANDER LOWY. *Ind. Eng. Chem.* **17**, 1289-90 (1925).—A series of dyes was prepd. from 33 diazo compds.; as the coupling component were used H acid and acetyl-H acid. The latter series was hypsochromic, and in general faster to the action of acids and alkalis. T. S. CARSWELL

A microscopic method for identifying Naphthol AS dyeings. LUDWIG LÖCHNER. *Textilber.* **6**, 914-6 (1925).—Dyestuffs formed on the fiber by coupling with Naphthol AS may be extd. with HIOAc and crystd. on an object glass. As a variety of crystal forms are so obtained, it seems that by considering the color and crystal form, a systematic method of identifying the original substances can be devised. Some typical photomicrographs are exhibited. E. R. CLARK

Lime in the treatment of dye and textile wastes. F. D. SNELL. *Rock Products* **28**, No. 18, 61-2 (1925).—Description of acid neutralization and coagulation of dye wastes by Fe or Al sulfate and lime. High Ca lime is preferable to magnesian lime. RAYMOND WILSON

New possibilities in dyeing with indigosols. GUSTAV FRIEDLANDER. *Textilber.* **6**, 916-7 (1925).—The properties of the sol vat colors recently introduced suggest a number of new possibilities in dyeing. Much better fastness to soap and crocking as compared with the ordinary vat is obtained. Combinations with the fast direct colors give a variety of shades of great fastness, and with aniline blacks, a pleasing depth is obtained. Metanitrailine Orange and the like can be used together with indigosols and the possibilities of new discharge styles are great. By impregnating fabrics with a mixt. of Indigosol O, Na₂S₂O₄, and NH₄ClO₄, and exposing partially to light, novel photographic prints may be obtained. E. R. CLARK

Report of Research Committee. I. A. OLNEY. *Proc. Am. Assoc. Textile Chem. Colorists* **1925**, 224-5; *Am. Dyestuff Rept.* **14**, 852-3.—A brief general review of the work of the year is given. The reports of the various sub-committees were followed by discussion. **Report of Sub-Committee on Light Fastness.** WM. H. CADY. *Ibid.* **1925**, 6, 853-4; cf. *C. A.* **19**, 1057.—Tests with sunlight led to the following conclusions: (1) The angle of exposure is important when total fading is considered, the fading being greatest with horizontal exposure and less in order with 45 and vertical exposures. Angle of exposure has little effect on relative fading. (2) Covering samples with glass influences the fading but not always in the same way. (3) The effect of free circulation of air or the lack of it cannot be ignored. (4) Continuous exposure produces different fading from exposure only to the sun when it is high and free from clouds. (5) Direct sunlight has a different effect from "skylight" without sun. (6) Exposures made in different localities show little variation in relative fading. (7) Exposures made at the same location at different seasons of the year show little variation so far as these tests have been carried; the work, however, is not completed. **Report of Sub-Committee on Standard Tests for Fastness to Washing.** W. M. SCOTT. *Ibid.* **1925**, 6, 855-8.—The 4 tests used were made with 1% soap solns. acting for 10 min. under the following conditions: (1) boiling, (2) 71, (3) 49, (4) 29. According to the results of these tests goods were divided into Class 1—no appreciable change after test (1), Class 2—changed by test (1) but not by test (2), Class 3—not changed by test (3), Class 4—not changed by test (4), and Class 5, which was changed by test (4). **Report of Sub-Committee on Fastness to Perspiration.** HUGH CHRISTISON. *Ibid.* **1925**, 6, 858-9.—Expts. with relation to this subject are in progress. L. W. RIGGS

Suggestions for a simple standard for testing the fastness of dyed materials to light. W. F. DEADY. *Proc. Am. Assoc. Textile Chem. Colorists* **1925**, 242-6; *Am. Dyestuff Rept.* **14**, 878-82.—The "suggestions" were made to call forth discussion by the members of the Assoc. L. W. RIGGS

Deterioration of fabrics by light. ANON. *Dept. Sci. Ind. Res. First Report of*

the Fabrics Coordinating Research Committee 1925, 10-3.—The most destructive portion of the solar spectrum is the band bounded by 3900 and 3100 A.U. The best protection for airplane wings is to dye the dope with spirit black. The work is still in progress. **Deterioration of fabrics by microorganisms.** *Ibid* 14-28.—The study proceeded along the following lines: isolation of microorganisms including bacteria, molds and higher organisms that cause destruction of fabrics; the study of the harmful organisms with special regard to the conditions of growth and inhibition; the evolution of treatment to delay or arrest the deterioration due to microorganisms. For preserving fish nets a treatment with Cu oleate and coal tar was best. **The mechanical testing of fabrics.** *Ibid* 29-51.—The details for carrying out tests on the strength of fabrics by means of various machines are given. An essential piece of app. for this work is the const. humidity box which is described. **Fireproofing of fabrics.** *Ibid* 52-3.—This work is in progress.

L. W. RIGGS

Fading tests with an Osram point light lamp. E. HOCHLEIM and E. KNEBEL. *Textilber* 6, 912-11 (1925).—A W arc lamp made by the Osram Co., Berlin, shows a spectral distribution very similar to normal sunlight, and is superior for fading test to either the quartz-tube Hg lamp, which has a very discontinuous spectrum, or the C arc, which gives off too much ultra-violet light. The life of the lamp is some 500 hrs. and decreased intensity of radiation with age may be compensated for with a rheostat.

E. R. CLARK

A new lamp for fading tests. W. D. APPEL. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 216-9; *Am. Dyestuff Rept* 14, 882-5.—A description of the lamp built at the Bureau of Standards is given.

L. W. RIGGS

Pineapple fiber. R. O. BISHOP and E. A. CURTLER. *Malayan Agr. J.* 13, 293-301 (1925).—Fiber prepd. from the leaves of the fruiting pineapple plant of the "Singapore" variety resembles manila hemp in compn. Although its tensile strength is about 75% that of Manila fiber its qualities warrant further study. The cost of growing, collecting and sepg. the fiber is 1 sh. compared with the cost of producing sisal or Manila fiber.

L. W. RIGGS

Cold bleaching. ROBERT MOHR. *Textilber* 6, 906-12 (1925).—Several bleachers in Germany are using the Mohr process, in which cold NaOH soln. is circulated through the goods, alternately with rinse water, and oxidizing and souring solns. Their experience has been such that the inventor warrants that results at least as good as can be obtained by boiling processes will follow the introduction of the system. The special app. sold by the Zittau Machine Works is recommended. Samples of colored rayon striped fabrics bleached by the Mohr process are exhibited (cf. C. A. 17, 2056).

E. R. CLARK

Chemical analysis of cotton. Waxes of cotton of different origin and their characteristics. L. V. LECOMBER and M. E. PROBERT. *J. Textile Inst* 16, 338-44T (1925).—The wax content fails completely as a means of differentiation of cottons of different geographic origin. **Identification of the fatty ingredients in sized goods.** *Ibid* 345-51T.—Samples of sized yarn and gray cloth known to contain tallow, Japan wax, spermaceti, castor oil, paraffin wax, or mixts. of these substances were extd. with CCl_4 . The results showed that the characteristics of the added fatty ingredient, as deduced from analysis, are in good agreement with the generally accepted values for the particular substances in question.

L. W. RIGGS

New process in the [dry] cleaning industry. ALB. FISCHER. *Warme & Kälte* 27, 53-6 (1925).—The benzine used in washing the clothes is circulated, during the washing, through a centrifugal separator to remove the dirt. The dirt has a fat content of 6.9%, while the benzine contains only 0.76%, which is not objectionable and tends to keep the clothes from absorbing moisture.

ERNEST W. THIEL

Effect of alkalis on wool: Importance of p_H . H. C. CHAPIN. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 231-3; *Am. Dyestuff Rept* 14, 859-61.—The point of view in this paper is that the amt. of free acid or alkali in a dye soln. does not matter so much as the percent of that free acid or alkali which is active. Thus H_2SO_4 and AcOH or NaOH and NH_4OH of equal neutralizing powers have very different actions in the dye bath because of their different degrees of ionization. Hence the importance of detg. the p_H from which the degree of ionization is estd. **Hydrogen-ion concentration. Its relation to the problems of dyeing.** W. M. SCOTT, E. M. SHELTON and (MISS) HAZEL F. GROVER. *Ibid* 234-7; 862-5; cf. Speakman, C. A. 19, 1200, 2275.—It has proved that the theories of Speakman apply to silk as well as to wool.

L. W. RIGGS

Recent developments in the coloring of acetate silk. H. R. DAVIES. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 251-4; *Am. Dyestuff Rept* 14, 887-90; cf. C. A. 19, 401.—An address.

L. W. RIGGS

Quantitative studies on the action of alkalis (sodium hydroxide) on rayon silks and of their relative hygroscopic properties. A. K. JOHNSON. *Proc. Am. Assoc. Textile Chem. Colorists* 1925, 238-46; *Am. Dyestuff Rept.* 14, 866, 875-82—The object of this study "was to ascertain the actual losses and their uniformity upon treatment with NaOH, in order (1) to det. the suitability of this reagent under proper conditions for making union fabric analyses, and (2) to establish the factor to be applied to the wt. of the residual fiber mass from the analysis to correct it for the loss from caustic action."

L. W. RIGGS

History and development of bronze printing. OSKAR GAUMNITZ. *Textilber.* 6, 923-7(1925)—An historical account of methods for printing metallic powders on fabrics, with a large no. of modern recipes for adhesives.

E. R. CLARK

Plasticity as applied to artificial silk (VENABLE) 2.

Dyes. S. SOKAL. *Brit.* 233,452, Feb. 16, 1924. Blue and gray vat dyes are obtained by potash fusion of benzylideneacenaphthenone and *o*-hydroxybenzylideneacenaphthenone, resp. Other examples are given of dyes produced similarly from condensation products of similar aldehydes or their chloro-, hydroxy- or amino derivs.

Indigoid dyes. B. MAYER and W. MOSER. *U. S.* 1,567,158, Dec. 29. Glycine is condensed with a 2-halogen-anthraquinone-3-carboxylic acid, the anthraquinone-3-carboxylic acid thus obtained is treated with condensing agents and the indoxyl compds. of the 2,3-anthraquinone series thus formed are converted into indigoid dyes and the latter are halogenated. The halogenated dyes thus produced dye cotton fast red-blue to blue-black and green.

Vat dyes of the thioindigo series. A. W. JOYCE. *U. S.* 1,568,458, Jan. 5. The condensation product from 4-methyl-6-chloro-2,3-diketodihydro-1-thionaphthene and its 2-keto equivs. with 6-ethoxy-3-hydroxy-1-thionaphthene is brominated. A bright red powder is produced, insol. in H₂O, alc. and ether, sol. in PhNO₂ and in concd. H₂SO₄, forming a yellow vat with alk. hyposulfite, dyeing animal and vegetable fibers bright bluish red shades, fast to light, Cl and washing.

Carbocyanine dyes. G. O. GUTKUNST. *U. S.* 1,568,667, Jan. 5. Dyes of the carbocyanine type are obtained by the "condensation on itself" of a naphthoquinaldine alkyl halide, *e. g.*, β -naphthoquinaldine ethiodide with alc. potash in the presence of CHI₃.

Lakes, pigments, etc. COLLOISIL COLOUR CO., LTD. *Brit.* 233,426, Feb. 7, 1924. Basic dyes, *e. g.*, Brilliant Green, are heated with liquid, *e. g.*, boiled with H₂O in the presence of "Neuburger Kieselkreide" or other material consisting at least principally of hydrated silica, to form lakes, pigments or body colors.

Dyeing textile materials. SANDOZ CHEMICAL WORKS. *Brit.* 233,704, May 7, 1924. Reserve effects by local esterification of vegetable fibers, either as yarns, loose material or fabrics, are produced by printing with an alkalizing agent such as concd. alkali, with or without a thickening agent, alc. or an alc. soln. of an alkali alcoholate, then applying an esterifying agent such as an acidyl chloride or anhydride or a sulfochloride, and finally washing. A white reserve on a colored ground is obtained by subsequent dyeing with a substantive dye, and a colored reserve on a white or colored ground is obtained by mixing an excess of dye with the alkalizing agent, with or without subsequent dyeing, or by other dyeing methods. Numerous details are given.

Apparatus for dyeing yarns. FULD & HATCH KNITTING CO. *Brit.* 233,255, Nov. 17, 1924.

Kier for bleaching, dyeing and other treatment of wound yarns. JOHN, THOMAS and JOSEPH BRANDWOOD. *U. S.* 1,567,568, Dec. 29.

Bleaching straw braid. E. W. GEISLER. *U. S.* 1,568,664, Jan. 5. Moist Cl is preliminarily applied to straw braid, to render it more readily penetrated by another bleaching agent which is subsequently used, *e. g.*, H₂O₂.

Linen-like finish on cotton goods. R. L. M. G. HEBERT. *U. S.* 1,567,264, Dec. 29. Cotton fabric is scoured with Na₂CO₃, chlorinated, treated with a bath of 53-53.5° Bé. H₂SO₄ at a temp. not exceeding 15° for 14-18 sec., rinsed and then subjected to a "dressing" treatment.

Spinning threads from cellulose acetate solutions. FARBENFABRIKEN VORM. F. BAYER & CO. *Brit.* 233,342, April 29, 1924. In spinning threads of acetate soln. into a soln. of CaCl₂ or other saline coagulating bath, danger of breakage of the thread is reduced by adding to the bath a solvent or swelling agent for cellulose acetate, *e. g.*, acetone, an alc., acetone-alc., formaldehyde or formaldehyde-acetone.

Balloon envelope material. R. TRENCKMANN and B. TRENCKMANN. U. S. 1,567,556, Dec. 29. A sheet of one or more layers of animal membrane such as gold-beaters' skin is moistened, stretched and treated with a mixt. formed of glue, Turkey red oil, glycerol and $K_2Cr_2O_7$ or formaldehyde. A sheet of fabric such as cloth is then united with the coated membrane under pressure.

Ammonia from waste liquors. J. P. BEMBERG AKT.-GES. Brit. 233,669, May 6, 1924. NH_3 present in waste liquors from the manuf. of artificial silk by the cuprammonium process is recovered by pptn. as $Mg NH_4$ phosphate.

Apparatus for forming and coagulating filaments from viscose. S. A. NEIDICH. U. S. 1,568,687, Jan. 5.

Apparatus for manufacture of artificial silk filaments. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 233,298, May 3, 1924.

Apparatus for "dry spinning" of artificial silk filaments. SOC. POUR LA FABRICATION DE LA SOIE RHODIASETA and N. GRILLET. Brit. 233,384, Jan. 3, 1924.

Apparatus for making filaments of artificial silk. A. KAMPF. Brit. 233,268, July 3, 1924.

26 PAINTS, VARNISHES AND RESINS

A. H. SABIN

Modern paint grinding mills. H. KOLLN. *Farbe und Lack* No. 47, 555-7(1925). — Descriptions and illustrations of modern com. mills. F. A. WERTZ

Aluminium bronze powder. J. D. EDWARDS. *Paint, Oil and Chem. Rev.* 80, No. 16, 10, 12(1925). — A brief review of the method of manuf., phys. characteristics, detection and estn. of adulteration and coloring processes. F. A. WERTZ

Fundamental facts about aluminium paint. J. D. EDWARDS. *Paint, Oil and Chem. Rev.* 80, No. 20, 10 2(1925). — Review. F. A. WERTZ

Cadmium pigments. FR. HEPLER. *Farbe und Lack* No. 48, 568-9(1925). — A brief review of the manuf., properties and uses of cadmium yellow (CdS), and of cadmium red (Cd sulfide-selenide) pigments. F. A. WERTZ

China wood oil. MAXIMILIAN TOCH. *J. Soc. Chem. Ind.* 44, 511 2T, 517 8T, 527 8T(1925) (abridged). See C. A. 19, 2277. F. A. WERTZ

Effect of zinc oxide pigments upon rate of oxidation of linseed oil. F. H. RHODES AND R. A. MATHES. *Ind. Eng. Chem.* 18, 30-1(1925). — Some of the previously observed variable effects of ZnO pigments on the rate of oxidation of linseed oil (C. A. 17, 3922) were investigated by using a variety of ZnO pigments of known compn. Pure ZnO has no effect on the oxidation rate; that contg. Pb as an impurity may increase the oxidation rate because of the formation of Pb driers by interaction between oil and pigment. The presence of sol. compds. of Zn causes the linseed oil to coagulate at an earlier stage in the oxidation and to form a harder and less permeable film; but the final amt. of O absorbed in 400 hrs. is less than if $ZnSO_4$ is not present, so that the action of $ZnSO_4$ is not that of an oxidation catalyst. It is probably $ZnSO_4$ which causes the formation of a hard film from a ZnO paint, the hardening action which ZnO imparts to a white lead paint, and the apparent drying action of Zn. F. A. WERTZ

Effect of yellow and brown iron oxide pigments upon rate of oxidation of linseed oil. F. H. RHODES AND J. D. COOPER, JR. *Ind. Eng. Chem.* 17, 1255-7(1925). — Expts. as previously carried out to det. the effect of red Fe oxide pigments on the rate of oxidation of linseed oil (C. A. 18, 3280) were applied to brown and yellow oxides. Others first retard, then accelerate drying of the oil. The initial retardation is caused by adsorption of the Pb drier from the oil; the final acceleration is due to the formation of Fe soaps which act as catalysts. The Fe oxide in an ocher reacts less readily with the drying oil than does the Fe_2O_3 in a red oxide pigment. Siennas and umbers show less initial retardation of drying of the oil than does ocher because the removal of the Pb drier is compensated by the formation of a small quantity of Mn drier. Metallic brown shows a less pronounced influence on the oxidation process. Results are plotted. F. A. WERTZ

Gold and silver pigments for book printing. F. SCHIRMER. *Farbe und Lack* No. 45, 528(1925). — Review of materials used and processes of application. F. A. WERTZ

Priming materials. ALB. FRUMENTOR. *Farbe und Lack* No. 45, 529-30; No. 46, 543-4(1925). — A review principally of various com. and patented primers for wood, metals, etc. F. A. WERTZ

The status of cellulose lacquering. M. WINKLEMAN. *Farbe und Lack* No. 47,

557(1925).—A brief description of the use of lacquers in the German automobile industry. Lacquer primers and undercoats are preferred to oil undercoats. F. A. W.

Lamp lacquers. C. R. FRÖMMING. *Farbe und Lack* No. 48, 569(1925). F. A. W.

Florentine lac. BING. *Farbe und Lack* No. 48, 570(1925).—Review. Florentine lac is cochineal coloring matter combined with Al hydrate and sometimes tin, usually marketed in dry cone-shaped pellets. F. A. WERTZ

Crystallizing lacquer. W. J. MISKELLA. *Paint, Oil and Drug Rev.* 80, No. 24, 10-1(1925).—A review of the various present and possible uses of tung oil japans which produce a frosted or cryst. effect when baked in an oven having an open flame gas burner in it. F. A. WERTZ

Phenol-formaldehyde resins as constituents of lacquers and varnishes. A. C. HOPPER. *Chem. Age* (London) 13, 370-1(1925).—A review of the solvent constituents of lacquers, of methods suggested for detg. the soly. of resins, of patents aiming to improve the characteristics of artificial and natural resins, and of the A. S. T. M. tests for varnish (C. A. 17, 1337). Artificial resins do not appear to be displacing natural resins in the lacquer industry. F. A. WERTZ

The improving of rosins and copals. R. SCHWARZ. *Farbe und Lack* No. 48, 566-7(1925).—A review of methods and patents for raising the m. p. of rosin by oxidizing the finely divided rosin, for removing impurities from natural resins, etc. F. A. WERTZ

The inter-esterification on heating of fatty acid glycerides with resin acids. K. PISTOR. *Z. anorg. Chem.* 38, 1118-21(1925). See C. A. 20, 117. H. G.

Georgia and Alabama clays as fillers [for paint (WEIGEL) 23. Recovering values from acid sludge [for use as a paint] (U. S. pat. 1,568,261) 22. Chlorinating sulfite liquor [for use as resin substitute] (U. S. pat. 1,567,395) 23.

MORRELL, R. S. AND WOOD, H. R.: **The Chemistry of Drying Oils.** Oil and Colour Chemistry Monographs, edited by R. S. Morrell. London: R. Benn, Ltd. 224 pp. 21s.

Paint. D. TAYLOR. U. S. 1,568,350, Jan. 5. A paint adapted for resisting gas or acid fumes comprises turpentine 2, linseed oil $1\frac{1}{2}$, a Pb compd. such as red lead $16\frac{2}{3}$, mineral red $16\frac{2}{3}$, asbestos powder $1\frac{2}{3}$, port. cement $2\frac{5}{8}$, Zn $1\frac{1}{2}$ and "chill room paint" 48 parts.

Bituminous paint. C. S. FLEMING. U. S. 1,568,215, Jan. 5. A bronzing powder is added to a dark colored bituminous vehicle such as "D" grade asphalt and C_6H_6 to prep. a paint which is suitable for use on roofs, etc.

Manufacture of zinc white. ROBERT LEPSPØE. Norw. 37,515, June 2, 1925. A jet of liquid metallic Zn is blown into a suitable heated chamber by means of compressed air, in which chamber it is burned to zinc white which is gathered in known ways.

Coating for wooden articles. JOHAN SIMONSEN. Danish 34,822, Aug. 3, 1925. Two parts of chalk and 1 part of a dry pigment are stirred with water to a thick paste and then the following ingredients are added: $\frac{1}{4}$ part by wt. of oil, $\frac{1}{4}$ part of lac, $\frac{1}{2}$ part of benzene and 2 parts of gluten.

Composition for removing paint and varnish. E. R. LITTMANN. U. S. 1,568,753, Jan. 5. A satd. aq. soln. of Na nitronaphthalate is mixed with acetone, EtOH, C_6H_6 and toluene.

Liquid enameling composition. C. D. HOCKER. U. S. reissue 16,240, Jan. 5. See original pat. No. 1,422,861, C. A. 16, 3219.

27—FATS, FATTY OILS, WAXES AND SOAPS

E SCHERUBEL

Colloidal reactions in the oil and fat industry. J. LEIMDÖRFER. *Seifensieder Ztg* 52, 791-2, 835-6, 854-5, 874-5, 893-4, 912-3, 931-2, 950-1, 968-9, 987-9(1925).—A popular discussion of the nature of colloid reactions in the fat industry. The ready digestibility of fats is made possible by rendering them by the wet method at low temp., thereby retaining their natural enzymes, while fats that are rendered dry at higher temp. are given a better keeping quality but lose some of their emulsifying property during digestion. Olive oil is the most easily digested oil, coconut oil is less so and may

even cause an unpleasant feeling during digestion by the gradual development of its characteristic odor. A food easily perishable is also easily digested. Refining oils: The removal of free fatty acids by esterifying, distn., alc. soln., and by caustic is discussed; the various phys. reactions when dil. or concd. NaOH is used and the resulting soap stock of Na or Ca base are considered from a colloid viewpoint. Hardening of fats: A catalyst must be insol. in the medium to be acted upon; the increase in surface due to fine particles and their equil. with the coarser suspended particles furnish the tension from which the energy is derived that accelerates chem. reactions. The inactivity of a dead catalyst is caused by the transformation of the suspensoid into a suspension with a corresponding loss in energy. "Poisoning" of a catalyst has its source in some chem. reaction.

Oxidation and polymerization of vegetable oils and their fatty acids. G. S. PETROV AND A. I. DANILOVICH. *Z. dent. Oel-Fett-Ind.* **45**, 669-71, 688-9, 703-5, 723-4 (1925).—The constns. of linseed, sunflower and other oils were detd. during their oxidation at different temps. and are tabulated. Polymerization expts. are also tabulated for temps. 180-300° and distns. for 290-325°, at which latter temps. the oils decompose, yielding distillates of polymerized fatty acids. The original Fahrion method (*Z. angew. Chem.* **1896**, 175) for detg. hydroxy fatty acids does not yield results agreeing with the recorded results of the literature, especially when applied to sunflower oil oxidized at 95-100° and at 160°, at which temps. no oxidized acids are obtained; however, oxidation at 250° yields hydroxy acids by Fahrion's method. P. and D. modified the latter's method by first dissolving the oxidized product in alc., and then shaking the soln. with gasoline to ppt. the insol. hydroxy acids. Comparative results of the 2 methods show that weakly oxidized oils may yield correct results with Fahrion's method, but highly oxidized oils give too high results, and to obtain correct results, an alc. soln. of the product must precede the gasoline extn. as is done in P.'s and D.'s method. Air oxidation of the fatty acids of linseed oil with 0.1% Co acetate for 48 hrs. yields 30.7% hydroxy acids (P.'s and D.'s method) of 132.1 I No. while oxidation under the same conditions with 2% Pb-Mn resmate yields 26.07% hydroxy acids with an I no. of 74.8. Most of the expts. were carried out on sunflower oil, its observed resistance toward oxidation cannot be explained on the basis of chem. constitution or its high content of oleic acid glycerides. *Summary*: (1) The most intensive action occurs at 290-320° when the glycerides are partially decomposed into fatty acids and some acrolein. (2) Polymerization in completely filled high containers results in light colored products of high acidity with little loss of oil, refined oil being used. (3) Open vessels furnish a product of low acidity but dark color. (4) The soaps from oil polymerized in an open vessel are dark, but they are light colored from oil which is polymerized without air access. P. and D. preferably employ a high temp. with partial decompn. of the oil and removal of the resulting fatty acids by superheated steam at diminished pressure.

P. ESCHER

The free acidity of edible oils. ANTONIO CERIOTTI AND ALFREDO SANGUINETTI. *Rev. facultad ciencias* **3**, No. 2, 65-75 (1925).—Of 458 com. pure olive oils of various origin and age only 26 had an acidity exceeding 1.5% oleic acid. It is, therefore, suggested that this figure be generally adopted as the limit of permissible acidity. M. J.

Determination of the melting point of cacao butter. TH. SABALITSCHKA. *Z. angew. Chem.* **38**, 1013-4 (1925).—Results of previous workers have been confirmed, that it is necessary to leave the m. p. tube on ice for several weeks before making the detn. in order to obtain complete solidification and thus the correct m. p. W. B. P.

A survey of equipment used in modern soap manufacture. IV. C. RICHTER. *Industria saponiera* **25**, 239-42 (1925); *C. A.* **20**, 304.—An illustrated description of machinery for mixing, automatic driers, presses, cutters, etc.

C. C. DAVIS

The determination of the turbidity point of soap solutions. K. BRAUN. *Chem.-Zig.* **49**, 1012 (1925). III.—The turbidity point of a soap soln. is that temp. at which a soln. contg. 3% fatty acids as an alkali salt begins to become turbid on cooling. The detn. may be made with an app. protected by trade-mark No. 920,816, consisting of a beaker inside another one that has an insulating mantle with 2 slits cut in at opposite sides, and a source of light behind one of them. The warm soap soln. is poured into the inside beaker, the outer one contg. hot H₂O. The thermometer or a sep. stirrer may be used to keep the temp. uniform. When turbidity occurs, the temp. is recorded.

P. ESCHER

A new method of determination of rosin in soap. G. DE BELSUNCE. *Bull. mat. grasses* No. **4**, 70-85 (1925).—The following method, based on the formation of Al resinate, is quicker and more convenient than the Twitchell method and is more accurate with low rosin contents. Dissolve 3-3.5g. of soap on the water bath in 60 cc.

H₂O in a 300-cc. wide-necked flask, allow to cool slowly to room temp., if the soln. gels add 20 cc. H₂O, redissolve, and let cool, pour the soln. with stirring in a mixt. of 20 cc. H₂O and 16.5 cc. Al₂(SO₄)₃ (55.5 g. in 1 l. of H₂O) (both solns. should be at a temp. not over 23°), immediately pour on a fluted filter, wash abundantly with cold H₂O till the washings are neutral. Without waiting for the last traces of H₂O to drain, wash the ppt. successively with five 15-cc. portions of 65% EtOH, 2 of 90% EtOH and 3 of 65% EtOH, if necessary remove the ppt. from the filter, triturate with 15 cc. of 65% EtOH and filter. All washings should be carried out at not over 23°. Titrate the combined 1st 10 alc. washings with *N* NaOH, add the last washing, transfer to a tared 300-cc. Soxhlet extn. flask, distil off the EtOH, dry first on the water bath and then in the oven at 100–5° to const. wt. The wt., corrected for the Na₂O used in the titration, gives the rosin present in the soap. The acids weighed are fatty acids which were displaced by the rosin acids and none of the latter is dissolved out. By assuming a mol. wt. of 287 for abietic acid, the wt. of acids calcd. from the titration should agree within 20% with the wt. found. In about 60% analyses B. found good agreement between the results of the titration and the weighing; but the former cannot safely be used for detg. the rosin. With 3–15% rosin the method gives result: agreeing with those obtained *via* Twitchell; with less than 3% rosin it is more accurate than the Twitchell method, and with more than 18% rosin it is inapplicable. In discussing the mechanism of the reaction of liberation of the fatty acids, from the fact that the latter are equal to the wt. of rosin and not equiv. to the rosin acids, B. considers that the rosin hydrocarbons must act in some physico-chem. or purely phys. manner. Wolff and Dorn (*C. A.* 16, 349) observed a somewhat similar phenomenon in investigating the nature of the ppt. causing turbidity in varnishes contg. driers. A. P. C.

Saponification under pressure. A. WELTER. *Z. deut. Oel-Fett-Ind.* 45, 685 6 (1925).—Referring to Löffl's (*C. A.* 19, 3606) and Stiepel's articles (*C. A.* 20, 514) on autoclave sapon., W. reports that he had successfully introduced pressure-sapon. into his factory 20 yrs. ago, but had abandoned it again on account of the danger of an explosion by a sudden rise of pressure when sapon. set in late as sometimes happened with cottonseed oil. By using fatty acids instead of oil and Na₂CO₃ a very uniform and gradual sapon. takes place if the acids are pumped in a steady stream into the hot Na₂CO₃ soln. As a safety measure W. had mounted a catch-all tank above the autoclave and had them connected with each other by a 200 mm. pipe contg. a Pb plate as a seal, the thickness of which was so adjusted as to give way at 6 atm. pressure. Sapon. is complete after 1½ hrs. at 3 atm. with NaOH; even Na₂CO₃ will saponify neutral fats under pressure in contradiction to statements in text books. When W. used mixts. of caustic and carbonates in open kettles, as much as 18% K₂CO₃ had participated in the sapon. of neutral cottonseed oil. For very large scale operations W. suggests preliminary sapon. in open kettles, followed by finishing in smaller autoclaves, or still better by pumping the soap through coils of pipes, heated to 150°.

P. ESCHER

Gloss and smoothness in milled toilet soaps. J. LIEBLEIN. *Z. deut. Oel-Fett-Ind.* 45, 689–90(1925).—L. discusses the causes and remedies for brittle or cracking cakes of toilet soaps.

P. ESCHER

Rancidity and spot formation in toilet soaps. C. BERGELL. *Z. deut. Oel-Fett-Ind.* 45, 653(1925).—Considerable trouble was recently experienced by toilet soaps turning rancid and developing spots, on account of the poor quality of certain by-product tallows which had been purified and were sold as high-grade tallows. Their detection is possible by boiling a test batch in the lab. and examg. the lyes: normal tallows yield only very small quantities of normal fatty acids of an acid no. of 200–210; the dangerous tallows yield ¼ to 1% of fatty acids, mostly gasoline-insol. hydroxy acids of an acid no. of 300 or over and an I no. of 20–30.

P. ESCHER

New fields of application for trichloroethylene. R. DECKERT. *Seifensieder Ztg.* 52, 975–6(1925).—A recipe is given for an alc. soln. of Na oleate which, after being mixed with about 9 parts by wt. of trichloroethylene, forms a permanent emulsion which is successful as a washing medium in the textile industry, and is also useful in dissolving old paint from furniture, textiles, etc., or in restoring colored leather.

P. ESCHER

Cacao beans and cacao products (FINCKE) 12. Estimation of water in oils and fats (SEABER) 22. Marine animal oils (ANDRÉ, CANAL) 10. Filter for reclaiming animal fats (U. S. pat. 1,567,989) 22. Purifying oils (Swed. pat. 59,250) 22. Oil filter (U. S. pat. 1,568,796) 1. Apparatus for neutralizing and bleaching oils under a vacuum (Brit. pat. 233,345) 1.

Refining fatty oils. HENRIK BULL. Norw. 41,590, July 6, 1925. The oil is mixed with aq. NH_4OH and heated to such a temp. that the NH_4 salts of the fatty acids will accumulate as a cohesive soap paste and the upper layer of oil can be sepd.

Manufacture of emulsions of marine oils. SVANEAPOTHEKET, BERGEN. Norw. 41,744, Aug. 17, 1925. The process is carried out in an atm. of CO_2 , N_2 or other O-free indifferent gas.

Separating oil from whale speck, flesh and other similar fatty materials. KRISTIAN HOLTER and SVERRE THUNE. Norw. 41,828, Sept. 7, 1925. The materials are disintegrated, and steam or hot water is applied during or immediately after the disintegration.

Boiler for liver-oil manufacture. OTTO HALSET. Norw. 41,403, June 2, 1925. Mech. features.

Wax mixture for treating thread. J. FRY. U. S. 1,567,497, Dec. 29. "Shoemaker's prep'd. machinery wax" 70, boiled linseed oil 20, banana oil 5 and oil of sassafras 5 parts.

Chromium soap. T. T. GRAY. U. S. 1,567,049, Dec. 29. A mixt. of Cr soap and an alkali metal soap in approx. equal proportions is adapted for use in dentifrices or, for shaving, in cold creams, etc.

Soap drier. C. W. AIKEN. U. S. 1,568,791, Jan. 5

Apparatus for purifying used soap solutions in laundries, etc. J. E. CAPS. U. S. 1,567,033, Dec. 29.

Washing powder. A. LINDAHL. Swed. 58,788, May 27, 1925. Finely divided soda and oil and fatty acids are blown into a container by means of compressed air through an atomizer. By this procedure the materials are mixed thoroughly and the saponification will take place instantaneously. The resulting dry powder is accumulated on the bottom of the vessel.

Washing powder. HAPPAHS INDUSTRI A.-B. Swed. 59,006, July 1, 1925. A liquid mixt. of soap, soda and a filler is brought in pulverulent state by cooling below the temp. of the surrounding air, or below the freezing point, under const. stirring. The powder formed is heated to the air temp. without being exposed to the air.

28—SUGAR, STARCH AND GUMS

F. W. ZIERBAN

The influence of the degree of extraction on the purity of sugar cane juice. WM. F. CROSS. *Rev. ind. agr. Tucuman* 15, 160-1 (1925).—C's. expts. and those published in the *Annual Synopsis of Mill Data* of the Expt. Station of Java lead to the following conclusions: The lab. mill gives about the same extn. as the first mill in the factory, approx. 60%. The highest extn. reached in a modern plant is 80%. The difference in purity between the first extn. and the juice resulting from intense milling is only 1-3%. The lab. results are therefore sufficiently reliable for plant control.

MARY JACOBSEN

Plasticity of starch paste (BERGQUIST) 2.

FAIRRIE, GEOFFREY: **Sugar.** Liverpool: Fairrie & Co., Ltd. 233 pp. 12s 6d. Reviewed in *Chemistry and Industry* 44, 1188 (1925).

Sugar manufacture. A. P. LEONARD. U. S. 1,568,512, Jan. 5. Bagasse is passed successively through a series of crushing mills. Juice from the foremost of the mills is conveyed to separators, clear juice is extd. from the separators and sugar is sepd. from the clear juice of one of the separators. H_2O is introduced into the residuum in another separator and clear juice from the separators is returned to an intermediate mill of the series and juice from the intermediate mills is led to the foremost mills. Juice from the last mill of the series is returned to a mill in advance of that receiving the liquid from the separators, and, from said advance mills, juice is returned to the foremost mill.

Electrolytic treatment of beetroot molasses or fermentation residues. Y. TAKAYAMA. Brit. 233,196, July 5, 1924. Beet molasses, or the residue remaining after molasses fermentation and distn. of alc., is electrolyzed so that glutamic, glutimic and

succinic acids or their salts are obtained at the anode and betaine and KOH and soda at the cathode.

Thin boiling starch. J. R. MACMILLAN. U. S. 1,567,609, Dec. 29. Dry starch is exposed to contact with gaseous Cl for about 1 min. and then treated with NH_3 , NaHCO_3 or other "anti-chlor."

Apparatus for manufacturing potato starch. L. P. HELTNE. Norw. 40,204, June 29, 1925.

29—LEATHER AND GLUE

ALLEN ROGERS

Acidity of chrome-tanned leather. AUG. C. ORTHMANN. *J. Am. Leather Chem. Assoc.* **21**, 30-3(1926).—The theory is advanced that a part or all of the sulfate combined with chrome leather may be in combination with the Cr rather than with the protein and not capable of hydrolysis in water. J. A. WILSON

An internal complex salt formation as the mechanism of chrome tanning. K. H. GUSTAVSON. *J. Am. Leather Chem. Assoc.* **21**, 22-30(1926).—The conditions of the acid and basic groups of collagen both play parts in the fixation of cathodic Cr. The acid groups of collagen probably combine with Cr through the primary valences and the basic groups through the secondary valences, the result being an internal complex salt. Anodic Cr fixation (oxalato compd.) shows a max. rate in the isoelec. zone of the protein and is probably of the residual valence type and is distinctly different from the combination of Cr cations with collagen. J. A. WILSON

Methods for measuring the enzyme activities of bating materials. J. A. WILSON AND H. B. MERRILL. *J. Am. Leather Chem. Assoc.* **21**, 2-18(1926). Detailed methods for detg. the activity of pancreatins upon keratose, elastin, collagen, casein and fat. J. A. WILSON

Tannin content of western hemlock after immersion in sea water. H. L. TEMPLETON AND E. C. SHERRARD. *Ind. Eng. Chem.* **18**, 101-2(1926).—Tannin contents of 11.82, 16.16, 12.99 and 16.38 were found after immersion periods of 0, 30, 60 and 90 days, resp. J. A. WILSON

Determination of water content in liquid glue. WM. A. KINGMAN. *Ind. Eng. Chem.* **18**, 93-4(1926).—The sample is floated on tetrachloroethane, which, on distn from a flask heated by an oil bath, carries over all the water. The condensed distillate is caught in a graduated tube. The water floats to the top and is measured. JEROME ALEXANDER

Gelatin and collagen (KATZ, GERNGROSS) 2. Collagen (HERZOG, GONELL) 2. Chlorinating sulfite liquor [for use as tanning substitute] (U. S. pat. 1,567,395) 23.

Tanning. J. HELL. U. S. 1,567,644, Dec. 29. Previous to tanning, hides or skins are treated with substances such as MgSO_4 and NaHCO_3 or Na_2CO_3 which react to form a substantially insol. Mg salt within the structure of the hide or skin. This pretreatment serves to render the leather produced resistant to heating (without becoming stiff).

Shoe grease. G. A. H. CALISSENDORFF. Swed. 59,330, Aug. 26, 1925. A mixt of about 60% by wt. of paraffin wax, 30% castor oil, 9% benzine, 0.9% lampblack or yellow ochre and 0.1% of turpentine.

Grease for shoe soles. V. A. H. MARCUSLUND. Danish 35,049, Sept. 12, 1925. A mixt. of oil, a soln. of gum, carbolineum and optionally CuSO_4 worked to an emulsion.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Guayule rubber. D. A. CUTLER. *Rubber Age* **18**, 202(1925).—An address dealing with the history, production, uses and technical value of guayule. C. C. DAVIS

Uses of rubber latex. S. B. NEILEY. *Rubber Age* **18**, 201(1925).—An historical description, with an itemized account of the most recent and various uses of latex. C. C. DAVIS

Coagulation phenomena in Hevea latex. III. Influence of some chemicals. O. DE VRIES AND N. BEUMÉE-NIEUWLAND. *Arch. Rubbercultuur* **9**, 590-630(1925);

Ibid 631-54; (In English), cf. C. A. 19, 419.—Various disinfectants were tested for their ability to coagulate fresh latex, for their toxicity toward the enzyme coalse and for their coalescing power on heated, flocculated latex (the B-mixt. described previously). H_2S , HCN, NaOCl and I had none of these properties. HCN retarded spontaneous coagulation due to bacteria. Of the substances tested, only quinosol was a strong coagulant, while large amts. of PhMe and of $CHCl_3$ caused coagulation. Thymol, β -naphthol and quinine, however, accelerated coagulation by HOAc, and since they had strong coalescing power, coagulation and coalescence in heated latex are independent phenomena. In fresh latex the processes overlap, for quinosol, though it had only slight coalescing power and inactivated the coalse, gave a coagulum and not a flocculate.

F. H. YORSTON

The structure of rubber. II. PAUL BARY. *Rev. gén. colloïdes* 3, 263 9(1925), cf. C. A. 20, 310.—A discussion of the reticular, cellular and solid solu hypotheses, of coagulation and the resulting structure and of the effects of mastication on the latter. Only a reticular structure explains the successive transformations which rubber undergoes. Rubber itself, *vis.*, the internal liquid of the cells (cf. Hauser, C. A. 19, 1962, 2280), has at each temp. a mean degree of polymerization which increases with decrease in temp. and *vice versa*. There is a temp. at which rubber has elastic properties which are due to a network structure of highly polymerized rubber impregnated with less polymerized rubber with mols. having a certain mobility. Mech. work ruptures the mol. chains of the network, as a result of which depolymerization begins. Moderate work such as stretching forces the less polymerized interreticular substance to flow through the meshes, with depolymerization and consequent increase in fluidity. This is the cause of the slow increase of the ultimate elongation and a recovery which is slower than can be explained merely by partial repolymerization. That mech. work causes depolymerization is also shown by the influence of mastication on vulcanization. The elasticity of rubber is then due to an unstable state of polymerization, the degree of which varies greatly through the mass. Equil. is attained very slowly and is partially destroyed by mech. deformation and by heat. Two mutually sol. components are present, the proportions of which vary according to external conditions. Vulcanization replaces the unstable bonds of natural polymerization by a more stable polymerization due to the action of S, and necessarily changes the phys. properties. Impurities in natural rubber probably render the state of polymerization particularly unstable compared with synthetic rubber, as a result of which the latter is less elastic and vulcanizes less readily.

C. C. DAVIS

The two-phase structure of rubber. I. E. A. HAUSER. *Rev. gén. colloïdes* 3, 289-93(1925).—A review and discussion of various theories proposed to explain the structure of rubber, including 29 references.

C. C. DAVIS

The significance of the protein film. H. P. STEVENS. *India Rubber J.* 70, 1059-60 (1925).—Photographs of thin films of rubber swollen in C_6H_6 are shown as evidence that the cellular structure of protein persists after such dispersion and that after distention to the bursting point the fragments are still visible. Crepe disperses more readily in solvents and with less swelling than sheet rubber because the former has received an earlier treatment drastic enough to destroy at least partially the protein envelopes. On long standing of a dispersion of milled crepe in C_6H_6 , the fragments of protein are deposited, a phenomenon not easily reconcilable with the observation of Sebrell, Park and Martin (C. A. 20, 309) that milled crepe dispersed in C_6H_6 has a structure similar to that of dried latex. Exception is also taken to their conclusion that grain effects in milled rubber are due partly to the presence of discrete latex globules. Milling of either crepe or sheet eventually causes complete destruction of the protein envelopes and it is at least more likely that the protein fragments act like pigments in causing a grain effect both before and after vulcanization. Crepe from rubber coagulated with tannic acid gives in C_6H_6 a gel similar to that from sheet rubber, perhaps because of a toughening effect of the tannic acid on the protein.

C. C. D

Observations on F. Kirchof's paper on the "Combination of water with rubber." O. DE VRIES. *Kolloid-Z.* 37, 178-9(1925); cf. C. A. 19, 1065.—Previous work is pointed out which seems to have been in part or wholly overlooked by K. (cf. de V., *Arch. Rubbercultuur* 7, 436(1913); C. A. 15, 2563; 17, 2796). The reversibility of the coagulation is questioned.

H. M. McLAUGHLIN

Rubber compounding. I. WEBSTER NORRIS. *India Rubber World* 73, 189-90 (1926).—The early development of compounding is described, with rules, materials, methods and typical formulas of the earlier period.

C. C. DAVIS

Lime in the manufacture of rubber. H. L. FISHER. *Rock Products* 28, No. 18, 56-7(1925).

RAYMOND WILSON

Handling solvents in the rubber industry. D. T. WRIGHT. *India Rubber World* **73**, 202-3(1926).—Carefully composed *specifications* should include d., initial and final b. p. and in special cases the % distd. at 2 or more intermediate points. Naphtha or benzene dild. to 40:60 with CCl_4 has less fire hazard than kerosene, and by dilg. to 30:70 the mixt. will not flash at its b. p. Fires of solvents offer special difficulties, for water tends to spread the fire. Foam systems, steam, CCl_4 , sand and Na_2CO_3 are all effective under various conditions. Maintenance of a high humidity is of great value in preventing static discharges.

C. C. DAVIS

Measuring effects of corona on rubber. Deleterious effects produced by ozone when rubber is subjected to corona and tension simultaneously. Significance in testing electrical rubber goods. F. L. HAUSHALTER. *India Rubber J.* **70**, 897-9(1925).—See *C. A.* **19**, 2785.

C. C. DAVIS

The "mouldy rot" disease of *Hevea brasiliensis* in Malaya. F. W. SOUTH AND A. SHARPLES. *Dept. Agr., Straits Settlements and Federated Malay States, Bull.* No. **37**, 31 pp.(1925).—The disease is caused by *Sphaeronema fimbriatum* and is very easily disseminated. Immediate and prolonged disinfectant or prophylactic treatment is necessary, the best results being obtained by painting with 20% "agrisol" soln., an unspecified com. disinfectant (manufd. by Major & Co., Hull, England). The bacteriology of *S. fimbriatum* and culture and inoculation expts are described

C. C. DAVIS

Georgia and Alabama clays as fillers [for rubber] (WEIGEL) **23**. Leaf diseases of *Hevea* (WRIGHT) **15**. The Ostwald viscometer, as a consistometer (HERSCHEL, BUCKLEY) **2**. Combining rubber with paper pulp (U. S. pat. 1,567,646) **23**. Hardened asphalt products (Swed. pat. 59,754) **22**.

Crude rubber from latex. GENERAL RUBBER CO. Brit. 233,651, May 12, 1924. Latex is desiccated (*e. g.*, by the process described in Brit. 157,978, *C. A.* **15**, 2019) to obtain substantially all the solid constituents and the product is heated until it is of dark color. A crude rubber is thus obtained which is more plastic and "tacky" than ordinary sprayed rubber.

Mixing rubber latex with other substances. E. HOPKINSON U. S. 1,567,506, Dec. 29. Rubber latex is mixed with (a) an aq. emulsion of an oil or other liquid insol. in H_2O ; (b) an emulsion formed from an aq. liquid and a soln. of a gum or resin or similar material in CCl_4 , C_6H_6 , turpentine or other org. solvent; and (c) an aq. suspension of finely divided solid particles, *e. g.*, C black, clay or ground cork. Substantially all the H_2O is then removed from the composite mixt by evapn. to obtain a product adapted for making vulcanized articles. Vulcanizing agents may be added to the aq. mixts.

Forming rubber articles from latex. G. VENOSTA. Brit. 233,458, Feb. 19, 1924. Gloves or other seamless rubber articles are formed by dipping a mold into latex which has been artificially concd. and which may have been dialyzed before concn., allowing the H_2O to evap. from the latex, and vulcanizing the product. Various compounding and vulcanizing ingredients may be added to the latex.

Aqueous rubber dispersions. W. B. PRATT. Brit. 233,370, Nov. 7, 1923. An aq. dispersion of previously coagulated rubber is prepd. by incorporating H_2O into a rubber mass and then subjecting it to stretching with gradual addn. of H_2O until a paste, and finally, a liquid, is obtained. The penetration of the rubber by the H_2O may be facilitated by the use of glue, albumin, casein, gum arabic, sugars, gluten, starch, dextrin or colloidal clay; and soap, saponin or the like may be added to the H_2O for the final dispersion. Various compounding ingredients may be added to the rubber prior to its dispersion, including oils, pigments, vulcanizing agents and accelerators. Cf. *C. A.* **19**, 420.

Apparatus for grinding, mixing or masticating rubber. F. GARNER AND A. HALL U. S. 1,567,587, Dec. 29.

Vulcanizing apparatus. H. E. L. HOVMANN. Danish 34,676, June 29, 1925.

CHEMICAL ABSTRACTS

Vol. 20.

MARCH 10, 1926

No. 5

1—APPARATUS AND PLANT EQUIPMENT

W. I. BADGER

Defects in chemical apparatus. D. B. DOTT. *Pharm. J.* **115**, 470-1(1925).—Errors in graduation of cylinders and burets are referred to. In alkalimetry, the use of burets of slightly tinted glass, red for acids, bluish for alkalis, is suggested. The stem of a sepg funnel should have a bevelled end, and a bore of 6-7 mm. even for a small separator

S. WALDBOTT

Important new equipment exhibited at the American Gas Association Convention. ANON. *Chem. Met. Eng.* **32**, 883(1925). Mention is made of the Cutler-Hammer gas mixing control which maintains the heating value of the mixed gases const., Koppers new naphthalene-removing equipment, and U. G. I. rotating grate water-gas generator

W. L. McCABE

New engineering equipment marks tenth chemical show. ANON. *Chem. Met. Eng.* **32**, 820-1(1925).—Mention is made of the Miller rubber-lined acid containers, Cr plating, Devine superimposed multiple effect evaporator, Buffalo distd water evaporator, a new homogenizing mill by the National Homogenizer Co., Annis-Knight gas generator, Freas rubber aging bath, and the Kemp system of premixing fuel gas with any desired amt. of air.

W. L. McCABE

Continuous extraction apparatus. J. W. MACMYN. *Ind. Chemist* **1**, 376(1925).—In the app. described by Sando (*C. I.* **19**, 421) the glass container is replaced by a tin bottle provided with a brass-wire gauze. This prevents the carrying over in siphoning of solids of small grain size

E. H.

Continuous extraction apparatus. G. S. WRIGHT. *Ind. Chemist* **1**, 448(1925).—The app. of the preceding abstract is improved by inserting a bulb in the siphon that returns intermittently the solvent to the distg. flask. The bulb prevents any break in the column of siphoning liquid, which otherwise tends to make siphoning continuous instead of intermittent.

E. G. R. ARDAGH

Improvements in analytical crucibles. J. D. M. SMITH. *J. Soc. Chem. Ind.* **44**, 539-40T(1925).—The use of a squat-shaped crucible with an interior fitting serrated lid avoids spattering, spurting and creeping. The alkali and alkaline earth metals can be detd. as anhydrous cryst. sulfates by igniting with H_2SO_4 , boiling with a mixt. of HNO_3 and HCl , and adding concd. H_2SO_4 , followed by ignition at a dull red heat.

T. S. CARSWELL

A method for the determination of small quantities of swelling. P. A. THIESSEN AND C. CARIUS. *Kolloid-Z. Special No.*, Apr. 1, 1925, 245-52.—The scale pans were removed from an analytical balance and by a system of levers one end of the balance beam was connected to a mirror rotatable about an axis parallel to the axis of the balance beam. The amt. of rotation of the mirror could be measured by a telescope and scale. In the other end of the balance beam was suspended a pestle-shaped glass rod in a glass dish which rested on a micrometer table. A circular glass plate was cemented to the bottom of the dish. Changes in the position of the pestle-shaped rod which were to be read on the scale by means of the telescope were standardized by the use of glass plates of known thickness (0.085 to 0.243 mm). The substance to be measured was stamped into a circular disk and laid on the glass plate under the pestle-shaped rod. The progress of the swelling could be accurately read on the scale. With a slight modification swelling either in vapors or in liquids could be detd. Expansion and contraction as well as substances in the form of ribbons or fibers could be investigated.

H. M. McLAUGHLIN

Pipets for potash work. C. M. BIBLE. *Ind. Eng. Chem.* **18**, 143(1926). E. J. C.

A rapid balance for weighing pills and tablets. HÅKAN SAN. *Svensk Farm. Tids.* **29**, 466-7; *Svensk Kem. Tids.* **37**, 284-5(1925).—A Becker-type instrument with a long pointer and long scale with a capacity of 5 mg. to 10 g. Illustration from a photograph.

A. R. ROSE

A small resistance thermometer. GEO. F. TAYLOR. *Phys. Rev.* **26**, 841-50 (1925).—The thermometer described consists of a Pb filament 1.5 cm. long and 2×10^{-3} mm. in diam. in a glass wall 4×10^{-6} mm. thick, embedded in a typemetal which makes contact with one end of the filament. It fits in a sheath 6.4 cm. long and 0.24 cm. diam. and has a temp. lag of 10 sec. Its resistance is 448 ohms so that a portable galvanometer gives a sensitivity of 0.005°. Full details of its construction are given.

D. C. BARDWELL

Improved salt-bridge. HANS T. STERN. *J. Phys. Chem.* **29**, 1583-4 (1925).—The salt bridge for electrometric work, customarily H-shaped, can be of wider use if a stopcock is applied and one paper plug is omitted.

JOHN T. STERN

Note on the capacity and graduations of dispensing bottles. W. S. STANNARD. *Pharm. J.* **115**, 469-70 (1925).—Detns. of capacity of 42 bottles in 7 groups (1-12 oz.) showed variations from -5% to +15%; only 12 had the indicated capacity. In a set of graduated bottles, 114 intervals were tested, of which 66 were accurate; yet not a single bottle was graduated accurately throughout. In dispensing, total vols. as well as doses should therefore be measured only by means of properly graduated glasses.

S. WALDBOTT

A simple form of gas circulating apparatus. A. R. PEARSON AND J. S. G. THOMAS. *J. Chem. Soc.* **127**, 2450-1 (1925).—A closed side bulb in a Hg U-tube is heated until there is a difference in pressure of 2-3 in. in the Hg, whereupon the Hg is set in oscillation by quickly opening and closing a valve at the top of the side of the U-tube with the side bulb. The pressure in the bulb is thereby reduced to that on the other side of the U-tube and the Hg then oscillates as long as the bulb is heated. By connecting suitable glass ball valves in each arm of a T-tube (in the system and connected by its stem with the top of the second side of the U-tube) gas is forced through the system.

C. C. DAVIS

Regulators for continuous gas sampling apparatus. FRIEDRICH PLENZ. *Gas u. Wasserfack.* **68**, 810-2 (1925).—In the usual form of Mariotte bottle a small tube may be used, closed at the bottom but open at the top, and into which the gas inlet tube dips. A siphon connects the H₂O in the tube with the main body of liquid in the bottle, so that the action of the aspirator is as usual save that the gas comes in contact only with the small quantity of liquid in the tube. Other devices for obtaining a const. head during the sampling period are described.

W. B. PLUMMER

Ultrafiltration under pressure. B. BRUKNER AND W. OVERBECK. *Kolloid-Z. Special No.*, Apr. 1, 1925, 192-6.—The app. consists of a bell-jar-shaped brass vessel with walls 1 cm. thick, fastened to a smooth perforated base plate bolted to a tripod, and at the top a valve housing with manometer. A magnetically operated stirrer is provided. The current cycle is opened and closed automatically by a special form of circuit breaker. The app. can be used with 100 atms. pressure. The time required to filter 300 cc. of a satd. soln. of Congo red without stirring was 14 days. With stirring an equal vol. of the same soln. was filtered in less than 2 days. H. M. McLAUGHLIN

Discharge in rarefied gases and a modified McLeod gage. E. PERUCCA. *Nuovo cimento* [N.S.] **2**, 287-94 (1925).—A modified McLeod gage has been developed which depends upon the variation in elec. cond. of air at different pressures and at high voltage. With this modification it has been possible to increase the limit of measurement from the usual value of $1-2 \times 10^{-6}$ mm. of Hg to a value of 1×10^{-7} mm. of Hg. L. T. F.

Laboratory apparatus for the wet grinding of plant tissues out of contact with air. W. A. ROACH. *Biochem. J.* **19**, 783-6 (1925).—An inverted glass bell-jar is suspended by its rim through a circular hole in a table and is cushioned by a ring of rubber. The bell-jar is held in position by the brass plate which is attached to the table by bolts and thumb screws. A second ring of rubber placed between the brass plate and the bell-jar serves to make an air-tight joint between them. Passing through the brass plate is a shaft carrying an alundum grinding wheel of just slightly less diam. than the bell-jar. Potatoes to be ground up are inserted through a cylindrical brass tube which is fitted tightly into a hole in the brass plate so that its basal end almost touches the grinding wheel. A second but much shorter brass tube of the same diam. is soldered into a second hole in the plate lying just to the side of the first. A cylinder of strong rubber is attached to the short brass tube and is closed at its free end with a block of wood into which is fitted the handle of a steel wire brush to remove the material from the grinding wheel. There are rubber-tube connections between the brass cylinder and the rubber cylinder and between the brass cylinder and the lower end of the bell-jar. Inert gas enters through the lower end of the bell-jar.

BENJAMIN HARROW

Laboratory mixing machine for solids. R. M. HIXON. *Ind. Eng. Chem.* **18**, 138 (1926).

E. J. C.

Special tool for packing condenser tubes. M. C. COCKSHOTT. *Chem. Met. Eng.* 32, 881-2(1925).—An adaptation of an ordinary brace carrying a packing tool and a spoon of packing instead of a bit.

An instrument for the rapid production of Laue photographs. J. T. NORTON. *J. Optical Soc. Am.* 12, 27-9(1926). W. L. McCABE E. J. C.

An X-ray spectrometer with which wave lengths are read directly on an ordinary micrometer screen. W. W. NICHOLAS. *J. Optical Soc. Am.* 12, 45-6(1926). E. J. C.

A new intensimeter for ultra-violet rays. A. GYEMANT. *J. Optical Soc. Am.* 12, 65-8(1926). E. J. C.

Crystal orientation apparatus for X-ray photographs. K. HERRMANN. *Z. Krist.* 62, 218-22(1926).—H. describes a theodolite goniometer modified for X-ray analysis of crystals. Patented. I. S. RAMSDELL

A new self-registering spectrothermograph. J. W. ELLIS. *J. Optical Soc. Am.* 11, 647-52(1925).—An improved app. with greater dispersion and resolution for infrared measurements is described. H. R. MOORE

Apparatus for the volumetric determination of small quantities of O and CO in N, etc. (GEISSLER) 7.

Acetylene generator. D. H. DANLEY U. S. 1,563,722, Jan. 12.

Acetylene generator. D. A. MILAM. U. S. 1,568,988, Jan. 12.

Thermostat for controlling gas heaters, etc. L. MOMBARUZZO. U. S. 1,570,446, Jan. 19.

Thermostat controlling flow of hot and cold liquids to a mixing chamber. H. H. SQUARE. Brit. 234,563, March 5, 1924

Thermostat mounting. A. J. OTTO and C. A. OTTO. U. S. 1,569,782, Jan. 12.

Filter for water, etc. R. H. L. PENNELL U. S. 1,570,523, Jan. 19.

Filters for acids and other liquids. D. M. GOETSCHEUS and L. F. VOGT. U. S. 1,569,627-8, Jan. 12.

Filter for liquids. R. SELIGMAN. Brit. 234,155, Jan. 21, 1924.

Filtering tank for liquids. I. B. TANNER. U. S. 1,569,896, Jan. 19.

Apparatus (with rotating disks) for washing and cooling gases. E. THEISEN. Brit. 234,109, May 15, 1924.

Apparatus for filtering metallurgical, sugar or other solutions. P. H. CRAWFORD and J. F. ABBEMA. U. S. 1,570,374, Jan. 19.

Oxidation, reduction or destructive distillation of different materials. H. G. FLODIN and E. G. T. GUSTAFSSON. Swed. 59,982, Dec. 8, 1925. The materials are treated with hot, whirling gases passed in counter-current through a system of two combined furnaces of suitable types. Mech. features.

Drying and sorting apparatus for materials of different grain sizes. O. NORDSTROEM. Swed. 59,860, Nov. 10, 1925.

Apparatus for determining the mechanical composition of pulverulent materials. S. L. A. ODÉN. Swed. 59,794, Nov. 3, 1925. The content of the different grain sizes is detd. by prepg. a suspension of the material in a suitable liquid and measuring the sp. gr. of the suspension at certain intervals after the beginning of the sedimentation. Mech. features.

Furnace for enamelled articles, etc. H. H. DODGE. U. S. 1,570,340, Jan. 19.

Gas-fired shaft-kiln for burning limestone, silica, etc. DOWSON & MASON GAS PLANT CO., LTD., J. PATON and E. W. MAWBY. Brit. 234,310, July 3, 1924.

Hardness-testing apparatus. H. HENKEL. U. S. 1,570,249, Jan. 19.

Annealing pot surrounded by inert gas. F. GIESECKE. Brit. 234,779, May 30, 1924.

Thermionic valves. E. Y. ROBINSON and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 234,565, March 7, 1924. A cathode coated with oxides of Ba and Sr or the like is further provided with a protective coating of a gum, resin, cellulose or cellulose deriv. to protect the oxides from H₂O vapor and CO₂. The oxide coating may be applied to a Pt Ir strip contg. 10% Ir by electrodeposition in a bath consisting of a mixt. of Ba and Sr iodides dissolved in acetone with a trace of H₂O. Cf. C. A. 19, 911.

Thermionic valves. DEUTSCHE GLÜHFADENFABRIK R. KURTZ and P. SCHWARZKOPF GES. and P. SCHWARZKOPF. Brit. 234,435, May 21, 1924. In forming filaments, a mixt. of molybdic acid with Th oxide or nitrate is reduced in H to obtain a powd. mixt. of reduced Mo with unreduced thoria. The powder is formed into bars, sintered at about 2000° and drawn. Part of the Th oxide is reduced by the Mo.

Composition for radio bulb filaments, etc., of high electron and light emission. C. A. LAISE. U. S. 1,569,095, Jan. 12. An alloy of W, Th and V has finely divided particles of Yt oxide interspersed through it and comprises W 90% or more, Th 0.5-5.0%, V 0.5% or less and Yt oxide 0.55-2.50%.

Absorption and diffusion photometer. A. VERNES, R. BRICQ, M. L. A. JOBIN and G. G. J. YVON. U. S. 1,569,342, Jan. 12.

X-ray apparatus. R. POHL. Brit. 233,837, March 28, 1924.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

The centenary of the discovery of benzene. Michael Faraday. ANON. *Nature* 115, 1001(1925). FLORENCE N. SCHOTT

Faraday as a chemist. WM. J. POPE. *Nature* 115, 1002-9(1925).—A lecture. FLORENCE N. SCHOTT

The Faraday benzene centenary. H. E. ARMSTRONG. *Nature* 115, 1010-3(1925). FLORENCE N. SCHOTT

Faraday and his contemporaries. ERNST COHEN. *Nature* 115, 1014-6(1925). FLORENCE N. SCHOTT

Some of the important chemical chemical-technical occurrences of the past year. P. WALDEN. *Chem.-Ztg.* 50, 2-3(1926). E. J. C.

Charles Avery Doremus. JEROME ALEXANDER. *Ind. Eng. Chem.* 18, 214(1926).—An obituary, with portrait. E. J. C.

Joseph Herzig. J. POLLAK. *Ber.* 58A, 55-75(1925).—An obituary. E. J. C.

Samuel Hahnemann, the founder of homeopathy, as a chemist. E. O. VON LIPP-MANN. *Chem.-Ztg.* 50, 4, 25-6(1926). E. J. C.

George B. Frankforter. F. C. FRARY. *Ind. Eng. Chem.* 18, 212-3(1926).—A brief biography, with portrait. E. J. C.

George Downing Liveing. C. T. HEYCOCK. *J. Chem. Soc.* 127, 2982-4(1925). E. J. C.

Guglielmo Körner. J. B. COHEN. *J. Chem. Soc.* 127, 2975-82(1925).—An obituary, with portrait. E. J. C.

The status of the chemical profession. C. E. FAWSITT. *Chem. Eng. Mining Rev.* 18, 68-70(1925).—An address. E. J. C.

The vital need for greater financial support to pure-science research. HERBERT HOOVER. *Mech. Eng.* 48, 6-7(1926). E. J. C.

The science museum, South Kensington, London. H. W. DICKINSON. *Mech. Eng.* 48, 104-8(1926). E. J. C.

Nuclear numbers. DIAZ DE BARROS. *Compt. rend.* 181, 719-22(1925).—The following 2 properties of at. wts. are presented without comment. (1). The nuclear no. of an element is defined as $N = (M - N)/2$, M and N being the at. wt. and the at. no., resp. The elements and their nuclear no. are arranged in a Mendelyeev-Moseley table of 16 vertical columns, each of which contains 5 spaces. Each space contains 1 and sometimes 2 or 3 elements, e. g., (Fe, Co, Ni). This table of nuclear nos. is shown to be almost identical with a table contg. the totals of the periodic series of Mayer, which express certain relations between the configurations assumed by floating magnets in a magnetic field. (2). If the spaces of a vertical column in the above table are numbered from 1 to 5, and if α represents the no. of the space occupied by an element, then, for the elements in the same column, $M_\alpha = 2N_\alpha + N_{\alpha-1}$. Substituting for N its value as defined above gives $M_5 = 2N_5 + (9N_4/2) + (N_3/4) + (N_2/8) + (N_1/16)$; $M_4 = 2N_4 + (N_3/2) + (N_2/4) + (N_1/8)$; and similarly for the other elements of the same column. As an application of this relation between the at. wt. and the at. no. there are calcd. the values of certain controverted at. wts., and those of the at. wts. of the undiscovered elements of known at. no. R. H. LOMBARD

The triumph of carbon. ALFRED STOCK. *Naturwissenschaften* 13, 1000-3(1925).—The singular position of C among the elements is discussed. B. J. C. VAN DER HOEVEN

Note on the hypothesis of molecular aggregation. Y. ROCARD. *J. phys. radium* 6, 198-201(1925).—Viscosity data do not agree with an expression deduced from the mol. aggregation theory. When van der Waals' $RT/v-b$ is modified by taking into account the general facts of cohesion and internal pressures, a satisfactory equation of state is evolved. H. R. MOORE

Molal volume and molal refraction in liquid mixtures. W. HERZ. *Z. anorg. allgem. Chem.* 149, 270-2(1925).—Previous calcns. (C. A. 19, 1515) have shown the

ratio of molar refractivity to molar vol. at zero abs. (MR/V_0) for "common" org. compds. to be about 3. (The calcd. values vary between 2.5 and 3.5.) The same ratio is now calcd. for mixts. of org. liquids. The molar refractivity is evaluated from existing refractivity and d. data with the mean mol. wt. as calcd. by the rule of mixts. The ds. at zero abs. of the mixts. are calcd. from existing data in a similar manner. The generalization previously made for the individual liquids holds for the following mixts.: benzene-acetone, benzene-acetic acid and aniline-ethyl alcohol. The relationship ($V_0 P_k/T_k = 5.7$, where $T_k =$ abs. crit. temp., $P_k =$ crit. pressure in atm., and $V_0 =$ mol. vol. at zero abs., holds for mixts. of ether-benzene and ether-diethylamine.

R. L. DODGE

A new method for the determination of molecular weights. G. RASTELLI *Gazz. chim. ital.* **55**, 552-4(1925).—The vapor tension of 2 solns. of different substances in the same solvent but of the same concn. are proportional to the mol. wt. of the dissolved substances. By the use of this principle mol. wts. are detd. in an app. the construction and use of which are fully illustrated and described.

E. J. WITZEMANN

Molecular weight determination in mixed solution media. C. DRUCKER. *Z. Elektrochem.* **31**, 409-12(1925); cf. *C. A.* **17**, 3825.—A study of the system CS_2 -MeOH with the solutes diphenylamine, azobenzene, naphthalene and acetanilide has shown the invalidity of Nernst's theory of mixed solvents. The vapor compn. is changed by different amts. and in different directions depending on the substance added. It is closely related to the effect of the added substance on the critical mixing temp.

H. R. MOORE

The molecular volumes of salts at their melting points. RICHARD LORENZ AND W. HERZ. *Z. anorg. allgem. Chem.* **145**, 88-94(1925).—The mol. vols. of salts at their m. ps. have been detd. and tabulated for 49 salts, mostly halides. In general, the ratio of the mol. vols. of the crystd. salts at room temp. to the mol. vols. at the m. p. is const. and equal to 0.8. $AlCl_3$ and AgI are exceptions. There is a linear relation between the mol. vols. of the different halides of the same alkali metal at the m. p. The mol. vol. of the alkali halides increases with increasing wt. of either the metal or halide. The mol. vols. of the carbonates, sulfates and nitrates of the alkali metals at the m. p. and in the cryst. state increase with the at. wt. of the alkali metal.

A. W. KENNEY

The influence of crystal lattice spaces on molecular mobility and solidity. ADOLPH SMEKAL. *Physik. Z.* **26**, 707-12(1925).—Brief discussion of contemporary work in this field (cf. *Wien Akad. Anz.*, June 25, 1925).

W. H. STRAIN

Paracrystalline and stressed substances. FRIEDRICH RINNE. *Naturwissenschaften* **13**, 690-4(1925).—A review.

B. J. C. VAN DER HOEVEN

Structure of crystals. H. MARK. *Naturwissenschaften* **13**, 1042-5(1925); cf. *C. A.* **19**, 3424.—The mosaic structure of crystals (even the best-formed, optically perfect, large crystals usually are built up from small (10^{-4} cm.), almost identically orientated crystals) can be demonstrated by means of X-ray reflection expts. The intensity ratio of reflected and incident ray is generally larger than expected from Ewald-Darwin theory, the reflection image broadens noticeably at larger distances from the crystal, the intensity of reflection from different lattice planes is proportional to the square (Laue), rather than to the first power (Ewald) of the structural factor. Whereas the divergence of the reflected ray from an ideal crystal is about 5 seconds, it was found to be for a diamond sample 3 min.; from the distribution of blackening over the broadened lines (10 m. distance) the av. orientation of the subcrystals can be estd.; the max. error in orientation for normal diamond is about 2 min., for rock salt crystals up to 15 min.

B. J. C. VAN DER HOEVEN

Lattice arrangements in deformed metal crystals and crystal agglomerations. G. SACHS AND E. SCHIEBOLD. *Naturwissenschaften* **13**, 964-8(1925).—Photographs are given of Debye-Scherrer diagrams obtained under different angles from drawn Al wire and rolled Al sheet. The "texture" of the deformed metal, i. e., orientation of the constituent crystal particles, is discussed and results obtained are reviewed (Ettisch, Polanyi, *C. A.* **16**, 1063; Mark, *C. A.* **17**, 2208, 3264; Glocker, *C. A.* **19**, 2581). It is shown how a highly symmetrical texture can be obtained by pressing an Al cube in the direction of the different crystallographic axis.

B. J. C. VAN DER HOEVEN

X-ray investigations of palladium-silver alloys containing hydrogen. F. KRÜGER AND A. SACKLÓWSKI. *Ann. Physik* **78**, 72-82(1925).—The system Pd-Ag forms a continuous series of solid solns. X-ray measurements with a Bohlin-Seemann spectrograph show that the lattice const. of the solid solns. obey Vegard's rule of additivity. Pd and Pd-Ag alloys were saturated with H electrolytically. For pure Pd, the absorption is greatest, and it decreases regularly with increasing Ag content to 70 mol. %.

when H_2 is no longer absorbed. The lattice const. of pure Pd and of Pd-Ag is increased by saturation with H_2 to a const. value of 4.00 A. U. ($Pd = 3.89$), regardless of the composition of the alloy. This value of the lattice const. is that of the Pd-Ag alloy contg. 70% Ag, which no longer absorbs H_2 . The H_2 is probably in the interstices of the space lattice. There is no evidence of a new compd. R. J. HAVIGHURST

X-ray interference in mixed crystals. M. v. LAUE. *Ann. Physik* 78, 167-76 (1925).—Tammann's theory (*C. A.* 14, 671) of a regular distribution of solute ats. over the lattice points in a mixed crystal is not confirmed by X-ray measurements on solid solns. If there is a regular arrangement of solute ats., new lines should appear on the X-ray diffraction patterns. Tammann claims that a slight departure from complete regularity in the substitution of solute ats. for solvent ats. would cause the intensity of these new diffraction lines to become too small for measurement. The author calcs. the structure factor for the intensity of these reflections, and shows that even if no more than one-half of the solute ats. in a 50 mol. % solid soln. are regularly distributed in the space lattice, the new diffraction lines should be observable. The fact that X-ray analysis of solid solns. has failed to find these new lines indicates that the solute ats. are distributed at random over the lattice points. R. J. HAVIGHURST

Elasticity. A. SCHÖR. *Gummi-Ztg.* 40, 624-5 (1925).—To obviate the confusion and errors current in the meaning and significance of elasticity in a material, it is proposed to define elasticity as the ratio: *work recovered/work expended*, when a material is subjected to deformation. For *complete elasticity* the ratio is 1, and for *complete plasticity* it is 0. Neither limit is reached, however, by any material. This definition does not involve the extent of the deformation, the latter depending merely on the sp resistance against deformation. Deformation thus presupposes elasticity but is not a measure of it. On this basis rubber is a relatively inelastic material, compared, e. g., with steel. Elasticity as thus defined can be measured directly by the relative height of rebound of a falling body. C. C. DAVIS

Pyrophorous bismuth. L. VANINO AND A. MENZEL. *Z. anorg. allgem. Chem.* 149, 18-20 (1925).—Pyrophorous Bi is a black powder which oxidizes spontaneously at room temp. in the presence of air. It is prepd. by reducing basic $Bi(NO_3)_3$ with H_2 . H. R. MOORE

The composition of a precipitated aluminium hydroxide. JITARŌ SHIDEI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 9A, 42-73 (1924).—(In English.) Expts. have been made to det. whether pptd. Al hydroxide kept in H_2O for a long time undergoes such a transformation as to bring about a change in its compn. The method employed was to measure its vapor tension and also to observe the mode of its dehydration in a vacuum at const. temp. The manometer used consisted of 2 glass cylinders 8 cm. in length and 5 cm. in diam. connected with each other by 2 Y-tubes, the one at the lower ends extending to a Hg supply and the one at the upper ends connecting with a vacuum pump. A micrometer screw through the top of each cylinder was adjusted with the aid of a telescope to contact with the Hg. The difference in levels of the Hg (vapor tension) could be read with an accuracy of 0.01 mm. The Al hydroxide was pptd. with NH_4OH from a soln. of alum, then dissolved in HCl and again pptd. with NH_4OH . The ppt. was thoroughly washed by decantation and finally freed from electrolytes by a hot dialysis. After being kept for 17 months under H_2O , the ppt. was subjected to the expts. carried out at 30°. The dehydration of the hydroxide contg. 5.639 H_2O per mol. of Al_2O_3 was continuous, without any sudden change in its velocity in a vacuum at least until the compn. had been reduced to 2.494 H_2O per mol. of Al_2O_3 . Further dehydration would have taken a very long time and was not continued. The increase of the pressure of the aq. vapor from the hydroxide placed in a vacuum was rapid at first and then gradual, taking a long time to reach equil. The vapor tensions decreased continuously with the diminution of the H_2O content of the substance. S. concluded that the pptd. Al hydroxide which was kept for 17 months under H_2O still remained as an oxide absorbing H_2O , not as a definite hydrate. H. M. McLAUGHLIN

Uranyl oxalate (reply to M. Colani). A. RAYNAUD. *Bull. soc. chim.* 37, 1375-6 (1925); cf. Colani, *C. A.* 19, 3183.—R. points out that the results of work published later than that to which Colani refers agree perfectly with those of Ebelen, Courtois and Colani. The conclusions from this later work were: (1) uranyl oxalate crystd. with 3 mol. H_2O , loses 2 of them when heated to 100-120° for 10 hrs. The 3rd is lost only by heating to 250° for 4 hrs. (2) The anhyd. salt is hygroscopic and quickly regains 2 mols. H_2O but the 3rd is absorbed very slowly. P. B. PLACE

Hydroxides of aluminium and of trivalent iron. F. HABER. *Naturwissenschaften* 13, 1007-12 (1925).—Report on work partly published previously (*C. A.* 16, 3243; Boehm, *C. A.* 18, 1406). All mineral cryst. forms of Al and Fe hydroxides have one

metal at. to the mol. $(\text{Al}(\text{OH})_3, \text{AlO}_2\text{H}, \text{FeO}_2\text{H})$. It follows from the low heat of formation of $\text{Fe}(\text{OH})_3$ as compared with that of $\text{Al}(\text{OH})_3$ that an iron hydroxide of this compn. has too high a $p_{\text{H}_2\text{O}}$ to be stable. Data are given on the temp. at which a noticeable water loss occurs for several minerals. This temp. is always higher for the hydroxide of the α series: bauxite 300° , diasporite 420° , hydrargillite 200° . The compds. of the γ series are the less stable ones; at high temps. (above 400°) they are converted into α forms. Very likely an artificial hydroxide $\text{Al}_2\text{O}_3\text{H}_4$ exists, this is in agreement with Willstätter's observations. The mechanism and energetics of the hydration are quant. discussed.

B. J. C. VAN DER HOEVEN

The effects of dyes upon the crystallization of calcium carbonate. V. KOHL-SCHÜTTER AND CARLA EGG. *Helvetica Chim. Acta* 8, 697-703(1925). (In German.) Cf. C. A. 20, 132.—In order to det. the mechanism of the formation of "somatoid" forms (C. A. 20, 131), K. and E. study the crystn. of CaCO_3 in the presence of Congo red, gallacetophenone, ponceau, alizarin, Bismark brown, eosin, crystal violet, fuchsin, tropaeolin and chrysoidine. No direct relationship exists between the observed effects and the physical or chem. properties of the dyes. However those dyes seem to have an effect which either alone or in solns. with Ca ions can be observed with the ultra-microscope. The regular growth of the lattice of both calcite and aragonite is repressed probably because of an adsorbed film on the crystal faces which mechanically passivifies them. Excellent half-tone reproductions of the crystal forms are included.

GEORGE L. CLARK

The conditions and fundamentals of the formation of somatoid forms. V. KOHL-SCHÜTTER, M. BORTEL'SKY AND CARLA EGG. *Helvetica Chim. Acta* 8, 703-23(1925). (In German.)—A more detailed treatment of C. A. 20, 131, as to production of the disk-shaped, a - and b -forms. The crystn. process of the a -form from calcite seeds is influenced by the changed diffusion in the colloidal hull zone and the mechanical action of the limiting layers, but it det. finally the development form of the substance. In the formation of the b -form the growth is more directly dependent upon the colloidal substance from the beginning. The a -form is studied as decompn. in air streams of bicarbonate solns. contg. varying amts. of Co salts, the slow neutralization of bicarbonate solns. with NH_3 , the decompn. of $\text{Ca}(\text{HCO}_3)_2$ solns. in free atm., decompn. of hydrate crystals, decompn. of $\text{CaCO}_3 \cdot \text{Na}_2\text{CO}_3 \cdot 5\text{H}_2\text{O}$ (Gay-Lussit) crystals, and for other cases.

GEORGE L. CLARK

The compression and decomposition of nitric oxide. R. BRINER, H. BIEDERMANN AND A. ROTHER. *Helvetica Chim. Acta* 8, 923-8(1925). (In French.)—The compressibilities of NO are measured in the temp. interval from -80° to $+10^\circ$ and up to 160 atm. and the isotherms plotted in the usual way, p against v where p is fractionally related to $p_0 v_0 = 1$ (where p_0 is unit pressure and v_0 is the corresponding vol. at the temp. considered). When compared with the isotherms of N_2 , O_2 , C_2H_4 and CO_2 , there is no indication of an abnormal polymerization of NO. Decompn. with formation of N_2O_3 is studied at 700 atm.

GEORGE L. CLARK

Investigation of ozone. HANS V. WARTENBERG AND GEORG V. PODJASKI. *Z. anorg. allgem. Chem.* 148, 391-6(1925).—Phys. methods are not satisfactory for detg. small quantities of O_3 in the air (0.1 to 1.0 mg./cu.m.). Small quantities of KI in soln. are sufficient completely to remove all traces of O_3 from air bubbled through it however rapidly. The authors tried to use this as a basis for a colorimetric detn., but found it unsatisfactory except in daylight. The following method was found to be reliable. The air contg. O_3 is drawn through a tube contg. about 2.5 cc. KI soln. (2 g. in 100 g. H_2O) at a rate of 1 to 2 l. in 5 to 15 min. Then to the soln. is added 1 drop 2% HCl soln., 1 drop of starch soln. and a small quantity of NaHCO_3 and the liberated I is titrated with very weak As_2O_3 soln. (about 0.0004 N). This method was found to be reliable, the O_3 concn. which could be detd. being independent of current velocity and vol. of air. O_3 was found to be more sol. in org. solvents than in H_2O and reaches a higher concn. in these than in air. Thus when air contg. 101 g./cu.m. is passed through vinegar a concn. of 249 g./cu.m. is reached at 18.2° , 157 g./cu.m. at 30.2° and 138 at 38.8° . Figures are given for dichloroacetic acid, Ac_2O , EtCO_2H (EtCO_2) $_2\text{O}$ and CCl_4 . Solns. in these solvents do not decompose as quickly as H_2O solns. H. S.

Densities and inner friction of glycerol solutions. W. HERZ AND A. WEGNER. *Z. deut. Oel-Fett-Ind.* 45, 401-2(1925); cf. C. A. 19, 1519.—H. and W. report results of d. detns. of the higher concns. of glycerol and calc. the inner friction from Ostwald's formula $st/\sigma\tau$ in which s and σ denote the densities of two substances and t and τ the times of flow from a capillary pipet. The abs. inner friction is calcd. by multiplying the relative friction by the H_2O value.

P. ESCHER

The distillation of amalgams. A. MIETHE AND H. STAMMREICH. *Z. anorg. all-*

gem. Chem. **149**, 263-9(1925).—Pb, Zn, Cd and Na were separately dissolved in Hg in the proportions 1:100, 1:500, 1:2000, 1:5000 and 1:10,000. The amalgams were then distd. at various pressures from 26 mm. to 1 mm. Particular care was taken in the construction of the distn. app. to prevent spattering of the amalgam and mech. contamination of the distillate. The amalgam was heated uniformly to avoid bumping, the distn. furnace temp. being maintained at 300°. The distn. was stopped when 98% of the Hg had been distd. The residue was analyzed by the usual analytical methods. Except with the Cd amalgam, the loss of base metal from the distn. flask never exceeded 1/10 mg. per 200 g. amalgam. The vapor pressure of Cd at 210-110° is sufficient to account for the loss observed in this case. There is no amalgam of the above metals that has a vapor pressure very close to that of pure Hg. Tiede's expts. with Au amalgam (cf. *C. A.* **19**, 3209) were repeated, with particular care to avoid transfer of amalgam by spattering. No Au could be detected in the distillate. The analytical method would have detected 1/1,000,000 mg. of Au. By a single distn. the concn. of Au in the distillate was reduced to at least 1/3,000,000 of the concn. in the original amalgam. Colloidal Au dissolved in Hg gave the same results.

R. L. DODGE

Pressure-temperature charts. Extended ranges. GEORGE CALINGAERT AND D. S. DAVIS. *Ind. Eng. Chem.* **17**, 1287-9(1925); cf. *C. A.* **19**, 2430.—An extension of Cox's empirical method (*C. A.* **17**, 2359) to much higher temps. than reported previously. Graphs are shown for normal paraffin hydrocarbon series, C_6H_6 series, alcohol series, silicon hydrides and a metal series.

W. C. EBAUGH

Some remarks on viscosity measurements. J. DUCLAUX AND J. ÉRREIRA. *J. phys. radium* **6**, 202-4(1925).—Ostwald's viscometer is not suitable for liquids of high fluidity. When the capillary is replaced by a porous clay cup, detns. are made rapidly.

H. R. MOORE

Dehydration of alcohol by purification in the presence of benzene. J. BARBAUDY. *Compt. rend.* **181**, 911-3(1925).—Young (*J. Chem. Soc.* **81**, 707(1902)) detd. the compn. of the water-alc.-benzene eutectic and showed how abs. EtOH could be prepd. B., on studying boiling and compns. of vapor of this system attempts to explain in part the principle of Y.'s method. B. gives a phase diagram and traces the changes in concn. starting with a given water-alc.- C_6H_6 mixt. The effect of adding C_6H_6 to an EtOH- H_2O mixt. is discussed.

D. H. POWERS

Influence of adsorption on the color of sols and of precipitates. N. R. DHAR. *J. Phys. Chem.* **29**, 1394-9(1925).—Several cases have been reported where the color of the positively charged sol is different from that of the negatively charged sol of the same substance or from that of the electrolyte from which the sol is prepd. The color of freshly pptd. MnO_2 , $Fe(OH)_3$, $Co(OH)_2$ and $Cu(OH)_2$ depends a great deal on the nature of the substance adsorbed by the ppts. in the course of their formation. The blue color of adsorption compds. of I_2 with starch, dextrin, cholic acid, basic La acetate, etc., seems to be due to the existence of I_2 in the colloidal condition in such compds.

H. M. McLAUGHLIN

Adsorption of acids by filter paper. S. G. MOKRUSHIN. *Kolloid-Z.* **37**, 144-6(1925).—In explanation of the const. k in Holmgren's equation and of z in Schmidt's equation, $z = c(R^2 - r^2)/r^2$ (cf. *C. A.* **8**, 642), M. has assumed a monomol. layer of acid on the capillary walls of the filter paper in agreement with Langmuir's adsorption theory. The const. was independent of the degree of dissociation, i. e., acid mols. were adsorbed (cf. Schilow and Lepin, *C. A.* **14**, 1775). Expts. with HCl, HNO_3 , H_2SO_4 , $H_2C_2O_4$ and tartaric in concns. from 0.25 M to $M/1024$ supported this theory.

H. M. McLAUGHLIN

Absorption of iodine by casein. F. LIEBMAN AND D. LÁSZLO. *Biochem. Z.* **159**, 110-25(1925).—Casein (Na salt) is treated with KI_3 and dialyzed free of I . AcOH then is added to ppt. the iodinated casein. The amt. of I taken up by casein varies with the amt. of I used, much being adsorbed. The adsorption is not attributed to the presence of any one amino acid.

W. D. L.

Adsorption of iodine by starch. E. ANGELESCU AND J. MIRESCU. *Bul. soc. române științe* **27**, 59-64(1924).—Study of the adsorption by maize starch of I in 2, 5, 10 and 15% KI solns. showed that with 1 solns. having an initial concn. of 1% or over it takes place according to the exponential formula $C_a = K \cdot C^p$ in which C_a is the I adsorbed by 1 g. starch, C the concn. of I remaining in soln. after adsorption, and K and p are consts. K and p are independent of the concn. of KI . KI itself is not adsorbed by the starch. The equil. formula for hydrolysis, $x/(a-x)(n-x) = K$ does not hold.

A. PAPINEAU-COUTURE

The bases of the static and dynamic exclusion theory. D. REICHSTEIN. *Z.*

Elektrochem **31**, 593-613(1925).—An extended exposition of the hypothesis that the total no. of mols. adsorbed on any surface is const. In the case that the rate of absorption is infinite compared with the rate of reaction on the surface, a surface film should be formed which accounts for passivity and the related phenomena of catalytic poisoning and galvanic polarization. If the concn. of the adsorbed material in the adsorbed layer is proportional to its concn. in the outer phase, the hypothesis of const. sum leads to R's well-known equation for the absorption isotherm. In certain cases the rate of diffusion into the solid must be taken into account; if so a general theory can be given for electrode potentials, chem. reactions on surfaces, thermal cond. of surfaces and viscosity.

F. R. B.

The composition of soap films. MARY EVELYN LAING. *Proc. Roy. Soc. (London)* **109A**, 28-34(1925).—Criticism of previous work on the chemistry of soap films is based on the possibility of reaction between the film and the O_2 and CO_2 of the air. The films in this study were produced by shaking a pure soap soln. in an atm. of pure N_2 . The foam was sepd. from the liquid and analyses were made by chem., and by elec. cond., and refractive index methods. There is an increase of concn. of soap in the film, and the film contains not free fatty acid, but an acid sodium oleate, contg. 0.61 mol. oleic acid to 1 mol. Na oleate, probably hydrated. This result is in accordance with the suggestion that the black spot in soap films is due to the actual contact of the 2 adsorbed layers. The stability of soap films is much more readily understood if they are made of colloidal material, like the acid soap, rather than of a pure liquid, such as oleic acid.

A. W. KENNEY

Brownian movement of very large particles. JITSUSABURO SAMESHIMA. *Nagaoka Anniv. Vol. 1925*, 203-12; *Japan J. Physics* **4**, 12A - A suspension of large granules of mastic was made by diffusion of EtOH soln. of mastic into 36% aq. soln. of $CO(NH_2)_2$. The suspension was put in a hemocytometer of Thomas and the movements of the particles were observed with an ordinary microscope projecting on a screen of translucent paper. The diams. of the granules varied from 0.0002 to 0.002 cm. The Avogadro no. was calcd. by means of Einstein's formula: $N = 63.6 \times 10^{24}$. The Brownian movements of rotation were observed upon a particle of 0.001039 cm. diam. and it was shown that the Einstein formula for the rotational Brownian movement can probably be applied to this case.

C. J. WEST

The Brownian movement of rotation. FRANCIS PERRIN. *Compt. rend.* **181**, 514-6 (1925).—A mathematical paper.

MARIE FARNSWORTH

Peptization. A. V. SLATER. *J. Soc. Chem. Ind.* **44**, 499-506T(1925); 56 references. —A general theory of peptization is presented as follows. The definition accepted is deduced from Graham's use of the term. "True peptization is the transformation of a gel to a sol by the addn. of a small quantity of a dispersing agent." Increased elec. charge and lowered interface tension are not sufficient in themselves to cause actual dispersion. Chem. action between the colloid and the peptizer is essential. A substance in gel form whose particles are not above colloidal dimensions can be peptized. The peptizer should be easily adsorbed by reason of primary or secondary valence forces and one part of the peptizer mol. should unite with a part of the colloid mol. to form a non-ionized mol. This keeps the concn. of the flocculating ion low. The colloid particles are drawn into soln. by the soln. pressure exerted by the peptizer. In general, substances capable of forming sol. compds. with the colloid in high concn. will peptize easily at low concns. Raising the temp. and increasing the pressure enable some substances to peptize a colloid, which at lower temps. and pressures are unable to overcome the cohesion of the colloid. Peptizations are classified: (1) "peptization" by protection prior to formation of the colloid substance, e. g., adding KOH to a soln. of $CuCl_2$ contg. sugar; (2) reversible coagulation; (3) peptization by dissoln. of non-colloidal substance, e. g., $BaSO_4$ and $MgCO_3$ treated with $SeOCl_2$. True peptizations come only under (2).

H. M. McLAUGHLIN

Organophile colloids. G. S. WHITBY. *Can. Chem. Met.* **9**, 265-7(1925).—The best known organophile colloids are the cellulose esters and rubber. W. brings out the fact that with all the common classes of org. compds. those that dissolve the cellulose esters do not swell or dissolve rubber at all, or do so very slightly and *vice versa*. There are very few exceptions to this generalization. Furthermore, the lower members of any homologous series are the better solvents for cellulose esters, the higher members for rubber. W. considers the most satisfactory explanation of this lies in the polarity of the compds. concerned. Cellulose nitrate and acetate are polar substances and in general imbibe and yield sols and gels with polar org. substances, while rubber is non-polar and in general imbibes most freely non-polar liquids. E. g., AcH is a solvent for cellulose acetate, but produces scarcely any swelling with rubber. On going up the

aldehyde series to heptaldehyde, however, the position is reversed. This aldehyde is a non-solvent for cellulose acetate, but dissolves raw rubber. Presumably, increase in the size of the hydrocarbon residue from CH_3 to C_6H_{11} has reduced the polarity of the aldehyde, so that it no longer attaches itself readily to the polar cellulose acetate, but does to the non-polar rubber.

E. G. R. ARDAGH

The applications of colloids to electrotechnology and radiotechnology. P. HARMARDINQUER. *La nature* [ii] 53, 329-33(1925).—An illustrated description of the properties of colloidal solns., dealing particularly with the *colloidal commutator*.

C. C. DAVIS

Colloidal manganese oxide. ANASTASIE ANARGYROS. *Compt. rend.* 181, 419-21 (1925); cf. Witzemann, *C. A.* 9, 1567.—The method of prepn. was based on that of Deiss (cf. *C. A.* 4, 1583). Different reducing agents such as glycerol and HCHO gave unstable colloids. By mixing the KMnO_4 soln. with a stabilizing agent (Na protalbate) and then adding 1 of the reducing agents, stable colloidal solns. of deep brown color were obtained. Satisfactory results were obtained with solns. of NaAsO_2 which served at the same time as protecting and reducing agent. The analysis of 3 samples of the colloid corresponded to Mn_2O_3 .

H. M. McLAUGHLIN

Mechanism of the Liesegang phenomenon. A. STROPOR. *Bul. chim. soc. romând stiinte* 27, 51-8(1924).—Under the microscope Liesegang rings obtained with very thin films of gelatin are seen to consist of series of fine bands, those in the middle of a given ring being heavier and better defined than those at the edges. S. puts forth a theory explaining the mechanism of their formation based on the difference between the rates of diffusion of the pptg. ions, and on the variation in viscosity of the gelatinous mass, which is due mainly to the heat of the reaction by which the ppt. is formed and to a slight extent to the H_2O introduced by adding the pptg. soln. He shows how this results in a discontinuous, but recurring, reaction between the ions.

A. PAPINEAU-COUTURE

The behavior of silica gel towards alkalis and salts in aqueous solution. W. A. PATRICK AND E. H. BARCLAY. *J. Phys. Chem.* 29, 1400-5(1925).—The removal of NaOH from aq. soln. by silica gel and the subsequent replacement of the "adsorbed" Na^+ by Ag^+ , Cu^{++} and Fe^{+++} have been studied by: (1) shaking at 20° a known wt. (about 5 g.) of silica gel of known (8-11%) H_2O content (cf. *C. A.* 14, 1776) with solns. of NaOH of known vol. and known, but varying, concns. for sufficient time to reach equil.; (2) after rinsing the gel with distd. H_2O it was similarly treated with solns. of AgNO_3 (0.1 *M*), $\text{Cu}(\text{NO}_3)_2$ (0.1036 *M*) and $\text{Fe}_2(\text{SO}_4)_3$ (0.178 *M*). NaOH was removed from soln. by silica gel to a greater extent the greater the concn. of alkali in the surrounding soln. Na^+ ions were replaced by other ions in accordance with stoichiometric laws. The removal of NaOH could be accounted for by Freundlich's adsorption equation. It is proposed to subdivide adsorption phenomena into 3 classes: (1) chem.; (2) mol. layer; (3) capillary.

H. M. McLAUGHLIN

Jelly strength of pectin jells. GEO. L. BAKER. *Ind. Eng. Chem.* 18, 89-93(1926).—The new *jelly-strength tester* consists of a piston actuated by air pressure produced hydrostatically and measured by a connected manometer. Considering quantity of acid, the pectin jelly optima follow Tarr's 1:2:3 ratio for H_2SO_4 , tartaric and citric acids, the relative jelly strengths varying, as also do the p_H points of the optima. With 1% pectin, jelly was strongest with 69.44% sugar; with 2% pectin, with 66.66% sugar. At a certain p_H , a definite pectin-sugar ratio is essential for max. jelly strength. The optimum pectin concn. is 0.97%, beyond which clouding and poor texture appear. The injury to jelly strength caused by boiling while acid, is inhibited on addn. of sugar. Increased concn. of pectin and lower temp. of boiling both increase jelly strength.

JEROME ALEXANDER

The kinetics of swelling and shrinking of gels. II. S. LIEPATOV. *Kolloid-Z.* 37, 146-50(1925); cf. *C. A.* 19, 2436.—The velocity of the swelling was a function of the thickness of the gel. The amt. of surface of the gel and its wt. played a secondary roll. The temp. conditions, the presence of acids and the thickness exerted a strong influence on the velocity. The principle of the mobility of H_2O in colloids first proposed by van Bemelen could be used for explanation of the swelling phenomena. Swelling seems to be the first step of soln.—transformation of the gel into sol. H. M. MCL.

Is there a relationship between solubility and the stability of crystal-water binding? Tests on salts of aromatic sulfonic acids. FRITZ EPHRAIM AND ERNST SEGER. *Helvetica Chim. Acta* 8, 724-39(1925). (In German).—It would be predicted that those salts which hold mols. of H_2O with strongest bonds, so that a central metal atom would be surrounded by a hull of water, would be most sol. in H_2O . Of the hexahydrate salts of Cu , Cd , Mn , Zn , Ni , Mg and Co with benzenesulfonic and 2-naphthalenesulfonic

acids tested in the order of decreasing soly., however, it is established that the most difficultly sol. salts hold the crystal water most firmly. The salts of 1-naphthalene-sulfonic acid are most easily sol. which are least so in the case of the 2-acid. The influence of the at. vol. of the central metal upon the stabilizing NH_3 complexes is not observed with these closely related hydrates in which both cation and anion are concerned in a complicated fashion. Detailed directions are given for prepn. of the salts, many here produced for the first time.

GEORGE L. CLARK

The influence of electrolytes on the solubilities of some organic acids. N. A. VAYNIK, M. P. JAIN AND DINA NATH. *Quart. J. Indian Chem. Soc.* 2, 115-28(1925); cf. *C. A.* 8, 2292.—The effects were studied of small concns. (to about 0.01 *M*) of the chlorides and nitrates of NH_4 , Na, K, Ca, Sr and Ba and of the sulfates of NH_4 , Na and K on the solubilities at various temps. of the 3 isomeric nitrobenzoic acids and of $p\text{-NH}_2\text{C}_6\text{H}_4\text{SO}_3\text{H}$ and $p\text{-OHC}_6\text{H}_4\text{SO}_3\text{H}$. The solubilities of the 3 nitrobenzoic acids in H_2O at 25°, 35° and 42° were found to be as follows (in g./100 g. H_2O): *o*-acid, 0.750, 1.30, 2.28; *m*-acid, 0.344, 0.418, 0.515; *p*-acid, 0.028, 0.025, 0.022. The solubilities of $p\text{-NH}_2\text{C}_6\text{H}_4\text{SO}_3\text{H}$ at 20°, 30° and 40° were 1.00, 1.45 and 1.94. The conclusions drawn were as follows: (1) with increase of temp. the influence of alkali nitrates and chlorides in increasing or decreasing the solubilities of the acids decreases, but that of the alk. earth nitrates and chlorides and of the alkali sulfates increases; (2) with increase in concn. of the salts used, the solubilities of the *o*- and *p*-acids passes through a max., while that of the *m*-acid decreases first rapidly and then slowly and regularly; (3) the effect of cations (either to increase or decrease the solubilities) increases in the order NH_4 , Na, K, Ca, Sr, Ba (*i. e.*, in the order of their at. wts.); (4) the effect of anions increases in the order SO_4 , Cl, NO_3 . The effect of small quantities of salts was surprisingly great. at 35° the relative soly. (pure H_2O = 100) of *p*-nitrobenzoic acid in 0.0008 *M* $\text{Ba}(\text{NO}_3)_2$ was 152 and of *m*-nitrobenzoic acid in 0.0012 *M* $\text{Sr}(\text{NO}_3)_2$ was 56.

DONALD W. MACARDLE

The relationship of salts in dilute aqueous solution as determined by their influence on the critical solution temperature of the system, phenol-water. J. H. CARRINGTON, L. R. HICKSON AND WM. H. PATTERSON. *J. Chem. Soc.* 127, 2544-9(1925).—The investigation of Duckett and Patterson (cf. *C. A.* 19, 1519) on the elevation of the crit. soln. temp. of the system, $\text{PhOH-H}_2\text{O}$, due to the addn. of a salt sol. only in the aq. phase is continued. When hydrolysis and complex formation are absent, the elevation, e , for a mixt. (36.0-36.1% PhOH) is nearly proportional to the concn. C (g. mols. solute per 1000 g. total mixt.). When hydrolysis occurs, there is a lowering. The mol. lowering, ($-E = -e/C$) becomes greater with increasing concn.; it would remain const. if the lowering were due to soly. of the salt in both of the phases. Anions and cations may be arranged qual. in order of diminishing e : SO_4 , hydrogen tartrate, Cl, Br, BrO_3 , NO_3 = 1, ClO_3 , HCOO ; and Ni, Mg, Cd, Co = Ba = Sr = Ca, Zn, Cu, Be, Pb, Na, Li, K, NH_4 , H. The effect of the anion is in general greater than that of the cation. Definite values cannot be attributed to the ions since the value is modified by the other ion in the compd. The effect in general decreases with increasing at. wt. of the elements in the various groups of the periodic system, the first member being out of place. The relation, $e = aC^b$ is found to hold, where b is a const. characteristic of the $\text{PhOH-H}_2\text{O}$ (= 0.83-0.87) and a is a sp. const. of the salt. This equation holds also for salts which are sol. in both phases but b has a different value. D. S. V.

Vanadium oxytrichloride as a solvent. F. E. BROWN AND J. E. SNYDER. *J. Am. Chem. Soc.* 47, 2671-5(1925).—The solubilities of about 125 substances in pure VOCl_3 were tested. Of these (1) nearly all inorg. compds. were insol.; (2) most non-metals were sol.; (3) metals were unaffected; (4) all of the org. compds. either dissolved, reacted or both; (5) org. liquids were miscible in all proportions; (6) liquid aldehydes reacted vigorously. The soly. of S was detd. quant. for temps. between 0° and 65°.

H. M. McLAUGHLIN

Solubility experiments with boiler metals and the determination of the dissolved metal. K. K. JÄRVINEN. *Z. Nahr. Genussm.* 50, 221-5(1925).—Reproducible results were obtained. Sheets of metal, 0.05 to 0.1 cm. thick and 7 cm. square, were rolled up and placed in glass cylinders 2 to 3 cm. in diam. The liquid was added and the cylinders were placed in a bath of boiling H_2O for 3 hrs., evapd. H_2O being replaced. The dissolved metal was detd. colorimetrically in most cases. Tables are given showing the soly. of various metals and alloys in the following solns.: (1) 5% NaCl, (2) 1% HCl, (3) 400 g. sugar and 15 g. citric acid per l.

WILLIAM J. HUSA

The colorimetric dissociation constants of 3,5-dinitrocatechol and 4,6-dinitroresorcinol. F. C. LAXTON, E. B. R. PRIDEAUX AND WM. H. RADFORD. *J. Chem. Soc.* 127, 2499-2501(1925).— p_m (p_H of halfway change to yellow) is 3.25 for 3,5-dinitro-

catechol; p_{k2} (p_H of halfway change from yellow to reddish brown) is 10.39. For 2-nitroresorcinol, p_{k1} is very low; p_{k2} is 6.47. For 4,6-dinitroresorcinol, p_{k1} is 4.22.

B. H. CARROLL

Decomposition potentials and polarization of certain heavy metallic chlorides dissolved in anhydrous pyridine. R. B. MASON AND J. H. MATHEWS. *J. Phys. Chem.* **29**, 1379-93 (1925).—In a search for suitable reference electrodes for use in anhyd. C_5H_5N the decompn. potentials, total polarization and anode and cathode polarization e. m. f.'s against an amalgam of the metal under consideration were measured for increasing values of applied e. m. f. for the following salts in satd. anhyd. C_5H_5N soln.: $ZnCl_2$, $CdCl_2$, Cu_2Cl_2 , $CuCl_2$, $HgCl_2$, $PbCl_2$, $HgSO_4$. The rotating commutator method was employed for measuring the potential of the single electrodes. The Hg - Cd , $CdCl_2$ and Hg - Zn , $ZnCl_2$ reference electrodes were found to be the most satisfactory. The behavior of these 2 salts was very much the same as in aq. soln. $CuCl_2$ gave trouble on account of its low soly. and cond. and its behavior depended on its previous history. In the case of Cu_2Cl_2 a compl. formed at the anode obscured the issue. The solns. of $PbCl_2$, $HgCl_2$ and Cu_2Cl_2 acted as if there were present a depolarizer for small amts of Cl_2 .

R. S. GIBSON

Cryoscopic measurements with benzene. E. R. JONES AND C. R. BURY. *J. Chem. Soc.* **127**, 1947-51 (1925); cf. *C. A.* **19**, 2439.—The object of the work was to compare $PhNO_2$ and C_6H_6 as solvents for cryoscopy. The importance of control of the H_2O content of the C_6H_6 is emphasized and the use of Al_2O_3 for this purpose recommended. The use of Brown and Bury's formula (cf. *C. A.* **19**, 2439) instead of the van't Hoff formula is preferred at higher concns. Several solutes were tried and 66.95 was taken as the value of k in the B. and B. formula, corresponding to 29.53 cal. for the latent heat of fusion of C_6H_6 . No definite evidence was obtained for solvation. Substances tend to be abnormal in C_6H_6 more than in $PhNO_2$. Reproducibility is more difficult with C_6H_6 .

A. W. KENNEY

Molecular attraction and velocity of reactions. O. MAASS AND C. SIVERTZ. *J. Am. Chem. Soc.* **47**, 2883-91 (1925); cf. *C. A.* **19**, 766.—The velocity of reaction of propylene and HCl in the liquid state was detd. at 0° and 20° by methods similar to those used in the previous investigation. The main product of the reaction was isopropyl chloride, but a chlorohexane formed from a side reaction. The hydrogen halide acts as a catalyst though no ionization could be detected. The initial rate of reaction with HBr is about 200 times that with HCl . In the gaseous phase, no reaction was detected at room temp. in a period of 400 days. The absence of reaction in the gas phase shows that concn. alone does not det. the reaction rate, and it is suggested that the 3 forms of heat energy have different effects on the reaction rate. The kinetic energy of translation and of rotation of the mols. hinders the chem. combination, whereas the kinetic energy of vibration furthers it.

A. W. KENNEY

The velocity of decomposition of a few esters and its relation to the hydrogen-ion concentration. K. G. KARLSSON. *Z. anorg. allgem. Chem.* **145**, 1-57 (1925).—The velocities of sapon. of $AcOMe$, $AcOEt$ and monoacetin were detd. at 25° as a function of the H -ion concn. Care was taken to use highly purified materials, and expts. were conducted in the presence of varying amts. of HCl and of different salts, e. g., $AcONa$, $CaCl_2$, $BaCl_2$, $SrCl_2$, Na_2SO_4 , $NaCl$, etc. If it is assumed that the org. acid esters are amphoteric, giving both H and OH ions, it follows mathematically that if the log of the velocity const. is plotted against p_H , the curve should be symmetrical. The exptl. results indicate this to be the case, there being a sharply defined p_H of minimum velocity. The velocity const. is detd. chiefly by the p_H in the case of acid hydrolysis, and the alc. has little influence; but in alk. hydrolysis, the alc. plays a more important part. Neutral salts also exert a secondary action and increase somewhat the velocity of sapon. Assuming the org. acid esters to be amphoteric, it was possible to calc. the velocity const. except in the region of max. stability. Expts. were also conducted on sapon. of the ethyl benzenesulfonate. The soly. of this ester in pure H_2O was detd. as 0.00739 ± 0.00002 mole per l. at 25° . The soly. in solns. of $AcONa$ and other salts of different concns. was also detd. The rate of sapon. may be expressed by an equation having the form $dx/dt = K.C_E + K_2.C_E.C_{NaOH}$, where C_E denotes concn. of the ester, etc. The consts. detd. by the author are: $K = (6.46 \pm 0.08) \times 10^{-4}$; $K_2 = 0.0070$. It is evident that this hydrolysis has an entirely different mechanism from that of the esters first studied. Bibliography attached.

A. W. KENNEY

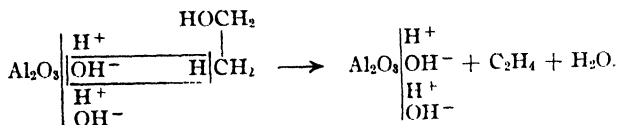
The action of silica on the sulfates of barium and magnesium. Mlle. GERMAINE MARCHAL. *Compt. rend.* **181**, 784-6 (1925); cf. *C. A.* **18**, 509.—The decompn. temps. of Ba and Mg sulfates are lowered by heating with an intimate admixt. of SiO_2 , the lowering being related to the heat liberated by the formation of the silicates of Ba and Mg from

the respective oxides. BaSO_4 alone breaks up at 1510° . With SiO_2 , gas is liberated at 1025° the pressure in cm. increasing as follows: 1100° , 2.3; 1190° , 5.0; 1240° , 8.2; 1270° , 12.0. MgSO_4 in a vacuum breaks at 880° and this is lowered to 680° by SiO_2 . Pressures are 700° , 0.6; 800° , 4.4; 900° , 15.0; 1000° , 61.5; 1012° , 76.0. P. B. PLACE

Reaction between potassium ferricyanide and morphine. R. A. BERETEVIDE. *Rev. facultad ciencias* 3, No. 2, 89–124 (1925).—The oxidation of morphine by $\text{K}_3\text{Fe}(\text{CN})_6$ is promoted by heat, excess $\text{K}_3\text{Fe}(\text{CN})_6$, alk. medium and pptn. of $\text{K}_3\text{Fe}(\text{CN})_6$ as soon as it is formed. The duration of contact between the 2 substances has no notable influence. The proportion in which they react is neither equi-mol nor const. M. J.

Comparative investigations on the activity of contact catalysts. III. The catalytic synthesis of water at elevated temperatures by metals and binary alloys of the eighth group of the periodic system that are inactive at room temperature. H. REMY AND H. GÖNNINGEN. *Z. anorg. allgem. Chem.* 149, 283–96 (1925); cf. *C. A.* 20, 5.—The lowest temp. at which some catalysts made of Ru, Fe, Co, Ni and alloys of Ir-Fe, Rh-Fe, Rh-Co, Os-Fe, Os-Co, Os-Ni, Ru-Fe, Ru-Co, Ru-Ni, Fe-Co, Ni-Fe, Ni-Co would initiate the reaction $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$ was measured. The temp. was detd. by gradually heating a sample of the catalyst material in a closed system filled with the gas mixt. The temp. of initial action was considered as that temp. at which the vol. increase of gas in the system, due to thermal expansion, gave place to a vol. decrease due to reaction. The activity temp. so measured was found to depend on rate of heating, form of catalyst, and previous treatment of the catalyst with H or O. No attempt was made to establish abs. values, but the relative activity temps. were evaluated in arbitrary units by conducting the expts. according to a uniform procedure. In general the Fe alloys were more active when previously treated with O, while the Ni alloys were more active after H treatment. Pure Fe, however, was more active after H treatment. R. L. DODGE

The mechanism of catalysis by aluminium oxide. M. C. BOSWELL AND H. M. DILWORTH. *J. Phys. Chem.* 29, 1489–1506 (1925).—Partially reduced oxides have an interior O content which may be drawn upon for the maintenance of the surface film. Al_2O_3 , in addn. to this interior O content (which, on account of the great stability of the oxide, is not available), has a surface layer of charged H^+ and OH^- . This film, in a state of tension due to the opposite charges, affords a remarkable protection for the underlying O. The great stability of the H_2O film is evidenced by the fact that it is still present after heating for 20 hrs. at 500° followed by 2 days' heating with a Meker burner. Another marked difference in the 2 types of catalysts (partially reduced oxides and Al oxide) is the fact that the former has a reduced metal layer over the unreduced oxide layer, and this reduced oxide layer probably carries charged H^+ and OH^- , whereas in Al_2O_3 the catalytic film of dissociated H_2O is wholly on the outside of each particle. The great stability of the H_2O film on the oxide indicates that the H^+ and OH^- are in alternate layers and completely envelope each oxide particle. The effect of heating the oxide to progressively higher temps. is progressively to remove the outer layers of the dissociated H_2O . Upon studying the reactions of $\text{C}_2\text{H}_5\text{OH}$ and Al_2O_3 , the authors conclude that the following constitution is most satisfactory:



The adsorption of electrolytes by Al_2O_3 also supports the theory of the layer of charged H^+ and OH^- on the surface of the oxide. The adsorption of C_2H_4 and C_2H_2 on Al_2O_3 for several partial pressures, and as a function of the temp. have been detd. When the water content of an Al_2O_3 catalyst is reduced, the activity is decreased. The catalyst has its max. activity at $350\text{--}400^\circ$. The catalytic action of Al_2O_3 on $\text{C}_2\text{H}_5\text{OH}$ at 350° has been studied in some detail. In addn. to formation of C_2H_4 , the 2 following reactions occur: (1) $2\text{C}_2\text{H}_4 \longrightarrow \text{C}_2\text{H}_6 + \text{C}_2\text{H}_2$, and (2) $\text{C}_2\text{H}_4 \longrightarrow 2\text{C} + 2\text{H}_2$. The C_2H_2 in (1) is polymerized and adsorbed on the Al_2O_3 together with the C formed in (2). C_2H_6 is formed entirely by reaction (1), there being none formed by a reaction of C_2H_2 with C_2H_4 . Al_2O_3 catalyzes the union of C_2H_4 and H_2O to give $\text{C}_2\text{H}_5\text{OH}$; $\text{C}_2\text{H}_2 + \text{H}_2$ with C_2H_4 . Al_2O_3 catalyzes the simultaneous dehydrogenation of C_2H_4 and $\text{H}_2\text{O} = \text{CH}_3\text{CHO}$ and $\text{H}_2 + \text{O} = \text{H}_2\text{O}$, the simultaneous dehydrogenation of C_2H_4 to C_2H_2 (which is adsorbed in a polymerized state on the catalyst), and the hydrogenation of C_2H_4 to C_2H_6 . The adsorptions of C_2H_4 at 24° and C_2H_2 at 25° on Al_2O_3 have been studied. Data on the adsorption of C_2H_4 on Al_2O_3 as a function of the temp. are included. J. H. PERRY

The poisoning of catalysts. F. B. MAXTED. *Ind. Chemist* 1, 449-52(1925).—

The criteria that enable one to predict the broad principles that govern the susceptibility of a system to poisoning can, in many cases, be defined. In general, a homogeneous system cannot be poisoned, while many heterogeneous systems can be. In this classification, a system is heterogeneous if the catalyst is a distinct phase. Purely chem. heterogeneous reactions like ordinary chem. reactions which differ only in that the former are cyclic, cannot be poisoned. Processes which are accelerated by general or non-specific adsorption, as by the action of the walls of the contg. vessel, cannot be poisoned. The preferential adsorption of a poison by a catalyst and the tenacity with which the adsorbed mols. are held, is briefly discussed. An infinitely small amt. of a poison cannot inhibit the activity of an infinitely great quantity of catalyst. The amt. of poison required to inhibit the activity of unit wt. of a catalyst to an equal degree varies with the state of subdivision of the catalyst. For catalytic hydrogenation in a liquid system the activity of a partially poisoned catalyst is linearly proportional to the concn. of the poison in the reacting system. The revivification of poisoned catalysts is briefly discussed.

J. H. PERRY

The chemical equilibrium between lead sulfide and its roasting products. III.

RUDOLPH SCHENCK. *Z. anorg. allgem. Chem.* 148, 351-68(1925); cf. *C. A.* 19, 1981—The data given in the previous papers are revised theoretically and a complete system for both cases: the roasting with an insufficient amt. of O (PbS present) and with excess O (PbS absent) is established.

JOHN T. STERN

Studies of equilibrium in systems of the type $Al_2(SO_4)_3-M''SO_4-H_2O$. II. Aluminum sulfate-nickel sulfate-water at 30°. R. M. CAVEN AND T. C. MITCHELL. *J. Chem. Soc.* 127, 2549-50(1925); cf. *C. A.* 19, 3440.—There is no evidence of double salt formation between $Al_2(SO_4)_3$ and $NiSO_4$ in soln. at 30°. To avoid the tendency for false end points in the *estn.* of *Ni* in the presence of *Al*, the $NaAl_2O_4$ soln. (cf. Sutton, *Vol. Analysis* (1924), p. 278) was added to an aliquot portion until the ppt. first formed began to redissolve. The ppt. was then completely dissolved by an excess of ammonia, and the soln. dild. to working vol. Dil. H_2SO_4 was added almost to neutralization and the titration was then carried out in the usual manner.

D. S. VILLARS

The lattice energy of the ammoniates. WILHELM BILTZ AND H. G. GRIMM. *Z. anorg. allgem. Chem.* 145, 63-87(1925).—The lattice energy of the ammoniates is equal to the lattice energy of the NH_3 -free salts plus the heats of formation of the ammoniates. On this basis, the lattice energy of a no. of ammoniates has been calcd. With equal nos. of added NH_3 's, the lattice energy decreases with increasing radius of the cations or of the anions. The lattice energy of the ammoniates of salts whose cations have 18 or 20 external electrons is higher than that of the corresponding ammoniates of the same period which have 8 external electrons. The lattice energy of different ammoniates of the same salt increases with the no. of NH_3 's attached, the increase per NH_3 diminishing with the no. of NH_3 's already attached. The increase in the lattice energy for the same no. of NH_3 's in different salts of cations having the same no. of external electrons is greater the higher the charge and the smaller the radius of the cation. The differences between the lattice energy of ammoniates with the same no. of NH_3 's and the same cation but 2 different halides decreases with increasing NH_3 if the cation has 8 external electrons but increases if it has 18 or 20. The stability of the corresponding ammoniates with different halogen ions depends on the lattice energy of the ammonia-free salt, whether the heat of formation from the chloride to the iodide increases or decreases. With the aid of the lattice theory of Born and Landé, the work of adding or removing NH_3 may be calcd. With $KI \cdot 6NH_3$, the work is about 14 Cal. per NH_3 . With the hexamines of the alk. earth metals, it is about twice that. For $CaF_2 \cdot 6NH_3$, a negative result is obtained which is in agreement with the fact that this compd. cannot be made by the direct combination of NH_3 gas and cryst. CaF_2 .

A. W. K.

The chemistry of complex natural substances. HANS PRINGSHEIM. *Naturwissenschaften* 13, 1084-90(1925).—A review with bibliography. Abundant evidence is given for the theory that naturally occurring substances, starch, cellulose and proteins are built up by secondary valence polymerization from (often labile) simple substances.

B. J. C. VAN DER HOEVEN

Oxidation potentials and equilibria in the system: chlorine, iodine, hydrochloric acid, water. G. S. FORBES, S. W. GLASS AND R. M. FUOSS. *J. Am. Chem. Soc.* 47, 2892-903(1925).—Oxidation potentials at 25° for Cl_2 , for $ICl_3 + Cl_2$, for ICl_3 , and for ICl , have been measured in HCl 4, 5, and 6 *N* against H electrodes in the corresponding acids throughout a wide range of concn. The results are expressed by linear equation involving the normal (molal) potential. The following consts. were detd. and are

independent of the acid concn. within the limit of error: $(\text{ICl})(\text{Cl}_2) = 7.2 \times 10^{-14}$ (ICl_3); $(\text{I}_2)(\text{Cl}_2) = 7.8 \times 10^{-16}(\text{ICl})^2$; $(\text{I}_2)(\text{ICl}_3) = 1.1 \times 10^{-11}(\text{ICl})^3$. The systems can be titrated electrometrically with great accuracy. All relations could be explained on the basis $\text{Cl}_2 + 2\ominus = 2\text{Cl}^-$ and scarcely any on the basis $\text{ICl} = \text{I}^+ + \text{Cl}^-$. There does not appear to be any evidence in support of the ion I^+ .

A. W. KENNEY

The condensed ternary system phenol-water-salicylic acid. C. R. BAILEY. *J. Chem. Soc.* 127, 1951-65(1925).—The ternary system has been studied by both analytical and synthetic methods, the latter being of particular value in studying metastable regions. PhOH was estd. by the bromide-bromate method. Salicylic acid, even in the presence of PhOH, was titrated with $\text{Ba}(\text{OH})_2$ using *p*-nitrophenol. H_2O was detd. by difference. In the binary system PhOH- H_2O , the crit. soln. temp. is 65.3° , corresponding to 36.5% PhOH; and the eutectic is at 1.2° with 6.5% PhOH. The ternary diagrams, as detd. by points of crit. opalescence, differ somewhat from those detd. by analysis or by the points of sudden thickening, the last two methods giving concordant results. No compds. or mixed crystals were observed. The binary system H_2O -salicylic acid gives 2 liquid layers in the metastable region. The system PhOH- H_2O has 2 liquid layers in the stable region and the phenomenon of "melting under the liquid" occurs at easily accessible temps. and in accordance with Schreinemaker's generalization. Salicylic acid has very slight soly in H_2O but a much higher soly. in PhOH and still higher in mixts. of PhOH and H_2O . Detailed data are given and different ternary and binary systems and isotherms are illustrated by diagrams.

A. W. KENNEY

The system water and the nitrates of potassium and ammonium at 25° . KINJI ANDO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 8, 284-6(1925). (In English), cf. Rutgers, *Z. physik. Chem.* 4, 622.—Roughly calcd. proportions of KNO_3 and NH_4NO_3 were dissolved in H_2O by warming and the soln. was brought to equil. at 25° . The liquid and the solid phases were sep'd and analyzed. The transition points (1) for the 2 series of solid solns. were for solid KNO_3 satd. with NH_4NO_3 at 13.5% NH_4NO_3 and for solid NH_4NO_3 satd. with KNO_3 at 65% NH_4NO_3 ; (2) for the liquid phase satd. with both salts at 79.41% NH_4NO_3 . The H_2O content in the liquid phase decreased to 2.18% with the addn. of NH_4NO_3 and then became const. All values are expressed as mol. fractions %.

H. M. McLAUGHLIN

The equilibrium in the system consisting of potassium sulfate, potassium nitrate and water at 25° . RYOHEI INOUE. *Mem. Coll. Sci. Kyoto Imp. Univ.* 8, 287-90 (1925). (In English).—The method was the same as used by Ando (cf. preceding abstr.). The solid phases were K_2SO_4 and KNO_3 only (cf. Massink, *C. A.* 11, 3181). Transition points occurred for the liquid phase at 14.89% K_2SO_4 with 26.49% H_2O and for the solid phases at 87.82% K_2SO_4 and 1.74% K_2SO_4 . All values are expressed as mol. fraction %.

H. M. McLAUGHLIN

The system silver sulfate-aluminium sulfate-water at 30° . R. M. CAVEN and T. C. MITCHELL. *J. Chem. Soc.* 127, 2550-1(1925).—It was decided that Ag_2SO_4 and $\text{Al}_2(\text{SO}_4)_3$ do not form a cryst. alum from mixts. at 30° . This is in disagreement with Kern (cf. *Chem. News* 31, 209(1875)) and Church and Northcote (cf. *ibid.* 9, 155 (1864)).

D. S. VILLARS

A method for the investigation of binary systems. I. The "thaw"-melting-point diagram. HEINRICH RHEINBOLDT, KURT HENNIG and MARINETTE KIRCHHEISEN. *J. prakt. Chem.* 111, 242-72(1925).—In the study of binary systems in which (I) components do not form compds. with each other, (II) components unite to a homogeneous melting compd., (III) components form a non-homogeneous melting compd. the authors suggest that the temps. at which melting begins, "Auftaupunkt," be plotted as well as the usual m. p. The "Auftau" curve coincides with the m. p. curve at the m. p. of the pure components and the eutectics. In this way it indicates maxima in the m. p. curve which are sometimes indistinct because of the extreme flatness of the curve. The values obtained agree with those of other investigators. The diagrams of the following systems are given and discussed: (I) naphthalene-*p*-nitrophenol; α -naphthol- β -naphthylamine; pyrocatechol-naphthalene; (II) β -naphthylamine-1,3,5-trinitrobenzene; β -naphthylamine-nitrosodimethylaniline; naphthalene-picric acid; phenol-picric acid; urea-phenol; benzamide-nitrosodimethylaniline; *m*-hydroxybenzaldehyde-picric acid; antipyrine-hydroquinone; (III) acetamide-salicylic acid; anthracene-picric acid; *p*-dinitrobenzene- α -naphthylamine; *p*-dinitrobenzene- β -naphthylamine.

J. R. SCHIERZ

The supposed isomorphism of compounds of uranyl with those of the isomorphogenic metals of the magnesium group. G. CAROBBI. *Gazz. Chim. Ital.* 55, 406-10 (1925).—See *C. A.* 18, 2655.

E. J. WITZEMANN

The study of the relations of isomorphism between compounds of beryllium and those of magnesium. F. ZAMBONINI AND G. CAROBBI. *Gazz. chim. ital.* **55**, 330-5 (1925); *Atti accad. Lincei* [5] **33**, II, 218-22 (1924).—The isomorphic relations between Be and Mg in chem. preps. and in minerals are fully reviewed. These data show that Be can substitute for Mg isomorphically in some minerals at least but the miscibility of Be compds. with the corresponding Mg compds. in the solid state is quite limited. Z. and C. have investigated this subject further with double nitrates of the Ce group of the type $Mg_3X_2'''(NO_3)_{12} \cdot 24H_2O$. Attempts to obtain a double nitrate between Be and La failed. It was then attempted to stabilize the compd. $Be_3La_2(NO_3)_{12} \cdot 24H_2O$ in mixed crystals with $Mg_3La_2(NO_3)_{12} \cdot 24H_2O$. To a soln. contg. 5.25 g. $La(NO_3)_3 \cdot 6H_2O$ and 4.2 g. $Be(NO_3)_2 \cdot 4H_2O$ a large excess of the Mg-La salt was added. The 1st fractions were nearly pure $Mg_3La_2(NO_3)_{12} \cdot 24H_2O$ (nearly free from Be). The final fractions contained 5.4-7.6% $Be_3La_2(NO_3)_{12} \cdot 24H_2O$. To the mother liquors 2 g. each of the Be and La nitrates were added. The solns. were concd., cooled rapidly and seeded with crystals of the previous fraction. They gave mixed crystals contg. 18.9% of the Be-La salt; this could not be increased by successive attempts. Z. (C. A. **19**, 1529) has recently discussed the relation of the isomorphism to at. structure as proposed by Bohr. The structure of Be and Mg is quite different.

	1 ₁	2 ₁	2 ₂	3 ₁
Be	2	2		
Mg	2	4	4	2

The marked difference is sufficient to explain the rather scarce isomorphic relations.

E. J. WITZEMANN

Investigations on the acid nature of some derivatives of sulfur, selenium and tellurium. D. D. KARVE. *Quart. J. Indian Chem. Soc.* **2**, 128-41 (1925); cf. C. A. **19**, 3203.—The acid nature of a compd., as regards its existence as a "true" acid or a "pseudo-acid," might be investigated by considering (1) the effect of the compd. on an indicator (dimethylaminoazobenzene), (2) the absorption spectra of solns. of the compd., (3) the effect of the compd. on the rate of inversion of cane sugar, and (4) the effect of the compd. on the velocity of decomn. of diazoacetic ester. The use of some or all of these methods led to the following conclusions: (1) In the pure state or in aq. soln., $MeSO_3H$ and $EtSO_3H$ exist as true acids ($ROSO_3H$); in dil. $EtOH$ solns. and even in concd. H_2O solns. the acids are present as pseudo-acids ($ROSO_2OH$). (2) H_2SeO_3 in aq. soln. is present partly as the true monobasic acid ($OHSeO_2H$) but chiefly as the pseudo-acid ($SeO(OH)_2$); in dil. $EtOH$ soln. it is present entirely as pseudo-acid. (3) H_2SeO_4 , like H_2SO_4 , exists in water either as true acid or as its oxonium salt; the addn. of $MeOH$ causes partial formation of pseudo-acid. (4) $C_6H_5SO_2H$ and $C_6H_5SO_3H$ are present as true acids in aq. solns. and as pseudo-acids in the pure state or in org. solvents. (5) $C_2H_5SeO_2H$ exists as pseudo-acid even in aq. soln. (6) H_2TeO_3 is a pseudo-acid of the formula $OTe(OH)_2$. (7) Ordinary telluric acid ($H_2TeO_4 + 2H_2O$) (I) is actually $Te(OH)_6$; allotelluric acid (prepd. by heating I in a sealed tube to 140°) is a true acid of formula " $(OH)_3TeO_2 \cdot H_2O$ "; anhyd. telluric acid should be represented as $O_2Te(OH)_2$.

DONALD W. MACARDLE

The thermal decomposition of some chloro salts of the platinum metals. I. Contribution to the study of monovariant systems. G. GIRE. *Ann. chim.* **4**, 183-221 (1925).—The dissociation pressures of several metallic chloroplatinates have been studied. $\frac{1}{2} K_2PtCl_6 \rightleftharpoons \frac{1}{2} Pt + KCl + Cl_2$ gives the following data: 607° , 4.4 mm.; 708° , 39.2, 801° , 245; 854° , 681; 921° , 1750 mm. For $\frac{1}{2} Na_2PtCl_6 \rightleftharpoons \frac{1}{2} Pt + NaCl + Cl_2$: 503°, 6 mm.; 601°, 64.4; 651°, 252; 720°, 848; 758°, 1450 mm. For $\frac{1}{2} BaPtCl_6 \rightleftharpoons \frac{1}{2} Pt + \frac{1}{2} BaCl_2 + Cl_2$: 428°, 4.6 mm.; 556°, 80.3; 607°, 210; 655°, 531; 721°, 1600 mm. For $\frac{1}{2} K_2IrCl_6 = \frac{1}{2} Ir + KCl + Cl_2$: 574°, 9.2 mm.; 651°, 30.7; 706°, 83.0; 751°, 189; 808°, 541; 844°, 933. For $2K_2IrCl_6 + 2KCl \rightleftharpoons 2IrCl_6K_3 + Cl_2$: 480°, 3.8 mm.; 552°, 24.3; 603°, 67.9; 705°, 437; 795°, 1610 mm. For $\frac{2}{3} Na_3RhCl_6 \rightleftharpoons \frac{2}{3} Rh + 2NaCl + Cl_2$: 609°, 14.0 mm.; 712°, 73.3; 751°, 120; 800°, 274; 825°, 460 mm. Additional data for each salt are given in the original. Each of the above reactions is reversible. At about 700° , K_2PtCl_6 goes to K_2PtCl_4 as: $K_2PtCl_6 \rightarrow Pt + 2KCl + Cl_2 \rightarrow \frac{1}{2} Pt + KCl + \frac{1}{2} K_2PtCl_6$. With an excess of KCl, the formation of chloro-iridate is limited by the reversible reaction: $2K_2IrCl_6 + 2KCl \rightleftharpoons 2K_3IrCl_6 + Cl_2$. At the m. p. of KCl, the tangents to the dissocn. curves of K_2PtCl_6 and K_2IrCl_6 undergo a sudden change which gives the mol. heat of fusion of KCl of about 5 Cal. From the break in the curve for Na_3RhCl_6 , the heat of fusion of $NaCl$ is calcd. to be 5.67 Cal. II. Calorimetric researches on the chloro salts studied. *Ibid* 370-409.—The following

heats of soln. and reaction have been measured (kg. Cals.): K_2PtCl_6 soln. + Aq. = -12.15 ; Na_2PtCl_6 soln. + Aq. = $+7.10$; BaPtCl_6 soln. + Aq. = $+9.05$; $\text{BaPtCl}_6 \cdot 6\text{H}_2\text{O}$ + Aq. = -1.06 ; Na_3RhCl_6 soln. + Aq. = $+7.70$; $\text{Na}_3\text{RhCl}_6 \cdot 12\text{H}_2\text{O}$ + Aq. = -20.56 ; K_2IrCl_6 soln. + Aq. = -13.12 ; K_2IrCl_6 soln. + Aq. = -7.90 ; K_2PtCl_6 soln. + Co = $+100.90$; Na_2PtCl_6 soln. + Co = $+99.10$; BaPtCl_6 soln. + Co = $+100.90$; Na_3RhCl_6 soln. + Aq. = $+56.50$. The Thomsen-Pigeon hypothesis that "The heats of formation of all the dissolved chloroplatinates, starting from the dissolved chlorides, is the same," has been verified, but, for the reaction $\text{Pt} + \text{MCl}_2 + 2\text{Cl}_2 = \text{MPtCl}_6 + Q$, Q has been found equal to 89 Cals., a new value. It has been shown that the reduction of K_2IrCl_6 by Co and by CrCl_2 takes place in 2 steps: $2\text{K}_2\text{IrCl}_6 + 2\text{KCl} = 2\text{K}_3\text{IrCl}_6 + \text{Cl}_2 - Q$ and $2\text{K}_3\text{IrCl}_6 = 2\text{Ir} + 6\text{KCl} + 3\text{Cl}_2 - Q'$, the second step being much the slower. The soly. of K_2IrCl_6 in H_2O was detd. to be at 0° , 0.66 g. and at 20° , 1.12 g. per 100 g. H_2O . The existence of the hydrate $\text{Na}_3\text{RhCl}_6 \cdot 12\text{H}_2\text{O}$ has been proven. From the heats of dissociation as a function of the temp. the ratio of the heat of reaction to the abs. temp. is 0.0325. For ammoniacal chlorides, this ratio is 0.032; for hydrides, oxides, carbonates and chlorides, it varies from 0.028 to 0.034. AuCl_3 gives a ratio of 0.0326. J. H. PERRY

Thermochemistry of beryllium. C. MATIGNON AND G. MARCHAL. *Compt. rend* **181**, 859-61 (1925).—The following heats of reaction have been measured: BeO (prepd. at 1000°) + 30% HF, $Q = 23.3$ kg. cal. at 17° ; $\text{Be}(\text{OH})_2 + 2\text{HCl}$ (aq.), $Q = 13.65$ kg. cal.; $\text{BeSO}_4 \cdot 4\text{H}_2\text{O}$ + aq., $Q = 1.5$; $\text{BeSO}_4 \cdot 2\text{H}_2\text{O}$ + aq., $Q = 8.0$; $\text{BeSO}_4 + \text{NaOH}$ (111.8 g. per l.), $Q = 34.5$; $\text{BeSO}_4 \cdot 2\text{H}_2\text{O} + \text{NaOH}$ (111.8 g. per l.), $Q = 17.5$; $\text{Be} \cdot \text{SO}_4$ aq. + BaCl_2 , $Q = 6.95$; BeCl_2 + aq., $Q = 51.1$ kg. cal. F. R. BIGNOWSKY

The temperature of the vapor evolved from a solution. E. REISSMANN. *Z. anorg. Chem.* **38**, 1040-4 (1925); cf. *C. A.* **19**, 917. In order to eliminate different possible sources of error the app. previously used was further improved. The results reported in the first paper agree with those of the 2nd communication. In addn. indirect expts. were carried out based on the following idea: Vapor which has the temp. of the boiling solvent is introduced into a soln. boiling at a higher temp.; then there should be an equil. according to Faraday, while a condensation of the vapor should take place according to Gay-Lussac, accompanied by a lowering of the temp. of the boiling soln. On the other hand if the temp. of the vapor is higher than that of the solvent, but lower than that of the soln., part of the soln. should evaporate and the b. p. should rise according to Faraday, while this should not take place according to Gay-Lussac; the temp. of the soln. will rise according to the latter only if the temp. of the vapor is higher than that of the solvent. The expts. prove the correctness of Gay-Lussac's opinion. Thus the vapor evolved from a soln. has the temp. of the soln. and not that of the solvent, as demanded by Faraday. EMIL KLARMANN

The latent heat of vaporization of liquid oxygen-nitrogen mixtures. L. I. DANA. *Proc. Am. Acad. Arts Sci.* **60**, 241-67 (1925).—This research deals with the detn. of the latent heat of vaporization at atm. pressure of liquid O_2 , N_2 and of mixts. of the 2 in all proportions. A new calorimeter is described which is designed for the detn. of the latent heats at low temps. of pure liquids and their binary mixts. The calorimetric method adopted is the continuous-flow method at const. pressure. A latent heat is defined and measured which involves the change in heat content from the liquid state to the vapor state vertically above it on the vapor line in the temp.-compn. diagram. The latent heats of vaporization of liquid O_2 and of liquid N_2 are 50.01 cal. (15°) per g. and 47.74 cal. per g., resp. The values of the latent heats of the mixts. read from a smooth curve drawn through the exptl. points, are tabulated and the accuracy is estd. to be within 0.2%, and in most cases within 0.1%. W. H. BOYNTON

The thermal dissociation of sodium carbide. E. W. GUERNSEY AND M. S. SHERRMAN. *J. Am. Chem. Soc.* **48**, 141-6 (1926).—An app. and techniq. for the prepn. of Na carbide from C_2H_2 and molten metallic Na are described. The dissocn. pressure of Na vapor from solid carbide is represented approx. by the equation, $\log p = 9059 - 6609/T$. The dissocn. pressure becomes 1 atm. at about 800° . It follows that any Na carbide which is formed as a step in the fixation of N as cyanide can exist only in the gas phase, since considerably higher temps. are required for the fixation. At 700° , Na carbide in the gas phase is largely dissocd. the partial pressure of gaseous Na carbide over solid Na carbide being about 0.6 mm. Hg as compared with 191 mm. dissocn. pressure of Na. F. R. B.

The chemistry of calcium cyanamide. I. The heat content of calcium cyanamide. H. H. FRANCK AND FRITZ HOCHWALD. *Z. Elektrochem.* **31**, 581-90 (1925).—The heat of combustion of almost pure CaCN_2 is 163.1 ± 0.4 kg. cal. The directly measured heat of nitrogenation of CaC_2 is 72.0 ± 2.0 kg. cal. The heat of combustion of MgCN_2

is 179.5 kg. cal. The heat of combustion of Mg is 146.1 kg. cal. These values are all for const.-vol. processes. The calcd. heats of formation for CaCN_2 and MgCN_2 are 84.0 and 61.0 kg. cal., resp.

Absolute critical temperatures. MAURICE PRUD'HOMME. *Bull. soc. chim.* **37**, 1330-40 (1925).—(1) *Relationships in groups of 2, 3 and 4 compds.* P. shows by many examples, that the difference between the abs. crit. temps. (T_c) of 2 compds. of a group, made up of binary or tertiary compds. of any 3 elements, is equal to the difference between some other 2. Thus, $\text{CS}_2 = 550$, $\text{CO}_2 = 304$, $\text{CO} = 132$, $\text{COS} = 378$; $\text{CS}_2 - \text{CO}_2 = 246 = \text{COS} - \text{CO}$, or $\text{CS}_2 + \text{CO} = \text{COS} + \text{CO}_2 = 682$. Similar associations are possible with derivs. of N, cyanogen, nitriles, ethers, etc. T_c for $\text{H}_2\text{O} = 647$ is twice that for $\text{HCl} = 324$. (2) *Addns. of T_c .*—P. states that the T_c for an inorg. compd. is equal to the sum of the simple multiples or fractions of the T_c of the constituent elements. T_c for metallic elements, when present, is ignored except in the case of Si, when a const. is required. Thus $\text{SO}_3 = 606 - \frac{3}{2}\text{O} + \frac{1}{3}\text{S} = 600$; $\text{PH}_3 = 324 - \frac{1}{3}\text{P} + \text{H} = 322$; $\text{TiCl}_4 = 631 - \frac{3}{2}\text{Cl} = 628$; $\text{SiCl}_4 = 501 - \text{Cl} + 82 = 501$. The no. of ats and the no. of valences in the mol. appear to be the guide in such calcs. but the general rule is not clear. P. illustrates the idea structurally as follows: $\text{O}=\text{S}=\text{O}$, $\frac{1}{2}\text{O}-\text{S}/3-\frac{1}{2}\text{O}$. (3) *Substances contg. 1 C atom.*—The T_c of C as with



the metals is ignored although it plays a part in compds. with more than 1 C atom. Thus, $\text{CS}_2 = 550 - \frac{1}{2}\text{S} = 550$; $\text{CH}_2\text{Cl} = 518 - \text{Cl} + 3\text{H} = 515$. (4) *Org. compds. of more than 1 C atom* may be split into groups contg. 1 or 2 C atoms and possessing 1 or 2 free valences. The sum of the T_c for these groups gives the T_c of the compd. in question. The principal groups are CH_3 , CH_2 , CH_3CH_2 , CH_2OH (alcs.), HCO_2 (esters), COOH (acids), etc. Thus, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH} \cdot \text{CH}_2 = 474 = 185 + 52 + 52 + 185$; $\text{HCO}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 = 551 = 323 + 22 + 22 + 185$. Hydrocarbons having the same no. of valences have the same T_c and in general T_c is an exponential function of the no. of valences. $T_c = \text{CV}^n$. For hydrocarbons, $n = 0.489$, $\log C = 2.0391$ and for alcs. $n = 0.1462$, $\log C = 2.5366$. Detd. values for T_c and for alcs., hydrocarbons, org. salts, acids, nitriles, etc., agree well with values calcd. either by addn. of group values or by use of the valence equation. Thus, for Pr alc. 537, 538 and 540, resp., butane 423, 422 and 424, Me formate 485, 475 and 474. The values given for some of the common groups are $\text{CH}_3 = 152$, $\text{CH}_2\text{CH}_2 = 185$, $\text{CHCH}_2 = 185$, $\text{CH}_2\text{CH}_2 = 52$, CH_2CH_2 (alcs., salts and fatty acids) = 22, $\text{OH} = 331$, $\text{HCO}_2 = 323$, $\text{CO}_2 = 192$, $\text{H} = 31$, $\text{N} = 127$.

P. B. PLACE

Thermal expansion of tungsten. PETER HIDNERT AND W. T. SWEENEY. *Bur. Standards, Sci. Papers* **20**, No. 515, 483-7 (1925).

E. J. C.

The heat capacity and entropy of lead bromide and bromine. W. M. LATIMER AND H. D. HOENSHEL. *J. Am. Chem. Soc.* **48**, 19-27 (1926).—The heat capacity of solid Br is measured from 14 to 252°Abs ; that of PbBr_2 from 18 to 297°Abs . Accuracy 0.02 cal. per mol. A careful description of app. and method is given. The entropies of PbBr_2 and of Br (liq.) at 298° are $39.7 \pm .45$ and 18.4 ± 0.2 cal. per formula weight, resp.

F. R. B.

A derivation of Saha's equation for temperature ionization. W. F. G. SWANN. *J. Franklin Inst.* **200**, 591-4 (1925).—Saha's equation is derived in a simple manner by equating the variation of Boltzmann's expression for the entropy of monat. gases. to $\delta S = Q_p/T$, where Q_p is the heat necessary for ionization of δn ats. B. J. C. v. H.

Remarks on the statistical definition of entropy of an ideal gas. E. SCHRÖDINGER. *Sitzb. preuss. Akad. Wissenschaften* **1925**, 434-41.—There are 4 definitions of entropy which are often confused: (1) $S = k \ln W_{\text{max}}$, where W_{max} is the max. no. of permutations at const. energy which can define a given state. $S = k \ln \Sigma W$, where ΣW is the sum of the no. of permutations for all possible states consistent with const. energy. (3) This definition is formally the same as (2) but is derived from (1) by a faulty application of Stirling's formula (4) $S = k \ln T$, where T is the total no. of all possible arrangements consistent with the total energy. All of these formulas give results consistent with the Nernst's law. S. prefers the fourth.

F. R. BICHOWSKY

The statistical definition of entropy. MAX PLANCK. *Sitzb. preuss. Akad. Wissenschaften* **1925**, 442-51.—The entropy is defined as proportional to the log of the total no. of stationary states consistent with the total energy E . This definition leads to a simple proof of the Planck law for a system of oscillators.

F. R. B.

A mass-action equation for compressed gases with application to the Haber equilibrium data. L. J. GILLESPIE. *J. Am. Chem. Soc.* **48**, 28-34 (1926).—The rule of Lewis and Randall that the fugacity of any component of a mixed gas is proportional

to its mol. fraction is tested with the best data for the equation of state of H_2 , N_2 and NH_3 and the equil. const. for the Haber reaction. Close agreement is found up to 100 atms.; above that, systematic variations occur due presumably to faulty equations of state. F. R. B.

Polonium and bismuth as amphoteric elements. FRITZ PANETH and BENJAMIN HEINZ. *Z. Elektrochem.* 31, 572-6(1925).—Po, like Tc, may be electrolytically dissolved and deposited both at anode and cathode, in KOH soln. Results in acid soln. were less conclusive. The cathode potential is between that of Au and Ag. Thorium C was used as a radioactive indicator for Bi; it gives similar results in alk. soln. With both elements, the ratio of anodic to cathodic dissolution decreases with increasing KOH concn., approaching 1. B. H. CARROLL.

Solubility measurements on ampholytes. H. EULER and K. RUDBERG. *Arkiv. Kemi Mineral. Geol.* 9, No. 18, 1-6(1924); *Z. anorg. allgem. Chem.* 145, 58-62(1925).—The sp. change in soly. AS of nonelectrolytes by neutral salts is expressed by the formula $AS = -(1/n)[(l_w - l_s)/l_w]100$ where l_w is the soly. of the nonelectrolyte in water, l_s its soly. in salt soln. and n the concn. of the salt. The increase in soly. of amino acids is dependent on the distance between the 2 elec. charges in the mol; hence glycylglycine should have a greater AS than tyrosine or leucine. Expts. confirm this theory. In accordance with the Bjerrum theory of ampholytes the soly. of methyl orange at definite pH is greater in a glyccoll soln. than in water. W. F. GOEBEL.

Electrical conductivity of phosphorus pentachloride. G. W. F. HOLROYD, HARRY CHADWICK and J. E. H. MITCHELL. *J. Chem. Soc.* 127, 2492-3(1925); cf. *C. A.* 18, 28.—This preliminary communication, for priority purposes, announces the intention of studying PCl_5 ions and soln. of PCl_5 in C_6H_6 . A method of prepg. pure PCl_5 and PCl_3 is given. R. E. GIBSON.

Electrical resistance of tungsten wire. JUN TSUKAMOTO. *Nagaoka Anniv. Vol.* 1925, 409-12; *Japan. J. Physics* 4, 22A.—The variation in elec. resistance of W was detd. when the rectangular sintered rods, contg. 1% of thoria, were swaged and drawn down to thin wires. The av. sp. resistance of the sintered rod, about 0.47 by 0.47 cm.² in section, is 6.1 microöhm at 20°. It decreases rapidly with the swaging operation and reaches a min. value of 5.7 microöhm at 4.5 mm. diam. By further swaging it increases gradually and attains a value of 5.9 at 0.75 mm. As this is drawn down to 0.35 mm. the sp. resistance increases steadily, attaining 6.0 microöhm at 0.35 mm., below which the rate of increase becomes more rapid and reaches 7.1 at 0.015 mm. The sp. resistance of sintered rods depends upon the fineness of W powder from which they have been made and also upon the time of heating. For wires it depends on the drawing temp. C. J. WEST.

On the work of Bernhard Neumann and Helmut Richter: "The potentials of fluorine, determined by measurements of the decomposition potentials of molten fluorides." OTTO RUFF and WERNER BUSCH. *Z. Elektrochem.* 31, 614-5(1925).—Cf. Neumann and Richter (*C. A.* 20, 141). B. H. CARROLL.

Investigations of electrolyte filaments. I. The behavior of streaming electrolyte filaments traversed by an electric current and their deviation by a magnetic field. E. MANEGOLD. *Z. anorg. allgem. Chem.* 145, 181-92(1925).—The effect of a magnetic field on a soln. contg. electrolytes has been utilized in analytical chemistry but little investigation made of this phenomena. An app. is described in which a thin stream of dyed salt soln. passes through a chamber contg. pure H_2O . Electrodes are inserted so that a current may be passed through this filament, and the filament may also be subjected to the action of a magnetic field. It was found that without a magnetic field, the filament could be thickened or broken by changing the intensity of the current flowing through it, and it was sharply deviated from its rectilinear position by the action of the magnetic field, the direction of deviation following the same law as for a metallic conductor. The preliminary expts. described are to be followed by a more comprehensive study. A. W. KENNEY.

Ionic mobilities in solid cuprous sulfide and silver sulfide. H. BRAUNE and O. KAHN. *Z. Elektrochem.* 31, 576-81(1925).—Continuation of the expts described in *C. A.* 19, 3196. The diffusion const. of the Cu ion in Ag_2S with 5% Cu_2S is expressed by $D = 40.3 e^{-(1490/T)}$. Diffusion of Se in Ag_2S contg. Ag_2Se was measured by a colorimetric detn. of Se. $D = 59.3 e^{-(10120/T)}$. These results are in agreement with the relative mobilities of cation and anion in solid salts as detd. by elec. cond. methods. B. H. CARROLL.

Dielectric constants of electrolytic solutions. H. ULICH. *Z. Elektrochem.* 31, 413-7(1925).—A review of the work of Walden and U. (*C. A.* 19, 1809, 2440, 3058). Curves are given for the dependence of the dielec. const. ϵ on the concn. of added salt,

and possible interpretations in the light of the theories of Debye and Hertz are discussed.

H. R. MOORE

The electrolytic oxidation of the quadrivalent molybdenum octacyanides. OSCAR COLLENBERG AND BJÖRN ANDERSEN. *Z. Elektrochem.* **31**, 558-65(1925).—The electrolytic oxidation of the Mo^{IV} cyanide of the type $\text{M}_4\text{Mo}(\text{CN})_8$ to Mo^{V} cyanide of the type $\text{M}_3\text{Mo}(\text{CN})_8$ has been accomplished by C. and A. and is considered a method to obtain a c. p. material for the study of the photochem. actions on this very light-sensitive compd. In the general procedure for this oxidation with KMnO_4 there is always a possibility of contaminating the material with a small amt. of Mn^{++} , which is known to act as a strong photochem. catalyst and thus may interfere with the true reactions. Expts. were carried out in acid, alk. and neutral solns. with anodes of Pt, Au, Fe and Ni, and a Pt cathode. The oxidation could be conducted without decompn. of the complex Mo^{V} cyanide in either case with anodes of Pt or Au under proper conditions. Fe and Ni were unsuitable. As anolyte was used a 0.108 *M* $\text{K}_4\text{Mo}(\text{CN})_8$ soln. On electrolysis in a 0.1 *N* H_2SO_4 soln., with a 0.1 *N* K_2SO_4 soln. as catholyte, the oxidation is quant. In the alk. oxidation with an alk., 0.5 *N*, only 92% could be oxidized in the best case, because of self reduction of the $\text{Mo}^{\text{V}}(\text{CN})_8$ ion at the end of the reaction. Comparatively high alk., as well as a sufficiently high temp. was found necessary to avoid decompn. The electrolysis in a neutral soln. could not be completed without addn. of other salts, because of decompn. of the complex cyanide ion. With the addn. of K_2SO_4 to 0.1-0.2 *N* this could be avoided and quant. results obtained. D. MIESEY

Various physical properties of rubidium and cesium and the resistance of potassium under pressure. P. W. BRIDGMAN. *Proc. Am. Acad. Arts Sci.* **60**, 385-421(1925).—New data for Rb and Cs are given as follows: cubic compressibility up to 15,000 kg./cm.², elec. resistance of the solid and liquid phases as a function of pressure and temp. between 0° and 100°, up to 12,000 kg./cm.², both for bare wires and for the metals enclosed in glass capillaries; and the complete melting data (variation of the *m. p.* with temp. and pressure and the change in vol. whence the latent heat is calcd.) from 0° to 100° and up to 12,000 kg./cm.². Extrapolating from the temp.-pressure curves for the *m. p.* B. gives 38.7° and 29.7° as the *m. ps.* at atm. pressure of pure Rb and Cs, resp. The initial compressibilities of Rb and Cs are given as 0.0452 and 0.0470. In the case of Cs the elec. resistance-pressure curve passes through a *minimum* around 4000 kg./cm.². This is shown to be an inherent property of the element and not to be due to its crystal structure. There are indications that the curve for Rb behaves similarly at very high pressures. The bearing of this phenomenon on the *theories of metallic conduction* is discussed. The elec. resistance of K and its temp. coeff. under pressure have been redetd. on bare wires instead of glass capillaries, which were shown to exert a constraining action on the metal. The temp. coeff. of the elec. resistance of K does not decrease rapidly at high pressures, as was previously stated. In discussion the above properties of all the alkali metals are compared and the "electronic volume" (at. vol./at. no.) is plotted against pressure. K. is anomalous in "electronic vol." (the anomaly disappears at 10,000 kg./cm.²), compressibility and melting data. Except in the case of Li, the fractional changes in vol. on melting and the latent heats of all the alkali metals are nearly the same, but the pressure-vol.-temp. relations of a compressible alkali element at high pressures are not similar to those of a less compressible one at lower pressures as has been supposed. *Methods of purifying Rb and Cs* are given.

R. E. GIBSON

Effect of tension on the transverse and longitudinal resistance of metals. P. W. BRIDGMAN. *Proc. Am. Acad. Arts Sci.* **60**, 423-49(1925).—A new exptl. method is given for measuring the change of resistance in a metal when the direction of the current is at right angles to the stress (transverse coeff.). The method gives the geometric mean of the transverse and longitudinal coeffs. whence, with the help of a direct detn. of the latter, the former can be found. The math. theory of the method is given in detail. Of the 8 metals examd. Ni is abnormal. The values for the softer metals, Al, Au, Ag, Cu, are doubtful. Exptl. details are given and the results are discussed with their bearing on the electron free path theories of metallic conduction. Results are given for Al, Au, Ag, Cu, Pd, Pt and Fe.

R. E. GIBSON

Points of magnetic transformation in the system sesquioxide of iron-magnesia. H. FORESTIER AND G. CHAUDRON. *Compt. rend.* **181**, 509-11(1925).—A study of the system $\text{Fe}_2\text{O}_3\text{-MgO}$ at various temps. by dilatometry and also by magnetic susceptibility. The results show the existence of $\text{Fe}_2\text{O}_3\text{.MgO}$.

S. K. ALLISON

The configuration of the ammonium ion. WM. H. MILLS AND E. H. WARREN. *J. Chem. Soc.* **127**, 2507-14(1925).—A crucial test between the tetrahedral and pyramidal configurations of the NH_4 ion is provided by the spirocyclic ammonium radicals, which

should be symmetrical on the latter and unsymmetrical on the former hypothesis. 4-Phenyl-4'-carbethoxybispiperidinium-1,1'-spiran bromide was prepared, and by fractionation of its d- α -bromocamphor- π -sulfonate, was successfully sep'd. into optical isomers with rotation $[M]_{5461} = 50.5-8^\circ$ and $[M]_{5780} = 44.9^\circ$. Prepn. of the spirocyclic comp'd. is described in detail.

Molecular asymmetry and optical activity. E. DARMOIS. *J. phys. radium* **6**, 232-40(1925).—A lecture with bibliography. The theories of optical rotatory power are briefly reviewed, in particular the one of Mallemann (*C. A.* **18**, 3527). Evidence is given for the necessity of assuming chem. combinations and elec. effects in solns. for the explanation of the optical rotation value.

Optical anisotropy of selectively absorbing substances; mechanical production of anisotropy. HANS ZOCHER. *Naturwissenschaften* **13**, 1015-21(1925).—A review is given of expts. with streaming liquids contg. nonspherical dye particles and with directionally polished surfaces of either org. dye layers or metals and metal oxides. Generally these systems show dichroism (difference in light absorption depending on direction of polarization) and consequently anomalous double refraction. From the ordinary dispersion theory these phenomena can be explained. The polish dichroism is due to slip of the dye particles; it is generally positive (helianthin negative) and is strongly dependent upon recryst. and moisture (cf. Zocher, *C. A.* **15**, 3576; *Ber. preuss. Akad.* **23**, 426(1925); Keeser and Zocher, *C. A.* **18**, 3511). B. J. C. VAN DER HOEVEN

The indices of refraction of some perchlorates in aqueous solution. ARRIGO MAZZUCHELLI AND ANGELINA VERCILLO. *Gazz. chim. ital.* **55**, 498-501(1925). The NH_4ClO_4 used was the same as that previously used (*C. A.* **16**, 1896). The NaClO_4 was prep'd., on account of its hygroscopicity, in conc'd. aq. soln. and the strength of the soln. was det'd. by evapg. a known portion to dryness. The HClO_4 was prep'd. according to Einster (*Z. anorg. Chem.* **52**, 278(1903)). From the data obtained the sp. refractive power in moderately dil. solns. was found to be 0.2479 for NH_4ClO_4 , 0.1844 for NaClO_4 and 0.2108 for HClO_4 . From these the mol. refractive power was calcd. to be 29.13, 22.58 and 21.18, resp. On subtracting the values for NH_4Cl , NaCl and HCl (22.53, 15.88 and 14.50, resp.) the values 6.60, 6.70 and 6.67 are obtained. These values are nearly const. and correspond to the difference between the mol. refractive power of perchlorate and Cl ions.

Relations between contraction, light refraction and light absorption in aqueous salt solutions. G. P. HÜTTIG AND MARTIN KELLER. *Z. Elektrochem.* **31**, 390-404(1925).—An extensive compilation of data on contraction, refraction and dispersion of Li halide solns. has shown that these properties afford a satisfactory measure of the deformability of the halide ions. In accordance with the predictions of Fajans and Joos (*C. A.* **18**, 1238, 2103), the deformation of I is greatest because of electrostatic attraction of neighboring ions and hence the change of these various properties with concn. is most marked for LiI. Hydration tendencies decrease in the order LiI, LiBr and LiCl.

Diffusion of light by methane and its gaseous homologs. J. CABANNES AND J. GAUZIT. *J. phys. radium* **6**, 182-98(1925); cf. *C. A.* **18**, 3529. The light transversely diffused by sat'd. gaseous hydrocarbons of the fatty series is not completely polarized. The factor of depolarization for CH_4 is 0.015 and increases regularly for C_2H_6 , C_3H_8 , C_4H_{10} , C_5H_{12} and C_6H_{14} . Present values are considerably greater than those obtained previously for air, Kr and Xe, and indicate an appreciable anisotropy of the C atom. Indices of refraction are criteria of the mean values of mol. polarization for all orientations. Lorentz' law of the additivity of refractions is applicable. A generalized form of Rayleigh's law is valid (*C. A.* **13**, 1184-5). For complete polarization, the depolarization factor $\rho = 0$.

Dispersion of light according to the quantum theory. L. S. ORNSTEIN AND H. C. BURGER. *Z. Physik* **32**, 678-80(1925).—The expression developed in a previous paper (*C. A.* **19**, 935) by means of which n for various compounds can be calcd. is put into a form which more nearly resembles the classical expression.

Rotatory dispersion of nicotine. T. M. LOWRY AND B. K. SINGH. *Compt. rend.* **181**, 909-11(1925).—L. and S. have studied the rotatory dispersion of nicotine to det. whether it is simple or complex. Their measurements show that the dispersion of nicotine is simple in the region they studied. Their results were calcd. by the formula $\alpha/\alpha_0 = 0.2379/\lambda^2 - 0.06$, where α_0 is the rotation for the green line of Hg. D. H. P.

Max Planck and the quantum theory. H. A. LORENTZ. *Naturwissenschaften* **13**, 1077-82(1925).—An excellent review of the trend of Planck's work around 1900, analyzing the thoughts leading to the quantum conception.

Quantum theory of the thermal conductivity in non-metallic crystals. YOSUTOSI

ENDO. *Nagaoka Anniv. Vol. 1925*, 67-75; *Japan. J. Physics* **4**, 3A.—The heat conduction through the non-metallic crystals was attributed to the at. oscillation. The thermal conds. were then calcd. on a quantum assumption and they were compared with Eucken's exptl. results in the case of rock salt, sylvite, fluorite and diamond. The variation of the cond. with temp. was also deduced and compared with his exptl. value.

A lesson in osmosis. J. V. JEWETT. *Gen. Sci. Quart.* **10**, 400-1 (1926).—An arrangement for school use. C. J. WEST
E. J. C.

The action of silica on electrolytes. A. F. JOSEPH. *Nature* **115**, 460 (1925).—A refutation of C. A. **19**, 1320, and a further explanation of C. A. **18**, 6. F. N. S.

The equilibrium of carbon dioxide with carbon monoxide and oxygen in the corona discharge. G. L. WENDT and MARIE FARNSWORTH. *J. Am. Chem. Soc.* **47**, 2494-2500 (1925).—CO₂ or a mixt. of CO and O₂ under the influence of the corona discharge reaches an equil. which corresponds to a decompn. of 28.54% of the CO₂. This decompn. corresponds thermodynamically to a temp. of 2600° K., although the actual temp. in the corona is little more than room temp. MARIE FARNSWORTH

Theory of the Joule effect in rubber (HOCK) 30. New type of gaseous catalysis (LIND, BARDWELL) 3.

CASTELOT, F. JOLLIVET: **La révolution chimique et la transmutation des métaux.** Paris. Chacornac frères. 360 pp. Fr. 10.

DREAPER, W. P.: **Notes on Chemical Research.** 2nd ed. Revised and enlarged. London: J. & A. Churchill. 195 pp. 7s. 6d. net. Reviewed in *Ind. Chemist* **1**, 455 (1925).

FOSTER, WM. and HEATH, H. W.: **Laboratory Exercises in General Chemistry.** New York: D. Van Nostrand Co. 186 pp. \$1.25.

JOB, P.: **Méthodes physiques appliquées à la chimie.** Collection de physique et chimie. Paris: Librairie Octave Doin. 251 pp. Fr. 30

PASTOURIAUX, L. and COINTET, A.: **Cours de chimie.** Paris: Charles Delagrave. 405 pp.

STERN, HANS: **Studien über d. elektromotorische Verhalten d. Aluminiums u. seine Verflüchtigung als Halogenid.** Weida (Thür.). Thomas Hubert. 51 pp.

WEBER, GUSTAVUS A.: **The Bureau of Standards. Its History, Activities and Organization.** Service Monograph 35 of the U. S. Government. Compiled and issued by the Inst. for Government Research. Baltimore: Johns Hopkins Press. 299 pp. \$2.00. Reviewed in *Ind. Eng. Chem.* **18**, 216 (1926).

3--SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The latest advances in atomic physics. A. SOMMERFELD. *Scientia* **20**, 9-18 (1926). E. J. C.

Motion of electrons in gases. J. S. TOWNSEND. *J. Franklin Inst.* **200**, 563-90 (1925).—An address with bibliography. B. J. C. VAN DER HOEVEN

The secondary emission from nickel surface due to slow positive ion bombardment. A. L. KLEIN. *Phys. Rev.* **26**, 800-6 (1925). D. C. BARDWELL

The mobility of negative ions in gasoline, hydrogen, and hydrogen-chlorine flames. P. E. BOUCHER. *Phys. Rev.* **26**, 807-19 (1925). D. C. BARDWELL

The absorption spectrum of manganese vapor in the visible and ultra-violet. R. V. ZUMSTEIN. *Phys. Rev.* **26**, 765-70 (1925). D. C. BARDWELL

Change in the infra-red absorption spectrum of water with temperature. J. R. COLLINS. *Phys. Rev.* **26**, 771-9 (1925). D. C. BARDWELL

The apparent shape of X-ray lines and absorption limits. F. K. RICHTMYER. *Phys. Rev.* **26**, 724-35 (1925). D. C. BARDWELL

Soft X-rays from iron, cobalt nickel and copper. C. H. THOMAS. *Phys. Rev.* **26**, 739-48 (1925); cf. C. A. **19**, 1534. D. C. BARDWELL

A reinvestigation of the wave lengths and relative intensities in the molybdenum K series X-ray spectrum. S. K. ALLISON and ALICE H. ARMSTRONG. *Phys. Rev.* **26**, 701-13 (1925). D. C. BARDWELL

Experiments on the relative intensities of some X-ray lines in the L spectrum of tungsten and the K β spectrum of copper. S. K. ALLISON and ALICE H. ARMSTRONG. *Phys. Rev.* **26**, 714-23 (1925). D. C. BARDWELL

A precision measurement of the change of wave length of scattered X-rays. H. M. SHARP. *Phys. Rev.* 26, 691-9(1925).

The direction of ejection of photoelectrons produced by X-rays. D. C. BARDWELL RIDGE. *Phys. Rev.* 26, 697-700(1925).

Quantum radiation. OLIVER LODGE. *Nature* 115, 798(1925).—A mathematical study of the fraction $x/(e^x - 1)$.

Quantum radiation. ALFRED LODGE. *Nature* 115, 838(1925); cf. preceding abstract.—A note on the introduction of RT into the radiation formula.

Magnetism and the structure of the atom and the molecule. B. CABRERA. *J. phys. radium* 6, 241-58(1925).—C. has calcd. the at. radii of the noble gases, using Larmor's theorem and the values of Hector and Pascal for the at. susceptibilities with the following results (expressed in $h \times 10^8$) He, 0.57; A, 0.85; Kr, 1.03; Xe, 1.44. Ionic radii are also calcd. from magnetic data for ions of the argon type from P^{---} to Ca^{++} . These numbers are in good agreement with those deduced by Fajans, Herzfeld and Grimm from crystal lattice data using Born's theory. The nos. for the noble gases correspond to about half the resp. values obtained from kinetic theory, as they should. The moment of inertia of Sommerfeld's (cf. *C. A.* 17, 2990) H_2 mol. model from magnetic data is 1.6×10^{-40} . Expt. has shown that the nature and distribution of electronic orbits in the atom are always such that the resultant magnetic moment is a certain multiple of the Weiss magneton. This does not prevent the orbit having a magnetic moment equal to a no. of Bohr magnetons corresponding to its azimuthal quantum no. In order to explain the effect of temp. on paramagnetism, it is suggested that the orientation of the magnetic axis of the atom takes place through a reorganization of the outer electronic orbits after perturbations caused by at. collisions from thermal agitation. II. *Ibid* 273-86.—It is found that the data on paramagnetism in the iron group and the rare earths agree fairly well with the electronic distribution scheme of Stoner. The connection between the magnetic behavior of the ions and the formation of complexes of the Werner type is discussed. The const. Δ of the Curie law is made to depend on the action of neighboring atoms on the paramagnetic atom under consideration.

A theory for the excitation by collisions of atoms and molecules. M. BORN, P. JORDAN AND L. NORDHEIM. *Naturwissenschaften* 13, 969-70(1925).—The authors give a rough outline on the developments of a new theory (to be published in *Z. Physik*) for the prediction of the possibility of quantum jumps occurring on mutual collision of atoms or mols. based on the elec. charge distribution inside the particles, smallest distance of approach, etc. The orbits of the atoms are considered to be linear. By means of the Born/Jordan (*C. A.* 19, 3211) treatment of aperiodic phenomena a classical expression is developed for the energy liberated on collision of the 2 systems. From this is found the probability for a quantum jump $\varphi_{\tau\sigma}^{\pm} = 1/h^2 \sum_n (\Gamma_{\tau} \Gamma_{\sigma})_{\pm}^n G_n$, in which Γ

represents a function of the elec. dipole moments inside the atoms τ and σ , G_n depends upon the orbits of the atoms (their smallest distance and relative velocity); the summation is due to a series development, expressing the influence of elec. moments of higher order. For the translation of the classical functions into quantum rules use is made of the reversibility condition of the Maxwell distribution law (along the lines of the Klein-Rosseland theory). Those processes are most probable in which both colliding particles experience a quantum change. H and H_2 are the most active particles; noble gases are very little active, particularly the light ones.

The K absorption levels of the light atoms: A correction. H. ROBINSON. *Nature* 115, 945-7(1925).—The deduction of ν/R values from measurements of a number of "soft" X-ray absorption levels gave results which agreed very well with values deduced from spectroscopic X-ray data, but fairly wide systematic deviations were observed in the case of the K levels of the light atoms (cf. *C. A.* 19, 623). R.'s values were appreciably higher than those previously accepted. By extending the series of measurements of corpuscular spectra R. obtains 36.7 for the value of ν/R of the oxygen K level instead of the former value of 42.3. Values of ν/R K level for the light atoms are re-detd. and given. R. attributes the error in the earlier expts. to the moving of the Helmholtz coils.

Structure of the nucleus of radioactive atoms, and the emission of ray-spectra. JEAN THIBAUD. *Compt. rend.* 181, 857-9(1925).—A quantum hypothesis of nuclear constitution which involves a very condensed central part of positive charge Ne , (N at. no.), giving rise to a central force of the form $F = (Nc^2/r^2)[1 - (b(a-2)/r(a-2))]$, where r is the radial distance from the nuclear center. Around this center gravitate in quantized orbits positive particles which emit γ -ray quanta in interorbital transitions.

Using the values $a = 3$, $N = 100$, $b = 3.29 \times 10^{-12}$ and supposing the emitting particle to be a proton, T. calcs. the term energies of such a system and compares the resulting combinations with the observed γ -ray spectrum of meso-Th. The agreement is satisfactory.

NORRIS F. HALL

The structure of light. J. J. THOMSON. *Phil. Mag.* **50**, 1181-96(1925).—This paper develops further the theory of light previously outlined by T. (C. A. **19**, 211). Light is assumed to have a two-fold structure, one part consisting of waves of the same character as postulated in the electromagnetic theory. These waves may be regarded as a periodic distribution of closed lines of elec. force like those of a Hertz oscillator. The other part of the structure of light is assumed to be corpuscular, or closed lines of elec. force which travel through space without change of shape instead of expanding as do the light waves. The effects which would follow from collisions between quanta and electrons are discussed. The quanta would be deflected and lose frequency by colliding with electrons. This deflection would cause a scattering of the light made up of a great number of small deflections combined according to the theory of probability; this in addition to the scattering accounted for by the wave theory which is proportional to $(1 + \cos^2)$. The theory indicates that when the electrons are in rapid motion collisions between the quanta and the electrons will produce an increase in the frequency of some of the quanta.

S. C. L.

A new type of gaseous catalysis. S. C. LIND AND D. C. BARDWELL. *Science* **62**, 593-4(1925).—It is found that the ions of inert gases such as He, A, Ne and N_2 are effective in accelerating polymerization of C_2H_2 , HCN, C_2N_2 and the synthesis of H_2O , although they do not enter chemically into the reaction. The ions are produced by α -particles from radon (Rn). This effect is given the name "ionic catalysis" and is added to the usual polymerizing effect of the ions of the reactants.

D. C. B

The radioactivity of the mineral waters of Hammam Meskoutine (Algeria). I. POUGET AND D. CHOUGHAK. *Compt. rend.* **181**, 921-3(1925); cf. C. A. **19**, 3214.—The radioactivity of several of the hot mineral waters in this district is given. It varies from zero to 13.7 millimicrocuries per l.

MARIE FARNSWORTH

Millikan rays and the acceleration of radioactive change. A. W. C. MENZIES AND C. A. SLOAT. *Science* **63**, 44-5(1926).—The objection that the energy associated with high voltage falls far short of that associated with changes in the nucleus does not apply to the Millikan rays. It is suggested that expts. on the possible acceleration of radioactive change by these high-frequency radiations would be of great interest.

MARIE FARNSWORTH

The decomposition period of radium E. GEORGES FOURNIER. *Compt. rend.* **181**, 502-4(1925).—Ra E was prepd. from Pb contg. a mixt. of Ra D + E and its activity measured with a quartz piezoelectrometer; the period of 2 samples of Ra E was found to be 4.86 days and of one sample 4.84 days. This value agrees with 4.85 days given by Thaller in 1912 and not with the value 4.98 recently detd. by Bastings.

MARIE FARNSWORTH

The special action of the sun on the radioactivity of lead and uranium. MLLE. ST. MARACINEANU. *Compt. rend.* **181**, 774-6(1925); cf. C. A. **18**, 1812.—Pb, previously inactive, when exposed to the sun exhibits an activity which manifests itself by its effect on a photographic plate and on ZnS, and by an ionization current. The activity of U becomes very irregular after exposure to the sun.

M. F.

Absorption of beta rays by matter. (MME.) J.-S. LATTES AND GEORGES FOURNIER. *Compt. rend.* **181**, 855-6(1926); cf. C. A. **19**, 1530, 1986, 2297.—The mass coeff. of absorption μ/ρ of the secondary β -radiation produced in C, Al, Ag, Pt, Au and Pb by the primary γ -rays of Ra was found to vary with N , the at. no. of the absorbing element, according to the law $\mu/\rho = a + bN$, where for these 6 elements, $a = 5.73$ and $b = 0.0547$. It is found that a/b is const. and $= 105$, not only for these secondary rays but also for both the hard and soft primary β -rays of Ra E, although a and b have different values for these rays. It is concluded that some function of an emission potential enters as a factor into the μ/ρ for all such rays.

NORRIS F. HALL

The number of particles in the β -ray spectra of radium B and radium C. R. W. GURNEY. *Proc. Roy. Soc.* **109A**, 540-61(1925).—The β -rays emitted from Ra B + C were analyzed by deflecting them into a spectrum with a magnetic field. The deflected rays were focused on a slit over a Faraday cylinder, the rate at which it charged giving the no. of electrons passing through the slit, provided the solid angle of the beam of rays is known. The exptl. conditions were varied for the purpose of detg. whether the continuous spectrum of Ra B + C is genuine or is an unresolved line spectrum. The evidence obtained shows that both Ra B and Ra C emit a genuine continuous spectrum of β -rays attributable to the electrons ejected from the nuclei of the disinte-

grating atoms. The spectra are illustrated with curves showing the rate of charging the Faraday cylinder with varying field strengths. Superposed on the curve for Ra B are peaks corresponding to its characteristic β -ray lines. These are due to electrons ejected by the absorption of γ -rays emitted from the nucleus. By measuring the peaks the actual no. of particles in the intense β -ray lines may be obtained, from which it is concluded that the probability of a γ -ray being converted instead of escaping from the radioactive atom is 1 to 7. The heating effect of the β -rays of Ra B + C is found to be 5.6 cal. per hr. per g., of which 1.3 cal. is contributed by Ra B and 4.3 cal. by Ra C.

C. C. KIESS

Determination of the decay constant of actinium A. HAZIME IKEUTI. *Nagaoka Anniv. Vol. 1925*, 295-300; *Japan. J. Physics* 4, 13A.—It was previously shown (C. A. 16, 3433) that when An (Ac Em) is introduced into the cloud chamber of a Wilson condensation app. and the tracks of the α -rays emitted by it, and also by its product Act A, are made visible by the usual method, most of them appear in pairs having common heads. Considering that the α -rays emitted during the effective intervals τ_1 and τ_2 before and after a certain moment, resp., at which condensation begins to take place, should result in diffuse and sharp tracks, the nos. of the pairs of tracks in the 3 different modes—diffuse-diffuse, sharp-sharp and diffuse-sharp—and those of single tracks—diffuse and sharp—were shown to be given by functions of the total no. of the tracks, the tracks τ_1 , τ_2 and the decay const. λ of Act A. In the present expts., the decay const. was deduced from the nos. of tracks in the above different modes and the length of the intervals τ_1 and τ_2 . The method by which the values τ_1 and τ_2 were detd. consists essentially in registering the time, at which α -rays passed through the chambers, on a photographic plate falling at a known speed, on which the motion of the plunger at expansion was simultaneously recorded, while the appearance of the tracks was being observed visually or recorded photographically. The value of λ obtained was 474 sec.⁻¹, to which corresponds a half value period of about 1/700 sec.

C. J. WEST

Theory of the range of α -particles. LEONARD B. LOEB AND EDWARD CONDON. *J. Franklin Inst.* 200, 595-608(1925).—Fowler's (C. A. 17, 3828) and Bates' (C. A. 19, 775) measurements have shown that the theoretical values derived on the basis of the quantum theory for the range of α -ray particles by Henderson (C. A. 17, 21) are too high. The stopping power calcd. is from 0.6 to 0.8 of the observed values in He, Ne, A, Kr and Xe. L. and C., taking into consideration the second ionization of the same atom, which may occur as soon as p_R (radius of the cylinder around the α -ray path, inside which ionization can take place) becomes of the order of the at. dimensions (for He and probably for A), calc. the error introduced in Henderson's values due to this effect (cf. Rosse-land C. A. 17, 1376). Whereas the exptl. range in He is 23.6 cm., Henderson's calcd. range 33.0 cm., L. and C. find a corrected range of 58 cm. From the increased discrepancy it is concluded that the calcn. of ranges by application of quantized energy changes to classical dynamical treatment is inadequate for He, very likely also for other gases, apparently because the assumption, that the electron is at rest and responds freely.

B. J. C. VAN DER HOEVEN

H. Petterson's explosion theory of atomic decomposition. E. CHALFIN. *Naturwissenschaften* 13, 969(1925).—According to Petterson (C. A. 18, 2103) the energy of the H particles ought to be independent of the energy of the incident α -particles. From Rutherford's measurements, however, follows an almost const. difference between the two for N₂ as well as for Al. According to Petterson one may expect a velocity of the nucleus after the impact calculable from $v_{\text{nucleus}} = 4v_{\alpha}/(A + 4)$, in which A is the at. no. This equation is exptly. verifiable by taking v_{nucleus} as the difference Δv_H between the velocities of emitted H particles parallel and perpendicular to the α -ray. The agreement for Be, C, Si is fairly good, but large discrepancies are found for N, F, Na, Al and P; of the first three elements the v_H values are too uncertain to consider this as sufficient support of P's theory.

B. J. C. VAN DER HOEVEN

Theory of the luminosity of canal rays. J. PALACIOS. *Anales soc. españ. fis. quim.* 23, 477-95(1925).—A theory is developed for the phenomenon of excitation and ionization of a canal ray when passing through gas at rest. It involves the av. distance between two collisions, the time of arrest in the Bohr orbits and the probabilities of different transitions, and calcs. the no. of atoms which in the stationary state are found ionized and in the different states of excitation. A comparison with the Wien theory permits pointing out the hypotheses he made which have been criticized as regards accuracy. All possibilities regarding time of emission are considered and it is shown that the instantaneous emission (from the light quantum) is more probable. Application of this theory to the case of canal rays propagated *in vacuo*, show that the Wien measurements on amortization of spectral rays could be interpreted with the light

quantum if it is admitted that there exists in the Bohr atom some orbits whose stability is greater than others. These considerations allow prediction of the amortization of luminosity curves of some spectral rays not yet studied. It can be seen how the principle of correspondence is in accord with the very great stability of the exterior orbits.

E. M. SYMMES

The critical potential of the negative band spectrum of nitrogen. E. E. WITMER. *Phys. Rev.* **26**, 780-5(1925).—Evidence is given that the negative bands of N_2 appear at the ionization potential of nitrogen or between the ionization potential and 17.75 v.

D. C. BARDWELL

Striated discharge in hydrogen. ARTHUR BRAMLEY. *Phys. Rev.* **26**, 794-9 (1925).—A study was made of the potential distribution, electron concn., and mean electron energy at eleven points in a discharge tube, by means of Langmuir's probe method.

D. C. BARDWELL

The ionization of nitrogen by electron impact as interpreted by positive-ray analysis. T. R. HOGNESS AND E. G. LUNN. *Phys. Rev.* **26**, 786-93(1925); cf. *C. A.* **19**, 3062.—At pressures less than 10^{-6} mm., only N_2^+ was observed. As the pressure increased the % of N_1^+ increased regularly to 60% at 0.006 mm. The percentage of N_1^+ was markedly greater in the presence of He. Below 24 v. no N_1^+ ions were produced, although N_2^+ ions appeared when voltage exceeded 17 v. It is concluded that two types of N_2^+ are formed in the primary process; at potentials greater than 24 v., and an unstable type which reverts to N_1^+ upon collision with mols. at less than 24 v. and greater than 17 v. The N_2^+ formed is stable with regard to collisions. The structure of the two types of ions is suggested in accordance with the G. N. Lewis theory. N_2^- ions were found in concns. too weak to study.

D. C. BARDWELL

The low-voltage arc in oxygen. L. L. LOCKROW. *Phys. Rev.* **23**, 553-4(1924).—The lowest potential of arc maintenance in O_2 is 16.1 v. At 22 v. the spectrum shows negative bands, some triplet system lines and one singlet system line at 4368 Å. U.

F. O. A.

The discharge of electricity between equipotential plates. M. E. HUFFORD. *Phil. Mag.* **50**, 1197-214(1925).—H. has investigated the phenomena accompanying the discharge in different gases at low pressure between a plate anode and a two-plate equipotential cathode, of which the one nearest the anode has a hole in the center for the passage of positive ions. By means of a probing electrode the voltage drop was detd. at different points between the equipotential plates. The conditions found in various gas mixts. are shown in a large no. of graphs. The two most striking phenomena are the presence of a bright bead passing through the hole in the nearest cathode plate, and a glow which then fills the entire space between the two cathode plates. A magnet showed the presence of electrons in this space. Current-voltage relations were detd. When the walls are covered with sputtered metal the bead could not be produced.

S. C. L.

The diffusion back, reflection and secondary radiation excitation of slow cathode rays. A. BECKER. *Ann. Physik* **78**, 253-76(1925).—B. measures the exit velocities of electrons which leave a pure or sooted Pt surface in a definite direction when radiated with slow cathode rays (10-1100 v.). The velocity distribution curve shows 3 parts (1) there is a quick decrease, then (2) a slow decrease and (3) a quick decrease. (3) corresponds to true reflection and occurs for electrons of velocities up to 12 v. For higher velocities or greater angles, the reflection decreases and secondary radiation (1) occurs. The velocity distribution of the latter does not depend on the emission direction for primary velocities above 100 v. (2) corresponds to electrons which have penetrated the surface and diffused back, losing 5 v. on the way.

D. S. VILLARS

The velocity of secondary cathode radiation. A. BECKER. *Ann. Physik* **78**, 228-53(1925).—The velocity distribution of secondary cathode rays excited by homogeneous primary rays of 24 to 1075 v. falling on a sooted metallic surface, is the same as for δ radiation; i. e., is the consequence of an inner Maxwellian distribution overcoming a surface force on exit from the surface. The most probable exit velocity, (2 v.) is independent of the primary radiation velocity so long as this is above 24 v. Thus the secondary radiation velocity is an at. const. and the variation in this velocity with the energy of the primary cathode rays found in the older expts. is evidently due to a secondary process. This all agrees with Lenard's critique of the older literature (cf. Lenard, *Quantitatives*, p. 160).

D. S. VILLARS

The velocity loss in metals of moderately fast cathode rays, from direct measurement and absorption experiments. A. BECKER. *Ann. Physik* **78**, 209-27(1925); cf. Baeyer, *C. A.* **6**, 2576; Terrill, *C. A.* **18**, 15; and Becker, *C. A.* **19**, 931.—Homogeneous cathode rays of const. initial velocity 0.52 times that of light undergo on passing

through Al foil of thickness, 0.0045, 0.0090, 0.0135, 0.0180, 0.0224 and 0.0280 a relative velocity loss of 1.5, 3.5, 5.6, 8.2, 10.6 and 14.4%, resp. For equal masses the loss in Al and Pt is nearly the same; in Au it is smaller. The exit velocities from the thicker layers are less homogeneous. The above values were obtained directly from micro-photometric measurement of photographs of magnetic deviation of the electrons. The absorption measurements show a strong increase in absorption coeff. with increasing layer thickness. This corresponds to the slowing down in the metal and the estd. velocity loss agrees satisfactorily with the direct observations.

D. S. VILLARS

The photoelectric effect due to the total radiation from solids. A. BECKER. *Ann. Physik* **78**, 83-111(1925).—Exptl investigation of the photoelec. excitation of Al by the total radiation of W at 2100-3200° abs. leads to the following conclusions: (1) the no. of photoelectrons is $n = \text{const.} \times \theta^{\alpha} e^{-c_2/\lambda\theta}$ where θ is the abs. temp. of the radiator, α has a value of 3-4, c_2 is a const., and λ_0 is the wave length of the spectral limit of the total radiation; (2) the velocity distribution and most probable emergent velocity of the photoelectrons are the same as those of the thermionic electrons of the radiator. There is a complete parallelism between photoelec. effect and thermionic activity of a temp. radiator. Theoretical summation of the individual photoelec. processes in infinitely small spectral regions leads to no conflict with exptl. data. These individual processes are independent of one another. The photoelec. sensitivity distribution of metals, i. e., the mass of electrons set free per unit of absorbed energy of wave-length λ , may be represented by the formula: $f(\lambda) = \text{const.} \times (1 - \lambda/\lambda_0)^a$ where a is 2 or 3, depending upon the phys. condition (gas content) of the metal.

R. J. HAVIGHURST

New researches with the Crookes tube. A. DAUVILLIER. *Compt. rend.* **181**, 691-3(1925); cf. *C. A.* **19**, 3424.—Expts. are made to det. the origin of gas evolution from the walls of X-ray bulbs and the Crookes dark space. Specimens of various glasses were subjected to homogeneous cathode rays in a very high vacuum. After irradiation of 1/2 hr. the green fluorescence due to Mn disappeared and the glass assumed a violet-brown color. This color change is coincident with the release of gas which is adsorbed chem. on the walls. D. demonstrates, further, the existence of positive emission in the "secondary dark space" produced by impact of cathode rays on the glass surface.

H. R. MOORE

The compound photoelectric effect. PIERRE AUGER. *J. phys. radium* **6**, 205-8 (1925); cf. *C. A.* **19**, 2776.—Photographs obtained with C. T. R. Wilson's cloud method reveal spurs which indicate the emission by the same atom of a series of photoelectrons of diverse velocities. A beam of 20-100 kv. X-rays was projected into the gases N, O, Cl, A, Br, Kr, I, Xe of increasing at. no. White points and short tracks were obtained in all cases, showing the emission of secondary electrons. With A the length of these paths was increased by adding H₂. Tertiary rays were frequently secured. Br and Xe gave quaternary emission, and Xe showed evidence of emission of a fifth electron of relatively small energy. The process is analogous to radioactive disintegration. The energy liberated by electronic transition in a lower K level is transferred wholly to one or more electrons in the same atom.

H. R. MOORE

Soft X-rays from certain metals. C. T. CHU. *J. Franklin Inst.* **200**, 615-27 (1925).—In a vacuum tube are sealed a filament, an anode of the material (Ni, Fe and Cu), being examd., and a photoelec. disk (Ni); the last 2 elements are sepd. from each other by an ion trap, consisting of a metal cylinder with axial wire. The radiation from the anode can reach the photoelec. target only under a very small solid angle; this improves materially the sharpness of the measurements. On bombarding the anode with electrons of varying speed, electrometer readings of the charge of the target indicate the radiation emitted by the anode. Breaks in the curve, indicating voltage threshold values for certain radiations, were found to occur for Ni at 49, 75 and 98 v., for Fe at 52, 68 and 80 v., for Cu at 30, 49, 62, 79 and 90 v. The values of corrections to be applied (0.5 v.) are immaterial; the 49 and 52 v. values may all be due to the Ni target. The necessity for further work is emphasized; the existing rather unreliable and little concordant data are tabulated.

B. J. C. VAN DER HOEVEN

Some properties of Compton radiation. H. KALLMANN AND H. MARK. *Naturwissenschaften* **13**, 1012-5(1925).—A preliminary report, to be published in *extenso* in *Z. Physik*. On radiating Li powder with a pencil of ZnK α doublet light, K. and M. found that of the dispersed ray, observed under an angle of 90° with the incident ray both the waves of original frequency and of the shifted Compton effect frequency were linearly polarized. The distribution of intensity over the Compton-effect radiation in different directions does not show selective interference maxima. A bibliography is added.

B. J. C. VAN DER HOEVEN

Reflection and refraction of X-rays. M. SIEGBAHN. *J. phys. radium* 6, 228-31 (1925); cf. *C. A.* 19, 1660.—If the frequency of the X-ray used $\nu > \nu_n$, the own frequency of resonators in the reflecting crystal, the following equation holds for the n th-order reflection: $n\lambda = 2d_0[1 - 4k(d_0^2/n^2)] \sin \varphi_n$, lattice const. is d_0 , k is a const. independent of λ . S. verified this relation by plotting $\sin \varphi'/\sin \varphi = d_{\text{calcite}}/d_{\text{gypsum}}$ as a function of λ . Two marked discontinuities from a straight line, parallel to the λ axis were found, corresponding to CaK and SK radiations, i. e., an ordinary anomalous dispersion effect. Refraction and total reflection of X-rays is shown to occur also for amorphous substances. With a glass prism ($d = 2.551$), using a thin pencil of Fe, Cu or Mo radiation, values were found for δ ($= 1 - \text{index of refraction}$), $\lambda = 1.933$ A. U., $\delta = 12.38$ ($\times 10^{-6}$); 1.750 A. U., 10.00; 1.538 A. U., 8.125; 1.389 A. U., 6.648; 0.708 A. U., 1.641; 0.630 A. U., 1.220. Due to the small proper frequencies of the glass resonators δ/λ^2 was found to be const. This method of measuring X-ray reflection is completely analogous to the optical one and may become of great importance for several purposes.

B. J. C. VAN DER HOEVEN

Standard measurements of wave lengths in the X-ray range. MANNE SIEGBAHN AND ELLIS HALMAR. *Arkiv. Mat. Astron. Fysik* 19A, No. 24, 12 pp. (1925).—New measurements with very great precision give for the wave length of Cu $K\alpha_1$ 1537.259 X. U. with the vacuum spectrograph and 1537.265 X. U. with a new tube spectrograph. In order to show the accuracy by the distribution of separate measurements around av. values the detailed results of these 2 series of expts. the measurements of Leide and of Lang on the same wave length, the relative measurements of Weber on Zn $K\alpha_1$ and the various measurements of the Na D_1 line are compared graphically on vertical scales expressing the same percentage deviation. The new measurements are so precise that they far surpass all previous efforts to obtain abs. values in either the X-ray or optical regions.

GEORGE L. CLARK

Experimental research on departures from Bragg's law with mica crystals. AXEL LARSSON. *Arkiv. Mat. Astron. Fysik* 19A, No. 14, 10 pp.—Precision researches by the Siegbahn method on the reflection of Cu $K\alpha_1$ rays by mica crystals verify the Ewald formula expressing correction to the Bragg law $\log \sin \phi_n/n = C + A/n^2$, where ϕ_n is the angle in the Bragg equation $n\lambda = 2d \sin \phi_n$ and C and A are consts. The theoretical value of A derived from the characteristic frequencies of the dipole lies between 6.2×10^{-4} and 7.5×10^{-4} . The exptl. value is 6.3×10^{-4} . Calcns. of departure from Bragg's law as a refraction phenomenon are also in agreement with the exptl. results. The Ewald equation $n\lambda = 2d[1 - 5.4 \cdot \rho d^2/n^2 \cdot 10^{-6}] \sin \phi_n$ is, therefore, approx. correct.

GEORGE L. CLARK

The time lag of X-rays. FRITZ KIRCHNER. *Ann. Physik* 78, 277-304 (1925).—The time between the absorption of an X-ray of about 2 A. U. which the K radiation of Fe affords and the emission of a photoelectron is smaller than $1/\alpha = 4 \times 10^{-10}$ sec. The time between the absorption of a primary cathode ray and the release of a secondary electron has the same upper limit. The yield in photoelectrons by X-rays is independent of the subdivision of illuminating time down to 10^{-9} sec. Photoelectrons driven back by an elec. field into the metallic surface from which they came do not disappear instantaneously but there is a time lag of the order of 10^{-9} sec. These results were obtained by using an improved Wiechert method for direct detn. of cathode-ray velocities.

D. S. VILLARS

The asymmetry of the discharge of Röntgen electrons. II. W. SEITZ. *Physik. Z.* 26, 610-5 (1925); cf. *C. A.* 18, 1238; 19, 777.—Further expts. are recorded including rays from Cu produced by X-rays from Ag filtered by Pd, from Ag by X-rays from Mo and from Pb by X-rays from Ag. The rays were sepd. magnetically and received on a photographic plate. The intensity was measured by a self-registering photometer which included a thermopile and galvanometer with record on photographic paper. Certain of the maxima are interpreted in terms of various combinations of X-ray energy.

F. O. A.

A method permitting the following, by means of X-ray spectra, of certain chemical reactions (oxidation of non-saturated fatty acids). JEAN-JACQUES TRILLAT. *Compt. rend.* 181, 504-6 (1925).—Remarkably intense X-ray spectra are obtained from thin layers of fatty acids on a metal plate, by the method of the turning crystal. Oleic acid, deposited on a Pb plate first gives a spectrum corresponding to $d_1 = 29.8$ A. U. After several hrs. a new spectrum appears, $d_2 = 37.5$ A. U. The first spectra corresponds to lead oleate and the second to the satn. of the double bond by O. After about 40 hrs. the compd. polymerizes and does not give spectra. Analogous results were obtained for linoleic acid: $d_1 = 37.1$ A. U. and $d_2 = 49.2$ A. U., the 2 double bonds being satd. simultaneously. With linolenic acid 3 spectra were obtained: $d_1 = 21.2$ A. U.,

$d_2 = 28$ A. U. and $d_3 = 34.44$ A. U. In this case the spectrum of the lead salt was not obtained and the 3 spectra correspond to the taking up of O_2 at the 3 double bonds.

MARIE FARNSWORTH

The excitation of the spectra of nitrogen by electron impacts. D. C. DUNCAN. *Astrophys. J.* 62, 145-67(1925).—The band spectra of N were excited by low-voltage arcs maintained in tubes with two or three electrodes for the purpose of detg. the excitation stages of the various spectral features. The region studied extended from wave length 7000 A. U. to 2000 A. U. in the ultra-violet. Below the ionization potential the bands which appeared were the first, second and fourth positive groups, and three new groups which are designated as the fifth, sixth and seventh positive groups. The wave-length data for the new bands, all of which lie in the ultra-violet, are tabulated. The negative bands appear only above the ionization potential and increase in intensity as the no. of ionized mols. increases. A new group of negative bands was observed in the ultra-violet and has been called the second negative system. The frequency differences derived from the measured wave lengths show that these new bands are related to the first negative group of bands. The existence of additional bands in the extreme ultra-violet is indicated by the fact that in the emission of the bands just described the N mol. is not brought back to its normal state. Since, in this work which was done with very pure N, the third positive group and the cyanogen bands did not appear, it is concluded that they do not belong to N alone, but perhaps to compds. with other elements. The excitation potentials at which the different band groups appear are tabulated.

C. C. KIESS

Colored photographs of line spectra. CL. SCHAEFER AND C. BORMUTH. *Physik. Z.* 26, 697-8(1925).—A description is given of color photographs of various line spectra to be used as lantern slides for lecture demonstrations. Agfa color plates were used for the purpose and it was found that they reproduce the spectral colors very well except in the region of the yellow Hg line at 579μ , which the plate reproduces as green, although the Na line 589μ was reproduced in its true color. Spectrophotometric measurements of the red, green and blue grains of the color plate showed that in the short interval between the Na and Hg lines the red grains decreased rapidly in transparency so that for the Hg line the red and green grains were not in the correct proportion to give a true color reproduction.

C. C. KIESS

The absorption spectra of some crystals of the rare earths and their modification in a magnetic field at the temperature of liquid helium. JEAN BECQUEREL, H. KAMEKLINGH ONNES AND W. J. DE HAAS. *Compt. rend.* 181, 758-60(1925).—The absorption spectra of four uniaxial crystals, xenotime, tysonite, bastnaesite and parisite, were observed at various low temp. stages down to 4.2° K. (liquid He). These crystals, very rich in absorption bands at 80° K., exhibit much simpler absorption at 14° K. At 4.2° K. the spectra are even less complex. A few bands, appearing feebly only at low temp., increase in intensity at 4.2° K. When the crystals are placed in a magnetic field with their axes parallel to the lines of force, marked dissymmetries in intensity of the bands appear as observed with and against the lines of force.

C. C. KIESS

Interpretation of the hydrogen and helium spectra. J. C. SLATER. *Proc. Nat. Acad. Sci.* 11, 732-8(1925).—Evidence is presented to substantiate the conclusion that the spectra of H and He resemble, resp., those of the alkalis and alk. earths. For He the resemblance to the alk. earths is based on similarity of term multiplicity and term character as required by the Zeeman effect. For H and He⁺ the resemblance to the alkalis is traced through the fine structure and Zeeman effect.

C. C. KIESS

Radiation emitted by optically excited zinc vapor. J. G. WINANS. *Proc. Nat. Acad. Sci.* 11, 738-42(1925).—Light from a Zn arc *in vacuo* was passed through a heated quartz tube contg. Zn vapor and called the resonance tube. In a direction perpendicular to the exciting beam the resonance tube was observed to emit the first member of the sharp series of the singlet system, the first and second members of the diffuse series and the first member of the principal series of the triplet system, and an intersystem line. That the exciting wave lengths were shorter than 3200 A. U. was proved by the non-appearance of the resonance lines when a plate-glass screen was placed in the path of the exciting beam. In addn. to the line spectrum of the atom a system of bands is also excited in Zn vapor. Wave lengths for 12 bands between 4301 A. U. and 2952 A. U. are given.

C. C. KIESS

Complementary researches on the structure and distribution of band spectra. H. DESLANDRES. *Compt. rend.* 181, 410-2(1925).—A new and special law of force which governs at very small distances the mutual reactions between the elec. charges of an at. nucleus is supposed to be the cause of intra-nuclear oscillations represented by

the const $d_1 = 1062.5$, which has been found to be a characteristic fundamental frequency of band and line spectra (C. A. 20, 14) C. C. KIESS

The behavior of benzene in the presence of aqueous solutions; the ultra-violet absorption as a function of p_H . FRED VLÈS AND MADELEINE GEX. *Compt. rend.* 181, 506-9(1925); cf. C. A. 19, 3427.—The ultra-violet absorption spectra of aq. benzene solns. are examd. In plotting p_H against ϕ , the ratio of the absorption consts. of 2 spectral lines which vary dissimilarly, sinuous curves are obtained, showing that benzene is not inert in respect to the H-ion concn. of the soln. Several different interpretations of the curves are given. MARIE FARNSWORTH

The spectrum of rubidium at low voltages. F. H. NEWMAN. *Phil. Mag.* 50, 1276-82(1925).—By applying voltages of 1.7-4.2, N. has obtained the line-by-line spectrum of Rb. A diagram of the possible electron shifts in the Rb atom is shown, and the wave lengths are given for 8 shifts, 7 of which are doublets. Comparison is made of the voltage which has to be applied to produce each line with the theoretical one. While agreement is fair the applied voltages are uniformly higher, in some instances as much as 0.4 v (cf. C. A. 19, 3215) S. C. L.

The absorption spectra of several ketones. (Reply to J. Plotnikov.) S. L. LANDELIK. *Rec. trav. chim.* 44, 931 4(1925). (In German.) —A reply to P.'s criticisms (C. A. 19, 3427) of L.'s earlier paper (C. A. 19, 2301). E. J. WITZEMANN

The influence of the p_H upon the ultra-violet absorption spectra of certain cyclic compounds. WILHELM STENSTROM AND MELVIN REINHARD. *J. Phys. Chem.* 29, 1477-81(1925).—Spectrophotometric observations of aq. solns. of phenol, tyrosine, resorcinol, *p*-hydroxybenzoic acid, salicylic acid and *p*-hydroxybenzaldehyde showed that the positions of their ultra-violet absorption bands between 3600 and 2200 Å are dependent upon the H-ion concn. For aq. solns. of benzoic acid, phenylalanine and tryptophan the positions of the bands were apparently independent of the p_H . When the solns. are made alk. by adding NaOH or other alkalies the bands shift toward the red and become more intense when a certain alk. has been reached. The compds so affected are those with a OH group in the benzene ring. For phenol, tyrosine and resorcinol curves are given which show the shift in wave length with p_H for definite extinction coeffs. The shifts are explained as a change in the absorption of neutral mols. and of mols. ionized at the carboxyl group. C. C. KIESS

Some remarks on primed terms in the spectra of the lighter elements. OTTO LAPORTE. *J. Wash. Acad. Sci.* 15, 409-13(1925).—Recent theoretical work by Heisenberg (C. A. 19, 3064) and by Hund (C. A. 20, 18) has shown that the quantum no which is related to the term character $S = 1, P = 2, D = 3, F = 4$, etc., is not the azimuthal quantum k of the last bound electron, but is the resultant l of the angular momenta of all the valence electrons obtained by space quantization. Hund's work shows that the arc spectrum of an element is built up from the spectrum of the ionized atom, that is, only those terms appear in the arc spectrum which can be derived from those of the first spark spectrum by the addition of one more electron to the atom. These principles permit the deduction of the correct electron configuration responsible for the appearance of the ($^2PP'$) group of Si II and the similar groups (C. A. 19, 2781-2, 3217) of Bowen and Millikan for Al, P III, S IV, Cl V and C II, N III, O IV. Likewise a similar derivation gives the ($^3PP'$) groups of Mg I, Al II, etc., and of Ca I, Sr I, Ba I and the spark spectra analogous to them; and the term separations ΔP and $\Delta P'$ can be explained accurately on the basis of Heisenberg's formula. C. C. K.

Correlation of absorption spectra with ionization in violuric acid. R. A. MORTON AND A. H. TIPPING. *J. Chem. Soc.* 127, 2514-7(1925).—The disson. const. of violuric acid at 18° is 1.992×10^{-5} . Absorption was detd. photographically with a sector photometer in approx. 0.01 M soln. with varying amts. of HCl. Dissoc. was calcd. from K and the p_H measured by a quinhydrone electrode. Mol. extinction coeff. for the ion is 60. Results in alk. soln. were less accurate, but in approx. agreement. The head of the absorption band in the visible is at 538 m μ ; there are also bands at 250 m μ ascribed to the undissocd. mol. and at 312 ascribed to the ion. B. H. CARROLL

Ultra-violet absorption spectra of the butenonitriles and their analogs. P. BRUYLANTS AND A. CASTILLE. *Bull. soc. chim. Belg.* 34, 261-84(1925).—The ultra-violet absorption spectra of solid MeCH:CHCO₂H, MeCH:CHCN (b. 108°), and MeCCl:CHCO₂H (m. 94°) are all continuous, while *iso*-MeCH:CHCO₂H, MeCH:CHCN (b. 121°), and *iso*-MeCCl:CHCO₂H (m. 61°) all have spectra quite sharply inflected near the lower end, this establishing definitely the stereochem. equivalence of solid MeCH:CHCO₂H and the lower m. MeCH:CHCN isomer (for identity of their thermochem. characteristics (cf. C. A. 19, 2324). The isomerization of CH₂:CHCH₂CN to MeCH:CHCN and of CH₂:CHCH₂CO₂H to MeCH:CHCO₂H, both in dil. alk.

soln., have been studied through the absorption spectra of the alk. solns., but little new information was gained. Spectra are given for trimethylenecarboxylic acid and its nitrile, and are compared with those of the corresponding vinylacetic and crotonic compds. from the standpoint of their chem. constitution; the vinylacetic compds. lie between the other 2 as regards intensity of the absorption. WM. B. PLUMMER

Note on the $L_{II}L_{III}$ levels of the atoms silicon, phosphorus, sulfur and chlorine. S. K. ALLISON. *J. Wash. Acad. Sci.* **16**, 7-10(1926).—By application of the combination principle it is possible to calc. the energy values of the $L_{II}L_{III}$ levels in the atoms Si, P, S, Cl, in various compds. from recent X-ray data. The resulting values are compared with a detn. of these levels in the hydrides of these atoms carried out by Holweck by photoelec. methods. The results show that for Si, P, S, these levels have very nearly the same energy in the hydrides as in the elementary substance itself, but that in the higher oxides of these elements there is an appreciable difference in this respect between the elements and their oxides. S. K. ALLISON

The experimental determination of the relative intensities of some of the molybdenum and copper K-series lines and the tungsten L-series lines. S. K. ALLISON AND A. H. ARMSTRONG. *Proc. Nat. Acad. Sci.* **11**, 563-6(1925).—The following relative intensities were found. $MoK\beta/MoK\gamma = 7.7/1$. $MoK\beta_1/MoK\beta_2 = 2/1$. $CuK\beta/CuK\gamma = 42/1$. $CuK\alpha_1/CuK\alpha_3\alpha_4 = 100/1$. In the L_γ group $\gamma_1\gamma_2\gamma_3\gamma_4\gamma_5\gamma_6\gamma_8 = 100:14.0:22.3:7.0:3.0:2.3:1(?)$. In the L_β group $\beta_1\beta_2\beta_3\beta_4\beta_5\beta_6\beta_7\beta_9\beta_{10} = 100:49.3:15.0:7.7:0.47:2.0:0.4:0.68:0.60$. The relative intensities of the lines $WL\alpha_1/WL\alpha_2$ are 10/1. S. K. ALLISON

The dispersion of potassium chloride and sodium chloride. K. F. HERZFELD AND K. L. WOLF. *Ann. Physik* **78**, 35-56(1925); cf. C. A. **19**, 1223.—As would be expected, there is a close relationship between the dispersions of the alkali halides and those of the noble gases. The dispersion depends upon the absorption frequencies of the substance, as well as upon the no. of "effective electrons" per atom. The dispersions of NaCl and KCl are given by equations of the form $(n^2-1)/(n^2-2) = \sum C_i/(\nu_i^2-\nu^2)$ where $C_i = e^2N_i p_i/3\pi m$. N_i is the no. of ions per cc; ν_i is an absorption frequency; p_i is the no. of "dispersion electrons" per ion on the classical theory, and on the quantum theory it represents a transition probability. The exptl data are represented very well by an equation contg 3 members. One member belongs to the cation, and the other two to the anion. These equations give values of p for Cl^- which are very nearly equal to those for A. The two terms in the equation which are due to Cl^- mean that there are two absorption frequencies to be attributed to it. One term contains the frequency of the center of gravity of continuous absorption, and the other, the resonance frequency. Calcn. of the continuous absorption frequency shows that the work necessary to loosen an electron from a certain chloride ion is the work done against the attraction of that ion (electron affinity) plus the work done against the attraction due to other ions at the neighboring lattice points. R. J. H.

Spectrochemistry in the infra-red. VII. The absorption of some homologous ketones. G. B. BONINO. *Gazz. chim. ital.* **55**, 335-40(1925).—In a previous paper B. (cf. C. A. **18**, 3544) showed how the mol. coeff. maxima of absorption of the band lying between 3 and 3.5 of compds. contg. H bound to C depend on the no. of H atoms in the mol. From an empirical consideration of some exptl results B. then defined the relation thus: $e_2 = e_1 + C \log_{10} (n_2/n_1)$, in which e_2 and e_1 are mol. coeff. maxima of absorption of the 2 homologous compds., C is a const. and n_1 and n_2 are the nos. of H atoms per mol. This formula holds pretty well within certain limits for monohydric alcs. and aliphatic hydrocarbons. In this paper Me_2CO , $EtCOMe$, $n-PrCOMe$ and $n-BuCOMe$ were investigated, the methods previously described (C. A. **18**, 3544) being used. For these 4 compds. the values for $e_{max.}$ were detd. to be 2.617, 3.33, 3.98 and 4.47, resp., and using $C = 6.15$ three of them were calcd. with sufficient accuracy. Using data of Coblentz (*Investig. of infr. Spectra*, Carnegie Inst. **1905**, p. 15), B. calcd. $e_{max.}$ for some satd. hydrocarbons using the above formula and $C = 46$. Aliphatic ketones show an absorption band in the infra-red presumably due to oscillators constituted of H atoms bound to C atoms. The intensity of absorption varies in the same sense as the no. of H atoms so that $e_{max.}$ can be calcd. for other terms of the series. **VIII. The absorption of some halogen-substituted hydrocarbons.** *Ibid* 341-8.—In the homologous series other characteristics of the mol. change also and the mol. coeff. of absorption may also depend on some of these in the same way that it does on the no. of H atoms. B. used $EtBr$, $C_7H_4Br_2$, $C_2H_2Cl_2$, C_2HCl_3 , C_2Cl_4 , $C_2H_2Cl_4$, C_2HCl_5 and C_2Cl_6 having the same number of C atoms but a variable no. of H atoms. In these compds. (except C_2Cl_4 and C_2Cl_6) the max. of absorption was always at 3.51μ (Langley indices). For the region of the infra-red spectrum being studied these compds. that do not contain

H do not absorb the radiation. The values of the relative coeffs. for the 2 series, but for compds. having the same no. of H atoms, are not exactly equal, which is what B. expected to find true (*l. c.*). The results indicate that variations in ϵ_{\max} at 3.5μ depend on variations in the no. of oscillators constituted of H atoms that vibrate around their position of equil. imposed by the bonds of these atoms with the C atoms of the mol. **IX. The origin of the absorption band improperly attributed to the CH_3 and CH_2 groups.** *Ibid* 576-82.—The conclusion developed in the 2 preceding abstracts is contrary to the idea of Julius (*Oefversigt of Kongl. Vetensk. Akad. Stockholm* 5, 549(1889); 5, 331(1890)), usually given by other recent workers interested in this bond, namely that it is due to CH_3 and CH_2 groups present in the mol. J.'s conclusion is a rough empirical observation. In previous papers B. (cf. *C. A.* 18, 354) has shown that the absorption band at 3.4μ in the infra-red in compds. contg. CH , CH_2 and CH_3 groups may be attributed to linear oscillators formed of H atoms that oscillate around their position of equil. His principle arguments follow (a) that hydrogenated compds. that do not contain C (e. g., H_2O , hydro acids, NH_3) show an absorption band analogous to that in question that lies nearly in the same position ($3-4\mu$) (cf. *C. A.* 18, 354); (b) that the coeff. of max. absorption of this band in various compds. follows quantitatively the variations in the no. of H atoms per mol. independently of the number of C atoms present. In the remainder of the paper, B. shows in detail how the data obtained by him cannot be readily or simply interpreted by the idea of Julius.

E. J. WITZEMANN

New lanthanum rays in the arc spectrum at normal pressure between 3100 and 2200 Å. U. PINA DE RUBIES. *Anales soc. españ. fis. quim.* 23, 444-9(1925).—The arc spectrum of the elements in the rare-earth group are not well known in the extreme ultra-violet region. R. gives 184 new La rays. The salts used were oxides of rare earths purified by methods given in *C. A.* 19, 2299.

H. M. SYMMES

Anomalous dispersion and multiplet lines in spectra. C. V. RAMAN AND S. K. DATTA. *Nature* 115, 946(1925).—Measurements of the intensities of the components of multiple spectral lines made by Dorgelo (cf. *C. A.* 19, 1376) show that the intensities are represented by a simple integral ratio. This suggests that in the case of multiplet lines, a similar numerical relationship between the consts. of anomalous dispersion might be found. A study of King's photograph (cf. *C. A.* 11, 2636; 19, 933) of the anomalous dispersion due to the Cr triplet gives dispersion consts. which are in fair agreement with the intensity ratio obtained exptly. by Dorgelo. Hence a study of King's negative is suggested.

FLORENCE N. SCHOTT

Transparency of bakelite to different radiations. JACQUES RISLER. *Compt. rend.* 181, 782-3(1925).—(1) Bakelite panels 0.5 mm. thick are transparent to ultra-violet light as follows, $\lambda = 3126$, 30%; $\lambda = 2800$, 3%; $\lambda = 2750$, 0%, the resin turning yellow. Thicker panels change color to a max. depth of 0.7 mm. corresponding to the range of the ultra-violet rays. (2) Bakelite treated with a 1-1000 soln. of safranin, and a Wratten red shield transmit red rays, resp., as follows; $\lambda = 6100$, 1.5%, 1.27%; $\lambda = 6400$, 10.5%, 10.0%; $\lambda = 6700$, 11.4%, 7.1%; $\lambda = 7000$, 15.0%, 8.0%.

P. B. PLACE

The behavior of silver iodide in the photovoltaic cell. ALLEN GARRISON. *J. Phys. Chem.* 29, 1406-7(1925); cf. *C. A.* 19, 1377.—A rejoinder to the criticism of Price (*C. A.* 19, 2167).

H. R. MOORE

An attempt to excite a mercury surface by electron bombardment. H. R. MOORE. *J. Am. Chem. Soc.* 47, 2932-3(1925).—When O_2 is suddenly admitted to a Hg surface which has been bombarded by electrons of 0-240 v. velocity, a distinct indentation or crinkling of the surface is produced. Previous studies of chem. effects produced by photoelec. emission indicate that the duration of excitation is less than a second. (Cf. Moore and Noyes, *C. A.* 18, 2288.) Since positive results were frequently obtained when the gas was admitted several min. after turning off the filament, the crinkling test is not a decisive proof of activation. The presence of an atm. of electrons would seem to guarantee the occurrence of the effect.

H. R. M.

A new aspect of the photochemical union of hydrogen and chlorine. R. G. W. NORRISH. *J. Chem. Soc.* 127, 2317-34(1925).—A new theory of the *photosynthesis of HCl* is presented, consistent with the quant. data of Coehn and Jung on the catalytic action of H_2O (*C. A.* 18, 3144). The primary reaction is dissocn. of the Cl_2 mol. rather than formation of an active modification, and occurs through intermediate formation of a loose complex of H_2O and Cl_2 on the glass surface of the reaction vessel. The reaction surface has const. catalytic properties when covered with a monomol. layer of H_2O mols.; in C. and J.'s expts. this is equiv. to a H_2O pressure of 10^{-4} mm. This theory does not dispense with the "Nernst reaction centers," which are supposed to

originate in the surface H_2O film and persist in the gaseous phase until they encounter other centers (pairs of H and Cl) or the walls of the vessel. Quant. data uphold the assumption that the induction period is due to surface poisoning and removal of H_2O from the sphere of action. The anti-catalytic action of O_2 is probably due to transference of intra-at. energy from Cl_2 on collision.

H. R. MOORE

Decomposition of ozone in red light. GEORG KISTIAKOWSKI. *Z. physik. Chem.* 117, 337-60(1925).—The photochem. transformation $2O_3 \rightarrow 3O_2$ was studied at high O_3 concns., and with a very intense 1000-watt W lamp to offset thermal decompn. With a reaction chamber of suitable dimensions, less than 3% of the total pressure increase was attributed to the dark reaction. The pressure data were checked volumetrically with NH_4I soln. Max. light absorption, detd. with a thermopile, occurred at $620 m\mu$. The quantum efficiency is a direct function of the amt. of red light absorbed and the effective pressure of O_3 in the system. On gradually diminishing the intensity of the red light with a $FeSO_4$ filter, the reaction velocity const. assumed the values 1.42, 1.33, 1.22, 1.15. With increased O_2 content, the no. of mols. transformed per $h\nu$ absorbed is 1.9, 1.25, 0.65, 0.37 for O_3 absorption percents 28.8, 21, 10.3 and 4.2, resp. O_2 exerts no inhibiting action for pressures less than 10 mm. When the total pressure of O_2 and O_3 in the system is low, the relation $dp/dt = k_2 J_{abs.}$ is valid, and 2 mols. are transformed per $h\nu$ absorbed. Inert gases, such as He, were found to catalyze the decompn., in agreement with the work of Griffith and Shutt (*C. A.* 18, 789).

H. R. MOORE

Methods for studying the chemical effects of an electric discharge in rarefied gases. PIERRE JOLIBOIS. *Compt. rend.* 181, 608-10(1925).—An app. is described in which the chem. action induced by an elec. discharge in a gas or liquid under very low pressure may be followed by observation of pressure changes. Special features are the complete isolation of the gas during reaction and the elimination of dead space. R. E. GIBSON

Microbalance. II. Photochemical decomposition of silver chloride. E. J. HARTUNG. *J. Chem. Soc.* 127, 2691-8(1925); cf. *C. A.* 16, 2266, 2623.—The photochem. decompn. of $AgCl$ in air, N and H has been investigated by means of the microbalance. The max. percentage loss of Cl in thin films of $AgCl$ when insulated was found to be: in air 91.1%, in N 89.9%, and in H 94.8%. The photochem. decompn. products are Cl and Ag; O is not necessary for the reaction. The rates of chlorination of Ag and of previously insulated $AgCl$ have been studied and it was found that optimum concns. of Cl in air exist in each case at which chlorination is most rapid and above which the rate of reaction rapidly diminishes with increasing Cl concn. No evidence of the formation of Ag subchlorides has been found.

E. P. WIGHTMAN

Light absorption and emission phenomena in anthracene. N. S. CAPPER AND J. K. MARSH. *J. Am. Chem. Soc.* 47, 2847-50(1925).—Bands found in anthracene solus. at 445 and $475 m\mu$ by Taylor and Lewis (*C. A.* 18, 2468) were not the photochemically active ones, but were due to the presence of chrysogen. Hence, the deduction that dianthracene should absorb at $707 m\mu$ does not follow, and their evidence brought forward to show that light of this wave length is capable of inducing a photochem. depolymerization of dianthracene is inconclusive. Some further information concerning chrysogen is given.

E. P. WIGHTMAN

The effect of ultra-violet light on dried hydrogen and oxygen. H. B. BAKER AND MARGARET CARLTON. *J. Chem. Soc.* 127, 1990-2(1925).—Well-dried H and O do not react when exposed for a short period to ultra-violet light. A trace of moisture, however, starts the reaction, which then increases at an increasing rate as more moisture is formed.

E. P. WIGHTMAN

Constricted mercury arc as a source of light for photochemical work. GEO. S. FORBES AND GEO. R. HARRISON. *J. Am. Chem. Soc.* 44, 2449-54(1925); cf. *C. A.* 19, 1093, 2915.—The intensity, steadiness, economy, convenience, efficiency and life of the water-cooled constricted-column Hg-vapor lamp at atm. pressure are discussed in comparison and contrast with the standard vertical-sealed-electrode com. lamp. The constricted arc will furnish, per $mm.^2$ of exit slit of a monochromator, energy flux up to 30 times that available from a com. lamp run at normal rating. For quant. work the radiations of the former must be followed by a thermopile, and the energy integrated graphically. The deterioration of this arc is more rapid than that of the com. form, being 50% for the first hr. at $\lambda = 254 m\mu$.

E. P. WIGHTMAN

The radioactivity of the water of the thermal spring of Chaudfontaine (Prost) 14.

KESSLER, ERNST: Ueber d. Verhältnis von Actinium zu Radium in Uranerzen. Bern: P. HAUPP. 43 pp.

SIEGBAHN, M.: **Spectroscopy of X-rays**. Translated by G. A. Lindsay. London: Oxford University Press. 287 pp. 20s.

4- ELECTROCHEMISTRY

COLIN G. FINK

Review of the electrochemical and electrometallurgical industries for 1925. C. D. J. *four élec.* **35**, 1-4 (1926). C. G. F.

American electric furnaces for melting metals. The Detroit rocking electric furnace. H. NATHUSIUS. *Z. Ver. deut. Ing.* **69**, 1470-3 (1925).—N. discusses the practical and theoretical considerations which make elec. furnaces superior to the older types of fuel-burning furnaces. He describes the *Ajax-Wyatt* furnace as an example of the induction type. If this is to be used for melting Cu-Zn alloys showing considerable range in elec. resistance, a means of varying the primary voltage must be provided. A 30 kw. furnace produces 2-3 tons in 24 hrs. The construction of the *Detroit rocking arc type* of furnace is described together with a number of installations of this type. The thermal efficiency is 75% as against 10-15% for fuel-burning furnaces, and the energy consumption is from 330 to 360 kw. hr. per 1000 kg. of metal melted. The loss of metal is always less than 1%.

Physical-chemical rapid methods for the operating control of electric furnaces. (Ferro alloys.) I. E. SCHLUMBERGER. *Chem.-Ztg.* **49**, 913-5 (1925).—Chem. analyses are not sufficiently rapid for elec. furnace control. S. describes a rapid method for a binary mixt. of solids, alloys, etc., where the sp. gr. of the constituents is widely sepd. and where no mixed crystals are formed, which is a modification of the usual method for detg. the d. of a solid body by measuring the vol. displaced in a liquid. The weighed sample is dropped into a graduated buret in a const. temp. bath, and the vol. of the volatile liquid in the buret is measured before and after adding the sample. By use of a curve and the difference in the 2 readings, the compn. of the sample is quickly detd. The method was applied to Fe-Si, Fe-Al, Fe-W and technical CaC₂, curves being shown. Extrapolation gives the low value of 2.1 for the d. of pure calcium carbide. H. STOERTZ

Analyses of basic electric furnace steel and furnace materials in Europe. JOHN HRUSKA. *Blast Furnace & Steel Plant* **13**, 490-1 (1925).—About 100 chem. and mech. analyses, comprising practically all of importance in European elec. steel making, are given. Tabulations include: analyses of C and alloy steels, comparisons of basic elec. furnace slags, compn. of the addns., refractories, etc. A. D. S.

The Nolly electric rocking furnace. ANON. *J four élec.* **34**, 230-2 (1925); 2 illus. The roof of this furnace is a movable block of graphite. The furnace is easily opened from the top by lifting out this graphite block. When the furnace is in operation the block is luted in with fireclay into a water-cooled collar of cast iron or steel. The graphite roof is not corroded as easily as one made of refractories, by arcing or by the volatilization of lime, or by very basic slags. By proper insulation the graphite roof may be divided into several electrodes. The movable electrodes are inserted as usual at an angle through the walls of the furnace. At the bottom of the furnace is an electrode plate which is connected in parallel with a second plate on the side of the furnace so that when the charge is frozen and contact cannot be made with the plate on the bottom, then contact can be made with the plate on the side by rocking the furnace. Priming is therefore not necessary. Single- or three-phase current may be used. The furnace is suitable for melting, reductions, or refining. C. J. BROCKMAN

Electrically annealed glass superior. ANON. *Elec. World* **87**, 95 (1926).—By a uniform application of heat and a close control of temp., a continuous elec. glass annealing furnace has been perfected to yield a very satisfactory product. C. J. BROCKMAN

Automatic arc furnace (electrode) control. J. A. SEEDÉ. *Blast Furnace & Steel Plant* **13**, 482-4 (1925).—In discussing automatic electrode controls for arc furnaces melting steel and Fe, S. mentions that, owing to the excessive strains to which the mechanism of the Thury regulator was subjected, a regulator was developed which moved the electrodes from the old to the new position in one movement instead of a series of steps. The functions of the different parts of this regulator are described with the aid of figures and it is indicated that the trend for improvements is for greater simplicity and reliability. A. D. SPILLMAN

The manufacture of carborundum. IAN STEWART. *Chem. Eng. Mining Rev.* **18**, 7-9 (1925).—This is an historical review and description of the manuf. of carborundum. Furnaces in the modern installations are 50 ft. long, 80 ft. wide, and 6 ft.

high, the charge consisting of a mixt. of coke, sand, sawdust and salt. A temp. of 2250° is attained. H. STOERTZ

Note on the protection of iron by cadmium. H. S. RAWDON. *Trans. Am. Electrochem. Soc.* 49, Preprint(1926).—Simple expts. in which specimens of steel and of iron, in each of which a plug of another metal had been inserted, were immersed in dil. NaCl soln. Zn and Cd behaved *alike*. This anodic behavior with respect to Fe was also clearly revealed by the etching action which took place on the surface of the inserted plugs. Al, Ni, Cd, Cu, Sn, Pb, and Zn were used. The p. d. between Zn and Fe in contact and immersed in NaCl soln. is considerably greater than that between Cd and Fe under the same conditions. No conclusion regarding the single electrode potentials of the metals used, that is, their relative position in the series, seems warranted. W. H. BOYNTON

Studies on electroplating. VI. Barrel plating. (2) Types of plating barrels. W. E. HUGHES. *Metal Ind.* (London) 27, 379–82, 403–5, 129–30(1925); cf. C. A. 19, 3223. —H. discusses in detail the main constructional features of examples of the 2 main types of plating barrels and the advantages and disadvantages of each from the practical viewpoint. More attention toward the development of a barrel with an inside anode is needed. W. H. BOYNTON

Progress of the electroplating industry. C. H. FROCTOR. *Metal Ind.* (N. Y.) 24, 20–1(1926).—A review for 1925. E. J. C.

Plating of soda fountain fittings. JOHN YOUNG. *Metal Ind.* (N. Y.) 23, 456 (1925).—Bronze, brass, Britannia metal, nickel-silver and block Sn fittings are Ag-plated. The bath used contains 3 oz. (75 g.) Ag and 4 oz. (93.4 g.) of free cyanide per gal. Where there are deep recesses 6 oz. (170 g.) of free cyanide should be present. W. H. BOYNTON

Spotting out. R. M. GOODSSELL. *Metal Ind.* (N. Y.) 23, 457(1925); *Metal Ind.* (London) 28, 14(1926).—Spotting out from cyanide solns. is more frequently found on porous metals like cast Fe, cast bronze, and steel known as pickled stocks. The trouble is prominent in heavy plating and is minimized by keeping plenty of free CN in soln., by rinsing work thoroughly, and when using water dip lacquers, keeping the hot water used free from impurities. The lacquer should be kept cold. W. H. BOYNTON

Hydrogen-ion control of nickel-plating baths with the quinhydrone electrode. H. C. PARKER AND W. N. GREER. *Trans. Am. Electrochem. Soc.* 49, Preprint(1926).—The quality of Ni deposits depends largely upon the acidity or the p_H of the bath. The quinhydrone electrode gives reliable measurements, which must be made very rapidly when the p_H is above 8, due primarily to the oxidation of the quinhydrone in the alk soln. The set-up and diagram of connections are illusd. Curves show the effect of Ni-plating constituents on the shape of the titration curve and the change in p_H upon adding H_2SO_4 or NH_4OH to the plating solns. Colorimetric measurements are shown to have an accuracy of 0.2 p_H , while the quinhydrone electrode gives greater accuracy and is easier and quicker to manipulate, and requires less-elaborate app. W. H. BOYNTON

The production of sulfuric acid by electrolysis. ROBERT SAXON. *Chem. News* 131, 385(1925).—The addn. of Mg to a soln. of NH_4 -alum or $CuSO_4$ causes a slight evolution of H_2 which is more rapid under the influence of electrolysis. It is likewise accelerated by the addn. of an equimolar amt. of $CuSO_4$. The use of easily deposited metal assists in the production of H_2SO_4 in the electrolyte because: (1) the deposited metal juts out from the cathode, enlarging it; (2) the metal being in fine state gives a greater surface for gas discharge; (3) it forms a compd. cathode-anode between the regular electrodes everywhere where there is no actual connection with the cathode. As electrolysis proceeds alum is split, liberating NH_3 , which eventually becomes $(NH_4)_2SO_4$ and $Al(OH)_3$. The addn. of fresh $CuSO_4$ results in vigorous action which is accelerated as the Cu is deposited. Using a lighting circuit a 17% soln. of acid and an abundant crop of Cu are secured. As electrolysis removes water only, a stronger current would assist in concg. the acid by this means, and by virtue of the heat generated by passage of a greater c. d. W. H. BOYNTON

Sulfuric acid form a quadruple mixture. ROBERT SAXON. *Chem. News* 131, 372–3(1925).—Ferric ammonium sulfate on electrolysis yields $Fe(OH)_3$ and H_2SO_4 , with NH_3 and H_2 liberated at the cathode and O_2 at the anode. With the same current in series through ferrous ammonium sulfate the same evolution of gas results with that salt, when the second mixt. is $CuSO_4$ and the ferrous ammonium sulfate. In the triple mixt. the deposited Cu allows greater action resulting in a 9% H_2SO_4 in the first bath and 12% in the Cu-Fe- NH_4 mixt. When a mixt. of equiv. proportions of Ni, Cu, NH_4 and Fe⁺⁺ sulfates are electrolyzed in tandem with the same strength of ferrous ammonium

sulfate, there is only a Cu deposit with no sepn. of hydrate of Ni or Fe and the production of H_2SO_4 is more rapid than in the triple mixt. The Cu deposit is smooth and tenacious. A 7-hr. run yielded 14% H_2SO_4 in the $\text{NH}_4\text{-Fe}^{\text{m}}$ mixt. and 19% H_2SO_4 in the quadruple mixt. Where Cu is in excess the evolution of gas increases in amt. and more is dissolved and broken up

W. H. BOYNTON

Theory of the autovalue arrester. JOSEPH SELPIAN. *J. Am. Inst. Elec. Eng.* 45, 3-8(1926).—The autovalue arrester for protecting power lines from excessive voltage induced by charged clouds, etc., is of the film type. The film is a thin layer of air next to a cold cathode, which is the seat of the cathode drop by a glow discharge. With the application of sufficient voltage this air becomes ionized but the discharge of these ions into the electrodes and recombination quickly restore the normal resistivity when the voltage is reduced. A mica spacer, 0.003 to 0.005 in. thick, gives the required space regulation between the electrodes. If the electrode warms up the glow, discharge changes to an arc. This heating of the cathode is due to imperfections and an uneven c. d. over the surface of the plates. The autovalue electrodes possess a high resistivity which seems to be particularly able to prevent local overheating and therefore arcing. With 0.005 inch gap-length a break-down occurs at a little more than 350 v. The low limit for resistivity in com. autovalue electrodes is now 20 ohms per cc.; therefore the area of the electrodes det. the rate of discharge. Problems of design are discussed with the discharge curves that are given.

C. J. BROCKMAN

Electrical dust precipitation in the textile industries. O. HAHN. *Siemens Z.* 5, 604-7(1925).—High tension (50,000-80,000 v.) pptn. of dust. As the air enters the precipitator (at a speed of 40 cu. m. per sec.) it contains 30-40 mg. of dust per cu. m. The purified air contains 0.6 to 1.0 mg. dust per cu. m. Details and illus. are given.

C. G. F.

The developments in pig-iron production (HOFMANN) 9. Transformer and switch oils (ONSLow) 22.

Electric batteries. M. MARKIEWICZ and W. ROMER. *Brit.* 234,701, Oct. 31, 1924. In sealed dry cells or secondary batteries with Zn and C electrodes, a MnO_2 depolarizer and NH_4Cl in the electrolyte, MgCl_2 is added to the electrolyte and only as much H_2O is used as is normally absorbed by the electrolyte. The NH_4Cl and MgCl_2 preferably are used in equimol. proportions.

Electric batteries. W. D. FOX. *Brit.* 234,257, April 29, 1924.

Composition for coating battery terminals. C. A. SEASE. U. S. 1,569,040, Jan. 12. A coating compn. for preventing corrosion comprises NH_4 stearate 1-3 lbs., $\text{C}_{10}\text{H}_{17}$, 3 lbs., NH_3 soln. 1-3 qts. and H_2O 8-10 gals.

Storage battery. C. W. HAZELETT and A. R. GOLDRICK. U. S. 1,569,125, Jan. 12. Structural features.

Storage battery. W. H. WOOD. U. S. 1,570,115, Jan. 19. Fully charged negative plates comprise spongy Pb with MgSO_4 in its pores.

Lead oxide from old storage battery plates. S. M. EVANS. U. S. 1,570,438, Jan. 19. Pb grids and a large proportion of the sponge Pb of battery plates are sepd. from associated Pb sulfate and peroxide. The sepd. sulfate, peroxide and sponge Pb, all in finely subdivided form, are treated with a hot soln. of NaOH or other alkali metal base until an exchange of bases is effected, the treated material is washed to remove sol. salts and the residue is heated in an oxidizing furnace to produce Pb oxide.

Electrolyte-level indicator for storage batteries. H. FLEISSNER. *Brit.* 234,788, May 31, 1924. Auxiliary electrodes at the top of the battery are connected with a lamp or bell serving as a tell-tale in an external circuit.

Alkali metal amides. T. EWAN. U. S. 1,570,467, Jan. 19. An elec. current is passed between an anode of alkali metal amalgam and a cathode immersed in a soln. of an inert alkali metal salt such as NaCN in liquid anhyd. NH_3 and the reaction between the NH_3 and the metal thus removed is catalyzed, *e. g.*, by use of high-C steel for the cathode and cell walls, to produce the alkali metal amide.

Treating mercury (to obtain gold, etc.). SIEMENS & HALSKE AKT.-GES. *Brit.* 233,715, May 8, 1924. Au or other precious metal is stated to be obtained by subjecting Hg to elec. treatment; *e. g.*, an arc may be formed between Hg poles to produce Au in the Hg.

Apparatus for electric precipitation of suspended particles from gases. E. ANDERSON. U. S. 1,569,529, Jan. 12.

Apparatus for electric precipitation of suspended particles from gases. G. H. HORNE. U. S. 1,569,492, Jan. 12.

Apparatus for electric precipitation of suspended particles from gases. F. H. VIETS. U. S. 1,569,595, Jan. 12.

Apparatus for electric precipitation of suspended particles from gases. C. H. WEISKOPF. U. S. 1,569,597, Jan. 12.

Apparatus for production of electrolytic iron. E. DUHME. U. S. 1,570,212, Jan. 19. An Fe anode is used having a C content sufficient to leave a coherent graphite skeleton after the anode Fe has been electrolytically consumed.

Electric arc furnace. J. L. DIXON. U. S. 1,569,463, Jan. 12. A furnace for a. c. is specified, adapted for melting and refining metals.

Electric resistance furnace. A. D. KEENE. U. S. 1,569,376, Jan. 12.

Electric resistance furnace. J. C. WOODSON. U. S. 1,569,415, Jan. 12.

Refining steel in an electric arc furnace. J. L. DIXON. U. S. 1,569,464, Jan. 12. Currents of high and low voltages, resp., are used between different electrodes of an elec. furnace.

Electric furnace for treating gases. F. H. FROELICH. Norw. 41,983, Oct. 12, 1925. The gases are given a rapid rotary motion in a forechamber and are then passed into an extended reaction chamber through a narrow axial opening connecting the two chambers.

Electrode for electric arc furnaces. OLAF JENSEN. Norw. 42,079, Nov. 2, 1925. The electrodes are made from a mixt. or alloy contg. one or more metals which are only slightly or not at all attacked by the reaction gases and one or more metals which are difficultly atomized at the cathode.

Apparatus for electrolyzing fused metal salts. E. A. ASHCROFT. U. S. 1,569,606, Jan. 12. An app. is specified adapted for producing Mg from fused $MgCl_2$.

Electrically heated still for distilling hydrochloric acid or other materials. GRASSELLI CHEMICAL CO. Brit. 234,234, March 31, 1924.

Tungsten filaments. NAAMLooZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 234,489, May 24, 1924. Helical W filaments are subjected to a recrystn. before insertion in lamps or the like, e. g., by heating to above 1500° on a mandrel. A Mo mandrel may be removed after the heating by a mixt. of H_2SO_4 and HNO_3 or Se oxychloride, and a Ta or Zr mandrel can be removed by HF.

Sheathing for electric cables. FELTEN & GUILLEAUME CARLSWERK AKT.-GES. Brit. 233,736, May 12, 1924. Sheathing for single-core a. c. cables is made of non-magnetic Fe, e. g., Fe contg. Mn or Ni. Cr also may be added to reduce the cond. of the sheathing and thus reduce eddy currents.

Electric circuit maker and breaker electroplated with chromium. V. YNGVE. U. S. 1,570,420, Jan. 19.

Photographic transfer and electroplating process for producing ornamental embossed designs in metal. O. F. HACKER. U. S. 1,570,246, Jan. 19.

5—PHOTOGRAPHY

C. E. K. MEES

The importance of dyes in the progress of photography. A. SEYEWETZ. *Bull. soc. chim.* 37, 1197-1223(1925).—An historical and descriptive résumé of the uses of dyes in photography including the following applications: color sensitizing, desensitizing, non-halation backing for plates, prepg. dichromated gelatin images, tinting and toning of silver images and direct color formation by photochem. reactions such as the oxidation of leuco bases.

Recent progress in color cinematography. A. SEYEWETZ. *Tech. moderne* 17, 798-800(1925).—A brief review of the various processes. A. PAPINEAU-COUTURE

Photographic transfer and electroplating process for producing ornamental embossed designs in metal (U. S. pat. 1,570,246) 4.

Photographs in natural colors on paper. H. DIERNHOFER. U. S. 1,570,375, Jan. 19. Dissolved colors are transferred one after the other, from several printing plates each provided with a gelatinous layer, to a sheet provided with a receiving gelatinous layer, by placing the sheet on the printing plate, layer on layer, after protecting the color of the print already applied to the sheet against being impaired and shifting the sheet into exact register of the design with that of the plate before any color transfer is effected and then printing in the usual manner.

Nonstatic photographic film. H. J. HOFFMAN. U. S. 1,570,062, Jan. 19. A film of cellulose nitrate compn. or other cellulose ester is treated with an NH_4NO_3 soln. or other electrolyte soln. in the proportion of about 2% of the electrolyte and 98% of the solvent, such as an alc. and acetone mixt., which is a solvent also of the cellulose ester of the film. Such a quantity of this soln. is used for treating the film as will, after drying, leave, with NH_4NO_3 , about 0.25% the wt. of the film as a deposit upon the latter.

Nonstatic photographic film. E. C. PITMAN. U. S. 1,570,076, Jan. 19. Films of cellulose nitrate compns. or the like are backed with a compn. comprising NaOAc which may be used with glycerol and saponin. U. S. 1,570,077 also specifies the use of glycerol, which may be associated with NH_4OAc . U. S. 1,570,078 specifies films associated with substances for reducing surface tension, *e. g.*, saponin and glycerol, as a backing for films. U. S. 1,570,079 specifies acetate of starch in backing compus. which also may contain glycerol.

Photographic sensitive layers. KALLE & Co. AKT.-GES. Brit. 234,818, May 28, 1924. Instead of using diazo anhydrides as described in Brit. 210,862 (*C. A.* 18, 1619) sensitive layers are formed by using azo dye coupling components in conjunction with stable diazo components having the property of coupling slowly and without premature formation of the dyes. Such layers keep for a long time, especially when a non-volatile acid is incorporated with them. The exposed layer is developed with an alk. reagent such as gaseous NH_3 . Metal salts may be added and various examples are given.

Built-up multi-color photographs and cinematographic films. J. E. THORNTON. Brit. 233,989-90-1, Feb. 15 and Nov. 6, 1924. Mech. features.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Residual affinity and coördination. XXV. A quadridentate group contributing four associating units to metallic complexes. G. T. MORGAN and J. D. M. SMITH. *J. Chem. Soc.* 127, 2030-7(1925); cf. *C. A.* 20, 326.—*Diaquocobaltous ethylenediaminobisacetylacetonate*, $[(\text{H}_2\text{O})_2 \text{C}_2\text{H}_4(\text{N}:\text{C}(\text{CH}_3)\text{CH}:\text{C}(\text{CH}_3)\text{O})_2 \text{Co}]$, is prepd. from 1 mol. hexaquocobaltous chloride in 20 cc. hot water and 1 mol. $\text{C}_2\text{H}_4(\text{N}:\text{C}(\text{CH}_3)\text{CH}:\text{C}(\text{CH}_3)\text{OH})_2$ to which 2 mols. 5 *N* NaOH (8 cc.) is added. The compd. ppts. on boiling in bright orange-red prismatic needles, is insol. in H_2O and readily sol. in most org. solvents. On oxidizing this compd. by the calcd. amt. of 6 *N* H_2O_2 in the presence of excess 18 *N* NH_3 and NH_4Cl , the salt $[(\text{NH}_3)_2 \text{Co C}_2\text{H}_4(\text{N}:\text{C}(\text{CH}_3)\text{CH}:\text{C}(\text{CH}_3)\text{O})_2]\text{Cl}(\text{H}_2\text{O})_2$, *diamminoethylenediaminobisacetylacetonocobaltic chloride dihydrate* is obtained in pale fawn needles, insol. in org. solvents and moderately sol. in H_2O . It is readily transformed into *bromide*, *iodide*, *nitrite*, *nitrate*, *chlorate*, *perchlorate* and *d-camphorsulfonate*. The latter allowed in a few expts. the sepn. into a *cis-dextro* and a *cis-trans-dextro* bromide, thus revealing a racemoid mixt. They invariably transformed themselves into inactive (*trans*) bromide. The constitution is discussed.

JOHN T. STERN

Chromammynes. II. Hydroxypentamminochromic salts and electrical conductivities of chromammynes. H. J. S. KING. *J. Chem. Soc.* 127, 2100-9(1925); cf. *C. A.* 18, 2699.—A study is made on the transformation of aquo into hydroxypentamminochromic (and cobaltic) hydroxide. The elec. cond. of the aquo ion is detd. as 174.3 mhos, the cond. of the hydroxo ion to 73.3 mhos at 0°, in infinite dilution by extrapolation according to Noyes and Coolidge, giving 489.3 and 283.3 mhos for the respective hydroxides. Newly prepd. analyzed and described are: *aquopentamminochromic picrate*, $[\text{Cr}(\text{NH}_3)_5(\text{H}_2\text{O})(\text{C}_6\text{H}_2\text{O}_7\text{N}_3)_2 \cdot 1/2 \text{H}_2\text{O}]$ in yellow needles; the *oxalate*, $[\text{Cr}(\text{NH}_3)_5(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2 \cdot 4\text{H}_2\text{O}]$ in orange plates; the *chromic* and *cobaltic 2,4-dinitrophenoxide*, $[\text{Cr}$ or $\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})(\text{C}_6\text{H}_3\text{O}_6\text{N}_2)_3 \cdot 1$ or $3\text{H}_2\text{O}]$, in a yellow powder; and the following *hydroxypentamminochromic salts*: the *sulfate*, $[\text{Cr}(\text{NH}_3)_5\text{OH}]\text{SO}_4$, in rose-red needles; the *nitrate*, $[\text{Cr}(\text{NH}_3)_5\text{OH}](\text{NO}_3)_2 \cdot 1/2 \text{H}_2\text{O}$, in red plates; the *chloride*, $[\text{Cr}(\text{NH}_3)_5\text{OH}]\text{Cl} \cdot \text{H}_2\text{O}$, in rose needles; the *bromide* and *iodide* as pink needles with $1/2 \text{H}_2\text{O}$; the *chromate*, $[\text{Cr}(\text{NH}_3)_5\text{OH}]\text{CrO}_4$, in brown plates; and the *oxalate*, $[\text{Cr}(\text{NH}_3)_5\text{OH}]\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$, in pink needles. A table of the elec. conductivities of the various complex ions, which were studied, is given.

JOHN T. STERN

Mixed aquo-ammonocarboxylic acids. I. Ammonolysis to ammonocarboxylic acid. J. S. BLAIR. *J. Am. Chem. Soc.* 48, 87-95(1926).—A certain class of compds. of which urea, carbamic acid, biuret, etc., are examples, may be regarded as mixed aquo-ammonocarboxylic acids, which are here defined. Mixed aquo-ammonocarboxylic acids, as a

class, may be ammonolyzed to guanidine, an ammonocarbonic acid. This result is attained only in systems from which H_2O is excluded. Anhydrous liquid NH_3 solns. were used in the present investigation. The ammonolytic reaction does not go to completion but results in an equil. mixt. of guanidine, urea, and probably carbamic acid. The nature of this equil. at 300° was detd. approx. **II. Salt formation in liquid ammonia solution.** *Ibid* 96–103.—Certain of the mixed aquo-ammonocarbonic acids such as urea, biuret, guanylurea, etc., are ordinarily called bases because of their forming a base by the addition of H_2O . Their acidic character, however, has been demonstrated by the prepn., in liquid- NH_3 soln., of the following K salts of a representative no. of this class of compds. *Monopotassium carbamate*, $\text{KH}_2\text{CO}_2\text{N}$, and *dipotassium carbamate*, $\text{K}_2\text{HCO}_2\text{N}$, from the reaction of $\text{NH}_4\text{H}_2\text{CO}_2\text{N}$ with KNH_2 . The K salt of *ethyl carbamate* is unstable, the reaction between KNH_2 and the latter being, $\text{H}_2\text{N}-\text{COOC}_2\text{H}_5 + \text{KNH}_2 = \text{KNCO} + \text{C}_2\text{H}_5\text{OH} + \text{NH}_3$. *Monopotassium biuret*, $\text{KH}_4\text{C}_2\text{O}_2\text{N}_3$; *tripotassium biuret*, $\text{K}_3\text{H}_2\text{C}_2\text{O}_2\text{N}_3$; *monopotassium triuret*, $\text{KH}_4\text{C}_3\text{O}_2\text{N}_4$; *dipotassium triuret*, $\text{K}_2\text{H}_2\text{C}_3\text{O}_2\text{N}_4$; and *monopotassium ethyl allophanate*, $\text{KNHCON}-\text{HCOOC}_2\text{H}_5$; each from the reaction of KNH_2 with the corresponding aquo-ammonocarbonic acid. Monopotassium ethyl allophanate decomposes at 215° giving KNCO and ethyl carbamate. The action of excess KNH_2 on ethyl allophanate eliminates the (C_2H_5) , presumably by ammonolysis, and forms cyanates; but the reaction requires further study.

R. H. LOMBARD

The group of volatile hydrides. Supplementary remarks. FRITZ PANETH AND EUGEN RABINOWITSCH. *Ber.* 58B, 2446–8(1925).—Polemical against Hantzsch and Carlsohn (*C. A.* 20, 130). As a supplement to their previous paper (*C. A.* 19, 2460). P. and R. give as a new law: The b. p. of a halide of a metal of the Si group is equal to the sum of the b. p. of the halogen plus the b. p. of the rare gas at the beginning of the period following that in which the metal occurs.

EMIL KLARMANN

The formula of cerium hydride. E. J. WEEKS. *Chem. News* 131, 245–6(1925).—Muthmann and Kraft (*Ann.* 325, 261(1902)) ascribed a formula to Ce hydride on the basis of 2.4% H in their sample. CeH_3 requires 2.09% and CeH_4 , 2.79% CeH_3 was chosen because cerous salts were formed with acids. This and the fact that CeH_2 forms CeO_2 and CeN with O_2 and N_2 , resp., may be explained by the theory that Ce hydride consists of a mixt. of CeH_4 and Ce_2H_2 , the latter dissociating to form CeH_4 and Ce, which would unite with O or N. At higher temps. CeH_4 would decompose into Ce and H_2 . W.'s theory of mixed hydrides is substantiated by the fact that Muthman and Baur (*Ann.* 325, 281(1902)) found that the dissociation pressure of the hydride was not constant.

M. O. LAMAR

Compounds of some bivalent, trivalent and quadrivalent metals with pyrocatechol. R. WEINLAND AND HELENE SPERL. *Z. anorg. allgem. Chem.* 150, 69–83(1925).—It is known that pyrocatechol forms complex compds. with many metals. The authors prepd. the following new compds: *sodium tripyrocatecholatomanganate*, $[\text{Mn}(\text{C}_6\text{H}_4\text{O}_2)_3]\text{Na}_3 \cdot 1/2\text{NaOH} \cdot 6\text{H}_2\text{O}$; *potassium tripyrocatecholatomanganate*, $[\text{Mn}(\text{C}_6\text{H}_4\text{O}_2)_3]\text{K}_3 \cdot 3\text{H}_2\text{O}$; *ammonium tripyrocatecholatomanganate*, $[\text{Mn}(\text{C}_6\text{H}_4\text{O}_2)_3](\text{NH}_4)_2 \cdot 5\text{H}_2\text{O}$; *basic manganese pyrocatecholate*, $\text{Mn}_6(\text{OH})_2(\text{C}_6\text{H}_4\text{O}_2)_8 \cdot 10\text{H}_2\text{O}$; *pyridine dipyrocatecholatomanganate*, $4[\text{Mn}(\text{C}_6\text{H}_4\text{O}_2)_2] \cdot \text{H}_2\text{py}_2 \cdot \text{C}_6\text{H}_4(\text{OH})_2$; *pyridine dipyrocatecholatomnickelate*, $4[\text{Ni}(\text{C}_6\text{H}_4\text{O}_2)_2] \cdot \text{H}_2\text{py}_2 \cdot \text{C}_6\text{H}_4(\text{OH})_2$; *pyridine dipyrocatecholatozincate*, $[\text{Zn}(\text{C}_6\text{H}_4\text{O}_2)_2] \cdot \text{H}_2\text{py}_2$; *pyridine chloropyrocatecholatosilicate*, $[\text{Sn}(\text{C}_6\text{H}_4\text{O}_2)_2]\text{Cl} \cdot \text{Hpy}$; *a pyridine pyrocatecholaluminum compd.*, $[\text{Th}(\text{OC}_6\text{H}_4\text{O})_4] \cdot \text{H}_4\text{py}$; *a pyridine pyrocatecholozirconium compd.*, $2[\text{Zr}(\text{C}_6\text{H}_4\text{O}_2)_3] \cdot \text{H}_2\text{py}$; *a pyridine pyrocatecholatoaluminum compd.*, $[\text{Al}(\text{C}_6\text{H}_4\text{O}_2)_2] \cdot \text{Hpy} \cdot \text{H}_2\text{O}$; *a bismuth pyrocatechol compd.*, $\text{C}_6\text{H}_4\text{O}_2\text{BiOC}_6\text{H}_4\text{OH}$; and *a bismuth nitrate pyrocatechol compd.*, $\text{Bi}(\text{OC}_6\text{H}_4\text{OH})_2\text{NO}_3$.

EMIL KLARMANN

Dichromates of ter- and sexivalent metals. G. CALCAGNI. *Gazz. chim. ital.* 55, 396–406(1925).—The basis of this work was the idea that in heating CrO_3 to redness Cr chromate is formed. The various oxides of Cr of interest in this connection are reviewed, but are largely rather indefinite compds. The metallic oxides and hydroxides were dissolved in CrO_3 . Numerous other ways of prepg. these compds. were tried. The products obtained were black, amorphous and hygroscopic. They decompd. above $130\text{--}40^\circ$ but most of them were analyzed in the moist condition with a correction for the H_2O present. Excess $\text{Cr}(\text{OH})_3$ was placed in CrO_3 soln. The liquid became brown and on evapn. of the clear soln. a pasty amorphous mass was obtained. This was dried in an oven below 130° and was hygroscopic and easily sol. in H_2O ; at temps. above 130° it is decompd., giving products difficultly sol. in H_2O and even in boiling HCl . When Cr_2O_3 was allowed to act in CrO_3 soln. at low temps. for some days the solns. on evapn. gave *chromium dichromate*, $\text{Cr}_2(\text{Cr}_2\text{O}_7)_3$. The product obtained with $\text{Cr}(\text{OH})_3$ was the *basic dichromate* $\text{O}(\text{Cr}:\text{Cr}_2\text{O}_7)_2$, if thoroughly dry and insol. in H_2O ,

or $\text{Cr}(\text{OH})\text{Cr}_2\text{O}_7$ if it had not been dried above 130° . $\text{Fe}(\text{OH})_3$ in CrO_3 soln. treated as above at low temps. and then finally evapd. and dried at 140° gave the *basic dichromate of iron*, $\text{O}(\text{Fe}:\text{Cr}_2\text{O}_7)_2$; the compd. $\text{Fe}(\text{OH})\text{Cr}_2\text{O}_7$ was not isolated from soln. in this case. In the same way, the *basic dichromate of aluminium* was isolated. Solns. of MoO_3 and CrO_3 were repeatedly evapd. The product formed was *molybdenum dichromate*, $\text{Mo}(\text{Cr}_2\text{O}_7)_3$. Attempts to obtain the corresponding W compd. failed. U_3O_8 is sol. in solns. of CrO_3 . The compn. of the product obtained does not resemble that of the other compds. described above.

H. J. WITZEMANN

The separation of the platinum metals. LOTHAR WÖHLER AND L. METZ. *Z. anorg. allgem. Chem.* **149**, 297-323(1925).—For most of the chem., phys. and electro-technical uses to which they are put, the metals of the Pt group should be in as pure a state as possible; hence the importance of improved methods of sepn. In a detailed study, W. and M. find that: (1) In the presence of Te or Pb, Os volatilizes as the tetroxide when distd. with acid permanganate or chromosulfuric acid, but not in the presence of Ru. (2) In the presence of Te, Ru and sulfides, Os may be volatilized in the presence of the nitrogen oxides (preferably NO_2) and a much better sepn. obtained at 275° than by volatilization in air. A satisfactory sepn. of Os in the presence of nitrate and nitrite is shown to be possible. (3) OsO_2 , formerly considered difficult to prep., results from the action of NO on Os at 520° . (4) In NO_2 at 275° Te slowly forms TeO_2 ; above 370° this decomposes into Te and TeO_2 . (5) Rh is sepd. from Ru or Ir by fusing it with more than 20 times its wt. of Bi and dissolving the melt in HNO_3 . If 10 instead of 20 parts of Bi are used, a *new cryst. alloy*, RhBi_2 , results, which is insol. in HNO_3 , though sol. in aqua regia. (6) Rh may be sepd. from Ir by transformation into the anhyd. complexes Na_3RhCl_6 or Na_2IrCl_6 . The complex of quadrivalent Ir is easily sol. in cold 1:1 acetone-ether, while that of trivalent Rh is entirely insol. (7) Molten NaOH at 550° converts Ru mostly to the sol. ruthenate, the small residue of RuO_2 being sol. in HNO_3 . Ir is not dissolved by molten NaOH (though appreciably dissolved by KOH) but is oxidized to IrO_2 insol. in HNO_3 . This furnishes a sepn. of Ru from Ir and Rh. Molten K_2CO_3 dissolves Ir, in consequence of higher temp., more than KOH while molten Na_2CO_3 dissolves only a little Ru, more, however, than does NaOH. (8) Finely divided metallic Ru (not in an alloy with Ir or Rh) can be converted directly by distn. with alkali chlorine compds., as NaClO , into the volatile tetroxide. Thus the oxidation with K_2CO_3 and KNO_3 or Na_2O_2 is avoided. But to sep. Ru from an alloy with Ir the sol. ruthenate first must be formed by oxidizing fusion. (9) By following the above methods it has been possible to obtain a satisfactory analysis of a complicated mixt. of the Pt metals. Recommended analytical procedure: (1) volatilize Os by NO_2 ; (2) extract Pt and Pd by dil. aqua regia and ppt. Pt with concd. NH_4Cl soln.; (3) fuse the insol. residue from (2) with Bi to dissolve Rh; (4) in the insol. residue separate Ru from Ir by alk. Cl_2 distn. or fusion with NaOH. Or, (3) volatilize Ru, then separate Rh from Ir by fusion with Bi. The analysis is detailed of a complicated mixture containing Os, Ru, Pt, Rh, Ag, Sb, Te, Fe, Al, SiO_2 , S, etc.

ROSALIE M. COBB

The binary bromides and iodides of platinum. LOTHAR WÖHLER AND F. MÜLLER. *Z. anorg. allgem. Chem.* **149**, 377-86(1925).—It is possible to obtain PtBr_4 by direct combination, but the yields are poor. For the prepn. of the Pt halogens, Br_2 or I_2 is heated to boiling in a retort and led at atm. pressure into a Jena glass reaction chamber, which contains Pt or a Pt compd. Const. temp. is maintained by a 1 mm. Ni or chrome-nickel coil, and the temp. recorded by a Ag-Ni thermoelement. Uncombined I_2 and Br_2 are drawn off and condensed. PtBr_4 is obtained by passing Br_2 over H_2PtBr_6 at $285\text{--}310^\circ$, while at 335° a new compd., *platinum tribromide*, PtBr_3 , results. PtBr_3 is perfectly stable at 368° , but at 410° loses 1.6% Br in 16 hrs. It is difficultly sol. in cold water, more easily in hot; its soln. is acid, on account of the probable formation of the complex $\text{H}_2\text{PtBr}_3(\text{OH})_2$. Its greenish black crystals dissolve slowly in alc. and acetic ester; complexes are formed with HBr and the alk. bromides. In all these properties its behavior is half-way between that of PtBr_4 and PtBr_2 . PtI_3 , *platinum triiodide*, may be obtained by heating PtI_4 in a current of I_2 to $262\text{--}272^\circ$, or by passing I_2 over Pt black for 4 days at 350° . Excess I_2 is removed by a CO_2 stream at $80\text{--}90^\circ$. *Platinum tetra, tri and bi iodides* are all black, insol. in water, ether and acetic ester; PtI_4 is slightly sol. in alc. They form dark reddish brown complexes with I and KI. The dissociation of PtI_4 and PtI_3 seems to be autocatalytic, and the temp. between them is so small as to make it difficult to det. the rate of dissociation. PtI_3 can be obtained only above 411° or at 3 atm. and 350° . A phase diagram is given for the Pt halides and Ir chlorides.

ROSALIE M. COBB

Lead bromate and diaceto-diplumbic bromate. E. GÜNZEL AND E. MARCUS.

Z. angew. Chem. **38**, 929–30 (1925).—One of the methods given in Gmelin-Kraut for the prepn. of $\text{Pb}(\text{BrO}_3)_2 \cdot \text{H}_2\text{O}$ is by the action of an alkali bromate upon excess $\text{Pb}(\text{AcO})_2$ in the presence of AcOH . This method led to a fatal accidental explosion. Weinland and Paul (cf. *C. A.* **17**, 3293) have prepd. an explosive diaceto-diplumbic bromate. This compd. is sometimes formed if Gmelin-Kraut's method is used for the prepn. of $\text{Pb}(\text{BrO}_3)_2 \cdot \text{H}_2\text{O}$. The formation is not limited to W. and P.'s particular conditions but may take place when one would expect to have only the bromate produced. G. and M. warn against the use of this method.

M. O. LAMAR

The equilibrium in the systems aluminium sulfate-copper sulfate-water and aluminium sulfate-ferrous sulfate-water at 25° . V. J. OCCLESIAW. *J. Chem. Soc.* **127**, 2598–602 (1925); cf. Caven and Mitchell, *C. A.* **19**, 3440.—The triple component diagrams for $\text{Al}_2(\text{SO}_4)_3$, CuSO_4 , H_2O and $\text{Al}_2(\text{SO}_4)_3$, FeSO_4 , H_2O are given for a temp. of 25° . There is no double salt formation in the CuSO_4 system. In the FeSO_4 system, a salt $\text{Al}_2(\text{SO}_4)_3 \cdot \text{FeSO}_4 \cdot 24\text{H}_2\text{O}$ exists at 25° and O. succeeded in crystg. it from an aq. soln. of equi-mol. quantities of $\text{Al}_2(\text{SO}_4)_3$ and FeSO_4 .

D. S. VILLARS

The fluoro salts of aluminium, trivalent iron and chromium. R. WEINLAND, IRMA LANG AND HEINRICH FIKENTSCHER. *Z. anorg. allgem. Chem.* **150**, 47–67 (1925).—The purpose of this paper is to establish whether the above named metals possess a varying coordination number in fluoro anions. The cations were hydrazine, pyridine, ethylenediamine and guanidine. Thus in the fluoaluminates the Al has the coordination number 6, all compds. permitting a derivation from the type of the hexafluoro- or pentafluoaqualuminate ion. In the series of fluoferrates, when guanidine or ethylenediamine was used, the formation of only the pentafluoaquoferrate ion was observed (coordination number 6) while pink tetrafluoro- and greenish pentafluoaquo compds. (coordination number 4 and 6, resp.) are formed with pyridine. The coordination number of Fe in the K and NH_4 fluoferrates is 4, while in the corresponding Ag, Tl, Cd and Cu compds. it is 6, a pentafluoaquo ion being formed with the first three as cations and a hexafluoferrate ion with the latter. The trivalent Cr shows the coordination number of 6, all known compds. allowing a derivation either from the hexafluoro- or the pentafluoaquo anion. In some cases a binuclear formulation is necessary in order to visualize the coordination number of 6, e. g., $2(\text{FeF}_3 \cdot$

$2\text{NH}_4\text{F}) = \left[\text{F}_4\text{Fe} \begin{array}{c} \nearrow \text{F} \\ \searrow \text{F} \end{array} \text{FeF}_4 \right] (\text{NH}_4)_4$. It is possible, but improbable, that there are

compds. with the coordination number of 5. The prepn. of the following compds. is described. *Hydrazinefluoaaluminate*, $[\text{AlF}_6]\text{H}_2\text{N}_2\text{NH}_2$, *pyridine fluoaaluminate*, $[\text{AlF}_6]\text{H}_2 \cdot 2\text{C}_5\text{H}_5\text{N} \cdot \text{H}_2\text{O}$; *ethylenediaminefluoaaluminate*, $[\text{AlF}_6]\text{H}_2 \cdot \text{C}_2\text{H}_4(\text{NH}_2)_2 \cdot \text{H}_2\text{O}$; *guanidine tetrafluoaaluminate*, $[\text{AlF}_6]\text{H} \cdot \text{CN}_2\text{H}_5 \cdot \frac{1}{2}\text{H}_2\text{O}$; *guanidine pentafluoaaluminate*, $[\text{AlF}_6]\text{H}_2 \cdot (\text{CN}_2\text{H}_5)_2$; *guanidine hexafluoaaluminate*, $[\text{AlF}_6]\text{H}_3 \cdot (\text{CN}_2\text{H}_5)_3$; *potassium pentafluoaaluminate*, $[\text{AlF}_6]\text{K}_2 \cdot 2\text{H}_2\text{O}$; *guanidine pentafluoaquoferrate*, $[\text{FeF}_6(\text{H}_2\text{O})]\text{H}_2 \cdot (\text{CN}_2\text{H}_5)_2$; *ethylenediaminepentafluoaquoferrate*, $[\text{FeF}_6(\text{H}_2\text{O})]\text{H}_2 \cdot \text{C}_2\text{H}_4(\text{NH}_2)_2$; *pyridine pentafluoaquoferrate*, $[\text{FeF}_6(\text{H}_2\text{O})]\text{H}_2 \cdot (\text{C}_5\text{H}_5\text{N})_2 \cdot 2\text{H}_2\text{O}$; *pyridine tetrafluoferrate*, $[\text{FeF}_4] \cdot \text{H} \cdot \text{C}_5\text{H}_5\text{N} \cdot \text{H}_2\text{O}$; *potassium tetrafluoferrate*, $[\text{FeF}_4]\text{K}$; *ammonium tetrafluoferrate*, $[\text{FeF}_4] \cdot \text{NH}_4$; *silver pentafluoaquoferrate*, $[\text{FeF}_6(\text{H}_2\text{O})]\text{Ag}_2 \cdot 2\text{H}_2\text{O}$; *thallium pentafluoaquoferrate*, $[\text{FeF}_6(\text{H}_2\text{O})]\text{Tl}_2 \cdot 2\text{H}_2\text{O}$; *hexafluocadmium pentafluoaquoferrate*, $[\text{FeF}_6(\text{H}_2\text{O})] \cdot [\text{Cd}(\text{H}_2\text{O})_6]$; *hexafluocopper hexafluoferrate*, $[\text{FeF}_6]_2[\text{Cu}(\text{H}_2\text{O})_6]_3$; *guanidine hexafluochromate*, $[\text{CrF}_6]\text{H}_3 \cdot 3\text{CN}_2\text{H}_5$. The ferric fluoride 4.5 hydrate does not contain any bivalent Fe, contrary to a statement made by Deussen and Kessler (*C. A.* **1**, 1527). Its tentative formula is $\text{FeF}_3 \cdot 4.5\text{H}_2\text{O} = [\text{FeF}_6(\text{H}_2\text{O})_3] \cdot 1.5\text{H}_2\text{O}$. EMIL KLARMANN

Decomposition of alkaline earth phosphates by means of alkali carbonates. D. RAQUET. *Bull. soc. chim.* **37**, 1548–9 (1925); cf. Colani, *C. A.* **19**, 3230.—Treatment of alk.-earth phosphates with alkali carbonates showed the following % of phosphate decomposed:

Reagent	NH_4MgPO_4	$\text{Ca}_3(\text{PO}_4)_2$	$\text{Sr}_3(\text{PO}_4)_2$	$\text{Ba}_3(\text{PO}_4)_2$
Satd. Na_2CO_3	40	30	90	95
Satd. $\text{Na}_2\text{CO}_3 + \text{NaOH}$	94.5	25	85	90
Concd. K_2CO_3 (1:1)	5	50	100	100
Concd. K_2CO_3 (1:1) + NaOH	94.5	35	95	95

NaOH interferes slightly with the decompn. of the Ca, Ba and Sr phosphates, but is necessary for the decompn. of the Mg salt. R. considers that decompn. of the alk.-earth phosphates with concd. alkali carbonate soln. is quite sufficient for use in qual. analysis.

A. PAPINEAU-COUTURE

The acetato (formato) cations of cadmium, manganese, lead and the alkaline earths.

R. WEINLAND AND HERMANN SCHLAICH. *Z. anorg. allgem. Chem.* **150**, 35-46(1925); cf. *C. A.* **17**, 3293.—A series of new compds. of Cd and Mn was prepd. which show a behavior similar to that of Pb and the alkaline earth compds. previously described. Besides, some new compds. with *p*-nitrophenol were prepd. The same method of prepn. was used in all cases, a soln. of the metal acetate or formate of HClO_4 , HNO_3 , picric acid or *p*-nitrophenol, resp., having been allowed to evap. slowly; in some instances the presence of AcOH was required. Thus the following compds. were obtained
acetatocadmium picrate, $[\text{Cd}_2(\text{AcO})_2]\text{picr}_2 \cdot 3\text{H}_2\text{O}$; *acetatocadmium p-nitrophenolate*, $[\text{Cd}_2(\text{AcO})_2](\text{OC}_6\text{H}_4\text{NO}_2)_2 \cdot 2\text{C}_6\text{H}_4(\text{NO}_2)\text{OH} \cdot \text{AcOH} \cdot 6\text{H}_2\text{O}$; *acetatodicadmium perchlorate acetate*, $[\text{Cd}_2(\text{AcO})_2](\text{AcO})\text{ClO}_4 \cdot 3\text{H}_2\text{O}$; *acetatocadmium nitrate*, $[\text{Cd}_2(\text{AcO})_2](\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$; *acetatocadmium perchlorate*, $[\text{Cd}_3(\text{AcO})_4](\text{ClO}_4)_2 \cdot 2\text{H}_2\text{O}$; *formatocadmium picrate*, $[\text{Cd}_2(\text{OOCH})_2]\text{picr}_2 \cdot 6\text{H}_2\text{O}$; *acetatomanganese picrate*, $[\text{Mn}_2(\text{AcO})_2]\text{picr}_2$; *acetatomanganese p-nitrophenolate*, $[\text{Mn}_3(\text{AcO})_4](\text{OC}_6\text{H}_4\text{NO}_2)_2 \cdot \text{AcOH} \cdot 9\text{H}_2\text{O}$; *acetatolead p-nitrophenolate*, $[\text{Pb}_2(\text{AcO})_2](\text{OC}_6\text{H}_4\text{NO}_2)_2 \cdot 2\text{AcOH}$; *acetatobarium p-nitrophenolate*, $[\text{Ba}_2(\text{AcO})_2](\text{OC}_6\text{H}_4\text{NO}_2)_2 \cdot 2\text{AcOH} \cdot 6\text{H}_2\text{O}$; *acetatocalcium p-nitrophenolate*, $[\text{Ca}_2(\text{AcO})_2](\text{OC}_6\text{H}_4\text{NO}_2)_2 \cdot 2\text{AcOH} \cdot 4\text{H}_2\text{O}$; and *acetatostrontium p-nitrophenolate*, $[\text{Sr}_2(\text{AcO})_2](\text{OC}_6\text{H}_4\text{NO}_2)_2 \cdot 2\text{AcOH} \cdot 6\text{H}_2\text{O}$. The compds. with *p*-nitrophenol probably possess a configuration similar to that of the aquo compds. *i. e.*, the connection is established by the O of the OH group of the phenol (cf. *C. A.* **13**, 1714); on the other hand the NO_2 group possibly might effect the attachment.

EMIL KLARMANN

The desulfurization of heavy metal sulfides with barium oxide. WILHELM BILTZ AND ERNST VON MÜLLENDAIL. *Z. anorg. allgem. Chem.* **150**, 1-9(1926).—The reactions between Cu_2S , CuS , PbS and BaO were studied microscopically, chemically and thermodynamically. They proceed according to the equations: $\text{M}'\text{S} + \text{M}''\text{O} = \text{M}'\text{O} + \text{M}''\text{S} + \text{Q}$, $4\text{M}'\text{O} + \text{M}''\text{S} = 4\text{M}' + \text{M}''\text{SO}_4 + \text{Q}$, and combining these $4\text{M}'\text{S} + 4\text{M}''\text{O} = 4\text{M}' + 3\text{M}''\text{S} + \text{M}''\text{SO}_4 + \text{Q}$, in which M' is a bivalent heavy metal or 2 atoms of a univalent heavy metal and M'' is an alk. earth atom. The reactions take place in the absence of C and with exclusion of air and commence between 200° and 400° . The greatest yield of heavy metal was obtained when 2 moles of BaO per mole of sulfide were used and the reaction time was 1 hr. With Cu_2S and BaO , the yield was 50-60% of the theoretical under these conditions. With Cu , the sulfide is completely decompd. at 800° , but Cu_2O remains, while with PbS the sulfide is never completely decompd. It was not possible to substitute CaO for BaO . Tables and time-temp. curves are included.

H. STOERTZ

Sulfur monochloride and sulfur. G. BRUNI. *Z. anorg. allgem. Chem.* **149**, 387-8 (1925); cf. *C. A.* **14**, 2893.—The conclusion drawn by Ruff and Golla (*C. A.* **19**, 221), that S is dissolved in S_2Cl_2 as S_8 , has been previously published by B. R. M. C.

Hypochlorous acid and the alkali hypochlorites. GEORG MÜLLER. *Z. anorg. allgem. Chem.* **149**, 401-2(1925); cf. *C. A.* **19**, 3441.—The observation of Dietzel and Schlemmer, that the reaction $2\text{NaOH} + \text{Cl}_2 = \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$ does not go quant. as indicated, is due to confusion between equiv. and mol. wts. Where 2 mols. of NaOH is required, they seem to have used but 1; hence the apparent deficiency of titratable NaOCl .

ROSALIE M. COBB

The reaction between bismuth trisulfide and hydrochloric acid. S. RAMACHANDRAN. *Chem. News* **131**, 294-5, 386(1925).— HCl of all concns. up to 1:16 aq. acts upon Bi_2S_3 with liberation of H_2S . Bi_2S_3 dissolves easily in boiling HCl of 1:5 aq. concn. The more dil. the acid, the higher the temp. at which H_2S is evolved. With 1:5 aq. acid the H_2S begins to be evolved at 40° ; with 1:16 aq. acid at 70° . Even at 29° there is soln. of Bi_2S_3 . Mere diln. of the acid solns. does not ppt. the Bi_2S_3 . Keeping Bi_2S_3 in contact for 48 hrs. with the soln. from which it is pptd. apparently does not change its properties.

M. O. LAMAR

Reactions of the type $\text{Cl}_2 + 2\text{KOH} = \text{KCl} + \text{KClO} + \text{H}_2\text{O}$. F. W. BERGSTROM. *J. Phys. Chem.* **30**, 12-9(1926).— KNH_2 reacts in liquid NH_3 with Pb and all elements more electronegative than Pb, provided the alkali metal salts contg. these elements in homo-at. anions are sol. in liquid NH_3 . These reactions are all of the type named in the title. The reactions in aq. solns. of bases and Sn, As or P are also of this type. The H_2 , AsH_3 , or PH_3 obtained in these cases results from hydrolysis of the potassium stannide, arsenide or phosphide, resp., produced. K and Na ammonostannites ($\text{K}[\text{Sn}(\text{NH}_2)_2]$, etc.) were prepd. They are white solids, very reactive with water and derivs. of bivalent Sn.

D. S. VILLARS

A new peroxide of barium. MARGARET CARLTON. *J. Chem. Soc.* **127**, 2180-4 (1925).—If instead of adding just enough H_2O_2 to aq. $\text{Ba}(\text{OH})_2$ at 15° to form $\text{BaO}_2 \cdot 8\text{H}_2\text{O}$, excess H_2O_2 is added, a granular ppt. is formed. This becomes buff-colored on standing and on being dried over P_2O_5 in *vacuo* it becomes first deeper buff, then lighter,

finally giving a cream colored amorphous powder (cf. Schöne, *Ann.* **192**, 257(1898)). Analysis indicated it to be the previously unknown *compd.*, BaO_3 . It decolorizes neutral $KMnO_4$ faster than does BaO_2 . It does not liberate I from neutral KI even on standing but in the presence of HNO_3 I is rapidly liberated in greater quantity than from BaO_2 . It does not react with neutral KBr , but on adding a trace of HNO_3 or HF , Br is liberated, whereas only a trace is liberated with BaO_2 . Unlike BaO_2 , Cl is liberated from concd. HCl and when heated with S no SO_2 is liberated, though there is vigorous action in the latter case. The reactions in general show BaO_3 to be a very active oxidizing agent, much more so than BaO_2 . Expts. are to be continued to prep. from this a new peroxide of H.

C. C. DAVIS

Purification of phosphoric oxide. HENRY WHITAKER. *J. Chem. Soc.* **127**, 2219–21(1925).—The difficulties inherent in the method of Finch and Peto (*C. A.* **16**, 2277) for purifying P_2O_5 are overcome by using a special new type of receiver which is described and illustrated. $HgCl_2$ is more convenient than $AgNO_3$ as a reagent for detecting the presence of lower oxides of P, since with $HgCl_2$ the H_3PO_4 need not be neutralized with $NaOH$. A turbidity or ppt. of $HgCl$ on boiling P_2O_5 with aq. $HgCl_2$ indicates the presence of P_2O_3 in the P_2O_5 .

C. C. DAVIS

Compounds and alloys of titanium with aluminum. W. MANCHOT and A. LEBER. *Z. anorg. allgem. Chem.* **150**, 26–34(1926).—Al is melted in a crucible and K_2TiF_6 is added in small portions. A Ti content of more than 37.3% caused the formation of a non-homogeneous mass contg. undecomposed Ti salts and metal. The hardness of the melt increased with increasing Ti content; it becomes very hard with more than 20% Ti. Dctn. of the cooling curve shows 2 branches, one characterized by a temp. max. of 1355°, corresponding to a Ti content of 37.28% by wt and 25 at. %. Since this point represents 3 parts of Al to 1 of Ti, the compd. Al_3Ti must sep. along this branch. The other branch corresponds to a temp. of 658°, along which Al crystallizes out. There is no indication of mixed crystals of Al and Al_3Ti . Photomicrographs are shown for Ti content of 1.5, 3.0, 11.2, 26.2, 36.0 and 37.3%, needle-like crystals of Al_3Ti being plainly seen. Small bright crystals of nitride are present as an impurity. Al_3Ti can be isolated by action of 5% HCl on the alloy, but if Ti is high it is better to use 5% $NaOH$ to dissolve out Al and wash with H_2O and alc. The compd. has a d. of 2.74. For analysis it is dissolved in concd. HCl and Ti titrated with *methylene blue*. Another sample is decomposed in concd. HNO_3 , the residue after evapn. ignited and weighed as the mixed oxides of Al and Ti. These are then fused in Na_2CO_3 and K_2CO_3 , the melt is dissolved in HCl , neutralized with NH_4OH and TiO_2 pptd. with SO_2 . Al is detd. in the filtrate by pptn. with NH_4OH . The results agree with the formula Al_3Ti . The authors were unable to obtain any other compd. of Al and Ti, and repeated efforts failed to introduce more than 37.3% Ti into the alloy. This is not in agreement with the work of other investigators.

H. STOERTZ

Hydroxides of Al and of Fe (HABER) 2. Supposed isomorphism of compounds of uranyl with those of the isomorphogenic metals of the Mg group (CAROBBI) 2. X-ray investigation: of Pd-Ag alloys containing H (KRÜGER, SACKLOWSKI) 2.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Points arising from the analytical standardization of British chemical standards. C. H. RIDSDALE and N. D. RIDSDALE. *Analyst* **50**, 425–40(1925).—Just as the U. S. Bureau of Standards has had various materials sampled and analyzed until the chem. compn. is established with considerable certainty to serve as standards, so in England similar materials have been analyzed and offered to chemists for the purpose of testing their methods of analysis. The evidence shows indisputably that errors are likely to arise in the work of any chemist, no matter how skilful, and that the mere checking of one's results does not prove that the method is accurate. A strong plea is made for the "mechanicalizing" and standardizing of methods of procedure and for common sense among chemists in reporting their results. One should not say that a sample contains 81.850% Fe_2O_3 when about 81.5% is present.

W. T. H.

Investigation into the analytical chemistry of tantalum, columbium and their mineral associates. IV. A new method for the separation of tantalum from columbium. V. The detection and determination of tantalum in columbium compounds. A. R. POWELL and W. R. SCHORLLER. *Analyst* **50**, 485–98(1925).—To sep. Ta from Cb advantage can be taken of the different extents to which oxalotantalic and oxalocolumbic

acids are affected by hydrolysis. The former complex acid is stable only in the presence of oxalic acid but the latter is relatively stable. Tannin favors the hydrolysis of the Ta compd. and the ppt. formed on boiling the slightly acid soln. is probably an adsorption product of tannin and tannic acid. The method is subject to 2 errors: (1) contamination of the ppt. by adsorption and (2) the danger of getting incipient pptn. of Cb because of the narrow range between complete pptn. of Ta and partial pptn. of Cb. When the ignited Ta ppt. is orange or red, the sepn. should be repeated. Fuse 0.3-0.5 g. of the mixed oxides with 3-6 g. of $K_2S_2O_7$. If the melt does not become clear, cool, add 1 cc. of concd. H_2SO_4 and again heat. Leach the cold melt with a satd. soln. of 2-4 g. $(NH_4)_2C_2O_4$ and filter if necessary. Fuse the residue again in the same SiO_2 crucible. Dil. the soln. to a vol. of about 125 cc. for each 0.1 g. of original oxide and add 10 cc. of freshly prepd. 2% tannin soln. If no permanent turbidity results after a short boiling period, add 0.5 *N* NH_4OH to the vigorously stirred soln. until a permanent ppt. forms. Now add more tannin if necessary (0.2 g. for less than 0.03 g. Ta_2O_5 ; 1 g. for 0.25 g. Ta_2O_5). Next add 5 g. NH_4Cl dissolved in as little water as possible. If the ppt. is orange to red, the soln., though sometimes of a pale straw tint, should be free from any orange color or cloudiness. If not, continue boiling and add more NH_4OH as necessary. Filter and wash with 2% NH_4Cl soln. If the filtrate is not practically colorless, again boil, add 5-10 cc. of tannin soln. and NH_4OH enough to decolorize any colloidal soln. Filter, ignite and again fuse with $K_2S_2O_7$, this time using oxalate as described below. If the first ppt. is S-yellow, filter and wash as above. Evap. the filtrate to $\frac{3}{4}$ of its original vol., add a little tannin, boil, and add NH_4OH dropwise until the orange coloration that forms around the drops dissolves only with difficulty. Add a satd. soln. of $(NH_4)_2C_2O_4$ in portions of 25-10 cc. until the yellow ppt. has coagulated and the supernatant soln. is clear and colorless. Allow to stand overnight, filter, ignite and weigh. To the filtrate add more oxalate and heat to see if pptn. was complete. In the final filtrate, the Cb can be pptd. by making ammoniacal and boiling. This ppt. yields Cb_2O_3 on ignition. By following the above procedure in 23 test analyses, the max. error did not exceed 1 mg. in 14 tests, 2 mg. in 4 tests, 3 mg. in 3 tests and 4 mg. in 2 tests. A slight modification of the above procedure is recommended for the detection and identification of Ta and Cb.

W. T. HALL

An uncommon indicator. WALTER PARRI. *Giorn. farm. chim.* **74**, 225-30 (1925).—Formaldehyde *n*-nitrosophenylhydrazone is colored red by acids, orange by the mono-salts of weak polybasic acids and yellow by alkali. It is not altered by weak bases, except NH_3 . CO_2 , CS_2 and all neutral salts of strong or moderately strong acids except K_2CO_3 give an acid reaction. It is of particular advantage for the detn. of alkali in alkaloids, of phenols, of impurities in drugs, e. g., aminophenol in phenacetin, etc. It has the disadvantage of pptg. heavy metals and of being altered by heating with acids and alkalies.

MARY JACOBSEN

Sodium sulfide as reagent. ERNST RICHTER. *Pharm. Ztg.* **70**, 1739 (1925).—An aq. soln. of $Na_2S + 9H_2O$ is preferred to one of H_2S because of the greater stability of the former.

W. O. E.

Sensitive Congo paper. F. W. HORST. *Z. angew. Chem.* **38**, 947 (1925).—For the prepn. of a sensitive paper the com. dye should be recrystd. from hot H_2O , $NaCl$ being used to salt it out, then pptd. from hot H_2O by HCl , washed and redissolved in hot dil. aq. NH_3 , this soln. being used to dye a pure filter paper. Paper so prepd. is sensitive to 0.0003 *N* HCl .

WM. B. PLUMMER

The analytical chemistry of indium. J. HEYROVSKY. *Chem. Listy* **19**, 168-72 (1925).—In deposits reversibly on the dropping Hg cathode from acid and slightly basic solns. The potential corresponding to 1 M soln. of In^{+++} is -0.503 v. and changes by approx. -0.022 v. for each tenfold diln. Traces of In in presence of certain other metals can be detd. by this method with a precision of 10% at a diln. of 10^{-4} *N*, i. e., 0.01 mg. In per 25 ml. soln. As an example, 0.0001% In in Zn can be detected. In strongly alk. solns. In exhibits a weakly acidic character. True solns. of indates formed at first are slowly hydrolyzed, depositing $In(OH)_3$. The equil. soln. in *N* $NaOH$ contains 0.25 equiv. In per l. The ion product of basic dissociation of freshly prepd. $In(OH)_3$ is 10^{-33} ; that of an aged prepn. is 10^{-35} . The ion product acid dissociation in an equil. prepn. is approx. 0.25×10^{-14} .

FRANK C. KRACEK

A method for the spectro-photometric determination of fluorescent substances. RENÉ FABRE. *Bull. soc. chim.* **37**, 1304-10 (1925).—The intensity of the fluorescence spectrum of solns. is not proportional to the concn. but reaches a max. at a certain definite concn. By measuring the intensity of a given soln. and then again after dilg. it is possible to det. its concn. In this way it is possible to est. the quantities of dissolved hydrastinine, quinine, quinidine and fluorescein, for example.

W. T. H.

Determination of silicic acid in fluorspar by treatment with sulfuric acid. H. MENDE. *Chem.-Ztg.* 49, 921(1925).—Fuse 1 g. of finely powdered mineral with 6 g. NaKCO_3 . Ext. with hot water and wash thoroughly. Neutralize the soln. with HCl , using an indicator. Add 10 g. $(\text{NH}_4)_2\text{CO}_3$ and 30 cc. of 25% ammoniacal ZnO soln. Heat in a covered Pt or porcelain dish until danger of loss by effervescence is over, then remove the cover glass, evap. to dryness and heat at 140° for an hr. Treat the residue with water and filter off the insol. Zn silicate. Ignite this residue, treat it in a porcelain dish with enough dil. HCl to decompose it, evap. with H_2SO_4 until SO_3 fumes are obtained, dil., filter and weigh the SiO_2 , correcting with HF as usual. This procedure is a slight modification of the well-known Berzelius method and gives somewhat higher values, which are assumed to be more accurate. W. T. H.

Rapid method for the determination of phosphoric acid. ROBERT F. LE GUYON AND R. M. MAY. *Bull. soc. chim.* 37, 1291-3(1925).—The method, suitable for the detn. of phosphates in urine, depends upon pptn. of Ag_3PO_4 in the presence of NaOAc , dissolving of the well-washed ppt. in HNO_3 and titration of the Ag content by the Volhard method. W. T. H.

Determination of small quantities of halogen and of sulfur. O. WAGNER. *Z. angew. Chem.* 38, 1068(1925).—Natural benzaldehyde is free from Cl but the artificial product is likely to contain it. By using the micro app. of Pregl it is possible to det. accurately a few thousandths of 1% Cl in 0.2 g. of substance decomposed with fuming HNO_3 in a Carius tube, eventually weighing as AgCl . Similarly, the S content of Texas oil can be detd. as BaSO_4 with 0.2 g. of substance. These methods are described to illustrate the advantages of micro-analysis. W. T. H.

Argentometric titration of iodide. I. M. KOLTHOFF, *Pharm. Weekblad* 62, 1309-12(1925).—To 25 cc. of iodide soln. (0.1N) add 1 drop of 0.1N KIO_3 and a few drops of 4 N H_2SO_4 . A sepn. of I imparts a yellow color to the soln. Add starch soln. and 5-10 cc. of 2 N $(\text{NH}_4)_2\text{CO}_3$ and titrate with 0.1 N AgNO_3 . The blue soln. becomes gray and the AgI ppt. is at first gray from adsorption of starch iodide. Toward the end of the titration shake vigorously after each addn. of AgNO_3 and a pure yellow ppt. is finally obtained. The end point is sharp within 0.1 cc. The advantage of this method is that practically all of the I is pptd. before the other halogens. The filtrate contains the Br and Cl . Accurate results may be obtained in acid medium even with great dilns. of iodide. More than 3% bromide or 20% chloride diminish the accuracy of the detn. A. W. DOX

Apparatus for the volumetric determination of small quantities of oxygen and carbon monoxide in nitrogen or other inert gases. J. GRISSLER. *Z. angew. Chem.* 38, 948-9(1925).—Separate samples of CO_2 -free gas are used for the O and CO detns., H being added in the O detn. while O is added for the CO detn., combustion being carried out in each case in a SiO_2 capillary elec. heated and contg. a Pt wire as catalyst. Since greater contractions for a given amt. of O or CO are thus obtained than in the ordinary procedure, and since the buret used has a capacity of approx. 380 cc., an accuracy of 0.01% is said to be obtained. WM. B. PLUMMER

A quick method for the determination of ozone. H. B. McDONNELL. *Ind. Eng. Chem.* 18, 135(1926).—The gas is allowed to flow into 30 cc. of 1% KI soln., contg. 5 cc. of 0.01 N $\text{Na}_2\text{S}_2\text{O}_3$ and starch, until a blue color develops and the time detd. with a stop-watch. The method is applicable to low concns. of O_3 in air and can be used for the detn. of small quantities of other gases such as Cl_2 which react with KI . W. T. H.

Determination of hydrogen and methane in illuminating gas. MAX PERNECKER. *Chem.-Ztg.* 49, 1073(1925); 1. Orr. *Ibid* 1073-4. WILHELM STEUER. *Ibid* 1074; cf. C. A. 20, 656.—This somewhat polemical discussion may be of interest to chemists because it represents 3 different viewpoints and opinions with respect to the best way to det. H_2 and CH_4 in the presence of considerable CO . W. T. H.

Successive potentiometric titration of copper and iron in metallurgical products. T. F. BUEHRER AND O. E. SCHUPP, JR. *Ind. Eng. Chem.* 18, 121-4(1926).—When CrCl_2 is used as the reducing agent, either by direct titration or by residual titration with $\text{K}_2\text{Cr}_2\text{O}_7$, the detn. of Cu and Fe is accurate and rapid, either singly or together. The Fe is reduced to the bivalent condition before any Cu is reduced. Then the bivalent Cu is reduced in 2 stages but the reduction of the univalent Cu starts before all the bivalent Cu is reduced so that the entire reduction has to be accomplished. With this method the time required for the detn. of Cu and Fe in metallurgical products is shortened considerably. W. T. H.

Detection of traces of gold by spectrography. PIERRE JOLIBOIS AND ROBERT BOSSUET. *Bull. soc. chim.* 37, 1297-1304(1925).—Very often in assaying for gold, tiny fragments of material are obtained which are assumed but not definitely proven

to be Au. By means of photographing the arc spectra of an alloy contg. Au and comparing the rays obtained in the ultra-violet region with similar spectra of pure C, Fe and pure Au it is possible to identify 1 mg. of Au from a mass of 50 g. of Pb. To detect Au in soln. a little HgCl_2 or Bi salt can be added and then H_2S introduced. This ppt. placed in a cavity on the C-terminal of the arc will suffice to show the characteristic Au spectrum when only 0.001 mg. of Au is present. For the examn. of minerals, it is best to add a little Ag, obtain a Pb button in the usual way, and cupel the button before applying the test. W. T. H.

Estimation of cadmium in copper. C. BLAZEY. *Chem. Eng. Mining Rev.* 17, 502-3(1925).—When Cu is heated in H_2 as in the detn. of oxides by the Ledebur method, all of the Cd distills away from the Cu and condenses in the cold part of the tube and can be analyzed easily. It requires several hrs. to remove all of the Cd from a large sample but the method may be useful. W. T. H.

Electrolytic method for the determination of zinc in ores. R. E. SULLIVAN AND H. S. LUKENS. *Chem. News* 131, 321-4(1925).—Add 10 cc. of concd HNO_3 to 0.3-0.4 g. of moistened ore powder, heat 5 min., dil. to about 20 cc. and add enough of a soln. of 20 g. KOH in 100 cc. of water, to ppt. all the Fe and leave the soln. distinctly alk. Filter and add the remainder of the KOH soln. to the filtrate. Dissolve the $\text{Fe}(\text{OH})_3$ ppt. in HCl and reppt. with NH_4OH , adding this filtrate to the former. Electrolyze the KOH soln. with 2 Pt anodes and a 40-cc. rotating Ni crucible as cathode, using a current of 0.8 amp. at 5-6 v. At the end of 45 min. test a little of the soln. for Zn with HCl and $\text{K}_4\text{Fe}(\text{CN})_6$. W. T. H.

The chemistry of basic slag. I. The determination of fluorine in basic slag. R. G. WARREN, C. T. GIMINGHAM AND H. J. PAGE. *J. Agr. Sci.* 15, 516-28(1925).—A new method for the detn. of F in basic slag is proposed. The F content and citric soly. of basic slags are compared. The method in brief is as follows: Fuse 5 g. of slag and 6 g. of NaKCO_3 . Extract the melt in the H_2O and conc. the extract to approx. 100 cc., cool, add 3-4 g. solid $(\text{NH}_4)_2\text{CO}_3$, and let stand overnight. Filter and wash with 5% $(\text{NH}_4)_2\text{CO}_3$ soln. Retain the residue. Evap the filtrate to dryness on the water bath, take up with 50 cc. H_2O , filter and again take to dryness. Next add 50 cc. H_2O satd. with phenolphthalein, and titrate hot, using 4N H_2SO_4 at first. The color of the indicator must not be allowed to fade completely as loss of HF might occur; boil after each addn. of acid in a covered beaker. When the end point is nearly reached transfer to a 100-cc. beaker and complete the titration with 0.1N acid. Then evap. the soln. to a vol. of 50 cc. To the well-stirred hot soln. add 0.6 g. of powdered Ag_2SO_4 . Set aside overnight, in the dark. Filter in the dark into a 100-cc. flask through a double 7 cm. filter paper. Twenty cc. of H_2O should suffice to wash the ppt. Add 10 cc. of H_2SO_4 (d. 1.55) and 3 cc. H_2O_2 . No brown color should develop. Finally, add 10 cc. of $\text{Ti}(\text{SO}_4)_2$ and adjust the soln. to a vol. of 100 cc. Use a standard of $\text{Ti}(\text{SO}_4)_2$ with the same quantity of reagents for comparison in a Kober instrument.

R. B. DEEMER

Determination of manganese in alloy steels rich in cobalt. KROPP. *Chem.-Ztg.* 49, 1074(1925); ERNST KLIMA. *Ibid.*—The objections to adding Mn to solns low in Mn are outlined and the difficulties when Co is present pointed out. W. T. H.

Analysis of some lithium minerals. A. GUNTZ AND F. BENOIT. *Bull. soc. chim.* 27, 1294-7(1925).—In the SiO_2 detn. the results are likely to be low unless precautions are taken to overcome the effect of F. Thus 50.4% SiO_2 was obtained by the Berzelius method using $(\text{NH}_4)_2\text{CO}_3$ and ammoniacal Zn soln. and 49.80% SiO_2 by the method ordinarily used. For the detn. of F it is advised to fuse the mineral with KOH and to titrate the resulting K_2SiF_6 with KOH soln. For the H_2O detn. it is necessary to remember that the presence of F causes evolution of HF when the mineral is heated so that CaO should be provided to remove F before absorbing the H_2O . For the detn. of alkalis, the Berzelius method of decompn. with HF and H_2SO_4 is recommended, but it is well to heat the sulfates strongly to make Fe and Al insol. For the Li detn., ppt. as LiF by means of 20% NH_4 in 2% NH_3 soln., weighing finally as LiF or Li_2SO_4 . Then after the removal of the SO_4 — the usual HClO_4 method can be used for detg. K. The wt. of Na_2SO_4 can be estd. by the weighing of the K_2SO_4 and Na_2SO_4 obtained after the Li detn. In the analysis of minerals contg. PO_4 — a similar treatment can be used after removing the PO_4 in the original soln. obtained from the HF- H_2SO_4 treatment, by means of PbO added to the slightly acid soln. Then the dissolved Pb can be removed as PbSO_4 . W. T. H.

Analysis of zinc minerals. ANON. *Bull. féd. ind. chim. Belg.* 4, 323-33(1925).—The modification of the Na_2S volumetric method as approved by the Association Belge de Standardisation is described, instructions also being given for dissolving various

Zn products. After elimination of the H_2S and Fe groups the Zn is titrated with Na_2S soln. (20 g./l. of $Na_2S \cdot 9H_2O$), spot tests on paper impregnated with basic $PbCO_3$ being used to det. the end point. The titration must be carried out simultaneously (2 burets) with one vs. a standard Zn soln. to insure accuracy. Detailed directions and discussion are given.

WM. B. PLUMMER

The titration of mercury with potassium cyanide, lead with arsenate and iron with thiosulfate in reply to a paper by E. Rupp with W. Wegner and P. Maiss. KARL JELLINEK and JOHANNES CZERWINSKI. *Z. anorg. allgem. Chem.* **149**, 359-76(1925).—When KCN is added to a boiling hot soln. of $HgCl_2$ contg. phenolphthalein the colored end point is obtained when all the $HgCl_2$ has been converted to $Hg(CN)_2$. The reaction between $HgCl_2$ and pure KCN is complete at the boiling temp. If the KCN contains, as it usually does, a little KOH and K_2CO_3 then some $Hg(OH)CN$ and some $KHCO_3$ are formed so that if the KCN has been standardized against $AgNO_3$, less of the soln. is required than corresponds to the KCN content; but if the KCN has been standardized by acidimetric titration, apparently too much of the soln. is needed in the titration of $HgCl_2$. To avoid the error due to carbonate, titrate with the KCN soln. to the end point, add a little HCl soln. to decompose $KHCO_3$ and again titrate with KCN soln., allowing for the HCl added. Further expts. in the titration of Pb solns. with alkali arsenate indicate that K_3AsO_4 is unsuitable but that the titration succeeds with Na_3AsO_4 soln. standardized against pure Pb soln. In the titration of $FeCl_3$ with $Na_2S_2O_3$, the amt. of $Na_2S_2O_3$ required varies with the H-ion concn. of the soln. Equiv. amts. of $FeCl_3$ and of $Na_2S_2O_3$ are involved if the titration is accomplished at 60-65° in a soln. contg. 2 milli-equivalents of HCl and a final vol. of 80 cc. and 0.25 cc. is deducted from the final $Na_2S_2O_3$ reading. By using methylene blue and fuchsin as indicators and finishing the titration at the boiling temp., a somewhat better titration value is obtained.

W. T. H.

Determination of metals dissolved in mercury. Rapid method of purifying mercury. A. S. RUSSELL and D. C. EVANS. *J. Chem. Soc.* **127**, 2221-30(1925).—By treating Hg contg. Zn, Mn, Cd, Th, Sn, Pb, Cu, Cr, Fe or Bi with dil. H_2SO_4 and $KMnO_4$, the Hg is freed from the foreign metals and from the vol. of $KMnO_4$ the amt. present can be estd. If a mixt. of 2 metals such as Sn and Pb is dissolved in Hg and the resulting amalgam titrated with $KMnO_4$ in dil. H_2SO_4 soln. the compn. of the mixt. can be computed from the original wt. and the vol. of $KMnO_4$ required. The end point is easy to find as bubbles begin to form on the surface of the Hg.

W. T. H.

A new and very sensitive method for detecting, separating and determining bismuth. A. GIRARD and E. FOURNEAU. *Compt. rend.* **181**, 610-11; *Bull. soc. chim.* **37**, 1669-73; *Reperl. pharm.* **36**, 353-4(1925).—It is known that BiI_3 gives red products with natural alkaloids. By substituting certain synthetic bases for the natural alkaloid it is possible to obtain highly colored products which are sol. in benzene. Several of these synthetic bases have been tested and the most promising appears to be tetraacetylammmonium hydroxide. With BiI_3 the following compd. is formed, $(C_{16}H_{32})_4NOBiI_3$. Certain oxidizing agents, such as ferric iron, interfere with the test but with Fe the difficulty can be overcome by adding a soln. contg. formic acid, NH_4 formate, KI and $NaHSO_3$. The method of prepg. the reagent and directions for applying the test will be published elsewhere.

W. T. H.

The determination of small quantities of other elements in tungsten. K. AGTE, H. BECKER-ROSE and G. HEYNE. *Z. angew. Chem.* **38**, 1121-9(1925).—Based largely on the work of Arnold (*C. A.* **8**, 3165; **9**, 422), a sample of scheelite was analyzed and found to contain besides 63.3% WO_3 , 15.04% SiO_2 , 10.72% Fe_2O_3 and 9.51% CaO , some 17 other constituents. The WO_3 and metallic W prepd. from the scheelite were tested for each of the constituents found in the mineral and for C, N, O, and S in addn. The method of analysis is outlined and the limit of sensitiveness detd. in each case. The WO_3 was 99.75% pure and the W much purer.

W. T. H.

The carbon error in the quantitative deposition of nickel and iron from complex oxalate electrolytes. P. K. FRÖLICH. *Analyst* **50**, 444-5(1925).—Reply to comments on his paper (*C. A.* **19**, 2614).

W. T. H.

The electrometric determination of iron with bromate. OSCAR COLLENBERG and KARL SANDVED. *Z. anorg. allgem. Chem.* **149**, 191-202(1925).—In studying the electrometric titration of ferrous salts with $KBrO_3$, Kolthoff came to the conclusion that the method was not sufficiently accurate, but the present studies show how the conditions can be changed so that the titration can be accomplished without undue delay and with satisfactory accuracy. The reaction between ferrous salt and bromate is very slow in dil. acid solns. but the rate of reaction can be accelerated by raising the temp. to 50°, by adding a catalyzer, best $CoCl_2$, and by carrying out the titration in

2 *N* HCl soln. To the hot soln. add a slight excess of 0.2 *N* SnCl₂ and 5 cc. of 6% CoCl₂ soln. Add 10–20 cc. of concd. HCl per 100 cc. of soln. and titrate with 0.1 *N* KBrO₃. From changes in electrode potential the end of the oxidation of the stannous Sn and the end of the oxidation of ferrous Fe can be easily detd. The change at the end point of the Fe titration is about 670 millivolts and between 120 and 180 millivolts at the end of the Sn titration. A bimetallic electrode system can be used if desired.

W. T. H.

The complete analysis of brass. IV. Magnesium, manganese, copper, arsenic, sulfur and cadmium. C. C. D. *Metal Ind.* (London) 27, 599–600(1925).—It is recommended to det. Mg as Mg₂P₂O₇ after pptn. as MgNH₄PO₄ in strongly ammoniacal NH₄Cl soln. prior to the removal of Mn, Cu and Cd. The persulfate method with a sep. sample is recommended for Mn. For the Cu, the iodide method is advocated. For As, distn. of AsCl₃ and subsequent iodometric titration are described. For S, fusion with KClO₃ and Na₂CO₃ is preferred to oxidation in the wet way. For Cd, it is advised to remove Cu by electrolysis, and ppt. all of the CdS and some ZnS in the residual soln. by means of H₂S, repeating the pptn. until pure CdS is obtained which can be converted easily to CdSO₄ and weighed.

W. T. H.

Chemical study of basic eruptive rocks. I. A. ATANASIU. *Bul. chim. soc. română științe* 27, 17–36(1924).—The method recommended for the analysis of basic rocks contg. Ti is essentially as follows: Fuse 1 g. with 7 g. Na₂CO₃ and 1 g. Na₂SO₄, evap. the melt in the dil. H₂SO₄ till the SiO₂ is granular, take up in H₂SO₄, filter, ignite, volatilize SiO₂ with HF, fuse the residue with Na₂CO₃, take up in HCl, ppt. ZrO with NH₄OH, filter, weigh and in the filtrate from the ZrO ppt. BaO with H₂SO₄. In the filtrate from SiO₂, BaO and ZrO, ppt. Ti and P by adding H₂SO₄ to the nearly neutral soln. and boiling. Filter, dissolve in concd. H₂SO₄, reduce with Zn and det. TiC₂ by titration with KMnO₄. Oxidize the filtrate from TiO₂ and P with Br and HCl, in an aliquot portion ppt. Fe and Al by means of AcONa, titrate Fe with KMnO₄ as usual, calc. Al₂O₃ by difference, and ppt. Mn in the filtrate as Mn₂O₃ by means of Br and NH₃. In another aliquot from the TiO₂ ppt., ppt. Fe and Al with NH₃ and det. CaO with (NH₄)₂C₂O₄ and MgO with Na₂HPO₄ as usual. Det. S and P on a sep. portion (2 g.) of sample as follows: fuse with 8 g. Na₂CO₃ and 2 g. KNO₃, dissolve in 150 cc. hot water, filter, acidify with HCl, remove SiO₂, add 0.5 g. FeCl₃, ppt. FePO₄ by nearly neutralizing with NH₄OH and boiling. In this ppt. det. P by a known method (preferably volumetrically), and in the filtrate ppt. S as BaSO₄. Analyses, carried out by this method, of a no. of basic eruptive rocks from the Eastern Carpathians are tabulated and commented.

A. PAPINEAU-COUTURE

Photometric methods for studying and estimating suspensions of dusts, fumes and smokes. PHILIP DRINKER, R. M. THOMSON AND JANE L. FINN. *J. Ind. Hyg.* 7, 567–76(1925).—The Tyndallmeter with Macbeth illuminometer or measurement by transmitted light or by a contrast photometer method such as that developed by Owens provides accurate, convenient and rapid methods of estg. suspensions. Although concn. cannot always be detd., the readings give reliable indices of the size and dispersion of the particles.

C. M. SALLS

Destruction of organic matter by hydrogen peroxide. Application in toxicology. C. A. GRAU. *Rev. facultad ciencias* 3, No. 2, 131–2(1925).—Na perborate is used instead of H₂O₂.

MARY JACOBSEN

An accurate general iodometric method for the quantitative determination of the carbonyl group in organic compounds. E. G. R. ARDAGH AND J. G. WILLIAMS. *J. Am. Chem. Soc.* 47, 2983–8(1925).—The method is based upon the formation of a phenylhydrazone, the excess of phenylhydrazine being detd. by titration with I₂. The hydrazone reaction is carried to completion by producing the conditions shown to be necessary in a preceding paper (*C. A.* 20, 374). Attention is also directed to the conditions to be maintained for an accurate titration of phenylhydrazine by I₂, as well as to the necessity of using air-free water and an atm. free from O to avoid oxidation of the phenylhydrazine. The general method is given in detail, also detailed calcs. for a typical compd. (acetaldehyde) and results for a number of others. Also in *Trans. Roy. Soc. Can.* 19, 73–4(1925).

J. W. SHIPLEY

Microanalytical method for the determination of lactic acid and lactates in pure solutions. KLAUS HANSEN. *Tids. Kemi Bergv.* 5, 172–4, 187–9 (1925).—The following method will give accurate results within very wide limits of concn. but is adaptable to pure solns. only. Measure out into a 100-cc. Erlenmeyer flask by means of a microburet 5 cc. of a soln. contg. 7.6237 g. K₂Cr₂O₇ per l., 1 cc. of which will correspond to 3.5 mg. of lactic acid. Add the soln. to be examd., at least 5 cc., or if necessary dil. to 5 cc. with H₂O. Add 15 cc. of 40% H₂SO₄ from a buret.

Insert a rubber stopper and keep the stoppered flask for 1 hr. at 70° in a thermostat. Dil. with 50 cc. H₂O, add 2 cc. of 10% KI and titrate with Na₂S₂O₃ from a microburet. If the amt. of lactic acid corresponds to more than 3 cc. of the K₂Cr₂O₇ soln. the amt. of the latter should be doubled. With quantities of lactic acid below 0.1 mg. the method is unsuitable.

C. A. ROBAK

Determination of formaldehyde. E. SCHULEK. *Ber.* 58B, 732-6(1925).—Two methods are proposed which are based on the KCN reaction already used by Romijn. HCHO reacts with KCN to form HCH(OK)CN which hydrolyzes forming HCH(OH)-CO₂K and (NH₄)₂SO₄. The excess of the KCN can be detd. by titration with AgNO₃. To 50 cc. of 0.1 N KCN and about 5 cc. of 30% MgSO₄ soln. (as catalyzer) add 5-10 cc. of the formaldehyde soln. contg. 10-50 mg. HCHO. Stir well and after 1-2 min. add 1 g. of NH₄Cl (to dissolve the Mg(OH)₂ formed), a little KI and 2-3 drops of 6 N NH₄OH. Titrate quickly with AgNO₃ soln. till a turbidity persists for 1-2 min. If less than 10 mg. of formaldehyde is present, it is better to proceed as follows: To 10-25 cc. of 0.1 N KCN soln. add 5-10 cc. of the formaldehyde soln. while stirring. After 3 min. make the soln. strongly acid with concd. HCl and introduce aq. Br₂ until the soln. assumes a permanent yellow coloration. Add 1-2 cc. of 5% phenol soln. to react with the excess Br. Add KI and titrate with thiosulfate soln. W. T. H.

Improvements in analytical crucibles (SMITH) 1. Examination of refractory materials and other aluminous substances (SCHÜRMANN, BÖHM) 19. The separation of the Pt metals (WÖHLER, METZ) 6. Decomposition of alkaline earth phosphates by means of alkali carbonates (RAQUET) 6. Ozone (WARTENBERG, PODJASKI) 2. Equilibrium in systems of type Al₂(SO₄)₃-M¹¹SO₄-H₂O [estimation of Ni in presence of Al] (CAVEN, MITCHELL) 2. Micro-method for sugar determination (KOMM) 11B.

BLUMENTHAL, MORITZ: *Elektrometrische Titrationsstudien.* Weida (Thür.): Thomas & Hubert. 97 pp.

DERINGER, HANS: *Ueber exakte gasanalytische Methoden. Die Bestimmungen d. schweren Kohlenwasserstoffe.* Zürich: Fachschriften-Verlag und Buchdruckerei. 88 pp.

WEINLAND, R.: *Anleitung für das Praktikum in der Gewichtsanalyse.* 3rd edition, revised and enlarged. Dresden and Leipzig: Theodor Steinkopff. 132 pp. M. 6.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Magnetic rotatory power of some paramagnetic minerals at very low temperatures. H. KAMERLINGH ONNES, JEAN BECQUEREL AND W.-J. DE HAAS. *Compt. rend.* 181, 838-41(1925).—B. showed (*C. A.* 3, 859) that the increase in magnetic rotatory power of certain Di minerals (tysonite, parisite) from lab. temps. to that of liquid air is approx. inversely proportional to the abs. temp. Combination of this with Curie's law on paramagnetic susceptibility would indicate that the rotatory power of the crystals is proportional to their susceptibility, which has been confirmed for temps. down to 20° abs. (*C. A.* 4, 861). Further expts. with tysonite showed the proportionality to hold for temps. down to 4.2° abs. (boiling He). The ratio of the rotations seems to decrease slightly from the violet to the red end of the spectrum, but the accuracy of the measurements is not sufficient to state it definitely. The susceptibility of tysonite is therefore considered to follow Curie's law, with a slight correction for Weiss's law. Parisite and bastnaesite follow the same law. Xenotime (Er spectrum) gives much more complex effects owing to numerous bands very sensitive to the magnetic field and to general absorption throughout the spectrum. There are apparently 2 essentially different polarization phenomena involved in magnetic rotation: one, generally positive, depending on the Zeeman effect, the other negative, apparent in paramagnetic substances, resulting from unsymmetrical absorption of circular vibrations in opposite directions, caused by orientation or distortion in the field. The 2 effects are additive, and either one can predominate.

A. PAPINEAU-COUTURE

Some points of relationship between artificial ferro-nickels and a nickeliferous iron of meteoric origin. MARCEL PESCHARD. *Compt. rend.* 181, 854-5(1925).—The Chinitla meteorite contains 9.05% Ni and less than 1% impurities, which consist of localized masses of schreibersite and of Fe sulfide. On etching a polished section

with HNO_3 , microscopic examn. shows a very pronounced segregation of kamacite and taenite. From magnetic measurements P. deduces the Ni contents of kamacite and taenite as 6.9–7.0% and $32.8 \pm 0.2\%$, resp. A comparison of the magnetic properties of the meteorite and of an artificial Fe-Ni having the same compn. shows that on annealing the meteorite 15 hrs. at 1000° and cooling in 40 min. it is brought to the same state as the artificial Fe-Ni, and by reheating to 1000° and cooling in 21 days it is restored to its original state. P. concludes that meteorites are in a state of physico-chem. equil., while artificial Fe-Ni's are in a state of metastable equil. A. P.-C.

The electric conductivity of the ore veins at the Kongsberg silver works. M. MORTENSON. *Tids. Kemi Bergv.* 5, 209–13(1925).—A proportionality was observed between the cond. of the surrounding rock and the Ag content of the veins, in accordance with the theory of Münster and Vogt on the genesis of the Ag. C. A. ROBARK

Zonolite: utilizing a useless mineral. E. N. ALLEY. *Eng. Mining J.-Press* 120, 819–20(1925).—The com. development of a large deposit of *altered phlogopite* in Montana brings out many uses for the treated material. The dark heavy mineral when roasted swells to about 15 times its original vol. and becomes a light flaky material of golden leaves sepd. by air spaces. It is a silicate of Mg and Al contg. a little Fe. Exptl. work indicates the following uses for the treated material: insulator for heat or cold, decorative material for plastered walls, fireproof roofing; component of wall paper, wall board, paint, cement products and pipe and boiler coverings; fireproof and insulating packing, in greases and lubricants and as a gold-bronze paint. W. H. B.

Petroleum in Poland. Z. TH. PAZDRO. *La nature* 53, ii, 308–11(1925).—An illustrated description of the fields. C. C. DAVIS

Edward Fuller Holden. EDW. H. KRAUS. *Science* 63, 84–5(1926).—An obituary. E. J. C.

The durability of roofing slates (BOHR) 20. Hydroxides of Al and of Fe (HABER) 2.

STRÖSE, KARL: *Lehrbuch der Chemie und der Mineralogie, der Gesteinskunde und der Geologie für höhere Lehranstalten.* Part I. Vorbereitender Lehrgang d. Chemie u. Mineralogie. Edited by Otto Pauli and Adolf Rücker. Leipzig: Quelle & Meyer. 139 pp.

WHITE, J. TH.: *Petrografische Werkzaamheden ten Behoeve van het Bodenkundig Onderzoek in Ned.-Oost-Indie.* SCHEIBENER, EDM. *Die Petrographie der Residenz von Bantam.* Published together as Mededeeling 18 van het Algemeen Proefstation van den Landbouw, Java xxii and 152 pp. with one map. Reviewed in *Arch. Suikerind.* 33, 1261–3(1925).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

A review of metallurgical progress. S. B. GOODALE. *Blast Furnace & Steel Plant* 14, 37–40(1926). E. J. C.

Blast-furnace progress in 1925. H. E. McDONNELL. *Blast Furnace & Steel Plant* 14, 16–7(1926). E. J. C.

The purchasing of manganese ores. R. NAVET. *Rev. universelle mines* 8, [7], 227–40(1925).—Based on their role in the reactions of the metallurgical process, methods are derived for calcg. the value of Mn ore contg. different amts. of Mn, SiO_2 and Fe. By such calcns. an ore can be evaluated economically from the amt. of Mn and of these secondary ingredients. C. C. DAVIS

The proper use of lime to alkalize mill currents. C. T. HENDERSON. *Eng. Mining J.-Press* 120, 1016(1925).—H. shows that the proper type of milk of lime for flotation work is made by slaking high-Ca quicklime with at least 10 times the amt. of water theoretically required for hydration. Calcined dolomite is not satisfactory. The lime serves 3 purposes: It neutralizes the temporary hardness of the water used in pulp making; more is consumed in neutralizing any acidity in the ore; and the remainder creates the necessary alk. condition in the circuit. W. H. BOYNTON

Viscosity of mill solutions. F. C. BOND. *Mining & Metallurgy* 7, 15–6(1926).—Little attention has been paid in cyanide milling to the effect of the viscosity of the mill soln. on extn. speed. Viscosity varies with the amt. of dissolved salts present as impurities which build up to a max. depending on the character of the ore, the grade

of cyanide used, the lime and salts added, and the impurities in the water. Each of these factors is discussed. A viscosity detn. of sufficient accuracy is made by attaching the bottom of a 50-cc. buret with a short rubber tube, a glass tube blown to a capillary of such size that it will deliver 50 cc. of water in a steady stream in about 120 sec. The buret is filled with distd. water at a known temp., the buret cock is opened completely, and the time recorded that the water takes to drain to the 50-cc. mark. The sample is similarly treated and corrected to the temp. of the water by the formula: $\text{Time} = \text{time observed} (1 \pm 0.037t)$, where $t = \text{temp. difference}$, and Time is the time in sec. for the 50 cc. of soln. to drain from the buret. The sign is + if the temp. of the mill soln. is higher than that of the water and - if lower. The no. of sec. required by the soln. divided by the no. of sec. for distd. water = sp. viscosity of the soln. Duplicate detns. check within 2%. This method is much simpler than the detn. of the elec. cond. of the soln.

W. H. BOYNTON

New stack for ferrophosphorus. ANON. *Iron Age* 116, 1731-2(1925).—A new blast furnace at Rockdale, Tenn., for the production of ferrophosphorus is described and illusd. The gas is removed from the furnace by 2 4 ft (1 2 m.) downcome pipes lined with firebrick and extended to the brick-lined dust catcher with a diam. of 12 ft. (3.6 m.) and a height of 16 ft (4.8 m.).

W. H. BOYNTON

The developments in pig-iron production within the last decade with respect to the technical and chemical-metallurgical points of view. KONRAD HOFMANN. *Z. angew. Chem.* 38, 1058-64, 1085-8(1925).—A review of the latest theoretical and practical developments in the operation of blast furnaces. The various reactions which take place are described and illustrated. A diagram is shown from which can be detd. the amt. of CO that theoretically can be used for reduction of FeO. In actual practice the CO content of the furnace is much higher. Working methods are given by which ideal conditions in the furnace during the operation can be approached. The recent developments in the construction and operation of elec. furnaces are given in detail.

D. THUESEN

Review of iron and steel literature for 1925. E. H. MCCLELLAND. *Blast Furnace & Steel Plant* 14, 49-51(1926).—A classified list of books, serials and trade publications.

E. J. C.

Iron ores of the world. OLIN R. KUHN. *Blast Furnace & Steel Plant* 14, 2-12 (1926).—A broad survey of the important Fe ore resources.

E. J. C.

The technical development of the Swedish iron industry. ANON. *Industriidningen Norden* 54, 313-6(1925).—A review.

C. A. ROBAK

The reaction between manganese and iron sulfide. C. H. HERTY, JR. AND O. S. TRUE. *Blast Furnace & Steel Plant* 13, 492(1925).—Expts. were carried out to det. the reversibility of the reaction $\text{Mn} + \text{FeS} = \text{MnS} + \text{Fe}$. Electrolytic Fe is melted in a ZrO_2 crucible and in various runs Mn and MnS are added to give 1, 2 and 4% Mn with 0.5% S in each, while in others Mn and FeS are added to give a 2nd series with the same proportions of Mn and S. Results show that MnS even with an excess of Mn forms FeS. The greater the excess of Mn the lower the S, whether it is originally present as MnS or FeS. The authors conclude that the reaction is reversible, the *equil. const.* being $K = [(\text{MnS}) \text{ metal}] / [(\text{FeS}) \text{ metal} \times (\text{Mn}) \text{ metal}]$, from which it follows that as the concn. of Mn is raised the ratio (MnS) metal/(FeS) metal must increase.

H. STOERTZ

Controlling molding sand in a radiator shop. II. H. W. DIETERT AND W. M. MYLER, JR. *Foundry* 54, 9 12(1926); cf. *C. A.* 19, 2021.—The tentative tests of the Joint Committee on Molding Sand Research of the Am. Foundrymen's Assoc. are briefly discussed and a special strength test, regarded by the authors as reliable and more rapid, is described. The prepn. of the sample, the app. employed in the tests, and the advantages of the special test in connection with testing of molding sands for radiator casting are pointed out. The strength rammer with mold and bottom rammer, and the strength test machine are illusd. and comparative test values of some sands tabulated.

W. H. BOYNTON

The Swedish Institute of Metallography. ANON. *Industriidningen Norden* 54, 406-7, 418-9, 421-2(1925).—A review of the progress and development of the Institute during the 5 years since it was founded, with a brief report of some of the more important scientific results attained.

C. A. ROBAK

Pearlitic cast iron. BERNARD BUFFET AND ALPHONSE ROEDER. *Bull. soc. ind. Mulhouse* 91, 622-34(1925).—A discussion of its structure and properties. B and R. recommend the general adoption of the shock test instead of the tensile-strength detn. for this grade of Fe.

A. PAPINEAU-COUTURE

Comparative study of the corrosion of cast irons in sulfuric acid of different strengths.

G. DELBART. *Compt. rend.* **181**, 786-8(1925); cf. *C. A.* **19**, 3244.—Twenty-seven different cast irons were immersed in H_2SO_4 of the following strengths: 1.6, 80, 85 and 92.6% SO_3 . The analyses of 10 samples are given. In weak acid for 72 hrs. these showed that P up to 1.7%, 4% Si, or 3% Mn tended to increase the soly., S up to 0.2% did not have much effect, and the semi-steel, white Fe and malleable Fe dissolved least. The most resistant irons were normalized to destroy internal stresses, and compared with steels in the weak acid. The gray irons were much more sol. than the steels, but the malleable and white irons showed about the same loss as the medium-hard steels, though more than the soft steels. In acid contg. 80% SO_3 for 240 hrs. the results were similar. Acid contg. 85% SO_3 gave irregular results, but in general the less pure irons (except the sample with high Mn) showed the highest loss, while the purer irons (except malleable Fe) gave better results. With the strongest acid the differences were less, the purer irons in general being slightly better. It is concluded that steel is preferable to cast Fe for corrosion resistance in most cases. A few special irons give results similar to those obtained from steel, but they are generally weak and difficult to cast. GEO. F. COMSTOCK

Correlating gray-iron tests. J. W. BOLTON. *Foundry* **53**, 912-5, 959-61(1925).—Some common mech. tests for cast Fe, and their correlation to the structure and chem. compn. are considered. The strength varies inversely with the graphite content. The assumption of a ferrite network within the graphite seems plausible. The strength drops with increasing C content more rapidly when the C is high. Increased pearlite causes greater Brinell hardness, but the strength is affected as much by graphite and grain-size. Heat-treatment of gray Fe may increase the strength 50%. Cr and high Mn decrease graphitization; Si and high C increase it; Ni strengthens the matrix. Increase of section size weakens the Fe more in tension than in transverse loading, on account of piping of thick bars. The ratio of transverse to tensile strength depends on the type of structure. Fractures follow graphite flakes. The highest strength is found with Brinell hardness of 200 to 240, low total C and fine grain-size. High P reduces machinability but helps resistance to wear. Fluidity is not affected by P variation between 0.2 and 0.9%. GEO. F. COMSTOCK

The mechanical properties of steel. WM. H. DALBY. *Engineering* **120**, 625 (1925).—An abstract of a paper presented before the Institution of Civil Engineers, giving the results of tests made with photographic recorders by the looping-in-tension, push-pull and torque-twist methods. A push-pull or a torque-twist cycle gives a curve of characteristic shape called the plastic contour, repeated tests changing the boundaries slightly. Metal fails by slipping, but retains some elasticity even after slipping almost to fracture. The results of X-ray analyses are discussed to explain these phenomena. Reduction of load after failure by slipping gave an elastic response. The plastic contour showed that with reversal of load the elastic property almost disappears. Overstrain in manuf. may account for mysterious failures, and equal elastic properties in tension and compression should always be restored before use. GEO. F. COMSTOCK

Structural diagrams of some special steels. TSUTOM KASÉ. *Science Repts. Tohoku Imp. Univ.* **14**, 453-78(1925); *Chem. News* **132**, 18-9(1926).—The structures of Ni, Mn and Cr steels were investigated by means of the scleroscope, microscope and magnetic and expansion measurements, and the results are presented in tables, diagrams and photomicrographs. Immersion in liquid air transformed austenitic steels of about 20 to 34% Ni to martensite, increasing the hardness and producing an irreversible expansion. Magnetic tests showed that the A_1 transformation is a stepped change in most Ni steels of between 8 and 20% Ni. The structural diagram given for annealed Ni steel shows four fields bounded by lines approx. parallel to the C axis. The Mn steels gave somewhat similar results, except that alloys with over 15% Mn are non-magnetic. Steels with about 5 to 10% Mn are non-magnetic at room temp. but become magnetic on immersion in liquid air. The diagram for Mn steels is similar to that for Ni steels, except that much smaller amts. of Mn are involved. Fe-Cr alloys must contain C in order to harden by quenching in liquid air. Magnetic tests showed that the A_2 point of Fe-Cr alloys decreased with increasing Cr. Cr carbide when dissolved at high temp. in the steel does not sep. at ordinary rates of cooling, and the transformations are correspondingly affected. In steels with 0.7% C the expansion curves showed that the $Ac_{1,2}$ point is raised by increasing Cr. The structural diagram of the Cr steels shows fields bounded by sloping lines, and annealing changes the diagram decidedly. GEO. F. COMSTOCK

Silicon steel. W. E. RUDER. *Blast Furnace & Steel Plant* **13**, 473-5(1925).—R. reviews the development of Si steels and discusses their mech. and magnetic prop-

erties. *Resistivity* increases 11.4 microhms for every % Si, and the soly. of Fe for C is limited to 0.008% with Si up to 5%. The *saturation value* is decreased from $B = 22,300$ for pure Fe to $B = 20,200$ for 4% Si, and the alloy increases in brittleness. Grades of Si steels are discussed.

H. STOERTZ

Influence of some elements on the spheroidization of carbides in steel. TOMIMATU ISIHARA. *Sci. Repts. Tohoku Imp. Univ.* 14, 377-90(1925).—Previous work on the causes of spheroidized cementite is first discussed. Heating must be at least up to the A_1 point to permit spheroidization, or the sepn. of lamellar pearlite must be effected by mech. treatment. Spheroidized cementite is less likely to occur in eutectoid steel than in other steels. The temp. range above A_1 in which spheroidal cementite appears is larger if the grain-size is coarse, or if the soln. of carbide is hindered by the presence of other elements. Lamellar steel specimens were heated to different max. temps. and cooled at 2° per min. around A_{c1} to study spheroidization. The presence of Mn in steels was found to widen the spheroidizing interval of temp. With const. Mn, it increased slightly with C up to the eutectoid concn., and rapidly above that. Cr increased the spheroidizing interval more than Mn. The spheroidized structure was finer and easier to produce in Cr steels. Cu produced a coarser spheroidized structure, and its effect on the spheroidizing range was intermediate between those of Mn and Cr.

GEO. F. COMSTOCK

Variation with temperature of the resistance to tensile shocks of ordinary mild and hard steels. J. COURNOT AND K. SASAGAWA. *Compt. rend.* 181, 1065-6(1925).—Tests were carried out with an ordinary 30-kg. Charpy pendulum, fitted with a special elec. furnace so that the test bar was ruptured inside the furnace. An extra-mild (C 0.04, Mn 0.57, Si 0.005, S 0.04, P 0.11) and an extra-hard steel (C 0.97, Mn 0.41, Si 0.19, S 0.004, P 0.02) were tested, after annealing 10 min. at 830° and 800° and cooling slowly. The impact energy, T , per unit of useful vol. (in kg./cc.) and the elongation %, A , of this part of the bar were detd. for temps. of $20-800^\circ$. T has a max. at 200° and another at 625° and 700° for the mild and hard steel, resp., with corresponding min. at 500° and 600° . The "mean unitary tension," T/A , was not found to correspond to the breaking load in ordinary tensile-strength tests. Much more complex results were obtained with a steel contg. C 0.62, Ni 25.5%. A. P.-C.

Modern developments in steels resistant to corrosion. W. H. HATFIELD. *Engineering* 120, 657-60(1925).—A paper presented before the Institution of Engineering Inspection. The theories of corrosion are briefly described. The modern conception is that the nature of the first thin oxide film det. the subsequent chem. action. Corrosion tests are always disturbed by accelerating or retarding factors, such as contact of the specimen with a solid body, improper aeration, or change in compn. of the medium. Expts. were conducted with specimens 1 cm. in diam. weighing 50 g. polished with 00 emery, and totally immersed in 70 to 80 cc. of liquid. A tabular summary of the qual. action of 22 alloys in 14 liquids at a temp. of 15° is given. All ordinary alloy steels corrode in water and acids, but to different degrees. The losses of various Cr and Ni steels in acids of different temps. and concns. are given in tables. Ni and Ni steels are resistant to H_2SO_4 and Cr and Cr steels to HNO_3 . Ni also increases the resistance of Cr steels to HCl. Steel with 18% Cr and 8% Ni, called "Staybrite" is more resistant to general corrosion than 12 to 14% Cr steel, and especially so in alternate exposure to sea-water and air. It is austenitic and is not hardened like the Cr "stainless steels" but becomes very ductile when quenched, being more susceptible to cold deformation than the low-C, high-Cr "stainless iron." Staybrite steel has a high impact resistance, and retains its strength well at high temp.; its coeff. of expansion is high and it is non-magnetic. The mech. properties of the stainless steels are given in a brief table. Some illustrations are given of applications of the ductile Staybrite steel. It can be welded by fusion methods, and after cleaning the corrosion resistance at the weld is not impaired. The cost of production is bound to be high, even with a large output, because of the comparative scarcity of Cr.

GEO. F. COMSTOCK

Experience with steel-melting units. I, II. JOHN SONNENFELD. *Foundry* 53, 964-5, 1009-10(1925).—Details of good melting practice for converter and acid elec. steel castings are given. S in converter metal may be kept low by using high-Mn, easy-melting pig and as little coke as possible in the cupola. Scrap for the acid elec. furnace should contain about 0.18% C and 0.20% Mn when melted. If the furnace doors are tightly sealed, N may be absorbed by the steel. The proper use of lime in the slag is explained.

GEO. F. COMSTOCK

Zinc and the problem of corrosion. A. BILLAZ. *Industrie chimique* 12, 202-5, 440-2, 541-3(1925).—A review of the theories of corrosion and of work done on the corrosion of Zn.

A. PAPINEAU-COUTURE

Testing metals for aircraft. N. S. OTEY. *Iron Age* **116**, 1660-4, 1797-1800 (1925).—Uniformity of material is necessary in order that samples may be representative. Piping and segregation are more prevalent in Al alloys than in steel. With mild steel test specimens of $\frac{1}{2}$ in. diam. between shoulders, the tensile stress decreased and the reduction of area increased as the gage length increased from zero to 1 in.; further increase in gage length gave no change in properties. Flattened sections of steel tubing showed less elongation than full-section specimens of the same tubes. Abnormal stresses occur in tensile specimens near the shoulder, and the gage length must be kept further away from the shoulder as the shoulder radius is increased. Tests of different-shaped specimens of duralumin sheet from 0.015 to 0.25 in. thick showed that too short a gage length resulted in low values for elongation and high strength values, while too wide a specimen gave the opposite effect. Another series of tests showed that the deformation in tension increased with the width-thickness ratio. These results are presented in tables and diagrams. Loading should be accomplished with positive and even gripping through some universal socket arrangement, and at the proper speed. Specifications are given for sampling, prep. specimens of sheets, bars, tubes, castings, etc., and for testing methods in tension, bending, impact, etc., with sketches showing all important details. GEO. F. COMSTOCK

Hardness of metals. J. J. CLARK. *Iron and Steel of Canada* **8**, 107-8 (1925).—A simple description of hardness testing by the scratch, Brinell and scleroscope methods; the limitations of each are noted. Abbott's formulas for computing tensile strengths of various steels from Brinell or scleroscope numbers are given. GEO. F. COMSTOCK

Quaternary alloys. N. PARRAVANO. *Bull. soc. chim.* [4], **37**, 1485-521 (1925).—An address expounding the fundamental principles of the method of study of quaternary alloys by means of tetrahedral coordinates showing their application in the study of these alloys to date and indicating lines of further study. A. PAPINEAU-COUTURE

Relation between the color and the chemical composition of alloys. ERNEST PANNAIN. *Rass. min. met. chim.* **63**, 133-6 (1925).—Descriptive, including numerous examples. The subject combines a utilitarian and a theoretical importance. C. C. DAVIS

Effect of cold-working and annealing on some physical properties of copper, aluminium and their alloys. TSUTOMU MATSUDA. *Sci. Repts. Tôhoku Imp. Univ.* **14**, 343-76 (1925).—The effects of rolling, drawing and twisting at ordinary temp. and of subsequent low-temp. annealing on Cu, bronze, brass, Al, duralumin, etc. were studied by tensile tests and measurements of hardness, elec. resistance and expansion. Cold rolling increased the tensile strength and decreased the elongation, more in a transverse than in a longitudinal specimen. Low-temp. annealing removed all differences. The elec. resistance was increased by cold-rolling, similarly in transverse and longitudinal specimens. Cold-drawing and twisting gave similar results. The increased resistance is not due to more regular orientation of the crystals, or to the formation of minute cracks, but may be due to the straining of the space lattice. When cold-rolled plates or cold-drawn rods were heated, abnormalities in the rate of change of resistance occurred around 200° and around 320°. The latter was the temp. of recrystn. and the former marked the beginning of strain-release and was accompanied by slight changes in tensile properties but not in microstructure. Cold working has been found to cause a small decrease in density. Cold-worked specimens were heated in a tube furnace and changes of length up to 500° were compared with similar changes for annealed specimens, the results being shown by curves. Two points of abnormal change were found, at about the same temps. as the points noted above for elec. resistance and they were explained in the same way. Longitudinal specimens showed abnormal expansions, and transverse specimens contractions. In the rods the abnormal change in length began at a lower temp. and was much greater, the difference being due to internal stress. It is concluded that strain produced in the space lattice by cold working contributes to variation in elec. resistance and length. GEO. F. COMSTOCK

Mechanical tests at high temperatures on a non-ferrous alloy of nickel and chromium. H. J. TAPSELL and J. BRADLEY. *Engineering* **120**, 614-5, 648-9, 746-7 (1925).—A brief review is given of previous investigations of creep or flow of metal at high temp. under small loads. An alloy of about 80% Ni and 20% Cr was tested in the "as-rolled" condition, the results being presented in tables and diagrams. Tensile tests made at the usual speed showed that all properties are well maintained up to about 400°, but drop sharply between 500° and 800°. Creep at high temp. makes the value of the tensile strength depend on the speed of testing. Creep may persist for weeks at a low stress until fracture occurs. Creep was investigated by applying different stresses to different specimens at definite temps. between 500° and 800°, and measuring the elongation each

day with an extensometer. The limiting creep stress was detd. as the highest stress under which a continual elongation did not persist at a const. temp. This varied from about half the tensile strength at 500° to about one-tenth at 800°. Torsion tests were made at the same speed and temps. as the ordinary tensile tests, showing similar changes in strength. The angle of twist, and the Charpy impact resistance showed max. at 200°. The Brinell hardness was detd. at room temp. and correlated with results from the Edwards impact hardness test at room and high temp. The hardness decreased with slight irregularity as the temp. rose to 700°. Fatigue tests with the Haigh machine at zero mean stress showed small variations in fatigue range, which was no lower at 700° than at room temp. Comparing these results with those obtained in similar tests by others on various alloys showed that at 350° the tensile strength of the Ni-Cr alloy was about the same as that of high-Cr steel or high-speed steel, but above 350° the Ni-Cr alloy was stronger. In creep tests the Ni-Cr alloy was superior to all other alloys tested at high temp. under steady loading. In torsion strength above 300° and in impact resistance at all temp. it was superior to alloy steels, but its fatigue range was consistently lower than that of a Ni-Cr steel. GEO. F. COMSTOCK

Variation in elastic properties with chemical composition of alloys. P. CHEVENARD AND A. PORTEVIN. *Compt. rend.* 181, 780-2(1925).—Physical properties, such as hardness, thermoelec. power, resistivity and its temp. coeff., when examd. in a series of alloys as functions of the chem. compn., show different variations according as the alloys are composed of two definite phases or a solid soln. C. and P. have investigated the variations of elastic properties in such series. The modulus of elasticity varies very slightly and uniformly with chem. compn. and is not much affected by the structure, with a possible exception in the Fe-Ni alloys with over 26% Ni at temps. where their transformations are not complete. The thermoelastic coeff. varies practically as a straight line in the Fe-C alloys, but not in series of solid solns. such as Ag-Au, for which the curves are shown. The reduction of area at the elastic limit is considerable for pure Fe, but drops rapidly with C up to about 0.2%, remaining const. in annealed steels with higher C. In quenched steels it is higher, with a mix. at the eutectoid compn. In solid solns. (Ag-Au) it is lower than for the pure metals, small alloy addns. causing a rapid drop. It is concluded that the modulus of elasticity is a mol. property, and cannot be raised, like the elastic limit or hardness, by alloying or treatment. G. F. C.

Sand-cast aluminium-manganese alloys. SAMUEL DANIELS. *Ind. Eng. Chem.* 18, 125-30(1926).—The compn. and characteristics of Al-Mn alloys are discussed. The mech. properties of binary sand-cast Al alloys are not improved by heat treatment. More than 2% Mn increases the shrinkage, the unsoundness and the difficulties in machining. The Mn does not affect the normal resistance of c. p. Al to salt-spray corrosion and probably improves the resistance in ternary and more complex alloys. Al-Mn alloys are less resistant to corrosion by distd. water than to that by salt-spray. Metallographic examn. of the as-cast alloy after addn. of 0.5% Mn showed the presence of tiny blue-gray colonies of a new compd., possibly MnSi. Several tables, curves, and photomicrographs are shown. W. H. BOYNTON

Aircraft castings in aluminium alloys. SAMUEL DANIELS. *Am. Foundrymen's Assoc. Preprint* No. 471, 22 pp.(Oct., 1925); *The Foundry* 53, 1003-6(1925).—The 6 Al alloys used by the U. S. Air Service for castings are described in detail and specifications for the raw materials used are given. The methods for making the hardeners used for introducing Cu, Ni, Fe and Si into the alloys are described. The alloy with 8% Cu is most commonly used, being easy to cast and machine, though low in strength and ductility. The alloy with 10% Cu, 1.25% Fe and 0.25% Mg maintains its strength and hardness well at high temp. It may be strengthened by heat treatment, but has low ductility. The alloy with 2.5% Cu, 1.25% Fe and 0.5% Mg has a better combination of strength and ductility. The alloy with 5% Cu and 1% Si is hard to cast without cracking, but after heat-treatment has excellent strength and ductility. The alloy with 4% Cu and 3% Si is excellent for complicated or difficult castings, but is not easily machined. The alloy with 4% Cu, 2% Ni and 1.5% Mg is used for castings subjected to high temps. and has excellent strength and machinability after heat-treatment. The structures are illustrated by excellent photomicrographs. Specifications for castings and test-bars are given. GEO. F. COMSTOCK

The behavior of inhomogeneous aluminium castings on cold rolling. E. SEIDL AND E. SCHIEBOLD. *Z. Metallkunde* 17, 221-6, 320-8, 365-8(1925).—From commercial bars of Al (10 × 10 × 125 cm.) contg. 0.2% Si and 0.3% Fe small cubical samples were cut and were studied microscopically, mechanically and by means of X-rays. The castings showed a radial structure of long fibers extending from the outside towards the center, while the core consisted of a conglomerate of rounded grains. Samples

were taken from the outside (zone of nuclei), from the center and from the fibrous material in between. These three zones showed distinct differences on etching and also differed in Brinell hardness. In the center the (av.) hardness was 16.5, on the outside 20 and in the fibrous structure 18.8. Laue diagrams of these 3 zones indicated that in the outer zone considerable stresses existed as shown by the pronounced asterism of the interference points. In the fibrous zone and in the interior the stresses have largely been equalized during cooling and as a result the tendency towards asterism is much less. Annealing destroyed the phenomenon of asterism. The effect of increasing degrees of cold rolling (25, 70 and 99% deformation) on pieces cut in the direction of the fibers, crosswise and vertically, is illustrated by a series of interesting Laue diagrams. The rods cut lengthwise reach the "rolling texture" most readily as proved by the very symmetrical arrangement of the asterism in the Laue diagram while those cut vertically show the least symmetrical arrangement. A detailed macroscopic study was made, illustrated by numerous sketches and photographs, of the deformation of the castings when subjected progressively to cold rolling. H. S. v. K.

The economy in the electric arc welding of ingot iron. KARL MELLER. *Siemens-Z.* 5, 457-64(1925).—The recent increasing application of the elec. arc for welding of ingot iron is merely due to a better economy in the working method. This welding is at present only undertaken with metal electrodes, directly molten into the seams. Data in regard to technology and efficiency are given in detail, followed by a series of diagrams. For the comparison of expenses with autogenous welding an example is given in the welding of an oil tank, made from 8-mm. plate, 2 m. high and 1.3 m. diam. The elec. arc welding showed an actual saving of 50.6%. D. THUESSEN

Cooling fractures in journal brasses. R. R. CLARKE. *Metal Ind.* (N. Y.) 23, 448(1925).—Cracks in journal brass castings are not always due to cooling strains, shrinkage, or improper gating. Pressure of steam from the mold is a frequent cause of cracking while the metal is plastic and weak. A thin facing of hard impervious sand to keep the pressure of gas from the mold away from the casting prevented cracking as well as mold erosion. GEO. F. COMSTOCK

Operating conditions in the open hearth as they affect the life of refractories (SMITH) 19. Refractory problems of the malleable-cast iron foundry (SCHWARTZ) 19. Refractory requirements in the gray-iron foundry (MOLDENKE) 19. Effect of variations in cupola practice on the life of refractory blocks (MACKENZIE) 19. Desulfurization of heavy metal sulfides with BaO (BILTZ, MÜHLENDahl) 6. Compounds and alloys of Ti with Al (MANCHOT, LEBER) 6. Effect of tension on the transverse and longitudinal resistance of metals (BRIDGMAN) 2. Lattice arrangement in deformed metal crystals and crystal agglomerations (SACHS, SCHIEBOLD) 2. Chemical equilibrium between lead sulfide and its roasting products (SCHENCK) 2. Distillation of amalgams (MIRTHE, STAMMREICH) 2. Apparatus for filtering metallurgical solutions (U. S. pat. 1,570,374) 1.

COUTAGNE, A.: **Fabrication des Ferro-alliages.** Published under the direction of L. Guillet. Paris: J. B. Baillièrre et Fils. Fr. 60. Reviewed in *Rev. prod. chim.* 28, 799(1925).

HADFIELD, R. A.: **Metallurgy and Its Influence on Modern Progress. With a Survey of Education and Research.** London: Chapman & Hall, Ltd. 388 pp. 25s.

MAASS, EMIL: **Korrosion und Rostschutz.** Berlin, S. W. 19: Beuth Verlag. 35 pp R. M. 1.

REGELSBERGER, F.: **Chemische Technologie der Leichtmetalle und Ihrer Legierungen.** Chemische Technologie in Einzeldarstellungen. Edited by A. Binz. Leipzig: Otto Spamer. 385 pp. Price, paper, G. M. 26; bound, G. M. 29.

Treating ores. D. C. HARE. Brit. 234,524, May 26, 1924. Ores are roasted to form sol. compds. and volatilized substances are conveyed from the roasting furnace for recovery of their values. The residue is subjected to leaching. NaCl and S, the latter if not present in sufficient quantity in the ore itself, are used in the roasting. CaCl₂, MnO₂, vanadic acid or Ce nitrate also may be added as may also Cl (activated by ultra-violet rays). Treatment of Pb, Zn, Cu, Ag and Au ores is referred to. With Au, C is also added to the charge to prevent the formation of S chloride and AuCl₃ is then produced by the action of CCl₄ which is formed. An app. is described.

Treating iron ores. MASCHINENBAU-ANSTALT HUMBOLDT. Brit. 234,377, Nov. 11, 1924. Low-grade Fe ore contg. a large proportion of SiO₂ is roasted at a temp. insufficient to cause sintering and quenched in H₂O. The product is subjected to rub-

bing to sep. ore particles from SiO_2 and then to washing and magnetic and mech. sepn.

Treating sulfide ores. F. KRUPP AKT.-GES. GRUSONWERK. Brit. 234,826, May 30, 1924. Sulfidic ores or similar materials contg. volatilizable metals such as Zn, Pb, Sn, Bi, As and Sb are decomposed, in one operation at a high temp. without previous roasting, to effect volatilization of the metals and combination of the S with the residue. The oxidation of the metallic vapors may then be effected immediately or as a sep. operation. Raw ore is mixed with coke or other reducing material to maintain a strong reducing atm. in the material itself and a neutral atm. adjacent the particles of material so that oxidation of S is avoided. Temps. of $1250\text{--}1400^\circ$ are suitable. Alk. compds. may be added to fix the S; and refractory material such as Al_2O_3 , SiO_2 or limestone may be added to prevent liquefaction of the charge.

Briquetting ores. A. CARLSON. Brit. 233,731, May 10, 1924. "Purple ore," burnt pyrites or other material contg. Fe_2O_3 is mixed with 2-3% CaO and pressed into briquets which are hardened by steam.

Refining copper-nickel mat. R. L. PEEK and T. F. TORELL. U. S. 1,569,137, Jan. 12. In utilizing bessemerized Cu-Ni mat, Cu is sepd. from Cu-Ni sulfate solns. by cementation upon an excess of the mat, the greater part of the Cu is removed from the partially exhausted mat and from the residue there is produced Cu-Ni sulfate soln. for treatment of a further quantity of bessemerized mat.

Gas-fired furnace for blast-furnace boilers, Cowper apparatus, etc. ASKANIA-WERKE AKT.-GES. VORM. CENTRALWERKSTATT-DESSAU UND C. BAMBERG-FRIEDENAU. Brit. 234,791, May 31, 1924.

Thermostatic control device for gas supply to furnaces for melting metals, etc. C. F. H. BOHNHARDT. U. S. 1,569,312, Jan. 12.

Furnace for melting brass, type metal, etc. W. H. CHENOWITH and G. C. SCHIMPF. U. S. 1,569,314, Jan. 12.

Hardening copper. L. NEMITOF. U. S. 1,569,130, Jan. 12. Cu heated to bright redness is embedded in a mixt. moistened with mineral distillate oil or other hydrocarbon material and comprising sand or similar siliceous substance and ground bone or other material contg. Ca phosphate.

Producing aluminium, copper or other metals in powdered form. E. J. HALL. U. S. 1,569,484, Jan. 12. While disintegrating metal in a ball mill or the like it is kept covered with "varnoline" (a petroleum distillate) or with a protective lubricating liquid of similar properties with respect to facility of sepn. by evapn.

Granulating metals. HARTSTOFF-METALL AKT.-GES. (HAMETAG). Brit. 233,720, May 7, 1924. Molten metal is fed into the path of a rapidly rotating beater and the subdivided metal thus formed is projected into tetralin, paraffin or other inert material. The beater may be surrounded by CO_2 or other inert gas.

Magnetic silicon iron. V. B. BROWNE. U. S. 1,570,229, Jan. 19. A Si Fe with a sufficient Si content to adapt it for use as a magnetic alloy and a C content of not over 0.03% is made by reducing the C in refined Fe by making additions of Fe ore to the bath until no further reduction of C is effected by these additions, then causing air or other oxidizing gas to permeate the bath until substantially all the remaining C is removed and making the necessary Si additions to the metal.

Decarburizing iron or other metals. P. J. MARTIN and G. F. BERTELS. Brit. 234,434, May 23, 1924. In decarburizing Fe, Cr, Mo, U, V, etc., by CO_2 the materials are heat-treated in the presence of metallic oxides capable of transforming the CO formed during the decarburizing process into CO_2 . Oxides of Sn or Zn may be used, or ferric oxides, mixed with inert materials, e. g., SiO_2 , Al_2O_3 or lime and the CO_2 used may be pure or may contain N or other inert gases.

Casting iron. MEIER and WEICHEL. Brit. 234,106, May 13, 1924. To insure the solidification of Fe in a finely divided state, the rate of cooling the casting is varied according to the Si and C content. Fe contg. 3% Si may be cast in a chill. If white Fe or pearlite is found in the casting it is heated for a short time to convert them into ferrite.

Degassing and deoxidizing steel. S. PEACOCK and N. E. COOK. U. S. 1,570,176, Jan. 19. Molten Fe or steel is treated with anhyd. tri-Na aluminate, forming compds. with any eutectoids present that melt in the metal and liberating any compds. of O and C that are associated with the eutectoids.

Annealing sheet steel. G. H. COLE. U. S. 1,569,355, Jan. 12. Sheets of magnetic Si steel alloy are heated to a temp. not above 700° in an atm. contg. C in about the same proportion to N as in air, and then cooled.

Furnace for annealing sheet steel, etc. G. H. COLE. U. S. 1,569,356, Jan. 12.

Furnace for annealing metal plates and sheets. E. WIRZ. U. S. 1,569,444, Jan. 12.

Tellurium for refining or modifying metals. A. I. Pocock, C. T. CALVER and W. H. WATKINS. Brit. 234,547, Feb. 27, 1924. In treating Al, Al-Cu alloys or other metals (excepting Pb and alloys contg Pb) Te is introduced beneath the surface of the molten metal in powd. form or alloyed with other metals such as Cd, Ca, Cr, Cu, Au, Fe, Mg, Mn, Ni or Zn or, in some cases, Si or W. The added material may be enclosed in metal foil or sheet.

Crucibles for melting metals. A. J. JACKMAN. U. S. 1,570,064, Jan. 19. Crucibles for melting steel or other metals with accompanying slag formation comprise a graphitic body portion adapted to contact with the bulk of the metal and a portion of chromite, sillimanite, zirconia, spinel, zircon or other more resistant material adapted to contact with the slag and withstand its action.

Treating lead and other metals with phosphorus. AMERICAN MACHINE AND FOUNDRY CO. Brit. 234,618, June 19, 1924. Pb-P alloy is made by heating Pb with P at 650° in an inert gas and this alloy is used for treating additional Pb or other metals.

Magnesium. B. E. F. RHODIN. Brit. 234,074, May 13, 1924. See U. S. 1,539,955 (C. A. 19, 2184).

Alloy steel. J. I. MEE. U. S. 1,569,996, Jan. 19. An alloy adapted for making hard bearings, burglar-proof vaults, etc., is formed from W 65-68, V 2, C 4, Cr 2-5, S 0-1, Cu 3-5, Ir 0-3, Co 0-4 and pig Fe 14-18%.

Alloy for pen points. M. M. GOLDSMITH. U. S. 1,569,921, Jan. 19. Os 65-85 is alloyed with Ru 10-20 and Ni 3-10 parts.

Welding copper with zinc, tin, etc. ELECTRO-METALLURGICAL CO. Brit. 233,395, May 26, 1924. A welding rod or the like (for welding Cu or Cu alloys to Zn, Sn, etc.) is formed of an alloy of Cu with Si 0.5 or less (in no case over 4%) or with Mn 0.5-1.0 and Si 0.3-0.8%. An alloy of Cu with over 5% Si may be used for filling up holes in castings.

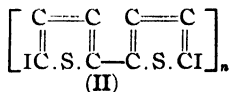
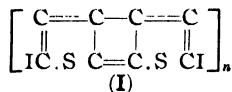
Pressure-molding of heavy fusible metals from crucibles. E. PETERSSON. Swed. 59,978, Dec. 8, 1925. A tube of refractory material, for instance SiO₂ glass, is built within the wall of the crucible communicating with the metal bath through a hole near the bottom of the crucible and provided with a nozzle for connecting it to the mold.

Ingot mold. E. GATHMANN. U. S. 1,570,473, Jan. 19.

10--ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Some substances analogous to graphite. R. CIUSA. *Gazz. chim. ital.* 55, 385-9.—Ciamician and Ciusa (C. A. 15, 2838) showed that C₆, C₈S, C₄NH can exist. Such compds. would tend to polymerize giving (C₆)_n, (C₄S)_n, (C₄NH)_n and (C₄O)_n, *i. e.*, common graphite and graphite of thiophene, pyrrole and furan, resp. Pauly and Waltzinger (C. A. 8, 127) obtained somewhat similar products. C. heated indole at 150° *in vacuo* and obtained (2C₄NH)_n, which is an intermediate compd in the prepn. of graphite of pyrrole. Tetraiodothiophene (Paolini, C. A. 10, 1972) heated 2-3 hours, *in vacuo* loses 3 I atoms at 340°, giving I or II. The I was not all eliminated even at 490° but



at 450° in a current of CO₂ (free from O₂) all I was removed. The graphite (C₄S)_n thus obtained is another sulfide of C to be added to those known: CS, CS₂, C₂S₃, C₃S₂, C₆S₂. Furan reacts easily with Hg(OAc)₂ giving the tetraacetate. The latter was converted into the chloride and this with KI gave tetraiodofuran (III), m. 145°. Heated in the sealed tube and then in a current of CO₂ III loses all of its I and some O. The pure graphite of furan was not obtained. Hexaiodobenzene heated in the sealed tube to 400° gives a product contg. 46.33% I. This product heated to redness in CO₂ lost all I and gave the graphite of benzene, which is quite similar to ordinary graphite. The conversion of ordinary C into graphite requires very high temps. while the temps. used here are relatively low.

E. J. WITZEMANN

Oxidation of ethyl ether to oxalic acid in presence of uranyl nitrate. S. W. ROWELL and A. S. RUSSELL. *J. Chem. Soc.* 127, 2900-2(1925).—Et₂O (60 g.), 60 g. UO₂(NO₃)₂ and 20-60 g. H₂O, exposed to bright sunlight for 24 hrs., give up to 12 g. of UO₂C₂O₄.

2H₂O. In certain expts. a light yellow basic oxalate, U(OH)₄·UO₂C₂O₄·2H₂O(?), was formed. When UO₂(NO₃)₂ in Et₂O is neutralized so that a ppt. is just not formed and exposed to sunlight for a few hrs., there results a black or greenish black slimy ppt. of U(OH)₄. A suggested mechanism of the above reaction is given. C. J. W.

Hydroxy and ethoxy mercaptans and their condensation products. C. A. ROJAHN AND GUSTAV LEMME. *Arch. Pharm.* **263**, 612–24 (1925).—In a study of various reactions looking to the prepn. of hydroxy and ethoxy mercaptans and certain related products of possible hypnotic nature, the following compds. were prepd. and characterized. 1,3-Bisethylmercapto-2-propanone, CO(CH₂SEt)₂, from CO(CH₂Cl)₂ and EtSH, b₁₆ 117–21° (semicarbazone, C₈H₁₇N₃S₂O, m. 98–9°; dimethiodide, C₉H₂₀S₂I₂O, m. 182°). 1,2,2,3-Tetrakisethylmercapto propane, C(SEt)₂(CH₂SEt)₂, b₁₆ 51–3°. γ -Ethoxypropyl mercaptan, EtOCH₂CH₂CH₂SH, from EtOCH₂CH₂CH₂Br and KSH, b₂₀ 52–4°. γ -Ethoxypropyl benzyl sulfide, EtO(CH₂)₃SCH₂Ph, b₁₉ 161°; γ -ethoxypropyl benzyl sulfone, EtO(CH₂)₃SO₂CH₂Ph, m. 45–6°. Acetone di- $[\gamma$ -ethoxypropyl] mercaptole, Me₂C(SCH₂CH₂CH₂OEt)₂, from AcMe and EtO(CH₂)₃SH by the action of ZnCl₂; methyl ethyl ketone di- $[\gamma$ -ethoxypropyl] mercaptole, MeEtC(SCH₂CH₂CH₂OEt)₂. γ -Hydroxypropyl mercaptan, HOCH₂CH₂CH₂SH, from Cl(CH₂)₃OH and NaSH, b₁₆ 85–90° (dibenzozate, C₁₇H₁₆SO₃, oil), yields on boiling with fuming HCl dihydrodimethylenglycol mono- $[\gamma$ -chloropropyl] ether, HS(CH₂)₃S(CH₂)₃Cl, oil (benzoate C₁₃H₁₇OS₂Cl, oil); γ -hydroxypropyl disulfide, S₂(CH₂CH₂CH₂OH)₂, (dibenzozate C₂₀H₂S₂O₄, oil); γ -hydroxypropyl benzyl sulfide, HO(CH₂)₃SCH₂Ph, b₂₀ 185–8° (benzoate C₁₇H₁₆SO₃, oil); acetone di- $[\gamma$ -hydroxypropyl] mercaptole, Me₂C(SCH₂CH₂CH₂OH)₂, (dibenzozate C₃H₂S₂O₄, oil); methyl ethyl ketone di- $[\gamma$ -hydroxypropyl] mercaptole, MeEtC(SCH₂CH₂CH₂OH)₂, oil, (dibenzozate C₂₄H₃₀S₂O₄, oil); benzaldehyde di- $[\gamma$ -hydroxypropyl] mercaptal, PhHC(SCH₂CH₂CH₂OH)₂, oil (dibenzozate C₂₇H₂₈S₂O₄, oil). Diacetate of β -hydroxyethyl mercaptan, AcOCH₂CH₂SAC, b₂₅ 118–20°; β -ethoxyethyl mercaptan, EtOCH₂CH₂SH, b₁₅ 37–40°; β , β' -di- $[\beta$ -ethoxyethyl] disulfide, S₂(CH₂CH₂OEt)₂, b₁₅ 150–2°; β -ethoxyethyl benzyl sulfide, EtOCH₂CH₂SCH₂Ph, b₁₆ 146°; methyl ethyl ketone di- $[\beta$ -ethoxyethyl] mercaptole, MeEtC(SCH₂CH₂OEt)₂.

W. O. E.

Addition of alkali alcoholate to acid esters. I. ADICKES. *Ber.* **58B**, 1992–9 (1925).—The formation of alkali alcoholate addn compds. with acid esters as intermediate products has been assumed in a no. of reactions. In all these cases the basis for such an assumption has been the addn. products of benzoates described by Claisen (*Ber.* **20**, 651 (1887)), the existence of which, however, as shown below, can as a matter of fact not be proved at all. When alc.-free NaOEt in dry Et₂O suspension is treated with somewhat less than 1 mol. (CO₂Et)₂, much heat is evolved and 1 equiv. NaOEt dissolves; after a short time the mixt. is rapidly filtered and the soln. evapd. *in vacuo*, protected from moisture. The solid product (I) so obtained has the compn. (CO₂Et)₂·NaOEt, and is very hygroscopic and unstable. It yields EtO₂CCO₂Na, not by splitting off Et₂O but as the result of the hydrolytic action of traces of moisture, even in a H₂SO₄ desiccator, when allowed to stand a long time, and is no longer sol. in Et₂O. It decomp. about 115° with formation of CO and Et·CO₂; the residue reacts strongly alk. and contains much (CO₂H)₂. It undergoes a similar decompn. in hot xylene. In Et₂O it at once gives with dry CO₂ a gelatinous ppt. of NaEtCO₃. With H₂O it gives (CO₂Na)₂ and (CO₂Et)₂ while with acids free from H₂O it yields (CO₂Et)₂ and the Na salt of the acid. With CS₂ it yields EtOCS₂Na. No hemi-ortho-oxalate can be obtained with EtBr or Me₂SO₄. The addn. product of NaOMe to (CO₂Et)₂ has the compn. C₇H₁₅O₆Na, gives with H₂O an equimol. mixt. of EtO₂CCO₂Na and MeO₂CCO₂Na and in Et₂O with dry CO₂ mixts. of NaMeCO₃ + NaEtCO₃ and EtO₂CCO₂Me + (CO₂Et)₂. The addn. product, C₆H₁₁O₆Na, of NaOEt to (CO₂Me)₂ behaves in the same way. There is therefore no evidence against the formulation EtO₂CC(OEt)₂ONa for I; that no hemi-ortho-oxalate can be obtained from it may be explained by assuming an equil., EtO₂CC(OEt)₂ONa \rightleftharpoons (CO₂Et)₂ + NaOEt, which, even if shifted almost completely to the left, would prevent the formation of the hemi-ortho-oxalate on account of the much greater reaction velocity between the NaOEt and the EtBr. Not more than 1 mol. NaOEt can be added to (CO₂Et)₂. The KOEt addn. product is markedly less stable than I; it reacts vigorously with H₂O with partial destruction of the (CO₂H)₂, and even on slower decompn. by moisture it gives no EtO₂CCO₂K. The properties of these addn. products are entirely different from those of Claisen's compds. The substance obtained from BzOEt and NaOEt on the H₂O bath, when washed with Et₂O, contains 31.6–26.1% Na, depending on the length of heating, and that it is really a mixt. of NaOEt and gelatinously pptd. NaOBz was confirmed by detg. the amt. of Na present as NaOEt by titration; calcn. then showed that the rest of the Na could be present only as NaOBz. That the substances obtained by C. from BzOMe + PhCH₂ONa,

$\text{BzOCH}_2\text{Ph} + \text{NaOEt}$ and $\text{BzH} + \text{NaOEt}$ consist of NaOBz , often mixed with some Na alcoholate, was found by A. in a series of expts. carried out before he was aware of the work of Tishchenko (C. A. 7, 777), who reached the same conclusions. C. A. R.

Transformation induced by solar light in the presence of uranic compounds. MME. J. ALOY AND A. VALDIGUIÉ. *Bull. soc. chim.* 37, 1135-40(1925); cf. C. A. 16, 1905; 17, 2705.—When various org. compds. are mixed with 5% U salt solns. in glass tubes and exposed to sunlight for a few hrs., the ease with which a violet ppt. of $\text{U}_3\text{O}_8 \cdot 2\text{H}_2\text{O}$ is formed serves as a standard of comparison of their relative stability. The discoloration of methylene blue is another test of reducing power. Substances with satd. C-C linkages in general were most resistant to catalytic decompn. by U salts. Aldehydes gave positive results, but ketones were resistant to change. Ethylenic compds. gave abundant violet ppts. This evidence supplements knowledge of stability gained from chem. behavior. H. R. MOORE

The higher methyl ketones. G. T. MORGAN AND EUSEBIUS HOLMES. *J. Soc. Chem. Ind.* 44, 491-2T(1925); cf. C. A. 19, 2807.—Behenic acid (I), m. 83°, was prep'd. by reduction of erucic acid with H in the presence of colloidal Pd. Distn. of the mixed Ba salts of I and AcOH yielded *Me n-heneicosyl ketone* (II), m. 66.5°. Oxidation of II with $\text{Na}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 yielded *heneicosic acid* (III), m. 74°; Me ester m. 49.5°. Distn. of the Ba salt of III with $(\text{AcO})_2\text{Ba}$ yielded *Me eicosyl ketone*, m. 63.5°. T. S. CARSWELL

The crossed Cannizzaro reaction. III. CHUSETSU ENDOH. *Rec. trav. chim.* 44, 866-75(1925).—(In German.) Cannizzaro's reaction takes place thus: $2\text{RCHO} + \text{HOH} \rightarrow \text{RCH}_2\text{OH} + \text{RCO}_2\text{H}$. Nord (C. A. 14, 3677; 17, 1526; *Beitr. Physiol.* 2, 301(1924); (and Nakai) C. A. 19, 2807) have described a mixed or crossed Cannizzaro reaction involving 2 aldehydes: $\text{R}'\text{CHO} + \text{R}''\text{CHO} + \text{HOH} \rightarrow \text{R}'\text{CH}_2\text{OH} + \text{R}''\text{CO}_2\text{H}$ (or $\text{R}''\text{CH}_2\text{OH} + \text{R}'\text{CO}_2\text{H}$). The existing literature and views on the significance of this reaction in chemistry and biology are carefully reviewed. The aldehydes may also be considered as adding to the alcoholate used: $\text{R}'\text{CHO} + \text{R}'\text{OM} \rightarrow \text{R}'\text{CH}(\text{OM})\text{OR}^\circ$ (I); $\text{R}''\text{CHO}$ then adds to I, giving $\text{R}'\text{CH}(\text{OR}^\circ)\text{OCHR}''(\text{OM})$, which decomps. giving the mixed ether $\text{R}'\text{CH}_2\text{OC}(\text{O})\text{R}''$ and $\text{R}'\text{OM}$. 7 pairs of aldehydes have been investigated for their capacity to undergo this reaction, giving a mixed ether. In this paper the action of AcH with an unsatd. aldehyde ($\text{PhCH}:\text{CHCHO}$ (II)) was investigated. Tishchenko and Gushov (*J. Russ.-Phys. Chem. Ges.* 38, 517(1906)) and Pauly, Schmidt and Böhme (C. A. 19, 265) obtained unsatisfactory results in this condensation with Al alcoholate but E. found that the reaction goes smoothly, giving cinnamyl acetate (III) and *Et cinnamate* (IV). The formation of styracin led to the study of this reaction for the prep'n. of cinnamic alc. (V). 3.0 g. powd. $\text{Al}(\text{OEt})_3$ was added to 33 g. II in 33 cc. cold abs. Et_2O and after standing 1 day at room temp. the mixt. was warmed some days on the H_2O bath, poured into satd. NaCl, then treated with the calcd. amt. of HCl required to convert the $\text{Al}(\text{OH})_3$ into AlCl_3 and repeatedly extd. with Et_2O ; the Et_2O soln. was washed with NaHCO_3 , dried several days over Na_2SO_4 and fractionated *in vacuo*: (1) b_{10} 131-40°, 14.6 g.; (2) b_{10-11} 145-200°, 8 g. After refractionating again the portion b_{10} 138.5-41.5° was seeded in vain with V. 15 g. of this fraction in 100 cc. abs. Et_2O was treated with 30 g. powd. fused CaCl_2 . After 24 hrs. the ppt. was filtered off, washed with Et_2O and decompd. with H_2O ; the V was extd. with Et_2O , etc., and 0.5 g. III, m. 30°, was obtained. The filtrate from the CaCl_2 ppt. was fractionated after evapg. the Et_2O and found to be a mixt. of IV and V. Details of other preps. also are given. A 41% yield of cryst. V was obtained. 66 g. II + 22 g. pure dry AcH with 50 cc. Et_2O and 15% $\text{Al}(\text{OEt})_3$ were heated 3.5-5 days on the H_2O bath. When this was worked up a mixt. of III and IV was obtained. III, which was a new compd., was prep'd. from V and Ac_2O , b_{12} 142-4°. The CaCl_2 compd. with V, $\text{CaCl}_2 \cdot 1.5\text{PhCH}:\text{CHCH}_2\text{OH}$, m. 157°, was prep'd. from V in abs. Et_2O with powd. fused CaCl_2 and filtered off after standing 24 hrs. E. J. WITZEMANN

Observations on the Claisen reaction. G. T. MORGAN AND EUSEBIUS HOLMES. *J. Chem. Soc.* 127, 2891-6(1925); cf. C. A. 19, 1558.—The fatty acid was converted into its Ba salt, distd. with 3 mol. proportions of $\text{Ba}(\text{AcO})_2$, the crude product purified and subjected to the Claisen condensation with Na and AcOEt; under these conditions the ketones $\text{C}_n\text{H}_{2n-1}\text{Ac}$ (where n varies from 7 to 19) give normal reactions and a satisfactory yield of the diketone. The % below are the yields as the Cu salt. Octoylacetone, b_5 118°, $b_{7\text{HS}}$ 248°; Cu salt, pale blue, m. 118° (41-8%). Nonoylacetone, b_{11} 150°; Cu salt, m. 115.5° (69%). Undecoylacetone, m. 28°; Cu salt, m. 112° (70%). Dodecylacetone, m. 31-2°; Cu salt, m. 112.5° (50%). Tridecylacetone, m. 35°, gives a red color with FeCl_3 only on warming; Cu salt, m. 111° (64%). Tetradecylacetone, m. 39°; Cu salt, m. 112° (52%). Pentadecylacetone, m. 42°; Cu salt, m. 111° (35%).

Hexadecoylacetone, m. 49°; *Cu salt*, m. 112° (34%). *Heptadecoylacetone*, m. 51°; *Cu salt*, m. 112° (27%). *Octadecoylacetone*, m. 52.5°; *Cu salt*, m. 113° (55%). *Nona-decylacetone*, m. 55°; *Cu salt*, m. 112.5° (32%). *Eicosanoylacetone*, m. 57°; *Cu salt*, m. 114° (28.4%). All the Cu salts are blue, but the color becomes less pronounced as the series is ascended.

C. J. WESR

Hydrogenation of aldehydes and ketones in the presence of platinum blacks. M. FAILLEBIN. *Ann. chim.* 4, 156-82, 410-96(1925).—A more active Pt black is obtained from K_2PtCl_6 than from H_2PtCl_6 . Pt blacks contg. known amts. of Fe, Al and SiO_2 were prepared by reduction of mixts. of the chlorides with HCHO and NaOH. A slow reduction and a low temp. (-5°) is necessary for the most active catalysts. The catalyst is washed free from salts by decantation and by drying either *in vacuo* or by using abs. EtOH and Et_2O . Acetone with the pure Pt gives propane, while the Pt contg. Fe gives iso-PrOH. The Pt contg. SiO_2 gives propane. The velocity of hydrogenation is much slower than with the first two catalysts. With $MeCOEt$ there is the same difference between the pure Pt and that contg. Fe; pure Pt gives butane, while Pt contg. Fe gives sec-BuOH. Pure Pt gives, with $MeCOPr$, pentane, while the Pt-Fe gives pentanol. The hydrogenation of $AcCH_2CO_2Et$ in the absence of a solvent has been studied in the presence of pure Pt, Pt-Fe, Pt- SiO_2 and Pt- Al_2O_3 . Alc., ether and normal hexane have been used as solvents. With $AcCH_2CO_2Et$, the differences between the actions of pure Pt and that of the Pt contg. Fe is most marked. The action of Pt contg. Al_2O_3 is entirely comparable with that of Pt contg. Fe; Pt contg. SiO_2 has essentially the same effect as pure Pt. With pure Pt, $PrCO_2Et$ (I) is obtained. Pt containing Fe gives $MeCH(OH)CH_2CO_2Et$ (II); Pt contg. Al_2O_3 gives some I and a small amt. of II. Pt containing SiO_2 gives a result intermediate between that of pure Pt and Pt contg. Fe, the products being I and II. The hydrogenation of $AcCH_2CO_2Et$ in ether gives the following results: pure Pt, I; Pt contg. Fe, II. In normal hexane, $AcCH_2CO_2Et$ gives with pure Pt mainly I; Pt and Fe, II. In alc., pure Pt gives I and II. With Pt contg. Fe, *o*- $MeOC_6H_4CH_2CH_2COMe$ (III) in $AcOEt$ and $AcOH$ is hydrogenated to *o*-methoxy-4-phenyl-2-butanol, $MeOC_6H_4CH_2CH_2CH(OH)CH_3$, liquid with a strong odor resembling the poppy, b_{13} 144°, $b_{0.5}$ 90-1°, n_D^{18} 1.5245, d_{18} 1.044. Its benzoate, b_9 212°, $b_{0.33}$ 163°, d_{18} 1.0995, n_D^{18} 1.5500. With pure Pt, III gives a variety of substances depending in part upon the proportion of the reacting substances used, among them being cyclohexylbutane, b_{781} 176-7°, $n_D^{17.5}$ 1.4438, $d_{17.5}$ 0.8043. A detailed study of the other substances prepd. is given, among which are 4-cyclohexyl-2-butanol and 4-[2-methoxycyclohexyl]-2-butanol. The acetate of the latter, b_9 133.5-4.0°, $n_D^{21.5}$ 1.4540, $d_{21.5}$ 0.972. *p*- $MeOC_6H_4CH_2CH_2COMe$, prepared from anisalacetone in the presence of Pt contg. Fe, liquid of slight odor, m. 9°. With the same catalyst, *p*- $MeOC_6H_4CH_2CH_2COMe$ in $AcOEt$ or $AcOH$ was hydrogenated to 4-*p*-methoxyphenyl-2-butanol, $b_{0.5}$ 107°, n_D^{16} 1.5249, d_{16} 1.042. From this, two esters were prepd.: the acetate, by heating the alc. with Ac_2O at 140° for 2 hrs., $b_{0.25}$ 104°, $b_{0.16}$ 99°, b_{14} 160°, n_D^{21} 1.4956, d_{21} 1.0322; and the benzoate, from the alc. and $BzCl$, $b_{0.33}$ 172°, n_D^{28} 1.5427, d_{28} 1.080. With a pure Pt catalyst from *p*-methoxybenzylacetone, several products are possible: *p*- $MeOC_6H_4CH_2CH_2CH(OH)Me$, $b_{0.33}$ 107°, *p*- $MeOC_6H_4Bu$, b_{19} 120°, $b_{0.25}$ 55°, *p*- $MeOC_6H_{10}CH_2CH_2CH(OH)Me$, $b_{0.25}$ 84°, *p*- $MeOC_6H_{10}Bu$, $b_{0.25}$ 47°; $C_6H_{11}CH_2CH_2CH(OH)Me$, b_{14} 112°, and $C_6H_{11}Bu$, b. 176-7°. In the presence of Pt-Fe, and $AcOEt$ as solvent, veratrylacetone has been hydrogenated to 4-[3,4-methoxyphenyl]-2-butanol, $b_{0.2}$ 125°, n_D^{18} 1.5316, d_{18} 1.095; its acetate $b_{0.33}$ 132°, n_D^{18} 1.509, d_{18} 1.086. Piperonylacetone has been hydrogenated (with Pt-Fe) to *p*-[3,4-methylenedioxyphenyl]-2-butanol; b_{10} 168°, n_D^{21} 1.5340, d_{21} 1.146; its acetate and benzoate have been prepd. Pure Pt has been used in this connection but its products have not been identified. Acetone, quinone, piperonalacetone have been hydrogenated. With aldehydes, the difference between Pt and Pt-Fe is very marked. iso-BuCHO, enanthal, BzH, *p*- $MeOC_6H_4CHO$ have been hydrogenated with the above two catalysts.

J. H. PERRY

Preparation and specific gravity of mesityl oxide. C. A. YLLNER. *Svensk Kem. Tids.* 37, 227-9(1925).—Forty cc. acetone is stratified over 25 cc. concd. H_2SO_4 and carefully mixed to a completely homogeneous fluid. When deep red it is poured into ice water. The dark orange emulsion is extd. with Et_2O and washed with soda soln. The Et_2O is distd. and the residue fractionally distd. at 125-35°, treated with alc. KOH and redistd. at 128-31°. Yield, 25%; d_4 0.8634.

A. R. ROSE

The reaction of organomagnesium compounds on nitriles. Chloroacetonitrile. L. MATHUS. *Bull. soc. chim. Belg.* 34, 285-9(1925).— CH_3ClCN with $PhMgBr$ gives

95% of undistillable pitch, small amts. of Ph_3 , PhCOCH_2OH and PhCOCH_2Cl being isolated by extn. and distn.

WM. B. PLUMMER

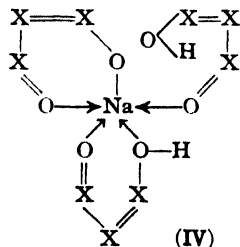
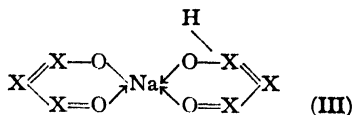
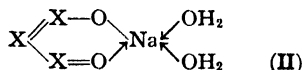
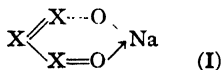
Condensation of the sodium derivatives of trimethyleneglycol and glycerol. ARTHUR FAIRBOURNE AND G. E. FOSTER. *J. Chem. Soc.* **127**, 2759-64 (1925); cf. *C. A.* **15**, 3079.— Na (1.14 g.) in 40 cc. $\text{HO}(\text{CH}_2)_3\text{OH}$ (I), treated with 10.2 g. $2,4\text{-(O}_2\text{N)}_2\text{-C}_6\text{H}_3\text{Cl}$ in 30 cc. I and heated until soln. was complete, gave 6 g. *trimethyleneglycol 2,4-dinitrophenyl ether*, m. 52° (*Ac deriv.*, m. 85° ; *Bz deriv.*, m. 95°) and 0.5 g. of the *bis-ether*, m. 180° . Either the mono- or di- Na deriv. of $\text{C}_3\text{H}_6(\text{OH})_3$, treated with an equimol amt. of $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ in Et_2O or C_6H_6 , gives *glyceryl tri-p-toluenesulfonate*, m. 103° , mol. wt. in freezing C_6H_6 , 564; the corresponding *tribenzenesulfonate*, m. 80° . The di- Na deriv. of $\text{C}_3\text{H}_6(\text{OH})_3$ and BzCl give the tri-*Bz* deriv., m. 72° after crystn from ligroin, m. 75° after crystn from EtOH . The mono- Na deriv. and $p\text{-O}_2\text{NC}_6\text{H}_4\text{-COCl}$ yield the mono-deriv., m. 107° . *Isopropylidene ether of glycerol 3,5-dinitrobenzoate*, m. 85° (80% yield); heated with 0.5 *N* HCl at $70\text{--}80^\circ$ for 1 hr., it gives 70% of *glycerol α -mono-3,5-dinitrobenzoate*, m. 118° , also obtained from the mono- Na deriv. and $3,5\text{-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{COCl}$ in Et_2O .

C. J. WEST

d-Glucuronic acid. FELIX EHRLICH AND KURT REHORST. *Ber.* **58B**, 1989-92 (1925); cf. *C. A.* **19**, 3169.—E. and R. have succeeded in obtaining the free *d*-glucuronic acid (I) in cryst. form by hydrolyzing the paired compd. (e. g. mentholglucuronic acid (II)) with dil. H_2SO_4 on the H_2O bath, removing the H_2SO_4 with excess of $\text{Ba}(\text{OH})_2$ or BaCO_3 , pptg. the Ba salt of I with alc., decompg. in moderately warm aq. soln. with H_2SO_4 , cautiously evapg., extg. the resulting sirup with alc. and concg. the ext. The I thus obtained in needles in 50-70% yield from II, m. 151° (decompn.), neutralizes the calcd amt of 0.1 *N* NaOH (phenolphthalein), $[\alpha]_D^{24}$ in H_2O (*c* 5.626) 11.73° (initial), 36.26° (final, after 1.5-2.0 hrs.) (the acid pptd. from alc. by Et_2O shows a const. $[\alpha]_D^{21}$ 36.30° immediately in H_2O); corresponding to its p_H value of 2.5-2.8, it is not sweet but has a pronounced acid taste comparable to that of AcOH ; it reduces Fehling soln. only on boiling, gives no ppt. with $\text{Pb}(\text{OAc})_2$, yields a basic Pb salt with basic Pb acetate and a basic Ba salt with excess of hot $\text{Ba}(\text{OH})_2$; cinchonine salt, m. $199\text{--}200^\circ$, $[\alpha]_D^{24}$ 135.0° (H_2O , *c* 1.23). Heated a long time in H_2O its rotation decreases and it yields a mixt. of varying amts of I and the anhydride. By means of the above method of prep. I its presence in beet saponins has been established.

C. A. R.

Coördinated compounds of the alkali metals. II. N. V. SIDGWICK AND F. M. BREWER. *J. Chem. Soc.* **127**, 2379-87 (1925).—The discovery of 4-covalent derivs. of ψ -indoxylspirocyclopentane (cf. *C. A.* **19**, 1140) led to further study to det. whether such derivs. are formed by simpler compds. which give chelate rings with multivalent metals, such as β -diketones, β -ketonic esters, *o*-hydroxyaromatic esters and aldehydes and *o*-nitrophenols, the alk. derivs. of which have hitherto been regarded as salts. Considerable exptl. evidence was obtained to show the existence of type I of the following types ($\text{X} = \text{C}$ or N) and numerous examples of II, III and IV were prepd. Examn. of



the alk. derivs. of the simple compds. mentioned showed them to belong to 1 of 3 classes: (1) salts; (2) non-polar chelate compds. which on sepn. change to a more stable ionized form; or (3) stable non-polar compds. The majority of compds. belong to class (1), including the Li derivs. of $\text{AcCH}_2\text{CO}_2\text{Et}$, CH_2Ac , BzCH_2Ac , $\text{NCCCH}_2\text{CO}_2\text{Et}$, Me salicylate, salicylaldehyde, *o*-nitrophenol, 3-nitro-*o*-cresol, quinizarin and the *K* analogs of the Na derivs. which belong to class (2). To class (2) belong the Na derivs. of alkyl- and phenylmalonic esters, 1-ketohydrindene-2-carboxylic esters and Et picrylmalonate and to

class (3) the Na derivs. of $\text{AcCH}_2\text{CO}_2\text{Et}$, $\text{AcCHEtCO}_2\text{Et}$, $[\text{CH}(\text{CO}_2\text{Et})_2]$, the K derivs. of $\text{AcCH}_2\text{CO}_2\text{Et}$, $\text{NCCH}_2\text{CO}_2\text{Et}$ and BzCH_2Ac . The replacement of H on the middle C atom of the 3 (as in esters of alkylmalonic acids) promotes stability of the nonpolar form. Many of these metal derivs. react with excess mother-substance to form unstable addn. compds., the identity of which could be established in no case, because of decompn. *Prepn. of compds.* Na deriv. of benzoylacetone, $\text{PhC}(\text{ONa})\text{:CHCOMe}$, no definite m. p., insol. in hydrocarbons, but on recrystn. from 96% EtOH it becomes sol. in PhMe, in consequence of formation of the hydrate $\text{C}_{10}\text{H}_8\text{O}_2\text{Na}\cdot 2\text{H}_2\text{O}$, m. 115° (loss of H_2O). A corresponding Li deriv., $\text{C}_{10}\text{H}_8\text{O}_2\text{Li}\cdot 2\text{H}_2\text{O}$, was prepd., though not free of anhyd. salt. The K compd. did not form a hydrate. Et sodioacetoacetate, m. 108° . Dihydrate, $\text{C}_8\text{H}_8\text{O}_3\text{Na}\cdot 2\text{H}_2\text{O}$ (cf. Eliot, *Rec. trav. chim.* 3, 240(1884)), m. 102° , decomps. on standing to a compd., m. 82° , which was also obtained by adding excess H_2O to Eliot's soln. of the Na deriv. and was probably the dihydrate of Na acetoacetate. This was confirmed by the fact that whereas an aq. soln. of the original dihydrate became turbid on acidification the decompn. product remained clear, but evolved CO_2 (cf. De Forcrand, *Ann. chim.* 5, 405(1895)). Na acetylacetone. Hydrate, $\text{C}_8\text{H}_7\text{O}_2\text{Na}\cdot 2\text{H}_2\text{O}$, very unstable, evolves H_2O on heating. K acetylacetone. Hydrate, very unstable, being hydrolyzed by its own H_2O . No Li deriv. could be prepd. Me lithiosalicylate. Hydrate, $\text{C}_8\text{H}_7\text{O}_3\text{Li}\cdot 2\text{H}_2\text{O}$, stable, loses H_2O gradually on heating, finally m. 278° . Li salicylaldehyde. Dihydrate, $\text{C}_7\text{H}_5\text{O}_2\text{Li}\cdot 2\text{H}_2\text{O}$, glistening yellow, gives colorless soln. in PhMe, evolves H_2O on heating, finally m. about 228° . Na salicylaldehyde, $\text{C}_7\text{H}_5\text{O}_2\text{Na}\cdot \text{C}_7\text{H}_5\text{O}_2$ (cf. Hantzsch, *Ber.* 39, 3089(1906)), yellow. Na o-nitrophenoxide, bright red, forms with salicylaldehyde an addn. compd., $\text{C}_6\text{H}_4\text{O}_2\text{NNa}\cdot \text{C}_7\text{H}_5\text{O}_2$, yellow, decomps. on heating. No similar compd. is formed from p- $\text{O}_2\text{NC}_6\text{H}_4\text{ONa}$, nor does Li form a corresponding deriv. K o-nitrophenoxide, red, absorbs H_2O to form a hydrate, $(\text{C}_6\text{H}_4\text{O}_2\text{NK})_2\cdot \text{H}_2\text{O}$ (cf. Fritzsche, *Ann.* 110, 153(1859); Frazer, *Am. Chem. J.* 30, 309(1903)), orange, forms with salicylaldehyde an addn. product difficult to purify, of the approx. compn. $\text{C}_6\text{H}_4\text{O}_2\text{NK}\cdot \text{C}_7\text{H}_5\text{O}_2$, when fresh, decomps. easily. Na deriv. of 3-nitro-o-cresol, red, gives with salicylaldehyde an addn. compd., $\text{C}_7\text{H}_5\text{O}_2\text{NNa}\cdot \text{C}_7\text{H}_5\text{O}_2$, yellow. K deriv., absorbs salicylaldehyde to form an unidentified addn. compd., Li deriv. Alk. salts of quinizarin: Na salt and K salt, deep blue-purple; Li salt, red-purple, all easily hydrolyze with sepn. of quinizarin. The Na salt gives with salicylaldehyde an addn. compd., $\text{C}_{14}\text{H}_8\text{O}_4\text{Na}_2\cdot 4\text{C}_7\text{H}_5\text{O}_2$, salmon-pink, decompd. by org. solvents, with sepn. of the original Na salt, but can be heated in H_2O without hydrolysis. The K salt also gave an addn. compd., $\text{C}_{14}\text{H}_8\text{O}_4\text{K}_2\cdot 4\text{C}_7\text{H}_5\text{O}_2$. These compds. are the first known 6-covalent compds. of the alk. metals. If their formulas are correct Li cannot form an analogous compd., for its covalency is limited to 4. The salt can, therefore, take up only 1 mol. of aldehyde for each Li atom. The Li salt, $\text{C}_{14}\text{H}_8\text{O}_4\text{Li}\cdot 2\text{C}_7\text{H}_5\text{O}_2$, has properties like those of the K and Na salts. C. C. DAVIS

Action of halogen on enolates of glutaconic dialdehyde and the synthesis of β -halopyridines. PAUL BAUMGARTEN. *Ber.* 58B, 2018-23(1925); cf. C. A. 19, 517.—The action of halogens on the simpler glutaconic aldehyde derivs., ROCH:CHCH:CHCHO (I, R = Na; II, R = Bz), results not in addn. at the double bond but in substitution, with formation of OCHCHXCH:CHCHO (III) and elimination of NaX or BzX . Whether the intermediate addn. products which are undoubtedly formed have the structure ROCHXCHXCH:CHCHO or ROCHXCH:CHCHXCHO cannot be detd., as both would at once change into the same III (or its tautomeric form). That the halogen in the III is on 1 of the α -C atoms is shown by the formation of β -halopyridines with NH_3 . The reaction of the halogens with the I was effected in H_2O or MeOH (in chlorination only MeOH can be used, as in H_2O the reaction follows a different course), with the II in CCl_4 or Et_2O . Thus, II in cold Et_2O with Cl gives $\text{BzOCH:CHClCH:CHCHO}$, m. 127° , identical with Dieckmann's product (*Ber.* 37, 4645(1904)), and giving with PhNH_2 $\text{PhNHCH:CClCH:CHCH:NHPhCl}$, bright red-violet, m. 119° (decompn.), which is also obtained in 1.2 g. yield from 1.5 g. I in cold MeOH treated with Cl and then with PhNH_2 in HCl and seps. from alc. with $2\text{H}_2\text{O}$, 1 of which is lost in vacuo over H_2SO_4 ; with hot alc. HCl this yields N-phenyl- β -chloropyridinium chloride; chloroplatinate, orange, m. 194° (decompn.). The free δ -hydroxy- γ -bromo- α , γ -butadiene- α -aldehyde could not be isolated from the reaction product of I and Br in either H_2O or MeOH but was identified as the benzoate, light yellow, m. 107.5° , or the dianilide HBr salt, blue-red microrodlets, m. $135-6^\circ$ (decompn.); its Na salt, distd. with steam after addn. of solid NH_4OAc , gives β - $\text{C}_6\text{H}_4\text{NBr}$, b₇₆₀ 169° ; chloroplatinate, m. 175° (decompn.). N-Phenyl- β -bromopyridinium iodide, from the dianilide HBr salt with hot alc. HBr and subsequent pptn. with KI, bright yellow, m. 247° (decompn.). α -Iodoglutaconic aldehyde (δ -hydroxy- γ -iodo- α , γ -butadiene- α -alde-

hyde), faintly brownish, m. about 90° (decompn.); benzoate, somewhat yellowish, m. 127°. α -Anilino- α,γ -butadiene- α -[aldehyde anil] *N,N'*-bis-di HI salt (3.4 g. from 1 g. I), violet-blue micronedles, m. 133-5° (decompn.), loses some HI on recrystn., decompd. by hot aq. alc. into *N*-phenyl- β -iodopyridinium iodide, yellow, m. 272° (decompn.). I (4 g.) treated in MeOH with I and then converted into the Na salt with NaOMe and refluxed with NH_4OAc gives 1.7 g. β -iodopyridine, m. 53.5°, very volatile even at room temp.; *HCl* salt, hygroscopic; chloroplatinate, yellow, m. 211° (decompn.). C. A. R.

Rupture of ring systems. RICHARD KUHN AND FRIEDRICH EBEL. *Ber.* 58B, 2088-94(1925).—Comments on the paper of Meisenheimer (*C. A.* 20, 190). C. A. R.

Oxidation of uric acid by iodine. WILHELMINE E. FÜRTH. *Biochem. Z.* 159, 130-40(1925).—One mol. of uric acid reacts with 3.5 atoms of I, giving urea, allantoin, NH_3 and CO_2 . Alloxan and oxalic acid are not formed directly, but the latter may be obtained by hydrolysis of one of the fractions with NaOH. W. D. L.

The constitution of lupeose. N. CASTORO. *Gazz. chim. ital.* 55, 463-7(1925)—C. reviews the earlier history of lupeose (I), the mol. wt. of which was unknown because of its amorphous state and the fact that it forms colloidal solns. C. (*C. A.* 5, 512) isolated I from *Cicer arietinum* and concluded that it was a tetrose consisting of 2 mols. of galactose and 1 mol. each of fructose and a *d*-rotatory monose. Later Schulze and Pfenniger (*C. A.* 5, 1272) concluded that the latter sugar is glucose and thus $\text{I} + 3\text{H}_2\text{O} \rightarrow 2$ mols. galactose + 1 mol. glucose + 1 mol. fructose. E. J. WITZEMANN

Behavior of glucose and certain other carbohydrates towards dyestuffs and towards potassium ferricyanide in an alkaline medium. EDMUND KNECHT AND EVA HIBBERT. *J. Chem. Soc.* 127, 2854-60(1925); cf. *C. A.* 19, 623, 1835.—In an alk. medium, glucose, levulose and certain other carbohydrates are oxidized to a definite degree by methylene blue and by K indigotintetrasulfonate (I). Glucose, glucosamine and galactose take up, under the conditions, exactly 3 and levulose 4, atomic proportions of O. $\text{K}_3\text{Fe}(\text{CN})_6$ can replace the dyestuffs in these estimations. When boiled for 2 min. with excess of NaOH in an atm. of N, both glucose and levulose neutralize an amt. of alkali corresponding exactly to the formation of 2 mols. of lactic acid. When glucose is boiled with excess of $\text{K}_3\text{Fe}(\text{CN})_6$ and KOH, the amt. of alkali neutralized (over and above that required to form $\text{K}_4\text{Fe}(\text{CN})_6$) represents exactly 3 equivs. of KOH. In the case of levulose, this is approx. 4 equivs. Glucuronic acid can be estd. quant. by titration with I. The volumetric osazone titration method may also be employed for the purpose. In the presence of alkali glucose is also oxidized quant. by kitone blue and by rosinduline. In the former case, 2 and in the latter, 1 atomic proportion of O is supplied by these dyestuffs. Neither lactic, saccharic, mucic nor gluconic acid reduces methylene blue when boiled with this dyestuff in the presence of KOH. C. J. WEBER

Transformations of the sugar nitrates. J. W. H. OLDHAM. *J. Chem. Soc.* 127, 2840-5(1925).—Trimethylglucosan in a mixt. of fuming HNO_3 and CHCl_3 contg. a little P_2O_5 gives after 19 hrs. at room temp. 2,3,5-trimethylglucose 1,6-dinitrate, m. 86°. $[\alpha]_D$ 149.3° (CHCl_3 , *c* 2.3193), 151.7° (Me_2CO , *c* 1.463), 144.8° (MeOH , *c* 1.508) and 147.2° (60% fuming HNO_3 + 40% CHCl_3 by vol., *c* 2.915). Boiled in 5% soln. in MeOH for 0.5 hr. with BaCO_3 , there results 90% of trimethylmethylglucoside 6-nitrate, m. 53-4°, n_D 1.4565 (superfused), $[\alpha]_D$ -5.2° (CHCl_3 , *c* 2.0653), -4.4° (Me_2CO , *c* 3.5845), -1.3° (MeOH , *c* 3.3413). Hydrolysis with Fe dust in glacial AcOH in not more than 5% concn. gave a good yield of trimethylmethylglucoside; NaI gives a good yield of the iodohydrin. Triacetylglucosan (5 g.) in a mixt. of 30% CHCl_3 and 70% redistd. HNO_3 by vol., to which is added 10 g. solid N_2O_5 and the whole made up to 100 cc. with CHCl_3 , on standing 110 hrs. at room temp., gives about 30% of triacetylglucose 1,6-dinitrate(?) (I), m. 132-3°, $[\alpha]_D$ 144.2° (HNO_3 + CHCl_3 , *c* 5.0). Boiled with AcOH, Ac_2O and AcONa for 1-1.5 hrs., there results tetraacetylglucose 6-nitrate, m. 142-3°, $[\alpha]_D$ 23.2° (AcOH , *c* 2.494), 27.2° (CHCl_3 , *c* 2.038), reduces Fehling soln. strongly on boiling. Further hydrolysis with Fe in AcOH gives tetraacetylglucose, m. 126.5-7.5°, $[\alpha]_D$ 9.8° (CHCl_3 , *c* 0.816). I reacts with difficulty with $\text{MeOH}\cdot\text{BaCO}_3$, even when $\text{C}_2\text{H}_5\text{N}$ is added, giving 50-60% of triacetyl-methylglucoside 6-nitrate (II), m. 133.5-4.5°, $[\alpha]_D$ -14.3° (CHCl_3 , *c* 5.964), -14.1° (Me_2CO , *c* 2.6913). Hydrolysis with Fe and AcOH gives triacetyl-methylglucoside, m. 134-4.5°, $[\alpha]_D$ -19.1° (CHCl_3 , *c* 1.514). II, treated with 5% $\text{MeOH}\cdot\text{Me}_2\text{NH}$, gave *Me* glucoside 6-nitrate, which did not cryst., but was identified by methylating to trimethylmethylglucoside 6-nitrate. Triacetyl-methylglucoside 6-iodohydrin, m. 111-2.5°, $[\alpha]_D$ 0.9° (CHCl_3 , *c* 3.027); Me_2NH gives a poor yield of *Me* glucoside 6-iodohydrin, m. 157-8°, $[\alpha]_D$ -18.1° (CHCl_3 , *c* 1.677). The mother liquors from the crystals of I gave an acetoniropentose (triacetyl-pentose ni-

trate), $m.$ 168–9°, $[\alpha]_D$ 92.0° (CHCl_3 , c 1.214). This indicates that during the nitration degradation to the pentose series had taken place to a limited extent. C. J. WEST

Partial hydrolysis of sucrose-phosphoric acid to *d*-fructose and *d*-glucose-phosphoric acid. J. HATANO. *Biochem. Z.* 159, 175–8 (1925).—Sucrose-monophosphoric acid is gently hydrolyzed in dil. acid and glucose-phosphoric acid pptd. as the Ca or Ba salt by the addn. of EtOH. From the alc. residue *d*-fructose is obtained. W. D. L.

Polymerization of β -glucosan. The constitution of synthetic dextrans. J. C. IRVINE AND J. W. H. OLDHAM. *J. Chem. Soc.* 127, 2903–22 (1925).—Polymerization of β -glucosan by heating 7 g. with 0.1 g. Zn dust at 250° *in vacuo* for 60–75 min. occurs without loss in wt. Fractional pptn. from H_2O by EtOH gives 3 dextrans: Dextrin I, *heptagluconan*, the less sol. of the 3, slightly hygroscopic, gives a pale yellow soln. in H_2O which is non-reducing and has $[\alpha]_D$ 83.9° for c 2.08; *triacetate*, $m.$ 142°, $[\alpha]_D$ 85.1° (50% EtOH, c 2.2315); heating I 2 hrs. with MeOH nearly satd. with HCl gives Me glucoside. Dextrin II, *tetragluconan*, intermediate in soly., also is hygroscopic, $[\alpha]_D$ 60.7° (H_2O) and yields the same triacetate as I; it is readily converted into Me glucoside. Dextrin III, *trigluconan*, $[\alpha]_D$ 29.9°, also yields the same triacetate as I and is converted into Me glucoside in the usual way. Methylation of I with Ag_2O and MeI causes the introduction of 2 Me groups, giving an easily powdered glass with $[\alpha]_D$ 76.0° (CHCl_3 , c 0.6035); Me_2SO_4 gives a product approx. the tri-Me stage, with $[\alpha]_D$ 89.4° (CHCl_3 , c 2.745); mol. wt. in freezing C_6H_6 1446 (calcd., $\text{C}_{63}\text{H}_{112}\text{O}_{36}$, 1428). Heating with MeOH, nearly satd. with HCl for 15 hrs. at 70° gives a colorless sirup, hydrolyzed by 3% aq. HCl to a soln. of methylated glucoses with $[\alpha]_D$ 68.4°; from this cryst. tetramethylglucose was obtained, the remaining being a mixt. of di- and trimethylglucoses in unknown proportions. II gives with Me_2SO_4 a *tri-Me deriv.*, glass with $[\alpha]_D$ 68.7° (MeOH, c 1.3625), 70.5° (Me_2CO , c 1.958), 61.2° (CHCl_3 , c 2.900); mol. wt. in freezing C_6H_6 , 873 (calcd. for $\text{C}_{36}\text{H}_{64}\text{O}_{20}$, 816); hydrolysis as above gave a mixt. of di-, tri- and tetramethylglucoses. III gave a *tri-Me deriv.*, glass with $[\alpha]_D$ 53.5° (CHCl_3 , c 2.1035), 56.4° (Me_2CO , c 2.048), 52.8° (MeOH, c 1.753); mol. wt. in freezing C_6H_6 , 595 (calcd. for $\text{C}_{27}\text{H}_{48}\text{O}_{15}$, 612). Heated *in vacuo*, approx. 0.5 of the material distd. at 180–200° and 0.5 mm., but this is evidently due to polymerization, since the product is a mobile sirup with n_D 1.4770 and $[\alpha]_D$ 23.9° (CHCl_3). The end products of the acid hydrolysis are the same as for the II and I. In place of sepg. the polyglucosans by pptn. and then methylating, it is more effective and economical to alkylate the total polymerized product and sep. the resulting methylated compds.; thus, from 60 g. glucosan there was obtained 55 g. methylated product, which gave: 17% trimethylglucosan, 23.6% di-[trimethylglucosan] (IV) and 57.8% poly[trimethylglucosan] (V). IV, pale yellow sirup, $b_{0.2}$ 205–10°, n_D 1.4720, $[\alpha]_D^{20}$ 46.5° (CHCl_3 , c 1.9515), 48.3° (MeOH, c 1.8790), 51.8° (MeCO, c 2.0040). With MeOH and HCl there result 46.6% dimethylmethylglucoside and 53.4% of the tetra-Me deriv., which are very nearly the proportions required for equal mols. (47.1 and 52.9). V showed $[\alpha]_D$ 63.3° (CHCl_3 , c 1.850), 66.6° (Me_2CO , c 2.266), 64.4° (MeOH, c 1.755). Conversion into glucosides gave: 35.5% 2,3,5-trimethylmethylglucoside, 33.5% 2,3,5-tri-Me deriv., 26% di-Me and 5% Me derivs., the last probably being due to incomplete methylation; here again the % are almost identical with those required for equal mols. Attempts to establish the constitution of the dimethylglucose failed; the Me glucoside $b_{0.4}$ 190°, n_D 1.4743. The mechanism of the polymerization is discussed, also the applicability of the methylation process to the structural problems of carbohydrates.

C. J. WEST

Methylation experiments with polysaccharides. L. SCHMID. *Ber.* 58B, 1963–5 (1925).—Seeking as mild as possible a method of methylating carbohydrates, S. tried the action of CH_2N_2 on cellulose (I), lichenin (II), inulin (III) and sol. starch (IV). I does not react at all with CH_2N_2 . When the other hydrocarbons, dried *in vacuo*, are treated with CH_2N_2 in abs. Et₂O, protected from atm. moisture by a Hg seal, there is an evolution of gas which begins soon with III and IV but is hardly noticeable with II; moreover, it soon ceases. On adding small amts. of H_2O , N is again evolved and within a few hrs. the yellow CH_2N_2 solns. are decolorized. Addn. of fresh CH_2N_2 is repeated until N is no longer evolved (7 times). The product so obtained from IV can be sepd. into an alc.-sol. and an alc.-insol. fraction, contg. 22.24 and 21.51% MeO, resp., which correspond to more than the mono-ether (17.60%); neither fraction reduces Fehling soln. and with I they give a dark-red color; the alc.-sol. fraction is easily sol. in H_2O , the other less so. The product from II likewise yields an alc.-insol. and an alc.-sol. fraction, with 17.37 and 21.62% MeO (calcd. for the mono-ether, 17.37%), which do not reduce Fehling soln. The product from III is very easily sol. in alc. and H_2O ; the MeO content (25.24%) corresponds to 3 MeO groups for 2 $\text{C}_6\text{H}_{10}\text{O}_5$ complexes; it does not reduce Fehling soln. and is less sol. in hot than in cold H_2O . C. A. R.

Alkali compounds of carbohydrates. L. SCHMID AND B. BECKER. *Ber.* **58B**, 1966-8(1925).—Thinking that the impossibility of completely methylating carbohydrates with CH_2N_2 (cf. preceding abstr.) might be due to the fact that the reaction system is heterogeneous, S. and B. attempted to effect the methylation in a homogeneous system by converting the carbohydrates in liquid NH_3 soln. by means of alkali metals into the alcoholates which then, by double decompn., should give the desired ethers. In all cases, addn. of 1 atom alkali metal to 1 mol. of the carbohydrate or alc. gives products whose compn. agrees well with that calcd. for the expected monoalcoholate, but with more than 1 atom alkali metal, the reaction proceeds in an entirely different way; with 1 atom, the reaction is complete within a few min., as shown by the decolorization of the deep blue soln., while with more than 1 atom it requires several hrs. Moreover, the sensitiveness of the product to air increases parallel with the increase in the amt. of metal; the product from 1 mol. inulin with 3 atoms K becomes brown in the air, evolves heat and emits vapors of empyreumatic odor. The metal content of these products does not correspond to a di- or trialcoholate; those obtained with 3 atoms Na or K contain 1-5% N. Ca does not react. The carbohydrates studied were inulin, lichenin, sol. starch, mannitol, and α -Me glucoside. A sketch of the app. used is given. C. A. R.

Chemical nature of the hop resin acids. II. HEINRICH WIELAND (WITH ERWIN MARTZ AND HEINZ HOEK). *Ber.* **58B**, 2012-7(1925); cf. C. A. **19**, 1428; Wollmer, C. A. **19**, 2042.—Isolumulinic acid, which in the 1st paper was assumed to be a 1,2,4-triketocyclopentane, RCH CO CHR' CO CO (I), gives with KOH at 180° 75-

80% $(\text{CO}_2\text{H})_2$, 52% of $\text{MeCOCH}_2\text{CHMe}_2 + \text{MeCO}(\text{CH}_2)_3\text{CHMe}_2$ and 76% $\text{Me}_2\text{CHCH}_2\text{CO}_2\text{H} + \text{MeCH}(\text{CH}_2)_3\text{CO}_2\text{H}$, whence R must be $\text{Me}_2\text{CHCH}_2\text{CH}_2$ and R' $\text{Me}_2\text{CHCH}_2\text{CO}$, and humulone, the original hop resin, must have the structure

$$\text{Me}_2\text{CHCH}:\text{CHCH} \overset{6}{\text{C}}(\text{O}) \overset{1}{\text{C}}(\text{COCH}_2\text{CHMe}_2) \overset{2}{\text{C}}(\text{OH}) \overset{3}{\text{C}}(\text{OH})(\text{CH}:\text{CHCHMe}_2) \overset{4}{\text{C}}(\text{O}) \overset{5}{\text{C}}(\text{O}) \text{ (II)},$$

only the position of the 2nd double bond in the side chains (that in the chain on C atom 4 is established) being still uncertain. This double bond is still present in humulinic acid and in the hydrocarbon $\text{C}_{15}\text{H}_{28}$ obtained by reduction of III by the Clemmensen method. Similarly, lupulone, the 2nd cryst. hop resin acid, must have the structure II with a 2nd C_6H_5 residue instead of HO on C atom 4. C. A. R.

Cyclohexyl ether. V. N. IPATIEV AND I. ORLOV. *Compt. rend.* **181**, 793-5(1925).—In hydrogenating phenol under pressure over NiO I. obtained (C. A. **3**, 1014) a fraction, b. $272-5^\circ$ (I), thought to be cyclohexyl ether. I. and O. treated I for 36 hrs at 290° under pressure with Al_2O_3 , CuO and H_2 and obtained cyclohexylcyclohexene (II) and dicyclohexyl (III), $b_{37} 237-8.5^\circ$, $d_4^{20} 0.8835$. The formation of II and III favors the view that I is cyclohexylhexanol. Reducing diphenylene oxide with H_2 at 140 atm at 290° for 36-40 hrs gave III, b. $236-7.5^\circ$, $d_4^{20} 0.8919$. A small amt. of cyclohexylcyclohexene and cyclohexylhexanol also was formed, indicating a splitting of the O-C bond. The difference between III as obtained by the two methods may be due to stereoisomerism. D. H. POWERS

Monochloro-*o*-methylcyclohexanone. M. GODCHOT AND P. BEDOS. *Compt. rend.* **181**, 919-21(1925); cf. C. A. **19**, 2644.—Chlorination of *m*- and *p*-methylcyclohexanone has already been discussed (C. A. **18**, 1990). *o*-Methylcyclohexanone (I) chlorinated gives only a single mono-Cl deriv., $b_{14} 78-9^\circ$, $d_{16} 1.099$, $n_D 1.4696$, believed to be 2-chloro-2-methylcyclohexanone (II). II distilled with quinoline gives 60% of 1-methyl- Δ^4 -cyclohexen-2-one (III), b. $170-1^\circ$, $d_{17} 0.956$, $n_D^{17} 1.4646$, M. R. 31.78, (calcd. 32.01). Oxime of III, m. $142-3^\circ$. III and MeMgI give 1,2-dimethyl- Δ^6 -cyclohexen-2-ol, $b_{23} 71-3^\circ$, $d_{16} 0.9313$, $n_D^{15} 1.4647$, M. R. 37.39, (calcd. 37.95). The phenylurethan of III was prepd. II with MeMgI gives 1,1,2-trimethyl- Δ^2 -cyclohexene, b. $144-6^\circ$, $d_{14} 0.862$, $n_D^{14} 1.4590$. D. H. POWERS

The mechanism of reduction. IV. H. J. PRINS. *Rec. trav. chim.* **44**, 876-88 (1925). (In English).—In a previous paper (C. A. **18**, 1604) the action of PhNO_2 in AcOH on Zn was studied. In this paper the action of these compds. on Pb was studied. The expts. were carried out like those with Zn. A rectangular piece of sheet Pb with a hole near one edge was suspended from a glass hook in the soln. which was kept at const. temp. After each treatment the piece was dipped in a rapid current of H_2O for 20 secs. and then washed in pure Me_2CO and dried at 80° for 20 secs. Washing with Me_2CO proved to be the best way to avoid a change in velocity of soln. through impurities from the liquid used for washing. In general the action of PhNO_2 in AcOH

on Pb is the same as on Zn; the Pb is rapidly dissolved at room temp. and the velocity of soln. can be calcd. with the aid of the same formula as was used for Zn. In both cases up to a critical concn. of PhNO_2 the velocity of soln. is directly proportional to the concn. of the PhNO_2 . Expressed in mols. per unit of surface the velocity of soln. is the same for Zn as for Pb. This is valid from zero to the critical concn. of the PhNO_2 . This and the low temp. coeff. proves the velocity to be a velocity of diffusion. Above the critical concn. the velocity depends on the condition of the surface of the metal, which in its turn depends upon the velocity of diffusion of the acetate from the metallic surface. The type of curve for concns. above the critical one is detd. by the ratio between K_2 and K_1c_K . For Zn $K_2 < K_1c_K$ while for Pb $K_2 > K_1c_K$. The influence of the condition of the surface is also apparent from the expts. with AcOH, which confirms P.'s opinion that the reaction takes place between PhNO_2 and a mol. of AcOH adsorbed on the surface of the metal and, therefore, in an activated condition. On the other hand the reaction can also take place probably between adsorbed H^+ ions and PhNO_2 as is indicated by the increase in velocity upon adequate diln. of the AcOH with H_2O . The condition of the surface not only det. the velocity of the reduction but may also change its course. If, e. g., the active surface of the metal is small compared with its total surface the chance that 2 or more elemental spaces are close together will be much less than in the reverse case. Many compds. can react with one another when taking up H_2 , e. g., aldehydes, ketones (especially unsatd ketones). This condensation reaction will be promoted if the mols. are close together while taking up H_2 , whereas it can be prevented if the active spaces on the metal are small and widely scattered. The expts. here described give a method of realizing this condition e. g. by keeping the metal surface covered by the salt. This can be done by choosing an appropriate concn. of the reducible compd. or by diminishing the velocity with which the metal salt diffuses from the metal either by lowering the temp., by choosing an appropriate metal or by changing the medium. The latter may be done by satg. the medium with the salt of the metal or by choosing a medium in which the salt is only sparingly sol. There are, of course, other factors that influence the course of the reaction, e. g., the magnitude of the activation of the acid, the magnitude of activation of the reducible compd. and the individual velocity with which each mol. takes up H_2 . I. J. WITZEMANN

Isomeric changes in aromatic compounds. I. Conversion of diacylanilides into acylaminoketones. A. W. CHAPMAN. *J. Chem. Soc.* 127, 2818–20 (1925).—Passing a current of dry HCl through a fused PhNAC_2 gives the acid chloride and an acylaminoketone. PhNAC_2 (20 g.) gives 6.7 g. AcCl and 11.5 g. PhNHAc ; PhNBz_2 (10 g.) gives 2.1 g. BzCl and 4.8 g. PhNHBz . PhNAC_2 (20 g.) and ZnCl_2 , heated at $140\text{--}60^\circ$ while HCl was passed through for 4.5 hrs., gave $p\text{-AcNHC}_6\text{H}_4\text{Ac}$, isolated as $\text{H}_2\text{NC}_6\text{H}_4\text{Ac}$ (2 g.). This product was not formed when the HCl was omitted from the reaction. When $p\text{-H}_2\text{NC}_6\text{H}_4\text{Ac}$ was heated alone no PhNAC_2 was formed. C. J. WEST

***o*-Aminophenylhydrazine and some interesting heterocyclic compounds derived from it.** PRAPHULLA CHANDRA GUHA AND SUDHANYA KUMAR RAY. *Quart. J. Indian Chem. Soc.* 2, 83–94 (1925); cf. *Ber.* 22, 240, 2810, 3221.—10 g. $o\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2\cdot\text{HCl}$ was reduced with SnCl_2 and HCl; the soln. was concd. *in vacuo* and the *o*-aminophenylhydrazine-HCl (I) purified by pptn. with Et_2O from alc. Yield, 3–4 g., m. $263\text{--}5^\circ$ (decompn.). *Dibenzylidene deriv.*, m. $206\text{--}7^\circ$. *Free base*, from I and NH_4OH or NaOAc (crystd. from dil. alc. in absence of air), m. $295\text{--}302^\circ$ (decompn.). **4-Phenyl-1-*o*-phenylthiocarbamidophenylthiosemicarbazide**, $\text{C}_{18}\text{H}_{14}(\text{NHCNHPH})\text{NHNHCNHPH}$, from I and PhNCS , m. 80° . **4-Tolylthiocarbamidophenylthiosemicarbazide**, from I and $p\text{-MeC}_6\text{H}_4\text{NCS}$, m. 282° . **2-Thio-1,2,3,4-tetrahydro-5,6-benzo-1,3,4-triazine**, from I, alc. KOH, and CS_2 , m. $298\text{--}300^\circ$; *Bz deriv.*, m. 174° ; *disulfide*, m. $208\text{--}10^\circ$. **Benzo-ketotetrahydrotriazine**, from I and urea, m. $310\text{--}2^\circ$. **Benzoheptatriazine**, from I and glycol, m. $212\text{--}4^\circ$ (decompn.). On reduction, $o\text{-O}_2\text{NC}_6\text{H}_4\text{NHNHCNHPH}$ (from $o\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ (II) and $\text{H}_2\text{NCSNHPH}$) gave **1-*o*-aminophenyl-4-phenylthiosemicarbazide-HCl** (III), m. $253\text{--}5^\circ$ (decompn.), gave a red dye on diazotization and coupling with β -naphthol, and **2-phenylimino-1,2,3,4-tetrahydro-5,6-benzo-1,3,4-triazine**, m. $150\text{--}1^\circ$. III and Ac_2O gave a compd., m. 152° . II and $\text{C}_6\text{H}_5\text{NCS}$ gave **1-*o*-nitrophenyl-4-allylthiosemicarbazide**, m. $164\text{--}5^\circ$. On reduction, the benzal deriv. of II gave **μ -phenylbenzimidazole-HCl**, m. above 306° ; *free base* m. $288\text{--}9^\circ$. II and $o\text{-HOC}_6\text{H}_4\text{CHO}$ gave a deriv. (IV), m. 190° , which dyed wool orange-red from an acid bath. *Bz deriv.* of IV, m. 180° . D. W. MACARDLE

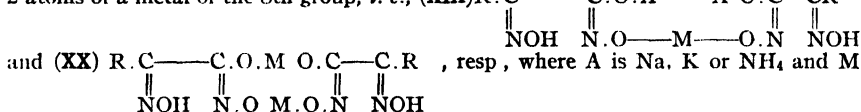
Preparation of *p*-bromophenylhydroxylamine by the emulsification process. A modification. R. D. HAWORTH AND ARTHUR LAPWORTH. *J. Chem. Soc.* 127, 2970 (1925); cf. C. A. 15, 2838.—Reduction of $p\text{-BrC}_6\text{H}_4\text{NO}_2$ by the method previously described is often unsuccessful. The emulsification of 5 g. $p\text{-BrC}_6\text{H}_4\text{NO}_2$, 40 cc. C_6H_6 ,

120 g. of reducing soln. and 5 g. CaCl_2 and after 0.5 hr. adding 5 g. solid NH_4Cl gives 2.7-3.4 g. $p\text{-BrC}_6\text{H}_4\text{NHOH}$. C. J. WEST

The dioximes. XXIV. G. PONZIO. *Gazz. chim. ital.* 55, 311-23 (1925).—The compd. $\text{Ph}(\text{C}_2\text{N}_2\text{O}_2)\text{H}$ which Scholl (*Ber.* 23, 3503 (1890)) considered to be the phenylglyoxime peroxide is, according to P. (*C. A.* 17, 3875, 3876; Avogadro, *C. A.* 18, 1491) the oxide of benzoyl cyanide oxime (I) $\text{PhC}(\text{:NOH})\text{C}\equiv\text{N}=\text{O}$ or $\text{PhC}(\text{:NOH})\text{C}=\text{N}-\text{O}$, and adds NH_3 and PhNH_2 , giving phenyl aminoglyoxime and phenylamino-

phenylglyoxime (III) (Wieland, *Semper*, *C. A.* 2, 1012; P., *C. A.* 17, 2267, 3874). II and III were the α -forms and P. expected I to add H_2O giving phenylhydroxyglyoxime but it is stable toward H_2O as well as toward PhNHNH_2 . P. and Ruggeri (*C. A.* 18, 661) tried to replace Cl in $\text{PhC}(\text{:NOH})\text{C}(\text{:NOH})\text{Cl}$ in aq. Na_2CO_3 and obtained the dioxime of dibenzoylglyoxime peroxide (IV). With $\text{Ac}_2\text{O} + \text{NaOAc}$ IV gave the *di-Ac deriv.* (V) $\text{PhC}(\text{:NOAc})(\text{C}_2\text{N}_2\text{O}_2)\text{C}(\text{:NOAc})\text{Ph}$, m. 128°. $\text{PhC}(\text{:NOAc})\text{C}(\text{:NOAc})\text{Cl}$ in Et_2O with 5% Na_2CO_3 or heated in C_6H_6 , with AgOBz also gave V, confirming its constitution and that of IV. Werner and Buss (*Ber.* 27, 2197 (1894)) state that $\text{Ph}(\text{:NOH})\text{Cl}$ (VI) is converted by Na_2CO_3 into diphenylglyoxime peroxide but P. found that benzohydroxamic acid, $\text{PhC}(\text{:NOH})\text{OH}$, is formed if 5 g. VI is treated with 20 g. NaOAc in 50 cc. of 50% AcOH . After some time the soln. is neutralized with NaOH , filtered, treated with a little NH_4OH and then BaCl_2 to ppt. the Ba salt, $(\text{C}_7\text{H}_5\text{O}_2\text{N})_2\text{Ba}$. This with dil. H_2SO_4 gives the free acid. 5 g. $\text{PhC}(\text{:NOH})\text{C}(\text{:NOH})\text{Cl}$ with 20 g. NaOAc in 50 cc. of 50% $\text{AcOH} + 25$ cc. EtOH were kept at 40-50° until limpid. The mixt. was dild. with H_2O , neutralized with NaOH and treated with 20% $\text{Ni}(\text{OAc})_2$. A red ppt. of the Ni-Na complex of phenylhydroxyglyoxime (VII) was obtained, which when decompd. with dil. H_2SO_4 gave the free compd. m. 191° (decompn.). VII was also obtained by the action of NH_4OH on $\text{BzC}(\text{:NOH})\text{OH}$ and on *Et* α -oximinophenylacetate (cf. a later paper for prepn.). The last method is the most convenient way of prepg. VII. With FeCl_3 solns. of VII give a red color and at 100° they attack Ni with the evolution of H_2 and the formation of the Ni salt. VII in EtOH with 0.5 mol. NaOH ppts. the Na salt, $\text{C}_7\text{H}_5\text{O}_2\text{N}_2\text{Na} \cdot \text{C}_5\text{H}_5\text{O}_2\text{N}_2 \cdot 2\text{H}_2\text{O}$; the corresponding K and NH_4 salts (without H_2O of crystn.) were obtained similarly. A soln. of the Na salt added to AgNO_3 ppts. the Ag salt, $\text{C}_7\text{H}_5\text{O}_2\text{N}_2\text{Ag} \cdot \text{C}_5\text{H}_5\text{O}_2\text{N}_2\text{Ag}$. *p-Tolylhydroxyglyoxime* (VIII), m. 186° (decompn.), was prepd. like VII from *p*-tolylchloroglyoxime, $\text{MeC}_6\text{H}_4\text{C}(\text{:NOH})\text{C}(\text{:NOH})\text{Cl}$ (prepn. to be described in paper XXVII). VIII with FeCl_3 gives a wine-red color; with $\text{Cu}(\text{OAc})_2$ a green ppt. insol. in dil. AcOH ; with $\text{Ni}(\text{OAc})_2$ a yellow ppt. sol. in dil. AcOH , slowly in excess of $\text{Ni}(\text{OAc})_2$ soln. and easily in NH_4OH with red color. VIII is identical in all its properties with *p*-methylbenzoylformohydroxamic acid (IX) obtained by the action of NH_2OH on $\text{MeC}_6\text{H}_4\text{COC}(\text{:NOH})\text{OH}$ by Gastaldi (*C. A.* 19, 285). P. believes that the supposed α - and β -forms of IX are both one substance for reasons given. Some comments on results in earlier papers are not abstracted. XXV. L. AVOGADRO AND G. TAVOLA. *Ibid.* 323-30.—Meyer and Auwers (*Ber.* 21, 3510 (1888)) and Dittrich (*Ber.* 23, 3589 (1890)) did the only existing work on di-Me ethers of the glyoximes $\text{RC}(\text{:NOH})\text{C}(\text{:NOH})\text{R}$, but encountered insuperable difficulties. In attacking this subject, A. and T. went back to the α - and β -phenylglyoxime (cf. P. and A., *C. A.* 17, 2268, 3874; P. and Bernardi, *C. A.* 18, 1490) and in this paper studied the ethers of methylglyoxime (X). X in 20% NaOH was treated gradually with a little more than the calcd. amt. of Me_2SO_4 with cooling and sepd. the *di-Me ether* of X, $\text{MeC}(\text{:NOMe})\text{C}(\text{:NOMe})\text{H}$, as a liquid, b. 145.5-6.5°; it is unchanged when treated with Cl in CHCl_3 ; in H_2O - EtOH with NaOH , NH_3 is slowly evolved and NaOAc is formed. X was treated with 1 mol. Me_2SO_4 as above and the di-Me ether sepd. with Et_2O ; the alk. liquid was acidified with dil. H_2SO_4 with ice-cooling and the *mono-Me ether* (XI), $\text{MeC}(\text{:NOMe})\text{C}(\text{:NOH})\text{H}$, m. 98-9°, was pptd. as a solid. In NaOH , XI is sol. and with excess Me_2SO_4 is converted into the di-Me ether. XI heated with $\text{PhNHNH}_2 + \text{AcOH}$ gives methylglyoxal osazone, m. 146°. XI with $\text{Ac}_2\text{O} + \text{NaOAc}$ gave the *Ac deriv.*, $\text{MeC}(\text{:NOMe})\text{C}(\text{:NOAc})\text{H}$, m. 43°. XI in CHCl_3 with Cl_2 gave methylchloroglyoxime mono-Me ether (XII), $\text{MeC}(\text{:NOMe})\text{C}(\text{:NOH})\text{Cl}$, m. 49°. XII in abs. EtOH with gaseous NH_3 gave methylaminoglyoxime mono-Me ether (XIII), m. 99°. With $\text{BzCl} + 15\%$ NaOH XI gave the *Bz deriv.*, $\text{MeC}(\text{:NOMe})\text{C}(\text{:NOBz})\text{NH}_2$, m. 134-5°. XIII or methylamino glyoxime with a small excess of Me_2SO_4 in 20% NaOH gave the *di-Me ether* of XIII as a colorless liquid, b. 192°. XI in 10% NaOH with the calcd. amt. of PhN_2Cl was allowed to react 24 hrs., filtered and acidified with AcOH to ppt. *β -methylphenylglyoxime mono-Me ether* (XIV), $\text{MeC}(\text{:NOMe})\text{C}(\text{:NOH})\text{Ph}$, m. 99°. XIV with $\text{Me}_2\text{SO}_4 + 20\%$ NaOH gave the corresponding di-Me ether, m. 84°, identical with that previously obtained

(C. A. 19, 262). The *Ac deriv.*, m. 63°, and the *Bz deriv.*, m. 113–4°, of **XIV** are obtained by the usual methods. Dimethylglyoxime treated with $\text{Me}_2\text{SO}_4 + 20\%$ NaOH sepd. the *di-Me ether*, $\text{MeC}(:\text{NOMe})\text{C}(:\text{NOMe})\text{Me}$, m. 44°; heated with PhNHNH_2 in EtOH, it gives the osazone of Ac_2 , m. 242°. Diaminoglyoxime treated similarly gave the *di-Me ether*, $\text{H}_2\text{NC}(:\text{NOMe})\text{C}(:\text{NOMe})\text{NH}_2$, m. 144°, which heated with $\text{Ac}_2\text{O} + \text{NaOAc}$ gives $\text{Ac}_2\text{NC}(:\text{NOMe})\text{C}(:\text{NOMe})\text{NAC}_2$, m. 205°. **XXVI**. G. PONZIO AND G. RUGGERI. *Ibid* 453–62 (1925).—Nothing is known about the complex internal salts of hydroxyglyoximes (**XV**), $\text{RC}(:\text{NOH})\text{C}(:\text{NOH})\text{OH}$. P. and R. intend to study the properties of the **XV** from the viewpoint of the Werner theory but before doing so wished to obtain a more general method of prepn. than the $\text{NaOAc} + \text{HOAc}$ method described above (paper **XXIV**). This was attained by an extension of Lossen's method of prepg. hydroxamic acids (**XVI**) from RCO_2Et . By considering **XVI** as hydroxyoximes it was possible that **XV** would be formed similarly from α -oximino-acid esters, $\text{RC}(:\text{NOH})\text{CO}_2\text{Et}$, by the action of NH_2OH . In this way nearly calcd. yields of mono-hydroxyglyoxime, $\text{HC}(:\text{NOH})\text{C}(:\text{NOH})\text{OH}$ (of interest because of its relation with hydroxyfurazan and fulminic acid) and of methyl-, ethyl-, phenylhydroxyglyoxime, etc., were obtained. A concd. aq. soln. of MeCOCO_2Et treated with an equimol. amt. of $\text{NH}_2\text{OH} \cdot \text{HCl}$, pptd. $\text{MeC}(:\text{NOH})\text{CO}_2\text{Et}$ (**XVII**), m. 100°. **XVII** in EtOH was treated with 1 mol. NH_2OH and after 6–8 hrs., 1 mol. EtOK and gave the K salt $\text{C}_3\text{H}_5\text{O}_3\text{N}_2 \cdot \text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{K}$ in 90% yield. If Na is used the Na salt $\text{C}_3\text{H}_5\text{O}_3\text{N}_2 \cdot \text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{Na} \cdot \text{H}_2\text{O}$ is obtained in smaller yield. Either salt in H_2O with dil. H_2SO_4 gives methylhydroxyglyoxime (**XVIII**), decomps. 150–60°. The K salt explodes with great violence at 115°. The hydroxyglyoximes form 2 series of internal complex salts: (1) salts that contain an atom of a metal of the 8th group and an atom of an alk. metal: (2) salts that contain 2 atoms of a metal of the 8th group, *i. e.*, (**XIX**) $\text{R} \cdot \text{C} \begin{array}{c} \parallel \\ \text{NOH} \end{array} \text{C} \begin{array}{c} \parallel \\ \text{N.O} \end{array} \text{M} \begin{array}{c} \parallel \\ \text{O.C} \end{array} \text{C} \begin{array}{c} \parallel \\ \text{O.N} \end{array} \text{R}$, resp. where A is Na, K or NH_4 and M



is Ni, Cu or Co. The compds. of the 1st series are undoubtedly derived from 2 mols. of hydroxyglyoxime, are well crystd., have an abnormal color, are sol. in H_2O and behave crytometrically like electrolytes, contain the 8th group element as a complex stable anion and are pptd. by electrolytes having an ion in common as well as by other strong electrolytes. The compds. of the 2nd series are colloidal. **XVIII** in H_2O heated on the H_2O -bath with the calcd. amt. of aq. $\text{Ni}(\text{OAc})_2 + \text{a little AcOH}$ seps. *Ni* [dimethylhydroxyglyoxime] nickelate, (**XXI**) XX , $\text{M} = \text{Ni}$), as a cryst. red-brown powder contg. 4 mols. H_2O of crystn. Sodium [dimethylhydroxyglyoxime] nickelate (**XXII**), (like **XIX**), $(\text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{Ni})\text{Na}_2 \cdot 12\text{H}_2\text{O}$, treated with a little AcOH at 100° gives **XXI**, also warming 5 g. $\text{MeC}(:\text{NOH})\text{C}(:\text{NOH})\text{Cl}$ (**XXIII**) in 25 cc. EtOH with 20 g. NaOAc in 50 cc. 50% AcOH for some time at 40–50° and then adding 25 cc. $\text{Ni}(\text{OAc})_2$ and later 20% NaOH to a persistent alk. reaction seps. gradually 4.9 g. **XXII**. From concd. solns. of **XXII** a tetrahydrate $(\text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{Ni})\text{Na}_2 \cdot 4\text{H}_2\text{O}$, seps. Both of these hydrates at 100° give the monohydrate. The corresponding K salt was obtained as a trihydrate and this gave an anhyd. form at 105°. The *NiH*, salt $(\text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{Ni})(\text{NH}_4)_2$ was obtained similarly. **XXIII** treated as above, with $\text{Cu}(\text{OAc})_2$, gave Na [dimethylhydroxyglyoxime] cuprate, $(\text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{Cu})\text{Na}_2 \cdot 7\text{H}_2\text{O}$, and at 100° this gave the anhydride. The K and NH_4 salts were obtained similarly. *NiH*, [dimethylhydroxyglyoxime] cobaltoate, $(\text{C}_2\text{H}_5\text{O}_3\text{N}_2\text{Co})(\text{NH}_4)_2 \cdot 2\text{H}_2\text{O}$, also was obtained.

Reactions of organic thiosulfates. H. B. FOOTNER AND SAMUEL SMILES. *J. Chem. Soc.* 127, 2887–91 (1925).— $\text{RS} \cdot \text{SO}_2 \cdot \text{ONa}$ and NaSR' react quickly at the ordinary temp. to give RSSR' and Na_2SO_3 ; when R and R' are not the same radical, there results in most cases a mixt. of the 2 possible sym. disulfides. The yields generally exceed 95%. $2\text{-O}_2\text{NC}_6\text{H}_4\text{SNa}$ and $\text{PhCH}_2\text{SSO}_2\text{Na}$ give 99% of benzyl 2-nitrophenyl disulfide, yellow, m. 54°. Benzyl 9-anthryl disulfide, yellow, m. 128°. $\text{RS} \cdot \text{SO}_2\text{Na}$ are also quickly decompd. by aq. alkali cyanides, more than 90% reacting to give RSCN . 4-Nitrobenzyl thiocyanate, m. 79°. 9-Anthryl thiocyanate, pale yellow, m. 181°. $(\text{PhCH}_2\text{SO}_2)_2\text{S}$ and RSNa give $\text{PhCH}_2\text{SO}_2\text{SNa}$, $\text{PhCH}_2\text{SO}_2\text{Na}$ and $(\text{RS})_2$. $\text{Na}_2\text{S}_2\text{O}_6$ and RSNa give $(\text{RS})_2$ and $\text{Na}_2\text{S}_2\text{O}_8$, the yield of disulfide being 95–99%. $\text{Na}_2\text{S}_2\text{O}_8$ and RSNa give $(\text{RS})_2$, Na_2SO_3 and $\text{Na}_2\text{S}_2\text{O}_8$, the yields of disulfides again varying between 95 and 100%.

C. J. WEST

Chlorination of tetramethylenic polymers. E. PUXEDDU. *Gazz. chim. ital.* 55, 604–10 (1925).—In earlier work (C. A. 3, 1144; 6, 1136; 7, 1724; 11, 1158; 14, 3066) on the constitution of polymers of phenols having a propenylic side-chain, P. studied

the action of Br_2 on the polymers and found that substitution occurs, showing that these compds. do not contain the propenyl double bond. In this paper results on the chlorination of these polymers are given. It was hoped to gain a better insight into these compds. through these chlorination products but the products are not cryst., do not have a m. p. and do not show any distinctive reactions; they are amorphous yellow to red-yellow powders, insol. in H_2O but sol. in org. solvents, sol. in hot alkali hydroxides and are purified with difficulty. Isoeugenol in EtOH treated with concd. HCl and exposed to the light gave a cryst. ppt. of diisoeugenol (I), m. 180° . 6 g. I in 70 cc. CHCl_3 was treated with Cl gas until no more Cl was absorbed (about 2 hrs.). On evapg. the CHCl_3 a plastic yellow mass was obtained which hardened on standing in the air for some time. This was dissolved in 95% EtOH and was pptd. as a yellow non-homogeneous powder by adding H_2O . Part is sol. in hot ligroin and seps. on cooling; this is *hexachlorodiisoeugenol*, $\text{C}_{20}\text{H}_{18}\text{Cl}_6\text{O}_4$, decomp. about 105° . The insol. part is red-brown and was not analyzed. Chlorination of I in AcOH, in boiling CCl_4 at 76° and in xylene at 140° gave the same hexa- Cl deriv. as was obtained at ordinary temps. I shaken for an hr. with alkali and Me_2SO_4 sepd. dimethyldiisoeugenol (II), m. 106° . II chlorinated in CHCl_3 as with I gave a red-yellow product contg. more than 6 atoms of Cl . Diethyldiisoeugenol (III) was prepd. from $\text{Et}_2\text{SO}_4 + \text{I}$ as with II and when chlorinated in CHCl_3 as above gave the *tetra-Cl deriv.* of III, decomp. 85° . A soln. of isosafrole in dry Et_2O treated with dry HCl gas in the presence of FeCl_3 gave diisosafrole. This chlorinated in CHCl_3 at room temp. as above gave *hexachlorodiisosafrole*, $\text{C}_{20}\text{H}_{14}\text{Cl}_6\text{O}_4$, softens 90° , decomp. 123° .

E. J. WITZEMANN

Rearrangements of benzyl ethers. II. PAUL SHORIGIN *Ber.* 58B, 2028 36 (1925); cf. C. A. 19, 496.—The opinion expressed in the 1st paper that in the rearrangement, $\text{PhCH}_2\text{OR} \longrightarrow \text{PhCH}(\text{OH})\text{R}$, which benzyl ethers undergo under the influence of Na the radical R becomes attached to the central C atom through the same C atom through which it was originally attached to the O has been further confirmed with those ethers where $\text{R} = p\text{-tolyl}$, cyclohexyl and PhCH_2 , while *o*- $\text{MeC}_6\text{H}_4\text{OCH}_2\text{Ph}$ (I) and 2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{OCH}_2\text{Ph}$ (II) gave entirely unexpected results, forming phenols instead of carbinols. Thus, I yielded *o*- $\text{HOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Ph}$ (III). Other ethers (Ph , Et) of *o*- $\text{MeC}_6\text{H}_4\text{OH}$ are much more stable towards Na than I and require heating to 260° , and in both cases only the normal decompn. into $\text{PhMe} + \text{ROH}$ and $\text{MeC}_6\text{H}_4\text{OH} + \text{RH}$ occurs, there being no rearrangement, showing that in these cases also the ability to rearrange is dependent on the presence of a PhCH_2 group. Among the reaction products of $\text{PhCH}_2\text{CH}_2\text{OPh}$ and Na no $\text{PhCH}_2\text{CH}(\text{OH})\text{Ph}$ could be detected. PhCH_2SPh undergoes with Na only the normal decompn. into PhMe and PhSH . From 22 g. *p*- $\text{MeC}_6\text{H}_4\text{OCH}_2\text{Ph}$ and Na heated 28 hrs. on the H_2O bath are obtained 1.5 g. PhMe , 3 g. $\text{MeC}_6\text{H}_4\text{CH}(\text{OH})\text{Ph}$, b_{18} $185\text{--}90^\circ$, m. $53\text{--}4^\circ$, and 5.7 g. *p*-cresol. Cyclohexyl benzyl ether, from $\text{C}_6\text{H}_{11}\text{ONa}$ and PhCH_2Cl in boiling C_6H_6 (27 g. from 45 g. $\text{C}_6\text{H}_{11}\text{OH}$), b_{17} 146° , d_4^{21} 0.9856; 20 g. with Na gives PhMe and 4.6 g. $\text{C}_6\text{H}_{11}\text{CH}(\text{OH})\text{Ph}$, b_{12} $152\text{--}7^\circ$, m. $50\text{--}1^\circ$. From 20 g. $(\text{PhCH}_2)_2\text{O}$ are obtained 1.6 g. PhMe , 2 g. PhCH_2OH , 3 g. $\text{PhCH}_2\text{CH}(\text{OH})\text{Ph}$, b. $167\text{--}200^\circ$, m. $62\text{--}3^\circ$, a small amt. of a substance (probably stilbene), m. 124° , and about 0.2 g. BzOH . From 20 g. I, b_{24} 183° , d_4^{20} 1.0601, d_{20}^{20} 1.0528, heated 80 hrs. with Na , are obtained 0.5 g. PhMe , 3.5 g. III, m. $84\text{--}5^\circ$ (mixed with *o*- $\text{MeC}_6\text{H}_4\text{CH}(\text{OH})\text{Ph}$, m. $92\text{--}5^\circ$, it m. 60°), and 3.5 g. *o*-cresol. The same decompn. can be effected in 3.5 hrs. by heating the I and Na in dry H at $200\text{--}50^\circ$. The isomeric 2-methyl-6-benzylphenol, from *o*- $\text{MeC}_6\text{H}_4\text{ONa}$ and PhCH_2Cl , b_{15} $187\text{--}8^\circ$, m. $51\text{--}2^\circ$, sol. in alkalis, dissolves in concd. H_2SO_4 without color. Benzyl 2,4-dimethylphenyl ether (II), from $\text{Me}_2\text{C}_6\text{H}_3\text{OK}$ and PhCH_2Cl (30–5 g. from 35 g. of the phenol), b_{18} $186\text{--}7^\circ$ (cor.), d_4^{20} 1.0455; 20 g. heated 70 hrs. with Na gives 0.6 g. $\text{PhMe} + \text{C}_6\text{H}_4\text{Me}_2$, 2.4 g. 2,4- $\text{Me}_2\text{C}_6\text{H}_3\text{OH}$ and 5.4 g. of a compd. (undoubtedly somewhat impure 3-methyl-6-hydroxydibenzyl), b_{15} $193\text{--}4^\circ$, d_4^{26} 1.060, only partially sol. in alkalis, sol. without color in H_2SO_4 ; phenylurethan, m. $114\text{--}5^\circ$. From the product obtained by heating 19 g. $\text{PhCH}_2\text{CH}_2\text{OPh}$ and Na 70 hrs. in a sealed tube on the H_2O bath were isolated 0.7 g. EtPh , 3.5 g. unchanged ether and 5.2 g. PhOH . *o*- $\text{MeC}_6\text{H}_4\text{OPh}$ (18 g.) and Na heated 6 hrs. at $200\text{--}70^\circ$ gave 0.3 g. $\text{C}_6\text{H}_6 + \text{PhMe}$ and 5.5 g. $\text{PhOH} + \text{cresol}$, the PhOH predominating. *o*- $\text{MeC}_6\text{H}_4\text{OI}$ (24 g.) after 4 hrs. at $240\text{--}65^\circ$ gave inflammable gases ($\text{C}_2\text{H}_2 + \text{C}_2\text{H}_4$), 10 g. unchanged ether and 6 g. *o*-cresol. PhCH_2SPh , m. $41.5\text{--}2.0^\circ$, b_{27} 197° (cor.); 20 g. heated 36 hrs. with Na gives 0.7 g. PhMe , 4 g. PhSH and a residue smelling faintly of S compds., which in Et_2O did not decolorize I-KI .

C. A. R.

The peroxides of aldoximes. III. R. CIUSA AND E. PARISI. *Gazz. chim. ital.* 55, 416–21 (1925); cf. C. A. 17, 2570; 18, 821.—The formula, RCH:N.O.O.N:CHR for the peroxides of aromatic aldoximes (I) has been accepted without question. It explains

most of the properties of these compds. but it does not explain for instance why peroxides of the ketoximes do not exist. It is necessary to note that the various products obtained in the spontaneous decompn. of I (Robin, *C. A.* 15, 3469; Parisi, *C. A.* 19, 49) or by heating or recrystg. in solvents are of 2 kinds: monomol. and bimol. The 1st are the unchanged aldoxime, hydroxamic acid, phenylnitromethane, nitrile, aldehyde and CO_2H acid. The 2nd or bimol. products are furazan, dibenzenyloxime, α - and β -dibenzenylosazoxime (II and III) (Parisi, *C. A.* 18, 1297). Both kinds of products always accompany the formation of the peroxides. From the available facts C. and P. are convinced that I may be a mol. compd. of the unchanged oxime with the nitrile oxide. The formation of II from PhCH:N.O O N:CHPh observed by R is difficult to explain by the old formula, but if I is considered to be $\left[\begin{smallmatrix} \text{R.CH:NOH} \\ \text{R.C N:O} \end{smallmatrix} \right]$, this reacting with O would give 2 RC:N:O and II, i. e. RC:N(O) O.CR:N , finally. The peroxide of PhCH:NOH on reduction gives the oxime, the nitrile, BzOH and BzNH_2 according to the reaction: $\left[\begin{smallmatrix} \text{PhCH:NOH} \\ \text{PhC:N:O} \end{smallmatrix} \right] + \text{H}_2 \rightarrow \text{PhCH:NOH} + \text{PhC:N} + \text{H}_2\text{O}$. This also confirms the new formula for I. Some other data and arguments are given

E. J. WITZEMANN

Photochemical reactions in the series of *o*-nitrobenzylidene acetals. IOAN AND HELENE TĂNĂSESCU. *Bul. soc. stiinte Cluj* 2, 369-82 (1925). T. and T. study the action of sunlight on *o*-nitrobenzylideneglycol, $\text{O.CH}_2.\text{CH}_2.\text{O.CHC}_6\text{H}_4\text{NO}_2$ (I), (b_{12} 171°),

and *di-o* nitrobenzylidene-erythritol, $\text{O}_2\text{NC}_6\text{H}_4\text{CH.O.CH}_2.\text{CH.O} \left[\begin{smallmatrix} \text{O} \\ \text{O} \end{smallmatrix} \right] \text{CH.CH}_2.\text{O.CH}.\text{C}_6\text{H}_4\text{NO}_2$, (II) (cf. *C. A.* 19, 2932) (*amphi*-form, m. 193° and *anti*-form, m. 238°) Heating *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$ with the dried glycol in a closed tube produces I. According to Sachs and Hilpert (cf. *Ber.* 37, 3425) the group *o*- $\text{NO}_2\text{C}_6\text{H}_4\text{CH}$ should be light-sensitive. This is confirmed. Insolation of I yields an isomer, *o*- $\text{NOC}_6\text{H}_4\text{C(OH).O.CH}_2.\text{CH}_2.\text{O}$

(III), which forms white crystals, m. 128°, to a green melt or soln. III hydrolyzes easily on boiling with acid or base, giving glycol, and *o*- $\text{ONC}_6\text{H}_4\text{CO}_2\text{H}$. It has no primary alc. group. The *amphi*-form of II yields readily on insolation

o- $\text{ONC}_6\text{H}_4\text{C(OH).O.CH}_2.\text{CH.O} \left[\begin{smallmatrix} \text{O} \\ \text{O} \end{smallmatrix} \right] \text{CH.CH}_2.\text{O.CHC}_6\text{H}_4\text{NO}_2$. The

latter gives a mono-Bz deriv., m. 92-3°, and hydrolyzes, with *N* NaOH to $\text{HOCH}_2\text{CH(OH)CH.O.CH(C}_6\text{H}_4\text{NO}_2\text{).O.CH}_2$, m. 114°. The *anti*-form of II is almost

insensitive to light and evidently undergoes an isomerization before reacting photochemically.

D. S. VILLARS

The polymerization of derivatives of cinnamylideneacetophenone. MICHELLE GUJA. *Gazz. chim. ital.* 55, 567-76 (1925).—This is a continuation of earlier work (*C. A.* 16, 557) on the influence of the NHCOMe group on the polymerization of derivs. of PhCH:CHCH:CHCOPh (I). 20 g. *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{COMe}$ (II) in 200 cc. EtOH agitated with 16 g. $\text{PhCH:CHCHO} + 10$ cc. 15% NaOH sepd. presently *cinnamylidene-m-nitroacetophenone* (III), yellow, m. 135-6°. 3 g. III in dry CHCl_3 with 10% Br_2 in CHCl_3 after standing was treated with an equal vol. of petroleum ether; *tetrabromotetrahydrocinnamylidene-m-nitroacetophenone*, yellow, m. 203-4° (decompn.), sepd. 1.6 g. II treated as with III with *p*- $\text{McOC}_6\text{H}_4\text{CH:ClCHO}$ gave *p-methoxycinnamylidene-m-nitroacetophenone*, yellow, m. 157-8°. A 10% soln. of III in CHCl_3 was insolated 15 days in a sealed flask and gave on evapn. a semisolid tar that hardened on standing. The resinification also occurred on exposing the soln. in a quartz tube for 12 hrs. to the rays of an ultra-violet lamp. No indications of the formation of a dimer were observed. I is also easily resinified but not so easily as to interfere with obtaining the dimeric form. The presence of the NHCOMe group and NO_2 in the aromatic ring favors resinification. These groups are called resinophors (Gibner, *C. A.* 17, 3796). A no. of binary equil. curves were detd. In the system I-*o*- $\text{ClC}_6\text{H}_4\text{NO}_2$ a eutectic is formed that solidifies at 25.8° at a concn. of 24% I by wt. The eutectic with I-*p*- $\text{ClC}_6\text{H}_4\text{NO}_2$ solidifies at 54.8° at a concn. of 43% I; with I-*p*- $\text{BrC}_6\text{H}_4\text{NO}_2$ the eutectic comes at 60% I and solidifies at 74°. In the system I-*m*- $\text{C}_6\text{H}_4(\text{NO}_2)_2$ an addn. complex is formed at 48.15% I which is strongly dissociated in the fused state

and m. 59°. In I-1,2,4-BrC₆H₃(NO₂)₂ an equimol. addition complex (IV) is formed that m. 90°; the eutectic between IV and BrC₆H₃(NO₂)₂ solidifies at 61.2° and that between I and IV solidifies at 84.7°. In the system I-*p*-NH₂C₆H₄COMe a eutectic exists at 53% I and solidifies at 72.5°. In the system I-thymoquinone a eutectic exists at 25% I that solidifies at 37.4°. I forms addn. compds. with polynitro compd. only, as is shown in earlier work (C. A. 11, 1141) E. J. W.

Synthesis of ephedrine. E. FOURNEAU AND C. TORRES. *Anales soc. españ. fís. quim.* 23, 450-6(1925).—The action of MeNH₂ on PhCOCHBrMe, followed by reduction of the aminoacetone obtained, gives two bases: one m. 117° and its HCl salt, m. 164°, and is the Späth pseudo-ephedrine (C. A. 15, 1016); the other m. about 60° and its HCl salt m. about 190°. This latter base, according to Späth, does not correspond to *dl*-ephedrine, m. 73°. A base of exactly the same properties was obtained by Emde (C. A. 6, 866) and by Fournéau and Puyal (C. A. 17, 2418) by reducing PhCH-(NHMe)COMe. Although the identity of these NH₂ alcs. is established there are anomalies hard to explain. E. M. SYMMES

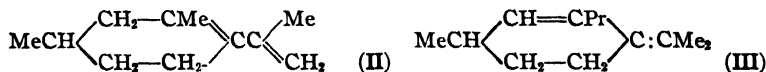
Action of hydrazine upon nitro and chloronitro derivatives of benzene and naphthalene. I. ERNST MÜLLER. *J. prakt. Chem.* 111, 273-6(1925).—General introduction II. Action of hydrazine hydrate upon several nitro and chloronitro compounds. E. MÜLLER AND GEORG ZIMMERMANN. *Ibid* 277-92.—*m*-O₂NC₆H₄CO₂H and N₂H₄·H₂O (I) in EtOH give the *hydrazine salt* of the acid, m. 182°; heating the salt with more I on the H₂O bath for 0.5 hr. gives *m*-H₂NC₆H₄CO₂H. The *p*-O₂NC₆H₄CO₂H behaves similarly. *o*-, *m*- and *p*-O₂NC₆H₄Me give nearly theoretical yields of the NH₂ derivs. when heated with I in a sealed tube 4 hrs. at 130°. The 3 O₂NC₆H₄NH₂ and I at 150° for 4 hrs. give the corresponding C₆H₄(NH₂)₂. 2,4-(O₂N)₂C₆H₃Me and I heated 6 hrs. on the H₂O-bath give the 4-NH₂ deriv., which, heated with more I at 140° gives 2,4-(H₂N)₂C₆H₃Me. *m*-ClC₆H₄NO₂ and I at 100° give 84% of *m*-ClC₆H₄NH₂. *o*-ClC₆H₄NO₂ and I, boiled 4 hrs., give 88% of benzeneazimidole, m. 156°, whose *hydrazine salt*, m. about 110-20°. 2,4-Cl₂C₆H₃NO₂ and I give 89% of the *hydrazine salt*, m. 182-3° (decompn.), of 4-chlorobenzeneazimidole, explodes 204-5°; this is a strong acid and liberates CO₂ from carbonates; the *K* salt explodes when heated above 300°. *Et ester*, m. 59-60°; *Bz deriv.*, m. 126°. The following derivs. of 5,2,4-Cl(O₂N)₂C₆H₂NHNH₂ are described: *Benzal*, orange, m. 242°. *Acetone*, yellow, m. 123°. *Acetoacetic ester condensation product*, m. 115°. *HCHO condensation product*, yellow, m. 124°. *Bz deriv.*, reddish yellow, m. 219°. *NO deriv.*, yellow, decomp. 85°; decompn. in 50% AcOH gives 2,4,2',4'-tetranitro-5,5'-chloroazobenzene, yellow, m. 93°; on further heating it explodes with a yellow vapor; mol. wt. in boiling C₆H₆ 342.5. 2,4,1,5-(O₂N)₂C₆H₂-(NHNH₂)₂ forms a *HCl salt*, light yellow, decompd. by H₂O, a *sulfate*, yellow, decomp. 213° and a *Bz deriv.*, orange-yellow, m. above 300°. III. Action of hydrazine hydrate on 2,4,5-trichloronitrobenzene. E. MÜLLER AND WALTER HOFFMANN. *Ibid* 293-306.—2,4,5-Cl₃C₆H₂NO₂ and I in EtOH give a very poor yield of 3,4-dichloro-6-nitrophenylhydrazine (II), orange-yellow, m. 194.5°; *benzal compd.*, yellow-red, m. 184°; *o*-hydroxybenzal deriv., greenish yellow, m. 207°. *m*-Dihydroxybenzal deriv., orange-red, m. 251°; *acetone compd.*, citron-yellow, m. 157°; *benzophenone compd.*, light yellow, m. 162°. II and HNO₂ (NaNO₂ and HCl) give 3,4-dichloro-6-nitrodiazobenzeneimide, yellow-brown, m. 56°. 2,4,5-Cl₃C₆H₂NO₂ and I in EtOH, heated 3 hrs. on the H₂O-bath, give the *hydrazine salt*, m. 205° (decompn.), of 4,5-dichlorobenzeneazimidole (III), decomp. 194-6°; *K salt*, decomp. explosively at 230-50°; *Ba salt*, needles, explodes on heating or on treating with concd. H₂SO₄; *Mg salt*; Cu salt, green needles; *Ag salt*, darkens in the light and explodes upon heating. *Aniline salt*, m. 168° (decompn.). *Me ether*, m. 129°; *Et ether*, m. 90°. *Bz deriv.*, m. 152°. *Ac deriv.*, m. 150°. *Et acetate deriv.*, m. 109°. *Et formate deriv.*, m. 123°. 2,4,5-Cl₃C₆H₂NO₂ (22 g.) and 5 g. N₂H₄ give 0.6 g. 2,3-dichloro-6-nitrophenylhydrazine, red, m. 172°; *HCl salt*, yellow, m. 195° (decompn.), hydrolyzed by hot H₂O; *benzal compd.*, red, m. 225°. II dissolves in aq. NaOH with a violet color; heating with concd. alkali gives a brown smeary mass, a little III being isolated from the filtrate. II and I give III. IV. Action of hydrazine upon 1-chloro-2,4-dinitronaphthalene. E. MÜLLER AND KARL WEISBROD. *Ibid* 307-12.—2,4-(O₂N)₂C₁₀H₆Cl and I in EtOH, warmed 6 hrs. on the H₂O bath, give a mixt. of 4,4'-dinitro-2,2'-azonaphthalene (IV), brown-red, m. 315°, the *di-NH₄ salt* of 2,4-C₁₀H₆-(NO₂)₂ (V), red, m. 203-5°, *m*-nitronaphthylazimidole, yellow, m. 215° and some V. The reaction in the cold gives the same products. Anhyd. N₂H₄ gives IV and V. C. J. WEST

Relationship between the optical rotatory powers and the relative configurations of optically active compounds. II. The relative configurations of the optically active mandelic acids and β -phenyllactic acids. G. W. CLOUGH. *J. Chem. Soc.* 127, 2808-12

(1925); cf. *C. A.* 12, 2188.—From published data on the ~~not~~ rotations of optically active α -HO acids and their derivs., it is concluded that ~~hexahydromandelic and mandelic acids belong to the "d" series of α -HO acids as probably does d - β -phenyllactic acid.~~ *l*-Mandelic acid, $[\alpha]^{14}_{D} -158^{\circ}$, -166° , -188° , -426° for $c = 5.893, 5.780, 5.661, 4.078$ (this order used below) (in H_2O , c 1.59); $[\alpha]^{14}_{5461} -203^{\circ}$ (4 *N* NaCl, c 1.59). Et ester, d_4^{15} 1.128, $[\alpha]^{15}_{D} -129.4^{\circ}$, -135.7° , -156.4° , —; $[\alpha]^{15}_{D} -117.4^{\circ}$, -121.9° , -141° , -325° (in MeOH, c 10); $[\alpha]^{15}_{D} -149.6^{\circ}$, —, -180.5° , — (N MeOH-NaBr, c 10.12). *Me l*-phenylbenzoyloxyacetate, b_{18} 224–5°, d_4^{20} 1.217, $[\alpha]^{20}_{D} -141.4^{\circ}$; *Me l*-phenyllactate, d_4^{20} 1.129, $[\alpha]^{20}_{D} -4.74^{\circ}$. *Me d*- α -acetoxy- β -phenylpropionate, b_{20} 185°, m. 30–1°, d_4^{18} 1.125°, $[\alpha]^{18}_{D}$ 7.33°. *Me l*- α -benzoyloxy- β -phenylpropionate, b_{18} 224–5°, d_4^{20} 1.161, $[\alpha]^{20}_{D} -32.45^{\circ}$. C. J. WEST

Reaction of lactoses with aromatic hydrocarbons and aluminium chloride. E. J. KING. *Trans. Roy. Soc. Can. Sec. III* (3) 19, 29(1925).—Phthalide gave only *o*-PhCH₂-C₆H₄CO₂H. Diphenylphthalide gave no reaction. Phthalide with C₁₀H₈ in C₆H₆ reacts only with C₆H₆. In CS₂ C₁₀H₈ with phthalide and with phenylphthalide gave only β -C₁₀H₇ derivs. Coumarin with C₆H₆ and AlCl₃ gave a very little of a product, m. 82°, which with Br in the cold gave a product m. about 112°. J. W. S.

The constitution of pulegone, of tertiary alkylpulegols and of alkylpulegenes. V. GRIGNARD AND J. SAVARD. *Compt. rend.* 181, 589–92(1925).—It is already known that pulegone (I) and MeMgI give a methylpulegol which on dehydration yields a hydrocarbon of doubtful compn. (cf. Grignard, *Ann. chim. phys.* 24, 433(1901); Rupe, *C. A.* 2, 2384; Auwers and Eisenlohr, *C. A.* 4, 1745). This problem was studied further with the aid of a more recent method of G. (*C. A.* 18, 659). Contrary to previous belief, I is not a single compd., but a mixt. of the β -form of I and 15–8% isopulegone (α -form). Org. Mg compds. do not alter this equil., so that the tertiary β -pulegols and α -pulegols are in the same proportion. Instead, however, of hydrocarbons of corresponding form being obtained on dehydration, partial isomerization of the β - to the α -form occurs. The hydrocarbons from 4 pulegols gave on ozonization the following proportions of Me₂CO and HCHO + HCO₂H, resp.: Me, 28, 68; Pr, 77, 24; Bu 45, 50; iso-Pr 56, 43. It is concluded that the double bond created by dehydration is intranuclear, and not semicyclic. A study of the position of the double bond in the ring showed that it was probably conjugate, methyl- α -pulegone having the compn. II, which cannot give the



β -form. On ozonizing the β -form of propylpulegene and decomp. the ozonide with H₂O, the chief product was α -methylglutaric acid, indicating that β -forms of such compds. have the compn. exemplified by III. In general the alkylpulegenes are mixts., in varying proportions, of the α - and β -forms, the origin if not the proportions of which depend on the natural pulegone itself. In both series the double bonds are conjugate, from which arises the unexplained anomaly of an absence of any increase in mol. refraction. C. C. DAVIS

Menthone series. I. JOHN READ AND ALISON MARY RITCHIE COOK. *J. Chem. Soc.* 127, 2782–8(1925).—*dl*-Piperitone, reduced with EtONa, gives about 9% of *dl*- α -phellandrene and 42.4% of liquid and solid menthols. The fraction b_{10} 95–7° (410 g.), on oxidation with CrO₃, gave 332 g., 37% of which b_8 82°, n_D^{17} 1.4553, $\alpha_D^{17} -0.18^{\circ}$ and 40% b_8 82–5°, n_D^{17} 1.4571, $\alpha_D^{17} -0.34$, the latter consisting essentially of *dl*-isomenthone. Further reduction of the isomenthone fraction with EtONa gives a mixt. of *dl*-menthol (and *dl*-isomenthols), which was further oxidized to *dl*-menthone. Catalytic reduction of piperitone gave as the main fraction *dl*-isomenthone, which was converted as above to *dl*-menthone. *dl*-Isomenthone oxime, m. 99–100°, anorthic crystals with forms *a*, *m*, *M*, *c*, *Q*, and rarely *O*; *a*:*b*:*c* = 2.049:1:2.281, α 112°12', β 116°17', γ 86°57'; optical extinction is nearly straight with the vertical edge and an optic axis lies just within the field. *B β* deriv., m. 55.5°. *dl*-Isomenthone isoöxime, m. 94–5°. *Benzoyl-dl*-menthone oxime, m. 72–3°. *dl*-Menthone isoöxime, m. 114–5°. *dl*-Menthone gives a small amt. of a α -semicarbazone, m. 185–6°, but principally the β -deriv., m. 161–2°. *dl*-Menthone and *dl*-isomenthone may most readily be discriminated by prep. the oximes or semicarbazones in weakly acid soln. C. J. WEST

Aluminium oxide as a condensing agent and the role of carrier substances in the catalysis. K. W. ROSENMUND AND A. JORTHE. *Ber.* 58B, 2054–8(1925).—The object

of the present work was to det. whether Al_2O_3 can act as a condensing catalyst in a liquid medium. In high boiling solvents, it can bring about the condensation of PhCH_2OH with amines, with elimination of H_2O . The reaction is already marked at 170° , and in tetralin or PhNO_2 70–85% yields can be obtained. Both Al_2O_3 obtained by dehydrating $\text{Al}(\text{OH})_3$ at 400° and the com. article were used; the efficiency of the latter was variable. The favorable influence of Al_2O_3 in certain catalytic reactions is probably due to this property it has of effecting dehydrating condensations, as already suggested by Ipat'ev in the case of the reduction of borneol to isocamphane (*C. A.* 7, 2187), but R. and J. do not believe that his assumption of the formation of a labile complex $\text{Al}_2\text{O}_3 \cdot \text{NiO}$ is sufficiently general; a more satisfactory explanation is the assumption of "com-

plex" formation between the catalyst and the 2 reacting substances:

$$\begin{array}{c} \text{C}_{10}\text{H}_{17} \cdots \text{H} \\ \diagdown \quad \diagup \\ \text{[Al}_2\text{O}_3\text{]} \\ \diagup \quad \diagdown \\ \text{Ni} \\ \diagdown \quad \diagup \\ \text{HIO} \cdots \text{H} \end{array}$$

Borneol and H_2 are bound to the catalyst by partial affinities (adsorption), and the inner forces of the mol. are consequently loosened and the conditions prerequisite for the regrouping of the forces are established. The HO of the borneol tends towards I, the borneol residue towards the other atom of the H_2 mol. and the whole breaks down into H_2O , the reaction product and the catalyst. The Al_2O_3 plays a double role; by its marked adsorptive power it brings the borneol to the catalyst and, secondly, it eliminates H_2O from the labile complex. The reduction therefore seems to be a condensation between ROH and H_2 , the Ni effecting the loosening between the atoms of the H_2 and the Al_2O_3 , the elimination of the H_2O . Other substances, like ThO_2 and TiO_2 , show in principle the same phenomena as Al_2O_3 . C. A. R.

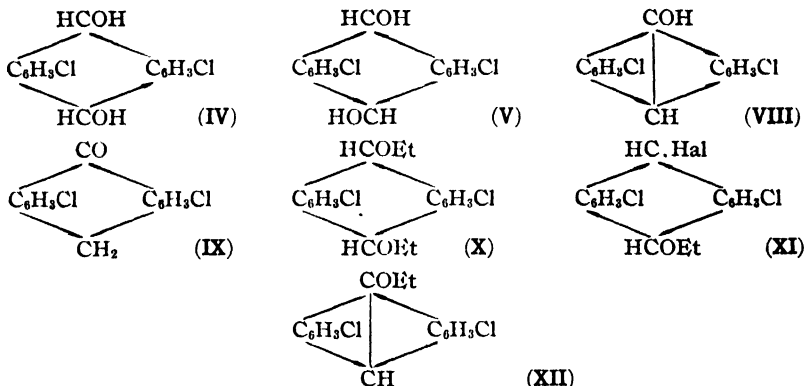
Recent researches on sesquiterpenes. RAGNAR VESTERBERG. *Svensk Kem. Tids.* 37, 219–26(1925).—The work of Ruzicka in developing the structural formulas of cadalene and selenene is traced step by step. Tests of samples contg. sesquiterpenes are given briefly. These will be published in the *Ann* A. R. ROSE

Benzidine derivatives of thiourea. LEÓN PINTO. *Compt. rend.* 181, 788–90 (1925)—A low yield of monoacetylbenzidine (I) is obtained by condensing benzidine with 10 parts of glacial AcOH at 130° for 3 hrs. I is treated with an excess of CS_2 in EtOH for 20 hrs. on the water bath to form diacetylbenzidinethiourea (II), m. above 360° . The free base (III) is obtained by hydrolyzing at $125\text{--}130^\circ$ with 0.1 N HCl III at 70° loses its water of crystn. Diazotizing and coupling III with aromatic amines and phenols gives a new series of direct cotton colors. D. H. POWERS

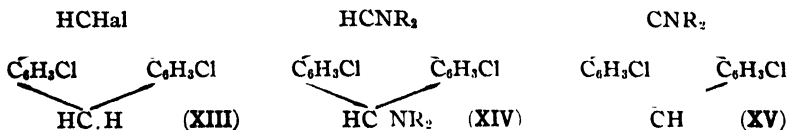
Methylation of the oximes of benzil. O. L. BRADY AND HILDA M. PERRY. *J. Chem. Soc.* 127, 2874–82(1925).— γ -Benzil oxime in NaOH and Me_2SO_4 give a mixt. of the *N*-Me ether, m. $109\text{--}10^\circ$, which is less sol. in ether-petroleum ether than the isomeric *O*-Me ether (I), m. 63° (cf. Dittich, *Ber.* 23, 3589(1890)). Me detns. on the *O*-Me ether gave consistently low results in the presence or absence of Ac_2O . α -Benzil oxime gave only the *O*-Me ether, m. $58\text{--}9^\circ$, which is transformed into I by heating 30 min with concd. HCl. α -Benzil dioxime and Me_2SO_4 give the *N,N*-di-Me ether, m. 192° (decompn.); it crysts from C_6H_6 with 0.5 C_6H_6 , m. 185° and from EtOH with 0.5 EtOH(?), m. $165\text{--}6^\circ$; it is sep'd by its insoly. in Et₂O. The mother liquor, purified through the HCl salt, gives the *N*O-Me ether, m. 109° (cf. Auwers and Meyers, *Ber.* 21, 3510(1888)); with concd. HCl this gives I. The *O,O*-di-Me ether was prep'd. from the oxime, Ag_2O and EtI in dry Et₂O; it m. $163\text{--}4^\circ$ and on heating with concd. HCl gives the β -deriv. β -Benzil dioxime and Me_2SO_4 give a mixt. of the *N,O*-di-Me ether, m. $102\text{--}3^\circ$, transformed by concd. HCl to I, and the *O,O*-di-Me ether, m. $72\text{--}3^\circ$. Methylation of γ -benzil dioxime gave only I, which suggests that the *N,N* and *N,O*-di-Me ethers are formed but very readily hydrolyzed. C. J. WEST

The mechanism of substitution reactions in the aromatic nucleus. III, IV. E. DEB. BARNETT, J. W. COOK AND M. A. MATTHEWS. *Rec. trav. chim.* 44, 728–39, 818–26(1925) (In English); cf. *C. A.* 19, 2488.—In a previous paper (B. and M., *C. A.* 19, 59) it was shown that 1,5-dichloroanthracene dibromide (I) probably has the *cis*-configuration, since on thermal decompn. it loses Br and gives 1,5-dichloroanthracene (II) almost quant. The stability of the corresponding dichloride (III) (Liebermann, Beudet, *C. A.* 8, 2159) pointed to its having the same configuration and this has now been proved by its thermal decompn. into II. The yield from II is poorer than from I. KOH-EtOH acting on III gives not over 50% of 1,5,9-trichloroanthracene. These facts suggest that III is a mixt. of isomers or that the *cis*- is readily converted into the *trans*-form under some conditions. The latter is more probable since III is crystd. unchanged from boiling xylene and no isomer has been obtained by this method. I and II have now been investigated more fully. The results show that generally both

react as if they were *cis*-forms but sometimes a partial conversion into a *trans*-compd. seems to take place. This conversion is particularly well marked in hydrolytic reactions. If I and III are hydrolyzed by boiling with $\text{H}_2\text{O}-\text{Me}_2\text{CO}$ in the presence of excess CaCO_3 , MgCO_3 or MgO a mixt. of *cis*- and *trans*-dichlorodihydroanthraquinols (IV and V), II, 1,5-dichloroanthraquinone (VI) and 1,5,11,5'-tetrachlorodianthrone $\text{CO}-(\text{C}_6\text{H}_3\text{Cl})_2\text{CHCH}(\text{C}_6\text{H}_3\text{Cl})_2\text{CO}$ (VII) is formed. Of IV and V only the *trans*-isomer



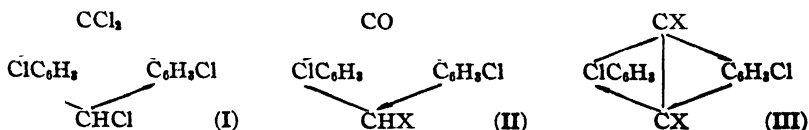
(V) shows any tendency to lose H_2O ; V when heated with KOH or in $\text{H}_2\text{O}-\text{Me}_2\text{CO}$ with a little halogen acid gives the anthranol (VIII) isolated as dichloroanthrone (IX). The formation of VI and VII is due to the oxidation of VIII. This oxidation takes place at the expense of some of the dihalide, which is reduced to II, some of which is always formed. The oxidizing action is thought to be due to nascent halogen formed in the reaction. HBr or HCl acting on IV or V gave dihalides identical with I and III, which with CaCO_3 in $\text{H}_2\text{O}-\text{Me}_2\text{CO}$ gave a mixt. of IV and V. In this way, the change of configuration was demonstrated. IV and V have the same compn. and mol. wt. and both give a diacetate with Ac_2O and a diurethan with PhNC . The *trans*-isomer is less sol., and has the higher m. p. and does not free I from HI in the cold like the *cis*-isomer. When I and III are sapon. by boiling in EtOH a mixt. of mainly dichlorodihydroanthraquinyl di-Et ether (X) and dichloroanthranyl Et ether (XII) is formed. XII is probably formed from a compd. having the *trans*-form and since V is so stable it is not likely that its di-Et deriv. is the intermediate stage. The change of configuration occurs in the I and II used or in an intermediate like XI. Sapon. of II with other alcs. (Pr-, iso-Pr, *n*-Bu, iso-Bu and iso-Am) gave only the homologs of XII and none of X. Only the Pr, *n*-Bu and iso-Am derivs. were purified; the others were viscous oils which were identified by their easy sapon. with AcOH + a little H_2SO_4 to give IX. III boiled 6 hrs. with *tert*-BuOH was recovered unchanged. I reacts with PhOH giving II, which is a typical reaction for the *cis*-form. III behaves differently, giving 1,5-dichloroanthranyl Ph ether and this reaction must be accompanied by a change in configuration. Other phenols (*o*-, *m*- and *p*-cresol, *p*- $\text{ClC}_6\text{H}_4\text{OH}$ and β -naphthol) appear to behave similarly. Thymol reacts with difficulty. The Et and Me homologs of XII are easily sapon. in AcOH and mineral acid (cf. B., C. and M., C. A. 17, 3503; Krollpfeiffer, C. A. 18, 1124). The aryl ethers are more stable but are easily decompd. by HI in AcOH : II is formed and the probable mechanism of this reaction is discussed. It was previously shown (B., C. and M., C. A. 19, 2488) that in many of their reactions the anthracene dihalides and their *bz*-substitution products show a tendency to undergo a change of geometrical configuration, and that in *trans*-isomers the tendency for re-establishment of the "bridge" is considerably greater than in the *cis*-isomers. In this paper, the behavior of I and III with org. bases is described. In this case different reactions were found: (a) a loss of halogen with the formation of II; (b) a change of configuration and loss of halogen acid with production of 1,5,9-trihaloanthracene



(XIII); (c) replacement of both halogen atoms by substituted amino groups (XIV); (d) replacement of 1 halogen atom by a substituted NH_2 group, change of configuration and loss of halogen acid, giving (XV). Of these (a) and (c) must be regarded as "cis-reactions" and (b) and (d) as "trans-reactions." II frequently accompanies other products obtained by the action of bases on I and III and especially when I is used. It is the only isolable product of the action of Ph_2NH , EtNH_2 , PhNMe_2 , α -picoline and quinoline on I. With III loss of halogen takes place less readily and treatment with PhNMe_2 gives mainly 1,5-dichloro-9,10-tetramethyldiaminodiphenyl-9,10-dihydroanthracene, m. 175° (decompn.). XIII is rarely if ever the sole product of the action of a base on I or III but it is the main product when III in boiling xylene is treated with excess piperidine or quinoline. This tendency of bases to cause loss of halogen rather than loss of halogen acid is regarded as an argument in favor of the *cis*-structure of the dihalides I and III. Reaction (c) represents the usual action of primary aromatic amines or secondary aliphatic or aromatic amines on I and III and in many cases the same products are obtained by the action of aromatic amines on 1,5-dichloro-9,10-dihydroanthraquinylidipyridinium dibromide. In this respect I and III differ from the corresponding anthracene derivs (cf. B and C., C. A. 15, 2869; B., C. and M., C. A. 19, 2488). The XIV derivs. are regarded as having the *cis*-configuration since they show little tendency toward reestablishment of the "bridge," e. g. by boiling with EtOH-HCl . Their formation from I and III is a simple replacement of halogen atoms but their formation from the dipyridinium salt must involve a change of configuration, since the ease with which these pyridinium salts lose a mol. of $\text{C}_6\text{H}_5\text{N.HX}$ with the reestablishment of the "bridge" points to their having the *trans*-configuration. This behavior is discussed. The formation of anthranilamine derivs (XV) (*trans*-type of reaction) by the action of bases on I and III has only been demonstrated in the case of $m\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$, in which the product was found mixed with II, showing that both *cis*- and *trans*-reactions had taken place. Tertiary bases in which nuclear reactions are excluded (NEt_3 , NPr_3 , N -methylpiperidine) do not as a rule react with I, although α -picoline and quinoline cause loss of Br and the formation of II; NH_2Me and Ph_2NH behave similarly. The following other new compds. are described. 1,5-Dichloro-9,10-tetraethyldiamino-9,10-dihydroanthracene, m. 130° ; 9,10-dipiperidino deriv., m. 195° ; 9,10-dianilino deriv., m. 211° ; 9,10-dimethylanilino deriv., m. 230° ; 9,10-tetramethyldiaminodiphenyl deriv., does not m. below 300° ; 1,5-dichloroanthranylaniline, yellow, m. 177° ; *o*-toluidine deriv., yellow, m. 189° ; *m*-nitroaniline deriv., yellow, m. 268° . With $\text{C}_6\text{H}_5\text{N}$, III gave 1,5-dichloro-9,10-dihydroanthraquinyl-9,10-dipyridinium dichloride, which with NH_4OH added to its cold H_2O solns. gives 1,5-dichloroanthranylpyridinium chloride, yellow, m. 330° (decompn.). With SO_2 , H_2S (passed through the glacial AcOH soln. at 100°), with Na_2S (in boiling $\text{H}_2\text{O-EtOH}$), with $\text{AcCHNaCO}_2\text{Et}$ and $\text{CHNa}(\text{CO}_2\text{Et})_2$ (both in boiling Et_2O) and with PhMgBr (in boiling abs. Et_2O) I is reduced to II. Et_3S and Mg failed to react with I. C_6H_6 (+ AlCl_3) gave a tar with I. I in EtOH suspension with concd. aq. KCN heated 2 hrs. on the H_2O bath gave 1,5-dichloroanthronitrile, yellow, m. $230\text{--}42^\circ$.

E. J. WITZEMANN

The mechanism of substitution reactions in the aromatic nucleus. V. E. DE BARRY BARNETT, J. W. COOK AND M. A. MATTHEWS. *Rec. trav. chim.* 44, 894-9(1925). (In English.)—In previous papers (C. A. 19, 59, 2488; preceding abstract), it was shown that the tendency for reestablishment of the "bridge" to take place when *meso*-halogen derivs. of 9,10-dihydroanthracene undergo reaction depends on the configuration of these halogen derivs. and on their tendency to undergo change in configuration during the course of the reaction. In the case of 1,5,9-trichloroanthracene dichloride (I) geometrical isomerism is no longer possible and some of its reactions were studied.



2 types of reaction occur: (1) reactions in which 1 halogen atom is replaced by a new group and the remaining 2 by an atom of O, giving a *meso*-substituted anthrone (II); (2) reactions in which 2 halogen atoms on different C atoms are replaced by new groups with simultaneous reestablishment of the "bridge" by loss of HCl , the product being a 9,10-substituted anthracene deriv. of the general formula III ($\text{X} = \text{OH}$, alkoxyl or substituted NH_2 group). H_2O , EtOH , NaOAc , Et_3NH and piperidine react mainly according to (1) and PhNH_2 , MeNHPh and Me_2NPh react according to (2). The *gem*-

Cl_2 group is the more reactive and hydrolysis with aq.- Me_2CO gives first 1,5,9-trichloroanthrone (IV) and subsequently 1,5-dichloro-9-hydroxyanthrone. The action of KOH - EtOH on I leads to 1,5,9,10-tetrachloroanthracene (V) and since in the dichloride there must be a Cl atom in the same plane as the H atom it was expected that the action of heat would lead to reestablishment of the "bridge" by the loss of HCl . But this does not occur in boiling *p*-cymene; IV is almost the sole product. This curious reaction is difficult to explain and throws doubt on the reliability of reactions of this type for detg. geometrical configuration. The question is to be investigated. Although 1,5,9-trichloroanthracene (VI) adds Cl_2 easily in CCl_4 the reaction with Br_2 is much slower and less certain and is accompanied by the evolution of HBr . No definite additive compd. could be isolated; the crude product treated with $\text{C}_6\text{H}_5\text{N}$ gave a little 1,5,9-trichloro-9-bromoanthracene but the prepn. was very uncertain. Although V is easily obtained as described above it is not obtained by the action of SOCl_2 on either 1,5-dichloroanthracene or 1,5,9-trichloroanthracene; both are recovered unchanged. 35 g. VI was ground to a thin cream with 50 cc. CCl_4 and 150 cc. CCl_4 contg. 9% Cl by wt. was added; after standing overnight I was filtered; recrystd. from H_2O - Me_2CO it m. 162° (decompn.). 14 g. I was boiled 0.5 hr. with 150 cc. abs. EtOH contg. 7 g. KOH in 15 cc. H_2O ; V was filtered off and recrystd. from $\text{C}_6\text{H}_5\text{N}$ and MeCOEt ; it m. 195° and on oxidation with CrO_3 gives 1,5- $\text{Cl}_2\text{C}_6\text{H}_3(\text{CO})_2\text{C}_6\text{H}_3\text{Cl}$. V with much Cl in CCl_4 was recovered unchanged after 24 hrs. I heated on the H_2O bath with twice its wt. of Pr_3N gave some V. 5 g. I, 5 g. pptd. CaCO_3 , 12.5 cc. H_2O and 50 cc. Me_2CO were refluxed 1 hr., filtered hot and dild. with H_2O until crystn. began. The product was IV. 5 g. II + 10 g. NaOAc + 40 cc. glacial AcOH heated 15 min., sepd., 1,5-dichloroanthronyl acetate, m. 177° . 5 g. I boiled with 100 cc. abs. EtOH for 1 hrs. gave 1,5-dichloroanthronyl *Et* ether, m. 159° ; when heated with HCl in EtOH it gives IV. 7 g. I in 50 cc. hot C_6H_6 + 7 cc. Et_3NH in 25 cc. C_6H_6 after several days at room temp. gave 1,5-dichloro-9-diethylaminoanthrone, m. 194° . 1,5-dichloro-9-piperidinoanthrone, m. 239° , 1,5-dichloro-9,10-dianilinoanthracene, m. 271° , 1,5-dichloro-9,10-dimethylanilinoanthracene (does not m. below 310°) and 1,5-dichloro-9,10-tetramethyldiaminodiphenylanthracene (does not m. below 300°) were obtained somewhat similarly. I heated with $\text{C}_6\text{H}_5\text{N}$ gave 1,5,9-trichloroanthronylpyridinium chloride, yellow but does not melt, gives a picrate, m. 253° , in H_2O .

E. J. WITZEMANN

Indan bases. CH. COURTOT AND A. DONDELINGER. *Ann. chim.* 4, 222-30(1925); cf. C. A. 19, 1859.—It has been previously shown that indanyl bromide reacts uniquely with primary aromatic amines to give only sec. amines in good yields and not a mixt. of sec. and tert. amines. C. and D. find that indanyl chloride reacts at *ordinary temp.* with aromatic amines to give sec. amines. The mobility of the α -position is not due necessarily to the nearness of the ethylenic bond, and the 5-membered ring may have a sp. action in increasing this mobility. Primary and sec. aliphatic amines have been found to react with indene- HCl . Mixed alkylarylamines also react with the indene- HCl to give the tert. amine in good yields. NHPh_2 gives only traces of diphenylindanyllamine, as decompn. occurs and polymerized indene is obtained. I. Synthesis of aliphatic indanyllamine derivs. *Ibid* 231-59.—Previous methods for prepg indanyllamine (I) are long. C. and D. prep. I from indene (II), a coal-tar product. To prep. II the coal-tar fraction b. $176-82^\circ$ is treated with NaNH_2 and distd. and the residue is extd. with water to liberate free II. A 98% yield of II. HCl (III) was obtained by improving Weissgerber's (C. A. 5, 3064) method. Aq. NH_3 reacts with III very slowly and after weeks gave 3 products, indanyllamine (IV), II and α -hydroxyhydrindene. Liquid NH_3 reacts with III slowly at low temp.; at room temp. under pressure it reacts in 12 hrs. I absorbs CO_2 very rapidly and under H_2 b_{747} 220.5° b_8 $96-7^\circ$. The mol. refraction of I is 41.55 (calcd. for a primary aliphatic amine, 41.38), showing no aromatic exaltation. It resembles closely tetrahydronaphthylamine and its continuous and selective absorption spectra in the ultra-violet, the degree of hydrolysis of its salts all confirm its aliphatic character. Diindanyllamine (V) is formed from liquid NH_3 and III under pressure; it m. $84-5^\circ$. Indanylmethylamine (VI), from liquid MeNH_2 and III for 12 hrs. (86% yield), b_{18} $106-7^\circ$. VI and MeI in ether give trimethylindanyllammonium iodide, m. 198° (VII). Indanyldimethylamine (VIII), prepd. from liquid Me_2NH and III, b_{10} $99-100^\circ$ (85% yield). VIII and MeI give VII. Liquid EtNH_2 and Et_2NH reacted with III to give indanylethylamine (IX) (65% yield), b_7 $106-7^\circ$, and indanyldiethylamine (X) (20-25% yield), b_{14} $108-26^\circ$. VI and III yield diindanylmethylamine (XI) (56% yield), m. $92-3^\circ$. VI and BzCl give indanylbenzylmethylamine (XII) (54% yield), b_{17} $197-8^\circ$. II. Synthesis of secondary and tertiary aliphatic amines. *Ibid* 260-92.—III and PhNH_2 give 53% of indanylphenylamine, m. $42-3^\circ$. III was treated directly with *o*-, *m*- and *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ to give the corre-

sponding indanyltolylamines, m. 70.5–71.5°, b₉ 202–3°, m. 65.5–6.5°, resp. (yields 45.66 and 52%). With Me₂C₆H₃NH₂ **III** gives indanylxylylamine (55%), b₁₇ 218°. With PhNHMe and PhNH*i*Bt **III** gives the corresponding tert. amines, b₁₁ 191–2° (77%), and b₁₂ 193–4° (73%). **III** with Ph-NH gives an extremely low yield of a product seeming to be indanyldiphenylamine, m. 85–6°. **III** and aromatic primary amines condense almost instantaneously, aromatic alkylamines very rapidly and aliphatic amines more slowly. *o*-, *m*- and *p*-O₂NC₆H₄NH₂ with **III** give the corresponding sec. amines after several days. m. 87–8° and 92.5–3.5° (55%); 127–8° and 137–8° (50%) and 126–7° (30%). The *o*- and *m*-comps. have two m. ps. only when crystd. from EtOH. This may be due to EtOH of crystn. or formation of less stable isomers. The effect of the NO₂ group in the aromatic ring is a stabilizing one and also weakens the basicity of the amines. So as expected di- and trinitroaniline do not react with **III**. α-C₁₀H₇NH₂ and **III** give a noncrystallizable oil which is indanyl-α-naphthylamine but β-C₁₀H₇NH₂ and **III** give diindanyl-β-naphthylamine, m. 169–70°. α-Aminoanthraquinone and **III** give only **II** and no sec amine. Sulfonated amines did not react with **III**. **II** was hydrogenated quant. with Pt black to indan (**XIII**), b₁₀ 56–7°. EtMgBr reacts quant. with **II** at 100°, but does not react with **XIII** even at 135°. This shows the reactivity of the indene derivs. is due to the double bond in the 5-membered ring. In all of the comps. listed, not only have C. and D. made C, H and N detns., but also the d., mol. wts. in C₆H₆, *n* refraction and mol. refractions have been detd. **III**. **Preparation of the salts of the indan bases and determination of their electrolytic constants.** *Ibid* 293–326 —C. and D. prepd. the HCl salts of all the indan bases synthesized and some of the oxalates. Their prepn. offers a convenient method of purification. A study of the affinity const. and degree of hydrolysis of the HCl salts showed that in the indanylamine series the groups Me and *i*Bt linked to the N decrease the affinity const. (a. c.), while the Me group in the PhNH₂ series decreases and the *i*Bt group increases the a. c. The a. c. becomes lower in passing from BzNH₂ to **IV** than to PhNH₂. It is probable that this lowering is due to the aromatic, hydroaromatic and aryl aliphatic structure of the bases in question. The substitution of an indanyl group for an amino H atom lowers the a. c. and the ionization of the base. The substitution of the indanyl group in *o*-, *m*- and *p*-isomers does not change the relative positions of their a. c. Substituting the *p*-Me group in phenylindanylamine has only slight influence on the const. **IV**. **Optical study of the indan bases.** *Ibid* 327–45, cf. C. A. 19, 1859. **V. Action of the hydrogen acids on indene.** *Ibid* 345–69 —HCl reacts with **II** readily to form **III**, which decomp. slowly to give polymerized **II** and HCl vapor. **III** must be prepd. freshly and it is useless to attempt to purify it. HBr reacts with **II** even more rapidly than HCl does but the product is much less stable and cannot be purified. HI combines with **II** avidly but the product decomp. almost at once. The halogens are linked in the α-position in the indan ring. HF, like H₂SO₄, polymerized **II** into parindene.

D. H. POWERS

The influence of mercury on the sulfonation of anthraquinone. A. COPPENS. *Rec. trav. chim.* **44**, 907–30(1925). (In English.) —The behavior of Hg in the sulfonation of anthraquinone (**I**) has not been fully explained. In 1903–4 it was found that if **I** is sulfonated in the presence of Hg the reaction product consisted mainly of anthraquinone-α-sulfonic acid (**II**) instead of the β-SO₃H acid (**III**) which is the main product without Hg. It was suggested that the catalytic action of Hg could be ascribed to the formation of organometallic comps. Such an influence of a catalyst upon the position taken up by the constituent is rare (C. A. 1, 2580; Maarse, *Diss. Amsterdam* 1913, for another instance). The purpose of this work was to det. how the Hg acts and to demonstrate the occurrence of intermediate products. On the basis of the work of Roux and Martinet (C. A. 15, 1497) it may be supposed that the Hg will accelerate only the α-sulfonation without influencing the transformation α → β. This hypothesis complicates affairs needlessly and the formation of intermediate products has not been examd. It may also be supposed that the Hg accelerates the α-sulfonation catalytically without influencing the β-sulfonation which takes place simultaneously. The sulfonations were carried out according to Schmidt (*Ber.* 37, 66(1904)) thus: 100 g. **I** + 1 g. Hg₂SO₄ were ground together and kept at 150° with 120 g. 20% oleum while stirring. After cooling the reaction product was poured into 1400 cc. H₂O, boiled, filtered to remove pptd. **I**, boiled with "purit," filtered again and to the filtrate which was heated to 80–90° 70 cc. satd. KCl were added. At 60–70° the K salt which had sepd. was filtered off, washed with cold H₂O and recrystd. from H₂O. The mother liquor was found with H₂S to be free of Hg. The Hg could not be recovered by extg. the unchanged **I** with boiling H₂O. The Hg was found in the unchanged **I** in a non-ionizable form which could not be removed by boiling with dil. acids. The results showed that in the unchanged

I recovered from a sulfonation with Hg an org. Hg compd. is present analogous to that obtained from anthraquinonesulfonic acid and HgCl_2 . From this it is evident that such a compd. is formed in sulfonating with Hg. This compd. cannot be the product of a side reaction because the unchanged I when sulfonated again gives the same amt. of II as when ionic Hg is added. Moreover anthraquinone- α -mercuric chloride added as a catalyst gave about the same amt. of II. But from the fact that the greatest part of the Hg is found in the recovered I and none is in ionic form, it cannot be concluded that during the reaction Hg is largely bound to I so that the velocity of the mercuration is great compared with that of the sulfonation. In about 0.5 hr the sulfonation is nearly complete; in the 2nd 0.5 hr. practically no sulfonation takes place. The SO_3 concn. has fallen considerably and the Hg compd. can no longer be sulfonated rapidly. The result will be that all the Hg is transformed into an org. Hg compd., while practically none of this compd. disappears on sulfonation. This result is also reached when the velocity of mercuration is of the same order of magnitude as that of the sulfonation of the Hg compd. The course of the reaction is hypothetically formulated as follows: (1) $\text{C}_{14}\text{H}_8\text{O}_2 + \text{HgSO}_4 \longrightarrow (\text{C}_{14}\text{H}_7\text{O}_2)\text{HgSO}_4\text{H} (\alpha)$; $\text{C}_{14}\text{H}_7\text{O}_2\text{HgSO}_4\text{H} + \text{SO}_3 \longrightarrow (\text{C}_{14}\text{H}_7\text{O}_2)\text{SO}_3\text{H} + \text{HgSO}_4$ or $2\text{C}_{14}\text{H}_8\text{O}_2 + 2\text{HgSO}_4 \longrightarrow (\text{C}_{14}\text{H}_7\text{O}_2\text{Hg})_2\text{SO}_4 + \text{H}_2\text{SO}_4$; $(\text{C}_{14}\text{H}_7\text{O}_2\text{Hg})_2\text{SO}_4 + 2\text{SO}_3 + \text{H}_2\text{SO}_4 \longrightarrow 2(\text{C}_{14}\text{H}_7\text{O}_2)\text{SO}_3\text{H} + 2\text{HgSO}_4$. The 1st process is most probable because here collision of only 2 mols. is necessary, while in the last case collision of 4 mols. must take place simultaneously. In the 1st equation the velocity of reaction will be proportional to the HgSO_4 or Hg_2SO_4 concn. On doubling the quantity of Hg_2SO_4 the velocity of α -sulfonation should also be doubled. In the 2nd equation the velocity will be proportional to the 2nd power of the HgSO_4 concn. The results obtained with small concns. of Hg_2SO_4 where its slow soln. does not interfere show that the velocity is proportional to the Hg_2SO_4 concn. and accordingly the 1st equation is preferred. A method of estimating II and III in mixts. was worked out and is given in detail. This depended on a chlorination of II and III with $\text{KClO}_3 + \text{HCl}$ for 6 hrs. and detg. the final m. p. of the chloroanthraquinone formed. For this purpose, the m. p. diagram of the systems α - and β -chloroanthraquinone was detd. The Me esters of II and III were prepd. from the alkali salts and Me_2SO_4 ; that of III m. 163.4–4.2° and not as given by Heffter (*Ber.* 28, 2261 (1895)). An anthraquinone-Hg compd. which is probably anthraquinone- α -mercuric chloride was prepd. It was shown that such a compd. occurs in the mixt. of compds. obtained when I is sulfonated with Hg in the presence of insufficient oleum. In the presence of 2% Hg_2SO_4 at 156° 16.1% III is formed; in the absence of Hg 98–100% of III is formed. Sulfonation at 132° did not change the result. The temp. effect is about the same on both α - and β -sulfonations. I cannot be mercurated in the absence of H_2SO_4 . E. J. W.

9,10-Anthraquinone-2,3- and 1,2-quinonediazide and their derivatives. MUNE-NARI TANAKA. *Ber.* 58B, 1986–8 (1925).—3-Nitroanthraquinone-2-diazonium sulfate, obtained quant. from the 2-NH₂ compd. (m. 316°) diazotized in H_2SO_4 , yellow, deflagrates 133°, becomes red and finally brown-red in the light. When it is heated in concd. H_2SO_4 it evolves N at 120–30° and forms a brown-black mass but yields neither a quinonediazide nor 2,3- $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3(\text{OH})\text{NO}_2$, but if it is heated in small amts. (0.5 g.) in Ac_2O about 0.5 min. at 95° it yields around 33% of 9,10-anthraquinone-2,3-quinonediazide, $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_2(:\text{O}): \text{N}_2$, metallic crystals with 0.75 Ac_2O which is completely lost at 150–70° (together with some N), sparkles in incident light, forms solns. which are almost always red (violet in $\text{C}_6\text{H}_5\text{N}$), is quite stable in the air, turns brown 160°, decomps. 227°, evolves gas with PhNHNH_2 at room temp., couples slowly with R salt with blue color, dissolves smoothly in concd. H_2SO_4 with blue color and is repptd. on diln., is sensitive to alkalis; in dil. alkali suspension with $\text{Na}_2\text{S}_2\text{O}_4$ at 66° it gives [2-hydroxyanthraquinonyl]-3-hydrazine, brown-red, decomps. 330–40°, which with much boiling Ac_2O yields a compd. (possibly the oximidazine $\text{C}_{16}\text{H}_{10}\text{O}_3\text{N}_2$; found, 9.65% N), m. 314°. 9,10-Anthraquinone-1,2-quinonediazide, from 1,2- $\text{C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_3(\text{NO}_2)\text{NH}_2$, red crystals with 0.75 Ac_2O . C. A. R.

Action of hydrazine hydrate on phenanthraquinone. A correction. SIKHIBHUSHAN DURR. *J. Chem. Soc.* 127, 2971 (1925); cf. C. A. 18, 684.—Phenanthraquinone and $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ (50%) give 9,10-dihydroxyphenanthrene; anhyd. N_2H_4 gives phenanthrone. C. J. WESR

Condensation of β -ketonic acids with α,β -dichloroethyl ethyl ether. A. FUJITA. *J. Pharm. Soc. Japan* No. 519, 450–6 (1925).—Using Benary's method (C. A. 5, 1766), F. condensed $\text{CH}_2\text{ClCHClOEt}$ with $\text{CO}(\text{CH}_2\text{CO}_2\text{Et})_2$ in the presence of NH_3 and isolated 3-carboxy-2-furanacetic acid, but the expected 3-carboxy-2-pyrroleacetic acid could not be obtained. With $\text{BzCH}_2\text{CO}_2\text{Et}$ and $\text{CH}_2\text{ClCHClOEt}$ 2-phenyl-3-furan-carboxylic acid, and 2-phenylpyrrole were isolated, but the expected 2-phenyl-3-pyr-

rolecaboxylic acid could not be obtained, probably because of the ease with which decarboxylation can occur at the 3-position of pyrrole nucleus. S. T.

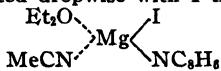
Pyrylium compounds. XVI. Triphenylpyrylium salts containing amino groups. W. DILLTHEY AND C. BERRER. *J. prakt. Chem.* 111, 340-52 (1925); cf. *C. A.* 20, 417.—While an NH_2 group in the *m*-position has little or no effect upon the color and behavior of triphenylpyrylium salts, the NH_2 group in the *p*-position acts as an auxochrome. *p*-AcNHC₆H₄CH:CHBz and BzMe in a little Ac₂O, treated with 3 mols ZnCl₂, give 15% of 4-[4-acetylaminophenyl]-2,6-diphenylpyrylium chloride-zinc chloride, straw-yellow, m. 158°; a soln. of EtOH-C₆H₅N, dild. with hot H₂O to turbidity, gives the pale yellow 4-[4-acetylaminophenyl]-2,6-diphenylpyranol, m. 188-9° (dark red melt); *perchlorate*, orange-yellow, m. 220-5° (decompn.). Concd. H₂SO₄ splits off the Ac group, giving with picric acid 4-[4-aminophenyl]-2,6-diphenylpyrylium *picrate*, violet-black needles with Cu luster, slowly decmps. above 250°; an *acid picrate* also results, brick-red and transformed by crystn. to the neutral *picrate*; *perchlorate*, steel-blue needles, slowly decmps. above 295°. *N*-acetylaminomethoxychalcone, light yellow, m. 186-7°; its solns. show light green fluorescence. With 4-MeOC₆H₄Ac and ZnCl₂, followed by HClO₄, there results 4-[4-acetylaminophenyl]-2,6-di-[4-methoxyphenyl]pyrylium *perchlorate*, orange-red, decmps. above 250°, m. 294° if rapidly heated; *picrate*, brick-red, m. 267° (decompn.). With 40% HBr, this gives the free *amino deriv.*, as the *bromide*, violet needles with green surface luster, m. 196°; *acid HCl salt*, dark brownish red, m. 205° (decompn.). Heating with concd. HCl 8 hrs. at 160° gives 4-(4-aminophenyl)-2,6-di-[4-hydroxyphenyl]pyrylium *acid chloride*, violet-red with a metallic luster, decmps. 240°; *perchlorate*, reddish yellow needles. 4-[4-Acetylaminophenyl]-2-[4-methoxyphenyl]-6-phenylpyrylium *perchlorate*, reddish orange, m. 143°. Deacetylation gave the free *amino deriv.*, analyzed as the *chloride-HCl*, violet-red with green metallic luster, which gives off HCl on heating. Concd. HCl gives 4-[4-aminophenyl]-2-[4-hydroxyphenyl]-6-phenylpyrylium *chloride*, violet needles with green luster, decmps. 230°; *HCl salt*, violet-red, decmps. 240°. 2,4-Di-[4-aminophenyl]-6-phenylpyrylium *picrate*, violet-black needles, giving a deep red aq. EtOH soln. with marked dyeing capacities. C. J. WEST

Dimethylisoidigotin and a new decomposition of the disulfisatides. A. WAHL AND T. FAIVRET. *Compt. rend.* 181, 790-2 (1925).—W. and F. on reducing 5-methyl-(I) and 7-methylisatin (II) obtained 5- and 7-methyldioxindole but could not obtain pure 5-methyl- (III) or 7-methyloxindole (IV). A catalytic reduction of isatin and of I gave diisatide and 5,5-dimethylisatide, but II gave no corresponding product. I and II in boiling EtOH with H₂S gave non-cryst. 5,5- (V) and 7,7-dimethyldisulfisatide (VI). Treating V and VI with pyridine at 100° gave 5,5-dimethylisoidigotin (its leuco base m. about 330°) and 7,7-dimethylisoidigotin, having a non-crystalline leuco base. From the C₆H₅N mother liquor was obtained 5-methyloxindole, m. 168°, and 7-methyloxindole, m. 203-40°. Their benzylidine derivs. m. 182° and 224°, resp.

D. H. POWERS

Synthetic experiments in the indole group. V. Synthesis of β -indolyethanolamine. RIKO MAJIMA AND MUNIO KOTAKE. *Ber.* 58B, 2037-41 (1925); cf. *C. A.* 19, 279.—Cold β -indolaldehyde (I) and excess of PhNH₂ with concd. HCl give β -indol-aniline-HCl, yellow needles from EtOH-Et₂O, decmps. 240-6°, seps. from hot HCl, on cooling, in red needles, decomp. about 200°, which apparently contain 1 H₂O; free *aniline* (II), m. 126-7°. *N*-Acetyl- β -indolaldehyde (III), from II, Ac₂O and NaOAc at 95-105°, or, in 11 g. yield, from 10 g. I, Ac₂O and NaOAc at 102°, m. 159-62°; the AcOEt mother liquors yield its *diacetate*, AcC₆H₄NCH(OAc)₂, m. 154°. *N*-Acetyl- β -indolaldehyde-aniline-HCl, AcC₆H₄NCH(OH)NHPH₂·HCl, from III, PhNH₂, hot H₂O and concd. HCl, yellow, m. 191-4°. *N*-Acetyl- β -indolyl- ω -nitroethanol (8.3 g. from 10 g. III and 20 g. MeNO₂ in 64 cc. 10% KHCO₃ shaken 200-50 hrs. at 30°; this temp. and concn. of KHCO₃ must be adhered to closely), m. 138.5-40.5°, easily sol. in alkalis with brownish red color, AcOH pptg. III from the soln.; with Ac₂O and NaOAc at 165° it gives *N*-acetyl- β -[ω -nitrovinyl]indole, yellow, m. 189-92°, while 2.5 g. with SnCl₄ and HCl gas in cold AcOH gives 1.2 g. *N*-acetyl- β -indolyethanolamine-HCl (IV), apparently hydrated leaflets, m. partially 53-7°, completely 163-6°; *chloroplatinate*, brownish, blackens somewhat around 200°, decmps. about 225°; *picrate*, yellow, m. 174-6° (decompn.). IV in H₂O with alkali gives an oil yielding with picric acid orange crystals, decomp. 188°, having the compn. of β -indolyethanolamine *picrate*. [*N*-Acetyl- β -indolyl]-*N*,*O*-diacetyl ethanolamine (0.3 g. from 0.5 g. IV with Ac₂O-NaOAc in the H₂O bath), m. 68-71°, gives with alc. KOH at room temp. β -indolyl-*N*,*O*-diacetyl ethanolamine, decmps. 202-4°. VI. A new synthesis of β -indolyalkylamines. RIKO MAJIMA AND TOSHIO HOSHINO. *Ibid* 2042-6.—Indolylmagnesium iodide (I) in

cold PhOMe treated dropwise with 1 mol. MeCN in PhOMe gives a greenish gray sirup, presumably



, which is unchanged by heating 30 min. at 60–70° and on decompn. with ice in the usual way gives back the unchanged indole quant. The I from 7.8 g. indole similarly treated with ClCH₂CN likewise gives a gray sirup which, heated 20 min. at 60–70° and decompd. with ice, yields 5.3 g. β -indolylacetonitrile (V), faintly yellow-brown, b_{0.2} 160°; *picrate*, orange, m. 127–8°. V is also obtained in 47% yield in Et₂O instead of PhOMe. Boiled 6 hrs. with 20% KOH it gives 84% β -indolylacetic acid, decomp. 164.5–5.0°; *picrate*, decomp. 178°. β -[β' -Indolyl]-propionitrile (VI) (16.8 g. from the I from 18 g. indole with ClCH₂CH₂CN), m. 67–8°, b₁ about 200° (*picrate*, red, m. 123.5–4.5°); *acid*, m. 133–4° (*picrate*, m. 141–3°). β -[β' -Indolyl]ethylamine (4 g., together with 1.2 g. skatole, from 6 g. V in boiling abs. alc. treated in the course of 15 min. with 7.1 g. Na), m. 114.5–5.5°; *HCl salt*, decomp. 248–9°; *picrate*, decomp. 242–3°; *acetate*, loses 0.5 mol. H₂O at 56° and m. 135–6°. β -Indolylacetamide (2.5 g. from 8.5 g. V in boiling 85% AcOH with Zn dust), m. 150–1°. γ -[β' -Indolyl]propylamine (4.1 g. from 5 g. VI with Na in boiling alc.), hygroscopic, m. 60–4°; *HCl salt*, m. 169–70°; *picrate*, red needles with 3H₂O, sinters 82°, becomes yellow, begins to foam 103°, m. completely 146–9°; the yellow anhyd. crystals m. 155–6°.

C. A. R.

Velocity of decomposition of heterocyclic diazonium salts. I. Diazonium salts of the pyrazole and pyrazolone series. JOSEPH REILLY AND DENIS MADDEN. *J. Chem. Soc.* 127, 2936–40 (1925).—A definite vol. of a soln. contg. a known wt. of the amine (sufficient to give 56 cc. of gas under standard conditions, normal diazotization being assumed) was heated in a quartz vessel at 100° (bath temp., 101.5°), a current of air-free CO₂ being passed periodically through the soln. The following values for $k(t)$ measured in min., % decompn. in first hr. and time (min.) for half decompn. were obtained: *m*-O₂NC₆H₄NH₂, 0.0322, 100, 10; *o*-O₂NC₆H₄NH₂, 0.00564, 54, 53; 4-amino-pyrazole, 0.00317, 40, 80; 4-aminoantipyrine, 0.00088, 13, 360; 4-amino-3,5-dimethyl-pyrazole, 0.00030, 1.7–2, 1020. In the case of antipyrine-4-diazonium salts, the rate of decompn. is considerably influenced by the nature of the anion; the chloride and nitrate follow mainly a unimol. law, while the sulfate does not, the rate of decompn. being much more rapid at the beginning.

C. J. WEST

Some derivatives of phenylpropionaldehyde and of α -bromocinnamaldehyde. K. v. AUWERS AND B. OTTENS. *Ber.* 58B, 2060–71 (1925).—The object of this work was to det. under what conditions the semicarbazones, phenylhydrazones and oximes of PhC: CCHO (I) and PhCH: CBrCHO (II) can be converted into heterocyclic compds. I and H₂NCONHNH₂.AcOH in the cold regularly give 2 compds. sepd. by their differing soly. in C₆H₆: III, the less sol., m. 193–4°, and IV, m. 132–4°; the crude products generally contain 25% III and 60% IV. III is changed into IV by acids. Both are semicarbazones and can be hydrolyzed to I, and yield BzOH with KMnO₄. They are therefore the stereoisomeric *cis-trans*-semicarbazones; which configuration corresponds to each could not be detd. The compd. obtained by the addn. of alc. to PhC: CCH(OEt)₂ (Lieske, *Diss. Kiel*, 1908, 20) is α -ethoxycinnamaldehyde di-Et acetal (V), as shown by its spectrochem. const. and by the fact that its semicarbazone (VI), m. 151–2°, cannot be converted into a ring compd. The semicarbazone (VIII) of II is likewise unchanged by heating several hrs. with AcOH; hot alc. KOH converts it into III. Similarly, neither of the phenylhydrazones of I can be converted into 1,5-diphenylpyrazole and the phenylhydrazone of II is unchanged or resinified by hot HOAc and with alc. KOH yields the labile phenylhydrazone of I. The phenylhydrazones of PhCH: C(OEt)CHO and PhCH: CMeCHO behave in the same way. On the other hand, the methylhydrazone of I gives with great ease 1-methyl-5-phenylpyrazole (VIII), which is obtained directly even in the cold. By working at a lower temp. (–15°), the solid unstable intermediate product in the prepn. of VIII from II and MeNHNH₂ (C. A. 19, 2048) has now been obtained in greater amt. and shown to be PhCH: CBrCH(OH)NHNHMe (IX); mineral acids decomp. it in the cold into II and MeNHNH₂. On decompn., it loses H₂O and from the product can be isolated, by rubbing with Me₂CO, a small amt. of what is apparently 4-bromo-1-methyl-5-phenylpyrazoline-HBr (X), m. 129–30°. If the original material is allowed to stand under Et₂O it decomp. gradually with formation chiefly of VIII, together with some II and MeNHNH₂. The oxime of I resembles the methylhydrazone in the ease with which it forms a ring compd. Even under the mildest possible conditions it gives PhC: CCN with Ac₂O, as found by Claisen (*Ber.* 36, 3671 (1903)), and not an Ac deriv. The oxime of II on the other hand yields an Ac deriv. under mild conditions and gives the nitrile only at high temps.;

from cold NaOH acids ppt. it unchanged but on gentle warming the odor of PhC:CH develops and acids now ppt. the oxime of I. Possibly the 2 oximes are to be represented by the formulas PhC:CCH and PhCH:CBBrCH. I b_{10} 105-8°, $d_4^{15.8}$ 1.0639, d_4^{20}

HO \ddot{N}

NOH

1.060, n 1.59746, 1.60717, 1.63287, 1.65835 for α , He, β and γ at 15.8°, n_{α}^{20} 1.5965, $E\Sigma$ 2.95, 3.12, 103%, 120%, for α , D, β - α and γ - α . *p*-Nitrophenylhydrazone, yellow powder, m. 133-5°. V b_{14} 158-60°, $d_4^{18.1}$ 0.9937, d_4^{20} 0.992, n 1.51167, 1.51665, 1.52936, 1.54093 at 18.1°, n_{He}^{20} 1.5158, $E\Sigma$ 1.44, 1.52, 49%, 54%. Benzylglyoxal α -semicarbazone, from V and alc. HCl on the H₂O bath, m. 168-9°, sol. in NaOH with yellow color and reppd. unchanged by HCl, gives no color with FeCl₃, is converted in the usual way into the *disemicarbazone*, m. 238°, identical with the product obtained from Ph-CH₂COCHO and 3 mols. H₂NCONHNH₂·HCl in aq. alc. at 50°. With *p*-O₂NC₆H₄-NHNH₂·HCl in boiling alc. V yields a *p,p'*-dinitroösazone, scarlet, m. 275-6°, identical with that obtained from PhCH₂COCHO (Dakin and Dudley, *C. A.* 8, 2552) VII, yellowish, m. 206-7°. IX m. 45-50° (decompn.). Oxime of II, m. 144° (Naar, *Ber.* 24, 247(1891), gives 135-6°); *acetate*, m. 81-2°, from the oxime dissolved in Ac₂O by gentle warming, cooled with ice and treated with solid Na₂CO₃; if the oxime is boiled 15 min. with excess of Ac₂O it gives α -bromocinnamonitrile, yellow, b_{30} 155°, b_{15} 144-5°, $d_4^{19.9}$ 1.4640, d_4^{20} 1.464, n 1.62099, 1.63134, 1.65850 for α , He, β at 19.9°, n_{He}^{20} 1.6316, $E\Sigma$ 1.54, 1.69, 103% for α , D and β - α . Cinnamonitrile, b. 254-5°, b_{18} 135°, $d_4^{19.9}$ 1.0304, d_4^{20} 1.031, n 1.58536, 1.59467, 1.61932 at 19.9°, n_{He}^{20} 1.5948, $E\Sigma$ 2.16, 2.35, 98%. C. A. R.

Formation and rearrangement of pyrazolecarboxamides. K. v. AUWERS and B. OTTENS. *Ber.* 58B, 2072-80(1925).—This work was undertaken to det. whether 3(5)-phenylpyrazole (I), like the Me compd. (*C. A.* 19, 2953), can form 2 structurally isomeric carboxamides. PhCOCH:CHOH (II) cautiously treated with H₂NCONHNH₂ in neutral or faintly alk. or acid (AcOH) soln. yields a *semicarbazone* (III), m. 175-6°, sol. in alkalis with yellow color, also obtained regularly from H₂NCONHNH₂ and the benzoate or Et ether of II, even at -15°. III easily yields a *disemicarbazone* (IV), m. 238°, which is also obtained in greater or lesser amt directly from II or its *O*-derivs. with H₂NCONHNH₂. CO₂ or mineral acids at a low temp ppt. III unchanged from alkalis but at room temp. acids give a *carboxamide* (V), m. 142-3°. An isomeric *carboxamide* (VI), m. 133°, is formed when II in alc. is treated with H₂NCONHNH₂·HCl; it is less easily sol. in Et₂O than its isomer and is hydrolyzed to I in MeOH or EtOH by picric acid at moderately high temps, while V gives a light yellow *picrate* (VII), m. 165-6°. Both V and VI give the same Ag salt, m. 85°, of I with AgNO₃. II at -15° with H₂NCONHNH₂·HCl gives III, which on cautious treatment with alc. and concd. HCl is converted into VI. V and VI are, therefore, both derived from III. VI can be converted into V under various conditions of heating. Thus VI, melted at 133°, resolidifies and m. again 142°; heating with AcOH or boiling 15 min. in C₆H₆ effects the same change; the product is now easily sol. in Et₂O and yields VII. Whether the isomerism persists in reactions which involve the nucleus could not be detd.; V readily yields a faintly yellow *mono-Br deriv.*, m. 161-3°, while with VI, even at -15°, the CONH₂ group is split off with formation of 4-bromo-3(5)-phenylpyrazole-*HBr*, m. 186-7° (free base, m. 116-7°). The oxime (VIII), m. 189-90°, of III is entirely different from benzoylacetalddehyde 1-oxime-3-semicarbazone (IX), PhC:(NNHCONH₂)CH₂CH:NOH, m. 154° (decompn.). With hot HCl IX gives a mixt. of I and V, while VIII yields γ -phenylisoxazole (X), showing beyond doubt that VIII has the structure PhC:(NOH):CH₂CH:NNHCONH₂, and, consequently, III the structure PhCOCH₂CH:NNHCONH₂; the soly. in alkalis of III is to be explained by the enolizing influence of the unsatd. grouping—CH:N—on the system—CO.CH₂—. These facts also establish that V and VI have the structures N:CPh.CH:CH.NCONH₂ and PhC:CH.CH:N.NCONH₂,

resp., and are completely analogous to the Me compds. When the H on the N of I is replaced by COCl by means of COCl₂ and the Cl is then replaced by NH₂, V is formed even at low temps.; it is also formed by the addn. of HOCN to I. The X obtained from VIII was identical with a sample prepd. by Zöpfchen's method (*Diss. Kiel, 1899*); it m. 1-2°, b_{30} 145°, $d_4^{18.7}$ 1.1406, d_4^{20} 1.139, n 1.56288, 1.56916, 1.58455, 1.59864 for α , He, β and γ at 18.7°, n_{He}^{20} 1.5686, $E\Sigma$ (av. for 2 samples) -0.18, -0.15, 17%, 20% for α , D, β - α and γ - α . For comparison was prepd. α -phenylisoxazole, b_{11} 128°, m. 22°.

d_4^{18} 1.1399, d_4^{20} 1.139, n_D^{18} 1.57921, 1.58693, 1.60670, 1.62541 at 18.8°, n_{He}^{20} 1.5864, E_D (av. for 2 samples) 0.49, 0.57, 47%, 54%. Only the α -deriv. forms a difficultly sol. $HgCl_2$ compd. and the γ -compd. dissolves in very concd. HCl , is hardly attacked by even hot aq. alkalis but is gradually converted by alc. alkalis into $PhCN$ and $AcOH$. *Benzoylacetalddehyde dioxime*, m. 109–10°; heated 10 min. on the H_2O bath with concd. HCl it yields a mixt. of about equal parts of the isomeric phenylisoxazoles, for the product with $NaOEt$ at room temp. gives **X** and $PhCOCH_2CN$. C. A. R.

Influence of constitution on the transformation of phenylhydrazones of unsaturated compounds into pyrazolines. II. K. v. AUWERS AND A. KREUDER. *Ber.* 58B, 1974–86 (1925); cf. *C. A.* 4, 586. As a rule, unsatd. aliphatic aldehydes yield phenylhydrazones while the corresponding derivs. of unsatd. ketones are so unstable that in attempts to prep. them they rearrange into the isomeric pyrazolines. The aldehyde phenylhydrazones in general do not readily change into the pyrazolines; they usually distil unchanged *in vacuo* and on heating with $AcOH$ chiefly undergo hydrolysis, with partial resinification. A p - NO_2 group in the $PhNH$ = residue hinders the change into the pyrazoline, while o - and p - Me and o - Cl substituents exert no marked influence. Aliphatic hydrazones ($RCH.NNHMe$) are far less stable than phenylhydrazones. That the Knorr reaction does not permit of distinguishing with certainty between phenylhydrazones and pyrazolines has been further confirmed by the present work, although there are certain differences between the color reactions of pyrazolines, hydrazones and phenylhydrazides; the hydrazones, unlike the pyrazolines, give no color when treated in dil. alc. soln. dropwise with $FeCl_3$ and H_2SO_4 (but under these conditions the reaction is also sometimes negative with pyrazolines). It is always advisable, therefore, to reduce the substance in question; the yield of $PhNH_2$ from the phenylhydrazones is 10–40%. In the case of the substituted hydrazones (e. g., the bromophenylhydrazones) it is not always so easy to det. the constitution, but the p -nitrophenylhydrazones can readily be distinguished from the pyrazolines by the intense red or violet color with which they dissolve in alc. alkalis. $CH_2:CHCHO$ with $PhNHNH_2$ in cold Et_2O yields a mixt. of 1-phenylpyrazoline, m. 51–2°, and $CH_2:CHCH:NNHPh$, for with $Na-Hg$ it gives considerable $PhNH_2$ and with 33% H_2SO_4 at room temp. it yields $PhNHNH_2$. $MeCH:CHCHO$ and $PhNHNH_2$ without a solvent yield the phenylhydrazone, m. 56–7°, b_D^{16} 165° (slight decompn.), quickly darkens and decomp. in the air but is stable for a considerable time under H_2O . *Tiglic aldehyde phenylhydrazone*, m. 92–4°, b_D^{16} 155–60°, b_D^{17} 163–8°, becomes yellowish in the air, is slowly hydrolyzed by cold 20% H_2SO_4 , more rapidly on the H_2O bath, gives the Bulow reaction either very faintly or not at all. α -Methyl- β -ethylacrolein phenylhydrazone, m. 60°, b_D^{16} 171–5°, is hydrolyzed by 20% H_2SO_4 and by boiling $AcOH$, gives $PhNH_2$ with $Na-Hg$, becomes red-brown and partly liquefies in the air; from a sample which had stood 5 months in an open bowl was isolated $HCONHNHPh$. $MeCH:CHCOMe$, d_4^{18} 0.8568, d_4^{20} 0.856, n_D^{18} 1.43710, 1.44078, 1.45016, 1.45833 for α , He , β and γ at 18.6°, E_D 1.23, 1.31, 32%, 37% for α , D , β - α and γ - α , gives in cold $EtOH$ - $AcOH$ 1-phenyl-3,5-dimethylpyrazoline, b_D^{18} 173–5°. Mesityl oxide with $PhNHNH_2$ in $EtOH$ - $AcOH$ yields 60% 1-phenyl-3,5,5-trimethylpyrazoline, b_D^{18} 152–3°, while in alc. with aq. p - $O_2NC_6H_4NHNH_2$ it gives the p -nitrophenylhydrazone, orange-yellow, m. 132–4°, gives a purple color in Me_2CO with alkalis, is smoothly rearranged by boiling $AcOH$ into 1-[p -nitrophenyl]-3,5,5-trimethylpyrazoline (obtained directly from mesityl oxide refluxed in aq. $MeOH$ with $O_2NC_6H_4NHNH_2 \cdot HCl$), deep yellow, m. 205–8°, which is unchanged by boiling $AcOH$ or by alc. HCl or H_2SO_4 at 160–240°, but when refluxed 50–60 hrs. with a mixt. of 3 parts $AcOH$ and 1 part 60% H_2SO_4 or 15 parts $AcOH$ and 1 part concd. H_2SO_4 it oxidizes and rearranges into 1-[p -nitrophenyl]-3,4,5-trimethylpyrazole, pale greenish yellow, m. 116–6.5° (also obtained in 66% yield from the pyrazoline in boiling $AcOH$ with Br , and in 80% yield from $MeCHAc_2$ and p - $O_2NC_6H_4NHNH_2 \cdot HCl$ in H_2O). 1-[p -Nitrophenyl]-3,5-dimethylpyrazole (86% from CH_2Ac_2 and $O_2NC_6H_4NHNH_2 \cdot HCl$), yellow, m. 99.5–100.5°. Phorone and $PhNHNH_2$ in boiling $EtOH$ - $AcOH$ or in alc. at room temp. give 1-phenyl-3-isobutenyl-5,5-dimethylpyrazoline, yellowish, b_D^{17} 186–9°, becomes dark brown-red on standing, resinifies in the air. From 25 g. $PhCH:CHCOMe$ with $MeNHNH_2$, H_2SO_4 and $NaOAc$ in boiling aq. alc. is obtained 19 g. 1,3-dimethyl-5-phenylpyrazoline, b_D^{18} 123–4°, b_D^{24} 243–5° (some decompn.) (picrate, m. 128–30°), while o - $MeC_6H_4NHNH_2$, $AcOH$ in tepid aq. alc. yields the o -tolylhydrazone, yellow, m. 176–8°, giving in concd. H_2SO_4 with $FeCl_3$ a very transient red color and converted by boiling $AcOH$ into 1- o -tolyl-3-methyl-5-phenylpyrazoline, yellow, m. 82–3°, which gives a somewhat more stable red color in H_2SO_4 with $FeCl_3$. p -Tolylhydrazone, best obtained in $EtOH$ - $AcOH$ at room temp., yellow, m. 120–1°, gives a transient green color with $FeCl_3$ in H_2SO_4 .

cannot be reduced by Na-Hg and AcOH under the usual conditions, converted by boiling AcOH and partly by distn. *in vacuo* into the *pyrazoline*, viscous yellow oil, b_{28} 215-9°, gives with FeCl_3 in H_2SO_4 a violet color and forms a *picrate* m 111-2° which gives the Knorr reaction just as intensely as the free base. *p*-Nitrophenylhydrazones, cinnabar-red, m. 165-7°, is obtained almost instantly from PhCH:CHCOMe and $\text{O}_2\text{NC}_6\text{H}_4\text{NHNH}_2 \cdot \text{HCl}$ in suitable solvents; if PhCH:CHCOMe and $\text{O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ are boiled in aq. alc., the red ppt. gradually dissolves and after heating 1 hr. there seps. on cooling a mixt. of red and egg-yellow crystals which persist after 3 hrs.' heating but after 8 hrs. only the yellow form seps.; boiling C_6H_6 and PhMe do not change the hydrazone but in AcOH on the H_2O bath it rapidly isomerizes into the *pyrazoline*, m. 149°. *o*-Chlorobenzalacetone, b_{17} 154-5°, with PhNHNH_2 in EtOH-AcOH at room temp. gives the yellow *phenylhydrazone*, m. 92-3°, slowly sol. in concd. H_2SO_4 with brown color gives a transient green color with FeCl_3 , converted by boiling AcOH into the *pyrazoline*, light ochre, m. 87°, gives an intense violet, then Burgundy-red Knorr reaction, in alc. from red-violet through blue to green. *o*-Tolylhydrazone, light yellow, m. 92-3°, darkens and gradually resinifies in the air, gives a transient red color with FeCl_3 in H_2SO_4 ; *pyrazoline*, yellow, m. 96-8°, shows green fluorescence in C_6H_6 , benzine and CHCl_3 and in the molten state; a crude sample of the hydrazone which would not cryst. yielded on distn. a dark oil b_{21-2} 220-30° which after a week deposited colorless crystals, presumably of 1-*o*-tolyl-3-methyl-5-[*o*-chlorophenyl]pyrazole, m. 98-9°, giving no color with FeCl_3 in H_2SO_4 and unchanged by boiling AcOH. *p*-Tolylhydrazone, light yellow, m. 122-3°, gives with FeCl_3 in H_2SO_4 a transient dark green color; *pyrazoline*, m. 77.5-8.5°, b_{17} 205-20°, gives a deep blue-violet color with FeCl_3 in H_2SO_4 , and on oxidation in alc. a green color. *p*-Hydroxybenzalacetone phenylhydrazone, dark red, almost black, m. 218-20° (decompn.), changes in dil. alc. or Me_2CO solns on addn. of alkali from orange to bluish red; *pyrazoline*, cinnabar-red, m. 149-51° (decompn.). $\text{Me}_3\text{CCOCH:CHPh}$ and *o*- $\text{MeC}_6\text{H}_4\text{NHNH}_2$ in EtOH-AcOH at room temp. give 1-*o*-tolyl-3-*tert*-butyl-5-phenylpyrazoline, m. 94-5°, gives a red-violet color with FeCl_3 in H_2SO_4 ; *p*-tolyl isomer, m. 116-7°, gives a blue-violet Knorr reaction. PhCH:CHCOMe and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NHNH}_2 \cdot \text{HCl}$ under various conditions always yielded mixts. of the hydrazone and pyrazoline but the 3,5-diphenyl-1-[*p*-nitrophenyl]pyrazoline, yellow, m. 177-7.5°, was obtained pure when the 2 reagents in alc. were boiled some hrs. with a little concd. HCl. C. A. R.

Constitution of the stable and labile acylindazoles. K. V. AUWERS. *Ber.* 58B, 2081-8 (1925); cf. C. A. 19, 509, 3091.—v. A. has at last succeeded in obtaining what he considers to be positive proof that the stable and labile "2-acylindazoles" are in reality structural isomers, *i. e.*, 1- and 2-acyl derivs. *o*-($\text{o-MeC}_6\text{H}_4\text{SO}_2\text{NH}$) $\text{C}_6\text{H}_4\text{CH:NOH}$ (I) treated with Beckmann's mixt. is not dehydrated but merely acetylated, with formation of a *product* (II), m. 151-3°, whose m. p. falls, however, on recrystn. of any kind, and finally becomes const. at 129-31°. Inversely, the lower melting form (III) changes back into II when treated with HCl gas in cold AcOH-Ac₂O. The nature of the isomerism between II and III has not yet been established; as both are easily hydrolyzed back to I by alkalis, they must both have the structure $\text{MeC}_6\text{H}_4\text{SO}_2\text{NHC}_6\text{H}_4\text{CH:NOAc}$. At higher temps. (180-90°) II and III lose AcOH with formation of $\text{MeC}_6\text{H}_4\text{SO}_2\text{NHC}_6\text{H}_4\text{CN}$ (IV). The desired indazole formation can be effected by treating II or III with alkalis under suitable conditions. At higher temps. is obtained exclusively or almost so the normal sapon. product (I), but the lower the temp. is kept the greater is the amt. obtained of 1-[*o*-toluenesulfonyl]indazole (V), m. 108°, which on hydrolysis yields indazole; this is almost the sole product when the II or III is rubbed with NaOH in the cold or treated in Me_2CO with Na_2CO_3 . V is also obtained from indazole with *o*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ on the H_2O bath, while in cold $\text{C}_6\text{H}_5\text{N}$ is obtained the 2-isomer (VI), m. 81-4° (yield, 65-70%), which is stable for a short time above its m. p. but rearranges into V when boiled a long time in high boiling ligroin. It has not been possible thus far to convert the free I into an indazole. *o*-($\text{p-MeC}_6\text{H}_4\text{SO}_2\text{NH}$) $\text{C}_6\text{H}_4\text{CH:NOH}$ (VII) is not acetylated by Beckmann's mixt. but converted into a lower melting isomer, m. 123-5°. The *acetate* (VIII) of VII (obtained with boiling Ac₂O), however, gives with alkalis either VII or an indazole (IX) or a mixt. of the 2, depending on the conditions. As there is no reason for considering the possibility of a shifting of the $\text{MeC}_6\text{H}_4\text{SO}_2$ residue in these expts. it follows that the compds. hitherto considered as the stable 2-acylindazoles are really 1-derivs. and their formation from the labile isomers depends on a migration of the acid radical. *N*-[*o*-Toluenesulfonyl]-*o*-aminobenzaldoxime (I), obtained in 35-40% yield from $\text{H}_2\text{NC}_6\text{H}_4\text{CH:NOH}$ and 1 mol. $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ in cold $\text{C}_6\text{H}_5\text{N}$, m. 130-1°, changes into IV when boiled 5 min. *in vacuo*. III is obtained directly when I is boiled a short time with Ac₂O and pptd. with C_6H_6 or when I is allowed to stand in Ac₂O-AcOH without passing in HCl. *N*-[*o*-Toluenesulfonyl]-*o*-aminobenzonitrile (IV), m.

125–6°, easily sol. in dil. alkalis and NH_4OH , is identical with the product obtained from $\text{H}_2\text{NC}_6\text{H}_4\text{CN}$ and $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ in $\text{C}_6\text{H}_5\text{N}$. VI is at once hydrolyzed in Et_2O by HCl and on standing in the air changes in great part into indazole *o*-toluenesulfonate, m. 167–9°. *N*-[*p*-Toluenesulfonyl]-*o*-aminobenzaldoxime (VIII), m. 136–6.5° (15 g. from 10 g. $\text{H}_2\text{NC}_6\text{H}_4\text{CH:OH}$). VIII, m. 101–2.5°. 1-[*p*-Toluenesulfonyl]indazole (IX), m. 103–4°. C. A. R.

Quantitative determination of nitramino and nitrimino groups. KURT LEHMSTEDT AND OTTO ZUMSTEIN. *Ber.* 58B, 2024–7(1925).—On the assumption that in the application of the Schulze-Tiemann method (reduction with $\text{FeCl}_2\text{-HCl}$) to compds. contg. both $\text{C}(\text{NO}_2)$ and $\text{N}(\text{NO}_2)$ groups the former probably would not be attacked, the method was tested on 1,1',5,5'-tetrinitro-2,2'-diimidazolyl (I); 2 mols. NO were smoothly split off but the resulting di- NO_2 compd. is so unstable that it could not be isolated. 2- $\text{C}_6\text{H}_4\text{NNHNO}_2$ (II), on the other hand, smoothly yielded 1 mol. NO and 87% 2- $\text{C}_6\text{H}_4\text{NNH}_2$ 1,5,5'-Trinitro-2,2'-diimidazolyl (III) and 5,2- $\text{C}_6\text{H}_3\text{N}(\text{NO}_2)\text{NHNO}_2$ (IV) (decomps. 158–9°) likewise gave 1 mol. NO each. The Lunge method (shaking in concd. H_2SO_4 with Hg) is not applicable to nitramines which are easily rearranged by acids into nucleus-nitrated amines; thus, II gave only 3.93–5.01% nitramine N instead of the calcd. 10.07%, while I and IV gave the theoretical amts.; in the last case was isolated 87% 5,2- $\text{C}_6\text{H}_3\text{N}(\text{NO}_2)\text{NH}_2$, m. 188°. C. A. R.

Benzo-(*i*)-1,2-thiazole. R. STOLLÉ (WITH W. GEISEL AND W. BADSTÜBERN). *Ber.* 58B, 2095–100(1925).—Thionaphthenequinone (4.9 g.) treated dropwise in cold concd. NH_4OH with perhydrol gives 3.5 g. benzo-(*i*)-1,2-thiazole-3-carboxamide, $\text{C}_6\text{H}_4\text{S.N:CCONH}_2$ (I), m. 134°, sol. in concd. H_2SO_4 with yellow color, and (*o*- HO_2C -

$\text{C}_6\text{H}_4\text{S}$)₂, m. 289°. 3- CO_2H acid (II) (6 g. from 7.1 g. I with boiling *N* NaOH), m. 143°, sol. in Na_2CO_3 and alkalis, in H_2SO_4 with yellow color, gives in alc. with AgNO_3 a gelatinous ppt. sol. in NH_4OH ; heated at 175° until the evolution of CO_2 ceases it gives benzo-(*i*)-1,2-thiazole, m. 37°, b. 220°, sol. in concd. acids (with yellow color in H_2SO_4), has an odor like that of oil of bitter almonds and is volatile with steam; *AgNO}_3* compd. ($\text{C}_7\text{H}_4\text{NS}$)₂. AgNO_3 , m. 105°, easily changes in the light. *Et ester* of II (2.8 g. from 3.5 g. I refluxed in alc. satd. with HCl), m. 44°, sol. in H_2SO_4 with yellow color; *AgNO}_3* compd. (1:1), m. 170°, easily changes in the light. *Hydrazide* of II (6 g. from 7.1 g. I refluxed in alc. with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$), m. 138°, sol. in dil. acids, in concd. H_2SO_4 with yellow color, gradually reduces hot $\text{NH}_3\text{-AgNO}_3$, quickly on addn. of NaOH; *benzylidene deriv.*, m. 231°. *Azide* (5 g. from 5.8 g. of the hydrazide in cold dil. HCl with NaNO_2), m. 102° (decompn.), deflagrates weakly when rapidly heated on Pt, gives with PhNH_2 the *carboxanilide*, m. 126°. *Et [benzo-(*i*)-1,2-thiazol]aminoformate*, from the azide boiled in alc., m. 107°; with concd. HCl in a sealed tube at 105–10° it gives 3-aminobenzo-(*i*)-1,2-thiazole, m. 115°, pptd. from dil. HCl by concd. acid as the HCl salt, gives in hot H_2O with Pergelon soln. an orange-yellow ppt. (probably the azo compd.) and in HCl with NaNO_2 a substance m. 151°, insol. in Na_2CO_3 and NH_4OH but sol. in NaOH. [α -Naphtho-(*i*)-1,2-thiazole]-3-carboxamide, from α -benzothionaphthenequinone and H_2O_2 , yellow m. 245°, sol. in H_2SO_4 with red-yellow color, also obtained from the quinone in NH_4OH with air. The corresponding *Et ester* (6.5 g. from 7 g. of the amide), m. 131°, sol. in H_2SO_4 with canary-yellow color, forms in alc. a *AgNO}_3* compd., decomps. 215°. Free acid, from the ester refluxed in 20% HCl , m. 212° (decompn.), sol. in H_2SO_4 with canary-yellow color, forms in alc. with AgNO_3 a gelatinous ppt. sol. in NH_4OH . C. A. R.

2-Phenyl-5-aminotetrazole. R. STOLLÉ AND O. ORTH. *Ber.* 58B, 2100–5(1925).—2-Phenyl-5-aminotetrazole (I) has only very weak basic properties and, unlike the 1,5-isomer (II), forms no stable HCl salt; it gives no diazonium compd. with HNO_2 . Unlike II, also, its soly. in alc. is not increased by the addn. of NaOEt , and *hydrazo-5,5'-di-[2-phenyltetrazole]* (III) does not, like the 1-Ph compd., dissolve in alkalis. 2-Phenyltetrazole-5-carboxyhydrazide, from the Me carboxylate and excess of $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ at 110–20°, m. 200° (decompn.), sol. in dil. mineral acids and in alkalis but not in carbonates, feebly reduces hot $\text{NH}_3\text{-AgNO}_3$, distinctly on addn. of NaOH; *HCl salt*, m. 182° (decompn.), easily loses HCl ; *benzylidene deriv.*, m. 164° (decompn.), sol. in alkalis; *isopropylidene deriv.*, m. 117°. *Azide* (9.7 g. from 11 g. of the azide), m. 100° (decompn.), detonates on Pt or in m. p. tubes over a free flame, is hydrolyzed by boiling H_2O ; the aq. mother liquor yields a small amt. of a substance, m. 167° (decompn.), which is apparently a salt-like compd. of the free acid with the amide into which 2 compds. it can be decompd. and from C_6H_5 solus. of which it can also be obtained. *Et [2-phenyltetrazolyl-5-amino]formate* (IV) (8.1 g. from 10.8 g. of the azide refluxed in alc.), m. 106°, sol. in alkalis. *sym-Di-[2-phenyltetrazolyl-5]-urea* (V) (5.5 g. from 10.8 g. of the

azide refluxed in xylene), yellowish, m. 216° (decompn.). **I** (6.4 g. from 11.6 g. **II** with concd. HCl at 200°), yellowish, m. 142°, also obtained from **IV** with concd. H₂SO₄ at 105–10° and by heating **V** with AcOH and concd. HCl under pressure. *AgNO₃ compd.*, m. 200° (decompn.), deflagrates faintly when rapidly heated over a free flame. **I** dissolves in concd. HCl but seps. from hot 20% acid on cooling. *Benzylidene deriv.*, m. 123° *2-Acetyl amino deriv.*, m. 177° (decompn.), sol. in NaOH, oxidized with loss of the Ac group, by Pegrelon soln. to the azo compd. *Azo-5,5'-di-[2-phenyltetrazole]*, obtained almost quant. from **I** in H₂O with Ca(OCl)₂ on the H₂O bath, canary-yellow, m. 148°, deflagrates faintly on rapid heating over a free flame, evolves gas and becomes red when covered with concd. H₂SO₄, shows in alk. suspension with air or H₂O₂ the same peculiar behavior as the 1-Ph isomer (regeneration of **I**). **III**, from the azo compd. in AcOH suspension with Zn dust on the H₂O bath, m. 184° (decompn.), insol. in NaOH, reduces hot NH₃-AgNO₃ and is easily oxidized back to the azo compd. by Ca(OCl)₂.

C. A. R.

Some derivatives of pyridine. ANTONIO PIERONI. *Atti. accad. Lincei* [6], 2, 125–7 (1925).—Some time ago P. undertook to prep. a series of C₆H₅N (**I**) derivs. analogous to those of C₆H₆ and this is a preliminary report. As in C₆H₆ the substitution of 1 H atom (α) with an NH₂ group renders the substitution of *o*- and *p*-H in **I** easy: thus α -H₂N-C₆H₄N (**II**) resembles PhNH₂. The following derivs. of **I** were prepd. from **II**: α , β '-(H₂N)I, α , β '-ClI, α , β '-Cl(ICI₂) (**III**), α , β '-Cl(IO₂) (**IV**), α , β -(NH₂)NO₂, α , β , β '-(NH₂)-(NO₂)Br, α , β , β '-Cl(NO₂)Br (**V**), α , β '-(NH₂)NO₂, α , β '-(NHAc)NO₂ (**VI**), α , β '-(NHAc)-NH₂ (**VII**), α , β '-Cl(NH₂), α , β '-Cl(N:NC₁₀H₂OH) (**VIII**), α , β '-Cl(NHNH₂) (**IX**), α , β '-Cl(NHN:CHPh) (**X**). The numbered compds. are new. The other were prepd. by modifications of methods of Chichibabin which will be fully described in another paper. α , β '-C₆H₄NCII adds Cl in CHCl₃, giving *dichloroiodochloropyridine* (**III**), yellow, m. 115° (decompn.). **III** in **I** treated with some H₂O pptd. the *iodoxy deriv.* (**IV**), explodes at 205°. From α , β -C₆H₃N(NH₂)NO₂ C₆H₃NCl(NO₂) was obtained in good yield and on reduction with Fe or Sn + HCl gave the corresponding amine. This on diazotization was coupled with β -naphthol and gave α -chloro- β '-azopyridyl- β -naphthol (**VIII**) red, m. 185°. **VIII** with SnCl₂ gave α -chloro- β '-hydrazinopyridine (**IX**), m. 127°, reduces Fehling soln. **IX** with BzH gave the corresponding *hydrazone* (**X**), m. 208°. Probably if the corresponding Br or I deriv. had been used the unsubstituted pyridylhydrazine would have been obtained.

E. J. WITZEMANN

Condensation products of α -aminopyridine with aliphatic-aromatic ketones. I. L. SCHMID AND B. BANGLER. *Ber.* 58B, 1971–3(1925).—All attempts to condense α -C₆H₄NNH₂ (**I**) with PhCOMe failed, but when **I** is refluxed 50 min. with 3 parts PhC(OEt)₂Me there is obtained 32.5% of a condensation *product* (**II**) (80% if the unchanged portion of the reaction mixt. is treated again in the same way), thick yellow oil, *b*₁₁, 174° (the vapor shows a light green-yellow fluorescence), unstable towards acids and alkalies and even on long standing in moist air decomps. into its components, especially if warmed; *HCl salt*, quickly deliquesces in the air; *methiodide*, yellow, m. 162°; *methosulfate*, m. 188°. With HCl gas at 180–204° **II** yields no quinoline but exclusively the *dynpnone deriv.*, m. 118.5°; *HCl salt*, m. 235°; *methiodide*, m. 201–2°. Heated with PhC(OEt)₂Me at 300° and then distd. *in vacuo*, **I** yields a fraction *b*₁₁ 245° and solidifying in the receiver, but its compn. does not correspond to that of the expected methylphenylnaphthyridine.

C. A. R.

Reaction of quinolinic anhydride with aromatic hydrocarbons and aluminium chloride. C. M. JEPHCOTT. *Trans. Roy. Soc. Can.*, Sec. III (3), 19, 28(1925).—C₁₀H₈ in C₆H₆ gave 22% of α -naphthoypicolinic acid, m. 155°, and the β -isomer, m. 145°. The HCl salt and the Me ester of each acid was prepd. Acenaphthene in C₆H₆ gave 10% of 4-acenaphthoypicolinic acid, decomp. 168–70° and does not form a HCl salt. A hydrate, m. 121° and a Me ester, m. 112–4°, were prepd. J. W. SHIPLEY

Constitution of corycavidine and corycavamine. F. v. BRUCHHAUSEN. *Arch. Pharm.* 263, 570–602(1925).—The present investigation substantiates the findings of Gadamer respecting the empirical compn. of corycavidine, *vis.* C₂₂H₂₄O₈N, and justifies its assignment to the corycavine group. Contrary to the behavior previously observed in 10-ring nuclei no rearrangement to a quaternary iso-compd. resulted from treatment with AcCl. Methylation and cleavage of corycavidine methosulfate by means of Na-Hg in acid soln. yielded optically active tetrahydromethylcorycavidine, C₂₂H₃₁O₈N. On evapn. with HCl it lost the elements of H₂O, yielding optically inactive anhydrotetrahydromethylcorycavidine, C₂₀H₂₉O₈N, which latter on oxidation with KMnO₄ gave methylacetoveratrone, C₁₀H₁₄O₃, *N*-methylhydrastinine, C₁₂H₁₅O₃N, methylveratric acid, C₁₀H₁₂O₄, 4,5-methylenedioxy-2- β -dimethylaminoethylbenzoic acid and a high mol. acid, m. 243°. From these cleavage products the formula of anhydrotetrahydro-

methylcorycavidine is established, as also indirectly that of corycavidine disclosed. Starting from *o*-cresol, methylacetoveratrone and methylveratric acid were prepd. synthetically, as also through degradation of corydaline. Reduction of corycavidine with Na-Hg leads to the formation of dihydrocorycavidine, $C_{22}H_{27}O_5N$, which is converted by $AcCl$ into isodihydrocorycavidine chloride, $C_{22}H_{26}O_5NCl$. Alc. KOH resolves the latter into anhydroisodihydrocorycavidine, identical with des-*N*-methyl-4-methyltetrahydroberberine prepd. from berberine. Optically active corycavamine is the desmotropic form (keto) of corycavine (enol.). W. O. E.

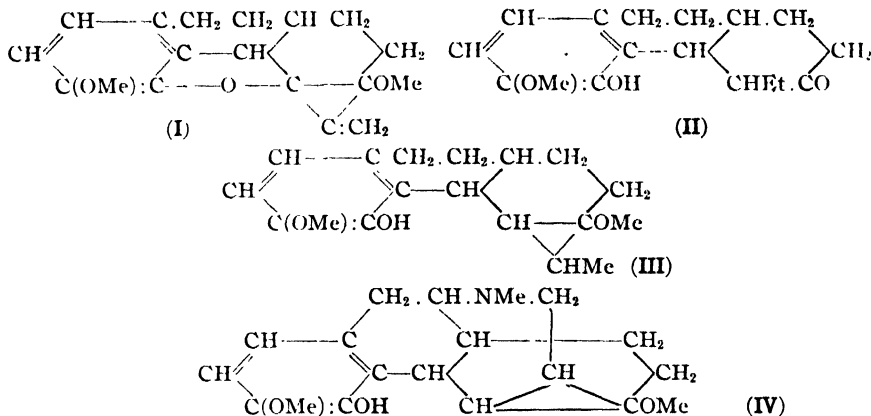
Alkaloids of *Corydalis cava*: corybulbine and isocorybulbine. F. V. BRUCH-HAUSEN AND KATSUJI SAWAY. *Arch. Pharm.* **263**, 602-5(1925).—Because of an identical study by Späth and Dobrowsky (cf. *C. A.* **19**, 2959) further work in this direction was discontinued. The methyl ethyl ether of nor-*m*-hemipinic acid obtained by S. and D. was prepd. in a different manner. Starting, *viz.*, from creosol and Et_2SO_4 , creosol Et ether was obtained and converted *via* Friedel-Craft into 3-methoxy-4-ethoxy-6-acetotoluene, $C_{12}H_{16}O_3$, needles, m. 50-1°, b_{11} 156-60° (oxime, m. 99-100°; semicarbazone, m. 185-6°), which latter on oxidation in Na_2CO_3 with $KMnO_4$ gave 1-methyl-3-methoxy-4-ethoxy-6-benzoic acid, $C_{11}H_{14}O_4$, needles m. 180-3° (*Me ester*, needles, m. 64-5°) and 1-methyl-3-methoxy-4-ethoxy-6-benzoylformic acid, $C_{12}H_{14}O_6$, needles, m. 75-7° (*Me ester*, m. 108-9°), which latter with H_2O_2 and alkali is converted smoothly into the former. On further energetic oxidation with $KMnO_4$ methyl ethyl ether of nor-*m*-hemipinic acid, m. 184-5° resulted. W. O. E.

Aconitum alkaloids. IV. Oxonitine and some new derivatives of it. RIKO MAJIMA AND HARUSADA SUGINOME. *Ber.* **58B**, 2047-51(1925); cf. *C. A.* **19**, 291. The various samples of oxonitine (I) prepd. from japonitine A, A_1 , A_2 , B, B_1 and aconitine A and C, are identical in compn., decompn. p. and rotation, contain 3 MeO groups and no MeN group. Heated up to the decompn. p., all the samples of I lose 1 mol. $AcOH$ and yield the same pyroxonitine (II) which very probably has the compn. $C_{23}H_{29}O_8N$; I would therefore be $C_{23}H_{33}O_{10}N$. II is very easily hydrolyzed by $Ba(OH)_2$, yielding $BzOH$ and, almost quant., pyroxonine (III), $C_{16}H_{23}O_5N$. The various I decomp. 282°, $[\alpha] -41.0^\circ$ to -42.7° ($CHCl_3$) and contain 59.44-59.61% C, 6.26-6.38% H. II, m. 231°, seps. from $CHCl_3$ with 1 mol. solvent, $[\alpha]_D^{20} -128.9^\circ$ ($EtOH$), -127.5° to -129.9° ($MeOH$), MeO 20.38%, C 61.06-61.45%, H 6.21-6.57%. N 3.30-3.40, mol. wt. in camphor 450-63. III, decomp. 273-4°, C 58.98-59.34, H 7.14-7.23, N 4.12, MeO 25.8-25.9%, dissolves in about 9 parts abs. alc., is easily turned yellow by the air in alkalis, does not decolorize Br in $AcOH$, reacts absolutely neutral, seps. unchanged from dil. HCl on concn. *in vacuo* over alkali, forms no ppts. with picric acid, $AuCl_3$ or $PtCl_4$. C. A. R.

Constitution of codeine and thebaine. J. M. GULLAND AND R. ROBINSON. *Mem. Proc. Manchester Lit. Phil. Soc.* **69**, 79-86(1925).—Hydroxycodeinone (I) and its dihydro deriv. (II) do not reduce Fehling soln. or NH_4OH-Ag_2O , even on warming; both bases are recovered largely unchanged from solns. in 30% aq. H_2SO_4 after boiling 2.5 hrs. These facts argue against the formulation of I as an α -hydroxy ketone. Bromocodeinone and I yield the same I oxime, m. 279°. I is considered 14-hydroxycodeinone. Structural formulas are suggested for these compds. II condenses with piperonal to form an amorphous yellow powder, $C_{26}H_{28}O_6N$, giving a red soln. in concd. HCl and a purplish red color in H_2SO_4 . The corresponding solns. of the benzylidene deriv. are colorless and red, resp. I gives similar derivs., showing the same color reactions, but analyses indicate the occurrence of reduction as well as condensation. Both I and II condense with *o*- HOC_6H_4CHO , giving the orange-red solns. characteristic of the salts of most salicylidene-ketones. I and 6-aminopiperonal condense with $EtONa$ to give the compd. $C_{26}H_{26}O_6N_2$, crystg. with $1C_6H_6$, m. 243-4°; it gives Gadamer's test and thus contains the CH_2O_2 group. II gives a dihydro-6-aminopiperonaldihydro-hydroxycodeinone, $C_{26}H_{24}O_6N_2$, m. 282-3° (decompn.); the colorless H_2SO_4 soln. does not exhibit fluorescence. C. J. WEST

Morphine alkaloids. IV. Constitution of thebaine. HEINRICH WIELAND AND MUNIO KOTAKE. *Ber.* **58B**, 2009-12(1925); cf. *C. A.* **19**, 2827.—As shown in the earlier paper the N-free ether (I) obtained by the Hofmann degradation of dihydrodes-N-methylidihydrothebaine gives on catalytic hydrogenation with Pd black the ketophenol (II), probably the vinylene group first adding H and the O bridge between the rings then being ruptured, but the intermediate thebaine deriv. (III) seemed to be incapable of existence. On repeating the prepn. of II in alc. freed from every trace of acid by the addn. of a very little $NaHCO_3$, however, III was unexpectedly obtained; on short warming with HCl, it changes into II. Methylation of II gives a *di-Me ether* (IV) isomeric with III. The isolation of III is a further indication that thebaine (V) is not, as repre-

sented in the Knorr-Hörlein formula, an enol ether. Hydrogenation of V in an absolutely acid-free medium gave an oil (VI) with phenolic properties yielding on short warming with 2 N HCl 80% of dihydrothebainone. III (0.75 g. from 1.3 g. I), m. 168–9°, gives with FeCl₃ the green color characteristic of the phenols of this whole group, MeO content 20.92%. IV (0.3 g. from 0.5 g. II with alk. Me₂SO₄ in aq. alc.), m. 111–2°, gives no color with FeCl₃, is stable towards KMnO₄ in Me₂CO; benzal deriv., m. 128–30°. Hydrogenation of I as described in the earlier paper gives only about 33% II; the greater part of the product is a viscous isomer, b₄ 180–5°, which likewise gives the green FeCl₃ reaction.



C. A. R.

Aluminioxalates of some optically active bases. T. B. CHILD, ELWYN ROBERTS AND E. E. TURNER. *J. Chem. Soc.* 127, 2971–2 (1925).—Attempts to resolve compds. derived from H₃Al(C₂O₄)₃ by the use of active bases were unsuccessful. *Strychnine aluminioxalate*, needles with 16 H₂O, α_D²⁰ –24° to –21° in 50% aq. Me₂CO; on recrystn. partial decompn. occurred. A sample prepd. from Na₃Al(C₂O₄)₃ showed α_D²⁰ –19°. *1-Methylamine aluminioxalate*, prisms with 1H₂O, α_D²⁰ –28.5° in 50% aq. Me₂CO. The *1-phenylethylamine* salt forms prisms with 1H₂O, α_D²⁰ –3.0° (H₂O). The *distrychnine K* and *d-phenylethylamine K₂* salts were also prepd., but in no instance was a change in sp. rotation observed after repeated crystn.

C. J. WEST

Resin acids. III. K. SUZUKI. *J. Pharm. Soc. Japan* No. 524, 888–95 (1925); cf. C. A. 19, 2501.—Further studies on the properties of densipimaric acid (I) and its derivs. I in solns. undergoes progressive changes in optical rotation, their extent depending upon the nature of the solvents. About 7% I in 96% alc. gives after 0, 11, 26, 38, 49 days [α]_D^{18–20} –63.1°, –59.3°, –48.2°, –42.6° and –36.1°; in 86% alc., after 0, 5, 10, 16, 31, 64 days, [α]_D^{20–22} –57.9°, –51.8°, –51.2°, –46.7°, –43.1° and –41.1°; and about 8% I in CCl₄ soln. after 0, 17, 38, 49, 64 days, [α]_D^{18–20} –41.40°, –43.9°, –34.2°, –25.3°, +2.8°. These solns. were left in the dark (18–22°), protected from air. The cause of these changes, which, S. is sure, are not to be due to an impurity at least, was not explained. When I is treated with dil. alkalies and optical sepn. is effected, 2 acids are obtained: α-acid, m. 173°, [α]_D²⁴ –4.5°; β-acid, m. 153–6°, [α]_D²⁴ –9.5°. These two are probably isomers of I, produced by the action of alkali on I. With HBr, is formed a di-Br. deriv., m. 174–5°, identical with the dibromohydroabietic acid of Levy and Ruzicka (C. A. 7, 2388; 16, 2500). Dihydrodensipimaric acid (II), previously reported to m. 182–3°, after repeated recrystn., m. 207°, a trace of impurity makes it 190°. By catalytic hydrogenation, I also gives another compd. (III), m. 172–3°. When II is heated with a mineral acid, it gives a substance, m. 173–4°, which is not the same as III, but is very similar to the dihydroabietic acid of Virtanen and Johanson. When abietic acid prepd. from I is hydrogenated, it yields a dihydroabietic, m. 141–3°, [α]_D²⁰ –7.7°, which when heated with HCl in sealed tubes goes over to a compd., m. 160–4°.

S. T.

Lignin compounds. K. KÜRSCHNER. *Brennstoff-Chem.* 6, 304–11 (1925).—The conclusion of a series on this subject (cf. C. A. 19, 3487). K. regards lignin as mainly a

colloidal coniferin complex on which free coniferin is to some extent adsorbed. This view is based on the similar chem. behavior of coniferin, and lignin (as prepd. by the HCl extn. process). A large no. of reactions which both lignin and coniferin give are cited. Important ones are: 1. Hydrolysis of coniferin and lignin to coniferyl alc. and glucose, the former being readily oxidized to vanillin and vanillic acid. 2. Identical color reactions with HCl and phloroglucinol. 3. Soly. in $\text{CCl}_3\text{CO}_2\text{H}$. 4. Similar products obtained on fusion with alkalis—protocatechuic acid, humic acid, etc. 5. Similar sulfo acids are formed by digestion in sulfite soln. Furthermore the C, H and Me content of lignin indicate it to be a coniferin complex. J. D. DAVIS

Constituents of the yew leaves. II. H. KONDO AND T. TAKAHASHI. *J. Pharm. Soc. Japan* No. 524, 861-76(1925).—Further studies on the constitution of texin (I) It was prepd. according to the method given in *C. A.* 17, 2442. Preliminary examn. shows that it has 2 NMe_2 , and no MeO groups. When it is acetylated by heating with Ac_2O , a yellow amorphous Ac deriv. is produced which contains 5 Ac groups, showing the presence of 3 OH. Since its methiodide has the compn. $\text{C}_{37}\text{H}_{61}\text{NO}_{10}\text{MeI}$, it must be a tertiary amine. When it is boiled on the water bath with 30 times its vol. of 0.2 *N* alc. KOH, a neutral, yellow amorphous nitrogenous substance (II), a cryst. substance (III), insol. in Et_2O , m. 286° , and HCO_2H , AcOH, citric and a powdery acid are formed. II, $\text{C}_{21}\text{H}_{35}\text{NO}_5$ $[\alpha]_D^{25} -45.51^\circ$, is named *taxinolamine*. An amorphous acid $\text{C}_{16}\text{H}_{24}\text{O}_6$ obtained by decompn. of II, is named *taxic acid* (IV) and has $[\alpha]_D^{20} -49.29^\circ$. II has at least 3 OH groups, gives no reaction with $\text{H}_2\text{NCONHNH}_2\cdot\text{HCl}$, $\text{NH}_2\text{OH}\cdot\text{HCl}$, $\text{PhNHNH}_2\cdot\text{HCl}$ or with phloroglucinol- H_2SO_4 . It does not form iodoammonium base with MeI even in a sealed tube. Thus of the 5 O atoms in II, 3 are in OH groups, but the others are not in C:O, or CH_2O_2 groups. When the Ac deriv. of II is oxidized in glacial AcOH with KMnO_4 , a compd. $\text{C}_{21}\text{H}_{26}\text{NO}_6(\text{COME})_3$ is obtained. When oxidized similarly at a high temp., a compd. $\text{C}_{20}\text{H}_{26}\text{NO}_6\text{Ac}_3$ is obtained. When $\text{I}\cdot\text{MeI}$, suspended in H_2O is decompd. by AgOH , Me_3N and an amorphous compd. $\text{C}_{35}\text{H}_{44}\text{O}_{10}$ (V), $[\alpha]_D^{20} 50.72^\circ$, are obtained. If V is decompd. with 0.2 *N* alc. KOH, it gives AcOH, citric acid, IV (m. $92-5^\circ$, and effervesces at 130°) and a neutral substance (VI), m. $94-5^\circ$, $\text{C}_{19}\text{H}_{24}\text{O}_6$, corresponding to II minus Me_2NH and named *taxinol*. From these, it is concluded that I is the ester of II and a hydrate of IV and VI is an unsatd. alc. produced by removing Me_2NH from II. Thus $\text{C}_{37}\text{H}_{51}\text{NO}_{10}$ (I) = $\text{C}_{16}\text{H}_{21}\text{O}_6\cdot\text{C}_{19}\text{H}_{24}\text{O}_6\text{NMe}_2 = \text{PhCH}(\text{CHC}_6\text{H}_4\text{O}_6\text{C}_{11}\text{H}_{14}\text{O}_2(\text{NMe}_2)(\text{OH})_3[(\text{CH}_2)_2\text{Ph}])$. S. T.

Further results in the study of the structure of proteins. EMIL ABDERHALDEN. *Naturwissenschaften* 13, 999-1000(1925).—A review pertaining to A.'s recent work on the properties and desmotropic forms of 2,5-diketopiperazines (cf. *C. A.* 19, 39, 79, 994, 2830, 2809, etc.). B. J. C. VAN DER HOEVEN

Halogenated proteins. V. Bromocasein. A. J. J. VANDEVELDE. *Rec. trav. chim.* 44, 900 6(1925); cf. *C. A.* 19, 2502.—Bromocasein (I) was mentioned in previous papers (*C. A.* 18, 2134; 19, 818). In prepn. A 150 g. pure Poulenc casein (14.8% N) was treated with 3 cc. Br_2 in 100 cc. CCl_4 for 35 days at room temp. 22 g. I was obtained with 32.3% Br. In the prepn. B 50 g. dry casein were treated with 10 cc. Br_2 in 300-cc. CCl_4 for 65 days and gave 77.3 g. I with 35.2% Br. I is yellow, finely granular and little hygroscopic; only traces of HBr are present, which indicates that I is an addn. and not a substitution product. 3 g. A treated with 50 cc. H_2O for 8 days at 18° left an insol. residue (1.5 g.) with 12.7% N and 11.6% Br. The same result was obtained with B. In the filtrate by treatment with $\text{HNO}_3 + \text{AgNO}_3$ it was found that only 7.7% of the total Br originally present is still combined organically. By expts. at 61° these results were confirmed and extended. The N content of the insol. portion is nearly const.; the Br content varies through a small range. The Br organically combined decreases as the duration of the action of H_2O is lengthened. When the amt. of H_2O is diminished, the amt. of insol. Br product increases and the amt. of organically combined Br diminishes. 5.4 g. A treated 8 days at room temp. with 100 cc. 0.5 *N* KOH is completely dissolved. On adding 60 cc. 1.0 *N* AcOH 2.9 g. of a product contg. 12.65% N and 8.45% Br is pptd. 5 g. B in 100 cc. 95% EtOH for 5 days gave 3.1 g. insol. product contg. 12.2% N and 14.7% Br. Only 2.7% of the total Br was organically combined in the sol. part. A heated 10 hrs. at 100° lost 8% Br and gave a product that behaved much like the unheated material toward H_2O and KOH. In attempting to develop an interpretation of this addn. of Br to proteins Vandeveld has obtained a *bromoleucine* contg. 49.3% Br and a *bromotyrosine* contg. 57.29% Br by similar methods. Other bromoamino acids are in prepn. E. J. WITZEMANN

Anomalies of nucleic acid salts. E. PRISER. *Ber.* 58B, 2051-4(1925).—Pure cryst. guanylic (I), adenylic (II), inosinic (III), cytosylic (IV) and uracylic (V) acids were

converted into the corresponding salts by neutralization with brucine and strychnine. These salts can be recrystd. unchanged from H_2O , but if they are extd. with $CHCl_3$, the $CHCl_3$ even at room temp. removes 0.5 of the base from the brucine salt of I and all of it from the salts of II and III. The strychnine salt of II shows the same property but that of I holds both strychnine mols. firmly. Of IV and V the neutral brucine salts are stable towards $CHCl_3$, even on hot extn. for days. C. A. R.

Lipoids. XX. Hypocerebric acid ("Hypohirnsäure"), a new triaminomonophosphatomonosulfatide from the human brain. S. FRANKEL AND O. KARPFFEN. *Biochem. Z.* 157, 414-24 (1925).--A C_6H_6 -insol. compd. $C_{101}H_{152}N_3PSO_{26}$ (I) is isolated from the brain. Upon hydrolysis it gives H_2SO_4 , H_3PO_4 , aminoethyl alc., glycerol and α -hydroxy-decanic acid, m. 161° . The following derivs. of the latter are prepd.: Me ester, m. 102° ; acetate of the Me ester, m. 123° . The Ag salt does not melt; and the Ba salt sinters 205° . The free acid upon oxidation with $KMnO_4$ gives pelargonic acid. All 3 N atoms in I are present in NH_2 groups. W. D. LANGLEY

ISLER, HANS: Ueber Phosphin-methylene. Ueber eine neue Gruppe von farbigen Halogenverbindungen aus Phosphinmethylenen. Weida (Thür.): Thomas & Hubert. 89 pp.

Organic "percompounds." NAAMLLOOZE VENNOOTSCHAP INDUSTRIEEL MAATSCHAPPIJ VOORHEEN NOURY & VAN DER LANDE and J. C. L. VAN DER LANDE. *Brit.* 234,163, Feb. 12, 1924. Org. peroxides or other percompds. such as benzoyl, cinnamyl or acetyl peroxides, peracetic and perpropionic acids, persalts and peraldehydes or other highly oxidized org. compds. are rendered safe to handle by mixing them with inert materials such as inorg. oxides, carbonates, phosphates, chlorides, sulfates or silicates of Mg, Ca, Na, K or NH_4 or with acetates, lactates, citrates or tartrates of Ca, Na, K or NH_4 or with flour.

Hydroxyalkyl sulfides. G. KRANZLEIN and M. CORELL. U. S. 1,570,262, Jan. 19. $(CH_3CH(OH)CH_2)_3S$ is prepd. from $CH_3CH(OH)CH_2Cl$ and alkali sulfides. It is readily sol. in H_2O and has a high solvent power for many org. dyes so that it can be used in dye printing. The sulfide which is produced from a mixt. of $CH_2(OH)CH_2Cl$ and $CH_3CH(OH)CH_2Cl$ by treatment with alkali sulfides (and which is probably a mixt. of simple and complex sulfides) has similar properties.

Methanol. A. MITTASCH and M. PIER. U. S. 1,569,775, Jan. 12. Reaction of CO and H to produce CH_3OH is effected under pressures above 50 atm. (in one example 220 atm.) and at temps. of 250 - 600° in the presence of catalysts such as an equi-mol. association of oxides of Cr and Mn in granular form. Fe is excluded from the catalyst, the walls of the app. in contact with the reacting mixt. and from the reacting materials themselves. Among the catalysts which may be used are oxides of V, U, Al or other oxides which are non-reducible under the conditions of working, or metals such as Cu, Ag, Pb or Zn in conjunction with a metal oxide or a metal salt acting as a promoter, especially those derived from metals of the fourth to seventh groups of the periodic system. Alloys of Cr, Mn, Cu and Zn are referred to as suitable. Cf. C. A. 20, 209.

Ethylating amines. A. R. CADE. U. S. 1,570,203, Jan. 19. $PhNH_2$, or other amine to be ethylated is treated with an Et sulfate under ethylating conditions in the presence of $Ca(OH)_2$ or other alk. compd. of an alk. earth metal which serves to promote the desired reaction.

Acetic anhydride. R. MEINGAST and M. MUGDAN. U. S. 1,570,514, Jan. 19. Vapors of $HOAc$ are heated to 400 - 800° in the absence of base metals and metal oxides, to form Ac_2O .

Hexamethylenetetramine. S. KARPEN & BROS. *Brit.* 234,192, Feb. 26, 1924. Methylene chloride is caused to react with NH_3 under pressure at an elevated temp. NH_3 is preferably used in excess and after the reaction the excess NH_3 is distd. off and the residual material treated with a solvent such as $CHCl_3$ or CCl_4 to dissolve the $(CH_2)_6N_4$.

Anthracene and carbazole. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. *Brit.* 233,734, May 12, 1924. Crude anthracene is freed from carbazole by heating with caustic alkali in the presence of an inert solvent such as paraffin, b. 260 - 320° , without distg. off the H_2O formed. The "alkali carbazole" is sepd. and converted into carbazole, and the $C_{14}H_{10}$ is crystd. and washed with C_6H_6 .

Esters. SOC. ANON. DES DISTILLERIES DES DEUX-SEVRES (formerly Soc. Ricard, Allenet, et Cie). *Brit.* 234,458, May 24, 1924. In forming esters of aliphatic or aromatic acids continuously, an equimol. mixt. of the alc. and acid is supplied continuously from a const.-level tank to a boiler contg. a quantity of the alc. and acid together with a catalyst such as benzenesulfonic acid, H_2SO_4 or HCl , heated to the b. p. With esters

of "medium" volatility such as Pr, Bu and Am formates, Et, Pr, Bu and Am acetates, Me, Et and Pr propionates, Me and Et butyrates and Me valerate, the H_2O produced in the esterification forms with the ester a const. boiling mixt. which may be removed by distn. Details of EtOAc manuf. are given.

Sulfonating β -naphthol. M. L. CROSSLEY and G. S. SIMPSON. U. S. 1,570,046, Jan 19. In sulfonating β -naphthol with H_2SO_4 , an O-contg. B compd such as H_3BO_3 or a borate is added and serves to increase the yield of the product.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Lactic acid and its importance in chemistry and physiology. C. NEUBERG AND M. KOBEL. *Z. angew. Chem* **38**, 761-6(1925).—A review M. BEBER

The odor of stereoisomers. FRIEDRICH RICHTER. *Z. angew. Chem* **38**, 1200 (1925).—Discussion of recent researches T. S. CARSWELL

The influence of the cultivation of yeast on galactose on the fermentability of this carbohydrate by the yeast. II. EMIL ABDERHALDEN. *Fermentforschung* **8**, 474-8(1925); cf. *C. A.* **18**, 3389.—The cultivation of yeast cells on galactose results in an increase in the galactose-fermenting power, and this when once acquired persists for a long time. It is not impaired when the yeast cells are dried, and it survives the subsequent cultivation of the yeast on solns. of other carbohydrates. A. W. DOX

The affinity relations of sucrase. V. The specificity of sucrase and raffinase action. KARL JOSEPHSON. *Z. physiol. Chem.* **149**, 71-93(1925); cf. *C. A.* **20**, 214.—The cleavage of sucrose is inhibited by α -methylglucoside to a much greater extent than that of raffinose, but is independent of the concn. of substrate. In view of the evidence in favor of the identity of sucrase and raffinase, the probable explanation of this difference in inhibition is an unequal binding of the 2 substrates to the enzyme. Inhibition by β -methylglucoside is, however, practically the same for the 2 sugars. Salicin, on the other hand, exerts a greater inhibition on raffinose than on sucrose cleavage, and in this respect resembles the simple sugars. Both glucose and fructose show a smaller inhibition in the presence of α -methylglucoside. The inhibition by glucose, but not that by fructose, is diminished by the presence of salicin; hence the glucoside possesses no affinity toward the fructose-binding group of the enzyme. Addn. of EtOH does not change the reactivity of the enzyme toward the simple sugars. A. W. DOX

Gluco- and fructo-sucrase. RICHARD KUHN AND HERBERT MÜNCH. *Z. physiol. Chem.* **150**, 220-42(1925).—On the basis of the inhibitory effect of cleavage products on the velocity of sucrose cleavage, 12 sucrase solns. prepd from various yeasts are classified into 4 groups: (1) those inhibited much more feebly by α - than by β -glucose and inhibited by fructose, (2) those inhibited by fructose but not by α - or β -glucose, (3) those inhibited by α - and β -glucose but not by fructose, (4) those inhibited by all 3 hexoses. Yeast sucrase therefore behaves sometimes as gluco- and sometimes as fructo sucrase. The yeast enzyme cannot be sharply differentiated as fructo-sucrase in contrast to the gluco-sucrase which occurs in other fungi and in animal secretions. The 4 types may be regarded as variable mixts. of 2 sucraes of different specificity, either mixts. of a gluco- and a fructo-sucrase or mixts. of 2 enzymes sp. for α - and β -sugars. A simpler explanation would be the assumption of the presence of accompanying substances which influence the sp. inhibitions of a single enzyme. A further possibility is a differentiation between 2 enzymes, 1 of which exhibits affinity for the amylenic oxide and the other for the butylene oxide structure of the sugar. A study of the effect of a purified yeast enzyme of type I (fructo-sucrase) and an enzyme prepn. from *Aspergillus oryzae* (gluco-sucrase) toward hesperonal (sucrosephosphoric acid) showed that the yeast enzyme hydrolyzed the sucrose without liberation of H_3PO_4 , whereas the mold enzyme liberated H_3PO_4 more rapidly than it hydrolyzed the sucrose. Both observations indicate that the H_3PO_4 in hesperonal is esterified with the glucose moiety of the disaccharide. Partial hydrolysis by HCl also gave chiefly fructose and glucosephosphoric acid. The isomeric glucofructosephosphoric acid is probably present also, since hesperonal is not an individual substance, and this accounts for the fact that yeast sucrase gave a cleavage of only 30%. A. W. DOX

Coproporphyrin synthesis by yeast and factors which influence it. III. Coproporphyrin ester from pure cultures of *Saccharomyces anamensis*. HANS FISCHER AND

HERMANN FINK. *Z. physiol. Chem.* **150**, 243-60(1925); cf. *C. A.* **19**, 2509.—The earlier evidence of coproporphyrin synthesis by yeast was not entirely conclusive because of the possibility that coproporphyrin or some precursory substance may have been supplied by the culture medium or by the relatively large amt. of yeast used for inoculation. The objection has now been met by expts. in which only a loopful of pure culture was used for inoculation and grown on coconut milk or ext. of shredded coconut. Coproporphyrin was thus demonstrated satisfactorily. The amt. was not further increased by the addn. of blood to the culture medium, showing that the substance results from an actual synthesis. From *Saccharomyces ananensis*, a yeast which requires no vitamin addn., a sufficient amt. was obtained for the prepn. of the ester in cryst. form. Other organisms, e. g., *Aspergillus oryzae*, saké yeast and tubercle bacilli, also synthesized coproporphyrin when cultivated on a coproporphyrin-free medium. From the evolutionary standpoint coproporphyrin is therefore the oldest form of blood pigment. The fact that the Fe complex does not occur in these lower forms is striking. Synthesis is favored by a temp. of 18-25° and a sugar content of 10%, but retarded by aeration. Addn. of various amino acids and pyrrole derivs. was without influence. A. W. D.

Porphyrins from blood pigment. III. ARNO PAPENDIECK. *Z. physiol. Chem.* **150**, 261-6(1925).—The prepn. of α -hematoporphyrin from hematin by treatment with $N_2H_4 \cdot H_2O$ -AcOH to remove Fe may be improved by allowing the reaction to proceed for a longer time at room temp. instead of water bath temp. The formation of a green pigment is thus diminished and the HCl salt of the porphyrin is obtained in cryst. form by treatment with Et_2O -HCl and $CHCl_3$. The $CHCl_3$ should be $EtOH$ -free in order to avoid esterification. The porphyrin contains 2 esterifiable carboxyls and the unsatd. side chain of hematin, and is identical with Küster's hematerindicarboxylic acid. A. W. DOX

Invertase. XI. Diminution of invertase in yeast. RICHARD WILLSTATTER AND CHAS. D. LOWRY, JR. *Z. physiol. Chem.* **150**, 287-305(1925); cf. *C. A.* **19**, 3194.—As certain maltase-free yeasts have the power of fermenting maltose directly without intervention of the hydrolytic enzyme, so it is possible to ferment sucrose directly under conditions which preclude a preliminary hydrolysis by invertase. Dil. alkalis and acids diminish the sucrose content of yeast without killing the organism and the fermenting power remains practically unimpaired. Without appreciable change in fermenting power the invertase content may be increased 15-20 times or diminished 30 times its original value by suitable treatment. The presence of 0.15-0.30 *N* H_2SO_4 or 0.05 *N* NaOH during 1 hr. destroys 95% of the invertase leaving the fermenting power practically unaltered, the only difference being a lengthening of the induction period. Invertase is, however, formed during the fermentation. By allowing the fermentation to proceed at p_H 2 the fermentation is retarded only 20-30% while the invertase action is diminished to 7% of its normal value. Fermentation then proceeds more rapidly than hydrolysis. A. W. DOX

The action of hydrogenase in the presence of peroxides. J. GRÜSS. *Wochschr. Brau.* **42**, 223-4(1925).—The theory of fermentation advanced in *C. A.* **19**, 3094, is further discussed. The reactions are comparable to those of the inversion of cane sugar by HCl, in which H_2O is added to sucrose and HCl regenerated. Invertin probably acts in an analogous way and must contain a H ion when in soln. Hydrogenase must act in a similar manner. To test this theory the following solns. were prepd.: 300 cc. H_2O , 2.5 g. peptone, 0.5 g. asparagine, 0.3 g. K_3PO_4 , 0.3 g. $MgSO_4$, 0.3 g. KNO_3 , 0.1 g. NaCl, 0.3 g. $Ca_3(PO_4)_2$, 45 g. glucose. To one-half of this soln. (a) 3 g. yeast was added, and to the other half (b) 3 g. yeast, 12 g. MnO_2 and 10 cc. 3% H_2O_2 . When fermentation was completed the following results were obtained: Soln. a yielded 3.283 g. CO_2 , 8.5 g. alc.; soln. b, 2.379 g. CO_2 , 10.5 g. alc. The excess of CO_2 produced in a may be explained by assuming that dihydroxyacetone is produced from glucose, which is oxidized to H_2O and CO_2 . C. N. FREY

Further investigations of the physical properties of serums by the addition of substances which combine with water. R. FÜRTH AND R. PECHHOLD. *Kolloid-Z.* **37**, 193-9(1925).—By methods which were identical with previous investigations (cf. *C. A.* **18**, 1508, 1837) the viscosity, cond. and refractive index of blood serum of cattle have been shown to change with the addn. of MeOH, iso-PrOH and acetone in a manner entirely analogous with that of EtOH. The discrepancy between the observed results of the authors and those of Hayashi (cf. *C. A.* **19**, 2346) is attributed to a difference in methods. By increasing the diln. of the serum with H_2O the min. of viscosity obtained by addn. of MeOH was gradually effaced and completely disappeared at dilns. of more than 10%. This confirms the former explanation on the basis of the dipolar theory of Debye. Also in *Biochem. Z.* **164**, 9-17(1925). H. M. McLAUGHLIN

The human organism as an energy system. W. A. WHITE. *Ann. Clin. Med.* **4**, 285-92(1925).—A study of the distribution of energy and stresses in the body.

JOHN T. MYERS

The kinetics of agglutination of red blood cell suspensions. JEAN OLIVER AND PEARL SMITH. *J. Phys. Chem.* **30**, 1-11(1926).—The formulas of Smoluchowski (*C. A.* **11**, 3140) were successfully applied to the rapid agglutination of red blood corpuscles at their isoelec. point. The agglutination does not follow the course of a mono-, bi- or tri-mol. reaction but does follow that observed in pptn. of colloids. The blood cell must have a larger radius of attraction than that of a colloidal particle, to account for the fact that agglutination proceeds almost as fast as colloidal pptn. D. S. VILLARS

Surface composition of normal and sensitized mammalian blood cells. STUART MUDD AND EMILY B. H. MUDD. *J. Exptl. Med.* **43**, 127-42(1926); cf. *C. A.* **19**, 92.—The interfacial tension method has been applied to the study of the surface composition of mammalian blood cells and to certain other particles. Unsensitized erythrocytes and stromata possess only a small margin of stability in the interface and pass readily into the oil phase. Specifically sensitized erythrocytes and stromata possess much greater stability in the interface and pass into the oil only with considerable mechanical aid; characteristic deformations of the erythrocyte surface or the interface or both often result. With special immune sera the quant. relations are such as to indicate that the increased polarity of the sensitized erythrocyte surface is due to combination of the red-cell surface lipoids with hemolytic sensitizer. These results are corroborative of the conclusions of Landsteiner and van der Scheer that erythrocytes contain sp. lipid-sol antigens. It is tentatively concluded that with these horse-erythrocyte anti-sera at least the agglutinins combine predominantly with the protein of the red cell surfaces. Fresh human leucocytes are spread and disintegrated by the interfacial stresses. After heat injury the leucocytes typically do not enter the boundary surface. They are pushed before the advancing interface and, if their further advance is obstructed, bend the interface backward to form peninsulas and vacuoles. This change after heating is in the opposite sense to that to be expected from denaturation of the proteins of the protoplasm. Fresh oxalated rabbit platelets pass very easily into the oils. After heating, these elements also become less oil-miscible. The interfacial tension relations of blood cells, bacteria and several cell products are tabulated C. J. WESR

FAURÉ-FREMIET, E.: **La cinétique du développement: multiplication cellulaire et croissance.** Paris: Les Presses universitaires de France. 336 pp. Fr. 35. Reviewed in *Nature* **117**, 9(1926).

Grundriss der Physiologie für Studierende und Aerzte. Part I. Biochemie, by CARL OPPENHEIMER. 5th ed. revised and enlarged. 376 pp. R. M. 12. **Part II. Biophysik,** by OTTO WEISS. 3rd ed. enlarged. 324 pp. R. M. 10.80. Leipzig: G. Thieme. Cf. *C. A.* **14**, 1837.

HANDOVSKY, H.: **Leitfaden der Kolloidchemie für Biologen und Mediziner.** Eine Einführung in die allgemeine Physiologie, Pathologie, Pharmakologie. 2nd ed., revised. Dresden and Leipzig: Theodor Steinkopff. Price, paper M. 12; bound M. 14.

WINTERSTEIN, ALFRED: **Beiträge zur Kenntnis d. Saponine.** Weida (Thür.): Thomas & Hubert. 41 pp.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

"Hemochromogen reactions" of yeast and plant seeds, oxidase reactions and blood test. O. SCHUMM. *Z. physiol. Chem.* **150**, 276-86(1925).—To ascertain whether the chem. and spectroscopic blood tests used in medical jurisprudence may be vitiated by org. Fe complexes present in higher and lower plants, exts. of yeast and plant seeds were tested for the benzidine and the pyridine-hemochromogen reactions. The positive reactions obtained cast some doubt on the specificity of such tests for the identification of blood. The substance which gives the pyridine-hemochromogen reaction is a normal constituent of plants and cannot be attributed to contamination with impurities of animal origin. From yeast and seeds an ext. may be obtained with AcOH and CHCl₃ giving a spectrum which can hardly be distinguished from that of hematin. With the cyan-hemochromogen test yeast autolysate and ext. of putrefied flesh give the same cyan-myochromogen reaction. A. W. DOX

A simple micro-method for the determination of sugar, particularly blood sugar. ERNST KOMM. *Z. angew. Chem.* **38**, 1094-6(1925).—This method depends upon the colorimetric detn. of Cu. Only 0.4 cc. of blood is necessary. The blood is freed from proteins with Na tungstate and H₂SO₄ according to Folin, then heated with Fehling soln.

The Cu_2O formed is isolated by centrifuging, and dissolved in dil. HNO_3 , then an excess of ammonia water is added and the blue soln. formed is compared colorimetrically with a standard soln. prep'd. by mixing a CuSO_4 soln. with an excess of ammonia water. The Autenrieth-Königsberger colorimeter is used. The results agree with those obtained according to the method of Bang

EMIL KLARMANN

Micro-method for titrating the bicarbonate in plasma. E. H. LEPPEP AND C. J. MARTIN. *Biochem. J.* **19**, 573-80 (1925).—Blood is drawn from the ear into a collecting tube made from a piece of glass tube 7 mm. internal bore, sealed at one end and drawn out at the other until the internal bore is about 1 mm. The collecting tube has a small hole near the drawn-out end to permit the air to escape as the blood enters, before use, a few crystals of oxalate and 0.1 cc. liquid paraffin are introduced into it. Draw 0.25 cc. plasma into a graduated pipet and deliver into a 100-cc. flask (with rubber stopper bored to take a test tube) Wash the pipet 3 times with saline soln. Add 1 cc. 40% alc., mix the contents, insert the rubber stopper carrying one of the test tubes, invert the flask so that the contents run down into the test tube, and place in this position in the colorimeter. Place in another test tube 2 cc. phosphate soln. (33.33 cc. 0.2 M KH_2PO_4 , 43.66 cc. 0.1N NaOH , CO_2 -free distd. water to 100 cc.; the soln. has a p_{H} of 7.07) and put in the colorimeter beside the plasma. Add a small quantity of burnt sugar soln. (carefully neutralized) until it matches the color of the plasma. Add another cc. of phosphate and 5-8 drops of neutral red (0.05% in water). Run acid into the flask from a micro-buret until the contents become bright pink. Shake the fluid and frequently change the air in the flask by inserting a piece of wide-bore glass tubing and inhaling through it. As the CO_2 is removed the color of the fluid changes to an orange tint again. Repeat the shaking out process after each addition of acid. As the end point is approached, add single drops of acid and place the stopper in the flask, invert the flask and compare the color of the contents with that of the phosphate tube.

BENJAMIN HARROW

Method for the estimation of glucose in blood. G. A. MILOV. *Biochem. J.* **19**, 746-9 (1925).—Nitroanthraquinone sulfonates are reduced when heated with glucose in alk. soln., first to the corresponding hydroxylamine derivs. having an intense green color, and later to a deep red substance which is probably an amine deriv. Under the conditions of the expt. neither uric acid nor creatinine "seriously affects the glucose values." *Method.*—At least 1 cc. blood is required. Ppt. the proteins by the Folin and Wu procedure (*C. A.* **13**, 2541), the blood is, therefore, dild. 1 in 10. Let the mixt. of dild. blood with sodium tungstate and $2/3\text{N}$ H_2SO_4 stand 30 min., filter and introduce 5 cc. of filtrate into a graduated tube of 15 cc. capacity. Introduce 1.5, 1.8, 2.1, 2.5 and 3.0 cc. of 0.02% glucose into 5 numbered graduated test tubes of 15 cc. capacity and 12 mm. bore. Add to each tube 1 cc. 0.4% aq. 1,5-nitroanthraquinonesulfonic acid and 2 cc. K_2CO_3 (50 g. per 100 cc.). Dil. all the solns. to 10 cc. with water, mix. thoroughly, immerse in boiling water for 8 min., cool and make the vol. of each to 12.5 cc. Compare the red tint of the tube contg. blood filtrate with the colors yielded by the glucose solns. The minimal error in the estn. of a sample of blood contg. 0.1% glucose is 4%.

BENJAMIN HARROW

van den Bergh's reaction. Its mechanism and value for the classification of the forms of icterus. G. FAVILLI. *Sperimentale* **79**, 647-64 (1925).—In icterus caused by ligation of the bile duct in the dog, rabbit and guinea pig the van den Bergh diazo reaction (*C. A.* **15**, 3297) gradually passes from the indirect to the direct form. The reaction can take all 3 forms in the same type of static icterus and in toluylenediamine poisoning in dogs, depending on the time at which it is carried out. These results are explained on the basis of the adsorption of all but small amts. of the bilirubin (I) by the colloids of the serum. The reaction is considered excellent for showing the presence of I in the blood, but not for distinguishing between the 2 principal types of icterus.

M. HEIDELBERGER

The determination of fibrinogen. III. W. STARLINGER AND K. HARTL. *Biochem. Z.* **157**, 283-97 (1925), cf. *C. A.* **18**, 2184.—The detn. of fibrinogen in blood serum by the refractometric, Kjeldahl and gravimetric methods shows that values may be higher by one method than by another, depending upon the nature of the serum, *e. g.*, whether native plasma, salt plasma, or salt serum.

W. D. L.

Simple method for determining sugar in cerebrospinal fluid. J. CSAPÓ. *Biochem. Z.* **157**, 350-3 (1925).—The method is based upon that of Bertrand. $\text{Cu}(\text{OH})_2$ is reduced in an alk. medium to Cu_2O , which is isolated and dissolved in H_2SO_4 and $\text{Fe}_2(\text{SO}_4)_3$. The amt. of FeSO_4 formed due to reduction by the Cu_2O is detd. by use of KMnO_4 . Compared with the method of Bang, the results vary by less than 5 mg. %.

W. D. LANGLEY

The determination of iron and blood pigments in normal tissues and tumors. M. YABUSOE. *Biochem. Z.* **157**, 388-95(1925).—Portions of moist organs (50-200 mg.) are placed in weighed porcelain dishes and dried at 100°, weighed and a drop of HCl and a crystal of KClO_3 are added. The mixt. is then ashed. The residue is dissolved in HCl and KCNS is added. The color developed is compared with standard Fe solns to which HCl and KCNS have been added. The method detcs. 0.01 mg. Fe with an error of 20%. **Blood Pigments.**—About 1 g. tissue is rubbed with sand, acidified with HCl to Congo red and extd. 3 times with MeOH, and the MeOH sepd. with a centrifuge. To the soln. obtained is added 1 g. MgSO_4 and after 5 min. of stirring, the whole is centrifuged. The supernatant liquid is removed, and made up to 20 cc. with HCl in MeOH. The hemin in the alc. is then estd. with a photometer. W. D. LANGLEY

Measurement of hydrogen ions of blood. The syringe as an electrode. E. MISLOWITZER. *Biochem. Z.* **159**, 77-9(1925).—To reduce the loss of CO_2 in blood, the syringe with which the blood is taken is converted to an electrode vessel with a gold electrode. By use of quinhydrone in Ringer soln., accurate p_{H} values may be detd. with 1-2 cc. of blood. W. D. L.

Electrotitration in physiological liquids. I. Determination of chlorides in blood and serum. E. MISLOWITZER AND MARTHE VOGT. *Biochem. Z.* **159**, 80-2(1925).—Potentiometric titration of chlorides in the presence of dissolved protein cannot be made but may be made if the protein in KH_2PO_4 is coagulated by heat. HNO_3 is then added and the electrotitration with AgNO_3 carried out. The analytical results agree well with results obtained by the method of Volhard or of Bang W. D. L.

Determination of phosphoric acid (LE GUYON, MAY) 7.

THIÉPNIER, ALFRED **Les sucres du sang.** Leurs dosages par la méthode de Bang, avec table à calcul. Saint-Cloud Impr. Girault 134 pp.

D—BOTANY

B. M. DUGGAR

Effect of tapping coconut palms for toddy on the copra and oil from subsequent fruiting. H. W. JACK AND J. H. DENNETT. *Malayan Agr. J.* **13**, 302-4(1925) Chem. analysis of 100 nuts from trees which had been tapped show a loss of 8.5% in the wt. of dry meat (copra) and of 12% in the wt. of oil per nut. Tapping, however, stimulates the tree in nut production so that the increased no. of nuts may offset the loss of oil by tapping. The proportion of trees tapped is very small. The phys. consts. of the oil were not affected by tapping. L. W. RIGGS

Composition and appearance of soy-bean plants grown in culture solutions, each lacking a different essential element. J. M. GINSBURG. *Soil Science* **20**, 1-13(1925).—Soy beans were grown in Shives R_2C_2 solution and in 8 modifications of the same in each of which one essential element was omitted. The plants were analyzed for dry matter, Ca, Mg, N and total ash. Careful observations were made on the change in appearance of the plants. The total yields of dry matter in the check and solutions lacking Ca, Mg, K, N, P, S, Fe and K (Na substituted) were 2.30, 0.19, 0.48, 0.33, 0.20, 1.40, 1.30, 1.40 and 1.05 g., resp. Na replaced K rather successfully until blossoming. Plants grown in solns. lacking P produced a few seeds which were not viable. The ash content varied from 8.61% where P was lacking to 18.41% where Mg was absent, as compared with 13.31% for the check. Plants grown in incomplete culture solns. with the exception of those grown without S always absorbed higher percentages of Ca and lower percentages of N and Mg than the checks. When Ca was high Mg and N were always low and vice versa. RICHARD BRADFIELD

Influence of water and salt solution upon absorption and germination of seeds. WILHELM RUDOLFS. *Soil Science* **20**, 15-37(1925).—Corn, watermelon, pea, soy bean, white lupine, wheat, buckwheat, alfalfa and rape seeds were germinated between filter paper, both with and without previous soaking in H_2O and MgSO_4 , NaNO_3 , $\text{Ca}(\text{NO}_3)_2$, NaCl , K_2CO_3 , KCl , KH_2PO_4 , KNO_3 and Shive's 3-salt solns. in concns. ranging from 0.001 to 7.0 atm. osmotic pressure. The relative H_2O absorption, length of roots and shoots, and percent of root injury were detd. Soaking in distd. H_2O was harmful to the germination of all seeds; corn was affected least. All seeds were injured in K_2CO_3 solns. Low concns. of some salts did not decrease germination as much as H_2O but the higher concns. proved harmful. As a whole the results were highly specific as to both kinds of seed and nature of salt. RICHARD BRADFIELD

Lack of nodule formation in a subfamily of Leguminosae. L. T. LEONARD. *Soil Science* **20**, 165-7(1925).—Numerous examns. in the field and in the lab. have failed to reveal nodules on 10 species of the genus *Cassia*. Nodules were found on 24 species of

Acacia but not on *Acacia baileyana*. It is not believed that the failure to produce nodules in these cases is due to lack of the proper organism but probably to the phys. character of the root hairs of the plant which inhibits the entrance of the organisms.

R. BRADFELD

The comparative growth of pineapple plants with ammonia and nitrate nitrogen. G. R. STEWART, E. C. THOMAS AND JOHN HORNER. *Soil Science* 20, 227-41 (1925).—The pineapple plant is capable of assimilating all its N in the form of NH_4 salts. Best growth was made, however, in the nitrate cultures. In the early period of growth the nitrate cultures became more alk. in reaction but later became more acid than the original cultures. The NH_4 cultures always become more acid. Analyses of the nutrient solns. after the plants had grown in them showed that K was absorbed more rapidly than any other element, N was next. Amt. of growth was closely correlated with amt. of absorption. The only difference in the compn. of the plants grown in nitrate and NH_4 was in the Ca and CO₂ content of the ash, both being lower in the NH_4 series.

R. B.

Selective absorption of ions by seeds. WILHELM RUDOLFS. *Soil Science* 20, 249-52 (1925).—Corn and soy-bean seeds were immersed in $\text{N}/175 \text{ Al}_2(\text{SO}_4)_3$ and $\text{N}/170 \text{ Al}(\text{NO}_3)_3$ solns. and the change in p_{H} was followed at frequent intervals by the colorimetric method. The p_{H} values were first reduced very rapidly, reaching a min. of about 4.1 in the $\text{Al}_2(\text{SO}_4)_3$ and 3.6 in the $\text{Al}(\text{NO}_3)_3$ solns., resp., in about 2 min. The acidity then decreased, reaching a const. p_{H} value of 5.8 for the soy bean and 4.3 for the corn in both solns. The initial increase in acidity is considered due to the rapid absorption of the Al ion, which is soon overbalanced by the absorption of the anion. The results are explained on the basis of the amphoteric nature of the seed proteins.

R. BRADFELD

The direct hydration of aliphatic carbon and the carbon dioxide assimilation of plants. F. J. NELLENSTEYN. *Chem. Weekblad* 22, 565-71 (1925); cf. *C. A.* 19, 3188.—The active carbons, carboraffin (I) and C black (II), are easily oxidized by dil KMnO_4 with a spontaneous rise of temp. of 50-60°. The oxidation products are characterized as sugar acids by their phys. and chem. properties and their tendency to molding. Norite (III) reacts less promptly. The products give, in contrast to I and II, the mellitic acid test (euchrone) and yield benzene on distn. with NaOH. This supports the conclusion drawn in the previous paper from the adsorption behavior that I and II are aliphatic, while III is an aromatic C. The ease with which C is hydrated suggests that it may be the first intermediate of CO_2 assimilation in the plant, perhaps in the form of a colloidal soln. and that it is directly hydrated to carbohydrates. The faculty of dead plant material to adsorb and store large quantities of CO_2 makes a similar role of C in the living plant probable.

MARY JACOBSEN

Chemical data on *Lilium tigrinum* Sawl. E. HERRERO DUCLOUX. *Rev. Facultad Ciencias* 3, No. 2, 23-32 (1925).—Only the pollen was studied. The coloring matter seems to belong to the anthoxanthine group. It gives with an Al mordant poor and variable shades on silk and wool. Cotton and flax are not dyed. The 2 absorption bands, one between 675 and 648 μ with a max. at 662 μ , the other from 589 μ to the end of the visible spectrum with a max. at 589 (568) μ , are characteristic. The physiologically active (emetic, purgative and hypnotic) principle is obtained in yellow rhombic crystals from the ether ext. of the dye. Its soly., optical consts., the pptn. and color reactions suggest close relationship to colchecin.

MARY JACOBSEN

Mono- and tri-hydrated calcium oxalate in the plant. ALBERT FREY. *Verh. Naturforsch. Ges. Zurich* 70, 1-65 (1925).—An extensive study of the conditions of formation of the mono- and tri-hydrates of CaC_2O_4 is presented. The 2 salts can readily be differentiated by crystallographic methods. F. shows from the standpoint of the phase rule that in the plant only the monohydrate is stable. The trihydrate is unstable and tends to go over into the monohydrate form. The trihydrate is formed in a solution of low osmotic pressure but satd. with CaC_2O_4 . The stability of the trihydrate is decreased in the presence of Ca ions. Each form of the oxalate is characteristic of a definite anatomical and physiol. unit. The formation of CaC_2O_4 in the plant can be explained on the basis of phys. chemistry.

H. R. KRAYBILL

Alcoholate digestion of wood. BROR HOLMBERG AND STEN RUNIUS. *Svensk Kem. Tids.* 37, 189-97 (1925).—Ground fir wood, free from moisture and crude fat, was analyzed for C, H, OMe group and pentose before and after digestion with Na and HCl in alc. The alc. used was both abs. and 95%; both gave the same result. The evidence indicates that the lignin in wood occurs as an acetylated substance with carbohydrate, the latter as an alc. and the lignin as a carbonyl component. A. R. R.

Tannin occurring in the kino of *Eucalyptus calophylla*. ALEXANDER MCGOOKEN AND I. M. HEILBRON. *J. Pharmacol.* 26, 421-46 (1926).—The historical review is ac-

accompanied by a comprehensive bibliography of 283 references. The kino of *E. calophylla* is believed, on the basis of fractional pptn. expts., to consist of 1 sp. tannin; it yields a tri-Me and a tri-Ac deriv. Oxidation (KMnO_4) of the Me deriv. yields veratric acid; O_3 gave only $(\text{CO}_2\text{H})_2$ as did HNO_3 . Fusion with KOH gives protocatechuic acid and catechol. From these results a possible formula is in part developed.

C. J. WEST

Chemical investigations in regard to citrus. C. F. JURITZ. Union of S. Africa, Department of Agr., *Sci. Bull.* No. 40, 3-22; *Chem. News* 131, 309 (1925).—Mech. and chem. analyses of oranges in various stages of ripeness are given. The deleterious effect of arsenical sprays on the flavor of oranges is shown to be due to changes in their chem. compn. The fruit from sprayed trees had less acid, a higher p_{H} , less sucrose and less sugars than that from the unsprayed. The flavor of the former was more insipid.

J. J. WILLAMAN

E-- NUTRITION

PHILIP B. HAWK

The vitamin problem. T. B. VON HAHN. *Kolloid Z.* 36, 271 (1925); W. WINDISCH. *Wochschr. Brau* 42, 351-5. Substances rich in vitamins lower the surface tension of H_2O much more than substances poor in, or contg. no, vitamins. Hemoglobin can be made to pass through membranes if substances which affect the surface tension are added. It is possible that vitamins B and C are identical.

C. N. FREY

The absorption of copper during the digestion of vegetables artificially colored with copper salts. J. C. DRUMMOND. *Analyst* 50, 481-5 (1925).—It appears that in the digestion of vegetables which have been subjected to "reverdisage" with CuSO_4 , Cu is obtained in a form which is capable of being absorbed in the animal body. Cu thus absorbed is held for some time in the liver and is then for the most part excreted in the urine or feces. Expts. with rats indicate no harm resulting from the absorption of traces of Cu over long periods of time.

W. T. H

Proteins in meat production. Their economic utilization in an adequate ration. E. A. HARTLEY. *Fertilizer, Feeding-Stuffs and Farm Supplies J.* 10, 981-2 (1925).—The functions of the different amino acids in their relation to the growth and development of animals are outlined and discussed.

K. D. JACOB

The nutritive requirements of poultry. J. B. ORR, M. MOIR, A. KINROSS AND G. S. ROBERTSON. *Scottish J. Agr.* 8, 263-9 (1925).—Expts were carried out to det. whether ordinary well-balanced rations, fed to poultry kept under practical conditions, were improved by the addn. of substances reputed to be rich in vitamins. Addn. of cod-liver oil, as a source of vitamin A, in amts. varying from 0.2 to 5 cc. per bird per day did not increase the rate of growth or egg production. There was some evidence that the use of cod-liver oil caused an actual decrease in egg production. Vitamin B in the form of yeast and vitamin C in the form of fruit and vegetable juices did not increase the rate of growth or egg production. However, addn. of 3 to 5% of yeast appeared to stimulate early egg production, but the yearly av. was not affected. Vitamins A and B were beneficial to poultry suffering from malnutrition or fed on poorly balanced rations. The effect of vitamin C under similar conditions was not detd. In order to det. the effect of mineral salts on egg production a mixt. composed of $\text{Ca}_3(\text{PO}_4)_2$ in the form of bone flour 100, CaCO_3 as chalk 40, NaCl 40, S 10, Fe_2O_3 10 and K1 1 part, was fed in varying amts in addn. to a well-balanced mash. In 3 expts. lasting from 5 to 12 months there was a total increase in egg production, over the controls, of 25 to 70%. While there seemed to be a definite stimulation at the beginning of the laying period the influence of the addn. of the salts appeared to be even more evident towards the end. The value of the inorg. constituents of fish meal was shown in 2 expts. in which this material was substituted for bean meal and blood meal, resp.

K. D. JACOB

Mineral nutrients in the rations of dairy cows. J. B. ORR, A. CRICHTON, J. A. CRICHTON AND W. MIDDLETON. *Scottish J. Agr.* 8, 312-8 (1925).—The effect of a mineral mixt. composed of CaCO_3 56, NaCl 28, Fe_2O_3 1 and K1 0.125 parts, and fed at the rate of 85 lbs. per ton of compound cake used in the ration, was detd. on 6 dairy cows, 6 cows also being carried as controls. The av. milk yield and the av. wt. of the calves tended to increase in the second lactation with the cows receiving the mineral mixt., while with the control animals there was a decrease. The health of the animals receiving the mineral mixt. was better than those receiving no minerals, with the exception of delay in cleansing after calving. The work is being continued.

K. D. JACOB

The mineral content of pastures. J. B. ORR, W. E. ELLIOT AND T. B. WOOD. *Scottish J. Agr.* 8, 349-59 (1925).—This investigation was undertaken in an attempt to correlate the chem. compn. of certain pastures with malnutrition diseases of animals.

particularly sheep, grazed thereon. Detns. of the amts. of CaO , P_2O_5 , Na_2O , K_2O , Cl , N and fiber and the calorific value were made on 338 samples from (a) typical Scotch, English and Welsh cultivated and natural pastures from different areas, (b) the Falkland Islands, (c) Romney Marsh and (d) some areas to show seasonal variations. The investigation included analyses of good natural pastures—all grazed, poor natural pastures—grazed, and poor natural pastures—not grazed, from the different areas. The calorific value was fairly const. for all samples examd. The amts. of N and all mineral elements, with the exception of Na , were less in the natural pastures than in the cultivated pastures, and were markedly less in the non-grazed areas of the former than in the grazed. With the exception of Na there appeared to be a definite correlation between the various mineral constituents, samples having a low content of one element tending in general to have a low content of the others. In certain samples it appeared that lack of Ca had limited the power of the plants to utilize Cl . Ca appeared to be the limiting factor in the majority of the pastures. In the analysis of samples from the Falkland Islands it was found that grass near the sea contained appreciably greater amts. of N and all of the essential mineral elements than grass from inland. From the results of feeding expts. with lambs it appeared that both linseed and olive oils had a depressing effect on growth, but cod-liver oil and Ca salts had a marked beneficial effect when added to rations deficient in Ca . The original should be consulted for the variety of analytical data.

K. D. JACOB

Nutritive values and physiological effects of different fats and oils. F. J. McCLEURE AND R. H. CARR. *Am. J. Physiol.* **74**, 70-8(1925).—Mature pigeons tolerate 6.7% cottonseed oil—cod-liver oil, oleic acid, beef tallow or cocoa butter when added to a basal diet of whole wheat gram and mineral supplement. In amts. of 5 cc. a day the first 3 proved fatal. The toxicity seems to depend on sp. factors not indicated by any of the known fat constns. Neither the amt. of fat in the egg nor its constns. seemed to be affected by the kind of fat of the ration. The av. fat content of the pigeon's egg was 4.96%, of the edible portion, 1 no. 176, sapon no. 70.5.

MARY JACOBSEN

Account of progress in dental dietetic research. P. R. HOWE. *Dental Cosmos* **68**, 33-5(1926).—Review of recent work on the influence of the diet on diseases of the teeth and related organs. "Dental disorders are to be considered as fundamentally due to irregular mineral metabolism, which in turn is due in a large part to the character of the diet."

JOSEPH S. HEPBURN

The energy requirements of dairy cows. II. Is net energy or metabolizable energy the more useful index for practical purposes? E. B. MEIGS. *J. Dairy Sci.* **7**, 523-36(1925).—A critical discussion of methods of calcn. of energy requirements with special reference to the system and data of Armsby.

H. B. LEWIS

Cellular changes under vitamin insufficiency. II. Liver, spleen, kidneys, supra-renal gland. P. HENRIKSEN. *Norsk Magazin Laegevidenskab.* **86**, 540-5(1925); cf. *Ibid* 265.—Five guinea pigs and 8 rats were fed on oats and water for 19-27 days and were then given food contg. sufficient amts. of vitamin A, and after some time those still living were killed. In all the organs examd. an extensive degeneration of the cells was observed.

C. A. ROBAK

F—PHYSIOLOGY

ANDREW HUNTER

Action of uric acid on the cardiac activity of *Testudo graeca*. BOLDRINO BOLDRINI. *Arch. farm. sper.* **40**, 112-8(1925).—The isolated tortoise heart continues to function 6-12 hrs. in the presence of physiol. NaCl soln. After it has stopped beating, even for several hrs., it may be revived by treatment with an isotonic soln. contg. 0.244% K urate and 0.86% NaCl . The stimulating action of the urate is not due to variations in osmotic pressure. There is probably some connection between this stimulation and the fact that tortoise blood is rich in uric acid. The action appears to be of a hormone nature similar to that exerted by urea in other animals. Part of the uric acid is destroyed during contact with the isolated heart.

A. W. DOX

Constancy of metabolism under normal living conditions. MAX REISS AND ROBERT WEISS. *Klin. Wochschr.* **4**, 2207-8(1925).—Rats and mice that are allowed to select their food and that have adequate space for free movement show a const. metabolism (as detd. by O consumption) for a 24 hr. period, to within 5%.

MILTON HANKE

Sexual glands and metabolism. IV. Influence of injections of emulsions of testes and prostate and of insulin-like testicular extracts upon the nitrogen metabolism of normal, castrated and thyroidectomized rabbits. VLADIMIR KORÉNCHEVSKII AND

MARJORIE CARR. *Biochem. J.* **19**, 773-82(1925); cf. *C. A.* **20**, 65.—Testes emulsion and insulin-like substances obtained from the testis produced only a slight fall in the N metabolism of normal or castrated rabbits, whereas in thyroidectomized animals the decrease in N metabolism was much more marked. In thyroidectomized rabbits, an emulsion of prostate alone produced practically no change in the N metabolism, whereas an emulsion of both prostate and testis usually decreased the N metabolism, although to a less degree than when an emulsion of testis alone was injected. B. H.

Lactic acid in mammalian cardiac muscle. I. The stimulation maximum. L. N. KATZ AND C. N. H. LONG. *Proc. Roy. Soc. (London)* **99B**, 8-20(1925) —The heart is dependent on its contemporary O supply, and fails rapidly in the absence of that supply, while skeletal muscle is unaffected by short intervals of lack of O. The heart cannot go into "O debt" to anything like the extent of skeletal muscle. Expts on 20 cats and rabbits demonstrated that the stimulation max. is much less in the heart than in skeletal muscle, having a mean value of 0.072% lactic acid in the former and 0.252% lactic acid in the latter. The heart is deficient in buffering power, and, therefore, is more susceptible to the accumulation of H ions. **II. The rigor mortis maximum and the normal glycogen content.** H. J. G. HINES, L. N. KATZ AND C. N. H. LONG. *Ibid* 20-6.—The rigor mortis max. and the caffeine rigor max. of lactic acid in cats is one-half as great in the heart as in the skeletal muscle. In normal well-fed animals, the glycogen content of the heart is much smaller than that of skeletal muscle. The heart shows a greater discrepancy between the resting glycogen content and the lactic acid produced in rigor mortis, than does skeletal muscle. Lack of a precursor of lactic acid is not the cause of the relatively low stimulation max. of that acid in the heart; however the major portion of this precursor is not glycogen, but may be a hexose phosphate or some related compd. **III. Changes in hydrogen-ion concentration.** L. N. KATZ, PHYLLIS T. KERRIDGE AND C. N. H. LONG. *Ibid* 26-7.—After stimulation to fatigue, skeletal muscle is more acid than cardiac muscle by approx. 0.2 p_H . In rigor mortis, skeletal muscle is more acid than cardiac muscle by approx. 0.4 p_H . The ratio of the concn. of lactic acid added to the resulting change in p_H varies with the type of muscle and with the p_H . It attains its max. at approx. p_H 6.3; here the ratio of the buffering power of skeletal muscle to that of cardiac muscle is approx. 2:1. In rigor mortis, apparently lactic acid is the only acid formed in the muscles. JOSEPH S. HEPBURN

Mechanism of muscular contraction. W. E. GARNER. *Proc. Roy. Soc. (London)* **99B**, 40-56(1925); cf. *C. A.* **19**, 2694.—The tension generated on application of a stimulus to a muscle fiber is due to the formation of a solid film on the surfaces of the ultimate fibrils. The anisotropic segments of muscle contain liquid crystals composed of long-chain C compds. The mols. of these compds. are so orientated that their chains are parallel to the axis of the fiber. A solid film is produced on the surface of the anisotropic segments by the action of lactic acid. Glycogen is converted into K lactate by a series of reversible reactions, the direction of which is influenced by changes in the surface energy of the membranes during movement of the muscle. If all the energy liberated during conversion of glycogen into lactic acid is not utilized in doing external work a portion may be stored by reversal of the series of reactions. J. S. H.

Effects of calcium and potassium ions on urine secretion as studied in the whole animal. I. BRULL AND F. EICHHOLTZ. *Proc. Roy. Soc. (London)* **99B**, 57-70(1925).—In the intact anesthetized dog, intravenous administration of KCl increases the flow of urine to a much greater extent than similar administration of a corresponding amt. of NaCl. This increase is not due to hydremia or changes in blood pressure. The excretion of chlorides is not constantly or specifically influenced by either KCl or CaCl₂ or a combination of the 2 salts. After removal of the pituitary, K or K plus Ca increases the flow of urine, Ca has no effect, and NaCl has but a slight effect. Ca plus K (actually Ca working on a background of K) increases the chloride content of the urine up to that of the serum. JOSEPH S. HEPBURN

Hydrolysis of phosphoric esters by the kidney in vivo. F. EICHHOLTZ, ROBERT ROBISON AND I. BRULL. *Proc. Roy. Soc. (London)* **99B**, 91-106(1925).—When an isolated kidney is perfused with a heart-lung prepn., it is unable to conc. the normal inorg. phosphate of the blood serum, but is able to conc. and hydrolyze added org. phosphates, and to excrete their P as inorg. phosphates in the urine at a much higher concn. than that of the inorg. phosphates of the serum. In the whole animal, in which the inorg. phosphates of the urine have decreased to a min. after removal of the pituitary or puncture of the tuber cinereum, injected org. phosphates are excreted, after an initial stage, entirely as inorg. phosphates. The suggestion is made that, normally, a considerable part, if not all, of the urinary phosphates are derived from the org. phosphates of the serum by enzymic hydrolysis in the cells of the kidney. JOSEPH S. HEPBURN

Glyconeogenesis. J. MARKOWITZ. *Am. J. Physiol.* **74**, 22-35(1925).—Adrenaline hyperglucemia can be evoked only in presence of glycogen in the liver. In rabbits made completely glycogen-free by starvation, strychnine injections and cold adrenaline caused deposition of glycogen in liver, heart and muscles, but no hyperglucemia. Simultaneous treatment with adrenaline and insulin is followed by an accumulation of glycogen in the liver up to 2.77%. This and other evidence quoted from the literature suggest that glycogen is an obligatory step in the formation of blood sugar from non-carbohydrate stores (fat). It is possible that fat is oxidized not as such but as glucose. In this case the low respiratory quotient of fat oxidation may be due to a decrease in the phase of transformation.

MARY JACOBSEN

Observations on depancreatized dogs before and after the withdrawal of insulin. I. L. CHAIKOFF, J. J. R. MACLEOD, J. MARKOWITZ AND W. W. SIMPSON. *Am. J. Physiol.* **74**, 36-48(1925).—The percentage of sugar and ketone bodies after the withdrawal of insulin was decidedly higher in fat dogs than in lean ones, but there was no constant difference in the amt. of fat or P. Acetoacetic acid was relatively high in fat dogs; hydroxybutyric acid was high in thin dogs. Fat animals died much sooner after the withdrawal of insulin under symptoms similar to those of diabetic coma. After the discontinuation of insulin and food the glucose/N ratio declined far below 2.8. After readministration of insulin sugar, inorg. P and hydroxybutyric acid diminished at uniform rates, acetoacetic acid fell more slowly, fat not at all. The P rose first after the insulin effect has passed off. In one of 3 animals the excreted glucose was higher than the ingested. The marked difference between fat and lean dogs is suggestive of a relationship between fat and sugar.

MARY JACOBSEN

Studies on the physiology of the liver. XI. The extrahepatic formation of bilirubin. F. C. MANN, J. L. BOLLMANN AND C. H. SHEARD. *Am. J. Physiol.* **74**, 49-60(1925); cf. *C. A.* **20**, 437. Spectrophotographical curves of the same general appearance were obtained from: (1) the yellow pigment isolated from the fat, plasma and urine of completely hepatectomized dogs, which gives all the chem. tests of bilirubin, (2) bilirubin obtained from the liver of the animals at the time of liver extirpation, (3) the pigment isolated from the plasma of a dog with the common bile duct obstructed and gall bladder excised. The identity of (1) with bilirubin and its extrahepatic formation are thus established.

MARY JACOBSEN

The chemical sensitiveness of the kidneys. E. F. ADOLPH. *Am. J. Physiol.* **74**, 93-110(1925); cf. *C. A.* **17**, 2133. An apparent constant threshold value exists under specified conditions for the excretion of urea, acids, NH_3 and creatinine in man, dog and rabbit. With high water intake and excretion a slightly different type results. When the threshold value is included, a constant excretory ratio is always found between the concentration of the substance in the blood and the rate of its excretion. The excretory ratio has the same value for urea and phosphates and possibly also for other substances so that a similar excretory mechanism may be inferred. Under ordinary conditions substances are often carried through the kidneys by a passive process in addition to the actively secreted.

MARY JACOBSEN

Notes on the relationship between volume and reaction of urine specimens. R. S. HUBBARD. *Am. J. Physiol.* **74**, 111-4(1925); cf. *C. A.* **18**, 2371. In general no relationship was found between the vols. and reactions of urine specimens excreted in 1 hr. Very small vols. usually coincided with acid reaction, but in a no. of instances this was not the case.

MARY JACOBSEN

Studies of emotional reactions. IV. Metabolic rate. CARNEY LANDIS. *Am. J. Physiol.* **74**, 188-203(1925).—It is concluded from a review of the literature that altered emotional conditions in psychotic patients do not necessarily affect the metabolic rate. L.'s expts. have shown that elec. stimulation alone or in conjunction with a gastric balloon, anticipation of strong elec. stimulation or anger cause either an increase or a decrease of metabolic rate of largely varying magnitude. Prolonged insomnia and fast had no effect at all. The variations are partly due to muscular activity but chiefly to vascular changes involving the vol. flow of blood.

MARY JACOBSEN

Heat regulation and water exchange. X. Water, salt and lipid accumulation in the serum as a preliminary to sweating. H. G. HARBOUR, M. H. DAWSON AND I. NEUWIRTH. *Am. J. Physiol.* **74**, 204-23(1925); cf. *C. A.* **18**, 1141. In hot environments water, salts and lipids are mobilized into the serum. The increase in the serum and the decrease in the whole blood of the ratio sp. gr./solids suggest that the salts migrate from the blood cells. Hydremia is maintained until the sweating is severe enough to induce anhydremia. The salt level is also maintained high, while the lipids decline as the sweating progresses. The increase of O satn. in the peripheral blood is believed to be responsible for hydremia and sweat production.

MARY JACOBSEN

Relative rates of secretion of various milk constituents. W. L. GAINES. *J. Dairy Sci.* **8**, 486-96(1925).—A statistical analysis of results of chem. analysis of 543 samples of cow milk (Haecker, *C. A.* **8**, 1979) is made use of for a physiol. interpretation of the relative ratio of secretion of various constituents of the milk at a constant level of activity of the mammary gland. Secretion of fat and protein seems to be intimately related, $p = (1.46 \pm 0.40 f) \pm 0.19$. This relation appears to hold very closely also between several species, covering a range of fat % from 0.36 to 22.46. The secretions of H_2O and fat or protein are largely independent.

A parathyroid hormone and its physiological action. J. B. COLLIP. *Ann. Clin. Med.* **4**, 219-30(1925); cf. *C. A.* **20**, 622.—Parathyroid tetany in dogs could be prevented or controlled by the subcutaneous administration of parathyroid hormone, and the blood serum could thus be kept within normal limits. Its administration to normal dogs caused an increase in serum Ca. Repeated injections at short intervals caused death. Just before death the blood Ca, P and non-protein N went up, the viscosity increased, and blood vol. decreased.

H. B. LEWIS

JOHN T. MYERS

G—PATHOLOGY

H. GIDEON WELLS

The value of the Fornet tuberculosis diagnosticum and its composition. G. BIGNAMI. *Z. Tuberk.* **41**, 191-7(1924).—The Fornet tuberculosis diagnosticum test was found not to be one of agglutination but rather a precipitation test dependent upon the content of the serum in albumin and globulin and their relation to each other. As a result of tests with other chem. mixts. it was found that the Fornet diagnosticum is a 0.6% carbolic acid soln. of Na phosphate contg. a sparse amt. of the acid constituents of the bacilli, and that the reaction is dependent not upon the bacillary content but rather upon the acidity. The Na phosphate ppts. certain of the serum protein fractions. The reaction is non-specific and of a non-immune nature and is of no diagnostic value in tuberculosis.

H. J. CORPER

Favism. C. LOTTI AND A. MANAI. *Sperimentale* **79**, 791-846(1925).—From the *fave* (a species of bean), as well as the kidney bean, exts. are easily obtained which, injected intravenously, cause death after hemoglobinuria, or if recovery follows, cause the subsequent appearance of bile pigments and urobilin in the urine. *In vitro* the exts. strongly agglutinate red cells, indicating the hemoglobinuria is due to colloidoclastic shock. Press juice from *fave* flowers (I) caused excitability, and, in large doses, death in a few min. with generalized convulsions. Both types of action occur in the juices of the green beans (II) while ext. of dried beans (III) usually causes only the former. Rabbits prepared with I react specifically with anaphylactic shock to I, II and III, as well as to ext. of dried kidney beans (IV); in animals surviving the convulsions, hemoglobinuria ensues. III and IV do not sensitize to I and II. The hemolytic property of the protein is destroyed by heat, but not the sensitizing power. II sensitizes to I and II almost as well as does I, but subsequent injections of III and IV usually cause only hemoglobinuria, just as they do in animals prepared with III and IV. Thus the effects of the colloidoclastic shock and anaphylactic shock may be distinguished, even in many cases in which they occur together. The anaphylactic state may be passively transmitted, even from hypersensitive humans, to the rabbit. The applications of the findings to clinical observations are discussed. A table is given of the density, surface tension, protein, total N and N in lethal dose of each ext.

M. HEIDELBERGER

Behavior of the sera of various animals in the colloidal benzoin reaction. G. ROY. *Sperimentale* **79**, 885-94(1925).—Each species of animal tested (ox, sheep, pig, guinea pig, rabbit, cat) gave a curve characteristic in the positions of the zones of flocculation.

M. HEIDELBERGER

Ovarian function, potassium and calcium content of the blood serum and the vegetative system. G. K. F. SCHULTZE. *Arch. Gynakol.* **126**, 35-44(1925).—The normal K:Ca ratio in the blood is 2:1. The Ca content seems to be more stable than the K content, and the normal value varies from 9.5 to 10.5 mg. per 100 cc. The K content may be as low as 14 mg. per 100 cc., particularly in the amenorrhea of young girls. There are certain relations between the ovarian function and the K and Ca content of the blood that indicate an influence of the corpus luteum on the sympathetic system. When the influence of the corpus luteum is lacking, as in the amenorrhea of young girls, there may be a heightened activity of the vagus, with an alteration of the ratio of K to Ca.

HARRIET F. HOLMES

Physiology of water metabolism in pregnancy. H. RUNGE AND R. KESSLER. *Arch. Gynakol.* **126**, 45-64(1925).—Measurements were made of the oncotic (osmotic)

pressure of the plasma colloids in pregnancy and the puerperium by the use of the Schade and Claussen method. Detns. were made also of the concn. of plasma proteins, viscosity of the plasma, residual N, and rapidity of sedimentation of the blood corpuscles. The oncotic pressure of the plasma colloids rises in the beginning of pregnancy, becomes lower after the fourth month, rises suddenly during labor, and falls in the first days after delivery. The changes in protein concn. of the plasma run parallel to some extent. The specific viscosity varies in the opposite sense to the specific oncotic pressure.

HARRIET F. HOLMES

The action of iodine-thyroglobulin on diuresis and metabolism in pregnant women. A. MAHNERT. *Arch. Gynakol.* **126**, 125-43(1925).—Intravenous injection of iodine-thyroglobulin in pregnant women caused a marked increased excretion of uric acid, urea and NaCl, with or without diuresis. Diuresis was more apt to follow in cases with edema. The cholesterol content of the blood was lowered. H F H

Obstruction of the renal tubules during the excretion of hemoglobin. S L BAKER AND E. C DODDS. *Brit J Exptl. Pathol* **6**, 247 60(1925) —*In vitro* expts. indicate that hemoglobin is thrown out of soln. when the reaction of the medium is not more than about pH 6 and the NaCl content is about 1% or over. Rabbits on an ordinary diet and passing an alk. urine are unaffected by hemoglobin injections, but if the urine is kept acid by means of a suitable diet an intra-renal obstruction can be produced. It is probable that hemoglobin is excreted in soln. in the glomerular transudate. After concn. in the tubules the acidity and NaCl concn. increase, with the result that the pigment is pptd., probably in the form of hematin. This theory would explain the production of intra-renal obstruction in cases of the type described and in blackwater fever. A suggestion for the treatment of these conditions, based on the above conclusions, is offered, namely, the production of alk. diuresis.

HARRIET F. HOLMES

Etiology of dental caries. IV. Accessory factors in dental caries. (1) Reaction of the saliva. (2) Acid resistance of teeth. (3) Bacteriotropic action of saliva. J. MCINTOSH, W. W JAMES AND P. LAZARUS-BARLOW. *Brit. J Exptl. Pathol.* **6**, 260-6 (1925).—Saliva appears to be intimately connected with the occurrence or non-occurrence of dental caries, being more acid in those subject to the condition than in those who are immune. Experiments devised to show that teeth vary in their powers of resisting acid were inconclusive. The saliva may contain agglutinins against *B. acidophilus odontolyticus*, but only in small quantities. Saliva has no appreciable bactericidal action against *B. acidophilus odontolyticus*. **V. The chemical composition of saliva.** E. C DODDS. *Ibid* 266-8. —The nitrogenous constituents and the chlorides were detd. in saliva and blood by a modification of the method of Folin and Wu. The urea content of the saliva is very low and there is a large amt. of NH_4 . Saliva contains no sugar. The values found for saliva are much lower than those for blood and there seems to be no const. relationship between the constituents of the blood and saliva. The variations in the saliva are so wide that no clinical significance can be placed upon the figures at least for normal individuals.

HARRIET F. HOLMES

The influence of asphyxia on the motor function of the large intestine. H. S. LURJE. *Z. ges. exptl. Med.* **46**, 425-8(1925) —In asphyxia the contractions of the large intestine are increased, particularly when cyanosis of the intestine sets in. This increase in contraction in asphyxia is doubtless due to the action on the neuro-muscular apparatus of the wall of the intestine of blood of altered compn., with an increase of CO_2 and a decrease of O.

HARRIET F. HOLMES

The action of thyroxin on the human organism. I. The influence of respiratory metabolism by thyroxin. H. LÖHR AND W. FREYDANK. *Z. ges. exptl. Med.* **46**, 429-42 (1925). —Synthetic thyroxin (Squibb), on intravenous or intramuscular injection, greatly increases O metabolism. The body temp. may or may not be raised, but the increased oxidation bears no relation to changes of body temp. There is no effect on blood pressure or activity of the heart. In myxedematous patients thyroxin is especially effective and increases oxidation with a rapidity not seen after the use of any thyroid prepn. Small doses can bring O metabolism to normal, with an improvement in the symptoms of myxedema.

HARRIET F. HOLMES

Changes in hydrogen ion concentration in the living organism. N. HENNING. *Z. ges. exptl. Med.* **46**, 459-65(1925).—By the method of Gräff (cf. *C. A.* **18**, 3069) the pH values for the organs of the white mouse were found to lie between 7.0-7.3. It was not found possible to alter these values by intravenous injections of sublethal-doses of HCl or NaOH. Lethal doses of HCl or NaOH led to increased acidity or alkalinity in all organs except the brain. HCl injected directly into the muscles is neutralized in 2-3 hours and injected into the peritoneum is neutralized in 20 minutes. Distilled H_2O and physiologic NaCl injected into the peritoneum in a few minutes have

p_H value of 7.6-7.8, the p_H value of the blood serum in the mouse indicating that these fluids are made alkaline from the blood system, before or while resorption takes place.

HARRIET F. HOLMES

Surface tension. I. The daily course of surface tension in the urine in pathological conditions (with exclusion of diseases of the liver). D. ADLERSBERG AND M. SUGAR. *Z. ges. expil. Med.* **46**, 466-85(1925).—The surface tension of the urine was detd. at 3-hr. intervals in 30 pathological conditions and compared with the findings in normal persons. Normal cases show great variations in sp. gr. and surface tension of the urine in the course of the day. In early carcinoma and early tuberculosis there is little variation from the normal. In advanced cases of carcinoma or tuberculosis there is much less variation in the surface tension and the surface tension seems independent of the sp. gr. Similar relations were noted in blood diseases and Basedow's disease. In Basedow's disease there was found the greatest abs. amt. of substances affecting surface tension. **II. Surface tension of serum in normal and pathological conditions.** D. ADLERSBERG AND E. SINGER. *Ibid* 500-17.—The surface tension of the blood serum in normal persons varies from 875 to 889, rising slightly after meals. In blood diseases high surface tension was found. The surface tension is markedly lowered in liver disease, chronic nephritis, acute rheumatism and severe cases of diabetes. In chronic nephritis the lowering of surface tension seemed to run parallel with the severity of the disease, and the detn. of surface tension might be of diagnostic importance in this condition. **III. Surface tension and the true acidity of the stomach.** D. ADLERSBERG AND A. L. MOLNAR. *Ibid* 718-30.—That there is some relation between the true acidity of the stomach content and its surface tension is shown in that with the highest acidity values ($p_H = 1.1$ and < 1.1) the highest surface-tension values occur. On the other hand the surface tension may remain practically the same with lower degrees of acidity ($p_H = 1.3$ to 2.1). Administration of fat or protein leads to a marked diminution of surface tension which does not seem to be in direct relation to the usual diminution of the true acidity.

HARRIET F. HOLMES

Basal metabolism in nephritis. R. DÜRR. *Z. ges. expil. Med.* **46**, 573-93(1925).—Repeated detns. of basal metabolism in 15 cases of nephritis indicate that in general in acute stages of glomerulo-nephritis there is a rise in basic metabolism up to 133%, soon falling in the subacute stage to low normal or subnormal values. Chronic nephritis shows a basal metabolism mostly normal, though often low normal and occasionally subnormal. Acidosis seems to lower the basal metabolism. There is often a high preagonal rise in basic metabolism.

HARRIET F. HOLMES

Pathogenesis of bronchial asthma. III. Uric acid metabolism. K. HAJOS AND L. KÜRTI. *Z. ges. expil. Med.* **46**, 625-32(1925).—Asthma patients as compared with normal individuals show a marked delay in the excretion of exogenous uric acid. Pilocarpine causes in asthmatics an even greater delay in uric acid secretion or a total retention (parasympathetic action). Adrenaline increases the rate of uric acid secretion (sympathetic stimulus). The retention of uric acid is not to be considered as the cause of the asthma but as a result of the changed reaction of the asthmatic organisms to different stimuli.

HARRIET F. HOLMES

The urine of the last hours of life. J. MANTZ. *Z. ges. expil. Med.* **46**, 646-9(1925).—Urine taken after death showed in 36 of 37 cases a Cl concn. much less than that of the blood serum while the uric acid and N concns. were slightly above those of the blood serum.

HARRIET F. HOLMES

Experimental alimentary hypercholesterolemia in rabbits. N. A. SSKOLOFF. *Z. ges. expil. Med.* **46**, 650-5(1925).—The feeding of rabbits with egg yolk or cholesterol dissolved in oil causes a marked increase in the cholesterol content of the blood. If the feeding of cholesterol is continued for some time the resulting cholesterolemia persists for a long time after the feeding is ended. Feeding of milk, lanolin or oil from some lower acids caused little or no hypercholesterolemia.

HARRIET F. HOLMES

The influence of some substances that affect the parasympathetic system on the formation of antibodies (agglutinins). S. LITARCZEK. *Z. ges. expil. Med.* **46**, 656-65(1925).—Rabbits immunized with typhoid bacilli show an increased agglutinin titer after the intravenous injection of pilocarpine or physostigmine. This indicates that substances that are stimulants for the parasympathetic system exert a stimulating effect on the formation of antibodies.

HARRIET F. HOLMES

The meaning of hypercholesterolemia for the development of solitary xanthomatic granulomas. O. WUSTMANN. *Z. ges. expil. Med.* **46**, 731-9(1925).—Periosteal foreign-body granulomas with a high lipid content were obtained in rabbits following the injection of infusorial earth, only when a high cholesterolemia was present from previous cholesterol feeding.

HARRIET F. HOLMES

The adaptability of diseased kidneys to an acid or basic diet. H. LUCKE. *Z. ges. expil. Med.* **46**, 740-51(1925).—The p_H content of the urine was detd. during 3 days of a basic diet followed by 3 days of an acid diet in a number of cases of nephritis and in normal individuals. The adjustment to the change in reaction of the diet was much more delayed in the case of nephritis. In some cases of nephritis there was no change in the reaction of the urine on changes of diet and this occurred both with acid and neutral urines.

HARRIET F. HOLMES

Coagulation of the blood in the rabbit after the introduction of various substances. PL. BATTAGLIA. *Z. ges. expil. Med.* **46**, 752-9(1925).—The fibrin enzyme and fibrinogen content of the blood of rabbits were detd. before and after aleucocytosis had been produced by injection of benzene. It was concluded that the fibrinogen was not a product of the leucocytes, but that they contain an activator for the fibrin enzyme. Injections of various bacteria and proteins also indicated no mutual relations between leucocytosis or leucopenia on the one hand and fibrinogen and fibrin enzyme on the other.

HARRIET F. HOLMES

The meaning of the acetone bodies for the organism and the occurrence of diabetic coma. K. HARPUDER AND H. ERBSEN. *Z. ges. expil. Med.* **46**, 768-83(1925).— β -Hydroxybutyric acid inhibits the action of a number of enzymes and also cell respiration and reduces the stability of various proteins. This action of β -hydroxybutyric acid is similar to that of a narcotic poison and is independent of its acid nature. A similar action of acetoacetic acid was not made out clearly. In diabetic coma there is frequently a concn. of β -hydroxybutyric acid sufficient to cause a disturbance of metabolism and independent of its acid nature.

HARRIET F. HOLMES

Is the reaction of a tuberculous person to "Tebeprotein" to be considered as a protein anaphylaxis? E. TRENNIESSEN. *Z. ges. expil. Med.* **46**, 789-98(1925).—"Tebeprotein" is a protein isolated by the author some years ago from tubercle bacilli by slight hydrolytic splitting of the protein of the tubercle bacillus. On injection of Tebeprotein a rapid rise of temp. and reddening at the site of injection are diagnostic of tuberculosis. This Tebeprotein reaction is not an anaphylaxis and the Tebeprotein is not an anaphylactogen nor a precipitinogen. The specific reaction is not to be explained as an antigen-antibody reaction as is the anaphylactic reaction against native tubercle bacilli protein, but probably depends on a heightened specific irritability of the cells.

HARRIET F. HOLMES

A new investigation of the Wassermann reaction. RICARDO CALATRONI. *Rev. Facultad Ciencias* **3**, No. 2, 125-9(1925).—In 1918 Scaltriti introduced a new antigen consisting of the freshly extd. phosphatides of hog heart in the form of their Cd salts. Noguchi's ether extn. was found by S. to increase the antialexin properties of the antigen and to make the lecithins partly insol. By direct extn. of the tissue first with acetone then with abs. alc. and pptn. of the alc. ext. with $CdCl_2$, C. has replaced the unstable alc. emulsion of S. by a nonhygroscopic, white sol. powder, which retains its original activity for at least 8 months. The phosphatides of leguminous plant seeds have the same effect in the Wassermann reaction. Both antigens were free from hemolytic or anticomplement properties and gave in 94% of the cases the same results as the common antigens.

MARY JACOBSEN

Researches on blood sugar in Indians. I. Blood sugar observations in young people in Bengal. UPENDRA NATH BRAHMACHARI AND PARIMAN BIKASH SEN. *Indian J. Med. Research* **13**, 271-4(1925).—"Defective sugar tolerance is manifested among many medical students in Bengal living on a dietary contg. a large amt. of carbohydrates. These are potential diabetics."

FRANCES KRASNOW

Simultaneous respiratory exchange and blood sugar time curves obtained in diabetic and non-diabetic individuals following ingestion of glucose. I. M. RABINOWITZ, with assistance of A. B. FRITH AND E. V. BAZIN. *J. Clin. Invest.* **2**, 143-56(1925).—By means of such studies the authors suggest a distinction between two forms of diabetes mellitus—one in which there is defective storage of carbohydrates, and in the other defective oxidation. The former type seems to be present in the more severe cases. In renal glucosuria (5 cases) and in pituitary disease with glucosuria (2 cases), normal values were obtained.

LOUIS LEITER

Total acid-base equilibrium of plasma in health and disease. VI. Studies of diabetes. J. P. PETERS, H. A. BULGER, A. J. EISENMAN AND C. LEE. *J. Clin. Invest.* **2**, 167-211(1925).—An analysis of 53 cases of diabetes of varying severity is presented. Ketosis has a variable effect on the total electrolytes of the serum. The total base may be normal, often low, rarely high. Bicarbonate is spared by reduction of chlorides in the serum and consequent liberation of base combined with the latter. In acute ketosis both serum bicarbonate and chlorides are reduced. In this manner there is less dis-

turbance of p_H by the organic acids in severe acidosis. The chloride ion may pass very rapidly into the tissues, liberating its base in the serum. In very severe instances the chloride content of the body is also probably depleted by actual excretion (as NH_4Cl). Loss of salt or base leads to dehydration; primary loss of water (due to glucosuria) will lead to loss of salt. These two forces operate together in diabetic toxemia. The administration of NaCl in such cases is advised in view of its sparing action on bicarbonate and the respiratory mechanism.

LOUIS LEITER

Tissue oxygen tension with special reference to tetany and convulsions. J. A. CAMPBELL. *J. Physiol.* 60, 347-64(1925).—Air injected under the skin and allowed to remain until equil. of O_2 and CO_2 tensions with the blood and tissues is established shows a rise in O_2 content when convulsions or tetany occur. Tetany was produced in various ways, such as by KCN, strychnine, parathyroidectomy and by the intravenous injection of NH_4Cl , $CaCl_2$, $SrCl_2$ and NaCl. The main factor causing the rise of O_2 tension under the skin following tetany seems to be acidosis and the resulting increased liberation of O_2 from oxyhemoglobin. It is suggested that tetany and convulsions are caused by O_2 deficiency in the brain cells and that the purpose of tetany is to counteract this defect.

J. F. LYMAN

Calcium in the blood of pulmonary tuberculosis. AXEL LOOFT. *Compt. rend. soc. biol.* 91, 190-1(1924); cf. *C. A.* 18, 553.—In light cases the Ca content of the blood was 0.099-0.107 g./l., while in 5 advanced cases it was 0.09-0.105; there was therefore no evidence of any diminution of the Ca content of the blood in tuberculosis. W. B. P.

Content of growing tissue in cozymase and inhibitory substance. I. HANS V. EULER AND KARL MYRBÄCK. *Arch. ges. Physiol.* (Pflüger's) 210, 521-6(1925).—In 2 cases of carcinoma of the breast an increase in cozymase was observed in the surrounding normal tissue, and at the same time the inhibitory substance was slightly augmented. In one case of carcinoma of the liver more inhibitory substance was found within the surrounding tissue than in the carcinomatous tissue. G. H. S.

Spasmophilia. H. VOLLMER AND J. SEREBRIJSKI. *Z. Kinderheilk.* 39, 655-64(1925).—In normal healthy infants the administration of chloral hydrate causes but very slight changes in the Ca and K, the av. values showing a slight reduction. P is unchanged. In spasmophilic infants, on the contrary, chloral hydrate administration causes an increased Ca, a uniform reduction in K, and no change in P. Infants showing clamtptic convulsions invariably show a reduction in the serum Ca of from 5.5 to 8 mg. %.

G. H. S.

H—PHARMACOLOGY

ALFRED N. RICHARDS

Acid therapy: Its origin, scientific fermentation and practical application. Dry acid vapors as prophylactic and curative agents. PAUL HASSACK. *Fruit Products J. and Am. Vinegar Ind.* 5, No. 4, 15-6(1925).

J. A. KENNEDY

The quantitative distribution of veronal in the organs in a case of veronal poisoning. G. W. PUCHER. Buffalo General Hospital, *Bull.* 3, 70-1(1925).—The detn. of the veronal content of the urine, and the organs was made according to the method of van Itallie and Steenhauer (*C. A.* 15, 2893) with several modifications. The results confirm the observation of other investigators that most of the veronal is to be found in the urine. The organs contain, however, appreciable quantities, particularly the liver, kidneys, brain and spleen. Calcd. on the basis of veronal per 100 g. of tissue it was found that the kidney is the highest and the brain next in veronal content. NATHAN VAN PATTEN

12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

The loss of mineral and other constituents from vegetables by various methods of cooking. W. H. PETERSON AND C. A. HOPPERT. *J. Home Econ.* 17, 265-80(1925).—The losses of solids, crude protein, Ca, Mg, P and Fe by 4 methods of cooking, namely, steaming, pressure cooking, boiling with moderate amt. of H_2O , boiling with double quantity of H_2O , in general all increased with the methods in the order named, the % loss ranging from zero for Ca in steamed spinach to 76% for Mg in boiled cabbage. The approx. av. losses for solids and crude protein were 15% by steaming and pressure cooking, 30% by boiling in a moderate amt. of H_2O , and 40% in double quantity. For Ca the losses were 10% for steam and pressure cooking and 20% and 30%, resp., for

the 2 boiling methods. Mg showed 20% loss for the first 2 methods and 30% and 45%, resp., for the 2 boiling methods. The av. losses for P and Fe were the same as those for Mg except in the case of the boiling procedures, where the figures are 5-10% higher. Cabbage, celery, beet greens and onions showed notably large losses, especially of minerals in the case of the last 3. Spinach retains all its Ca when cooked. L. D. F.

The estimation of pectin and a study of the constitution of pectin. C. F. AHMANN AND H. D. HOOKER. Missouri Agr. Expt. Sta., *Research Bull.* **77**, 5-39 (1925).—A method for estg. pectin by titration of the acidity developed on sapon. of pectin and the effect of time and temp. on the process is described. Under const. conditions the amt. of pectin found is proportional to the acidity developed. Titration curves of pectic acid show 11 carboxyl groups, but evidence is presented to show that sapon. was not complete, which would indicate that there are more than 11 carboxyl groups in pectic acid. On the basis of 12 carboxyl groups the mol. wt. of pectic acid would be 2124. The nucleus proposed for pectic acid is a dibasic acid galacturonic-galactonic acid. At least 6 of these nuclei are linked together to form pectic acid. Pectin dissolves in cond. HCl and undergoes hydrolysis and decompn. A method of sepg. the hydrolytic products produced by the cold concd. HCl is described and a preliminary study of some has been made. J. J. SKINNER

The evaluation of pectin raw material. WM. A. ROOKER. *Fruit Products J. and Am. Vinegar Ind.* **5**, No. 5, 22-5 (1926).—R. takes into consideration phys. appearance, moisture content, and the jelly test or detn. of the units of jelly strength. J. A. KENNEDY

Citrus and apple "pectins." R. O. BROOKS. *Fruit Products J. and Am. Vinegar Ind.* **5**, No. 4, 5-6 (1925). J. A. KENNEDY

Should flour be artificially bleached and matured? JAVILLIER. *Ann. fals.* **18**, 580-95 (1925).—From a detailed discussion of the various bleaching processes and the action of the bleaching agents on the constituents of wheat flour, J. concludes that: bleaching does not meet any physiological requirement of the consumer; it might allow of increasing the % of extn. and the nutritive value of the flour, at the same time meeting the present demand for very white flour; some advantage might be obtained from the maturing effects of bleaching and from the improved keeping qualities of the bleached flour, but these 2 points would require further study before a definite conclusion could be drawn; the main disadvantage is the destruction of vitamin A, and to a lesser extent the possible formation of toxic decompn. products, but the latter is not likely owing to the small amt. of bleaching agent used. Regulations limiting bleaching are suggested. A. PAPINEAU-COUTURE

Bread as the physician sees it. MORRIS FISHBEIN. *Am. Food J.* **20**, 474-7 (1925).—The author discusses the value of food in general and especially the value of bread, bread for reducing, and whole wheat. J. A. KENNEDY

Use of low temperatures in the preparation of pure proteins. T. R. PARSONS. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 194 (1924).—By simultaneous freezing and centrifuging it was found possible to sep. an upper layer of ice and a lower layer of hemoglobin crystals. It is easier, though theoretically less efficient, to centrifuge during the thawing of the previously frozen soln. *Egg-white* treated by this process yields a thick layer of ice above a very viscid concd. soln. contg. crystals, which mixt., on short exposure to the air, dries to a yellowish, glassy mass which can be kept indefinitely without change. The method is suggested as being suitable for the com. dehydration and concn. of food materials. A. PAPINEAU-COUTURE

Some problems of the freezing of beef presented to a biochemist. D. L. FOSTER. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 247-50 (1924); cf. Fearon and Foster, *C. A.* **17**, 315.—Method and rate of freezing have considerable effect on the autolysis of beef. In unfrozen beef, the sol.-N content on autolysis increased from about 10.5 to about 13% of the total N in 10 days and then remained const. In beef frozen in the ordinary way in air at -8° the sol. N increased from about 10.5 to 16% in 20 days; while in beef frozen by immersion in satd. brine at -8° the autolysis curve was strictly comparable to that of unfrozen beef. Absence of "drip" on thawing brine-frozen beef would indicate that by this method any extensive damage to the cell is avoided. The brown color produced to a depth of about 0.5 in. in brine-frozen beef was shown to be due to the formation of methemoglobin. Prevention of the discoloration was successfully carried out on a small scale by reduction of the oxyhemoglobin to hemoglobin previous to freezing; but it is doubtful if such a process could be successfully applied on a com. scale on beef quarters. Addn. of NH_3 to an ordinary NaCl brine also prevented discoloration, which was found to be due to formation of an alk. deriv. of methemoglobin. A. PAPINEAU-COUTURE

Freezing of eggs. T. MORAN. *Proc. Fourth Intern. Congress of Refrigeration* 1, 122-37(1924); cf. C. A. 20, 75.—When egg yolk is frozen at any temp. above -6° , on thawing it is apparently unchanged; if frozen below -6° the yolk changes to a pasty nonfluid condition. Egg yolk frozen in liquid air and thawed at room temp. is also irreversible, while if thawed rapidly it reverts to the fluid condition of fresh yolk. Eggs supercooled to any temp. above or below -6° do not suffer any apparent change. White of eggs on freezing and thawing becomes more fluid. The nature and possible theoretical explanation of these changes are discussed, and the state of our knowledge with regard to the general freezing of tissues is briefly outlined. Bibliography of 14 references.

A. PAPINEAU-COUTURE

Rendering soluble the organic constituents of milk. Its applications. R. VLADESCO. *Lait* 45, 479-83(1925).—*Detn. of fat:* As the outcome of an attempt to find a method for detg. fat in animal tissues, V. arrived at the following method for fat detn. in milk: add 20 cc. concd. HNO_3 to 10 cc. of milk and heat the mixt. in a 100-cc. Kjeldahl flask over a flame with continual agitation for 5 min. To the hot liquid add 10 cc. of water and cool the flask by plunging into cold water. To avoid congealing in a mass, shake the flask vigorously while cooling. This can be done under running water. When the fat is completely solidified, filter the liquid through a filter paper, previously tared, into a glass-stoppered flask. All the particles of fat can be brought onto the filter paper with several washings by cold water. Place the filter paper contg. the fat in the glass-stoppered flask, dry in the hot air drying oven, cool in a desiccator and weigh. The difference in the 2 weights gives the quantity of fat contained in 10 cc. of milk.

H. F. ZOLLER

The abnormal increase in the refractive index of calcium chloride serum from sour milk. L. PANCHAUD. *Lait* 5, 777-82(1925).—The unexpected increase in the n of CaCl_2 serum from sour milk is due principally to the formation of Ca lactate at the expense of the casein. The Ca lactate remains in soln. in the serum, raising the n , until all the Ca of the casein is satd. Once this is attained the n decreases, assumes once more the original value of the fresh milk, then again decreases. H. F. ZOLLER

Note on the determination of fat in powdered milk. A. SCHOONJANS. *Lait* 5, 782-5(1925).—The Röse-Gottlieb method of fat detn. is compared with the Weibull method. The latter gave slightly higher results and was found to be more accurate than the former. The Weibull method is in turn compared with the Teichert method, which is a recent modification of the butyrometric Gerber method. The Weibull and Teichert methods show very close agreement. The latter is recommended for simplicity, rapidity of operation and accuracy.

H. F. ZOLLER

Effect of a wound on the composition of cow milk. O. R. OVERMAN AND F. P. SANMANN. *Ann. faks.* 18, 531-2(1925).—As a result of an accident a cow developed a hernia which caused a swelling 15-20 cm. in diam. in front and to the right of the udder. Samples of her milk taken 5 and $2\frac{1}{2}$ weeks before the accident, and just after the accident, gave the following results: total solids 11.92, 11.55, 8.86; ash 0.77, 0.64, 0.67; fat (Röse-Gottlieb) 3.96, 4.00, 2.44; total proteins 3.56, 3.13, 3.15; lactose (polarimetrically) 3.77, 3.72, 2.50%; d. 1.0286, 1.0289, 1.0244, resp.

A. P.-C.

Determination of sucrose in condensed milk and in chocolate. GUNNER JØRGENSEN. *Ann. faks.* 18, 517-29(1925).—A detailed discussion of the subject and description of the results of J.'s investigations. Irregularities observed in the polarimetric readings of lactose solns. of identical concn. are shown to be due to variations in p_H , slight alky. (p_H 7.3) resulting in a considerable reduction in the reading. The slight pptn. of sugar by basic Pb acetate observed by German chemists was never observed by J., and is attributed by him to the fact that the Pb subacetate of the German Pharm. is much more basic than that of the Danish Pharm. When inverting sugar with HCl by immersing the soln. for 30 min. in a boiling water bath, inversion is not always complete with a p_H of 2.0, but is always complete with a p_H of 1.8-1.6, while with a p_H of about 1.0 there is partial decompn. of fructose. The proper acidity can be obtained, irrespective of the presence of buffers, by adding 4 drops of thymol blue (Clark's soln.), adding N HCl to a permanent red, and then 1 cc. in excess (for a final vol. of 100 cc.). The polarimetric reading of an inverted soln. of a mixt. of lactose and sucrose does not immediately assume its true value, and the soln. should be allowed to stand overnight before being read. In the detn. of fat in sweetened condensed milk, if the milk has been homogenized, or if the fat has been decomposed with liberation of fatty acids, it is preferable to use acids rather than NH_4OH as prescribed by Röse-Gottlieb. But if material contg. considerable sugars is heated with HCl, the sugars are partly decomposed with formation of Et_2O —and petrolic ether-sol. substances, which give high results. Accurate results can be obtained by allowing the mixt. of sample and acid to stand for

1-2 days in the cold and then extg. as usual. Using known quantities of sucrose and cocoa (fat content 50%) from the theoretical and observed polarization readings *J. calcd.* that the av. vol. of ppt. was 0.93 cc. per g. of cocoa as such, and 0.79 cc. per g. of fat-free cocoa.

A. PAPINEAU-COUTURE

Viscosity, surface tension, and whipping properties of milk and cream. A. C. DAHLBERG AND J. C. HENING. New York Agr. Expt. Sta., *Tech. Bull.* 113, 42 pp. (1924).—The viscosity of milk and cream increased with aging and with increased percentages of fat, but both effects were variable. The effect of fat was most noticeable when the percentage was 20 or above. Pasteurization slightly reduced the viscosity of milk and greatly reduced the viscosity of cream. The effect of aging on viscosity was inhibited to a large extent by pasteurization. The viscosity of cream could be greatly altered by the condition of the milk fat at the time the milk was sepd. If the fat was in a semi-solid condition at the time of sepg., the viscosity of cream from pasteurized milk was made to resemble raw cream, and cream from raw milk was made much thicker. If the milk was not allowed to cool and was sepd. immediately after milking or pasteurization, the resulting cream had a low viscosity comparable to normal pasteurized cream. The surface tension of milk and cream decreased with an increased fat content, and it usually decreased with aging. Pasteurization usually increased the surface tension and aging would not reduce it to normal. The whipping qualities of cream were improved by increased percentages of fat and aging. Pasteurization had a slightly detrimental effect. Good whipping cream gave a reduced vol. of whipped cream when compared to poor whipping cream. Well-whipped cream stored at cold temps. remained whipped permanently with little or no drainage from the cream. In a general way, increased viscosity and decreased surface tension were associated with good whipping qualities. The viscosity of normal cream could be altered to upset its relationship to cream whipping. Abnormally viscous cream whipped well, but not better than normal cream of the same fat content.

J. J. SKINNER

A contribution to the analysis of milk, condensed and desiccated milk. HARRY HURST. *Analyst* 50, 438-40(1925).—Dialyzed Fe is a suitable precipitant for fat and casein in the analysis of milk products. The addn. of 12 cc. of the Fe reagent (B. D. H.) to 10 cc. of milk or 20 cc. of dild. condensed milk yields a ppt. from which the fat can be extd. and weighed. The filtrate is suitable for the detn. of sugars (Maclean's method) as well as for boric acid, benzoic acid, etc.

W. T. H.

Evaporated milk. H. C. HOOKS. *Am. Food J.* 20, 488-91(1925).—H. discusses the invention of evapd. milk, tests on arrival, evapn., process of homogenizing, sterilization, production, and uses and value as a baby food. There is an illustration to show what happens in the vacuum pan in mfg. evapd. milk.

J. A. KENNEDY

Air made toxic by cheese. A. J. PARKER. *Analyst* 50, 446(1925).—While inspecting the hold of a steamer, an official was rescued with difficulty in a state of cyanosis. Examn. showed that the CO₂ content of the hold was very high. Often when new cheese is placed in cold storage the atm. becomes nonrespirable because of CO₂ developed.

W. T. H.

Proposed weight standard for ice cream. W. W. SKINNER. *Am. Food J.* 20, 511(1925).

J. A. KENNEDY

Modification of the sesame oil reaction by treatment of the oil with adsorbents. P. HONG. *Chem. Weekblad* 22, 509-12(1925); cf. *C. A.* 18, 718.—The acid or alk. reaction of the decolorizing carbon or bleaching earth used for the bleaching of the oil affects the intensity of the Baudouin test. Acid adsorbents decompose sesamin and split off sesamol; the latter produces the color reaction. The steam distillate of oils so treated gives an intense Baudouin test. The best bleaching effects are obtained with slightly alk. or neutral adsorbents. Sesamin is adsorbed by bleaching earths as well as by decolorizing carbons. The treated oil, however, retains part of its optical activity because of another, nonadsorbable constituent. Oxidizing agents also interfere with the test.

MARY JACOBSEN

The micrococci associated with dairy utensils. A. H. ROBERTSON. New York Agr. Expt. Sta., *Tech. Bull.* 112, 3-18(1925).—Certain species of micrococci are commonly associated with machines where the tubes and teat-cups receive some form of chem. treatment to prevent bacterial growth between milking periods. The chemicals in the consns. used for sterilizing the tubes and teat-cups of milking machines appear to permit the reproduction of certain species of the micrococci and at the same time inhibit the growth of the non-spore-forming rods which are more commonly found on utensils. Data are given on the survival of the cultures. Of 11 species found, *M. candidus*, *M. freudenreichii*, *M. casei* and *M. conglomeratus* were sufficiently common to be

considered a part of the normal flora present in the tubes of milking machines.

The examination of food and condiments at frontiers. P. J. VAN HAMEL ROOS. *Chem.-Zig.* 49, 965(1925).—R. advocates (1) labs. at importing points, (2) examn. of imported foods, thereby obviating further analyses in cities, (3) return of rejected shipments at shipper's cost, (4) certification of food exports, (5) mutual regulations between countries available to exporters.

About curry. J. W. ADAN. *Pharm. J.* 115, 350-2, 366(1925).—A discourse on the literature, compn. and modes of use of this East Indian condiment. S. WALDBOTT

Contributions to the consideration of table mustards. J. L. WILLS. *Fruit Products J. and Am. Vinegar Ind.* 4, No. 9, 21-2; No. 11, 18-20; 5, No. 2, 19(1925).—Wills gives the results of the analyses of 40 commercially prepd. table mustards, compn. of test samples used, and the analytical methods employed.

Sauerkraut. J. J. O'BRIEN and ROY IRONS. *Am. Food J.* 20, 543-4(1925).—The authors describe chiefly the curing process.

Mucic acid for food purposes. L. WEIL. *Ann. fals.* 18, 529-31(1925).—A sample of American origin consists of 48% oxalic acid and 52% mucic acid. A. P.-C.

Preparation and contamination of sirups. C. E. MCKELVEY. *Am. Food J.* 21, 39-41(1926).

Candying of fresh figs. ALEXANDER MATHIEW. *Fruit Products J. and Am. Vinegar Ind.* 5, No. 2, 16-8; No. 3, 18-20; No. 4, 18-20(1925).—Mathew discusses present practices; essential points governing the quality of the candied product; the effect of heat; the effect of sirup concn.; rapid candying of figs under vacuum; cold storage fruit; chem. preservation; canned figs; preliminary treatment of fresh figs; comparison of sugar mixts.; open kettle concn.; plumping in final sirup; washing; drying; glacéing; and packaging.

Hard rubber equipment most suitable for handling food products containing acids. P. B. L'HOMMEDIEU. *Fruit Products J. and Am. Vinegar Ind.* 5, No. 5, 26-7(1926).

J. A. KENNEDY

Jelly strength of pectin jells (BAKER) 2. Solubility experiments with boiler metals (JÄRVINEN) 2.

LABARRE, F.: *Manuel du chimiste de laiterie. Analyses de lait et de ses sous-produits.* Paris: Gauthier-Villars & Cie. 168 pp. Fr. 20. Reviewed in *Ind. Eng. Chem.* 18, 216(1926).

TINKLER, C. K., and MASTERS, HELEN: *Applied Chemistry. A Practical Handbook for Students of Household Science and Public Health.* Vol. II—Foods. London: Crosby Lockwood & Son. 276 pp. 15s. net.

Food mixture. E. R. MCSORLEY. U. S. 1,570,443, Jan. 19. A compn. for macaroni and noodles comprises soy bean flour 50 lbs., wheat flour 50 lbs., whole eggs 100, S 1 dram and an alkali such as lime H₂O to form a doughy mixt.

Food from bran, etc. J. L. KELLOGG. U. S. 1,569,861, Jan. 19. Bran or other cereal material is cooked under steam pressure and flavoring substances such as malt, sugar and salt are blown in with the steam during the cooking. Cf. C. A. 20, 462.

Margarine and similar compositions. E. V. SCHOU. U. S. 1,570,529, Jan. 19. An oil-sol. H₂O-dispersing medium derived from fatty oils, e. g., air-blown gelatinized soy oil, is dissolved in an oily constituent such as cottonseed or coconut oil and milk or other aq. constituent is distributed in the oily or fatty constituent until a permanent dispersion is produced.

Manufacture of vitamin-containing foodstuffs with addition of liver oil. P. M. HEYERDAHL. Norw. 41,943, Sept. 28, 1925. The liver oil, preferably from cod liver, is applied in the form of an intimate mixt. with olive oil.

Grained confection. M. A. SCHNELLER. U. S. 1,551,175, Aug. 25, 1925. Dextrose hydrate is melted together with invert sugar and sucrose or other sugars of greater soly. than the dextrose hydrate, in the presence of an amt. of H₂O not substantially greater than is desired in the final product and the mixt. is cooled and seeded with dextrose in cryst. form.

Food for animals from soy beans. L. BERCELLER. Brit. 234,202, March 1, 1924. Soy beans are heated and then subjected to satd. steam for 10-12 min. to remove objectionable constituents. Various details of treatment are given.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

A review of the heavy chemical industry in 1925. P. PARRISH. *Chem. Age* (London) **13**, 648-50(1925). E. J. C.

Chemical trade movements in 1925. W. G. WILSON. *Chem. Age* (London) **14**, 4-6(1926). E. J. C.

British chemical industry: Developments in 1925. W. J. U. WOOLCOCK. *Chem. Age* (London) **13**, 647(1925). E. J. C.

The heavy chemical industry in 1925. REX FURNESS. *Chemistry & Industry* **44**, 1241-3(1925). E. J. C.

What price progress? HUGH FARRELL. *Separate* (102 pp.) issued by the Chemical Foundation, Inc., N. Y. City, 1925. About the "stake of the investor in the development of chemistry." E. J. C.

What does labor cost in terms of product? A comparison of value of products with wages, salaries and material costs in the chemical engineering industries. C. R. DE LONG. *Chem. Met. Eng.* **32**, 919-21(1925). E. J. C.

The recovery of volatile solvents. J. H. BREGEAT. *Caoutchouc & gutta-percha* **22**, 12939-41(1925).—A criticism of an article by Ditmar on active C (cf. *C. A.* **19**, 3616). Numerous authorities are quoted to show that recovery processes using active C are less economical than those involving absorption in liquids. C. C. DAVIS

Calculation of the various factors in drying, with special reference to brown coal. K. DEIMLER. *Braunkohle* **24**, 853-60(1925).—Tables and charts showing the coal consumption (heat required) for various degrees of drying from various initial percentages of moisture, and giving the yields of (partly) dry substance thus produced. W. B. P.

New methods of gas-washing. IV. Studies on the saturation curves of mixed absorbents. G. WEISSENBERGER, F. SCHUSTER AND O. ZACK. *Z. angew. Chem.* **38**, 1010-3(1925); cf. *C. A.* **19** 3551.—The depression in vapor pressure of MeOAc (I), EtOAc (II), and CHCl_3 (III) was measured at 20° when mixed with phenol and cyclohexanol (IV), or tetrahydronaphthalene (V). Max depression for (I) and (II) was obtained with 2 mols. of phenol with 1 mol. of (V). For (III), 4 mols. of (V) to 1 mol. of phenol gave max. depression. Detailed data are given and discussed briefly. V. Studies with the aid of saturation curves. G. WEISSENBERGER, R. HENKE, AND E. SPERLING. *Ibid* 1164-9.—At 20° decalin (I) and tetralin (II) showed nearly the same absorption of EtOH. For acetone, benzene, and EtOAc, (II) was much better than (I). (II) was better than hydroterpinol (III) for absorbing benzene, acetone, and EtOH. Oil of turpentine, wash oil, (II), and (III) were about equally good absorbents for crude benzene. (II) was a poor absorbent for wood distillate, but when mixed with cresol (3 g. to 7 g. II) a good absorbent was obtained. C. G. KING

Progress made since 1913 in liquefaction of air and in separating atmospheric constituents by liquefaction. C. R. HOUSEMAN. *Proc. Fourth Intern. Congress of Refrigeration* **2**, 995-8(1924). Liquid oxygen apparatus. *Ibid* 998-1002.—Brief description of modern app. for the production of liquid O (Linde and Soc. L'Air Liquide). Purification of air and gases for liquefaction. *Ibid* 1002-6.—A description of the methods used for removal of CO_2 (by CaO and by NaOH) and of the app. used for eliminating the H_2O which condenses and freezes on cooling. Accidents in oxygen apparatus. *Ibid* 1007-10.—Explosions in liquid O app., which occurred when no C_2H_2 was used or stored in or near the plant, were traced to the production of C_2H_2 or of substances with similar properties from the lubricant owing to defective cooling. Lubricating oil with flash point of nearly 600° F. gave C_2H_2 when heated to about 350° C. in air at 30 atm. A. PAPINEAU-COUTURE

Apparatus for separating air into nitrogen, oxygen and argon. H. FILIPPO, JR. *Proc. Fourth Intern. Congress of Refrigeration* **2**, 1218-22(1924).—Brief description of the app. covered by Brit. pat. 101,860. A. PAPINEAU-COUTURE

Chemical engineering during 1925. S. G. URE. *Chemistry & Industry* **44**, 1244-5(1925). E. J. C.

Some methods of estimating quantities, as applied to dams, dumps, etc. F. T. KERR. *Proc. Australasian Inst. Mining & Met.* **1925**, No. 59, 99-106. Quantity estimation of concentrate in dams. A. B. BLACK. *Ibid* 107-14. E. J. C.

Inner Mongolia. B. F. READ. *Pharm. J.* **115**, 570-3(1925).—An illustrated account of travel, referring especially to the niter manuf. in the Chihli province, and the botany, the crops and trade of Mongolia. S. WALDBOTT

Hydrocarbons and their use in refrigeration including some recent discoveries re-

lating to several of their halogen derivatives. ALBERT HENNING. *Proc. Fourth Intern. Congress of Refrigeration* 1, 792-823(1924).—A review of H.'s observations and experience during the last 20 yrs., bringing out more particularly the merits of MeCl and of EtCl. A. PAPINEAU-COUTURE

Gran enciclopedia de química industrial. Química de Muspratt. Vol. 4. Barcelona: Francisco Seix. 960 pp. Ptas 70, bound Ptas 79. Cf. C. A. 17, 1678.

MILLIS, C. T.: **Technical Education, Its Development and Aims.** London: E. Arnold & Co. 182 pp. 6s.

Filtering and sterilizing water, etc. NAAMLLOOZE VENNOOTSCHAAP ALGEMEENE NORIT MAATSCHAPPIJ. *Brit.* 234,149, Dec. 20, 1923. H₂O or other liquid is filtered and sterilized by passing it through a layer of active C which has been treated with gaseous HCl or other innocuous acid or subjected to the action of Cl.

Liquefaction and rectification system for separation of helium from gaseous mixtures. R. R. BOTTOMS. U. S. 1,569,943, Jan. 19.

Compositions for use in refrigerating systems. R. R. STITT. U. S. 1,570,080, Jan. 19. A mixt. comprising MeCl 97½ and MeOH 2½ parts.

Molded heat-insulating material. W. T. IRVIN. U. S. 1,569,755, Jan. 12. Diatomaceous earth is mixed with lime, fiber and H₂O and the mixt. is molded and then hardened and dried by air under pressure.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Water supplies of the communes in the vicinity of Paris. LE COUPEY DE LA FOREST. *La tech. sanit.* 20, 247-8(1925).—Water of the Compagnie des Eaux de la Banlieu is taken from the Seine at Suresnes, put through pre-filters and slow sand filters and chlorinated. JACK J. HINMAN, JR.

Fridley conduit, St. Paul water works. J. W. KELSEY. *Munic. & County Eng.* 69, 70-3(1925).—Water is pumped from the Mississippi River to Charles Lake, a distance of 8 miles. Sixty-inch steel pipe having a semi-rubber base coating was used for the first 8150 feet. The balance of the conduit was constructed of reinforced concrete poured directly in place, with construction joints every 20 feet. C. C. R.

Notes on Toledo's water supply problem. W. J. SHERMAN. *Munic. & County Eng.* 69, 133-5(1925).—Data are presented showing the advisability of the Miami and Erie Canal as a source of Toledo's water supply. C. C. RUCHHOFF

Proposed secondary chlorination of New York water supply after leaving open reservoir at Hillview. WM. W. BRUSH. *J. Am. Water Works Assoc.* 14, 526-31(1925).—The supply, which is surface water, is treated by long sedimentation preceded by and followed by chlorination. Secondary pollution is apt to occur in open reservoirs or in conduits below ground water level, and this must be counteracted by secondary chlorination. D. K. FRENCH

The radioactivity of the water of the thermal spring of Chaudfontaine [Belgium]. EUG. PROST. *Rev. universelle mines* 8 [7], 21-8(1925).—The most recent analysis of the thermal water of Chaudfontaine shows a marked alk. reaction, the presence of Ca, Mg, Fe, Cl, SO₄ and org. material and the absence of NH₄, nitrites, nitrates and H₂S, the compn. by ordinary analysis showing no unusual features. But further expts. revealed the presence of Ra emanation, the content being of the order of 2-3 milli-microcuries per l. The water freed of this emanation by boiling showed a slight activity after several days, though it was not proved whether this were due to residual emanation or to the presence of Ra in the water. C. C. DAVIS

Public-health aspect of stream pollution. J. A. CHILDS. *J. Am. Water Works Assoc.* 14, 578-80(1925).—The effect of pollution on water for domestic use, bathers, ice, etc., is cited, and a study of surface supplies is recommended with the idea of establishing standards as regards permitted contamination. D. K. FRENCH

Differential media for detection of B. coli in water. H. G. DUNHAM, M. H. McCADY AND H. E. JORDAN. *J. Am. Water Works Assoc.* 14, 535-49(1925).—Need for revision of the present standard A. P. H. A. method prompted this work. Brilliant green bile, the principal medium reported on, is considered valuable and worthy of more attention. D. K. FRENCH

Rapid fine-sand filtration. H. W. BLAISDELL. *J. Am. Water Works Assoc.* **14**, 581-97(1925).—An interesting discussion of the various factors in rapid fine-sand filtration. Cost of installation and operation is low; operation is simple; and bacterial efficiency is comparatively high even without alum. D. K. FRENCH

The sterilization by "ferrochlor" of water of rivers used as city supply. NOËL ADAM. *Rev. universelle mines* (Feb. 15, 1924); *Genie civil* **84**, 387-8(1924).—Hypochlorites and FeCl_3 are used. The material added, therefore, contains hypochlorous acid, ferric oxide and a ferrate and is an energetic bactericide. The process has been used for some years at Middlekerk, Belgium, and at Letouze, France. Expts. made at Paris indicate that the dose there would not be more than 4 or 5 g. hypochlorite per cu. m. JACK J. HINMAN, JR.

Separation of small quantities of calcium from large quantities of magnesium in water. H. NOLL. *Chem.-Ztg.* **49**, 1071-2(1925).—Recently the well-known method of sepg. Ca and Mg by means of $(\text{NH}_4)_2\text{C}_2\text{O}_4$ has been subject to criticism and this suggested some expts. with dil. Mg-Ca solns. to see whether values obtained in water analyses by the conventional method were really accurate. Some 65 careful expts. show that the oxalate method is indeed satisfactory in water analysis provided the sepn. is effected in 200 cc. of the water when not over 125 mg. of MgO is present. W. T. H.

Methods for the determination of oxygen dissolved in water in the presence of nitrous acid. G. ALSTERBERG. *Biochem. Z.* **159**, 36-47(1925).—To eliminate the disturbing effect of N_2O_5 in the detn. of dissolved O, hydrazoic acid is used. ($\text{N}_2\text{O}_5 + 2\text{HN}_3 = 2\text{N}_2\text{O} + 2\text{N}_2 + \text{H}_2\text{O}$.) Solns. contg. alkali or mineral acid must be used to prevent the reaction $2\text{NaN}_3 + 2\text{I} = 2\text{NaI} + 3\text{N}_2$ from taking place. The rest of the detn. is the same as that of Winckler. In the presence of small quantities of N_2O_5 , the HN_3 may be added after the pptd. MnO_2 is dissolved in H_2SO_4 . The reagent has the following compn.: 3 g. NaOH, 20KI and 0.5 g. NaN_3 in 100 cc. solu. One cc. is used in a test for O. W. D. L.

Determination of oxygen dissolved in water in presence of nitrite. M. F. STAS. *Chem. Weekblad* **22**, 584-5(1925); cf. *C. A.* **7**, 4026.—Alsterberg's method (cf. preceding abstr.) gives accurate results provided the water is treated with NaN_3 before the liberation of I. The NO_2 content of sewage waters, even of very impure ones, does not exceed 8 mg./l., so that 10 mg. NaN_3 is sufficient. MARY JACOBSEN

Chemical supervision of plants for softening of boiler water. A. SPLITTERBERG. *Z. Nahr. Genussm.* **50**, 142-77(1925).—A review, with an extensive bibliography, of the soda, lime-soda and permutite processes, including a discussion of methods of detn. and allowable limits of various impurities. WILLIAM J. HUSA

The alkalinity of boiler feed water. KOIRANSKY. *Chaleur et industrie* **6**, 563-4(1925). J. SALLE. *Ibid* 563-4.—Polemical against Bru (*C. A.* **19**, 3136). A. P.-C.

The problem of sewage disposal in the Ems and Ruhr territory. JAN SMIT. *Chem. Weekblad* **22**, 537-41(1925).—The problem is particularly difficult because of the dense population, the network of coal mines and industrial plants and the continuous settling of the ground, which counteracts drainage. The river Ems is used as a canal to carry the sewage to the Rhine before the rotting sets in. Its bed has been raised to secure a shortcut; a high dam at the mouth makes it independent of the water level of the Rhine and protects the low country from being flooded. Before entering the Ems the water is freed from most of the org. floating matter in the highly efficient tanks, the "Emscherputten." The 400 tons daily of inorg. sludge from the coal mines are collected and dried in the mines and partly used as admixture to cheap fuel. The phenols and chlorophenols from the gas, coke and other industries threaten the fisheries, not so much by a direct toxic effect as by impairing the taste of the fish. They are removed from the sewage water by biol. oxidation on porous surfaces and aeration according to Fowler and Bach or extd. with benzene from the gas water. MARY JACOBSEN

Filter for water (U. S. pat. 1,570,523) 1. Filtering and sterilizing water (Brit. pat. 234,149) 13.

KERSHAW, G. BERTRAM: *Sewage Purification and Disposal*. 2nd ed. revised. London: Cambridge University. 18s.

Treating aluminosilicate minerals for water-softening. HERMAN REINHOLD. U. S. 1,570,006, Jan. 19. Minerals of the bentonite variety are ground, sized, calcined, treated with a sol. Al compd. such as $\text{Al}_2(\text{SO}_4)_3$, NaOH and NaCl and excess moisture is dried out.

Apparatus for deaerating boiler feed-water, etc. GRISCOM-RUSSELL Co. Brit. 234,448, May 24, 1924. A portion of the incoming liquid is distributed in the app. in the form of a curtain of falling drops through which the evolved gases and vapor pass to condense the latter.

Float signal device for indicating the presence of oil in boiler feed-water, etc. T. A. SHORT. Brit. 234,453, May 24, 1924.

Treating garbage. E. H. BRUNE. Brit. 234,700, Oct. 27, 1924. Liquids are pressed from green garbage and it is ground to a pulp which may be used for an animal or poultry feed or as a fertilizer. The liquid is heated to coagulate albuminoids. Oils and fats are sepd. and may also be used as animal foods. Cf. C. A. 19, 369.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Johnson County soils. R. S. SMITH, E. A. NORTON, E. E. DE TURK, F. C. BAUER AND L. H. SMITH. Illinois Agr. Expt. Sta., *Soil Report* No. 30, 40 pp.(1925).—An invoice of the elements of plant food in the soil types of the county is given, together with a rept. of fertilizer expts. J. J. SKINNER

Mercer County soils. R. S. SMITH, E. E. DE TURK, F. C. BAUER AND L. H. SMITH. Illinois Agr. Exp. Sta., *Soil Report* 29, 64 pp.(1925).—A general rept. on the soils of the county, giving soil classification, chem. analysis and results of fertilizer expts. J. J. SKINNER

Analysis of soils of Rabun County. L. M. CARTER, M. W. LOWRY, W. O. COLLINS, R. M. SOULE AND G. L. FULLER. Georgia State Col. Agr., *Bull.* 308, 24 pp.(1925).—The chem. analysis of 11 soil types of the county are given. J. J. SKINNER

Irrigation with special reference to the economic use of water. H. W. TURPIN. *J. Dept. Agr. Union S. Africa* 11, 436-54(1925).—A correlation of published data on the effect of irrigation on the soil and on the compn. and yield of various crops. K. D. J.

Condensation of water in the ground. J. VERSLUYS. *Water en Gas* July 3, 1925, 144; *Water and Water Eng.* 27, 381(1925).—Condensation of gases by adsorption takes place on the surface of solid bodies and is most intense in capillary spaces. Here water may condense from soil air though it may not be satd. at the temp. Between the adjacent grains a drop with a concave surface forms and increases in size until equil. has been attained. These drops probably do not fuse and flow into the ground water, but they are probably available to rootlets of plants which, by their absorption of the water, disturb the equil. and induce further condensation. JACK J. HINMAN, JR.

Roofing paper for agricultural purposes. ANON. *Teer* 24, 19-22(1926).—A review of expts. on the use of roofing paper, both tarred and tar-free, for the protection of crops during their early development. Results are given for a no. of different vegetables. Large increases in the crops obtained are noted. W. B. PLUMMER

Production of fertilizer material. ANON. *Meddl. Sveriges Kem. Ind.-kontor* 8, 124-6(1925).—The world's production of fertilizers for 1913, 1921, -22, -23 and -24 are tabulated for raw phosphate, superphosphate, Thomas slag, potash, Chili saltpeter, Norway saltpeter, CaCN_2 , and $(\text{NH}_4)_2\text{SO}_4$. The amounts are 1000 metric tons. A. R. ROSE

The physiological reaction of fertilizer salts. H. KAPPEN AND M. LUKACS. *Z. Pflanzenernähr. Düngung* 5A, 249-71(1925).—Expts. with nitrates and with NH_4 salts in water cultures with different plants again substantiated the physiol. reaction of these salts. NH_4NO_3 was physiol. acid under some conditions and physiol. alk. under other. The growth of corn, mustard and buckwheat produced the same reaction in physiol. alk. solns., but these varied in their effects on physiol. acid solns.; corn produced the most acid condition, and mustard the least. Corn grown in neutral glass sand produced an acid reaction in both solns. contg. NH_4 salts and nitrates after $4\frac{1}{2}$ weeks. Studies on the course of the reaction change showed that the physiol. alk. solns. changed their reaction slowly; while physiol. acid solns. changed rapidly. An arrangement by which the H-ion concn. of the nutrient solns. might be measured without disturbing the solns. was devised by immersing the electrode in the culture vessel and by using a Pt connection to the calomel half-cell. A standard deviation from the usual arrangement was noted and a correction applied. When the nitrate or NH_4 salts solns. were sepd. from the other nutrients and part of the root system was grown in each, the single salt (i. e. nitrate or NH_4) changed in H-ion concn. while that of the soln. contg. the other nutrients remained about const. A theoretical discussion of the absorption processes in plants is given. R. M. BARNETTE

Results with artificial fertilizers on cultivated plants in Java and Madura. A. WULFF. *Arch. Suikerind.* **33**, 1301-22(1925).—A summary is presented of the results of fertilizer tests made since 1911, mostly on rice, but including a few expts. on maize, tobacco, etc. P has been found beneficial, N has given good results as a top dressing in some cases; but K has rarely increased yields. Finally ground rock phosphate has been found useful on certain laterite soils. F. W. ZERBAN

Nitrogenous fertilizers in flax culture. M. GROHS. *Faserforschung* **5**, 37-51 (1925).—A no. of test plots were suitably prepd. to demonstrate the effect of N fertilizers on the flax produced, and to compare the efficiency of various sources of N. In general, N favors the products not considered valuable in fiber flax cultivation. The seed yield is increased under comparable conditions, but there is also an increase in the scutching waste, and a very serious decrease in the quality and strength of the fiber. Very evidently, K and PO_4 are more valuable for fiber flax. The rank growth obtained with Chili saltpeter was remarkable considering the dryness of the season, but the fiber was so weak comparatively that nitrate N is considered inadvisable. Cyanamide not only gave but little evidence of promoting the desirable effects of N fertilizing, but produced poor fiber. $(\text{NH}_4)_2\text{SO}_4$ gave the best results, all things considered. E. R. CLARK

Trials with artificial farmyard manure at Lincoln. M. J. SCOTT. *New Zealand J. Agr.* **31**, 256(1925).—Inconclusive results were obtained in expts on mangolds with artificial manure. K. D JACOB

Colloidal silica and the efficiency of phosphates. P. L. GILE AND J. G. SMITH. *J. Agr. Research* **31**, 217-60(1925). The addition of silica gel to millet grown in sand culture greatly increased the growth of plants supplied with rock phosphate and only slightly increased those supplied with acid phosphate. The addition of a mixed gel contg. Fe, Al and SiO_2 to a pot receiving rock phosphate was marked by reduced growth as compared with the growth made in pots receiving no P_2O_5 . Growth made by the plants was approx. proportional to the quantities of P_2O_5 in the plants, but seemed to bear no relation to the quantities of SiO taken up. The beneficial action of silica gel on the growth of plants supplied with rock phosphate is ascribed to the increasing of the availability of this phosphate through increasing the quantity of P_2O_5 in soln., and the deleterious effect of the mixed gel to a diminishing of the quantity of P_2O_5 in soln. owing to sol. Fe and Al produced by base exchange. This conclusion was substantiated by the quantities of P_2O_5 found in soln. on shaking up rock phosphate with silica gel and with a nutrient soln. such as was used in the pot expt. The relation of the action of silica gel on the efficiency of phosphates to that of the soil colloidal material is discussed. A bibliography of 40 references is appended. W. H. ROSS

Experiments on fertilization of rape in Canterbury. F. E. WARD. *New Zealand J. Agr.* **31**, 308-11(1925).—Mixts. of superphosphate and Ephos basic phosphate gave as high yields as superphosphate alone. Superphosphate gave much better results than Ephos basic phosphate during the first 8 weeks of growth but somewhat better results were obtained with the latter after 13 weeks. As compared with superphosphate, Ephos basic phosphate delayed ripening of the rape. Addn. of dried blood to the superphosphate increased the yields in all cases. K. D JACOB

The quality and yield of tobacco as influenced by fertilizing and other operations. J. N. MUKERJI. Mem. Dept. Agr. India, *Chem. Series* **8**, 1-26(1925).—Superphosphate or salt pter used singly is not effective as a fertilizer for tobacco in Pusa soil. A complete mineral fertilizer such as superphosphate, NaNO_3 and KCl gives excellent results. The presence of K_2O in the fertilizer has regularly increased the yield. The greatest total yield is produced by a fertilizer contg. relatively more P_2O_5 in proportion to N than is found in manure. Manure or indigo seeth is the best fertilizer for tobacco in Bihar on account of cheapness, availability and effectiveness. The ash, amino N and albuminoid N, constituents which have a bearing on the quality of tobacco, are hardly affected by different fertilizing treatments. Inorg fertilizers generally give a higher, and org. a lower K_2O content. KCl increases the Cl content, which injures the burning quality of tobacco. A comparison of topping and spiking the tobacco plants shows that topping improves the quality while the yield by both operations is almost identical. Studies on tobacco curing have shown that rack-curing produces a tobacco of a bright yellow color suitable for cigaret manuf., while ground-curing produces tobacco of a dark brown hue. Rack-cured leaves possess greater elasticity than ground-cured leaves. Rack-curing produces a tobacco of lower nicotine and higher starch content than ground-curing. RUSSELL M. JONES

Experiments on the control of wildfire of tobacco. J. JOHNSON AND H. F. MURWIN. Wisconsin Agr. Expt Sta., *Res. Bull.* **62**, 34 pp.(1925).—Wildfire infection of tobacco

occurs in the seed bed. Seeds are successfully disinfected by treatment with a 0.01% AgNO_3 soln. for 2 periods of 5 to 10 min. each. Cu-lime dust and Bordeaux mixts. reduce the amt. of infection in seed beds, but not sufficiently materially to reduce the amt. of subsequent field infection if conditions for its spread are favorable. The wild-fire bacteria produce a toxin in host tissue and in culture which is responsible for the chlorosis produced in plant tissue. The toxin is readily sepd. from the bacteria by filtration and will in itself produce typical symptoms by inoculation. J. J. SKINNER

Observations on the degree of solubility of phosphate and potash fertilizers. ROMUALDO AVATTANEO. *Rass. min. met. chim.* **63**, 140-1 (1925).—Great stress is laid on the lack of economy in the use of potash and phosphate compds. of too high soly. in H_2O , both because of the cost and of the unfavorable action. The most economical fertilizer for Italy is a mixt. of a natural phosphate and leucite, which will maintain nearly const. concns. of sol. phosphate and K salt favorable to the plant. Also in *Proc. Internat. Soc. Soil Science* [N. S.] **1**, 157-60 (1925) C. C. DAVIS

The action of copper compounds on the smut spores of wheat. J. BODNÁR AND ALEXANDER TERÉNYI. *Chem.-Ztg.* **49**, 902 (1925).— CuSO_4 does not kill the smut spores, but hinders their germination. The quantity of Cu absorbed by the spores from weak solns. of CuSO_4 , $\text{Cu}(\text{NO}_3)_2$ and CuCl_2 of various concns. is about the same; but the amt. absorbed is greater in solns. of $\text{Cu}(\text{OAc})_2$. Spores treated with CuSO_4 will not germinate in water, but if the Cu absorbed is leached out with dil. HCl or moisture in the ground, germination ensues. The retardation of the germination of the Cu-treated spores in the earth is proportional to the quantity of the Cu absorbed. If 9 mg. of spores (3,600,000) is contained in 10 cc. $\text{Ca}(\text{NO}_3)_2$ nutrient soln. contg. 0.001% of Cu as CuSO_4 , no germination takes place. If the soln. contains 0.0001% of Cu, germination is only retarded; while a soln. of 0.00001% of Cu has no effect upon the spores. GEO. R. BANCROFT

New seed disinfectants for the control of bunt of wheat and the smut of oats and barley. W. H. TISDALE, J. W. TAYLOR, R. W. LEUKEL AND M. A. GRIFFITHS. *Phytopathology* **15**, 651-76 (1925).—Greenhouse and field-plot expts. extending over 4 yrs. and employing a large number of the newer seed disinfectants, especially Hg compds., are reported. Naturally infested seed was employed insofar as possible, but all lots were heavily inoculated prior to treatment. Cu carbonate gave good control of bunt and improved the stand and yield of wheat, but did not satisfactorily control oat and barley smuts. None of the dust treatments thus far proposed controls these smuts satisfactorily. In liquid treatment, a number of the org. Hg compds. gave excellent results in controlling barley smuts and less satisfactory, but fairly good control of oat smut. The effectiveness was equal to that of CH_4O , there was no injury, and stimulation of growth was very evident. Furfural injured barley seed and permitted higher percentages of smut than in the controls. JOSEPH S. CALDWELL

Potassium xanthate as a soil fumigant. E. R. DEONG. *Ind. Eng. Chem.* **18**, 52-5 (1926).—K xanthate and Na xanthate change in an acid medium to xanthic acid, which at moderate temps. decomposes into CS_2 and alc. K xanthate on account of its soly. in H_2O may be distributed in the soil at any convenient depth and at any concn. This makes possible the treatment of soils at a lower concn. of CS_2 than is possible where the latter is used pure. By this means a uniform dosage may be distributed through large bodies of soil and with less danger to the living plant. Combining K xanthate with varying proportions of $\text{CaH}_4(\text{PO}_4)_2$, $\text{Fe}(\text{NO}_3)_3$, or S will give a variable rate of release of xanthic acid, depending on the proportion of the chemicals used and the soil medium. This offers the possibility of an immediate fumigating action followed by a slow release over a period of days or possibly weeks with varying concns. of CS_2 . This is being tried as a means of controlling the root knot nematode which in its encysted form is very difficult to kill with chemicals. J. J. SKINNER

Use of spreaders with Bordeaux mixture. H. L. MANUEL. *Agr. Gaz. N. S. Wales* **36**, 702 (1925).—Resin fish oil soap and casein were equally effective as spreaders for Bordeaux mixt. on grape vines. K. D. JACOB

Chemical control of weeds and its limitations. D. H. ROBINSON. *Fertilizer, Feeding-Stocks and Farm Supplies J.* **10**, 982-3 (1925); cf. *C. A.* **20**, 88.—The ease with which weeds may be controlled by chem. means, particularly spraying, is largely dependent on their specific botanical characteristics. K. D. JACOB

Sheep blow-fly control: a new method. BERNARD SMIT. *J. Dept. Agr. Union S. Africa* **11**, 455-8 (1925).—Dead sheep were placed in holes covered with heavy wire netting and after 2 days the carcasses were lightly sprayed each morning with a soln. contg. 2 ounces of Na_3AsO_3 per gallon. Practically all of the maggots were killed after 6 days but the adult flies seemed to be little affected. Decompn. had ceased by this

time because of the preservative action of the arsenite and flies were no longer attracted to the carcasses. Addn. of sugar did not increase the effectiveness of the poison. A new method of control not involving the use of poisons is described. K. D. JACOB

Experiments on means for combating the beet fly. HANS BREMER. *Deut. Zuck-erind.* 50, 1389-91(1925). W. L. BADGER

Calcium cyanide. THEODORE PARKER. *Fertilizer, Feeding-Stuffs and Farm Supplies J.* 10, 915(1925).—Complete control of white and green flies in hot houses was obtained with $\text{Ca}(\text{CN})_2$ used at the rate of 0.25 to 0.33 ounce per 1000 cu. ft. at a temp. of 60-70° F. In order to obtain its max. effect the air must contain sufficient moisture to decompose the $\text{Ca}(\text{CN})_2$. K. D. JACOB

Chemical investigations in regard to citrus (JURITZ) 11D. The chemistry of CaCN_2 (FRANCK, HOCHWALD) 2.

RIVS Y MIRO, ANTONIO: *Cianamida cálcica*. Madrid: Calpe. 207 pp. Ptas 6.

Destroying insects by fumigation. R. C. ROARK. *Brit.* 234,456, May 26, 1924. EtOAc is used (preferably with $1\frac{1}{2}$ times as much CCl_4) for fumigating grain, etc. to destroy weevils or insects.

Insecticides. I. McDougall and F. Howles. *Brit.* 233,857, April 15, 1924. Insecticidal powders for treating plants comprise nicotine, powd. *Derris* root or *Derris* ext. and an inert material such as CaCO_3 or CaSO_4 .

Dry disinfectant for seed. O. G. JOHANSSON. *Swed.* 59,798, Nov. 3, 1925. A dry mixt. of CuCO_3 and Hg compds. with or without addn. of CaCO_3 .

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Differentiation of abnormal wines from watered wines. FONZES-DIACON. *Ann. fals.* 18, 606-7(1925); cf. following abstr.—Analyses previously published by Aubouy of wines known to be abnormal conform with the rules given by F.-D. A. P.-C.

Abnormal wines: differentiation from watered wines: tartar number. FONZES-DIACON. *Ann. fals.* 18, 532-6(1925).—The "tartar no." is defined as the ratio of the total tartaric acid to the total K_2O , both expressed as K bitartrate. A wine may be considered as natural but abnormal when: fixed acidity (in g. per l.) + alc. (% by vol.) is less than 12, tartar no. < 1, total K_2O (as K bitartrate) < 4, and volatile acidity < 0.70. A wine may be considered as accidentally abnormal (through disease) when: fixed acidity + alc. is less than 12, tartar no. < 1, total K_2O (as K bitartrate) < 4, volatile acidity < 1. A. PAPINEAU-COUTURE

Wines of the coöperative wine cellars of the Bas-Rhône region (France). H. ASTRUC AND G. CHEVALIER. *Ann. fals.* 18, 536-46(1925).—Analyses of 71 wines of the 1923 and 1924 vintages are tabulated and commented. A. PAPINEAU-COUTURE

New method for the approximate determination of moisture in malts. L. FRIES. *Schweiz. Brauer Rundschau* 1925, 153; *Bull. assoc. inst. sup. fermentations Gand* 27; *Ann. soc. brasseurs* 35, 38(1926).—The method is based on the rise in temp. which takes place on mixing finely ground malt with water, and is carried out as follows: finely grind the malt under conditions which prevent rise in temp., place 100 g. of malt and 160 cc. H_2O in sep. covered containers in a water bath at room temp., allow to stand 3-4 hrs., pour the H_2O on the malt flour, stir with a wooden spatula for 1 min., and note the temp. to 0.1°. A rise in temp. of 2°, 3°, 4°, 5°, 6° and 7° corresponds to 8.6, 6.5, 5.0, 3.6, 2.4 and 1.4% H_2O , resp. The results agree to within 0.5% with those obtained by the usual methods. A. PAPINEAU-COUTURE

Use of aluminium in breweries. ALB. MERTENS. *Bull. assoc. école sup. brasserie Louvain* 26, 34-44(1926).—A discussion of the qualities required of com. Al for it to be suitable for use in breweries. A. PAPINEAU-COUTURE

The volutin in yeast cells. M. GLAUBITZ. *Z. Spiritusind.* 48, 363(1925).—A good yeast usually has a fairly high protein as well as high phosphate content. Volutin, a protein substance probably existing in the form of little droplets in the cells, was investigated to det. if any relation existed between volutin content and fermentative activity. No positive relation was found, for when 1 or 80% of the cells contained volutin the rate of fermentation was nearly the same. The content of volutin diminishes during storage. C. N. FREY

Chemical principles in vinegar investigation. ERICH WALTER. *Deut. Essigind.* 29, 460-1 (1925). W. O. E.

Review of the progress in making fermented vinegar. PAUL HASSACK. *Fruit Products J. and Am. Vinegar Ind.* 4, No. 10, 15-6; No. 11, 15-7 and 19; No. 12, 15-8; 5, No. 1, 14-8; No. 2, 13-5 (1925). J. A. KENNEDY

Formic acid in vinegar. H. MOHR. *Deut. Essigind.* 29, 469 (1925).—In the course of a large no. of investigations during the years 1912-14 the amt. of CH_2O_2 in vinegar and triple vinegar was shown to be appreciably less than 0.5 g. per 100 g. $\text{C}_2\text{H}_4\text{O}_2$. Recent examns. have, however, yielded relatively greater amts. of CH_2O_2 . Of 45 samples examd., 12 contained the following amts. of CH_2O_2 : 0.294, 0.44, 0.448, 5.494, 0.46, 0.50, 0.55, 0.56, 0.655, 0.25, 0.364, 0.572 in 100 total acid. It is reported from a competent source that com. 80% acetic acid contains an av. of 0.2% CH_2O_2 , an amt. in excess of that legally permitted. W. O. E.

Regarding dried-apple vinegar. R. O. BROOKS. *Fruit Products J. and Am. Vinegar Ind.* 4, No. 11, 13-4 (1925).—This is a discussion of the "notice of Judgment 12,367." J. A. KENNEDY

Generator size and optimum temperature for vinegar bacteria. H. WÜSTENFELD. *Deut. Essigind.* 29, 375-6 (1926).—To achieve max. efficiency in the production of acid in generators development of various types of bacteria would be necessary for different sized generators, each type having an optimum rate of oxidation at a different temp. level, degree of acidity and concn. of wort. The interior of a large generator with insufficient radiation reaches a higher temp. at a slower rate of oxidation and heat production than a small one. Consequently the temp. is not an index of the efficiency or rate of oxidation. As rapidly as the temp. in a com. generator reaches limits above the optimum, the rate of oxidation changes and the temp. falls. Because of this automatic regulation there is no period during which a temp. much above the optimum exists. C. N. FREY

The nipa palm as a source of sugar and alcohol (REIJGERSBERGH) 28.

Lactic acid. S. E. FAITHFULL. U. S. 1,569,221, Jan. 12. During the production of lactic acid by fermentation of solns. contg. glucose or similar carbohydrate material, air or O is injected to inhibit formation of butyric acid. Pb lactate may be used for pptg. proteins and similar substances from the resulting soln. and residual carbohydrate material in the lactate soln. produced may be caramelized and the soln. then decolorized with active C.

Aldehydes from cacti. W. M. SINCLAIR. U. S. 1,569,339, Jan. 12. Cacti are mashed without addn. of H_2O under conditions favorable to fermentation by indigenous fungous material, the fully fermented pulp is hydrolyzed, subjected to distn. and aldehyde material and essential oil are condensed and sepd. The product is suitable for alc. production.

Yeast. VEREINIGTE MAUTNER'SCHE PRESSHEFE-FABRIKEN GES. Brit. 234,843, May 30, 1924. Molasses for yeast production is purified without destruction of the vitamins by diln. and filtration. An inert powder may be added, e. g., talc with acid molasses and chalk with alk. molasses. The molasses may be subjected to lactic fermentation before filtration, to render the protein content available and the N content may be further increased by adding sepd. white of egg and NH_3 or NH_4 salts.

Preserving yeast. U. WEGENER. U. S. 1,570,418, Jan. 19. Yeast is embedded in a finely cryst. mass of invert sugar.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Myrrhis odorata Scop. and the microchemical detection of anisic acid. L. VAN ITALLIE AND A. J. STRENNHAUER. *Pharm. Weekblad* 63, 4-7 (1926).—*Myrrhis odorata* contains a volatile oil which consists chiefly of anethole. The distillate contains also MeAc and MeOH and the residue fumaric acid and sucrose. Anisic acid, obtained by oxidation of the anethole with CrO_3 , may be identified microchemically by the formation of Ag, Ca, Ba and Sr salts. A. W. DOX

Perfumes for vanishing creams. WM. A. POUCHER. *Am. Perfumer* 20, 511-2 (1925).—Among the topics discussed are: prerequisites for a good perfume, volatile solvent process, modern apph, volatile oil perfumes, synthetics and natural isolates, resinous substances and blending the perfumes. W. O. E.

Albumose silver. C. MANNICH AND K. CURTAZ. *Arch. Pharm.* **263**, 669-74 (1925).—A comparative study was made of 6 different brands of *Argentum proteicum* (including protargol) with respect to their behavior toward an ultrafilter of collodion membrane, 0.25% solns. of the sample being subjected to filtration over a period of 15 hrs., thereby yielding a filtrate of about 10 cc. All filtrates were colorless, although in the light they rapidly became discolored; they contained furthermore Ag and protein material. The Ag content of the ultrafiltrates was in every case less than that of the original soln., amounting to 10-40% of the unfiltered liquid, so that 60-90% of the Ag remained behind. A portion of the Ag loss is due to adsorption by the membrane. While the differences observed in Ag content of the several filtrates are probably outside the error limits of the method, they are not so marked as to permit the assumption that the degree of dispersion of the Ag is essentially different in the several brands. It is concluded, therefore, contrary to the findings of Utz (cf. *C. A.* **18**, 3101) that the degree of Ag dispersion in protargol is deserving of no special consideration. W. O. E.

Notes on bismuth compounds. II. ERNST MASCHMANN. *Arch. Pharm.* **263**, 721-6 (1925); cf. *C. A.* **19**, 1515.—As elaboration to the first communication, a chemotherapeutic study has been made of certain substances contg. As and Bi in the mol., as also a compd. involving the 3 parasitocidal elements As, Hg and Bi. The following compds. were prepd. for purposes of this study: *basic Bi salt of 3-amino-4-hydroxybenzenearsonic acid*, $C_6H_7O_6NAsBi$, ppt. insol. in H_2O and org. media; *basic Bi salt of 3-acetylaminio-4-hydroxy-5-hydroxymercuribenzenearsonic acid*, $C_8H_9O_7NAsBiHg$, ppt. insol. in H_2O ; *complex Bi compd. of 3-dihydroxypropylamino-4-hydroxybenzenearsonic acid*, sol. in H_2O , insol. in Et_2O and $MeOH$; *bismuthyl deriv. of di-Na o-(β -carboxy- α,β -dihydroxyethyl)benzoate*, $C_{10}H_7O_7BiNa_2$, insol. in alc. and Et_2O ; *complex Bi compd. of caffeic acid*, $C_9H_6O_6BiNa$; *complex Bi compd. of alizarin*, $C_{14}H_7O_6Bi$; *complex Bi salt of Na 7-iodo-8-hydroxyquinoline-5-sulfonate*, $C_{17}H_{12}O_2NaI_2BiNa_3$. W. O. E.

Preparation, properties, application and testing of antiseptics. T. H. FAIRBROTHER AND A. RENSHAW. *Ind. Chemist* **1**, 419-21 (1925).—In the 1st instalment of their paper the authors deal with the first 3 of the headings; in the final part the various methods of testing the antiseptic value of the several compds. are dealt with very thoroughly. An attempt has been made to show how modern methods have developed from the early efforts of Lister. First of all there was the trial-and-error method applied to all possible substances which might possess antiseptic properties. This slowly changed with the development of chemotherapy into an organized attack on parasites by the synthesizing of chem. mols. showing selective action. For general purposes of sanitation and disinfection the old coal-tar fluids have their uses, but this is only the fringe of the problem of antiseptic action. The main function of an antiseptic is to prevent the growth of organisms upon tissues of fabrics without damage thereto. The most critical application of this is, of course, in relation to human tissues. Progress in this direction must be made by the synthesis of further substances in the light of present knowledge. The pioneer work of Lister, Pasteur, Ehrlich and others showed that definite groupings and mol. configurations bring about antiseptic action and this foundation must be built upon by present-day investigators. W. O. E.

Vanillin, piperonal and coumarin. L. G. RADCLIFFE AND F. H. SHARPLES. *Perfumery Essent. Oil Rec.* **15**, 396-402, 437-9 (1924); **16**, 20-3, 51-3, 87-92, 156-62, 197-9, 271, 353-5, 387-90 (1925).—The present research had for its object an examn. of the various recognized methods of estn. In addn. to an extensive bibliography it presents in 2 parts the recognized methods for the estn. of vanillin and piperonal separately, gravimetric, volumetric and colorimetric methods, methods for the estn. of vanillin in the presence of piperonal, methods for the estn. of coumarin, examn. of the properties of vanillin, piperonal and coumarin with a view to the establishment of new methods as (1) vanillin in presence of piperonal and coumarin, (2) vanillin or piperonal, (3) coumarin in presence of vanillin and piperonal and (4) coumarin alone. W. O. E.

Biological evaluation of drugs. F. KNAFFL. *Pharm. Monatshefte* **6**, 209-15 (1925).—An address. W. O. E.

Cultivation of drug plants. LUDWIG KROEBER. *Pharm. Ztg.* **70**, 1738-9 (1925).—The personal experience of the author is briefly described in cultural expts. with plants like marsh mallow, valerian, Chinese rhubarb, peppermint, digitalis, stramonium, thyme, mullein, fennel, mustard, etc. W. O. E.

Action of *Matricaria discoidea* and *M. chamomilla*. C. G. SANTESSON. *Pharm. Zentralhalle* **66**, 829-31 (1925).—Comparative expts. on the action of these 2 drugs develop no essential difference in their behavior. W. O. E.

Colloid salve therapy and colloid cosmetics. L. ZAKARIAS. *Pharm. Zentralhalle* **66**, 831-2 (1925).—Certain advantages are claimed and discussed for the new therapy,

notably in that they do not hinder the natural and pathological secretion of the skin and possess furthermore a considerably greater covering capacity than ordinary H_2O -sol. salves. W. O. E.

The extraction of oil of lemon. A. A. RAMSAY. *Agr. Gaz. N. S. Wales* **36**, 705 (1925).—A note on the methods. K. D. JACOB

Investigation on Indian opium. IV. Further experiments on the influence of fertilizers on the yield and morphine content of the latex from the opium poppy. H. E. ANNETT AND H. D. SINGH. *Mem. Dept. Agr. India*, Chem. Series **8**, 27-37 (1925); cf. *C. A.* **15**, 248; **16**, 1484; **17**, 2767.—Org. fertilizers such as cakes and cattle manure in addition to giving an increased yield of opium appear to produce an increase in its morphine content. The increased morphine content does not seem to be brought about by the N or K_2O supplied by the fertilizer but rather by the P_2O_5 . **V. Experiments on oil content of the seed of the opium poppy.** H. E. ANNETT AND M. N. BOSE. *Ibid* **39**-43.—The oil content of the seed of the opium poppy as grown in the United Provinces seems to be remarkably const. There are very small differences in the oil content of the seed of 9 pure races tested. There is no marked effect due to season, climate or fertilizers tested. The terminal and lateral capsules appear to produce seed of the same oil content. The process of lancing the capsules for opium has no effect on the oil content of the seed. **VI. Studies on the ash constituents of Indian opium.** H. E. ANNETT AND M. N. BOSE. *Ibid* **45**-51.—There is a steady rise in the amt. of ash constituents of the latex of the opium poppy at each successive lancing up to the fourth, after which no increase appears. The compn. of the ash appears to be the same in each successive lancing and is not appreciably affected by fertilizing. SO_3 and P_2O_5 detd. in the original opium increase rapidly in the first three lancements, the P_2O_5 increasing up to the fifth lancing. Cl is not present in the latex. The increase in ash constituents of each successive lancing is accompanied by a rapid falling off in total alkaloid content of the latex. This is accounted for by the rapid fall in morphine and to a lesser extent by the fall in narcotine content. Codeine and papaverine are present in more or less const. amts. in each successive lancing. It is possible that there is a physiol. connection between the rise in ash constituents and the fall in morphine. R. M. J.

Investigations of essential oils. ANON. *Bull. Imp. Inst.* **23**, 421-9 (1925).—*Camphor leaves and twigs* from Uganda, contg. 11.8% H_2O , yielded on steam distn. 2.3% of oil or about 1.8% solid camphor. Two samples of *Massoi bark* (*Cinnamomum Massoia*, Schewe) from Papua yielded on steam distn. 6.0% and 6.3% of oil with: d_{15}^{15} 1.060, 1.064; $[\alpha]_D$ -0.90° , -0.34° ; n_D^{20} 1.534, 1.536; phenols (as eugenol) 60, 79%, resp. The approx. compn. of the 2nd sample was: eugenol 79, safrole 14, other constituents (mostly terpenes) 7%. The oil is similar to that obtained by previous investigators from "massoy" bark from New Guinea. *Oil of Origanum Maru* from Cyprus had: d_{15}^{15} 0.904, n_D^{20} 1.4775, $[\alpha]_D^{20}$ $+9.27^\circ$, acid value 4.1, ester value before acetylation 4.1, ester value after acetylation 74.5, oil absorbed by a 5% NaOH soln. 2.5%, sol. in 1.4 vols. 80% alc. at 15° . The const. are similar to those of *marjoram* oils previously received at the Imp. Inst. from Cyprus and of com. Spanish *marjoram* oils. *Medang losoh oil* distd. in the Federated Malay States from the wood of *Cinnamomum parthenoxylon*, Meissn., had: d_{15}^{15} 1.103, $[\alpha]_D$ nil, ester value before acetylation 0.8, ester value after acetylation 3.5, congealing point $+10^\circ$, sol. in 3.5 vols. of 90% alc. Distn. at 772 mm. gvc: 234-7° 91, 237-9° 5, residue 4%, showing the oil consists principally of *safrole*. A. PAPINEAU-COUTURE

Saffron. GEORGES PIERLOT. *Chimie et industrie* **14**, 839-50 (1925); cf. *C. A.* **30**, 263.—A monograph. *Oil of saffron* (obtained by steam distn. of the Et_2O ext.) had d_{15}^{15} 0.9514-0.9998, and a very slight *l*-rotatory power; it deposits rhombic crystals of a stearoptene m. 106° (recrystd. from a mixt. of Et_2O and petrole ether). Rectification of the oil *in vacuo* gives *sativol* (new), b_3 73° , b_3 69° , b_{760} 217° (corr.), d_{15} 0.9681, $[\alpha]_D$ 0, readily dehydrated to a mobile hydrocarbon, gives Denigès' reaction with $HgSO_4$, indicating that it is a tertiary alc. *Picrocrocine* recrystd. from $EtOAc$, m. 196° , showing that Kayser's product, m. 75° (*Ber.* **1884**, **1885**), must have been very impure. On hydrolysis it gives *sativol*, an uncrystallizable lactonic compd. which is apparently a phthalein, fructose and 1 mol. of HCO_2H . *Crocine* is best obtained by extn. with cold 70% $EtOH$ after extn. with Et_2O . It is next to impossible to obtain it entirely free from *picrocrocine*. *Croceline* is obtained by hydrolyzing *crocine* with dil. acids, filtering the red flocculent ppt., and recrystg. from Me_2CO or from $EtOAc$. Bibliography of 14 references. A. PAPINEAU-COUTURE

Essential oils in the Norwegian pharmacopea. GEORGES RENAUDET. *Parfumerie*

Albumose silver. C. MANNICH AND K. CURTAZ *Arch. Pharm.* **263**, 669-74 (1925).—A comparative study was made of 6 different brands of Argentum proteinicum (including protargol) with respect to their behavior toward an ultrafilter of collodion membrane, 0.25% solns. of the sample being subjected to filtration over a period of 15 hrs., thereby yielding a filtrate of about 10 cc. All filtrates were colorless, although in the light they rapidly became discolored; they contained furthermore Ag and protein material. The Ag content of the ultrafiltrates was in every case less than that of the original soln., amounting to 10-40% of the unfiltered liquid, so that 60-90% of the Ag remained behind. A portion of the Ag loss is due to adsorption by the membrane. While the differences observed in Ag content of the several filtrates are probably outside the error limits of the method, they are not so marked as to permit the assumption that the degree of dispersion of the Ag is essentially different in the several brands. It is concluded, therefore, contrary to the findings of Utz (cf. *C. A.* **18**, 3101) that the degree of Ag dispersion in protargol is deserving of no special consideration. W. O. E.

Notes on bismuth compounds. II. ERNST MASCHIMANN. *Arch. Pharm.* **263**, 721-6 (1925); cf. *C. A.* **19**, 1515. As elaboration to the first communication, a chemotherapeutic study has been made of certain substances contg. As and Bi in the mol., as also a compd. involving the 3 parasitocidal elements As, Hg and Bi. The following compds. were prepd. for purposes of this study: *basic Bi salt of 3-amino-4-hydroxybenzenearsonic acid*, $C_6H_7O_6NAsBi$, ppt. insol. in H_2O and org. media; *basic Bi salt of 3-acetyl amino-4-hydroxy-5-hydroxymercuribenzenearsonic acid*, $C_8H_9O_7NAsBiHg$, ppt. insol. in H_2O ; *complex Bi compd. of 3-dihydroxypropylamino-4-hydroxybenzenearsonic acid*, sol. in H_2O , insol. in Et_2O and $MeOH$; *bismuthyl deriv. of di-Na o-(β -carboxy- α,β -dihydroxyethyl)benzoate*, $C_{10}H_7O_6BiNa_2$, insol. in alc. and Et_2O ; *complex Bi compd. of caffeic acid*, $C_9H_6O_6BiNa$; *complex Bi compd. of alizarin*, $C_{14}H_7O_6Bi$; *complex Bi salt of Na 7-iodo-8-hydroxyquinoline-5-sulfonate*, $C_{17}H_{12}O_{12}NaI_2BiNa_3$. W. O. E.

Preparation, properties, application and testing of antiseptics. T. H. FAIRBROTHER AND A. RENSHAW. *Ind. Chemist* **1**, 419-21 (1925).—In the 1st instalment of their paper the authors deal with the first 3 of the headings; in the final part the various methods of testing the antiseptic value of the several compds. are dealt with very thoroughly. An attempt has been made to show how modern methods have developed from the early efforts of Lister. First of all there was the trial-and-error method applied to all possible substances which might possess antiseptic properties. This slowly changed with the development of chemotherapy into an organized attack on parasites by the synthesizing of chem. mols. showing selective action. For general purposes of sanitation and disinfection the old coal-tar fluids have their uses, but this is only the fringe of the problem of antiseptic action. The main function of an antiseptic is to prevent the growth of organisms upon tissues of fabrics without damage thereto. The most critical application of this is, of course, in relation to human tissues. Progress in this direction must be made by the synthesis of further substances in the light of present knowledge. The pioneer work of Lister, Pasteur, Ehrlich and others showed that definite groupings and mol. configurations bring about antiseptic action and this foundation must be built upon by present-day investigators. W. O. E.

Vanillin, piperonal and coumarin. L. G. RADCLIFFE AND E. H. SHARPLES. *Perfumery Essent. Oil Rec.* **15**, 396-402, 437-9 (1924); **16**, 20-3, 51-3, 87-92, 156-62, 197-9, 271, 353-5, 387-90 (1925).—The present research had for its object an examn. of the various recognized methods of estn. In addn. to an extensive bibliography it presents in 2 parts the recognized methods for the estn. of vanillin and piperonal separately, gravimetric, volumetric and colorimetric methods, methods for the estn. of vanillin in the presence of piperonal, methods for the estn. of coumarin, examn. of the properties of vanillin, piperonal and coumarin with a view to the establishment of new methods as (1) vanillin in presence of piperonal and coumarin, (2) vanillin or piperonal, (3) coumarin in presence of vanillin and piperonal and (4) coumarin alone. W. O. E.

Biological evaluation of drugs. E. KNAFFL. *Pharm. Monatshefte* **6**, 209-15 (1925).—An address. W. O. E.

Cultivation of drug plants. LUDWIG KROEBER. *Pharm. Ztg.* **70**, 1738-9 (1925).—The personal experience of the author is briefly described in cultural expts. with plants like marsh mallow, valerian, Chinese rhubarb, peppermint, digitalis, stramonium, thyme, mullein, fennel, mustard, etc. W. O. E.

Action of *Matricaria discoidea* and *M. chamomilla*. C. G. SANTESSON. *Pharm. Zentralhalle* **66**, 829-31 (1925).—Comparative expts. on the action of these 2 drugs develop no essential difference in their behavior. W. O. E.

Colloid salve therapy and colloid cosmetics. L. ZAKARIAS. *Pharm. Zentralhalle* **66**, 831-2 (1925).—Certain advantages are claimed and discussed for the new therapy,

notably in that they do not hinder the natural and pathological secretion of the skin and possess furthermore a considerably greater covering capacity than ordinary H_2O -sol. salves. W. O. E.

The extraction of oil of lemon. A. A. RAMSAY. *Agr. Gaz. N. S. Wales* **36**, 705 (1925).—A note on the methods. K. D. JACOB

Investigation on Indian opium. IV. Further experiments on the influence of fertilizers on the yield and morphine content of the latex from the opium poppy. H. E. ANNETT AND H. D. SINGH. *Mem. Dept. Agr. India*, Chem. Series **8**, 27-37(1925); cf. *C. A.* **15**, 248; **16**, 1484; **17**, 2767. —Org. fertilizers such as cakes and cattle manure in addition to giving an increased yield of opium appear to produce an increase in its morphine content. The increased morphine content does not seem to be brought about by the N or K_2O supplied by the fertilizer but rather by the P_2O_5 . **V. Experiments on oil content of the seed of the opium poppy.** H. E. ANNETT AND M. N. BOSE. *Ibid* 39-43.—The oil content of the seed of the opium poppy as grown in the United Provinces seems to be remarkably const. There are very small differences in the oil content of the seed of 9 pure races tested. There is no marked effect due to season, climate or fertilizers tested. The terminal and lateral capsules appear to produce seed of the same oil content. The process of lancing the capsules for opium has no effect on the oil content of the seed. **VI. Studies on the ash constituents of Indian opium.** H. E. ANNETT AND M. N. BOSE. *Ibid* 45-51.—There is a steady rise in the amt. of ash constituents of the latex of the opium poppy at each successive lancing up to the fourth, after which no increase appears. The compn. of the ash appears to be the same in each successive lancing and is not appreciably affected by fertilizing SO_3 and P_2O_5 detd. in the original opium increase rapidly in the first three lancements, the P_2O_5 increasing up to the fifth lancing. Cl is not present in the latex. The increase in ash constituents of each successive lancing is accompanied by a rapid falling off in total alkaloid content of the latex. This is accounted for by the rapid fall in morphine and to a lesser extent by the fall in narcotine content. Codeine and papaverine are present in more or less const. amts. in each successive lancing. It is possible that there is a physiol. connection between the rise in ash constituents and the fall in morphine. R. M. J.

Investigations of essential oils. ANON. *Bull. Imp. Inst.* **23**, 421-9(1925).—*Camphor leaves and twigs* from Uganda, contg. 11.8% H_2O , yielded on steam distn. 2.3% of oil or about 1.8% solid camphor. Two samples of *Massoi bark* (*Cinnamomum Massoia*, Schewe) from Papua yielded on steam distn. 6.0% and 6.3% of oil with: d_{15}^{15} 1.060, 1.064; $[\alpha]_D$ -0.90°, -0.34°; n_D^{20} 1.531, 1.536; phenols (as eugenol) 60, 79%, resp. The approx. compn. of the 2nd sample was: eugenol 79, safrole 14, other constituents (mostly terpenes) 7%. The oil is similar to that obtained by previous investigators from "massoy" bark from New Guinea. *Oil of Origanum Maru* from Cyprus had: d_{15}^{15} 0.904, n_D^{20} 1.4775, $[\alpha]_D^{20}$ +9°27', acid value 4.1, ester value before acetylation 4.1, ester value after acetylation 74.5, oil absorbed by a 5% NaOH soln. 2.5%, sol. in 1.4 vols. 80% alc. at 15°. The const. are similar to those of *marjoram oils* previously received at the Imp. Inst. from Cyprus and of com. Spanish *marjoram oils*. *Medang losoh oil* distd. in the Federated Malay States from the wood of *Cinnamomum parthenoxylon*, Meissn., had: d_{15}^{15} 1.103, $[\alpha]_D$ nil, ester value before acetylation 0.8, ester value after acetylation 3.5, congealing point +10°, sol. in 3.5 vols. of 90% alc. Distn. at 772 mm. gave: 234-7° 91, 237-9° 5, residue 4%, showing the oil consists principally of *safrole*. A. PAPINEAU-COUTURE

Saffron. GEORGES PIERLOT. *Chimie et industrie* **14**, 839-50(1925); cf. *C. A.* **30**, 263.—A monograph. *Oil of saffron* (obtained by steam distn. of the Et_2O ext.) had d_{15}^{15} 0.9514-0.9998, and a very slight *l*-rotatory power; it deposits rhombic crystals of a stearoptene m. 106° (recrystd. from a mixt. of Et_2O and petrole ether). Rectification of the oil *in vacuo* gives *sativol* (new), b_b 73°, b_s 69°, b_{760} 217° (corr.), d_{15}^{15} 0.9681, $[\alpha]_D$ 0, readily dehydrated to a mobile hydrocarbon, gives Denigès' reaction with $HgSO_4$, indicating that it is a tertiary alc. *Picrocrocine* recrystd. from $EtOAc$, m. 196°, showing that Kayser's product, m. 75° (*Ber.* **1884**, **1885**), must have been very impure. On hydrolysis it gives *sativol*, an uncrystallizable lactonic compd. which is apparently a phthalein, fructose and 1 mol. of HCO_2H . *Crocine* is best obtained by extn. with cold 70% $EtOH$ after extn. with Et_2O . It is next to impossible to obtain it entirely free from *picrocrocine*. *Croceline* is obtained by hydrolyzing *crocine* with dil. acids, filtering the red flocculent ppt., and recrystg. from Me_2CO or from $EtOAc$. Bibliography of 14 references. A. PAPINEAU-COUTURE

Essential oils in the Norwegian pharmacopea. GEORGES RENAUDET. *Parfumerie*

moderne 18, 297-9(1925).—The requirements of the Norwegian pharmacopea for essential oils and related products are given and briefly commented. A. P.-C.

The normal moisture content of essential oils. L. S. GLITCHITCH. *Parfums de France* No. 34, 351-2(Dec., 1925).—Detns. of H_2O (by distn. with dry xylene) on perfectly clear com. oils about a yr. old, and on the same oils after satn. with H_2O , gave: rosewood 2.4, 2.8; palmarosa 1.6, 2.4; Bourbon geranium 1.0, 1.6; Algerian geranium 1.0, 1.5; santal trace, 2.8; lavender (38% esters) 0.6, 1.0; spike-lavender 0.6, 1.0; bergamot (39% esters) trace, 0.3; French Mitcham mint 0.9, 1.0; citronella (Java) 1.1, 1.4; citronella (Ceylon) 0.4, 0.9; lemongrass 0.1, 2.8; French basil 0.6, 2.0; lemon 0.0, trace; juniper berries trace, trace; cedar trace, trace, resp. The max. H_2O which can be retained by these oils is of the order of 3% and is presumably merely in soln. in the alc. constituents of the oils. A. PAPINEAU-COUTURE

Oil of *Dacrydium elatum* from Tonquin. ÉTABLISSEMENTS A. CHIRIS. *Parfums de France* No. 34, 353(Dec., 1925).—A sample of oil distd. by the natives in the Langson region had: d_{15}^0 0.955, $[\alpha]_D^{20}$ -32°30', n unreadable, acid no. 1.54, ester no. 1.05, ester no. after cold formylation 56.7; ales. as $C_{10}H_{20}O$ free 22.70%, combined 0.41%, total 23.11%; insol. in 20 vols. of 85% and 90% alc., sol. in 0.1 vol. of 95% alc., with turbidity between 0.8 and 4.2 vols. Distn. *in vacuo* gave: 110-4° at 10 mm. pressure 70%; 115-20° at 2 mm. pressure 20%, resinous residue 10%. The first fraction after rectification had d_{15}^0 0.9391, $[\alpha]_D^{20}$ -55°50', n_D^{20} 1.50203, and consists of almost pure *l*-cedrene giving cedreneglycol, m. 167-8° (C. A. 19, 2726). The 2nd fraction crystallizes on cooling and consists of *d*-cedrol, m. 86-86.5°, $[\alpha]_D^{20}$ (in 19.15% xylene soln.) +8°50', giving phenylurethan, m. 106-7°. A. PAPINEAU-COUTURE

Some purity tests for ether. ALFRED WØHLK. *Arch. Pharm. Chem.* 82, 381-8 (1925).— H_2O_2 is detected by two reagents: (I) V_2O_5 0.4 g. in 4 cc. H_2SO_4 diluted to 100 cc. and (II) 1 g. TiO_2 in 10 cc. H_2SO_4 dil. to 100 cc. I gives a bright orange-red color with 0.1% H_2O_2 changing to a pale straw as the H_2O_2 is diluted to 0.0005%. II detects 0.0001% H_2O_2 as a very pale yellow, increasing in yellow with increase in concn. to a bright color for 0.01% and $K_2Cr_2O_7$ -red for 0.1% H_2O_2 . These two reagents also detect ethyl hydroperoxide but not diethyl peroxide. Nessler's reagent is used for CH_3CHO and C_2H_5CHO . Et_2O kept in partly filled containers and exposed to light gives peroxide tests, whereas Et_2O kept out of light and under N_2 remains unchanged. A. R. R.

Saponins and saponin drugs. KARL ALGOT KARSMARK. *Svensk Farm. Tids.* 29, 453-9, 467-72(1925).—A review of saponins giving a classified list of the drugs, suggestion as to chemical structures, method of preparations, tests and many references. A. R. ROSE

Additions to and modifications of the (French) Codex. ANON. *J. pharm. chim.* [8] 1, 578-89; 2, 31-45(1925).—The additions include stabilized alcohololates of horse chestnut and valerian; the modifications, neutralized olive oil, with full directions for neutralization with crystd. Na_2CO_3 ; cf. *Pharm. J.* 115, 327(1925). S. WALDBOTT

Neutralized olive oil. C. I. SAGE. *Pharm. J.* 115, 358(1925).—S. disapproves of the practice recently sanctioned by the French Codex (cf. preceding abstr.). Neutralized oils do not always retain neutrality and the small amts. of chemicals added will act as catalysts causing changes which lead to rancidity. S. WALDBOTT

Pharmacy in China. J. CAMERON AND K. K. CHEN. *Pharm. J.* 114, 433-6 (1925).—An historical comparison of the old and the new eras, with examples of the quaint modern prescriptions, each prefaced with the diagnosis of the case. The Chinese wts. and their metric equivs. are given, and wts. in actual use were found to be fairly accurate. S. WALDBOTT

The acidity of gelatins. J. RAE. *Pharm. J.* 115, 3-4(1925).—In 9 com. samples, the acidity varied from 0.3 to 3.85 cc. N NaOH in 10 g. dried gelatin; washing with H_2O removed less than 10% of the acid. The H_2O content varied from 7.5 to 16.0%. A definite limit of acidity should be adopted by the Brit. Pharm. (cf. C. A. 18, 2944). S. WALDBOTT

Analysis of Gregory's powder. J. F. LIVERSEEGE. *Pharm. J.* 115, 325(1925).—Of 27 samples of this powder (rhubarb 22 parts, ginger 12, light magnesia 66 parts (Brit. Pharm.)), 25 gave 11.4 to 14.1% of H_2O -sol. ext., 2 gave 10.4 and 10.7%. In 5 standard samples, H_2O -sol. ext. varied from 11.5 to 12.5%. However, 3 recent samples gave only, resp., 9.4, 7.3 and 11.8%. Considerable difference was found in the action of different samples of calcined MgO in preventing the soln. of the sol. matter in rhubarb. S. WALDBOTT

The active constituents of Cape aloes. H. KIEFFER. *Dissert. Basel*, 1925; *Pharm. J.* 115, 383-5(1925).—The purgative action of Cape aloes resides in 3 resins which are esters of *p*-coumaric acid and are obtained by the successive use of acetone, $AmOH$,

H₂O and AcOEt. The total constituents of Cape aloes are: (1) two possibly identical, very active, bright yellow resins, sol. in solns. of NaHCO₃, each about 30%; (2) a very active resin sol. in soln. of Na₂CO₃, 6–8%; (3) aloin, slightly active, 5%; (4) emodin, slightly active, 1.5–1.8%; (5) H₂O-sol. substances, inactive, 15–20%; (6) amorphous substances, insol. in acetone, producing abdominal pain but no purgation, 5–10%. The process of the Swiss Pharm. for the prepn. of ext. of Cape aloes is faulty, as it rejects as inert the bulk of the active constituents. S. V.

Contributions to the anatomy of monocotyledonous seeds. KARL SCHULTE. *Dissert.*, Basel, 1925; *Pharm. J.* 115, 411(1925).—The anatomy of the seeds of 18 plants of *Liliiflorae* and *Palmae* was studied at different stages of development as a basis for their identification in the powd. state. S. WALDBOTT

Contributions to the anatomy of the foliage leaves of official and pharmaceutically important Compositae. G. WEISS. *Dissert.* Basel, 1925; *Pharm. J.* 115, 411–2 (1925).—A list of the chief histological characters is given for 10 tribes of Compositae, and their relative value for identification is pointed out. The original contains a key for the recognition of about 53 Compositae, based on the characters of the leaves. S. WALDBOTT

Some notes on surgical dressings. F. A. HOCKING. *Pharm. J.* 115, 467–9(1925).—An address on the practical qualities of gauze, bandages, cotton, wool, etc. and the method of sterilization, with diagram of app. S. WALDBOTT

Decolorization of dilute solutions of syrupus glycerophosphatum compositus, B.P.C. G. J. W. FERREY. *Pharm. J.* 115, 493(1925).—A sample of undil. sirup. glycerophos. co., B.P.C., contg. 300 minims of tincture of cudbear per pint, lost its color in 4 days, on account of the reduction of cudbear by the invert sugar gradually formed (cf. Caines and Evers, *C. A.* 20, 94). The color is regained by admission of air. In dil. soln., however, decolorization is much retarded, because inversion of cane sugar does not seem to proceed to any appreciable extent in dil. solns. at room temp. (e. g., at 30°) even in presence of citric acid, etc., but does take place almost completely in the undil. sirup. The latter will diminish in color intensity during a given length of time more than the same sirup after (1:8) diln. S. WALDBOTT

Analytical control, its place in pharmacy. T. E. LESCHER. *Pharm. J.* 115, 518–20(1925).—An address on the responsibilities of the pharmacist and the manufacturer. S. WALDBOTT

The "hesperidin" of some plants. G. WANDER. *Dissert.* Bern, 1925; *Pharm. J.* 115, 520(1925).—To isolate "hesperidin," macerate the plant with cold 2% NaOH soln., strain and ppt. with HCl. Redissolve in dil. NaOH, ppt. with CO₂ gas, repeat the process 10 to 15 times, finally purify by extr. with EtOH or with NH₄OH. From *Hyssopus officinalis*, *Scrophularia nodosa*, *Barosma species*, *Mentha crispa*, *M. pulegium*, *Conium maculatum* (fruit and herb), *Hedeoma pulegioides*, *Toddalia aculeata*, *Linaria genistifolia* and *Capsella bursa-pastoris*, a substance different from hesperidin diosmin, C₂₈H₄₀O₁₁·2H₂O, the *rhamnoglucoside of diosmetin*, or 1,3,3'-trihydroxy-4'-methoxyflavone, was obtained. Hydrolysis with strong aq. alkali or with dil. H₂SO₄ under pressure yields rhamnose, dextrose and diosmetin. Diosmin is yellowish gray, m. 276–80°, loses H₂O at 120°, is insol. in NH₄OH, insol. or but little sol. in the usual solvents or in hot soln. (2 + 1) of CCl₄CH(OH)₁. No such rhamnoglucoside was obtainable from *Cuminum cyminum* (fruit), *Galium mollugo*, galls, *Mentha aquatica*, *M. piperita*, *Lythrum salicaria*, *Satureja hortensis* (minute traces only), *Viola tricolor*, *Tilia species*, *Verbascum species* (leaf), *Pilocarpus trachylophus*. *Verbascum* flowers gave a colorless, cryst. substance to be studied further. S. WALDBOTT

The U. S. Pharmacopeia, Tenth Decennial Revision. ANON. *Pharm. J.* 115, 545–6, 574–5, 634–5, 690–1, 720–1, 753(1925).—The general and specific deviations from the previous revision are pointed out. *Ibid* 116, 83(1926).—Corrigenda and addenda. S. WALDBOTT

Second International Conference for the unification of the formulas of potent drugs, Brussels, 1925. *Pharm. J.* 115, 547–50(1925).—The official final report and preliminary draft of international agreement are given. S. WALDBOTT

Some useful plants of India. D. PRAIN. *Pharm. J.* 115, 577(1925).—An abstr. of an address on Indian hemp and cinchona. S. WALDBOTT

The sumbul root of commerce. E. M. HOLMES. *Pharm. J.* 115, 633(1925).—A sample of sumbul root 50 years old, from *Ferula sumbul*, had still retained a distinct musky odor, which is absent in recent com. samples. The recent root, ascribed to *F. suaveolens*, Aitchison et Hemsl., has a faint taste of angelica and seems to resemble the old root in structure and size. Should both roots prove to be of identical structure through microscopic examn., it would then be probable that the typical *Ferula sumbu*,

plant does not possess the musky odor, and that the musky-smelling root of 50 years ago belonged to a variety that has since died out, having possibly grown in a limited locality (cf. *C. A.* 18, 2787).

S. WALDBOTT

A simple method of testing spiritus aetheris nitrosi. J. RAE. *Pharm. J.* 115, 633-4 (1925).—Into a 50 cc. Nessler tube put 20 minims of soln. *A* ($\text{NH}_2\text{C}_6\text{H}_4\text{SO}_3\text{H}$ 0.5 g.; HCl , Brit. Pharm., 7.5 g.; H_2O to make 100 cc.) and 20 minims of a 1 in 10 aq. soln. of the spirit. After 5 min. add 30 minims of soln. *B* (strong NH_4OH 10 cc., H_2O to make 100 cc.) and H_2O to make 50 cc. Compare the pale yellow to reddish brown color (permanent for hrs.) with that of a standardized $\text{K}_2\text{Cr}_2\text{O}_7$ soln. also dild. to 50 cc. Spirits contg., resp., 2.20, 1.52, 1.30% of NO_2Et , detd. by means of the nitrometer, are equiv. to, 42, 25 and 20 minims, resp., of a 1% $\text{K}_2\text{Cr}_2\text{O}_7$ soln. Whether a spirit is within the 1.25% limit of the Brit. Pharm. is easily detd. by this method.

S. W.

Some observations on light bismuth carbonate of commerce. B. F. HOWARD AND O. CHICK. *Pharm. J.* 115, 661-2; A. J. JONES. *Ibid* 711 (1925).—Of 10 com. samples, only 3 had the Bi_2O_3 content demanded by the Brit. Pharm. and a low content in CaCO_3 (0.1-0.25%). In the other 7, CaCO_3 was excessive (2.1-4%), likewise chlorides BiONO_3 was in excess in 8 cases. The "lightness" was measured as the "bottle-filling capacity" of 1 lb. The best grade occupied 45 fluid ounces, heavier grades less, to the limit of 30. A density of 120 ounces was obtained by pptn. with CaCO_3 at 40° , but the powder contained 9% CaCO_3 and only 84.6% Bi_2O_3 . No definite relation exists between density and bulk of emulsion in H_2O . The A. J. Jones method of prepn (*C. A.* 20, 95) is recommended. J. suggests that the possible use of the hard tap water of the London area (250 p. p. m.) may have caused the high % of CaCO_3 . In 1 sample he had found heavy traces of phosphates.

S. WALDBOTT

The essential oils and related substances of the new U. S. Pharmacopeia. H. FINNEMORE. *Pharm. J.* 116, 29-32 (1926).—A crit. review of the alterations from the previous revision in the monographs on essential oils and similar materials.

S. W.

Capacity and graduations of dispensing bottles (STANNARD) 1.

Pharmaceutical preparation for use as an anodyne. I. FLODQUIST and I. G. BLOMQUIST. U. S. 1,569,956, Jan. 19. A mixt. adapted for treating otitis, etc., comprises dextrose 50, levulose 10, adrenaline 0.02, cocaine 10, isoamylhydrocuprein 0.75, phenol 1 and H_2O 28.23 parts.

Synthetic drug. WELLCOME FOUNDATION, LTD. AND W. H. GRAY. Brit. 234,677, Aug. 12, 1924. A glucoside of Na *p*-aminophenylstibinate is prepd. by interaction of glucose and Na *p*-aminophenylstibinate in aq. soln. in the presence of an excess of alkali for a prolonged time. The product may be used for treating "tropical diseases."

Acyl derivatives of cyclic amino mercapto metal compounds. CHEMISCHE FABRIK AUF AKTIEN FORM. E. SCHERING. Brit. 234,806, June 2, 1924. A cyclic amino mercapto metal compd. is acylated or a cyclic amino mercapto compd. is first acylated and a metal then introduced into the mercapto group. The products are stable in aq. soln. and possess therapeutic properties. Among the compds. referred to are: the Na salt of 4-acetyl-amino-2-argentic mercapto benzoic acid and the corresponding auro compd. and the diphenylurea compds. derived from these by treatment with phosgene; 4-*m*-aminobenzoylamino-2-auro mercapto benzoic acid, which with phosgene yields a urea deriv.; other examples also are given.

Synthetic therapeutic gold compounds. FARBERWERKE FORM. MEISTER, LUCIUS and BRÜNING. Brit. 234,772, June 2, 1924. (Addn to Brit. 225,875; *C. A.* 19, 1615). Complex Au compds. are prepd. by the interaction of Au salts with heterocyclic or acyclic compds. derived from thiourea, other than a thio benzimidazole; the products, if acidic, may be converted into salts. Na salts may be formed from the products obtained from thiohydantoic acid and thioarbuturic acid by reactions with K auribromide.

Medicinal mixture. J. R. PROCHNOW. U. S. 1,569,202, Jan. 12. A compn. for the treatment of bacterial affections of the genito-urinary tract comprises constituents of balsam copaiba, sweet spirits of niter and $(\text{CH}_2)_6\text{N}_4$ with formaldehyde which is produced in the soln.

Ampules of reacting or unstable substances. M. HAHN. U. S. 1,570,346, Jan. 19. Substances such as dry sera and their solvents are kept sep. in glass ampules which are connected with each other by a capillary tube sealed with a mixt. of paraffin and wax or other material m. 45-100° so that the seal may be melted out and the substances mixed immediately before use.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Salt and allied chemicals. GEO. E. GOLLOP. *Can. Chem. Met.* **9**, 259-64(1925).—The nature and extent of the salt deposits underlying Michigan and S. W. Ontario are set forth, a detailed account is given of the manuf. of special brands of very pure salt, of NaOH, liquid Cl, pure HCl and bleaching powder as carried out at the plant of the Canadian Salt Co., Windsor, Ont., and many interesting features of the plant itself are described.

E. G. R. ARDAGH

Salt, bromine and calcium chloride in 1924. K. W. COTTRELL. *U. S. Geol. Survey, Mineral Resources of U. S., 1924*, Pt. II, 141-9 (preprint No. 12, publ. Dec. 15, 1925). Cf. *C. A.* **19**, 876.

E. J. C.

The manufacture of sodium thiosulfate. ROBERT HAZARD. *Rev. chim. ind.* **34**, 334-8, 365-70(1925).—A review.

A. PAPINEAU-COUTURE

The catalytic preparation of sulfur trioxide. ANON. *Chem. Age* (London) **13**, 320-1(1925).—The following factors in the conversion of SO_2 to SO_3 , as carried out in the Mannheim contact process for the mfg. of H_2SO_4 , may affect the conversions: the % SO_2 in the entering gas; the presence or absence of H_2O in the gas; the chem. compn. of the catalyst; the reaction temp.; the state of subdivision of the catalyst; the space velocity. It being impossible on a lab. scale to duplicate plant conditions as regards size of ferric oxide lumps and gas velocities, finely powd. oxide was used with a gas velocity higher than that used in the plant. H_2O in the gas mixt. is not harmful in moderate amts, indeed, it appears to have a beneficial influence, which is probably due to its hydrolytic action on $\text{Fe}_2(\text{SO}_4)_3$. From analyses of the catalyst before and after the expts. it is concluded that pyrites cinders undergo a no. of changes in the oxide shaft, the sulfides are roasted to SO_2 and a certain considerable amt. of sulfate is formed. The distribution of As in the shaft was also detd. and proves that the oxide acts as a trap for the As. The arsenical compd. formed when As is absorbed was isolated and has the compn. $2\text{Fe}_2\text{O}_3 \cdot \text{As}_2\text{O}_3$. Expts. undertaken to show the effect of As on the conversions showed that the catalytic value of the oxide is lowered and that a higher temp. is needed for the conversion.

J. H. PERRY

How sulfur is mined with superheated water. W. T. LUNDY. *Chem. Met. Eng.* **32**, 917-9(1925).—About the Frasch process as used at Freeport, Texas.

E. J. C.

The manufacture and uses of phosgene. G. M. DYSON. *Industrial Chemist* **1**, 557-41(1925).

E. J. C.

Progress of the nitrogen industry in 1925. EDW. B. MAXTED. *Chem. Age* (London) **13**, 644-6(1925).

E. J. C.

Various methods of manufacturing hydrogen. P. E. RAASCHOU. *Proc. Fourth Intern. Congress of Refrigeration* **2**, 1199-211(1924).—Comparison of the Fe-steam method and of the continuous method (water-gas or a mixt. of water-gas and power gas is freed from most of the CO according to $\text{CO} + \text{H}_2\text{O} \rightleftharpoons \text{CO}_2 + \text{H}_2$, and the CO_2 and residual CO are eliminated) for the production of a 3:1 H-N mixt.

A. P.-C.

The hydration of lime. W. G. WHITMAN AND G. H. B. DAVIS. *Ind. Eng. Chem.* **18**, 115-20(1926).—This paper deals with the effect of 3 variables—ratio of water to lime, temp. of hydration, and agitation—upon the properties of hydrated lime. The quality of the hydrated material was evaluated by 3 different methods: by rate of reaction of the lime suspension with acid; by rate of settling in water; and by microscopic examn. The best product is prepd. by hydrating at moderately high temps. with excess water.

L. B. M.

Aktivin and perborate. B. WAESER. *Chem.-Ztg.* **49**, 853-5(1925).—For *laundrying* Aktivin (Na deriv. of chloro-*p*-toluenesulfonamide) belongs to the class of mild bleaching agents; org. colors suffer more by Aktivin than by perborate and it also acts more quickly upon the fiber itself. Aktivin is not sufficient for a complete bleach; certain colors are proof against perborate. Addition of 1% Aktivin or perborate to a starch suspension with steam-stirring for 10 min. results in a *sol starch* of a compn. that stands between starch and dextrin, and when evapd. yields a white product with perborate from corn and wheat starch and a yellowish product with Aktivin. Perborate leaves borax as a by-product which is not objectionable while Aktivin yields *p*-toluenesulfonamide. Aktivin shows no advantage over perborate. The *disinfecting properties* of Aktivin are notable, and as a plant insecticide it deserves further study. Since the ion concn. is the true measure for all bleaching agents, it is probable that each agent possesses its own optimum of temp. and concn. at which max. effects can be produced. A bibliography of 15 titles is given in footnotes.

P. ESCHER

German fuller's earth—deposits, preparation and marketing. R. DECKERT. *Eng. Mining J.-Press* 120, 848(1925).—Deposits of fuller's earth are found in Lower Bavaria. The phys. condition of this earth is extremely altered during treatment with HCl. The raw earth has a smaller bleaching power than the American earth, but after the HCl treatment it is greater than the latter. The earth is sold either as a mixt. of raw and treated earth, or raw high-active earth, or as earth contg. a small amount of discoloring matter (C). Owing to inflation, much old-fashioned machinery is still used in the industry.

Pearl essence: its history, chemistry and technology. H. F. TAYLOR. *Bur. Fisheries, Document No. 989*, 16–36(1925).—The silvery substance deposited in the skin of many species of fish is rubbed from the scales, freed from foreign matter, and suspended in water or other suitable liquid. This constitutes pearl essence. A complete bibliography is appended.

W. H. BOYNTON

W. H. BOYNTON

Polishing wheel leather (BOWKER) 29. Production of H_2SO_4 by electrolysis (SAXON) 4. H_2SO_4 from a quadruple mixture (SAXON) 4. A mass-action equation for compressed gases with application to the Haber equilibrium data (GILLESPIE) 2.

EITEL, WILHELM: **Ueber die Synthese der Feldspatvertreter.** Leipzig: Akadem. Verlagsges. 258 pp. R. M. 25.

MOLITOR, H.: **Fabrikation der Soda.** Leipzig: Max Jänecke Verlagsbuchhandlung. 231 pp. Price, paper, M. 11.60; bound, M. 13.10.

ZERT, K., AND NOSEK, FR.: **Ueber Entfärbungskohle im allgemeinen und über "Carboraffin" und "Norit" in besonderen.** Tagesfragen aus der Zuckerindustrie, No. 2. Edited by Oskar Wohryzek. Magdeburg, Germany: Albert Rathke. G. M. 3 (unbound). Reviewed in *Intern. Sugar J.* 27, 666(1925).

Hydrofluoric acid. M. BUCHNER. *Brit.* 234,852, June 2, 1924. Pure HF is obtained from impure fluorspar or similar substances contg. SiO_2 as well as F by converting the mixt. of HF and H_2SiF_6 (obtained by decomposing the crude material with H_2SO_4) wholly into H_2SiF_6 by the action of SiF_4 and then treating the H_2SiF_6 with fluoride of Na, K, Ba or like fluoride to produce pure HF and a fluosilicate which on heating yields a fluoride and SiF_4 for further use.

Phosphoric acid. E. MERCK. *Brit.* 234,122, May 14, 1924. H_3PO_4 is treated with PH_3 in order to sep. As present as an impurity. Excess of PH_3 may be removed by passing CO_2 through the H_3PO_4 and the As which forms flakes may be removed by filtration of the dild. acid.

Apparatus for producing and recovering hydrocyanic acid, etc. M. J. BROWN. U. S. 1,569,171, Jan. 12. Solns. such as those of acid and cyanide are continuously supplied to a reaction vessel and gas produced and spent soln. are continuously and separately withdrawn.

Ammonia synthesis. H. HARTER. U. S. 1,570,485, Jan. 19. One part of a mixt. of H and N is treated with a catalyst at a pressure exceeding 400 atm. and another part of the mixt. is treated at a lower pressure, e. g., about 300 atm. The treated gas of higher pressure is expanded to lower pressure, the gases are united and NH_3 is condensed from them. The use of the different pressures serves to permit efficient temp. control and heat interchange. Cf. C. A. 20, 96.

Ammonia synthesis. I. W. CEDERBERG. U. S. 1,570,333, Jan. 19. In producing catalyzers for NH_3 synthesis, anhyd. FeCl_3 , or other compds. of metals of the Fe group are mixed with cyanides, e. g., KCN, in liquid anhyd. NH_3 , the mixt. is freed from surplus NH_3 and is heated in a nonoxidizing atm. without fritting.

Ammonia soda process. H. A. GALT. U. S. 1,570,299, Jan. 19. Crude ammonia, concd. brine and a low test CO_2 are brought into contact with each other to carbonate the ammonia without material pptn. of NaHCO_3 . High test CO_2 is passed into the soln. and NaHCO_3 thus pptd. and the latter is calcined to form Na_2CO_3 and produce the high test CO_2 , thus in effect concg. the low test CO_2 .

Separating potassium and sodium hydroxides. SOC. ANON. POUR L'IND. CHIM. À BÂLE. *Brit.* 234,072, May 15, 1924. NaOH and KOH present together in concd. aq. soln. are sep'd. by a process of fractional crystn. in which the KOH is sep'd. at a relatively high temp. and the NaOH by dilg. the remaining mother liquor and cooling. Inorg. salts when present in the original liquor are advantageously removed by concg.

and filtering and org. impurities are removed by evapg. and heating. Several detailed examples are given, with concns. and temps. used

Sodium thiosulfate. H. HOWARD. U. S. 1,570,253, Jan. 19. In producing $\text{Na}_2\text{S}_2\text{O}_3$ by the interaction of Na_2SO_3 with S, the S for the reaction is supplied in gaseous form.

Sodium thiocyanate. M. DARRIN. U. S. 1,570,047, Jan. 19. An aq. soln. contg. NaCNS , $\text{Na}_2\text{S}_2\text{O}_3$ and finely divided impurities (such as is obtained by treatment of gas-purifying materials) is concd. until it b₇₆₀ 130–135°, cooled to between the transition points of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ and NaCNS hydrate, seeded with crystals of a hydrate of $\text{Na}_2\text{S}_2\text{O}_3$ to cause a gelatinous ppt. of $\text{Na}_2\text{S}_2\text{O}_3$ capable of entrapping the finely divided impurities. The ppt. is sepd. and the filtered soln. is concd. until its b. p. is approx. that of a satd. soln. of NaCNS and is then cooled to cause crystn. of anhyd. NaCNS .

Potassium carbonate. H. KLOPSTOCK and W. NEUMANN. Brit. 234,585, April 1, 1924. See U. S. 1,562,891 (C. A. 20, 482).

Aluminium fluoride, etc. RUGERSWERKE-AKT.-GES. Brit. 234,485, May 26, 1924. Clay, bauxite or similar materials contg. Al_2O_3 and SiO_2 are treated with aq. HF (the aluminous material being in excess) so that the Al fluosilicate which is first formed is decomposed, with formation of AlF_3 and SiO_2 . Any SiO_2 remaining in soln. may be pptd. by Al_2O_3 or reactive clays and the pptd. SiO_2 may be used for "binding bacteria," for decolorizing liquids, etc.

Crystallizing acid sodium pyrophosphate, etc. J. T. MILLAR. Brit. 234,197, Feb. 29, 1924. Crystd. salts are prepd. by spraying a heated soln. (e. g., a soln. of acid Na orthophosphate at a temp. of 110° and a d. of 1.65–1.75) into a chamber (which may be heated to 160–200°) in which a quantity of crystals of the desired type has been previously placed. An agitating device in the chamber turns over the crystals as they form "in the manner of a ploughshare."

Hypophosphites, etc. E. MERCK. Brit. 234,138, May 17, 1924. H_3PO_4 and phosphites are obtained together with hypophosphites by treating an aq. suspension of $\text{Ca}(\text{OH})_2$ or other alk. earth hydroxide with P (which may be in the form of sticks) and burning the PH_3 which is evolved. The temp. is raised to start the reaction and when the pressure has risen to 6 atm. the PH_3 is allowed to pass out of the autoclave, through lime towers, to ovens in which it is burned to H_3PO_4 . A stream of N is used for expelling PH_3 from the liquor remaining in the autoclave and it is filtered. The ppt. of lime and Ca phosphite is washed, dissolved in HCl and repptd. by NaOH free from carbonate. The filtrate is neutralized with CO_2 , heated and filtered, and evapd. *in vacuo* to obtain hypophosphite.

Large crystals of metals, oxides or salts. GENERAL ELECTRIC CO., LTD. Brit. 234,449, May 26, 1924. Material to be formed into large crystals is packed in a container which is tapered to a point at one end and is heated progressively from the tapered end to a temp. above the m. p. of the material under treatment.

Alumina. T. R. HAGLUND. Brit. 234,830, June 2, 1924. In fusion of bauxite or similar raw materials in an elec. furnace with reducing agents and sulfide to obtain alumina in a sulfide melt, the raw material is subjected to a preliminary treatment to convert the Fe present into FeS . Numerous details are given.

Alumina. R. JACOBSSON. U. S. 1,570,353, Jan. 19. See Brit. 221,209 (C. A. 19, 877).

Alumina. HOEGANAËS-BILLESOLMS AKTIEBOLAG. Swed. 59,865, Nov. 17, 1925. Materials contg. Al_2O_3 are decomposed by HCl , crystals of AlCl_3 are pptd. by supersatg. the soln. with HCl , the crystals are calcined and the HCl expelled is returned to the process. All or part of the mother liquor from the pptn. app. is introduced into the decompn. app. in such quantities that equal amts. of Al_2O_3 are constantly introduced in the pptn. app. in the form of soln. and removed from it in the form of crystals. And likewise the amt. of HCl and H_2O vapor introduced into the pptn. app. should be equal to the amt. which can be gained by calcination of the crystals removed from the app. during the same period.

Titanium oxide. DEUTSCHE GASGLÜCHT-AUER-GES. Brit. 234,518, May 24, 1924. Acid solns. of Ti sulfate are hydrolyzed under pressure at 160–180°. A soln. of 1.35–1.55 sp. gr. and total free and combined acid of 25–45% is used and a salt such as Na_2SO_4 (or Fe sulfate if the product need not be free from Fe) may be added to weaker solns. to give the specified sp. gr.

Nitrogen. HYDRAZOTE. Brit. 234,104, May 19, 1924. N is obtained from air or other gases rich in N and also contg. some O (such as residual gases obtained in the manuf. of O by liquefying air, or combustion gases) by circulating the gases over hot

reduced Fe, the Fe oxide being then reduced to render the process cyclic. An app. is described.

Hydrogen from gaseous mixtures. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCÉDÉS) G. CLAUDE. Brit. 234,041, May 15, 1924. In the manuf. of H by partial liquefaction of gaseous mixts. contg. it, *e. g.*, coke-oven gas or illuminating gas, the final washing of the compressed H, to remove CO, before expansion, is effected by liquefied N intended for the lubrication of the H-expansion engine.

Activated and decolorizing carbons. G. W. WALLACE. Brit. 234,161, Jan. 25, 1924. See U. S. 1,565,129 (C. A. 20, 483).

Activated carbon from bone char. R. DUNCALFE, R. B. DREW and J. O. CUTTER. Brit. 233,840, March 29, 1924. Bone char or bone char dust is leached with a dil. H_3PO_4 soln. to obtain activated C and H_3PO_4 . The bone char may receive a preliminary re-calcination and may be washed with H_2O after leaching and dried. The combined washing H_2O and leaching soln. is treated with H_2SO_4 in considerably less than the quantity equiv. to the Ca and Mg present. On evapn. di-Ca II phosphate is pptd.

Storage of acetylene and other gases. SVENSKA AKTIEBOLAGET GAS-ACCUMULATOR. Brit. 234,777, May 27, 1924. Containers for storage of C_2H_2 or other gases are filled with balls or lumps which may be formed from kieselguhr, brick dust, pumice, asbestos, cellulose, silk or other fibrous materials agglomerated by cement, $ZnCl_2$ or other suitable binder. The interstices between the balls or lumps are filled with loose kieselguhr or similar material, and the balls may be made with a core of solid material such as charcoal.

Storing acetylene or the like in silica gel. GAS ACCUMULATOR CO. (UNITED KINGDOM), LTD. Brit. 234,462, May 22, 1924. A porous mass of silica gel, alone or with cement or other substances, is used as a filling for cylinders for holding C_2H_2 or other explosive gases. If used in lumps, the interstices may be filled with kieselguhr.

Silica gel. C. S. TERRESWORTH. U. S. 1,570,537, Jan. 19. Silicic acid is allowed to set to a gel in contact with an added porous substance such as diatomaceous earth which serves to produce a highly adsorptive material.

Purifying bauxite. T. R. HAGLUND. U. S. 1,569,483, Jan. 12. In treating bauxite, oxides of Fe, Si and Ti are removed and the Al_2O_3 is dissolved in a sulfide-contg. slag by fusing the bauxite with Fe sulfide or a similar sulfide-yielding material and a reducing agent such as C and sepg. the sulfide- Al_2O_3 slag from the reduced alloy.

Treating kieselguhr for filtration and similar purposes. CELITE CO. Brit. 234,735, Dec. 28, 1923. The process of Brit. 229,021 (C. A. 19, 3004) is modified in that the finely divided diatomaceous earth is calcined without addn. of other material.

Separating solids from solutions in coarse crystals. AKTIESELSKAPET KRISTAL. Norw. 42,020, Oct. 19, 1925. A supersatd. soln. is passed through an agglomeration of crystals of the substance to be sepd., the soln. in the crystn. vessel being kept at a nearly const. temp.

"Artificial snow" for stage effects. J. A. RICE. U. S. 1,569,396, Jan. 12. Powd. casein or a similar protein material soaked in H_2O in the presence of rennet is mixed with a foaming agent such as NH_4 resinate, the mixt. is agitated to produce a froth and a sol. Ca salt, *e. g.*, $CaCl_2$, is added.

Mat finish on coated articles. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 234,813, May 28, 1924. Material contg. bituminous or tarry substances, *e. g.*, asbestos board with a cement or magnesia binder impregnated with asphaltic material derived from still wax or petroleum tailings, is superficially treated with concd. H_2SO_4 or other strong inorg. acid, to give the surface a mat finish.

Composite metal articles. C. P. BYRNES. U. S. 1,562,145, Nov. 17. Composite metal products adapted for stair treads, ornamental articles, etc., are prepd. by mixing loose granules of one metal, *e. g.*, steel, with another metal of lower m. p., *e. g.*, Al, Cu or Al bronze, in molten condition, and permitting solidification of the molten metal.

Articles from cellulose nitrate and similar compositions. E. L. SCHUMACHER. U. S. 1,559,791, Nov. 3. Spectacle frames or other articles are blanked out from unseasoned stock formed from pyroxylin or similar compns. and the cuttings from the unseasoned stock are returned to the "base stock" for reuse in the process to avoid wastage. The blanked out frames, etc., are then seasoned.

Printing surfaces. ACTUALITE ILLUSTREE SOC. ANON. Brit. 234,140, May 19, 1924. A cellulose acetate compn. or similar material is used for forming matrices for making stereotype plates, which are made of material which softens at a lower temp. than the matrix.

Uniting sheets of cotton fabric or other materials under heat and pressure with

phenolic condensation products. J. McINTOSH and J. M. TAYLOR U. S. 1,557,302, Oct. 13.

Cements. ECONOMY FUSE & MFG. CO. Brit. 233,907, June 16, 1924. Cements for dental or other purposes are formed with a content of an aluminate, e. g., 2–10% of Ca aluminate, and used with a setting liquid comprising H_2PO_4 . Various fillers and auxiliary ingredients may also be added in accord with the use to which the cement is to be put and the rapidity of setting, etc., desired. Numerous examples are given.

Putty and filler cement. M. W. NELSON and W. F. NELSON. U. S. 1,570,169, Jan. 19. A putty for glass and wood of window sash, etc., is formed of plaster of Paris 14 lbs., PbO 3–5 oz. and varnish 2 quarts.

"Glass-cloth." A. S. TURNER. U. S. 1,557,185, Oct. 13. Bleached muslin is sized with a Na silicate compn., dried and coated with paraffin and carnauba wax.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

A machine for transverse tests of clay and glass laboratory specimens. A. C. HARRISON *J. Am. Ceram. Soc.* 8, 774–83(1925). C. H. KERR

The ceramics of Argentina in industry and art. A. S. DÍAZ. *Rev. facultad ciencias* 3, No. 2, 33–46(1925).—There are large deposits of Fe-free kaolin in Siján, Catamarca and Cerro de Velasco near La Rioja. In Mar del Plata and Balcarce (Buenos Ayres) are deposits of clay suitable for the manuf. of refractory materials. Argentina has no porcelain industry. Pottery is made from impure materials and has a good domestic market. The great demand for roof tiles, sewer pipes and sinks is covered by the U. S. and Europe in spite of the country's wealth of raw materials. Refractory plates are manufd. throughout the whole country by the most varied processes, from very primitive to entirely modern ones, but generally in a rather empirical manner entailing considerable waste. They gradually replace the imported product in all domestic industries.

MARY JACOBSEN

X-ray investigation of clays and some other ceramic substances. A. HADDING. *Trans. Ceram. Soc. (England)* 24, 27–32(1925).—X-ray "atom" analysis corresponds to ultimate chem. analysis, while X-ray "molecule" analysis shows the structure of the material. In the finest residues of clay obtained by elutriation only cryst. material is found. The only minerals found in quantity in normal clays are quartz, kaolinite and muscovite. A brief description of the X-ray app. used and some diagrams obtained are given.

H. F. K.

Introductory study of the Puget Sound shale and glacial clays. T. O. SMITH. *J. Am. Ceram. Soc.* 8, 849–52(1925). C. H. KERR

Some properties of clay-sillimanite mixtures. H. S. HOULDSWORTH. *Trans. Ceram. Soc. (England)* 24, 33–41(1925).—To Farnley fireclay, increments of natural corn. sillimanite were added and the effects on the phys. properties noted. With increasing sillimanite content the drying and burning contraction decreased, porosity at high temps. increased and a more regular coeff. of thermal expansion resulted. The refractoriness and the resistance to attack of slag and soda lime glasses were decidedly greater with sillimanite contents over 50%.

H. F. K.

Some observations on the drying properties of clays. D. C. LINDSAY and W. H. WADLEIGH. *J. Am. Ceram. Soc.* 8, 677–93(1925).—A preliminary report. Evapn. is directly proportional to surface area exposed per unit. wt. of dry clay. Rate of drying is very important and best rate varies with type of clay. Causes of drying injuries are discussed. A lab. drying cabinet is described.

C. H. KERR

Kaolin (1) Thermal changes. (2) Rational analysis of clay. K. A. VESTERBERG, et al. *Arkiv. Kemi Min. Geol.* 9, No. 14, 1–26(1925).—Kaolin on being heated to 800° does not decompose into free Al_2O_3 and SiO_2 , but forms $Al_2Si_2O_7$, which is sol. in HCl. On heating kaolin to 1000° the product is completely insol. in HCl. Glagerite ($Al_2O_3 \cdot 2SiO_2 \cdot 2.55H_2O$) differs from kaolin in that it is 50% sol. in 20% HCl, and is rendered completely sol. by heating to 750°. Pyrophyllite differs from both the other minerals in that it is not rendered sol. by heating. (2) The rational method recommended is: 1 g. clay is heated for 1 hr. with 10 cc. 20% HCl, and the undissolved portion is again subjected to the same treatment, part of it directly, and the remainder after being heated to 800°. Sol. Al_2O_3 is detd. in the HCl soln., and the sol. SiO_2 in the residue is extd. by boiling with 50 cc. of 5% Na_2CO_3 , 0.5% NaOH, and 25 cc. 5%

KOH. The differences between the Al_2O_3 and SiO_2 values obtained before and after heating give the Al_2O_3 and SiO_2 present as kaolin (they should be molecularly 1:2) and the kaolin is calcd. by multiplying Al_2O_3 by 2.533. Analyses of clays from Sweden and Germany gave kaolin contents varying from 73.9 to 1.65% B. C. A.

United States Government master specification for fireclay. Federal Specification Board, *Spec. No. 334*; Bur. of Standards, *Circ. No. 298*, 6 pp. (1925). E. J. C.

The influence of exposure on the chemical and physical properties of certain fireclays. W. HUGILL AND W. J. REES. *Trans. Ceram. Soc. (England)* **24**, 42-62 (1925).---Two sandy micaceous clays and one compact fine-grained clay were exposed to weathering for 12 months. The chem. analysis before and after exposure showed a loss of SiO_2 of about 1%, not much change in Fe_2O_3 and TiO_2 , definite but varied losses among the samples of the alkalis and alkaline earths, and gains in Al_2O_3 and loss on ignition. The greatest gain was in the Al_2O_3 content, this amounting to 2.79% in one case while the same clay gained 0.85% in loss on ignition. The refractoriness of each weathered clay increased about one cone, while the drying shrinkage decreased 8-25%. At 1600° more melt formed from the clay which had not been exposed. The working properties of the more siliceous clays were improved with exposure while the more aluminous clay suffered thereby. H. F. K.

The action of heat on kaolinite and on kaolinitic clays. V. VERNADSKII. *Trans. Ceram. Soc. (England)* **24**, 13-21 (1925).---The formula $\text{Al}_2\text{Si}_2\text{O}_5(\text{HO})_2 \cdot \text{H}_2\text{O}$ is suggested for kaolinite to distinguish the 2 kinds of H_2O which V. asserts are present. The chem. H_2O is driven off by heating to 450-460°, while the zeolitic H_2O is expelled gradually below and above this temp. The residue is held to be leverrierite, $\text{Al}_2\text{Si}_2\text{O}_7$, and not a mixt. of free Al_2O_3 and SiO_2 . The formation of sillimanite and mullite from leverrierite is discussed with the aid of certain cyclic structural formulas. H. F. K.

Alumina-silica minerals in firebrick. W. J. REES. *Trans. Ceram. Soc. (England)* **24**, 23-6 (1925).---The H_2F_2 -insol. residues in firebricks increase definitely with the temp. of firing and with the Al_2O_3 content. The residues agree closely with the compn. of mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$). H. F. K.

The manufacture and physical properties of dry-press brick. J. H. KRUSON AND C. A. SMITH. *J. Am. Ceram. Soc.* **8**, 829-32 (1925).---Advantages over stiff-mud brick are given. C. H. KERR

Firebricks for furnaces using pulverized fuel. ANON. *Brit. Clayworker* **34**, 255 (1925).---Speaking generally, bricks which will best resist the action in a furnace using pulverized fuel are those with a close surface and so accurate a shape that they can be laid with the thinnest possible joints. Beyond this, silica bricks—if they do not spall—are usually more durable than fireclay bricks, but no general statement such as this should be understood as excluding all fireclay brick. A method of comparing the resistances of different bricks to pulverized fuel, as devised by Steinhoff of Dortmund, is described. H. G. SCHURECHT

Shales of North Carolina. J. L. STUCKEY. *J. Am. Ceram. Soc.* **8**, 843-8 (1925).---They are well adapted to the manuf. of face brick, hollow blocks, sewer pipe, etc. C. H. KERR

Progress report on research of paving brick from Iowa shales. D. A. MOULTON. *J. Am. Ceram. Soc.* **8**, 694-701 (1925).---Eleven shales were tested, in full-size bricks. Five were found excellent. The soft-mud, roller expression machine gave equal or better results than the stiff-mud process. MgO reduced the rattler test from 27 to 22% loss, and changed color to buff. C. H. KERR

The manufacture of graphite pencils and its relationship to ceramics. H. V. PERRIER. *Chimie et industrie Special No.*, 339-45 (Sept., 1925).---Descriptive, showing the analogy with and difference from ceramics due to the use of clay. A. P.-C.

Calcining as an aid to grinding. W. M. MYERS. *J. Am. Ceram. Soc.* **8**, 839-42 (1925).---Expts. show no value commensurate with the cost. C. H. KERR

Bureau of Standards investigation of feldspar. R. F. GELLER. *Ceramist* **6**, 708-16 (1925).---G. reports the progress of the investigation of the factors affecting glaze hardness. Glazes to be tested are abraded by a falling stream of sand and the amt. of surface worn away by a definite weight of sand is detd. by an Ingersoll Glarimeter. Preliminary data are given in the form of a graph. The feldspar investigation is divided into 2 parts. The first part consists of a comparison of tests for softening point, fusion point, chem. analysis, fineness as carried out by cooperating industrial labs. and the Bureau. The second part includes studies of viscosity of feldspars at softening temps. and the effect of feldspars on the burning range, porosity, color and strength of vitreous and semi-vitreous bodies. Petrographic examns. are being made

in all cases. G. reports the outcome of studies on fineness, chem. analyses and quartz content to date.

Black cores. ANON. *Brit. Clayworker* 34, 256(1925).—Flaws in ceramic ware are often caused by the intrusion of particles of foreign matter into the bodies during manuf. As a rule, Fe_2O_3 , CuO or particles from the furnace are the sources. "Black core" is mainly attributed to the decompn. of pyrites. These cores have the form of small cone-shaped hollows contg. a fraction of the pyrites in the bottom. To prevent these flaws, ventilation should be good, and heating should be carried out slowly during the oxidation period, particularly as the temp. approaches 1000° . If the whole of the C present has not been oxidized when the temp. has reached 1000° , pyrites, which, under ordinary conditions decomposes rapidly at 850° , will most likely act with the clay, forming black core. The formation of this defect is less frequent in dry-pressed bricks than in the plastic-made of fine texture. The presence of large grains of calcareous matter also produces flaws. The method recommended to prevent black core applies also to preventing calcareous flaws.

H. G. SCHURECHT

The effect of heat on the strength of calcined kieselguhr-portland cement mixtures. S. J. McDOWELL AND H. M. KRANER. *J. Am. Ceram. Soc.* 8, 784-8(1925).—Strength decreases rapidly at 100° , remains fairly const. between 200° and 500° , decreases slowly to about 800° , increases slightly between 800° and 1000° , and decreases further above 1000° .

C. H. KERR

Comparison of methods used in estimating the maturing of terra cotta. L. ANDERSON. *J. Am. Ceram. Soc.* 8, 762-7(1925).—Shrinkage trial pieces are more reliable than slip trials. Cones also should be used.

C. H. KERR

Metal porosimeter for determining the pore volume of highly vitrified ware. L. NAVIAS. *J. Am. Ceram. Soc.* 8, 816-21(1925).—The app. is of the McLeod-Gage type.

C. H. KERR

A laboratory kiln for obtaining high temperatures. F. H. NORTON. *J. Am. Ceram. Soc.* 8, 826-8(1925).—Describes a small gas-fired lab. kiln with temp. range up to 1850° .

C. H. KERR

The thermal expansion of refractories. F. H. NORTON. *J. Am. Ceram. Soc.* 8, 799-815(1925).—Contains much new and valuable information. The following table summarizes important characteristics:

Specimen no.	Type of brick	Melting point (reducing atm.)	Firing temp.	Mean coeff. $\times 10^{-7}$ of expansion between 0°C. and shrinking temp.	Max. coeff. $\times 10^{-7}$ of expansion between 300° and 700°	Max. irreversible contraction or expansion up to 1700°	Inversion points	Changes in slope	Temp. at which shrinkage or expansion begins
1	Silica	1700°	...	83	1000	1%	$260^\circ, 610^\circ$	1400°	1550°
2	Kaolin	1740	1300°	47	79	1	$260^\circ, 600^\circ$	..	1050
3	Kaolin	1740	1430	68	87	1	$260^\circ, 600^\circ$	..	1380
4	Kaolin	1740	1500	53	70	1	$260^\circ, 600^\circ$	..	1580
5	Kaolin	1740	1620	43	67	1	.....	..	1610
6	Fire clay (Mo.)	1720	..	54	80	large	600°	..	1300
7	Fire clay (Pa.)	1680	..	51	64	-5°	600°	1250	1250
8	Fire clay (Colo.)	1700	..	54	174	large	$260^\circ, 600^\circ$	..	1220
9	Fire clay (Md.)	1610	..	45	80	-3	.....	..	1100
10	Silicon carbide	$2000+$	..	43	48	0	.....	..	$1700+$
11	Zircon (white)	$2000+$	1650	64	92	large	800°	1400	1510
12	Zircon (brown)	1935	1590	42	48	2	$600^\circ, 1400^\circ$	..	1550
13	Zirconia	$2000+$	1675	59	87	1	$800^\circ, 1150^\circ$	..	1600
14	Mullite	1850	1785	53	82	0	$780^\circ, 1350^\circ$	..	$1700+$
15	Magnesite (pure)	$2000+$	1680	142	151	0	1430°	1000	$1700+$
16	Magnesite (com.)	..	..	147	210	2	.....	500	1440
17	Chrome (com.)	..	..	104	124	2	1000°	1130	1540
18	Spinel	$2000+$	1690	76	110	1	.....	1200	1600
19	Lime	$2000+$	1740	138	145	0	1500°	700	$1700+$
20	Alumina	$2000+$	1650	77	82	1	1180°	..	1580
21	Insulating	1630	..	74	480	large	$200^\circ, 570^\circ$	..	1050

C. H. KERR

KOH. The differences between the Al_2O_3 and SiO_2 values obtained before and after heating give the Al_2O_3 and SiO_2 present as kaolin (they should be molecularly 1:2) and the kaolin is calcd. by multiplying Al_2O_3 by 2.533. Analyses of clays from Sweden and Germany gave kaolin contents varying from 73.9 to 1.65%. B. C. A.

United States Government master specification for fireclay. Federal Specification Board, *Spec. No. 334*; Bur. of Standards, *Circ. No. 298*, 6 pp.(1925). E. J. C.

The influence of exposure on the chemical and physical properties of certain fire-clays. W. HUGILL AND W. J. REES. *Trans. Ceram. Soc. (England)* **24**, 42-62(1925).—Two sandy micaceous clays and one compact fine-grained clay were exposed to weathering for 12 months. The chem. analysis before and after exposure showed a loss of SiO_2 of about 1%, not much change in Fe_2O_3 and TiO_2 , definite but varied losses among the samples of the alkalis and alkaline earths, and gains in Al_2O_3 and loss on ignition. The greatest gain was in the Al_2O_3 content, this amounting to 2.79% in one case while the same clay gained 0.85% in loss on ignition. The refractoriness of each weathered clay increased about one cone, while the drying shrinkage decreased 8-25%. At 1600° more melt formed from the clay which had not been exposed. The working properties of the more siliceous clays were improved with exposure while the more aluminous clay suffered thereby. H. F. K.

The action of heat on kaolinite and on kaolinitic clays. V. VERNADSKII. *Trans. Ceram. Soc. (England)* **24**, 13-21(1925).—The formula $\text{Al}_2\text{Si}_2\text{O}_5(\text{HO})_2 \cdot \text{H}_2\text{O}$ is suggested for kaolinite to distinguish the 2 kinds of H_2O which V. asserts are present. The chem. H_2O is driven off by heating to 450-460°, while the zeolitic H_2O is expelled gradually below and above this temp. The residue is held to be leverrierite, $\text{Al}_2\text{Si}_2\text{O}_7$, and not a mixt. of free Al_2O_3 and SiO_2 . The formation of sillimanite and mullite from leverrierite is discussed with the aid of certain cyclic structural formulas. H. F. K.

Alumina-silica minerals in firebrick. W. J. REES. *Trans. Ceram. Soc. (England)* **24**, 23-6(1925).—The H_2F_2 -insol. residues in firebricks increase definitely with the temp. of firing and with the Al_2O_3 content. The residues agree closely with the compn. of mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$). H. F. K.

The manufacture and physical properties of dry-press brick. J. H. KRUSON AND C. A. SMITH. *J. Am. Ceram. Soc.* **8**, 829-32(1925).—Advantages over stiff-mud brick are given. C. H. KERR

Firebricks for furnaces using pulverized fuel. ANON. *Brit. Clayworker* **34**, 255(1925).—Speaking generally, bricks which will best resist the action in a furnace using pulverized fuel are those with a close surface and so accurate a shape that they can be laid with the thinnest possible joints. Beyond this, silica bricks—if they do not spall—are usually more durable than fireclay bricks, but no general statement such as this should be understood as excluding all fireclay brick. A method of comparing the resistances of different bricks to pulverized fuel, as devised by Steinhoff of Dortmund, is described. H. G. SCHURCHT

Shales of North Carolina. J. L. STUCKEY. *J. Am. Ceram. Soc.* **8**, 843-8(1925).—They are well adapted to the manuf. of face brick, hollow blocks, sewer pipe, etc. C. H. KERR

Progress report on research of paving brick from Iowa shales. D. A. MOULTON. *J. Am. Ceram. Soc.* **8**, 694-701(1925).—Eleven shales were tested, in full-size bricks. Five were found excellent. The soft-mud, roller expression machine gave equal or better results than the stiff-mud process. MgO reduced the rattler test from 27 to 22% loss, and changed color to buff. C. H. KERR

The manufacture of graphite pencils and its relationship to ceramics. H. V. PERRIER. *Chimie et industrie Special No.*, 339-45(Sept., 1925).—Descriptive, showing the analogy with and difference from ceramics due to the use of clay. A. P.-C.

Calcining as an aid to grinding. W. M. MYERS. *J. Am. Ceram. Soc.* **8**, 839-42(1925).—Expts. show no value commensurate with the cost. C. H. KERR

Bureau of Standards investigation of feldspar. R. F. GELLER. *Ceramist* **6**, 708-16(1925).—G. reports the progress of the investigation of the factors affecting glaze hardness. Glazes to be tested are abraded by a falling stream of sand and the amt. of surface worn away by a definite weight of sand is detd. by an Ingersoll Glarimeter. Preliminary data are given in the form of a graph. The feldspar investigation is divided into 2 parts. The first part consists of a comparison of tests for softening point, fusion point, chem. analysis, fineness as carried out by cooperating industrial labs. and the Bureau. The second part includes studies of viscosity of feldspars at softening temps. and the effect of feldspars on the burning range, porosity, color and strength of vitreous and semi-vitreous bodies. Petrographic examns. are being made

in all cases. G. reports the outcome of studies on fineness, chem. analyses and quartz content to date.

Black cores. ANON. *Brit. Clayworker* 34, 256(1925).—Flaws in ceramic ware are often caused by the intrusion of particles of foreign matter into the bodies during manuf. As a rule, Fe_2O_3 , CuO or particles from the furnace are the sources. "Black core" is mainly attributed to the decompn. of pyrites. These cores have the form of small cone-shaped hollows contg. a fraction of the pyrites in the bottom. To prevent these flaws, ventilation should be good, and heating should be carried out slowly during the oxidation period, particularly as the temp. approaches 1000° . If the whole of the C present has not been oxidized when the temp. has reached 1000° , pyrites, which, under ordinary conditions decomposes rapidly at 850° , will most likely act with the clay, forming black core. The formation of this defect is less frequent in dry-pressed bricks than in the plastic-made of fine texture. The presence of large grains of calcareous matter also produces flaws. The method recommended to prevent black core applies also to preventing calcareous flaws.

H. G. SCHURECHT

The effect of heat on the strength of calcined kieselguhr-portland cement mixtures. S. J. McDOWELL AND H. M. KRANER. *J. Am. Ceram. Soc.* 8, 784-8(1925).—Strength decreases rapidly at 100° , remains fairly const. between 200° and 500° , decreases slowly to about 800° , increases slightly between 800° and 1000° , and decreases further above 1000° .

C. H. KERR

Comparison of methods used in estimating the maturing of terra cotta. I. ANDERSON. *J. Am. Ceram. Soc.* 8, 762-7(1925).—Shrinkage trial pieces are more reliable than slip trials. Cones also should be used.

C. H. KERR

Metal porosimeter for determining the pore volume of highly vitrified ware. I. NAVIAS. *J. Am. Ceram. Soc.* 8, 816-21(1925).—The app. is of the McLeod-Gage type.

C. H. KERR

A laboratory kiln for obtaining high temperatures. F. H. NORTON. *J. Am. Ceram. Soc.* 8, 826-8(1925).—Describes a small gas-fired lab. kiln with temp. range up to 1850° .

C. H. KERR

The thermal expansion of refractories. F. H. NORTON. *J. Am. Ceram. Soc.* 8, 799-815(1925).—Contains much new and valuable information. The following table summarizes important characteristics:

Specimen no.	Type of brick	Melting point (reducing atm.)	Firing temp.	Mean coeff. $\times 10^{-7}$ of expansion between 0°C. and shrinking temp.	Max. coeff. $\times 10^{-7}$ expansion between 300° and 700°	Max. irreversible contraction or expansion up to 1700°	Inversion points	Changes in slope	Temp. at which shrinkage or expansion begins
1	Silica	1700°	...	83	1000	1%	$260^\circ, 610^\circ$	1400°	1550°
2	Kaolin	1740	1300°	47	79	1	$260^\circ, 600^\circ$	..	1050
3	Kaolin	1740	1430	68	87	1	$260^\circ, 600^\circ$	..	1380
4	Kaolin	1740	1500	53	70	1	$260^\circ, 600^\circ$	..	1580
5	Kaolin	1740	1620	43	67	1	.....	..	1610
6	Fire clay (Mo.)	1720	..	54	80	large	600°	..	1300
7	Fire clay (Pa.)	1680	..	51	64	-5°	600°	1250°	1250
8	Fire clay (Colo.)	1700	..	54	174	large	$260^\circ, 600^\circ$	..	1220
9	Fire clay (Md.)	1610	..	45	80	-3°	1100
10	Silicon carbide	$2000+$	..	43	48	0	.....	..	$1700+$
11	Zircon (white)	$2000+$	1650	64	92	large	800°	1400°	1510
12	Zircon (brown)	1935	1590	42	48	2	$600^\circ, 1400^\circ$	..	1550
13	Zirconia	$2000+$	1675	59	87	1	$800^\circ, 1150^\circ$	..	1600
14	Mullite	1850	1785	53	82	0	$780^\circ, 1350^\circ$	..	$1700+$
15	Magnesite (pure)	$2000+$	1680	142	151	0	1430°	1000	$1700+$
16	Magnesite (com.)	..	..	147	210	2	.....	500	1440
17	Chrome (com.)	..	..	104	124	2	1000°	1130	1540
18	Spinel	$2000+$	1690	76	110	1	.....	1200	1600
19	Lime	$2000+$	1740	138	145	0	1500°	700	$1700+$
20	Alumina	$2000+$	1650	77	82	1	1180°	..	1580
21	Insulating	1630	..	74	480	large	$200^\circ, 570^\circ$	..	1050

C. H. KERR

The examination of refractory materials and other aluminous substances. E. SCHÜRMANN AND W. BÖHM. *Chem.-Ztg.* **49**, 933-4, 958-9(1925).—A scheme of analysis is given to det. the constituents occurring in small amts. in the presence of large amts. of SiO_2 and Al_2O_3 . The finely powd. material is freed from SiO_2 by H_2SO_4 and H_2F_2 treatment, the bulk of the Al_2O_3 is removed by double pptn. as AlCl_3 from satd. HCl soln., the small remaining amts. being pptd. with the Fe and Ti by NH_4OH . The TiO_2 is sepd. by cupferron. The Fe_2O_3 , CaO and MgO are detd. by the usual methods in the absence of Ni and Mn. Small amts. of MgO are sepd. from the alkalis by Fresenius' HgO method. The alkalis are sepd. by K_2PtCl_6 . The detn. of S and P is not recorded. H. F. K.

Contribution to the study of refractories. V. BODIN. *Ceramique* **28**, 98-9(1925).—B. discusses clause 98 of the (French) marine on refractories. It is pointed out that refractories used by the marine must stand temps., varying from 1450° to 1650° in certain cases. H. G. SCHURECHT

The effect of variations in cupola practice on the life of refractory blocks. J. T. MACKENZIE. *J. Am. Ceram. Soc.* **8**, 720-34(1925).—The chief trouble noted is the injurious effect of oxidation resulting from thin or rusty scrap and from too high velocity of the blast. C. H. KERR

Operating conditions in the open hearth as they affect the life of refractories. C. A. SMITH. *J. Am. Ceram. Soc.* **8**, 833-8(1925). C. H. KERR

Refractory requirements in the gray-iron foundry. R. MOLDENKE. *J. Am. Ceram. Soc.* **8**, 712-9(1925). C. H. KERR

Principal refractory problems of the malleable-cast-iron foundry. H. A. SCHWARTZ. *J. Am. Ceram. Soc.* **8**, 708-11(1925). C. H. KERR

Rapid (density) method for determining the bauxite content of refractory brick. J. A. L. *Rev. mat. constr. trav. pub.* **193**, 236-7B(1925).—The apparent d. of clay products varies between 1.5 and 2.4, whereas the true d. (by powder method) is in the neighborhood of 2.67 and does not exceed 2.72. The apparent d. of bauxitic products varies between 1.9 and 2.2, while the true d. is between 3.1 and 3.2. By detg. the true d. of a material an est. of its bauxite content can be made, assuming that each addn. of 10% bauxite causes an increase in true d. of 0.005 above 2.72. The (1) apparent and (2) true d. of 3 refractory bricks exemplify: Belgian (1) 2.13, (2) 2.820; English, (1) 2.09, (2) 2.647; French (1) 2.18, (2) 2.643. The Belgian brick contains about 20% bauxite. LOUIS NAVIAS

A laboratory load furnace. P. D. HELSER. *J. Am. Ceram. Soc.* **8**, 822-5(1925).—An improved furnace for testing the load-carrying capacity of refractories. The advantages are: (1) direct application of load to specimen, (2) perfect alignment of specimen beneath load, (3) control of temp., (4) control of atm. in the testing chamber, (5) measurement of vol. changes throughout the test. C. H. KERR

New type of oxy-acetylene fusion furnace, with notes on the behavior of refractories at cone 40. A. F. GORTON AND W. H. GROVES. *J. Am. Ceram. Soc.* **8**, 768-73(1925). C. H. KERR

Effects of composition on the properties of sheet-steel enamels. H. G. WOLFRAM AND W. N. HARRISON. *J. Am. Ceram. Soc.* **8**, 735-55(1925).—Substituting feldspar for flint and flint for feldspar, also varying other constituents were studied. Coeff. of expansion is only one of the important factors. B_2O_3 and Na_2O used in place of some opacifier sometimes increases opacity. Replacing flint by feldspar increased resistance to edge-impact; decreased resistance to center-impact; decreased opacity; decreased resistance to both quenching and acid attack. In most cases replacing feldspar by flint increased resistance to quenching and to acid attack; decreased opacity; slightly decreased resistance to impact on edge and center. Enamels contg. both SiO_2 and feldspar were, on the whole, most satisfactory. C. H. KERR

A method for testing the cross-bending strength of enamels. R. R. DANIELSON AND W. C. LINDEMANN. *J. Am. Ceram. Soc.* **8**, 795-8(1925).—Impact tests are not entirely applicable to flat ware where strains are usually due to bending. A bending test device is described. C. H. KERR

The application of pebble or ball mills in enameling. E. W. LAWLER. *J. Am. Ceram. Soc.* **8**, 853-7(1925). C. H. KERR

Electrically annealed glass (ANON.) 4. Furnace for enameled articles (U. S. pat. 1,570,340) 1.

BERGE, AUGUST: *Chemische Technologie der Tonwaren*. Ein Repetitorium f. Keramiker. Halle (Saale): W. Knapp. 47 pp. R. M. 2.

Vitreous composition. E. C. BUCK. U. S. 1,570,202, Jan. 19. A vitreous compn. which is adapted for resisting HF and fluosilicic acid comprises a fused complex metaphosphate of Al and an alkaline earth metal substantially free from SiO_2 .

Glass-melting tanks. T. H. SWARTZLANDER. U. S. 1,569,152, Jan. 12.

Ophthalmic lens. E. D. TILLYER. U. S. 1,557,631, Oct. 20. In order to apply trade marks or other markings, a spot on the lens is subjected to a treatment (such as application of H_3PO_4 and heating) which causes it to react differently from the rest of the lens with respect to vapor, there being no change in the refractive properties of the lens except as caused by vapor.

Clay for ceramic articles. A. O. AUSTIN. U. S. 1,569,251, Jan. 12. Material for ceramic articles is prepd. in 2 portions, a dry portion and a portion rendered fluent by admixture of H_2O . These 2 are mixed together in such quantities that the mixt will contain somewhat more H_2O than is desired when the ceramic articles are molded and the excess H_2O is removed by evapn. to condition the material for molding.

Insulation bricks, etc. H. V. ALLEN. Brit. 234,538, Feb. 26, 1925. Bricks and blocks adapted for use in smelting furnaces, coke ovens and the like are made from a compn. of 80–87½% of coke breeze or dust and 20–12½% of a refractory clay, such as fire, ball, or china clay, or marl, mixed with H_2O , molded and burned to produce a porous product.

Glazing brick. A. FISCHER, JR. U. S. 1,570,137, Jan. 19. The surface of a normally non-conducting brick is heated to bring it into condition for conducting electricity, glazing material is applied to the heated brick and the material is fused by passing an elec. current through the surface of the brick and glazing material.

Kilns for burning bricks, etc. W. W. DICKINSON, JR. U. S. 1,569,952–3, Jan. 19.

Kiln for porcelain enameled ware, etc. H. B. CANNON. Brit. 234,049, May 14, 1924.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Cement manufacture and its possibilities in the Crown Colonies and protectorates.

IV. ANON. *Bull. Imp. Inst.* 23, 431–51 (1925); cf. C. A. 19, 879—Particulars are given relating to deposits of materials, which might be suitable for cement making, which have so far been discovered in British Malaya, North Borneo, Sarawak, Ceylon, Hong Kong, Palestine, Cyprus and Malta, with a discussion of the possibilities of cement manuf. in these regions.

A. PAPINEAU-COUTURE

The calculation of coal expenses in rotary cement kilns. D. A. TCHERNOBAIEFF. *J. Am. Ceram. Soc.* 8, 702–7 (1925).

C. H. KERR

Cement duct as manufactured and used in California. H. H. BUELL, R. P. LUTZ and H. C. MOYER. *J. Electricity* 56, 52–4 (1926).—Detailed description of the manuf. of these small cement "pipes."

C. G. F.

Studies of curing concrete in a semi-arid climate. HARRISON F. GONNERMAN and C. L. MCKESSON. Structural Materials Research Lab., Lewis Institute. *Bull.* 15, 37 pp. (1925).—Transverse breaking tests and surface-hardness tests by a ball-indentation method at ages from 3 to 90 days were made on $7 \times 10 \times 38$ -in. plain concrete beams cured out-of-doors by the following methods: (1) Covering with wet earth, (2) open air, (3) covering with asphaltic paper, (4) sprinkling surface with flake CaCl_2 , (5) brushing surface with sodium silicate solutions. These and test of changes of wt. during curing indicate that a curing method which prevents loss of moisture for 3 days or more is sufficient; 7- and 14-day wet-earth curing gave slightly better results at 90 days than 3-day wet curing. Methods (2) and (5) gave flexural strengths averaging about 80% of those obtained by method (1). Methods (3) and (4) gave intermediate flexural strengths.

RAYMOND WILSON

Siliceous limestone roads. LOUIS CABU. *Rev. universelle mines* 8 (7), 241–5 (1925).—A new type of material for surfacing roads consists of a thorough mixt. of sand, (350 l.), Na silicate (40 l. of d. 1.32) and crushed and previously moistened stone (1 cu. m.). The chief advantage is its great economy wherever limestone and Na silicate are available at low cost.

C. C. DAVIS

The durability of roofing slates. EINAR BOHR. *Industriidningen Norden* 54, 363–5 (1925).—The durability of various slate species of European origin is considered with special regard to their geological nature and chem. compn.

C. A. ROBAK

Corrugated building paper, its production and use. ANON. *Teer* 24, 5–7 (1926).—A brief discussion of its pressing, impregnation and use in construction.

W. B. P.

Roofing paper nomenclature. HEINRICH MALLISON. *Teer* **24**, 7-8(1926).—Favoring expressed distinction between papers prep'd. from tar pitch and from asphalt.

W. B. PLUMMER

Wood preservation. J. A. MARONIER. *Arch. Suikerind.* **33**, 1141-59(1925).—The economic aspects of the subject are discussed from the Dutch East Indian standpoint, and a description is given of the various methods in general use, with illustrations. Particularly good results have been obtained on various woods by the use of *Ombilin*, a coal-tar distillate contg. 66.7% PhOH, and higher phenols. It is applied at 85° with first a pressure of 6 atm. for 0.5 hr., followed by a vacuum of 43-43.5 cm. for 0.25 hr. The installation is simple and can be improvized in the sugar factory.

F. W. ZERBAN

Experiments carried out with the object of ascertaining the suitability of various kinds of woods for industrial chemical and metallurgical operations. J. K. STEWART. *Fruit Products J. and Am. Vinegar Ind.* **5**, No. 5, 33-5(1926).—Information on the following points was sought: change in vol., absorption of the solns., phys. deterioration, such as fiber destruction, weakening, etc.

J. A. KENNEDY

AMAR, CHARLES. *Théorie général et formulaire pratique du ciment armé.* Paris: Gauthier-Villars et Cie. 179 pp. Reviewed in *Le Génie Civil* **87**, 524(1925).

Cement tiles, etc. SOC. LAP. Brit. 234,846, May 30, 1924. In processes such as those of Brit. 217,605 (C. A. **19**, 387) and Brit. 222,500 (C. A. **19**, 1040) special aluminous cements are used to obtain somewhat translucent polished products. The special cements comprise silico-aluminous compds. in which the index ($\text{SiO}_2 + \text{Al}_2\text{O}_3$) ($\text{CaO} + \text{MgO}$) is greater than 0.6 and in which the proportion of Fe is less than 1.5%; or Ca aluminate, CaO , Al_2O_3 , contg. less than 5% impurities and less than 5% Fe. Fillers may be added.

Wet process of cement manufacture. G. POLYSIUS. Brit. 233,764, Feb. 11, 1924. The sludge is dried by waste gases from a rotary kiln, the drying, *e. g.*, being effected in a drum situated in the smoke box between the kiln and stack. Various structural details of the plant are described.

Cement and mortar materials. O. TETENS and REKORD-ZEMENT-INDUSTRIE GES. Brit. 234,233, March 25, 1924. Mixts. contg. siliceous, calcareous and bituminous ingredients are burned without addn. of fuel at temps. below the vitrifying point and with recovery of oil. The residue may be molded into bricks or ground for use as a cement.

Artificial stone. G. POLYSIUS. Brit. 234,302, June 24, 1924. Ground slag is mixed with unburnt gypsum or anhydrite, with or without sand, soda or CaO .

Artificial stone. J. THOMAS. U. S. 1,570,538, Jan. 19. A cementitious mixt. of semi-fluid consistency such as "Kcene's cement" is poured in successive layers with small quantities of colored dry cement or similar dry material on the surface of each layer to form veins or striations when the mass has hardened.

Plaster of Paris. E. L. WILSON. U. S. 1,570,583, Jan. 19. In producing plaster of Paris from pptd. gypsum, cryst. accretion is effected by subjecting the material to pressure to cause the crystals to coalesce, the coalesced crystals are converted into a non-compacted, interstitially extended mass, *e. g.*, by a shaving or crumbling, and this mass is uniformly calcined.

Cold glazes. C. J. TIDY. Brit. 234,707, Nov. 12, 1924. A cold glaze for cement, concrete and the like comprises a mixt. of port. cement, Al_2O_3 and a soln. of CaCl_2 , to which various pigments also may be added.

Color-blending filler for pavement cracks. H. C. HELMLE. U. S. 1,570,219, Jan. 19. A mixt. comprising crude rubber $1\frac{1}{2}$ -3, rosin 25-30, 37-40° B \acute{e} . distillate oil 1-4, TiO_2 0.05-0.5 and BaSO_4 0.1-1.0 lb., together with sufficient lamp black to give the desired shade of gray.

Macadamized roads. C. H. MURRELL and E. A. PHILLIPS. Brit. 233,776, Feb. 14, 1924. Road surfaces are repaired by distributing powd. or broken bitumen on them and pouring heated rock asphalt on the bitumen. Sufficient heat is utilized to cause adhesion of the materials and finely divided granite, chalk, "refuse," ground clinker or glass may be incorporated in the layer of asphalt.

Bituminous paving. J. H. AMIES. U. S. 1,570,028, Jan. 19. A one-tenth portion of a natural soil of the grade is heated by a blast heater to about 1100°. The remainder of the soil is macerated with boiling hot H_2O and the heated soil added. To each 9 cu. ft. of this highly heated mass there is added 20-30 lbs. of finely granulated quicklime, and finally, highly heated bituminous material.

Bituminous emulsions. H. A. MACKAY. Brit. 233,784, Feb. 14, 1924. Naphthene acid (with or without oleic acid or a similar fatty acid) together with hot H_2O and alkalis or alk. salts is used for emulsifying Mexican asphalt, pitch, or similar substances for use in road-making, briquets or as a waterproofing agent for stone, wood, roofing felt, etc.

Treating roads with bituminous substances. I. M. MUMFORD and T. S. BUTTERWORTH. Brit. 233,826, March 15, 1924. An aq. soln., *c. g.*, one contg. $NaHSO_4$ 10 and H_2SO_4 5%, capable of pptg. tar, pitch or the like from an aq. dispersion in which it is applied to a road, is spread on the road before the spreading of the bituminous dispersion.

"Artificial wood." A. FÖRSTER. U. S. 1,569,272, Jan. 12. A mixt. of sawdust and chalk or other soft mineral filler is moistened with a dil. soln. of chromate-glue in which the content of glue is considerably under 10%, the mixt. is worked and molded under high pressure and after the pressure is maintained for some time the product is dried.

Dyeing wood. H. RENNER. U. S. 1,570,575, Jan. 19. There is combined with the sap through the cellular tissue of wood, a mixt. of a coloring metal compd. such as $FeCl_3$ and $NaOAc$ in H_2O and a volatile or unstable substance in soln. or suspension, *c. g.* formic acid, forming salts for a time. The wood is dried out and the complex salts are decomposed and dyeing is effected by depositing permanent dyes fixed in the cells of the wood by the reactions which ensue.

Heating and chemical treatment of wood. H. D. P. HUIZER. Brit. 233,778, Feb. 14, 1924. Wood, *c. g.* plywood or the sheets for making it, is heated in a mold or between plates until it scorches and may be treated with dyes, "chemicals," metallic powders or fireproofing substances.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Production of coal (substitute) from wood. H. STRACHE. *Chem.-Ztg.* 49, 985 (1925); *Z. österr. Ver. Gas-u. Wasserfach.* 65, 183-4; cf. *C. A.* 20, 102.—Briefly describes the product of S.'s process (Lignizit) and repudiates newspaper claims that it would break the anthracite monopoly.

W. B. PLUMMER

New studies on brown coal. VII. The microchemistry of lignite. KAMETARO OHARA. *Braunkohle* 24, 817-9(1925).—A lignitized branch of *Taxodiioxylon sequanium* from lignite deposits at Owari (Japan) was studied. Extn. with boiling KOH soln. apparently removes the lignin, after which treatment the cellulose reaction with $H_2SO_4 + I$ is particularly distinct. With Sudan III sections were dyed uniformly, but after the color was completely removed by extn. with alc. the section could be dyed just as deep a color as before; the dyeing with Sudan III cannot therefore be considered a test for wax or resin. The lignin reaction with HCl -phloroglucinol could not be obtained. The results of other tests are described.

W. B. PLUMMER

Secondary pulverized-coal firing for stoker-fired boilers. MAX WEISS. *Braunkohle* 24, 833-6(1925).—A description with diagrams of installations for firing pulverized coal under stoker-fired boilers in order to meet peak loads.

W. B. PLUMMER

Results with electrostatic dust precipitation in the brown-coal-briquet factories of the Köln-Ost mining section. KARL EHRLING. *Braunkohle* 24, 813-6, 836-40 (1925).—A no. of actual and proposed installations are described with diagrams. None to date has apparently been entirely successful, particularly in avoiding dust explosions, but expts. are being carried on.

W. B. PLUMMER

The properties and constitution of coal ulmins. Studies in the composition of coal. WILFRED FRANCIS and R. V. WHEELER. *J. Chem. Soc.* 127, 2236-45(1925).—In continuation of work showing that alkali-insol. ulmins are made alkali-sol. by oxidation (cf. *C. A.* 19, 1484), the reactions were studied by analytical means. No fundamental change occurs in the ulmin mol. by such oxidation with H_2O_2 or air at 150° , but the external groups are modified, those more readily detached being eliminated as simple oxygenated compds. and their place being taken by carboxylic groups. The internal (nuclear) structure of the mol. of the sol. ulmins is identical with that of the insol. matrix of unoxidized bituminous coal and a knowledge of the former allows an insight into the latter. The change from insol. to sol. ulmins is gradual, a moderate degree of oxidation changing the external groups enough to render the matrix of coal difficultly sol. in alkalis. As oxidation proceeds, more groups are eliminated and the ulmins become more acidic and more sol. in alk. and neutral solvents. The limit with air at low temps. is

reached when all external groups are eliminated (cf. Pearson, *C. A.* **17**, 1876), but H_2O_2 or HNO_3 decomposes the nucleus of the ulmin mol. Because oxidation is gradual, the sol. ulmins are not homogeneous and can be sepd. by fractional soly. in different solvents. The CO_2H groups formed by oxidation allow the formation of salts, insol. *Ba*, *Fe*, *Ag* and *Cu* salts of *alkali-sol. ulmins* being prepd. Hydroxyl groups also were identified in the sol. ulmins in an amt. corresponding to 1 OH per mol. wt. of 680, the latter unit also contg. $4\text{CO}_2\text{H}$ groups. The N content increases with increase in soly. of the ulmins until the whole coal matrix is sol., and indications point to N as an essential constituent of the ulmin mol. nucleus. This suggests both an important role of N and the occurrence of the Maillard reaction (*C. A.* **10**, 2577; **11**, 2010) in the formation of coal ulmins. In coal formation, sugars may be derived from the cellulose of the cell walls by enzymes or bacteria and the amino acids from polypeptides in the cells. Destructive distn. of sol. ulmins gave at $160\text{--}70^\circ$ a gas contg. CO_2 and CO in the ratio of 12:1, this ratio increasing to 300° and then decreasing. H and satd. hydrocarbons appeared first at 450° . H_2O was evolved at low temps. and a trace of an oil at 550° , the results resembling those of peat ulmin (cf. Tidswell and Wheeler, *C. A.* **17**, 1121) and confirming the earlier work (*C. A.* **19**, 2484) that the matrix of durain is much the same as that of vitrain. Extreme action of H_2O_2 on sol. ulmins yielded H_2O , CO, CO_2 and all N as NH_3 . Intermediate action gave aliphatic dibasic acids, including oxalic and succinic acids, and benzenepolycarboxylic acids. Dil. HNO_3 yielded 25% (based on the sol. ulmin) of H_2O -sol. products, comprising aliphatic dibasic acids, aromatic acids and nitrophenols, of which were identified oxalic, succinic, picric, pyromellitic and probably trimellitic acids. Picric and pyromellitic acids proved the presence of benzenoid rings in the nucleus of sol. ulmin mols. and hence in the matrix of bituminous coal. The further presence of oxalic and succinic acids indicates that the nuclei of the ulmin mols. (which comprise the bulk of all bituminous coals) are compact systems of benzenoid groups bound by heterocyclic rings, such as pyrrole and furan or their derivs. C. C. DAVIS

The application of X-rays to the determination of the washing properties and to the control of washing operations of coal. MACLAREN. *Rev. ind. minérale* No. 121, Pt. 2, 1-12, Jan. 1, 1926.—A description of recent developments (cf. *C. A.* **19**, 3362) with numerous illustrations of X-ray app. and photographs of coal. C. C. DAVIS

What prospects does the Bergius process offer for the German oil supply? MANFRED DUNKEL AND MYRON HEYN. *Naturwissenschaften* **13**, 1021-4 (1925).—A review. The process is considered the most valuable and important invention in the field of coal treatment. B. J. C. VAN DER HOEVEN

The melting point of ashes and its relation to their analytical composition. P. GRANDJEAN AND A. ROTHUN. *Chaleur et industrie* **6**, 530-5, 582-91 (1925).—After a brief review of present methods of detg. the m. p. of ashes, G. and R. propose a new method based on the triangular diagram of the quaternary mixt. $\text{SiO}_2\text{--Al}_2\text{O}_3\text{--CaO--FeO}$, or even of the ternary mixt. $\text{SiO}_2\text{--Al}_2\text{O}_3\text{--FeO}$ when Raoult's law can be applied to the CaO soln. (not over 5% CaO). From the diagram one can obtain the points of complete fusion and of incipient fusion; and the "softening point" as measured by a Seger cone depends mainly on the viscosity of the cone, which in turn depends on the quantity of liquid contained in the mass of the cone when it falls. It is suggested that the softening point be defined as the temp. at which $n\%$ of the ash is liquid, and n may be chosen so that the value of the softening point may be as close as desired to what is now generally called the m. p. The effects of the other constituents of ashes (mainly MgO and alkalis), considered as impurities, are discussed. A. PAPINEAU-COUTURE

The problem of the national [Italian] motor fuel with alcohol as a base. LUIGI DAL PRATO. *Rass. min. met. chim.* **63**, 136-40 (1925).—Comparative automobile performance tests of 6 different com. fuels contg. the following vols. % of EtOH, benzene, benzene and Et_2O , resp.: (1) 40, 60, 0, 0; (2) 38, 40, 20, 2; (3) 40, 30, 25, 5; (4) 50, 44, 0, 6; (5) 76, 20, 0, 4 and (6) 0, 100, 0, 0 showed (4) to be practically the equiv. of (6) and to be superior to (1), (2), (3) and (5). The power output varied inversely with the calorific power. See also Garelli, *C. A.* **19**, 1488. C. C. DAVIS

Present status of the facts and theories of detonation. GEO. G. BROWN. *Ind. Eng. Chem.* **18**, 213 (1926).—Polemic. Cf. Clark and Thee, *C. A.* **20**, 273. Answer. G. L. CLARK. *Ibid* 213. E. J. C.

The theory of anti-detonants. HENRI MURAOUR. *Chimie et industrie* **14**, 851 (1925).—M. suggests that anti-detonants act by formation of a cloud of solid particles which attract part of the ions of the explosive mixt. and reduce the rate of the reaction below the detonating point (cf. Malinovskii, *C. A.* **19**, 1630). This would also explain

why anti-detonants also act as anti-flashes. Exptl. verification of the hypothesis would be desirable. A. PAPINEAU-COUTURE

Purification distillation of crude anthracene by the addition of gas oil. A. WOLFRUM. *Chem. App.* 12, 241-2(1925).—The oil should be carefully fractionated and should contain very little boiling outside the limits of 260–310°, should contain but little solid paraffins and oil boiling between 305–330° and should hold back in soln. not over 2–3% of the substance to be purified. The amt. of oil used should be 2–3 times the wt. of the substance. Description and cut of app. are given. J. H. MOORE

Behavior of grate bars in the fire. ROBERT STUMPER. *Chaleur et industrie* 6, 549-54(1925).—A detailed discussion of the effects of the chem. compn. and metallographic constitution of the bars, of the chem. compn. of the fuel, of the condition of the fire and of the kind of boiler, from which S. concludes that white Fe is much better than gray Fe for the purpose. A. PAPINEAU-COUTURE

The combustion process as the basis for industrial gas utilization. F. PLENZ. *Gas u. Wasserfach* 69, 1-4(1926).—A discussion of the application of our knowledge of flame temps., flame propagation velocities, etc., to problems of industrial gas utilization. W. B. PLUMMER

Heating control by analysis of combustion gases. R. CAILLLOL. *Technique moderne* 18, 13-9(1926).—Description of various flue-gas-analyzers, and a discussion of the value of the indications which they give. A. PAPINEAU-COUTURE

Correction to Boyle's law for high-pressure gas. D. E. SILCOX. *Mech. Eng.* 47, 897-900(1925).—Graphs and tables show the deviation of natural gas from Boyle's law with change of pressure, temp. and gasoline content. In extreme cases such as natural gas high in ethane and under pressures up to 400 lbs. this deviation may reach 20%. H. L. OLIN

The present situation in gas street lighting. WILHELM BERTELSMANN. *Gas u. Wasserfach* 68, 819-24(1925).—Descriptions, tabulations of gas consumption and illuminating power, etc., for various types of mantles and arrangements of mantles for street lighting. W. B. PLUMMER

Scrubbing carbon dioxide from gases by water under pressure. ANON. *Gas u. Wasserfach* 68, 833(1925).—A brief discussion. W. B. PLUMMER

The evolution of the manufacture of illuminating gas toward the increase in the production of gas and the reduction of gas-house coke. A. GREBEL. *Le Genie Civil* 87, 245-9(1925). JACK J. HINMAN, JR.

Safety devices in gas generator installations. KARL KREKELER. *Braunkohle* 24, 840-4(1925).—A discussion of the location and construction of explosion safety vents. W. B. PLUMMER

Methods and apparatus for ammonium sulfate production. A. THAU. *Gas u. Wasserfach* 68, 799-805, 824-9(1925).—A detailed discussion of saturators, NH₃ stills, sulfate driers and conveying equipment, etc. and of special processes for NH₃ recovery such as the CaCl₂ and CaSO₄ processes. Diagrams are given of 11 different types of saturators. W. B. PLUMMER

The influence of water vapor and hydrogen chloride on the velocity of decomposition of ammonia. A. SCHMIDT. *Z. angew. Chem.* 38, 1146-54(1925).—In the decompn. of dry NH₃ in a porcelain tube, the velocity of decompn. is greatly accelerated during the course of the expt. This acceleration is parallel with the sepn. of metallic Fe from the tube, which is due to the reducing action of the decomposed NH₃. H₂O vapor, in sufficient concn., prevents the sepn. of Fe and stops the decompn. which has initially been accelerated by Fe. HCl acts in a similar manner and at high temps. forms FeCl₃. Expts. with coke show that the decompn. of NH₃ is slower when H₂O or HCl is present. It is, therefore, probable that the increase in the NH₃ yield in the gasification of fuel in the presence of H₂O or HCl is due to the fact that the formation of Fe (which would greatly accelerate the decompn. of NH₃ catalytically), is prevented. J. H. PERRY

Ammoniacal liquor and noxious effluents from distillation plants. J. W. YOUNG. Annual Report of Alkali etc., Works Inspector. *Gas World* 82, 647-50(1925).—This report discusses several noxious effluents and methods employed for removal and to prevent their formation. Liquors from vertical retort systems are highly charged with higher tar acids, color-producing substances, etc. Liquors from horizontal retort plants were relatively free from such substances. Phenol is considered to be the most noxious constituent in effluents. Its removal is effected by scrubbers in which flue gases are injected into the base of the scrubber, the injector working at a steam pressure of 70 lbs. Liquor enters at 91° and leaves at 95°. A phenol volatilization efficiency of 94% and reduction in O-absorbing figure of 34% is claimed. The content of thiocyanate, thio-sulfate, etc., is reduced by reducing the O and cyanide content of the crude gas and by

protecting the liquor against air during storage. Liquor stored in contact with tar or allowed to stand in contact with air gives a high figure for total O absorbed. The removal of 90-95% of tar from oven gases has been accomplished by spraying with liquor, thus reducing the temp. of the gases from 130-135° to 70-75°. Expts. show that free NH_3 in liquor favors emulsification of tar and the extn. of O-absorbing constituents from the tar, while fixed ammoniacal salts have a contrary effect. A. E. G.

Steam generation in 1925. DAVID BROWNLIE. *Chemistry & Industry* 45, 21-2 (1926). E. J. C.

Rich and lean gas for gas forging and welding. D. HUDLER. *Gas u. Wasserfach* 68, 812-4 (1925).—Comparisons from the standpoints of heat available, heat capacity of the combustion products, etc. W. B. PLUMMER

Water-gas tar. A. L. FRANKENBERGER. *Am. Gas J.* 124, 24-5 (1926).—A description of the operation and results of steam-heated settling and boiling tanks at 3 plants. Dehydration costs were 0.91-1.55 cents/gal., of which 0.74-1.22 cents is labor cost. W. B. PLUMMER

By-product coke and gas industry. C. J. RAMSBURG. *Blast Furnace & Steel Plant* 14, 13-4 (1926).—A review for 1925. E. J. C.

Rational improvements in the technic of by-product coking. H. SCHELAUSKE. *Teer* 24, 1-5 (1926).—A brief description of the Feld process for fractional condensation of tar direct from the raw gas (cf. C. A. 19, 165, 2739) and a discussion of its application to various types and sizes of plants. W. B. PLUMMER

New results with the Still coke oven. H. KUHN. *Gas u. Wasserfach* 69, 5-11 (1926).—The distinctive feature of the Still oven is that combustion in the vertical heating flues is multi-stage. A small air-inlet flue is located between each heating flue and air admitted to them through 4 openings in each of its sides. The walls of the oven are thus heated uniformly from top to bottom. Detailed data are given of gas consumption, wall temps., etc., for 2 installations of these ovens. In one case the ovens proper were 3.0 m. high \times 0.41 m. av. width (18-hr. coking time), in the other 2.55 m. high \times 0.48 m. av. width (26-hr. coking time). W. B. PLUMMER

Gas washing (WEISSENBERGER, et al.) 13. Calculation of the various factors in drying, with reference to brown coal (DEIMLER) 13. Determination of H and CH_4 in illuminating gas (PERNECKER) (OTT) (STUEVER) 7.

STEINERT, JOHANNES: *Der Torf und seine Verwendung*. Berlin: de Gruyter & Co. 149 pp. R. M. 1.25.

Fuel mixture. C. J. HOOVER. U. S. 1,570,585, Jan. 19. A fire-kindler comprises charcoal 8, granulated sawdust 60, lycopodium 2 and crude turpentine 30%.

Fuel for internal-combustion engines. R. H. MCKEE. U. S. 1,570,161, Jan. 19. A homogeneous mixt. is formed from the gasoline-like fraction of shale oil, com. C_6H_6 (contg. toluene), alc., and C_2H_4 2-8%. The use of C_2H_6 also is referred to.

Fuel for internal-combustion engines. G. HAMMOND. U. S. 1,570,059, Jan. 19. Kerosene is mixed with about 30% its quantity of gasoline or other light, freely ignitable hydrocarbon material and with small quantities of acetone, glycerol and BuOH . U. S. 1,570,060 specifies a mixt. of kerosene 40-50, gasoline 50-60, BuOH 1-4 and C_6H_6 3-12 parts.

Fuel briquets. R. TORMIN. Brit. 234,805, May 28, 1924. Coal or coke or similar material to be briquetted is treated with 1% or more of C_6H_6 , toluene, CS_2 , or similar solvent which is partially recovered in the pressing operation and causes the bitumen content to be distributed in the fuel mass. Pitch or other bituminous material may be added to "poor" coal.

Treating coal. W. E. TRENT. U. S. 1,570,103, Jan. 19. Finely divided coal together with a fluxing agent such as CaO , Fe_2O_3 , or Na_2CO_3 is introduced into a current of gas and passed through a heat zone to remove volatile by-products from the coal and cause a union of the ash-forming constituents and fluxing agent. The purified C content of the coal is then recovered.

Treating coal-washing water. R. A. BURROWS, F. S. SINNATT, L. SLATER and N. SIMPKIN. Brit. 233,842, April 1, 1924. Suspended materials in water used for washing coal are sepd. by addn. of a coagulating or flocculating agent such as lime, NaOH , $\text{Al}_2(\text{SO}_4)_3$, Na aluminate, MgCl_2 , Na silicate, silicic acid, silica sol, casein, glue, gelatin, Na stearate or albumin. The mixt. is allowed to settle with as little agitation as possible.

Extracting oils, waxes, etc. from coal and similar materials. H. NOVAK and J. TREBICKY. Brit. 234,564, March 6, 1924. Tetrahydronaphthalene, decahydronaphthalene, hexahydrophenol or other hydrogenated products of $C_{10}H_8$ or $PhOH$ are used to break down coal, anthracite, peat, lignite, bituminous slates and similar materials *e. g.*, by prolonged application of their vapors. Solvents such as C_4H_8 and acetone may also be used to assist in extg. oils, waxes and other substances.

Retort or oven for distillation of coal, shale, etc. (spreading and scraping mechanism). W. N. GRANT. U. S. 1,569,478, Jan. 12.

Dry distillation. J. J. DESCHAMPS. Brit. 234,840, May 30, 1924. In gas retorts, coke ovens and the like, pulsations are produced in the reaction chamber by periodical injections of vapors or gases into the discharge current. The addn. of gas or vapor or purified coal gas facilitates the purification of the gas produced and removes the risk of tar being deposited in the pulsator itself. H and H_2O vapor may be used.

Gas producer. BISMARCK-HÜTTE. Brit. 234,114, May 13, 1924.

Gas producer. S. A. MOSS. U. S. 1,570,314, Jan. 19.

Furnace and gas-producer construction. BERNITZ FURNACE APPLIANCE CO. Brit. 234,715, Nov. 19, 1924.

Gas-producer and preheating retort. SOC. ANON. DES ANCIENS ETABLISSEMENTS P. WURTH. Brit. 234,811, June 2, 1924.

Gas scrubber for separating oily constituents. M. F. WATERS. Brit. 234,436, May 23, 1924.

Apparatus for determining the proportion of carbon dioxide in flue gases, etc. F. X. SCHMIDT and U. O. HUTTON. U. S. 1,569,682, Jan. 12. Two portions of wire in adjacent tubes are equally heated (*e. g.*, by an elec. current) while air is present in one of the tubes and flue gases or the like under test in the other tube. Difference in expansion in the 2 portions of wire (due to difference in heat cond. in the gases on account of the CO_2 present in one tube) is utilized to operate an indicator attached to a roller over which an intervening portion of the wire is coiled.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Properties of typical crude oils from the producing fields of the Western hemisphere. A. J. KRAEMER and L. P. CALKIN. Bur. Mines, *Tech. Paper* 346, 49 pp. (1925).—Typical crude oils from Canada, Mexico, Trinidad, Venezuela, Argentina, Colombia and Peru are included. Tables, discussions and comparisons with oils of the producing fields of the U. S. are presented.

Distillation analyses of Roumanian crude petroleums. G. GANE and A. MOSCHUNA. *Mon. du petrole roumain* 24, 950(1925).

W. F. FARAGHER
M. B. HART

Proceedings of a conference to determine whether or not there is a public health question in the manufacture, distribution or use of tetraethyl lead gasoline. ANON. U. S. Pub. Health Service, *Pub. Health Bull.* 158, 116 pp.(1925).—This is a record of the testimony submitted by industrialists and public health officials and investigators regarding the history of tetraethyl lead in relation to gas engines; its manuf., distribution, and transportation; the exptl. and clinical data on toxicity; and its public health aspects. Expts. on animals in 4 sep. investigations indicate that a hazard exists wherever tetraethyl lead is made or used, but there is a wide divergence of opinion as to whether the hazard is great enough to warrant prohibition. Many city and state health officials have investigated in districts where millions of gal. of ethyl gasoline were being consumed in automobiles, and could find no evidence upon which they could logically base a prohibition regulation; but frankly admitted the need for national leadership, especially in regard to the interpretation of the fact of the extremely slow cumulative effects of very small quantities of Pb compds. After assembling all the available facts, the conference adopted the following resolution: "It is the sense of this conference that the Surgeon General of the U. S. Pub. Health Service appoint a committee of 7 recognized authorities in clinical medicine, physiol. and industrial hygiene, to present to him, if possible, by Jan. 1 next, a statement as to the health hazard involved in the retail distribution and general use of tetraethyl lead gasoline motor fluid; and that this conference indorses as wise the decision of the Ethyl Gasoline Corporation to discontinue temporarily the sale of ethyl gas; that this investigation shall be paid for exclusively out of public funds; and that the results of this investigation shall be reported back to a pub-

lic conference called for the purpose by the U. S. Pub. Health Service, at which labor shall be represented." (ABSTRACTOR'S NOTE.—The Surgeon General appointed Julius Stieglitz, W. H. Howell, Reid Hunt, D. L. Edsall, C. E. A. Winslow, W. S. Leathers and A. J. Chesley who reported on Jan. 17, 1926 that no good grounds exist for prohibiting the use of ethyl gasoline in automobiles, although employees of com. garages may be exposed to a slight lead hazard. No evidence of danger to the general public was found. The Ethyl Gasoline Corporation expects to resume the national distribution of ethyl gasoline.) C. M. SALLS

The effects of the tetraethyl lead upon the deterioration of turbine oils. SIRŌZI HATTA. *J. Soc. Chem. Ind. Japan* **28**, 1346-52(1925).—On the assumption that the deterioration of turbine oils is due mainly to the oxidation of the components of the oils by the action of heat and air, Et_4Pb was used as an anti-catalyzer of the oxidation. 0.05, 0.1 or 0.2% of Et_4Pb was added to pure oils and kept at 120° ; moist O_2 was passed in at the rate of about 150 bubbles per min. Samples were taken at definite time-intervals for testing color, sp. gr., viscosity, acid and sapon. values, amt. of sludge, and the Herschel deëmulsiivity. When an oil of the paraffin series was used, the darkening of the color, the sludge formation, and the deterioration of deëmulsiive power were distinctly decreased by the presence of Et_4Pb . The sp. gr., viscosity and acid and sapon. values of the oil were, however, independent of the presence of Et_4Pb . The sp. gr., viscosity and acid and sapon. values of the oil were, however, independent of the presence of Et_4Pb , all increasing gradually. As to oils of the naphthenic series, the result was of an opposite nature, except that the darkening of the color was retarded; the sp. gr., acid and sapon. values and the sludge formation were all distinctly increased by the presence of Et_4Pb . K. KASHIMA

Methods of testing transformer-oils. H. C. STARGER. *Ind. Eng. Chem.* **17**, 1272-5(1925).—Several of the commonly used tests are discussed critically. The "BBC" test (Brown-Boverie Co., Switzerland) is defended as the most useful test for detg. the quality of transformer oils (cf. *C. A.* **17**, 1851, 2639; **18**, 164). W. F. F.

Transformer and switch oils. D. V. ONSLOW. *World Power* **5**, 37-41(1926).—A review including chapters on viscosity, flash point, sludge, etc. C. G. F.

The constitution of Swedish generator shale oil. GUSTAV HELLSING and J. S. W. TROEDSSON. *Arkiv Kemi, Mineral. Geol.* **9**, No. 22, 12 pp.(1925).—Previous investigations carried out upon the constitution of shale oil obtained from dry distn. of Swedish alum shale on a small scale (*C. A.* **15**, 3552), has prompted the present work on shale oil produced on a factory scale in specially constructed gas generators. The product investigated was the unrefined fraction of the crude oil b. $150-300^\circ$. After preliminary treatment with H_2SO_4 and KOH and several fractionations finally a fraction b. $150-185^\circ$ was collected, amounting to 0.99% of the starting material. This fraction was oxidized with KMnO_4 , the oxidation loss being 17.5% (unsatd. compds.). The oxidized oil was subjected to a fractional distn. and the $155-185^\circ$ fraction was sulfonated, the sulfonation loss being 60.67% (sulfonated compds.). This was converted into Na sulfonates and these in turn into sulfonic acid amides, which after recrystn. from alc. Et_2O had a sharp m. p. 175° . The product was *pseudocumenesulfonamide*. From the oxidation and sulfonation losses it is concluded that generator shale oil is lower in unsatd. hydrocarbons and higher in aromatic hydrocarbons than shale oil obtained by direct dry distn., where the losses were 31.0 and 33.0%, resp. The unsulfonated oil consists mainly of naphthenes, in particular *decanaphthenes*, $\text{C}_{10}\text{H}_{20}$ b. $160-175^\circ$, and *hendecanaphthene*, $\text{C}_{11}\text{H}_{22}$, b. about 180° . Nitration of the unsulfonated part of the oil formed some $\text{H}_2\text{C}_2\text{O}_4$. Bromination of the nitrated oil yielded a heavy oil, probably $\text{C}_{10}\text{H}_{18}\text{NO}_2\text{Br}$. Direct bromination of the unsulfonated oil in a closed tube yielded a distinctly cryst. compd., probably 2,4,6,1,3,5- $\text{Br}_3\text{C}_6\text{Me}_2\text{Et}$, the parent substance thus being *β -decanaphthene*. The genetic relation of naphthenes and aromatic hydrocarbons in shale oil is discussed. D. THURSEN

Charts for studying the oil film in bearings. GEO. B. KARELITZ. *Mech. Eng.* **48**, 128-31(1926). E. J. C.

Substitutes for spirits of turpentine: hydroterpinol and other products derived from pine oil. J. H. FRYDLENDER. *Rev. prod. chim.* **28**, 829-35.—Review of its properties and method of prepn., based on recent German patents and literature. A. P.-C.

Petroleum in Poland (PAZDRO) 8. Gas washing (WEISSENBERGER, et al.) 13. Retort or oven for distillation of shale (U. S. pat. 1,569,478) 21. Extracting oils, waxes, etc., from coal and similar materials (Brit. pat. 234,564) 21.

Refining mineral oils. J. C. MORRELL. U. S. 1,569,870, Jan. 19. Oil is treated with an aq. soln. of alkali metal plumbite and, after sepn. from the plumbite soln., is further treated with Ca, Al or Mg sulfide or other sulfide capable of hydrolyzing in H_2O . The pptd. material and sulfide are then sepd. from the oil. U. S. 1,569,871 specifies treating oil with Na plumbite in aq. soln., sepg. the plumbite soln., treating the oil with an aq. sulfide soln., withdrawing the reaction products, and then further treating the oil with a flocculating agent such as dil. H_2SO_4 or HCl and sepg. pptd. material. U. S. 1,569,872 specifies treating oil such as cracked distillate (previously treated with H_2SO_4 , NaOH and H_2O) with alkali metal plumbite in aq. soln., agitating, sepg. the plumbite soln., treating the oil with sulfide in aq. soln. and removing the sulfide and reaction products.

Cracking petroleum oils. R. B. DAY. U. S. 1,570,131, Jan. 19. A first treatment chamber is maintained constantly full of liquid oil while a pool of oil is maintained in a second chamber at a level over the first chamber and constantly connected by a communicating body of the liquid with the oil in the first chamber through a column of oil extending from the interior and top of the first chamber to the interior and bottom of the second chamber. Sufficient heat is applied to the exterior of the first chamber to crack some of the oil in it and aeriform products are led off from above the pool of oil. Even heating within the first chamber is effected and deposition of C on its walls is prevented by violently agitating the liquid material.

Bleaching, "cracking," and desulfurizing petroleum. HERMAN REINBOLD and HUGO REINBOLD. U. S. 1,570,005, Jan. 19. Hydrous silicic acid together with metal chlorides such as $AlCl_3$ (produced from bentonite and HCl) are used for refining, distg. and "cracking" or converting oils. Cf. C. A. 20, 108.

Distilling hydrocarbon oils. G. EGLOFF and H. P. BENNER. U. S. 1,569,855, Jan. 19. Oil vapors produced in a still are passed through a filtering bed which may be formed of fuller's earth, boneblack or charcoal and which is located in the vapor space of the still above the oil level and above the oil inlet of the still. The vapors are subjected to dephlegmation, uncondensed vapors being led off to a condenser and reflux condensate being returned to the still below the filter bed.

Cracking and "converting" hydrocarbon oils. H. R. BERRY. U. S. 1,569,532, Jan. 12. Oil is continuously introduced into an enlarged zone or chamber together with a continuous supply of undil. steam in such vol. and at such temp. that the C released by the cracking is converted into C oxides by the action of the steam so that C deposition on the walls of the reaction chamber is avoided.

Recovering oil from oil-bearing sands. D. C. COLLIER. U. S. 1,570,205, Jan. 19. Oil-bearing material is mixed with H_2O and with subdivided coal, coke or other carbonaceous material and the mixt. is subjected to agitation so that the oil and carbonaceous material are agglomerated and float on the H_2O while the sand settles out.

Apparatus for de-emulsifying petroleum oils, etc. by filtration through oil-treated diatomaceous earth. C. V. ZOUL. U. S. 1,569,695, Jan. 12.

Distilling shale or other carbonaceous materials. R. M. CATLIN. U. S. reissue 16,252, Jan. 12. See original pat. No. 1,509,667, C. A. 18, 3713.

Extracting vanadium from petroleum hydrocarbons. A. OBERLE. U. S. 1,570,170, Jan. 19. Petroleum material such as still residue is heated to drive off volatile substances and the residue is subjected to a leaching operation with a V solvent such as H_2O and steam to recover the V compds. from it.

"Commercial gasoline" from natural-gas gasoline. H. J. MACKENZIE and A. W. STEENBERGH. U. S. 1,569,433, Jan. 12. Gasoline-contg. gas is compressed, cooled to normal temp. while the compression is maintained and the resulting "natural-gas gasoline" is sepd. under pressure. It is then mixed with blending gasoline and the mixt. is cooled under pressure and the pressure then released to atm. pressure, gas sepd. from liquid and the temp. is gradually brought to atm. temp. to permit a progressive sepn. of gas from liquid.

Separating paraffins from liquid hydrocarbons. AKTIEBOLAGET SEPARATOR-NOBEL. Swed. 60,012 and 60,013, Dec. 22, 1925. The paraffins pptd. by cooling are sepd. from the liquid hydrocarbons by centrifugalizing after the sp. gr. of the liquid first has been lowered by addn. of a separately cooled diluent of lower sp. gr. than the paraffins. Cf. C. A. 19, 2562.

Treating bituminous substances to remove sulfur. G. W. ACHESON. U. S. 1,570,193, Jan. 19. Bituminous material such as crude S-contg. oil is treated with a reflocculated solid adsorbent material, e. g., reflocculated clay and H_2SO_4 . A S-contg. ppt. is sepd. from the material.

Electric separation of petroleum emulsions. J. H. C. DE BREV. U. S. 1,570,209,

Jan. 19. Petroleum emulsions are treated with a pulsating a. c. having a peak voltage which is "a multiple of the effective voltage."

Purifying lubricating oils in internal-combustion engines. W. B. CLIFFORD. Brit. 234,082, May 16, 1924. A thermostatically controlled by-pass and vaporizer heats and purifies the oil at a temp. slightly below its flash point. The vaporizer is heated by the exhaust from the engine.

Apparatus for reclaiming asphalt, etc., from waste materials. R. D. DIVINE. U. S. 1,569,462, Jan. 12.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Depolymerization of cellulose. EMIL HEUSER AND NORBERT HIEMER. *Cellulose-chemie* 6, 101-22, 125-32, 153-66(1925).—A comprehensive study of the degree of polymerization (*i. e.*, aggregation) of alkylated cellulose prepd. from physically different celluloses. The following materials were used in the prepn. of various methylated celluloses: purified cotton; cellulose regenerated from cuprammonium solns. by CO_2 ; artificial silk prepd. by the cuprammonium process; "hydrocellulose" prepd. by the action of HCl gas on the same; viscose pptd. by adding a ripened xanthate soln. to boiling H_2O ; an alkali-sol. "hydrocellulose" formed from viscose silk on treatment with HCl gas for 3 hrs.; a "hydrocellulose" prepd. by further treatment of the latter with HCl for 50 hrs.; "cellulose A," a product formed by Hess and Weltzien's method (*C. A.* 18, 1385) from the corresponding acetate; "cellodextrin I" prepd. by dissolving cellulose in 72-74% H_2SO_4 pptg. (after 1 hr.'s standing) with EtOH and finally heating with alc. to insure hydrolysis of cellulose sulfates; "cellodextrin II" prepd. by a method similar to that used in the preceding prepn., except that the pptn. with alc. occurred after the acid soln. had remained standing for 10 hrs. In general it was found best to limit methylation with a view towards obtaining a product contg. 2-2.5 Me groups for every 6 C atoms. The products therefore ranged from 32 to 39% MeO and were partially or completely sol. in cold H_2O . Trimethylcellulose prepn. are much more insol. in H_2O and are unsatisfactory for use in mol. wt. detns. Normally, the milder the treatment of the cotton prior to methylation (1) the lower the soly. of the Me deriv. in cold H_2O (2) the higher the mol. wt. of the methylated product, (3) the higher its "softening point (Erweichungstemperatur), and (4) the greater the number of methylations required to effect complete methylation of the cellulose. Those methylation products which are sol. in cold H_2O are usually repptd. on heating the soln. and may be partially purified in this way. However, with an increasing "degree of depolymerization," the methylcelluloses become increasingly sol. in warm H_2O . The degree of depolymerization of cellulose ("depolymerisationsgrad") is defined as the mean mol. wt. of the dimethylated product divided by 190 (190 being the mol. wt. of $[(\text{C}_6\text{H}_5\text{O}_2)(\text{OMe})_2]$). There appears to be no correlation between the Cu no. (Schwalbe) and the degree of depolymerization. Heuser's and Hiemer's results indicate that every depolymerization product of cellulose is characterized by a series of properties which, in most cases, change regularly with the degree of depolymerization. The period of complete methylation of cellulose is greatly shortened by acetylation of the dimethyl deriv. of viscose. The monoacetyldimethylcellulose (2.5 g.), when treated with 50 g. NaOH in 50 cc. H_2O and 60 cc. Me_2SO_4 at 60° (in the presence of small quantities of EtOH) followed by treatment with 45 g. NaOH in 45 g. H_2O and 30 g. Me_2SO_4 gave rise to a methylcellulose contg. 44.3% MeO in a single operation. One further methylation in the presence of solid NaOH (5 g.) yielded trimethylcellulose (contg. 45.4% MeO; theory = 45.6%). Cellulose triacetate prepd. from cotton linters in 2-phase methylation yielded a product contg. 38.3% MeO, on further methylations gave a trimethylcellulose (contg. 45% MeO), m. $220-5^\circ$, fairly sol. in cold H_2O and completely sol. in AcOH and CHCl_3 .

LOUIS E. WISE

Dispersoidological investigations. VI. Quantitative study on cellulose dispersion in concentrated aqueous solutions of strontium thiocyanate, strontium bromide and strontium chloride. P. P. VON VEIMARN AND K. AOKI. *Reports of the Imp. Ind. Research Institute, Osaka, Japan* 6, No. 10, 11-33(1925); cf. *C. A.* 19, 3589.—Expts. on dispersion of 1 g. of cellulose (No. 292 tablets filtering mass, Schleicher and Schüll) in 100 cc. of aq. solns. of $\text{Sr}(\text{CNS})_2 \cdot 3\text{H}_2\text{O}$ satd. at 25° , at 50° and at 75° were carried out at definite temps. ranging from 130° to 160° , 170° or 180° (depending on the concn. of salt). The dispersion curves (drawn by plotting temps. against time periods required for complete dispersion) are of the normal type. Velocity of dispersion increases with rising temp. If the temp. is kept const. the velocity of dispersion

increases with increasing concn. of salt. Expts. were also carried out at 150°, 165° and 180° with the same concns. of $\text{Sr}(\text{CNS})_2$ and definite vols. of soln., the amts. of cellulose added being varied. Again the rate of dispergation increased with increasing temp. and increasing concn. of salt. The larger the amt. of cellulose added the longer the time required for complete dispergation. This is illustrated by dispergation curves (drawn by plotting wt. of cellulose against time required for complete dispergation). A series of excellent ultraphotomicrographs indicates the remarkable swelling of the cellulose prior to complete dispergation. Expts. on the dispergation of cellulose in aq. SrBr_2 showed that at a definite temp. the velocity of dispergation increased with concn. of the salt. The rate of dispergation also increases rapidly with increasing temp. (and pressure) in the SrBr_2 solns. The swelling of the fibers is less marked than in the case of $\text{Sr}(\text{CNS})_2$ soln. and the rate of dispergation is much slower. Even after heating 0.5 g. of cellulose in 100 cc. of aq. SrCl_2 (satd. at 125°) for 15 hrs. no complete dispergation occurred. VII. Quantitative study on cellulose dispergation in concentrated aqueous solutions of barium thiocyanate and barium bromide. P. P. VON VEIMARN AND S. KATAOKA. *Ibid* 37-44.—100 cc. of $\text{Ba}(\text{CNS})_2$ soln. kept at 128-130° with free access of air completely dispergated 1 g. cellulose in 13-14 hrs. On cooling the soln. forms an elastic jelly. If air is excluded and stirring avoided and the heating is carried out in sealed bottles, the rate of dispergation at 150° is approx. that obtained at 128° (above). The dispergation rate as usual increases with increasing temp. At 180° complete dispergation is reached in 1.5 hrs. BaBr_2 solns. did not effect complete dispergation of cellulose. Only a portion entered dispersoidal soln. On the other hand, the fiber was broken down into particles which formed a flaky ppt. with fine-grained structure. Photomicrographs, ultraphotomicrographs and curves illustrate the article. VIII. Quantitative study on cellulose dispergation in concentrated aqueous solutions of calcium bromide and calcium chloride. P. P. VON VEIMARN AND S. OTSUKA. *Ibid* 47-60.—Cellulose is readily dispergated by satd. CaBr_2 solns. With 1 g. cellulose in 100 cc. of satd. CaBr_2 (satd. at 15° and allowed to remain in contact with cellulose for 3 days), complete dispergation takes place at 110° in 13 hrs., at 150° in 0.5 hr. When 3 g. cellulose are used, dispergation at 110° is incomplete after 20 hrs. but is complete at 150° in 1 hr. With 100 cc. CaBr_2 soln. satd. at 50°, 1 g. of cellulose was dispergated at 120° in 4 hrs. and at 150° in 20 mins.; 3 g. of cellulose were dispergated at 120° in 6.5 hrs. and at 150° in 0.5 hr.; 4 g. of cellulose were dispergated at 120° in 9 hrs. and at 150° in 1 hr. Ultraphotomicrographs show that the swollen cellulose fibers split into very fine fibrillae prior to dispersion. Dispergated systems normally form translucent jellies on cooling. With 100 cc. satd. CaCl_2 solns. at 150° in a sealed flask, 1 g. of cellulose was incompletely dispergated in 9.5 hrs. The partially dispersed material failed to gelatinize. The hot disperse system on pouring into H_2O forms unorganized agglomerated flakes. These micro-particles may be orientated in a single direction by exerting slight pressure on the cover glass of the microscopic slide. (Illustrated by ultraphotomicrographs). IX. The ability of thiocyanates and halides of alkaline-earth metals to produce dispergation of cellulose. P. P. VON VEIMARN. *Ibid* 63-7.—An interpretation of the preceding exptl. data. The capacity for dispergating cellulose by different salts is approx. in the following order:

Ca salts > Sr salts > Ba salts; cyanates > iodides > bromides > chlorides.
Dispergating capacity decreases

The difficulties of making definite observations are emphasized and v. V. points out that while the dispergation capacity is in the order: $\text{CaCl}_2 > \text{BaBr}_2 > \text{SrCl}_2 > \text{BaCl}_2$, none of these salts produces complete dispergation. X. Cellulose dispergation in aqueous sodium citrate and calcium chloride solutions of extremely low concentrations. P. P. VON VEIMARN AND H. HORI. *Ibid* 71-9.—Dispersoidal solns. of cellulose in hot concd. salt solns. capable of gelatinizing on cooling are termed "dispersoidal solns. of the 1st kind." Those which are very dil. solns. of cellulose in cold salt solns. are termed "dispersoidal solns. of the 2nd kind." A preliminary study of the latter has been made by v. V. and H. Detns. of the amts. of cellulose dispergated by dil. aq. solns. of Na citrate indicate that max. dispergation (15-17 mg. of cellulose per l.) is obtained by 0.025-0.05 millimolar Na citrate solns. This max. corresponds closely to the max. point on a curve drawn by plotting the concn. of Na citrate against the time (in days) required for complete clearing of the disperse system. A similar study with dil. CaCl_2 solns. indicated that the max. dispergation (12-13 mg. of cellulose per l.) occurred in 0.025 millimolar CaCl_2 solns.

Sodium hydroxide and cellulose. J. D'ANS AND A. JÄGER. *Cellulosechemie* 6,

LOUIS E. WISE

137-51(1925).—The work of recent investigators of the cellulose-NaOH relationship has been critically reviewed (cf. Dehnert and König, *C. A.* **19**, 1050; Heuser *et al.*, *C. A.* **19**, 1051, 2272; Karrer and Nishida, *C. A.* **19**, 1051; Liepatov, *C. A.* **19**, 2152, 3188; Vieweg, *C. A.* **19**, 1050; Rassow and Wadewitz, *C. A.* **18**, 1568) and their data have been recalculated so as to det. in each case the no. of g. of NaOH in 100 cc. of soln. (after the cellulose has reacted with NaOH) and the no. of mg. NaOH taken up per g. of cellulose. The various absorption curves, redrawn on this basis, show some similarities, but also some striking divergences. d'Ans and J., in studying NaOH-cellulose adsorption, used various grades of cotton, chem. pulp, and mercerized cellulose, and carefully controlled the temp. In general the absorption curves for chem. pulp were somewhat higher than those for cotton, and it was also shown that temp. had a marked effect on absorption, which was higher at 2° than at 23°. Absorption curves for these 2 temps. are fairly similar in shape, but not parallel. In each case they show a flattened portion between 16 and 24% NaOH, giving indication (but not proof) of compd. formation. The addn. of 5-10% NaCl or 5% Na₂CO₃ to the NaOH soln. does not influence the absorption of NaOH by cellulose at the lower concns., but enhances absorption above 10% NaOH. (This finding contradicts the work of Liepatov.) The soly. of cellulose in NaOH is of decided importance in a study of the alkali celluloses. While the solubilities of different samples of cellulose in NaOH were shown to be very different, soly. curves indicate that in all cases the *max soly. of the cellulose (at 23°) occurred at about 12% NaOH (vol. %)*. Past this point, the soly. rapidly decreased, usually falling to nearly 0 at 40% NaOH. The soly. of β -cellulose (the portion sol. in NaOH, but pptd. by AcOH) in NaOH decreased more rapidly than did that of the γ -cellulose (the portion sol. in alkali and not pptd. by AcOH, but pptd. by addn. of EtOH). The simplest explanation of the soly. curves is that the soly. of the alkali celluloses is decreased by addn. of an excess of NaOH, and that the soly. of "NaOH- β -cellulose" is lowered more rapidly than that of "NaOH- γ -cellulose." Swelling of cellulose probably runs parallel to the soly. of cellulose in alkali, with a max. swelling at 12% NaOH. Present exptl. data on swelling are meager and data to be published elsewhere are used in the present paper. Soly. expts. carried out at 2° gave results that were less certain than those obtained at 23°, the max. soly. of the cellulose being reached *below* 11% NaOH. In view of the above soly. data, a revision for the methods used in detg. β - and γ -cellulose is suggested. The detn. of soly. of cellulose in 10-12% NaOH at 0-2° and at 20-25° would probably give characteristic figures for each individual kind of cellulose. Using all available data on adsorption, soly., swelling, etc. (and admitting the gaps in the exptl. work), d'Ans and J. have studied the ternary system: cellulose-NaOH-(H₂O)₂, using the equilateral triangular method of representation. The 3 phases are NaOH soln. (contg. more or less cellulose in soln.), swollen cellulose (*i. e.*, alkali cellulose) and the gaseous phase. The system has 2 degrees of freedom, concn. of NaOH and temp. Cellulose (in this system) is assumed to be a chem. individual, although its entire behavior makes it apparent that even highly purified cotton cellulose is a mixt. of mols. of different sizes. The binary system: NaOH-H₂O has been previously studied. In the system: cellulose-NaOH, the assumption is made that cellulose forms 2 compds. with NaOH:-(C₆H₁₀O₅)₂-NaOH and (C₆H₁₀O₅)₃-NaOH. In the system: cellulose-H₂O, exptl. data regarding the amt. of H₂O taken up by cellulose are lacking, and the assumption is made that cellulose is capable of combining with 15% H₂O. Study of the ternary system includes tabulated data and curves based on the soly. of a sulfite pulp, and on the approx. compn. of swollen cellulose in 8, 12, 16, 24, 36 and 52.4% NaOH. (For detailed discussion and data the original must be consulted.) This method of investigation gives a means of studying changes in compn. of swollen alkali cellulose, when celluloses of different origin are used, and when temps. are varied. The diagrams probably give a clearer insight into the mercerization phenomenon than do any expts. hitherto recorded, and d'Ans and J. suggest that the method be adopted for the study of such systems as cellulose-cuprammonium hydroxide-H₂O; cellulose-HNO₃-H₂O, etc. The work of Vieweg (*C. A.* **19**, 1050) on the system NaOH-cellulose, to which EtOH has been added, was repeated since V.'s results are out of harmony with the cellulose-NaOH absorption curves. The new results differ from those of V. While a simple stoichiometric relationship does not exist between cellulose and NaOH, when EtOH is present in soln., d'Ans and J. show that in the presence of 10% EtOH, the absorption curve still shows a flat portion at 16-24% NaOH, and even when larger amts. of alc. are added, the rate of absorption of alkali is decreased in this region. With increasing amts. of alc. added, the amt. of NaOH taken up by the cellulose (at any NaOH concn.) increases. d'Ans and J. also studied the alkali absorption of various other chem. pulps and viscose. The data are similar to those found with cotton. Soly. curves indicate that at 2°, the max. soly.

takes place at a concn. of 9–11% NaOH; at 23°, the max. lies at 12% NaOH. With viscose, at 2°, an "unlimited swelling" (complete soln.) takes place at the point of max. soly. Each set of soly. curves (*i. e.*, curves indicating the soly. of a particular kind of cellulose at 2° and also at 23°) shows a point of intersection, indicating a definite alkali concn. at which the soly. of cellulose is the same at either temp. The more sol. the original cellulose the higher the NaOH concn. at which this point is reached. (*E. g.*, viscose shows identical soly. in 26% NaOH (by vol.) at 2°, as it does at 23°. With a bleached pulp, this point was reached with 21% NaOH.) LOUIS E. WISE

Nature of solutions of cellulose in cuprammonium hydroxide. S. M. NEALE. *J. Textile Inst.* 16, T363–9 (1925).—Based on a consideration of the properties of cuprammonium cellulose solns., the hypothesis is put forward that these solns. belong to the class of colloidal electrolytes, typified by soap solns. According to this theory the strong base $\text{Cu}(\text{NH}_3)_4(\text{OH})_2$ forms with cellulose, which thus behaves as a weak acid, a sol. basic salt of which the cation is "crystalloidal" and the anion "colloidal." It appears that each cellulose hexose unit ($\text{C}_6\text{H}_{10}\text{O}_6$) is associated with one atom of Cu, and thus the anionic micelle consisting of a large no. (*n*) of condensed hexose groups and carrying *n* negative charges, is, together with *n* hydroxyl anions, equiv. to *n* bivalent cuprammonium cations. $(\text{C}_6\text{H}_{10}\text{O}_6)_n + n\text{Cu}(\text{NH}_3)_4(\text{OH})_2 \longrightarrow (\text{Cu}(\text{NH}_3)_4)_n \cdot (\text{C}_6\text{H}_9\text{O}_6)_n \cdot (\text{OH})_n + n\text{H}_2\text{O}$, the salt being highly ionized into $n\text{Cu}(\text{NH}_3)_4^{++}$, *n*OH and $(\text{C}_6\text{H}_9\text{O}_6)_n^-$. Cellulose neutralizes the cuprammonium to the extent of using completely the hydroxyl arising from the first dissociation of the substance. Further action is presumably inhibited on account of the weaker dissociation of the base with respect to its second hydroxyl, and by the impossibility of the existence of the sol. cellulose complex in any but a highly alk. medium. This hypothesis accounts in a satisfactory manner for the properties of the solns. The foregoing hypothesis is supported by the results of expts. on cuprammonium cellulose solns. in the following lines: *e. m. f.* measurements, electrolysis of the solns., heats of soln. of sugars, and pptn. of a solid contg. cuprammonium and cellulose. L. W. RIGGS

Time factor and yield value of cellulose esters. S. F. SHEPPARD, E. K. CARVER AND S. S. SWEET. *Ind. Eng. Chem.* 18, 76–7 (1926).—"Films of cellulose esters are imperfectly elastic and flow slightly even under very small loads. The yield points, as obtained by ordinary strength testing machines, depend largely on the speed at which the machine is run." LOUIS E. WISE

The action of ammonia on cotton cellulose. G. BERNARDY. *Z. angew. Chem.* 38, 1195–7 (1925).—Purified cellulose when treated at 200° and 40 atm. for 48 hrs. with 22% aq. NH_3 left a brown powder contg. 20% N. T. S. CARSWELL

The chemistry of the sulfite pulp process. ERIK HÄGGLUND. *Svensk Kem. Tids.* 37, 116–24 (1925). (In German).—Wood lignin is chemically combined with a carbohydrate. The rate of fixing the SO_2 is rapid at the beginning of the process but slows down very much through the formation of inhibiting substances. The ash in the residue runs parallel with the S. The sugar in the liquor runs parallel with the soln. of ligninsulfonic acid. The discoloration of the pulp is discussed. With the increase in ligninsulfonic acid the H_2SO_3 decreases. The bases present combine with both acids but the partition of the bases between them is not clear. At the end of the process there is only a small amt. of free ligninsulfonic acid present. Cf. C. A. 20, 284. A. R. ROSE

Solubility of lignin in phenols. ARMIN HILLMER. *Cellulosechemie* 6, 189–87 (1925).—Lignin as it occurs in the original plant has never been isolated; "primary lignin derivs." include "acid-lignin," "alkali-lignin," ligninsulfonic acid, "lignin chloride" and "phenol-lignin." H. has investigated the latter and has systematically detd. the soly. of encrusting materials of wood in various phenols. Wood flour (species not given) and "acid-lignin" (isolated by means of HCl) were studied. The soly. in the isolated phenol of acid lignin was always similar to that of the original wood lignin. The soly., however, involves a chem. reaction since the "phenol-lignins" are quite different in their properties from the "acid-lignin" or lignin of the original wood. The mechanism of the condensation of lignin with phenol is discussed at some length. In the soly. tests, 1 part of lignin was treated with 50 parts of the molten phenol. If the material dissolved rapidly at a temp. approximating the [m. p. plus $\frac{1}{3}$ (b. p. minus the m. p. of the phenol)] the lignin solvent was termed *excellent*. If the material dissolved completely above this temp., the solvent was termed *good*. If the solvent was heated to its b. p. before any soln. of lignin took place, the soly. was termed *slight*, or *very slight* as the case might be. If no discoloration of the solvent occurred at its b. p. the lignin was considered *insol.* In certain instances the soly. of the lignin was markedly increased by the addition of catalysts to the phenol, *e. g.*, in PhOH lignin is insol., but

this becomes an excellent solvent in the presence of HCl, Br, H_3PO_4 , $HClO_4$, and H_2SO_4 . The solvent powers of a large no. of phenols are given on the above classification. In general, phenolic delignification of wood, or soln. of isolated lignin is best effected by using a phenol with two OH groups, a hydroxybenzoic acid, or a phenol contg. a NO_2 , Cl, Br, or CHO group *m*, or *p* to the OH. The solvent action on lignin of a large number of non-phenolic substances was also studied. These included esters, amines, aliphatic acids, phenyl fatty acids, aralkyl alcohols and aldehydes, aromatic hydrocarbons and their substitution products, aromatic acids and aldehydes, sulfonic acids and acid chlorides, hydroaromatic compds., naphthalene derivs. and heterocyclic compds. "Phenol-lignins" were prepd. and purified by the following general method: the melted anhydrous phenol is treated with the lignified tissue or with "acid lignin" (depending upon whether "primary" or "secondary" phenol lignin is desired). If necessary 1% of a mineral acid or 0.2% I is added as catalyst. The mixt. is heated in a bath (temp. depending on the nature of the phenol used) until soln. is nearly complete (but before the cellulose is greatly attacked). The soln. is cooled (care being taken to avoid solidification) and filtered. The excess phenol is removed from the filtrate by distn. *in vacuo* and the viscous residue poured into anhydrous Et_2O . The ppt. is filtered off, washed with abs. Et_2O (with exclusion of moisture), and dried. The powdered "phenol lignin" may then be further purified by soln. and reprecipn. from Me_2CO , or by extn. with anhydrous Et_2O or $CHCl_3$. The phenol lignins are amorphous substances varying in color from purple to brown-black, sol. in glacial AcOH, MeOH, $EtOH$, AmOH, AcOEt, Me_2CO , C_6H_6N , quinoline, $PhNH_2$, phenols and in aq. NaOH. They are insol. in H_2O , Et_2O , $CHCl_3$, CCl_4 , CS_2 , NH_4OH , Na_2CO_3 solns. and aq. mineral acids, petroleum solvents, $ClCH:CCl_2$, C_6H_6 , PhMe and in turpentine and in rosin. The following lignin derivs. were isolated: "Primary phenol lignin" (obtained by the action of PhOH on wood flour) contg. 0.49% ash, 64.42% C, 5.96% H, and contg. no AcO groups; "secondary phenol lignin" (obtained by the action of PhOH on acid lignin) contg. 0.74% ash, 71.63% C, 5.28% H, and 12.15% MeO; primary creosote lignin contg. 0.70% ash, 66.35% C, 5.84% H, and 12.17% MeO (free from halogens) primary *p*-chlorophenol lignin, analytical data fluctuating widely with slight variations in method of prepn. (3.48-7.55% Cl, 64.67-57.96% C, 5.72-5.06% H); primary *p*-chloro-*m*-cresol lignin, contg. 0.73% ash, 58.48% C, 5.27% H; primary *o*-nitrophenol lignin, 2.15% N, 0.86% ash, 64.0% C, 4.72% H, 9.86% MeO. (There is no exptl. evidence that these "phenol-lignins" are homogeneous.)

LOUIS F. WISE

Alcoholate digestion of wood (HOLMBERG, RUNIUS) 11D. Organophile colloids (WHITBY) 2.

HOVER, FRITZ: *Die Pappenfabrikation*. Prakt. Handbuch. Berlin: M. Krayn 316 pp. R. M. 18, bound R. M. 20.

Bleaching cellulose. KÖLN-ROTTWEIL AKT.-GES. and J. OPFERMANN. Brit 234,454, May 22, 1924. Bleaching with Na or Ca hypochlorites is carried out in the presence of a small quantity of NaOH, alk. earth hydroxide or $Mg(OH)_2$ which may be about 1% the wt. of the cellulose.

Cellulose solutions. A. CLASSEN. U. S. 1,570,553, Jan. 19. The soln. of cellulose in HCl at moderate temps. is facilitated by the presence of metallic catalysts which are not readily attacked by HCl, *e. g.*, metals of the Pt group, W, ferro-W, ferro-V, silicides, Borchers metal (in which Ni may be replaced by Co, W by Mo and Ag by Cu) or Cu (the latter, however, being less suitable). Use of pressure facilitates the reaction also.

Alkali celluloses. F. VAN WEYENBERGH. U. S. 1,569,692, Jan. 12. In producing alkali celluloses contg. not less than 30% by wt. of caustic alkali and not more than 35% by wt. H_2O , the cellulose is steeped in a soln. contg. more than 55% by wt. of caustic alkali at a temp. of at least about 40° (but not high enough detrimentally to affect the cellulose) and the excess caustic alkali soln. is then removed while the material is still at an elevated temp.

Destructive distillation of sulfate cellulose waste lye. E. L. RINMAN. Swed. 59,923, Nov. 24, 1925. The distn. is discontinued when the more valuable org. substances have been evapd. after which the residue is discharged and burned to complete oxidation or carbonization of all the org. matter.

Cellulose acetate composition. H. BUCHHOLZ. U. S. 1,568,955, Jan. 12. A compn. for making elec. insulators or other molded articles comprises cellulose acetate, powd.-glass, bone meal or glue and magnesite.

Dyeing cellulose acetate. BRITISH DYESTUFFS CORPORATION, LTD., J. BADDILEY and H. BROWNING. Brit. 233,813, Feb. 27, 1924. Cellulose acetate goods are dyed from a hyposulfite vat without hydrolysis by means of quinone arylides of the benzene or naphthalene series or thiazines, azines, or oxazines derived from them. Numerous examples are given.

Wood pulp. C. J. STERNKOPF. Brit. 234,120, May 15, 1924. In the mech. production of wood pulp, the wood is softened by treatment with heated H_2O in the grinding app., before grinding.

Refining sulfite spirit. UDDEHOLMS AKTIEBOLAG. Swed. 59,818, Nov. 10, 1925. Pure alc., methanol and acetaldehyde are obtained from raw or rectified sulfite spirit by treating it with an acid or an acid salt with a subsequent sepn. of the components in known ways.

Non-inflammable cellulose ester and ether compositions. W. G. LINDSAY. Brit. 233,874, May 5, 1924. Cellulose esters or ethers or similar substances are mixed with an aromatic phosphoric ester and with substances such as Al phosphate, hydrated AlF_3 , Ca phosphate, Ca tartrate, Ca citrate, or Mg di-H ortho-antimonate.

Paper pulp from rice hulls. R. MORGENIER. U. S. 1,570,389, Jan. 19. Rice hulls are cooked in a 10° B \acute{e} . soln. of NaOH for about 2 hrs., sepd. from the soln. and beaten to a pulp.

Rubberized paper. RUBBER LATEX RESEARCH CORPORATION. Brit. 234,245, April 7, 1924. Paper, pulp board and pulp articles are treated with a soln. of latex stabilized with NH_3 or other alkali and then dried to convert the latex solids into a dried irreversible gel. To facilitate impregnation, paper may be moistened with H_2O , alc., ether or other volatile liquids. The product may be vulcanized or may be rendered tacky and faced with finely divided china clay or similar materials.

Rendering paper transparent. C. E. SWERT. U. S. 1,570,098, Jan. 19. In impregnating paper with a resinous compn. or similar substances to render it transparent, it is alternately heated and cooled to facilitate penetration and solidification of the impregnating substance.

Machine for the manufacture of paper board. O. V. BERGLUND. Swed. 59,924, Nov. 24, 1925.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Report of the Chief of the Bureau of Ordnance, U. S. N. for fiscal year 1925. C. C. BLOCH. Wash. Govt. Printing Office, *Phamphlet*, 13 pages.—This report for the year ending June 30, 1925 covers the various activities of the Bureau. Under casualties is brief mention of a *dust explosion* occurring Aug. 21, 1924, at the Naval Gun Factory, during the mixing of chemicals for a pyrotechnic compn.; the accidental *ignition of powder on the U. S. S. Trenton*, Oct. 20, 1924, while the powder was being brought up to the left gun of the forward mount, the court of inquiry being of the opinion that the accident was caused by the breaking of a powder bag and the consequent grinding up of powder in the mechanism of the hoist but it obtained negative results only in attempts to reproduce this effect; an explosion Jan. 7, 1925 at Hingham, Mass. in the *breakdown machine* while breaking down 3-in. projectiles; and on Apr. 24, 1925 at Indianhead, Md. an *empty tank*, which had been used in the recovery of solvents, in the manuf. of smokeless powder was destroyed by an explosion, due, it is surmised, to nitrocellulose in very fine granular form, having been carried over with the solvent and lodged in the tank, where it exploded spontaneously.

CHARLES E. MUNROE

Safety considerations as regards military explosives. G. PANDELE. *Chem. Age* (London) 13, 392(1925).—Wood-cellulose cotton wool is more readily nitrated than cotton cellulose in the same form and the resulting fulmicottons contain less N, are more sol. and retain the mixed acids to a greater extent. They can be made inert in much shorter time than the cotton nitrocelluloses and are far more stable. They dissolve more readily in Et_2O , requiring but about $1/2$ the quantity of ordinary gun-cotton.

CHARLES E. MUNROE

Gaseous explosions. II. Homogeneous and heterogeneous reactions defined and classified. G. G. BROWN. *Ind. Eng. Chem.* 17, 1229-32(1925); cf. C. A. 19, 1630.—Gaseous explosions are defined and classified under (a) homogeneous reactions wholly confined within a single gas phase and (b) heterogeneous occurring at the interface between 2 phases. Under (a) is classed (1) continuously homogeneous reactions, (2) progressive homogeneous reactions and (3) hetero-homogeneous or compd. pro-

gressive homogeneous reactions, and under (b) is classed (4) gas-gas, (5) gas-liquid and (6) gas-solid heterogeneous reactions. Surface catalysis of a gaseous reaction makes the reaction heterogeneous. This is of particular importance in internal-combustion engines. Mixed catalysts, such as those of Midgley and Boyd, affect homogeneous and heterogeneous reactions.

CHARLES E. MUNROE

An apparatus for studying gases of explosives detonated under confinement. J. H. CRAWSHAW AND G. W. JONES. *Eng. Mining J.-Press.* 120, 965-7(1925).—Beginning with the researches of Noble and Abel, some 50 years ago, repeated investigations have been made of the gaseous products from the detonation of explosives, but all have been made in vessels of limited capacity with low charging ds. and the samples for analysis were taken only after the gaseous products had slowly cooled under high pressures, during which reactions between the original components of the mixt. had taken place, giving rise to a different end product. Efforts have been made at the Bureau of Mines to ascertain directly the compn. of the products when the explosives were fired in mines but numerous difficulties were encountered in taking samples. C. and J. have sought to devise an app. in which explosives may be fired under mining conditions requiring (1) the use of fairly large charge; (2) a fairly rapid rate of cooling by conduction, radiation and expansion, because under mining conditions the explosive is surrounded by large masses of material and the detonation products are rapidly released into large vols. of air, (3) a confinement representative of mining conditions; and (4) detonation in contact with various minerals. The app., in which charges of 150 g., and larger, may be fired, is described in detail, with sketch and an illustrative typical example of a test given.

CHARLES E. MUNROE

Liquid-oxygen explosives. ERNEST FYLEMAN. *Proc. Fourth Intern. Congress of Refrigeration* 2, 1107-24(1924).—Brief outline of their theory and development, with a description of present day practice.

A. PAPINEAU-COUTURE

Explosion of ether and oxygen during a surgical operation. ANON. *Chem. Age* (London) 13, 399(1925).—In an operation for a fractured jaw, at East Ham on Oct. 8, 1925, Et_2O and O_2 were employed as the anesthetic, the patient's teeth being kept dry with warm air from a dental syringe. On the third application of warm air a violent explosion occurred in the patient's throat causing an acute and fatal hemorrhage. There was no naked light within 6 ft. of the patient.

CHARLES E. MUNROE

Inflammability of ether vapor. A. TAYLOR. *Chem. Age* (London) 13, 449(1925).—Comment on accident at East Ham (preceding abstract). The menace from naked flames in the presence of Et_2O vapors is pointed out. Such vapors have been known to be ignited by a flame 10 ft. distant.

CHARLES E. MUNROE

Warning against the customary process for preparing cooling baths from inflammable compounds with the aid of liquid air. WILHELM BILTZ. *Chem.-Ztg.* 49, 1001(1925).— CS_2 and liquid air mixt. caused a violent explosion at the Technische Hochschule, Hannover, although the method used was that commonly employed and recognized as correct. No satisfactory cause for the accident was found; this warning is issued accordingly.

W. C. EDAUGH

2,4,6-Trinitrobenzoic acid from the photochemical decomposition of 2,4,6-trinitrotoluene. KRANZ AND TUREK. *Chem. Age* (London) 13, 392(1925).—The Luttgen process has proved perfectly satisfactory for its prepn. when the crude product is purified with Na_2CO_3 instead of NaOH . All the trinitrobenzoates prepd. have proved to be cryst. substances with the exception of the Bi, Sn and Al salts, which are amorphous and have an indefinite constitution. All explode or detonate, either on shock or by heat, except the Hg compds. The presence of min. quantities of the metallic trinitrobenzoates considerably increases the explosiveness of TNT. In the presence of moisture trinitrobenzoic acid attacks Pb, Cu and Fe very readily, whether air be present or not, and the resulting salts explode on heating or impact. As com. trinitrotoluenes may contain trinitrobenzoic acid, the possibility of such salts being formed should always be guarded against in circumstances where there is any likelihood of their occurrence.

CHARLES E. MUNROE

Flame-proof electrical apparatus for use in coal mines. First report.—Flange protection. I. C. F. STATHAM AND R. V. WHEELER. Mines Department, *Paper No. 3, Safety in Mines Research Board*, 50 pp.—Factors governing the propagation of flame in fire damp within spherical vessels, both totally closed and with gaps of various widths left between flanges of different breadths at joints between 2 hemispheres, is investigated. In totally enclosed vessels, the percent of methane is detd. for max. pressure, and the influence of vol., asymmetrical ignition, turbulence and intensity of source of ignition is investigated. With vented vessels the influence of vol., breadth of flange, width of gap, and character of gap on the pressure is first investigated. The

ability of the gaps to prevent the passage of flames sufficient to ignite explosive mixts. of fire damp and air surrounding the vessels is considered and in this connection the influence of vol. of vessel, breadth of flange, position of ignition and compn. of mixt is investigated. The investigation of the influence of the intensity of the source of ignition is as yet unfinished. Conclusion With proper design a gap can be left for the release of pressure through the flanges of the enclosures of elec. mining app. inasmuch as a gap at such flanges of as much as $\frac{3}{64}$ in. does not, so far as our knowledge goes at present, enable the flame of the most explosive mixt. of fire damp and air to pass through it, but a breadth of less than 1 in. for flanges should not be used. Also, probably the most convenient application of the principle of flange protection will be in the use of "rough" machined instead of "finished" flanges or special bolts to allow a slight opening between flange surfaces when pressure is developed in the casing. L. C. LLSLEY

Accidents caused by acetylene apparatus. SCHOLTE. *Revue de la soudure autogène* (Oct., 1925); *Genie civil* 87, 516(1925).—Most accidents are caused by the presence of air in the apparatus and by the ignition of explosive mixtures by too elevated temperatures. JACK J. HINMAN, JR.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Dyestuffs progress and problems in 1925. E. F. ARMSTRONG. *Chem Age* (London) 13, 646-7(1925). E. J. C.

The dyestuffs situation: Aspects of the users' case. H. SUTCLIFFE SMITH. *Chem. Age* (London) 14, 3-4(1926). **Dyes and their application: Technical advances in 1925.** ANON. *Ibid* 5-7. E. J. C.

Patent law and the dye-making and dye-using industries. E. F. FRIEDRICH. *J. Soc. Dyers Colorists* 42, 17-23(1926).—A lecture. L. W. RIGGS

Developments of the Naphthol AS series. H. E. HAGER AND W. R. MARSSON. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 4 10; *Am Dyestuff Rept.* 15, 6-12; cf. ROSE, C. A. 19, 1057, Rath, C. A. 19, 734, 2748.—An address with much discussion by the members. L. W. RIGGS

Mauvein. A. COHENZL. *Farbe und Lack* 1925, 579; cf. C. A. 19, 2567.—Directions are given for lab.-scale production of mauve dye in various shades, equal to the French mauve. F. A. WERTZ

Schweinfurth green. KOBISA. *Textile Colorist* 48, 23-4(1926).—Dissolve 1000 parts of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in 2800 parts of boiling H_2O . Dissolve 610 parts of As_2O_3 and 348 parts of Na_2CO_3 in 1400 parts of H_2O by heating. After settling, add the hot Cu soln. to the hot As soln. and after 10 min. at 82-85° add 180 parts of 100% AcOH dild. to 1000 or 1200 parts with H_2O . Allow the ppt. to crystallize for 15 min., stir for 30 min. and then neutralize with Na_2CO_3 until the liquor is a light greenish blue color, filter and rinse well. CHAS. E. MULLIN

Setacyl and setacyl brilliant dyes (for acetate silk). CHAS. E. MULLIN. *Canadian Colorist & Textile Processor* 5, 356, 367(1925).—The constitution, properties, application and patents covering these dyes are discussed. CHAS. E. MULLIN

Physical condensation of dyes on fiber. R. HALLER AND A. RUPERTI. *Cellulosechemie* 6, 189-95(1925).—Chardonnet rayon when treated with β -naphthol followed by diazotized α - $\text{C}_7\text{H}_7\text{NH}_2$ showed a homogeneous microscopic appearance. On boiling with H_2O , the color tone changed and on heating under 6 atm., the dye particles decreased in no. and increased in size and appeared to migrate from the inner part of the fiber to the surface, on which they were finally deposited in the form of relatively large crystals, that adhered poorly and could be removed by pressing or washing. Cross sections of the fiber show that the inner portions are colorless. Many dyes manifest this same behavior and the phenomenon of surface accumulation and condensation appears to be general, when the fiber is heated under steam pressure. The pigment PbCrO_4 pptd. in the rayon fiber behaves differently. When heated with H_2O under 4 atm., the pigment was fully condensed, but a cross section of the fiber showed that it was uniformly distributed throughout the cell wall and not concd. at the surface. With cotton fiber dyed with various vat dyes, substantive dyes and dyes fixed by mordants, the growth of dye particles is at the outer surface as well as on the inner surface (bounding the lumen). The accumulation of dye particles within the lumen after the crystals migrating to the outer surface have been mechanically removed is clearly illustrated by numerous photomicrographs. Factors influencing the phys. condensation of dyes are the concn. of the dye, the pressure used in cooking, and the time of cooking.

In most cases simple heating in a boiling dye bath was insufficient but often protracted heating under slightly increased pressure proved sufficient to cause condensation of the dye. Dry heat never caused growth of crystals on fiber surfaces, although in individual cases, like Para-red, the dye sublimed out of the cell wall. Among the dyes which crystd. readily on the outer and inner surfaces of the fiber were indigo and thioindigo. Indanthrene Red 5GK was condensed on cotton by heating at 0.1-0.3 atm. excess pressure for 2 hrs. and after a short period of heating at 6 atm. was obtained on the surface and lumen in the form of long needles. Indanthrene Brilliant Violet RK condensed much more slowly and particles sepd. at the surface only after protracted heating. Indanthrene Blue RS showed no accumulation of cryst. surface particles, even after long heating under pressure. In the latter case the dyed fiber appeared practically uniform under the microscope and the only indication of condensation was the change in color tone. Ultramicroscopic examn. after steaming substantiated this evidence of increase of size of particles. A no. of dyes showed similar changes in color tone, which apparently characterizes condensation of the dye. Among the substantive dyes, Diamine Blue 3R, Congo Red and Congo Corinth showed unmistakable condensation. Trypan Red and Carbazole Yellow, however, remained unchanged. Cotton samples which had been mordanted with basic Al acetate, when uniformly dyed with Alizarin Red and steamed under pressure, showed migration of the dye to the outer and inner surfaces with the formation of the usual non-adherent particles. When similarly mordanted cotton was treated with Turkey red oil prior to dyeing with Alizarin Red, this migration and surface condensation was much less marked, showing that the oil served as a protective colloid inhibiting the growth of dye particles. As with Chardonnet silk, cotton dyed with PbCrO_4 evidenced no sign of migration or surface condensation. The pigment is deposited in the form of micro-crystals throughout the entire cell wall. H. and R. discuss the practical significance of their findings in connection with comm. printing and dyeing. LOUIS E. WISE

The dyeing of silk white effects on woollens and worsteds. ALAN A. CLAFLIN. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 21-2; *Am. Dyestuff Rept.* 15, 23-4.

L. W. RIGGS

New process of obtaining even dyeing of woollen fabrics. CAMILLE FAVRE. *Bull. soc. ind. Mulhouse* 91, 618(1925).—Sealed Note 1897 of April 2, 1909. The streakiness resulting from the excessive affinity of dyes for wool in presence of acids is prevented as follows: stir the fabric in the dye-bath contg. a certain amt. of Na_2CO_3 , at 30° add half the H_2SO_4 required for complete neutralization, at 35° make the bath slightly acid with H_2SO_4 , bring to a boil, wash and dry as usual. **New process for obtaining even coloring with substantive dyes by plating without steaming.** *Ibid* 619-20.—Sealed Note 2120 of Sept. 20, 1911. Plating is carried out in presence of soda, the fabric is dried and is then passed through 2 0.5% H_2SO_4 baths at room temp. and at 80° , resp., washed and dried. Report. HUGUES WAGNER. *Ibid* 620-1.—F.'s results were confirmed. No priority was found. A. PAPINEAU-COUTURE

Economic features of modern hosiery dyeing machines. J. S. FAIRCHILD. *Textile Colorist* 48, 44-5(1926).—A description of the rotary dyeing machine. C. E. M.

Dyeing of viscose rayon with mordant dyes. W. C. DURFEE. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 20-1; *Am. Dyestuff Rept.* 15, 22-3.—The advantages of mordant over vat, S and developed dyes are shown. L. W. RIGGS

The dyeing of vat colors on rayon. F. W. WARSHAW. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 1-4; *Am. Dyestuff Rept.* 15, 3-6.—An address with discussion by the members. L. W. RIGGS

Where rayon properties are valuable. M. G. LUFT. *Textile World* 69, 319-21(1926).—A review of the textile and phys. properties and uses of rayons. C. E. M.

Machinery for (viscose) artificial silk manufacture. A. G. PERT. *Canadian Colorist & Textile Processor* 5, 358-9, 362-5(1925).—The manuf. of viscose rayon is discussed. CHAS. E. MULLIN

A review of recent research in textiles. ALFRED BURTON. *Can. Chem. Met.* 10, 7-10(1926). E. J. C.

Science and the cotton industry. A. W. CROSSLEY. *Proc. Roy. Inst. Gt. Britain* 24, 491-510(1925).—In this address short descriptions are given of more than 70 researches now in progress in the labs. of the British Cotton Industry Research Assoc. L. W. RIGGS

Chemistry and its relation to cotton manufacturing. H. D. MARTIN. *Textile Colorist* 47, 775-6(1925).—General. CHAS. E. MULLIN

The application of scientific method to the solution of industrial problems. A. W. CROSSLEY. *Pharm. J.* 115, 693-5(1925).—An address on problems of the cotton

industry, e. g., mercerization and bleaching, notably the influence of H-ion concn. on the oxidizing properties of hypochlorites towards cellulose, non-cellulose impurities and certain dyes. S. WALDBOTT

Oiling of cotton preliminary to spinning. E. H. HINKLEY. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 11-5; *Am. Dyestuff Rept.* 15, 13-7. Some phases of cotton oiling process and its relation to finishing. R. B. EARLE. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 16-20; *Am. Dyestuff Rept.* 15, 18-22(1925).—These addresses showed many details of the process. L. W. RIGGS

Identification of methylhexalin in textile oils. J. MARCUSSEN. *Chem.-Ztg.* 49, 656(1925).—Of the oil suspected of contg. methylhexalin, 150 g. was acidified with H_2SO_4 and steam-distd. The oily distillate was benzoylated and the non-esterified substances were removed by a second steam distn. The residue, after sapon., yielded an ether ext., which was identified by odor and index of refraction as methylhexalin. E. R. CLARK

Castor-oil products in the textile industry. M. N. CONKLIN. *Chemicals* 25, No. 1, 34-5(1926).—The prepn. and uses of *Turkey-red oil*. CHAS. E. MULLIN

Bleaching of sized fabrics. ISMAR GINSBERG. *Textile Colorist* 47, 777-9(1925).—Work is reviewed which indicates that Cl will combine with starch to form a H_2O -insol. substance. In this way fabrics contg. a residue of starch size may take up Cl during bleaching. When this Cl product is decompd. the Cl may cause a deterioration of the cotton. CHAS. E. MULLIN

The felting of wool. F. A. HAYES. *Textile World* 69, 193-4, 199(1926).—A review of the theory and methods of felting wool. CHAS. E. MULLIN

Deterioration of woollen goods. J. MERRITT MATTHEWS. *Textile World* 69, 195, 227(1926).—The various deteriorating agencies of wool are discussed with emphasis upon bacterial damage as the most important factor. CHAS. E. MULLIN

Creping wool muslin (delaine). CAMILLE FAVRE. *Bull. soc. ind. Mulhouse* 91, 615-6(1925).—Scaled Notes 2236 of March 31, 1913 and 2266 of July 28, 1913. The process described in Scaled Note 1500 of Aug. 1, 1904 (*C. A.* 16, 3001) is improved as follows: (1) the unbleached fabric can be introduced directly in the creping bath without previously wetting in cold water; (2) instead of heating the bath to 75° , it is preferably brought to a boil as rapidly as possible and allowed to boil vigorously for 1 hr.; (3) bleaching with bisulfite is detrimental to the creping and bleaching is best carried out by allowing to soak a few hrs. in alk. H_2O_2 . Almost as good results are obtained much more cheaply with H_2SO_4 (10 g. per l.) without HCNS. Report. ADOLPHE WOLF. *Ibid* 616-7.—W. confirms F.'s claims. The process is expensive on account of the large amt. of labor required, the high shrinkage and the considerable proportion of treated goods which must be rejected owing to irregularities in creping and W. doubts if the process is applicable under present economic conditions. A. PAPINEAU-COUTURE

Ultra-filtration of wash waters from wool. ANON. *Halle aux cuirs* 1925, 368.—Cholesterol and higher fatty acids may be recovered by filtration through a nitro-cellulose membrane. H. B. MERRILL

Improving the tentering process. H. D. MARTIN. *Textile Colorist* 48, 19-20 (1926).—Suggestions. CHAS. E. MULLIN

Processing of linen. JACOB RICHTER. *Chemicals* 25, No. 1, 31-3(1926).—Bleaching and mercerizing are discussed. CHAS. E. MULLIN

Loaded and colored (textile) dressings. O. PIQUET. *Tiba* 3, 1169-73, 1283-5 (1925).—Brief description of dressings used for making imitation leathers and obtaining parchment effects. A. PAPINEAU-COUTURE

The moisture contents of bleached and mercerized cottons. E. BURLET. *Tiba* 3, 1311-5(1925).—The generally accepted com. standard of 8.5% for bleached cotton is satisfactory for general use, but 12% should be adopted for mercerized cotton. A. PAPINEAU-COUTURE

Analysis of finishing materials. C. F. GREEN. *Textile Colorist* 47, 789(1925).—Ten simple tests which indicate the nature of the product are given. C. E. M.

Oiled slicker clothing. MICHAEL DONIGER. *Textile World* 68, 3817-21(1925); *India Rubber J.* 71, 63-6(1926).—A discussion of the production and uses of oiled, rubberized and other coated fabrics. CHAS. E. MULLIN

Life of tent fabrics. J. A. HUNTER. *Textile World* 69, 309-11, 315(1926).—Expts. by the British Government upon cotton and linen tent fabrics indicate that the heavy tent fabrics are much less affected by the deteriorating influence of sunlight than are the light and much-exposed fabrics used in airplane and airship construction. Micro-organisms are the chief enemies of tent fabrics and their effects are most devastating in hot, damp climates. Chem. action is also a factor and in certain fireproofed fabrics,

it is the dominant cause of deterioration. The deteriorating action of sunlight, possibly caused by ozone formation, can be diminished by the proper use of pigments which are impervious to light, such as PbCrO_4 . The tannates, tungstates and sulfides frequently used in fireproofing, accelerate the deterioration. Waterproofing frequently, but not always, has a beneficial action, depending upon the process and materials used and the climatic conditions of exposure. Tables are given showing the tensile strength of waterproofed fabrics and the deterioration under exposure in various climates. Terra cotta-dyed cuprammonium-treated linen is regarded as the best tenting fabric, followed by cutch-dyed cotton. The latter has the greatest water-tightness.

CHAS. E. MULLIN

The pectin content of flax fiber. WM. HONNEYMAN. *J. Textile Inst.* **16**, T370-4 (1925).—"The ultimate fiber appears to be composed of a central column of pure cellulose, surrounded by layers of compound celluloses or hemicelluloses, contg. progressively less cellulose up to the outside layer (the middle lamella) where most of the pectin occurs. From a practical standpoint these suggestions offer an explanation of the difficulty of bleaching flax. In fully bleached material the fiber bundles are not present but have been resolved into their ultimate fibers. It is the difficulty of removing the pectin associated with the middle lamella which necessitates the protracted process used in order to resolve the bundles. If this pectin material is not removed, cloth made from the fiber will be discolored by alk. washing or by long storage." L. W. RIGGS

Method for evaluation of diastatic compounds. W. W. CHASE AND E. R. DONALDSON. *Textile Colorist* **47**, 781-2(1925).—C. and D. recommend a modification of Wohlgemuth's method of evaluating diastatic products for textile use. Sat. clean, dry, white cotton sheeting with a 1% soln. of cornstarch, mangle, dry and cut into swatches of 5 g. each. Add varying amts. of an aq. 1% diastatic soln. and H_2O to 150-cc. beakers to give a total vol. of 100 cc. Sat. each 5 g. swatch with one of these solns., lightly squeeze to a total wt. of 10 g., roll loosely and hold at 49° for 30 min. Then unroll and test with a drop of 0.1 *N* I soln. for a violet end point, which indicates complete solubilization of the starch. C. E. M.

Carpet beetles. A. P. SACHS. *Textile Colorist* **47**, 783(1925).—Larvex was effective against these insects in lab. expts. CHAS. E. MULLIN

Electrical dust precipitation in the textile industries (HAHN) **4**. Hydroxyalkyl sulfides (U. S. pat. 1,570,262) **10**.

DAVIDSON, A.: **Intermediates for Dyestuffs.** London: E Benn, Ltd. 256 pp. 36s.

RUGGLI, PAUL: **Praktikum der Färberei und Farbstoffanalyse für Studierende.** München: J. F. Bergmann. 197 pp. R. M. 12.

WOLF, HANS: **Zur Kenntnis der Darstellung der Clevesäuren.** Weida (Thür.): Thomas & Hubert. 41 pp.

ZÄNKER, W. and RETTBERG, H.: **Erkennung und Prüfung von Färbungen.** Wittenberg, Berlin: A. Ziemsen Verlag. 80 pp. M. 5. Reviewed in *Ind. Eng. Chem.* **18**, 217(1926).

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE and H. FRITZSCHE. *Brit.* **234,319**, July 22, 1924. The process of *Brit.* **219,653** (*C. A.* **19**, 736) is modified by substituting wholly or in part (for the aminomonoazo dyes used as diazo components) aminodisazo dyes. Dyes are formed by (a) coupling the urea of a 1-aminoaryl-5-pyrazolone with 2 mol. proportions of the same or different diazo-disazo compds. or 1 mol. of such compd. and 1 mol. of a diazoazo compd.; or, (b) by reacting with phosgene on the trisazo dyes made by coupling a diazo-disazo compd. with a 1-aminoaryl-5-pyrazolone. The dyes produce brown shades on cotton dischargeable to a pure white. Various examples are given.

Dyes. FARBWERKE VORM. MEISTER, LUCIUS & BRÜNING. *Brit.* **234,173**, Feb. 20, 1924. Dibenzanthrone dyes which dye cotton from a vat in violet, blue, gray-blue and similar shades are made by alkali fusion of hydroxybenzanthrones contg. no substituents or only halogen in the peri-positions of the naphthalene nuclei and alkylating the resulting dibenzanthrones. Among the various starting materials which can be used is *p*-methoxyphenyl α -naphthyl ketone, which is obtained by condensing α -naphthoyl chloride with anisole in the presence of AlCl_3 . 3- and 6-Methoxy-1-benzoylnaphthalenes are obtained, resp., from 3- and 6-hydroxy-1-naphthoic acids by methylating with Me_2SO , converting to the acid chlorides with thionyl chloride, and condensing with C_6H_6 in the presence of AlCl_3 .

Dyes. J. THOMAS, L. J. HOOLEY AND SCOTTISH DYES, LTD. Brit. 234,533, Jan. 26, 1924. Hydroxy- and chlorohydroxyanthraquinones are produced by condensing phthalic anhydride with *o*-chlorophenol or a chloro deriv. such as 2,4-dichlorophenol, preferably in H_2SO_4 contg. H_3BO_3 . NH_3 soln. may be used for sepg. the resulting mixts. Examples are given of dyes giving red shades on wool which become bluer on chroming. Cellulose acetate is dyed by suspensions of certain of these derivs. The NH_3 -insol. portion dyes yellow and the alkali-sol. portion red shades.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 234,086, May 13, 1924. 5- or 8-Amino-2,1-anthraquinoneacridone is condensed with a 1,3,5-triazine deriv. halogenated in the nucleus and may be further condensed with other compds. The products obtained dye cotton red-violet to Bordeaux shades from a hyposulfite vat.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 234,681, July 17, 1924. Production of an indigo-blue dye by sulfurizing the leuco-indophenol from carbazole and nitrophenol in the presence of benzidine (as described in Brit. 199,360; cf. C. A. 18, 333) is effected in the presence also of a substance such as NaCl , Na_2SO_4 or Na_2CO_3 which prevents sintering of the mass during the reaction.

Dyes. FARBENFABRIKEN VORM. F. BAYER & Co. Brit. 234,569, March 13, 1924. Triarylmethane dyes are prep'd. by condensing an alkylated diaminobenzohydrol with 1-naphthol-2-carboxylic-7-sulfonic acid or with 1-naphthol-2-carboxylic-4,7-disulfonic acid and oxidizing the resulting leuco compd. Tetramethyl- and tetraethyl-diaminobenzohydrol produce dyes giving reddish blue and greener dyeings, resp.

Perylene vat dyes. A. ZINKE and H. SHOEPPER. U. S. 1,569,111, Jan. 12. By the treatment of perylenequinone with Cl a product is formed which gives a more brilliant color on cotton than the corresponding Br deriv.

Thioindigoid dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 233,831, June 12, 1923. A naphthioindoxyl or a nuclear halogen substitution product is condensed with the usual indigoid dye components such as isatins, thioisatins, acenaphthenequinone, naphthoquinones or their anilides or halides. The products may be halogenated and dye cotton from the vat in Bordeaux, brown, blue, violet and other shades. Numerous examples are given. Cf. C. A. 19, 2135.

Sulfuretted dyes. AKT.-GES. FÜR ANILIN FABRIKATION. Brit. 234,470, May 23, 1924. Brown S dyes are made by heating 2-methyl-3-amino-6-hydroxyphenazine with alkali polysulfide with or without metal compds., such as CuSO_4 , to temps. above 180° (in some cases $235\text{--}240^\circ$).

Dye intermediate. BRITISH ALIZARINE CO., LTD., J. ANDERSON AND W. H. DAWSON. Brit. 234,263, May 6, 1924. Leuco-1,4,5-trihydroxyanthraquinone is made by reduction of the trihydroxy compd. by alk. hyposulfite. NaOH and Na hyposulfite may be used for the reduction and the leuco compd. ppt'd. from the reduction mixt. by pouring into dil. H_2SO_4 , filtered, washed and dried.

Dyeing and tinting composition. A. DAVID. U. S. 1,569,915, Jan. 19. A compn. for use with H_2O in dyeing or tinting fabrics or other materials comprises soap, H_2O , glycerol and dye.

Dyeing warp in rope or chain form. H. M. CHASE and G. W. ROBERTSON. U. S. 1,568,959, Jan. 12. Warp in rope or chain form is boiled out, dipped in a vat dye, oxidized, re-dipped in the same dye, again oxidized, washed and dried.

Apparatus for dyeing "raw stock." J. H. THOMPSON. U. S. 1,569,647, Jan. 12. Washing, dyeing and fulling fabrics in rope form. E. MUNDORF. Brit. 234,472, May 20, 1924. Mech. features.

Mercerizing and similar treatments. L. LILIENTELD. Brit. 234,847, May 30, 1924. A silky gloss, brilliance and elastic feel are given to woven and spun vegetable material by treatment in the presence of alkalies with an inorg. ester of a monohydric alc., and stretching. Patterns may be produced by preliminary printing with reserve materials. Numerous examples are given.

Apparatus for mercerizing yarn. NIEDERLAHNSTEINER MASCHINENFABRIK GES. Brit. 234,443, May 21, 1924. Details of tensioning devices are specified.

Printing textile materials. FARBWERKE VORM. L. DURAND HUGUENIN & Co. ANON. Brit. 234,829, March 9, 1923. White or colored effects are produced on fabrics by padding with an ester of a leuco vat dye (as described in Brit. 186,057; C. A. 17, 343) together with an oxidizing agent effective only in an acid medium, printing with a reducing agent (other than a hyposulfite prepn.) and developing the unprinted parts by passage through acid. Na_2SO_3 and $\text{Na}_2\text{S}_2\text{O}_3$ may be used as reducing agents. Dyes other than vat dyes, capable of withstanding reducing agents, are added to the reducing agents to produce colored reserve effects.

Apparatus for drying textile materials. H. HAAS. Brit. 234,444, May 23, 1924.

drying time of the resultant oil films observed. Microscopic examn. showed a pronounced difference in the av. particle size of the two samples, but their soln. rates in the oil and the drying tests showed no significant differences. Results are plotted and tabulated.

F. A. WERTZ

Some constituents of French and American rosins. E. KNECHT AND E. HIBBERT. *J. Soc. Dyers Colourists* **41**, 329-33(1925); cf. *C. A.* **13**, 2290; **18**, 759.—This paper gives an abridged account of the work. The term abietic acids has been adopted in place of pimaric to designate the acids having the compn. $C_{20}H_{30}O_2$ and obtained from French or American rosins. The m. p. and rotation of the abietic acids and their salts are studied, also the formation and properties of the nitrosites of the *l*- and *d*-acids. Bromination of abietic acids yields the tribromo deriv. Vesterberg's *d*-pimaric acid was studied. Analogs of Vesterberg's *l* pimaric and *d*-pimaric acids were obtained from Pinion pine pitch (American)

L. W. RIGGS

The detection of rosin. HANS WOLFF. *Farben-Ztg.* **31**, 515(1925).—Further expts. (cf. *C. A.* **19**, 3602) on the detection of rosin in linseed oils by the Storch-Morawski test have revealed some oils extd. from paint pastes which gave suspicious color reactions for rosin even though the same oils before grinding with the pigments gave negative reactions. This was particularly the case with oils ground with pigments contg. larger amts. of Fe_2O_3 . Comparative color tests with oils contg. a known rosin content of 0.5 to 1% are recommended.

F. A. WERTZ

Rosin esters. HANS BRENDL. *Farben-Ztg.* **31**, 576-8(1925).—A brief review of the natural resin substitutes, and of patented and published methods for producing rosin-glycerol esters, with a description and sketch of a com. app. for autoclave esterification.

F. A. WERTZ

Rosin oils for paints and varnishes. ANON. *Farbe und Lack* **1925**, 580.—Brief review of the method of mfg. rosin oils, and of their use in axle grease, printing inks and impregnating processes

F. A. WERTZ

Cumarone resin. KOCH. *Farbe und Lack* **1925**, 579.—Review.

F. A. W.

Furnace for enamelled articles (U. S. pat. 1,570,340) **1**.

HEATON, NOEL. **Volatile Solvents and Thinners.** Oil & Colour Chemistry Monographs. Edited by R. S. Morrell. New York: D. Van Nostrand Co. 154 pp. \$4.50 Reviewed in *Ind. Eng. Chem.* **18**, 216(1926).

WILSON, SAMUEL P.: **Pyroxylin Enamels and Lacquers.** New York: D. Van Nostrand Co. 213 pp. \$3 Reviewed in *Ind. Eng. Chem.* **18**, 217(1926).

Colored cellulose acetate varnishes. CHEMISCHE FABRIK GRIESHEIM-ELEKTRON. Brit. 233,891, May 19, 1924 Varnishes are prepd. by shaking together solns. of a cellulose ester in org. solvents with aq. pastes of inorg. pigments, H_2O -insol. azo or vat dyes or color lakes prepd. from sol. dyes. Solns. of rubber or of sol. dyes also may be added.

Coumarone resin. C. ELLIS. U. S. 1,570,584, Jan. 19. Coumarone resin contg. acid substances is treated with a basic neutralizing agent such as soda or $Ca(OH)_2$ in the absence of sufficient H_2O to dissolve the basic material, and heated to above the m. p. of the resin.

Resin substitute produced by Friedel-Crafts reaction. F. FREUND and H. JORDAN. U. S. 1,570,469, Jan. 19. $C_{10}H_8$, xylene, phenolic compds. from low-temp. tar or other aromatic compds. of similar reactivity with halogen compds. according to Friedel and Craft's reaction are treated with halogen compds. such as naphthalene tetrachloride or acetylene tetrachloride in the presence of about 0.1-10% of fuller's earth which serves to catalyze the reaction.

Linseed oil substitute. J. HOROWITZ. U. S. 1,570,252, Jan. 19. A mixt. adapted for use as a vehicle in paints comprises crude rubber 25, kerosene or other solvent 75, rosin 100, PCl_3 4 parts and sufficient NaOH to render the mixt. alk.

Apparatus for heating and thickening linseed oil and similar oils. G. H. LENART. Brit. 233,948, Aug. 21, 1924.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The adoption of uniform testing methods for the fatty oil industry. ANON. *Farbe und Lack* 1925, 583-4.—General methods for sampling, detn. of total fatty acids, unsapon. matter, impurities, etc., presented for discussion by the Fat Analysis Committee, are given. F. A. WERTZ

Dugong oil from Australia. ANON. *Bull. Imp. Inst.* 23, 429-30(1925).—A sample of filtered oil had the following const.: d_{15}^{15} 0.9242, d_{15}^{100} 0.8622, n_D^{40} 1.458, α_D^{40} (200 mm. tube) -0.12° , solidifying point of fatty acids 34.6° , acid value 0.3, sapon. value 204.7, I value (Hübl, 17 hrs.) 52.3%, unsapon. matter 0.2, sol. volatile acids 0.3 cc. 0.1 N NaOH (for 5 g. oil), insol. volatile acids 16 cc. 0.1 N NaOH (for 5 g. of oil). These const. are in general agreement with those previously obtained for dugong oil, but the sapon. value is slightly higher and the I value slightly lower than the previously recorded figures. A. PAPINEAU-COUTURE

Highly unsaturated acids in ox-liver oil. KANESUKE KIMURA. *J. Soc. Chem. Ind. Japan* 28, 1366-73(1925).—An oily liquid obtained by direct heating of an ox liver in a pan is extd. with Et_2O and then treated with Me_2CO and alc. Ox-liver oil, yellowish brown cryst. soft mass and sol. in Et_2O and Me_2CO , thus obtained has the following properties: d_4^{100} 0.9008, acid value 36.5, sapon. value 128.3, I value 113.3, n_D^{60} 1.4720 and amt. of unsapon. matter 40.62%. Fatty acids (I) freed from the unsapon. matter: m. $39-42^\circ$, d_4^{100} 0.8437, neutralization value 196.3, I value 104.4, n_D^{60} 1.4480 and Et_2O -insol. bromides 19.2%. Fatty acids (II) from Me_2CO -insol. but alc.-sol. part: m. $48.5-51^\circ$, d_4^{100} 0.8515, neutralization value 188.6, I value 132.1, n_D^{60} 1.4522 and Et_2O -insol. bromides 30.0%. Fatty acids (III) from Me_2CO - and alc.-insol. part: m. $51-54.5^\circ$, d_4^{100} 0.8521, neutralization value 186.0, I value 143.5, n_D^{60} 1.4529 and Et_2O -insol. bromides 38.3%. Et_2O -insol. bromides from I, II and III have nearly the same compn. The bromides were debrominated. Highly unsatd. acids thus obtained were converted into Me esters and distd. Hydrogenated products of some fractions contained arachidic and behenic acids; the presence of $\text{C}_{20}\text{H}_{32}\text{O}_2$ (cf. Hartley, *C. A.* 1, 2901; 5, 518) and of $\text{C}_{22}\text{H}_{36}\text{O}_2$ was proved. Acids of the $\text{C}_n\text{H}_{2n-10}\text{O}_2$ series may be absent or in minute amt. if present. The odor of highly unsatd. acids from ox-liver oil resembles that from fish oil. K. K.

The mistake in the acid value of crude oils and fats, and the use of the impure acid value. TEI HIDAKA. *J. Soc. Chem. Ind. Japan* 28, 1374-81(1925).—H. proposed to use the term acid value in the following meaning: (1) *Total acid value* represents the acid value due to free fatty acids and impurities in the oils or fats. (2) *True acid value* represents the acid value due to free acids only. (3) *Impure acid value* represents the acid value due to the impurities other than free fatty acids. (1) is detd. by the usual method using the original oils or fats and (2) by the following method: Shake 50-100 cc. of the sample with 5-10% of H_2O for from 5 min. to 1 hr., till the mixt. becomes an emulsion. Filter through paper, obtaining clear oil. The acid value of this clear oil is (2) and by subtracting (2) from (1), (3) is obtained. The most convenient temp. for the treatment is $20-30^\circ$. Percentages of impurities are expressed by $K \times$ impure acid value. As the value of K , H. obtained 3.9-4 for pressed soy-bean or peanut oil, 8.0-9.0 for pressed perilla oil and 2.0-3.0 for pressed cottonseed oil. K. K.

The separation of ricinoleic acid from the mixed fatty acids of castor oil. KINJIRO INOKUCHI. *J. Soc. Chem. Ind. Japan* 28, 1353-8(1925).—In order to det. the conditions of the sepn. of ricinoleic acid from the castor-oil fatty acids by the Ba salt-alc. process, I. measured the soly. of Ba ricinoleate and stearate in alc.: Soly. of Ba ricinoleate in abs. alc.; 0.06 g. in 100 g. of the soln. at 10° , 0.13 g. at 20° , 0.325 g. at 30° , 2.00 g. at 40° , 9.372 g. at 50° and 28.19 g. at 60° . Soly. of Ba stearate in abs. alc.; trace at 10° , 20° and 30° , 0.014 g. at 40° , 0.018 g. at 50° and 0.024 g. at 60° . Soly. of Ba stearate in alc. of $d_4^{15} = 0.8119$; trace at 20° , 0.011 g. at 30° , 0.017 g. at 40° , 0.022 g. at 50° and 0.029 g. at 60° . Soly. of a mixt. of Ba stearate and ricinoleate; 0.127 g. at 20° , 0.324 g. at 30° , 2.141 g. at 40° and 9.511 g. at 50° . The conditions for the prepn. of pure ricinoleic acid from castor oil: The temp. for the sepn. of the Ba salts is 50° ; the time given for dissolving the mixed Ba salts in the solvent is about 1 hr. to take advantage of the poor and difficult soly. of Ba stearate; the solvent should first be somewhat watery (say 95% alc. by wt.), then 98% and at last abs. alc.; the amt. of alc. used for one sepn. may be about 100 cc. for each 10 g. of the salts. K. K.

Studies on catalytic hydrogenation of highly unsaturated acids. I. The course of hydrogenation of methyl esters of highly unsaturated acids in the presence of nickel catalyst. YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. *J. Soc. Chem. Ind. Japan* 28, 1079-87(1925).—Methyl esters of highly unsatd. acids, obtained from Japanese sardine oil, have been hydrogenated in the presence of Ni at 185-210° under ordinary pressure. The ester b_p 210-27°, sapon. value 169.2, I value 350.6; the fatty acids obtained from the ester yield 127.1% of Et₂O-insol. bromide contg. 71.06% Br. The individual acids which may possibly be present in the original sample are C₂₀H₃₀O₂, C₂₂H₃₄O₂, C₂₀H₃₂O₂ and C₂₂H₃₆O₂. Before the I value of the original sample falls to 11.4, portions are taken out at 12 different stages of hydrogenation and analyzed. The amt. of the fatty acid giving Et₂O-insol. bromide steadily decreases according to the progress of hydrogenation. Thus when the I value of the acid becomes 173.1, the amt. of Et₂O-insol. bromide is 1.67% and at 134.9 of the iodine value, no bromide is produced. As the Br content of Et₂O-insol. bromide is found to be more than 69% in every case, no fatty acids giving Et₂O-insol. hexabromide can be found in substantial amt. during the entire course of hydrogenation. The fact that the Br content of Et₂O-insol. bromide decreases a little with the progress of hydrogenation may be accounted for by partial conversion of the fatty acids of five double bonds to those of four double bonds. Until nearly all of the fatty acids giving Et₂O-insol. bromide disappear, no distinct amt. of solid acid is formed. Immediately after almost complete disappearance of fatty acids giving Et₂O-insol. bromide, solid acids are formed in substantial amt. As it can reasonably be assumed that most of the fatty acids (C₂₀ and C₂₂) of one double bond formed during the hydrogenation are solids it appears that until nearly all of the fatty acids giving Et₂O-insol. bromide disappear, the hydrogenation results mainly in the conversion of highly unsatd. acids to acids of two double bonds. Immediately after almost complete disappearance of fatty acids giving Et₂O-insol. bromide, the conversion of the acids of two double bonds to those of one double bond with the formation also of satd. acids takes place mainly. Even in the sample having an I value of 134.9, the presence of satd. acids is indicated. It is found that the solid acids of one double bond formed during the hydrogenation contain those having markedly higher m. ps than naturally occurring C₂₀ and C₂₂ acids of the oleic series. Even the presence of solid acids of two double bonds is indicated. K. K.

The formation of the iso-unsaturated solid acids during the hydrogenation of fatty oils. I. Presence of iso-acids in hardened sardine oil. SEI-ICHI UENO. *J. Soc. Chem. Ind. Japan* 28, 1235-9(1925); cf. *Ibid* 27, 23(1924).—U. has examd. the original and hardened sardine oils as to the formation of iso-acids during hydrogenation of the oil at a high temp (160-182°) with Ni catalyst. Solid acids sepd. from the original sardine oil by the Pb-soap-Et₂O process have a high I value. The original sardine oil should contain iso-compds. of unsatd. acids. Properties of the solid and liquid acid, sepd. from some samples of the selectively hardened oil, are similar and the neutralization value of the former is pronouncedly higher than that of the latter. The hydrogenation takes place in a selective manner in regard to the mol. wt. of the unsatd. fatty acids; the higher acid is more slowly reduced than the lower. Some portions of highly unsatd. fatty acids, in the first stage of the hydrogenation, are changed into the iso-acid of the oleic series and then to the satd. series. All samples of the soft hardened oils do not contain the highly unsatd. fatty acids which are completely satd. more readily than those of the oleic acid series. K. KASHIMA

Constants of Victorian beeswax. Graph for the investigation of beeswaxes. A. A. WEIR. *Analyst* 50, 445(1925).—By making a graph showing the various possible consts. of pure beeswax (sp. gr., m. p., n_D , I₂ value, sapon. value, acid value, ester value, inverse ratio of the last 2 values, and unsaponifiable value) and plotting also the corresponding consts. of the possible adulterants, it was easy to establish the fact that the given sample was pure. W. T. H.

Soap and solvent (detergent) mixtures. C. F. GREEN. *Textile Colorist* 47, 788-9(1925).—The relative values of these mixts. may be approximated from simple tests of their power to wet-out and emulsifying action. CHAS. E. MULLIN

Naphthenic soap. JIRO MIKUMO. *J. Soc. Chem. Ind. Japan* 28, 1121-6(1925).—Na soap prepd. from a mixt. of Japanese naphthenic acids ($d_4^{25} = 0.9708$, acid value 249.2) was examd. for its soap characteristic, i. e., surface and interfacial tensions, emulsifying, lathering and detergent powers. Parallel tests were made with Na soaps from Kahlbaum's oleic acid, coconut oil and rosin. The naphthenic soap is extremely sol. in cold H₂O and has great lathering power, even more than coconut oil soap. It is, however, soft and is far poorer than oleate soap in cleansing activity. It stands between fatty and rosin soaps. K. KASHIMA

Densities and inner friction of glycerol solutions (HERZ, WEGNER) 2. Effect of tapping coconut palms for toddy on the copra and oil from subsequent fruiting (JACK, DENNETT) 11D. Castor-oil products in the textile industry (CONKLIN) 25. Composition of soap films (LARNG) 2. Margarine and similar compositions (U. S. pat. 1,570,529) 12.

Apparatus for clarification of oil. AKTIESELSKAPET FORSOEKSDRIFT. Norw. 41,935, Sept. 28, 1925. Mech. features. The clarifying vessel is kept completely full during the operation by means of a layer of water which at the same time will take up the sepd. impurities.

Rotary filter for separating oils or fats from aqueous liquids. E. F. SPANNER. Brit. 233,738, Nov. 15, 1923.

Apparatus for making soap. A. T. MIRZA. Brit. 234,346. Sept. 23, 1924. The app. comprises an autoclave in which ingredients injected through a sprayer are agitated while heated at about 113°, a cooler, salting-out pan and connections and other accessory app.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Report on meeting of Technical Advisers in the Java Sugar Industry, August 4, 1925. ANON. *Arch. Suikerind.* 33, Part 4(1925); cf. C. A. 19, 2754; 20, 120. Meeting of Agricultural Section, 137–88.—A round-table discussion on the field results of the 1924–25 campaign, and on the following points in connection with the 1925–26 crop: prepn. of land, planting, depth of planting, sources of seed cane, distance between plants, fertilizers, production of seed cane, diseases, insects and varieties. F. W. Z.

Report on meeting of Technical Advisers in the Java Sugar Industry; meeting of Agricultural Section, Aug. 5, 1925. ANON. *Arch. Suikerind.* 33, Part 4, 189–244 (1925); cf. C. A. 20, 120.—A round-table discussion on fertilizers, green manuring, supply of seed cane, warm water treatment of seed cane, diseases and insects. F. W. Z.

How large should the unknown losses be in a raw-sugar or mixed mill? WILHELM GREDINGER. *Deut. Zuckerind.* 50, 1597–8(1925).—Total losses (a), known losses (b) and unknown losses (c), for G.'s factory producing both raw and refined sugars, in % on beets, were: campaign of 1922–3, (a) 0.75, (b) 0.37, (c) 0.38; 1923–4, (a) 0.73, (b) 0.33, (c) 0.40; 1924–5 (a long and mild season with very poor beets), (a) 0.91, (b) 0.41, (c) 0.50. In contrast with this the losses in 2 raw-sugar mills having poor control were: (a) 1.34, 1.52, (b) 0.35, 0.38, (c) 0.99, 1.14.

W. L. BADGER

Practical application of bromothymol blue. C. FRANSSEN. *Arch. Suikerind.* 33, 1230(1925).—In a Java sugar factory the juice was, toward the end of the campaign, sulfured and limed to p_H 7, with this indicator. Ordinary titrations of the same juices with phenolphthalein as indicator usually showed between 130 and 180 mg. SO_2 per l. with an even greater variation in some cases, against 70–90 mg. per l. in the usual procedure. In spite of this no inversion could be detected. Liming to p_H 7 resulted in less filter-press mud. The juice obtained was not quite as brilliant, and boiling to grain was less easy to perform. However, there was no difficulty in purging.

F. W. ZERBAN

The behavior of raffinose in crystallizing processes. G. SCHECKER. *Deut. Zuckerind.* 50, 1474, 1499(1925); cf. Mehrle, C. A. 20, 306; Richard Mehrle, *Ibid* 1455, 1522, 1574.—Polemic.

W. L. BADGER

Precipitation of calcium sulfite under various conditions, with special reference to sugar factories. R. G. W. FARNELL. *J. Soc. Chem. Ind.* 44, 530–2T, 533–8T(1925); *Intern. Sugar J.* 28, 36–45(1926).—Previous literature is reviewed. The neutralization curve for 0.046 N solns. of H_2SO_3 and $Ca(OH)_2$ has been constructed for 20°, and also after boiling and quickly cooling. When 50% neutralization is exceeded, $CaSO_3$ is formed and partly pptd.; below this point boiling drives out some SO_2 , but above it the effect is merely an increased pptn. of $CaSO_3$. The p_H of 0.023 N $Ca(HSO_3)_2$ is 4.8, that of 0.005 N $CaSO_3$ is 9.2. Between 55 and 80% neutralization there is a strong buffer effect, the p_H remaining nearly const. at 5.2–5.3. Pptn. of Ca as $CaSO_3$ increases with time of heating at any given temp. The max. pptn. is reached when the p_H is at least 8. A pptn. of 94.6% may be attained by boiling and then keeping the temp. at 90–100° for 1 hr. In the presence of sucrose the pptn. of $CaSO_3$ is retarded at low temps., but above 70° the effect becomes negligible. The crystals ($CaSO_3 \cdot 2H_2O$) are smaller than in aq. soln., but otherwise of the same character. If colloids are

present besides sucrose, the pptn. of CaSO_3 is greatly retarded and becomes a function also of the SO_2 originally present; here the ppt. consists of spherical particles instead of needles, their size increasing with the p_H attained. In factory practice at least 0.5 g. SO_2 per l. should be used; 2 g. gives a better clarification effect and less scale in the evaporators than 1 g., the juice being limed in both cases to the same p_H . This confirms results of Brewster and Raines (*C. A.* 16, 4360). Better results would be obtained if liming were carried to p_H 7.6-7.8, instead of to 6.8 as now practiced in Natal and Mauritius. Of course, the capacity of the filter-press station would have to be increased in that case.

F. W. ZERBAN

Decolorizing carbons. A. A. BŁOWSKI AND J. H. BON. *Ind. Eng. Chem.* 18, 32-42(1926).—On the basis of exhaustive lab. tests with 5 decolorizing carbons, regarding the decolorizing efficiency, filtration efficiency and removal of ash for various refinery products and under varying conditions, it is concluded that these carbons do not, either as a substitute for or as an adjunct to bone char, offer sufficient technical and economic advantages at the present time to justify their adoption for cane-sugar refining on a large scale. They may be profitably used for a restricted trade, but a large amt. of study and investigation on a factory scale will be necessary before they may obtain a more favorable standing from the view-point of the large U. S. refiner. The exptl. results are shown in numerous tables and charts.

F. W. ZERBAN

The significance of active carbons for the production of sand sugar from thick juice. A. LINSBAUER. *Z. Zuckerind. czechoslov. Rep.* 50, 49-53, 56-60(1925). A lecture

W. L. BADGER

Hydrogen-ion concentration as a basis of refinery alkalinity control. A. A. BŁOWSKI AND A. L. HOLVEN. *Ind. Eng. Chem.* 17, 1263-6(1925).—Acidities and alkalinities of refinery products detd. by titration with the usual indicators are misleading as shown by a no. of tests. To reduce inversion losses to a min., the H-ion concn. must be detd. and kept as closely as possible to p_H 7. A practical spot plate test has been developed, with color charts of dyed gelatin-coated celluloid. H-ion control by this method is maintained throughout the factory, and wherever practicable, acidity is corrected by adding milk of lime of 2° Brix to p_H 7. This system has reduced the total amt. of lime used to one-half, and has increased the recovery of crystd. sucrose.

F. W. ZERBAN

The nipa palm as a source of sugar and alcohol. M. REIJGERSBERGH. *Arch. Suikerind.* 33, 1244-53(1925).—A brief description is given of the occurrence and habits of growth of this palm, and of the methods used for tapping. About 12,000 l. of juice, contg. 15% sucrose, is produced per acre. For alc. production the juice as obtained by ordinary tapping is fermented and distd. Losses are as much as 50%, as the juice sours before reaching the distillery. The yield is about 750-900 l. alc. per acre. For sugar production the effect of the invertase and oxidase in the fresh sap is counteracted by the use of lime and Ca sulfite in the collecting vessels. The juice is then worked up by the usual methods for producing white plantation sugars. The difficulty in the removal of albuminoid material can be largely overcome by first heating the raw juice to boiling, cooling and decanting, after which it is clarified and further treated as usual. The product is practically white, and has a characteristic, agreeable flavor. The sugar yield is about 1400 kg. per acre.

F. W. ZERBAN

Notes on the use of Soldaini's reagent. R. OFNER. *Z. Zuckerind. czechoslov. Rep.* 50, 53-4(1925); cf. *C. A.* 19, 583, 3029.—It is necessary to use a CaCl_2 bath and actually to boil the sample, and to use O.'s modification of the reagent.

W. L. B.

The drying of sugar cane and beets. V. KHAINOVSKY. *Arch. Suikerind.* 33, 1175-85(1925).—A review of previous literature.

F. W. ZERBAN

Further data on air removal from pressed beet juices, and on Herles' method of clarification for the analysis of pressed juice. FERDINAND KRYŽ. *Z. Zuckerind. czechoslov. Rep.* 50, 54-6(1925).—The figures given in *C. A.* 19, 3612, for the differences in d. caused by thorough removal of air, have been criticized as excessive. The original expts. were done on badly rotted beets. Figures taken during the campaign on juice from fresh beets pulped with the Staněk rasp show from 1° to 10° Bx. higher readings after air removal. In the analysis of 10 samples of press juice, clarified with Herles' reagent and with $\text{Pb}(\text{OAc})_2$, no differences were found in 6 samples, and only $\pm 0.1^\circ$ in the other 4. Hence the work of Ofner (*C. A.* 19, 3029) and that of Weiss (*C. A.* 19, 3612) have no bearing on this case.

W. L. BADGER

The utilization of sweet-corn cobs. G. G. NAUDAIN. *Am. Food J.* 20, 508(1925).—The juice from sweet-corn cobs contains sufficient sugar to warrant its utilization. Expts. indicate that the tannin compds. can be removed by such materials as decolorizing C. Phthalic anhydride in alk. soln. is the most delicate test for tannin compds.

J. A. KENNEDY

Chemical constitution of the gum from *Boswellia serrata*. M. A. MALANDKAR. *J. Indian Inst. Sci.* **8A**, 240-3(1925).—The gum was hydrolyzed by heating on a water bath for 8 hrs. with 3% H_2SO_4 . An EtOH-insol. residue proved to be the gum acid. On further heating with acid this gradually decreased in mol. wt. as judged by the Ba content of its salt. Arabinose, xylose and galactose were identified in the EtOH-sol. portion. J. J. WILLAMAN

Apparatus for filtering sugar solutions (U. S. pat. 1,570,374) 1.

HINZE, ADOLF: *Die Weisszucker-Fabrikation in den Rübenzuckerfabriken*. Magdeburg, Ger.: Schallehn & Wollbrück. Reviewed in *Intern. Sugar J.* **27**, 666 (1925).

Jaarboek voor Suiker-Fabrikanten in Ned. Indië, 1922-25. (Year Book for Sugar Manufacturers in Java.) Amsterdam, Holland: J. H. de Bussy. Reviewed in *Intern. Sugar J.* **27**, 665(1925).

SCHALLEHN, C. ARTUR: *Jahr und Adressbuch der Zuckerfabriken, 1925-26.* Magdeburg, Ger.: Albert Rathke. Reviewed in *Intern. Sugar J.* **27**, 665(1925).

Sugar. C. STEFFEN. Brit. 233,936, July 30, 1924. In using lime to ppt. sugar from soln. as Ca saccharate, undissolved lime which has not entered into the reaction is sepd., *e. g.*, by settling or centrifuging, before the saccharate is passed to the filter-presses. Lime thus sepd. may be used for pptg. a further quantity of sugar, the temp. of the separator being kept down to about 15°.

29—LEATHER AND GLUE

ALLEN ROGERS

The history of tanning and tanning chemistry. TH. KÖRNER. *Ledertech. Rundschau* **17**, 177-80, 191-3, 202-4(1925).—The work in the 18th century of Newmann and of Lemery on the iron-tannin reaction and the search for tannin-bearing materials during the last 2 centuries is reviewed. I. D. C.

New tanning materials and sundries. LEOPOLD POLIAK. *Gerber* **51**, 213-4 (1925); cf. *C. A.* **20**, 308.—Description and analyses of the following proprietary products: *Anti-oxydul*; *Pellastol C*; and *Pellastol N*. H. B. MERRILL

Syntans. OTTO ZOHLEN. *Gerber* **51**, 201-4(1925).—A description. H. B. M.

Modifications brought about by the war in the French industry of leather treating materials. MARCEL GILLET. *Rev. chim. ind.* **34**, 338-41, 370-3(1925); cf. *C. A.* **19**, 3034. A. PAPINEAU-COUTURE

Another important role played by enzymes in bating. J. A. WILSON AND H. B. MERRILL. *Ind. Eng. Chem.* **18**, 185-8(1926).—An important function of bating is the removal of keratose from the skins by hydrolysis with pancreatin, which proceeds only in the p_H range 5.5 to 11.2, with a max. at 7.9. The isoelec. point of keratose is at $p_H = 4.1$. Hydrolysis at 40° and $p_H = 7.9$ has been measured as a function of time and concn. of both enzyme and keratose. A method is outlined for measuring the keratose-digesting power of bating materials. J. A. WILSON

Ultrafiltration of vegetable tanning solutions. A. W. THOMAS AND MARGARET W. KELLY. *Ind. Eng. Chem.* **18**, 136-8(1926).—Ultrafiltration is not a reliable method for sepg. tannins from nontannin because the fraction of total material retained by the colloidion ultrafilter was found to vary widely with p_H value and with the concn. of colloidion used in the prepn. of the membrane. J. A. WILSON

Report of the International Commission on the Analysis of Chrome Leathers and Chrome Liquors. R. F. INNES, *et al.* *J. Intern. Soc. Leather Trades Chem.* **9**, 508-9 (1925).—Proposed changes in methods are discussed. H. B. MERRILL

Preparation of hide powder for analytical work. L. MEUNIER, P. CHAMBARD AND A. JAMET. *J. Intern. Soc. Leather Trades Chem.* **9**, 510-2(1925); cf. *C. A.* **19**, 747, 2143.—The best and most economical starting material is cow-hide flanks. Previous work on deliming is reviewed. Disintegration is best accomplished after dehydrating with 85% acetone and drying at 30°. H. B. MERRILL

The destruction of leather by microorganisms. F. SCHMIDT. *Ledertech. Rundschau* **17**, 185-6(1925).—Four photomicrographs are given of leather damaged by bacteria. I. D. C.

Dyeing of leather tanned with synthetic tannins. G. E. KNOWLES. *J. Intern. Soc. Leather Trades Chem.* 9, 512-7(1925).—See C. A. 19, 3385. H. B. MERRILL

Leather dyeing. I. H. SALT. *J. Intern. Soc. Leather Trades Chem.* 9, 518-20 (1925).—The addition of NaCl or Na₂SO₄ to the dye bath, in using acid dyes without added acid, interferes with the fixation of the color by sumac skivers. Acetic acid added to the bath gives results as good as those obtained with H₂SO₄. II. H. SALT AND D. McCANDLISH. *Ibid* 520-5.—Chrome leather has a much greater affinity for acid and direct dyes, and a much smaller affinity for basic dyes than vegetable-tanned leather or chrome leather mordanted with sumac. The usefulness of sumac mordanting in dyeing chrome leather is due to a retardation of dye fixation, resulting in more even shades. H. B. MERRILL

Polishing wheel leather. R. C. BOWKER. *Abrasive Ind.* 7, 14-5(1926).—Chem. analysis of some American sole leather, which gave poor results when used for rough polishing, showed a high grease content. Imported leather giving satisfaction showed a low grease content and the presence of CrO₃. It was established by tests that domestic leather prep'd. by a combination of the chrome and vegetable processes and contg. less than 0.5% of grease gave excellent results in rough polishing of cutlery blades. W. H. BOYNTON

Protective measures against the spread of anthrax by tanneries. WILHELM RIECK. *Ledertech. Rundschau* 17, 173-7, 186-90(1925).—Statistics show the no. of anthrax cases for several years. Methods for testing skins for anthrax and for disinfecting them are given. Imported skins should be exam'd. and disinfected at the port of entry. If infected hides are used, all tannery wastes and effluent must be disinfected or the disease will spread to the pasture land. I. D. CLARKE

Rendering gelatin insoluble with formaldehyde at moderate temperature in presence of sulfonate. ALBERT BRYLINSKI. *Bull. soc. ind. Mulhouse* 91, 611-2(1925). Sealed Note 2054 of Dec. 9, 1910.—According to the Fr. pat. 413,007, addn. of an org. acid to a bath contg. gelatin and CH₂O prevents the insolubilization, which is restored by NH₃. In order to eliminate the successive acid and alk. treatment which can be harmful with certain dyes, B. uses neutral Turkey red oil (com. 50% NH₃ sulfo oil) as follows: pass the fabric successively through a gelatin bath and through a bath contg. the sulfo oil and CH₂O, and dry as usual. By reversing the order of the baths a superficial insol. dressing is obtained. Insolubilization occurs in 1.5 hrs. at room temp., and in a few min. at 40-50°. Report. PHILIPPE BRANDT. *Ibid* 613-4.—The results claimed were readily duplicated. On heating the neutral sulfo oil for several hrs. at 50° with CH₂O, or on allowing to stand several hrs. in the cold, there is formed some hexamethylenetetramine, which has no action on gelatin but interferes with the reaction by using up some of the CH₂O. The sulfo oil acts merely as an accelerator, and other colloids (Na sulfonate, monol soap, Na oleate, gum senegal, protectol, albumin, starch paste, linseed oil emulsion) behave similarly. The coagulum is similar in every respect to that obtained with gelatin and CH₂O alone, except that the former is milky in appearance. The coagulum is insol. even in boiling H₂O, but is slowly attacked if it has not been previously dried. It is decomposed by prolonged digestion with cold 15% HCl. No priority for the process was found. A. PAPINEAU-COUTURE

Colored patent leather. W. C. WELCH. U. S. 1,569,056, Jan. 12. Patent leather is formed by successive applications of japanner's varnish to the leather and a powd. coloring material such as bronze powder is applied and firmly fixed in the surface of one of these coatings.

Leather grease. PAUL SKAUG. Norw. 41,999, Oct. 12, 1925. A mixt. of fat or paraffin wax, water-sol. soap and less than 50% of a liquid fat-solvent.

Stencil dyeing of leather. W. MOOG. U. S. 1,569,562, Jan. 12. Mech. features.

Autolyzed yeast in leather manufacture. D. McCANDLISH and W. R. ATKIN. U. S. 1,570,383, Jan. 19. An aq. soln. of autolyzed yeast is applied to hides, kips or skins as a substitute for pancreas tryptase for softening dried hides, depilating, bating and puering.

Tanning composition. O. RÖHM. U. S. 1,569,578, Jan. 12. Sulfite cellulose liquor is mixed with Fe chloride or other Fe salt and with an alkali metal silicate to form a compn. which produces leather of good weight and color.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Calender and shrinkage effects of unvulcanized rubber. W. DE VISSER. *Dissertation Delft* 1925, 147 pp.; *Gummi-Ztg.* 40, 457-8, 511-3(1925).—A systematic investigation was made of the factors which influence the calender effect (*c. e.*), the latter being characterized by a difference in the stress-strain curves across and along the direction of calendering of a sheet. The stress increases steadily with the elongation in the direction of calendering, but remains almost const. with increase in elongation across the direction of calendering. From these relations a *diagrammatical method for estg. the intensity of the c. e.* is derived. The tensile strength (based on the original cross-section) is greater along than across the direction of calendering, whereas the max. elongation is greater across. These differences are also manifest in changes in 3 dimensions on warming or on dissolution in a solvent, the length decreasing, the width and thickness increasing. These last phenomena, however, occur at times in sheets in which the *c. e.* is absent. With const. conditions otherwise, the *c. e.* decreases with an increase in the plasticity of the rubber and also with an increase in the temp. (1) of the lower roll, (2) of the upper and middle rolls and (3) of the rubber before calendering, all of which indicate a relation between plasticity and the *c. e.* A *c. e.* is also found in gutta-percha, balata, *Castilloa* and *Ficus elastica*. Nine methods of calendering were carried out with rubber plasticized to a const. degree and brought to 80°, the upper and middle rolls also being maintained at 80°. In all cases the sheets were first passed between the upper and middle rolls. (1) With no other treatment a *c. e.* was absent. (2) After passing around the middle roll and out between the middle and lower roll, a *c. e.* was absent. (3) After passing around the middle roll, between the middle and lower rolls and around the lower roll (hot), a *c. e.* was absent. (4) Under conditions like (2) except for rolling the sheets immediately in linings (without pressure between the lower rolls) a *c. e.* was evident. (5) Under conditions like (3) except for a cold lower roll, a strong *c. e.* was produced. (6) Under conditions like (2) except for passing the sheets immediately into cold water, a *c. e.* was absent. (7) Under conditions like (1) except for rolling immediately in linings a distinct *c. e.* was produced. (8) Under conditions like (7) except for preheating the linings at 80°, a *c. e.* was absent. (9) Under conditions like (3) and like (5) except for stopping the calender and allowing the rubber to remain in contact with the lower roll (either hot or cold) there was no *c. e.* The results indicate that a *c. e.* is produced only when the rubber is cooled instantly after calendering and free motion is inhibited. Furthermore, this effect is produced between the upper and middle rolls. By means of geometrical figures of known dimensions on the upper roll, which imparted impressions to the calendered sheet, it was shown that when free motion after calendering preheated rubber was permitted, shrinkage and full recovery occurred, but that when shrinkage was prevented, the figures remained enlarged in their original proportionate dimensions and a *c. e.* was produced. On calendering rubber not first preheated the phenomena were far different, differential motion between the inner and outer strata occurring. When rubber at 80° was stretched and while stretched instantly either rolled in cold cloth or held on a cold glass plate, there was no *c. e.* But with the rubber at room temp. a *c. e.* was produced. The effect was also produced by compressing to thin sheets. Further expts. showed that the degree to which calendered rubber shrinks bears no simple relation to the *c. e.* Rubber manifesting the *c. e.* also shows double refraction on polarization, corresponding to a positively refracting uniaxial crystal, whose optical axis lies in the direction of calendering. This double refraction disappears with the *c. e.* even when a shrinkage effect can be detected. Dichroism also accompanies a *c. e.* A diminution in d. occurs when the *c. e.* disappears (cf. Feuchter, *C. A.* 19, 2575). Rubber in which the *c. e.* is pronounced becomes hard and brittle rapidly compared with that in which it is absent. Furthermore rubber with the *c. e.* gives a *Debye-Scherrer Röntgen diagram*, whereas rubber showing only a shrinkage effect gives an *amorphous ring*, indicating that the *c. e.* depends on the formation of an ordered structure which probably involves formation of a cryst. phase. The shrinkage effect can be explained in the way that Lunn (*C. A.* 18, 1764) or Hauser and van Rossem sought to explain the *c. e.*, though according to de W., inadequately.

C. C. DAVIS

The Netherlands Government Rubber Institute. ANON. *Industrial Chemist* 1, 521-4(1925).—An illustrated description.

E. J. C.

The rubber industry. JEAN-CH. BONGRAND. *Chimie et industrie* 14, 823-38

(1925).--Review of the origin, properties, methods of collection, processes of transformation and chief chem. researches carried out in rubber, pointing out lines of further research. Bibliography of 115 references. A. PAPINEAU-COUTURE

Developments in the preparation of raw rubber. W. S. DAVEY. *Trans. Inst. Rubber Ind.* 1, 261-7(1925).--A review of methods involving coagulants, evapn. and electrodeposition. Discussion. D. F. TWISS, *et al.* *Ibid* 267-9. C. C. DAVIS

Gas black for rubber manufacture. The effects and detection of grit. G. GALLIE. *Trans. Inst. Rubber Ind.* 1, 247-53(1925).--Gritty particles, which originate from deposits which have passed through the mfg. process repeatedly and have burned to hard flakes, are a frequent impurity in gas black. Expts. show that they contain at times several % of ash and more Me_2CO -sol. and petr. ether-sol. components than the fine component. Part of this grit is not disintegrated during ordinary milling and that which remains is uniformly distributed and reduces the tensile strength of the vulcanized rubber contg. it. Furthermore when it is finely ground it acts as a filler with no reinforcing power. Discussion. D. F. TWISS, *et al.* *Ibid* 253-4. X-ray examn. of gas black in bag form is useful in detecting grit. C. C. DAVIS

The two-phase structure of rubber. II. ERNST A. HAUSER. *Rev. gén. colloïdes* 3, 321-4(1925); cf. *C. A.* 20, 667.--The opinion is held that the internal phase of rubber globules (cf. *C. A.* 19, 1962, 2280) is the rubber hydrocarbon in gel form in which a more highly polymerized form is dispersed. This membrane on the contrary is a gel in which this more highly polymerized form is the predominant component. The origin of this membrane, which is particularly firm in *Ficus elastica*, is unknown, but there may be some relation between its origin and the fact that when a drop of H_2O is placed on a C_6H_6 soln. of rubber, there forms at the surface of contact a milky turbidity which can be removed by a needle as a delicate membrane. The Röntgen spectrogram of rubber attributed by Katz (cf. *C. A.* 19, 2144, 2424, 2759) to crystn. is more easily explained by polymerization, particularly since the phenomenon is reversible. Likewise the concept advanced by Hock (*C. A.* 19, 3036) can be more simply explained by polymerization. A review and discussion of the subject in general are included, with 21 references. C. C. DAVIS

Tendencies in rubber compounding. W. B. WIEGAND. *India Rubber J.* 70, 900-2, 933-8(1925).--A discussion dealing with the materials and methods of modern compounding and replete with suggestions for improving present the methods (cf. Wiegand, *C. A.* 19, 2423, 3386). Reinforcement may be visualized in terms of *anchorage, continuity of stress and uniformity of stress*. The finer the pigment the greater the surface energy developed between the pigment and rubber and the greater the bond between each. With inert fillers, *e. g.*, whiting and barytes, this bond is insufficient to withstand stresses and the rubber phase seps. from the particles in the direction of major stress, with formation of vacuoles. As deformation increases, the particles are subjected to compression due to lateral contraction and the rubber phase between the particles is compressed thinner and thinner and eventually ruptures. With a reinforcing pigment the greater surface energy prevents the tension in the rubber phase from sepg. the rubber-pigment surface. Each particle assumes its share of the stress and the lines of stress pass through instead of around the particle. The finer the pigment the less this sepn. between rubber and pigment. Furthermore the particles are of uniform size and there is a balanced state of stress throughout the rubber matrix, each unit sustaining similar stresses and strains through the whole range of extension. This explains the high proof resilience of gas black mixings at intermediate elongations. It is suggested that the Joule effect in rubber is analogous to the gas laws, both in principles and formulas, and that a common basis rests on the fact that part of the energy expended in stretching rubber becomes reversible heat which is recoverable on retraction. Furthermore the stress-strain curves are analogous to the pressure-vol. curves of a gas, and since, as the temp. increases the former curves approach the load axis and the isotherms of a gas move up toward the pressure axis, a cycle of changes occurs with rubber which correspond to Carnot's cycle. Thus if rubber is contracted isothermally by an increase of temp. with absorption of heat, is cooled at const. elongation, is then stretched isothermally with consequent evolution of heat and finally is heated at const. elongation to its original temp., then theoretically the original state is resumed. When the Joule effect is large enough in relation to the frictional heat it is possible to construct a *rubber heat engine* (cf. W., *India Rubber World* 73, 200(1925)). Practically also these principles govern the compounding of rubber mixts. to obtain a linear stress-strain curve (cf. *C. A.* 19, 2423), max. resilient energy and resistance to abrasion, a ΔA function (cf. *C. A.* 19, 3386) far greater than at present and elimination of hysteresis and grain effect. Such improved mixts. have a greater capacity for storing energy than

any other structural material and are capable of a variety of uses hitherto impracticable.

C. C. DAVIS

Tensile strength of cold-cured rubber. ALBERT ZEITLIN. *Trans. Inst. Rubber Ind.* 1, 255-9(1925).—Detns. were made of the phys. properties of pale crepe cured for various periods up to 120 sec. in 1-5% CS_2 solus. of S_2Cl_2 . Immediately after curing the samples were immersed momentarily in CS_2 to remove excess S_2Cl_2 . The effect of increasing the time of immersion in S_2Cl_2 was similar to the effect of increasing the concn. of the % S in hot vulcanization. Most of the tensile strengths were 1200-1800 lbs. per sq. in. and the ultimate elongations 800-1000%. A cure of 7 sec. in 1% S_2Cl_2 , however, gave 2550 lbs. per sq. in. and 910%. The stress-strain curves were similar to those of similar mixts. vulcanized by the hot process. With C_6H_6 as solvent instead of CS_2 , the rate of cure was slower. Discussion. D. F. TWISS, et al. *Ibid* 259-60.

C. C. DAVIS

Further data on matured rubber. O. de VRIES AND W. SPOON. *Arch. Rubber-cultuur* 9, 849-99(1925); (In English, *Ibid* 900-8); cf. *C. A.* 13, 916.—The prepn. of slab rubber is advantageous to estates beginning production, and one estate in Java preps. 150-300 tons per year. Coagula matured for 2 and for 10 days vulcanized at the same rate. The addn. of disinfectants to the latex or soaking the slabs in disinfectant solns improved the odor of the rubber and prevented the formation of a slimy surface, but did not prevent maturation. No maturation took place after coagulation with EtOH . Coagulum matured in the air absorbed O, in one case about 0.25% of the wt. of the dry rubber. Gases formed in the coagulum kept under H_2O were mainly CO_2 with smaller quantities of N and of an inflammable gas and a trace of H_2S . Matured rubber from trees which had been rested cured relatively slowly. For 193 samples of matured rubber the mean deviation from the mean time of cure was 18.8% while the deviations for smoked sheet and for crepe were 11.6 and 6.66%, resp. Cf. also Brunl, *C. A.* 20, 309.

F. H. YORSTON

Rate of combination of sulfur with rubber in hard rubber. W. E. GLANCY, D. D. WRIGHT AND K. H. OON. *Ind. Eng. Chem.* 18, 73-5(1926).—In continuation of previous work (*C. A.* 18, 1763) a mixt. of rubber 70, S 30 with and without the addn. of different accelerators was used to study the amt. of S necessary to convert a rubber mixt. to the hard form and the effect of org. accelerators on the coeff. of vulcanization and on the tensile strength. As vulcanization proceeds, the phys. properties change rapidly only when the coeff. of vulcanization reaches about 23.5, which corresponds to $\text{C}_{10}\text{H}_{16}\text{S}$. No $\text{C}_{10}\text{H}_{16}\text{S}_2$ is apparently formed until the formation of $\text{C}_{10}\text{H}_{16}\text{S}$ is complete. Org. accelerators increase the rate of combination of rubber and S, without however increasing, as in soft vulcanizates, the tensile strength of the final product. Each accelerator regulates in a different way this combination of rubber and S. ZnO is not essential for activation with diphenylguanidine. A loss of S occurs during vulcanization, the loss averaging 0.4% with rubber and S alone but less when org. accelerators are present. The vol. of hard rubber is less than the vol. of the original ingredients. C. C. DAVIS

Theory of the Joule effect in rubber. LOTHAR HOCK. *Z. Elektrochem.* 31, 404-9(1925); cf. *C. A.* 18, 3490.—Evidence is presented for the view that the Joule effect in rubber is due to heat of compression of the internal latex fluid on stretching. X-ray measurements of Stintzing have confirmed the theory previously expressed that the restoring force produced by mech. deformation is localized in the arrangement of the particles analogous to optical anisotropy.

H. R. MOORE

Oxidation tests for rubber goods. F. PERITOR. *Gummi-Ztg.* 40, 94(1925).—Exposure of rubber simultaneously to ultra-violet light and to air contg. a high amt. of O_2 causes such a rapid deterioration that the effects of several months' exposure to sun and air under natural conditions can be duplicated in a few moments. A simple app. supplying O contg. 25% O_2 consists of a negative electrode such as a storage battery plate or a C of large surface area, a Pt point as positive electrode and 20% H_2SO_4 as electrolyte. The current is supplied by a no. of storage batteries or by a high-tension current, with the introduction of suitable resistance to yield a current of high amperage. The O_2 is collected by displacement in a cylinder over the positive electrode. By shutting off the bell jar from the cylinder, with the current on, O_2 is collected in the cylinder under pressure, the cylinder also serving as a gage of the vol. of activated O supplied to the samples. When the connection is opened, the same vol. of O_2 always enters the bell jar contg. the samples. The cylinder may be graduated for greater accuracy. The activated O is maintained in contact with the rubber a definite time and the relative deterioration detd. or until the samples are ruptured if exposed under tension.

C. C. DAVIS

Coagulation with sodium fluosilicate in conjunction with *p*-nitrophenol. H. P.

STEVENS. *Bull. Rubber Growers' Assoc.* **7**, 657-8(1925).—Latex coagulated with *p*-nitrophenol and Na_2SiF_6 , which had been ground together, gave a rubber which vulcanized as quickly as did a control prep'd. with HOAc. F. H. YORSTON

Single texture finishes. S. G. BYAM. *India Rubber J.* **70**, 1143-4(1925); *India Rubber World* **73**, 76-7.—A description of present methods of obtaining various finishes by means of starch, mica, varnishes, etc., and their relation to different methods of curing. C. C. DAVIS

Dielectric constant, power factor and resistivity of rubber and gutta-percha. H. L. CURTIS AND A. T. MCPHERSON. *Bur. Standards, Tech. Paper No.* **299**, 669-722 (1925).—The object of the expts. was to det. the relative suitability of raw rubber (I), vulcanized rubber (II) and gutta-percha (III) as insulators in submarine cables. The principles and technic of the methods employed in the measurements and the app. are described and illustrated in detail. The dielec. const. (d. c.), power factor (p. f.) and resistivity (r.) each depended upon the external pressure and the d. c. and p. f. on the frequency. In all cases the d. c. and p. f. increased with decrease in frequency. The d. c. of III decreased with increase of pressure, whereas an increase occurred in all samples of I. The p. f. and r. increased with the pressure in all cases except hard rubber, where they decreased with increase of pressure. The d. c. of I was less than that of III. The type of I had little influence, but wide variations occurred among samples of III. In each case the more nearly the compn. approached that of the base hydrocarbon the lower the d. c. The lowest value of I was 2.35 and of III 2.58. Dry com. I gave values up to 2.60, III (57% gutta) 3.0 and balata (45% gutta) 3.5. The accessory components caused the high values and I contg. unusually high amts., e. g., sprayed latex I and guayule, had a high d. c. and p. f. Removal of H_2O -sol. components therefore reduced the d. c. Vulcanization increased the d. c. of I, this increase depending in part upon the time and temp. of vulcanization and upon the amt. of S. Mixts. contg. accelerators had a lower d. c. than similar mixts. contg. S only, and accelerated mixts. with low S in some cases had a d. c. not far different from that of I. Those factors which increase the amt. of S combining with I also increased the d. c. With 8% S it increased from 2.5 when unvulcanized to 3.0 at the optimum cure and then to 3.5 when overcured. With 4% S it increased to a max. of only 2.9. Though the d. c. depended on the state of cure and not on the time or temp. of the cure, it was not a simple function of the amt. of combined S, for the d. c. of hard rubber was lower than some compds. with 8% combined S. In general the elec. consts. of mixts. contg. fillers were intermediate between those of the filler and those of the rubber. Therefore all fillers increased the d. c., and C black increased both the d. c. and the p. f. greatly and lowered the r. value. Softeners had little effect. Data are given for various fillers. The min. values of the p. f. of I and of III were about the same, viz., 0.1%. In each case it was greater with a small amt. of moisture and with more it again decreased until at satn. it was again much the same as dry material. The p. f. of III increased with the resin content, com. III being about 1.5%. Vulcanization increased the p. f. of I, this increase depending on the amt. of S and the state of cure. Cured with 2% S and accelerated, it was about 0.3% and with 4-8% S and no accelerator about 0.4%. When overcured with 8% S it increased at times to 1-2%. Most fillers increased the p. f., C black greatly, 20% C giving a p. f. of 8%. The r. of I and III varied with the source and compn., the range being 10^{14} to 10^{16} ohm-cm. in each case. Neither vulcanization nor ordinary amts. of most compounding ingredients changed greatly the value of r. PbO in some amts. increased it by a factor of 10 and 35% C black decreased it to 10^8 . The law d. c. = n^2 was found to be valid when both detns. were made at the same frequency. Various types of I had almost an identical value, viz., n_D^{25} 1.619, which was not altered by prolonged washing, indicating that n is a function of the hydrocarbon and is little influenced by accessory ingredients. *Absorption of water by rubber.* I absorbed 5-40% at room temp. in 6 months, 10-20% being absorbed in the majority of cases. In no case did this absorption reach an equil. In salt soln. the absorption was much less and reached an equil. In 3% aq. NaCl the absorption was 1-3% in 1 month at room temp., after which there was no further increase. The addn. of ozocerite, palm oil, beeswax, vaseline, asphalt, etc., did not influence this absorption, and with fillers the absorption decreased in proportion to the decrease in rubber content. Absorption was less at technically correct cures than at under- or overcures. Addn. of H_2O -sol. substances greatly increased the absorption, and so the absorption was lower when well washed I was used. Sprayed latex I had the highest absorption and pale crepe the lowest among com. types. It was possible by washing I to limit the absorption of the vulcanizate in water to 1-2% and to prevent all absorption in 3% aq. NaCl. Immersion in water for 3 yrs. caused an increase in the d. c. of III and II (prep'd. from

the best I) about 10%, whereas vulcanizates from poor I increased over 30%. There were no marked changes in the p. f. or r. The results indicate in general that it is possible to manuf. rubber insulation which is superior to gutta-percha for submarine cables. C. C. DAVIS

A new practical method for determining the viscosity of highly viscous solutions (solution of rubber) by means of a metal screen of fine mesh. RUDOLF DITMAR. *Rev. gén. caoutchouc* No. 16, 8-9(1925).—See C. A. 19, 3193. C. C. DAVIS

Acid-resisting rubber lining. W. PAULSEN. *Apparatebau* 37, 338-9(1925).—As the amt. of mechanically held S increases in the vulcanized rubber its resistance decreases. Rubber from old trees is better than that from young trees. Brief directions for applying are given. J. H. MOORE

Testing of rubber adhesive plasters and insulating tapes. RUDOLF DITMAR. *Rev. gén. caoutchouc* No. 16, 18-20(1925).—Substantially the same as C. A. 19, 3386. C. C. DAVIS

Vulcanization with sulfur chloride vapor. J. PANEM. *Rev. gén. caoutchouc* No. 16, 11-2(1925).—Descriptive. C. C. DAVIS

The action of vulcone. Reversion. LUDWIG STOLL. *Gummi-Ztg.* 40, 676-8 (1925).—It is already known that when a rubber-S mixt. is vulcanized longer and longer, reversion of the stress-strain curve to a form approaching that of an earlier stage of vulcanization takes place. Expts show that this type of reversion also occurs in rubber mixts. vulcanized with certain org. accelerators. Mixts. of rubber 100, S 5, ZnO 5 and vulcone (cf. Luttringer, C. A. 19, 1792) 0.5-6.0 were vulcanized in a press for progressively increasing times at 3.2 atm. steam pressure and the stress-strain curves, hardness and swelling power in C_6H_6 detd. The time to attain the max. tensile strength became less with increase in accelerator and the greatest max. was 266 kg. per sq. cm. in 12 min. with 4 parts. The elongations at a given stress (203 kg. per sq. cm.) also increased with the accelerator, while the range of optimum cure became shorter as the amt. increased. Beyond this range the ultimate elongation decreased more and more rapidly with increase in accelerator. After the max. tensile strength was reached, at which point the ultimate elongation decreased greatly, reversion of the latter occurred simultaneously with a decrease in the tensile strength. The magnitude of this reversion increased with increase in the accelerator, so that with the higher amts. the stress-strain curves approached those of the earlier stages of vulcanization. The swelling power decreased as vulcanization proceeded until reversion ultimately occurred, the extent of this reversion increasing with increase in the accelerator. The permanent elongation passed through a max., the magnitude diminishing with increasing amts. of accelerator. The hardness reached a max. which was approx. the same for all amts. of accelerator, after which it decreased, reversion therefore taking place. Reversion could not be detected in various mixts. contg. diphenylguanidine. It is suggested that these data may be of value in the reclaiming problem and may also serve as a basis for a simple classification of accelerators. C. C. DAVIS

The partial coagulation of latex. A. D. LUTTRINGER. *Caoutchouc & gutta-percha* 22, 12,942-3(1925).—A review and discussion of the work of Edwardes (cf. C. A. 19, 3037). C. C. DAVIS

The alkali reclaiming process. W. E. STAFFORD. *India Rubber J.* 71, 59(1926).—Pure gum tubes were devulcanized by the customary alkali process to det. changes in the chem. characteristics. The Me_2CO -sol. resin content is not increased by the alk. treatment and may be decreased through sapon. The free S can be completely removed. The mineral content increases, perhaps because of the retention of NaOH. A change in the rubber component occurs, which is manifest by an increase from a small proportion sol. in $CHCl_3$ to about over $1/2$ the total rubber content. The combined S in the $CHCl_3$ -sol. portion of the reclaimed rubber is present in proportionately much smaller amt. than in the $CHCl_3$ -insol. portion, though it was not proved whether the $CHCl_3$ -sol. portion becomes sol. only after removal of combined S or whether combined S is removed only after the substance becomes sol. in $CHCl_3$. C. C. DAVIS

Organophile colloids (WHITBY) 2. Elasticity (SCHOB) 2.

Articles of vulcanized rubber. T. W. MILLER. U. S. 1,569,662, Jan. 12. In the manuf. of rubber articles, a plurality of stocks are formed, each contg. a different proportion of agents such as oxide, S and accelerator which in proper proportion would produce vulcanization under working conditions, but separately ineffective to produce vulcanization in the sep. stocks. Layers or plies of these stocks are then assembled and vulcanization is effected.

Attaching rubber to metals. A. B. MERRILL. U. S. 1,570,445, Jan. 19. In uniting metals such as Fe or steel with soft rubber, a thin bonding film of a relatively rapid-curing hard-rubber compn. is applied to the metal, and on this film there is superposed a layer of relatively slow-curing soft-rubber compn. and the materials are vulcanized together.

Insulating gloves and boots. ST. HELENS CABLE AND RUBBER CO., LTD., AND H. C. HARRISON Brit. 234,716, Nov. 27, 1924. Two layers of rubber of different color are used together so that when the outer layer is worn through the exposure of the inner layer gives warning that the article is no longer fit for use. The outer layer may be formed of raw rubber 30, "crimson antimony" 5, French chalk 5, accelerator $\frac{1}{2}$, wax 1 and asbestine $8\frac{1}{2}$ parts.

CHEMICAL ABSTRACTS

Vol. 20.

MARCH 20, 1926

No. 6

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Potentiometer for routine determinations. C. W. G. HETTERSCHIJ. *Chem. Weekblad* 23, 3-4(1926).—The app. devised for the use of lab. technicians has the advantage of cheapness, simplicity, direct p_H reading and sturdiness. The measuring range is p_H 3.5-8.5. A rheostat and a resistance unit for rough and fine regulation are arranged on both sides of the circular constant resistance unit, subdivided into equal manganin coils with 100 dials. Thus the p_H difference between 2 dials is 0.05. The accuracy can be further increased by taking the av. of 2 galvanometer readings.

MARY JACOBSEN

Remark on the articles of E. Mislowitz "A new potentiometer" and "A new double electrode in the form of a beaker." M. TRÉNEL. *Biochem. Z.* 161, 506-7 (1925); cf. *C. A.* 19, 370, 927; Mislowitz, *C. A.* 20, 773.—T. claims priority. Reply to M. Trénel. E. MISLOWITZER. *Ibid* 508-10.

W. D. LANGLEY

The quartz plane manometer, an improved quartz wire manometer. ERNST BRÜCHE. *Physik. Z.* 26, 717-9(1925).—Preliminary report. The Haber-Kirschbaum manometer (the damping of the amplitude of a quartz wire, freely swinging in a gas with unknown pressure, is used as a measure for that pressure) has been improved by the author. He uses as a vibrating system 2 thin quartz bands (0.8×0.1 mm.), 7.5 cm. long, carrying a quartz plate of 3×3 cm., 0.05 mm. thick; the latter serves as a damper and also contains a small iron core for the initial magnetic agitation. The vibrations are recorded by projecting on a screen the motion of a quartz pointer attached to the system. The time for one reading (about one min.) is considerably reduced; the frequency is lower, which makes the instrument more accurate and less subject to external influences. Because of the large damping plane, the influence of internal friction (η) of the gas is noticeable, resulting in a smaller accuracy for higher pressures; the following relation holds (μ = mol. weight, p = pressure, c a const., θ the measured "half value time"): $p\sqrt{\mu} = c(1/\theta - \theta_\infty)$, in which $\theta_\infty\eta$ is a const. The instrument has an accuracy of 2% and can be used for pressures between 0.001 and 0.02 mm. Hg in chemically active gases. One standardization is sufficient if μ and η are known.

B. J. C. VAN DER HOEVEN

Photoelectric radiation pyrometer. F. A. LINDEMANN AND T. C. KEELEY. *Proc. Phys. Soc. London* 38, 69-73(1925).—By means of 2 photoelec. cells with suitable color filters the energy radiated in 2 distinct spectral bands is compared. By combining the ascertained sensitivities of the 2 cells and their filters with the radiation law the black-body temp. of the radiator can be detd. The cells, contg. resp. K and Rb, are cross-connected with an electrometer and the movement of the optical wedges in front of each cell necessary to give equal currents in the cells (no electrometer deflection) is detd. A change in wedge position of 1 cm. corresponds to 160° at 2000° K., 300° at 3000° K. and 700° at 4000° K.

W. B. PLUMMER

Two new types of high vacuum gage. E. BOLTON KING. *Proc. Phys. Soc. London* 38, 80-4(1925).—One gage described is of the *decrement type*, the construction being almost entirely of SiO_2 but with some interior metal parts, the app. being so arranged that the vibration of the cross-piece may be continuously photographed on an ordinary plate, the rate of damping being thus detd. more conveniently than in the ordinary app., an added advantage being that any irregularities in the vibration are clearly shown by the record. The app. must of course be calibrated against known pressures. A modified type of *Pirani gage* is also described in which the usual metallic filament is replaced by a fine spiral glass capillary filled with Hg, the pressure being detd. as usual by the rate of heat loss from the elec. heated Hg filament to the const. temp. walls of the app. The sensitivity is the same as the usual type of Pirani gage, the special advantage being that no metal is in contact with the evacuated space under examn.

W. B. PLUMMER

Densimeters with a sliding scale. Modification of the lactodensimeter of Quevenne.

MARIO SETTIMI. *Ann. chim. applicata* **15**, 378-86(1925).—A densimeter of the hydrometer type is designed to avoid reference to tables to convert the d. of the prevailing temp. to that at another temp. The top of the stem is provided with a bar, of rectangular cross-section and enlarged at its top, which slides back and forth through a slot of similar cross-section in a metal cap fixed to the top of the stem. The section of this bar sliding in the cap is graduated for the range of temp. desired. The app. is otherwise of the usual type with its d. scale on the stem below. The bar is set at the temp. of the measurement. The temp. scale on the bar is not arithmetical and it must be derived from temp.-d. tables for the particular liquid. The sliding scale is best prepd. by converting the temp.-d. tables to graphical form, from which the units of the scale to be constructed may be more easily obtained and the precision obtainable more easily detd. When used as a *lactodensimeter*, a scale may be provided for skimmed milk and for whole milk on the opposite flat sides of the bar. It is shown that one scale for each of these is accurate enough for most work. The metal parts are of Ni. By having the sliding graduated scale of flexible cardboard there is enough pressure of its lower end against the walls within the stem to hold the bar immovable when the instrument is set. Such densimeters are also particularly useful for the *rapid detn. of the d. of alc.-H₂O mixts.*, in which case they are fairly precise for mixts. contg 50-75% alc. but should not be used for mixts. contg. less than 50% alc. The following approx. relations were also derived for the *cubic expansion of whole milk and of milk dild. to 20% strength with water*. Whole milk (d_{15} 1.031): 0° to 5° , $V_t = V_0(1 + 0.0001t)$, 5° to 10° , $V_t = V_0(0.9999 + 0.00012t)$; 10° to 30° , $V_t = V_0(0.9997 + 0.0001t + 0.000004t^2)$; 20% milk (d_{15} 1.024): 0° to 30° , $V_t = V_0(1.0001 + 0.00004t + 0.000004t^2)$.

C. C. DAVIS

Dewar flasks in physical chemistry laboratory exercises. A. C. GRUBB. *Ind. Eng. Chem.* **18**, 163(1926).—In detg. heats of neutralization a simple app. is made from a quart size Dewar flask provided with a thin-walled tube (that can be made from an old condenser jacket) placed in it. Acid and alkali are thus contained in two glass vessels with an easily breakable wall between them, and the temps. before and after the reaction are read from the one (Beckmann) thermometer.

W. C. EBAUGH

New distillation flasks. ARNO MÜLLER. *Chem.-Ztg.* **49**, 691(1925), 3 cuts.—In 1 flask the side-tube enters the neck and terminates in a constricted opening bent slightly downward. In the other flask a large arm is fused to the neck close to the body and is bent upward parallel to the neck, extending a short distance above it. A bulb is blown near the lower end of the arm, and in the top of the bulb is a horizontal partition on which beads are placed. The opening through the partition is a tube extending downward with the end curved upward. A side-tube similar to the one on the other flask is attached to the arm above the beads.

J. H. MOORE

The Bureau of Mines Orsat apparatus for gas analyses. A. C. FIELDNER, G. W. JONES and W. F. HOLBROOK. *Bur. of Mines, Tech. Paper* **320**, 18 pp.(1925).—The app. described and illustrated differs from the ordinary Orsat app., principally in the compensation for changes of temp. and pressure by means of an auxiliary compensating tube, included in the water jacket surrounding the buret. If C_2H_6 is detd., a Cu oxide tube, elec.-heated, replaces the Cu_2Cl_2 tube and the CO is detd. with the H_2 by combustion. The prepn. of absorbents, notes on operation, and combustion data of the commonly occurring gases, vapors and solids are shown.

W. H. BOYNTON

Measurement of humidity in closed spaces. J. ALFRED EWING, R. T. GLAZEBROOK and EZER GRIFFITHS. *Dept. Sci. Ind. Research, Food Investigation Board Special Report* No. **8**, 54 pp.(1925).—Account of a study of existing types of hygrometers, together with a description of novel methods and instruments designed to meet special requirements. Cannot be satisfactorily abstracted.

A. PAPINEAU-COUTURE

Compressed air economizer. M. BERGER. *Apparatebau* **38**, 3-4(1926); 1 cut.

J. H. MOORE

A new instrument for the measurement of the flow of compressed air or gases. ANON. *Z. komprimierte flüssige Gase* **24**, 137-8(1925).—A compressed gas flowmeter has been designed to measure the rate of flow of compressed gases through pipes. A definite, small fraction of the main gas stream is expanded to atm. conditions and is measured by the usual type of gas meter. The fraction expanded is made proportional to the gas flow through the main pipe. The const. proportionality is automatically maintained by utilizing the pressure drop across an orifice in the main pipe to actuate the expansion valve, and by putting a small orifice in the sample line before the valve. The app. was designed by the Askania-Werke, Berlin-Friedenau. No data as to operating ranges are given.

R. L. DODGE

Apparatus for the determination of active hydrogen in organic compounds. R. BINAGHI. *Ann. chim. applicata* **15**, 432-4(1925).—The app. is designed primarily for detg. the vol. of hydrocarbon evolved in the action of RMgX on certain compds. contg. H which can be substituted (Grignard). Essentially it is the buret of the app. devised by B. for CO₂ (*Rend. soc. chim. ital* **12** (1913)) attached to the Grignard app. (*Compt. rend.* **130**, 1322(1900); *Ann. phys. chim.* **24**, (1902)). The top of the latter has a 2-way valve and during the prepn. of RMgX it opens to H₂SO₄. When the original compd. and the RMgX are mixed, the valve is changed so that the gas passes directly on through another 2-way valve to the buret. The pressure in the latter is regulated by a leveling tube. When the evolution of gas ceases, the valve on the buret is closed and the gas is measured after the pressure is adjusted. A jacket around the buret maintains the temp. const. and condenses the ether vapor accompanying the gas. By means of the 2-way valve on the buret and the leveling tube, the gas may be driven out and the app. made ready for a new detn. Satd. aq. NaCl is used to fill the buret. With a Grignard flask of 150 cc. and a 200-cc buret not over 0.004 g.-mol of substance should be used. The app. is illustrated. C. C. DAVIS

An automatic pipet for measuring noxious fluids. E. VAN SOMERAN. *Ind. Chemist* **1**, 528(1925). E. G. R. ARDAGH

A hydrogen electrode for flowing liquids. A. H. W. ATEN AND P. J. H. VAN GINNEKEN. *Rec. trav. chim.* **44**, 1012-38(1925). (In English).—Recently A. and van G. described a H electrode (*Tijdschr. Alg. tech. Ver. Beelwoortelsuikerfabr. en Raff.* **5**, 89(1924-5)) suitable for use with flowing liquids by which the H-ion concn. of a soln. of varying concn. can be detd. This H electrode app. was used at a sugar factory at Bergen op Zoom in 1923-24 and in 1924-25 for detg. the OH-ion concn. in sugar juices. The H potential established itself very quickly and gave reproducible values. The electrometric detns. of the H-ion concn. is superior to the phenolphthalein or rosolic acid method. It is not adapted at present for use by plant workmen but it is valuable in the factory lab. The app. is illustrated and described. The detn. of the OH-ion concn. of sugar juices and the experiences of the 1924-25 campaign are described in detail. E. J. WITZEMANN

The accuracy of graduated measuring vessels. I. H. V. RENN. *Ind. Chemist* **1**, 515-8(1925).—The liter and milliliter are defined and discussed. The following are then dealt with: standard temp., choice of vessels, occurrence of after-changes in glass vessels and in detail the essentials of the standard flask. Two tables of figures are to be used in detg. the wt. of the substance *in vacuo*: one of corrections for temp. variation, the other for atm. pressure variations. The procedure of testing a flask in the Natl. Phys. Lab. at Teddington is carefully described. E. G. R. ARDAGH

The value of the Lehmann microelectrode. G. E. VLADIMIRO AND M. J. GALIVIALO. *Biochem. Z.* **160**, 101-4(1925); cf. *C. A.* **18**, 2.—With Lehmann's microelectrode good results were obtained in the detn. of p_{H} in CO₂-free solns. When CO₂ was present, the method compared favorably in exactness and speed with other methods. It is considered as being especially convenient for the detn. of p_{H} in gels and tissues. F. A. CAJORI

Mistakes in attaching stirrer arms to the shaft. BERTHOLD BLOCK. *Chem. App.* **13**, 16-7(1926); 6 cuts. J. H. MOORE

The Dickinson alchometer. E. A. VUILLEUMIER. *Ind. Eng. Chem.* **18**, 261(1926).—An illus. description of a portable instrument for detg. EtOH content. It consists of a small still, hollow glass beads of definite d., and a graduated cylinder in a compact case. From the amt. of water needed to make the beads float, the % of EtOH is obtained by the use of a table. W. H. BOYNTON

Modern grate feeder. M. BERGER. *Apparatebau* **38**, 4-8(1926); 2 cuts. J. H. MOORE

Laboratory revolving furnace. D. K. *Chem. App.* **13**, 3-4(1926); 2 cuts.—Exptl. furnaces, 3 to 8 m. long, for oil or gas firing, built by G. Polysius, Dessau. J. H. MOORE

The vapor pressure of metals (RODEBUSH, DIXON) **2**. The utilization of volcanic steam in Larderello (OKRASSA) **13**.

British Standard Specification for Cast Iron Filter Plates and Frames. Edited by British Engineering Standards Assoc., London: C. Lockwood. & Son. 37 pp.

HONNICKE, G.: *Handbuch zum Dampfess und Apparatebau*. Berlin: Julius Springer. 210 pp. G. M. **15**. Reviewed in *Chemistry and Industry* **44**, 1169(1925).

- Color comparometer for liquids. BRITISH DRUG HOUSES, LTD., and H. A. ELLIS. Brit. 235,458, Nov. 12, 1924.
- Refractometer for testing liquids. H. SCHULZ. U. S. 1,571,066, Jan. 26.
- Apparatus for separating liquids of different gravity. F. PINK. Brit. 235,647, March 20, 1924.
- Apparatus for leaching and filtration. J. A. WATSON. U. S. 1,570,807, Jan. 26. The app. is adapted for prepg. *coffee* and similar beverages.
- Float and lever device for indicating the density of acids. D. W. SUTHERLAND, JR. U. S. 1,570,717, Jan. 26. The app. is adapted for testing *milk or cream*.
- Apparatus for gravity separation and filtration of oils and grease from bilge water, etc. C. DE V. GRANT and W. W. WILLIAMS. Brit. 235,066, Oct. 8, 1924.
- Fractionating tower for distillation of oil, etc. F. B. SAMUEL. U. S. 1,571,805, Feb. 2.
- High-speed continuous mixing and emulsifying apparatus. G. C. COOKE and J. A. MICHAEL. Brit. 235,285, March 10, 1924.
- Furnace for heating gases for drying salt, sugar, starch, etc. W. A. DARRAH. U. S. 1,571,575, Feb. 2.
- Scrubber for removing dust from air, etc. T. KAY. Brit. 235,988, Jan. 9, 1925.
- Apparatus for filtering gases. T. THOMSON and N. NISBET. U. S. 1,570,869, Jan. 26.
- Automatic recording gas-analysis apparatus. C. A. HARTUNG. Brit. 235,770, Nov. 4, 1924.
- Device for regulating the pressure of gases. H. A. ELKINS. U. S. 1,570,881, Jan. 26.
- Apparatus for testing gases by sound wave effects. S. RUBEN. U. S. 1,570,781, Jan. 26.
- Apparatus for separating, washing and discharging zeolites or other comminuted solids associated with liquids. C. H. NORDELL. U. S. 1,570,854, Jan. 26.
- Filter for gasoline or other liquids. A. BLACKMAN. Brit. 235,812, Feb. 21, 1925.
- Filters and other porous materials. J. MÜLLER. Brit. 235,557, June 12, 1924. Filters, electrolytic diaphragms, etc., are molded while hot and under pressure from a mixt. of granular or fibrous material such as quartz shivers, sand, glass, glass wool or asbestos and a binder which is plastic when heated, *e. g.*, tar, bitumen, asphalt or S.
- Filters of porous concrete. H. G. LLOYD. Brit. 235,314, March 13, 1924.
- Colloid mill. SIEMENS and HALSKE AKT.-GES. Brit. 235,227, June 7, 1924. In producing colloidal solns., the soln. contg. the materials to be ground is passed through ball bearings, which may be mounted in a housing in cooling liquid.
- Crucible furnace of the coke-hole or pit type. C. F. WADDE. Brit. 234,888, March 1, 1924.
- Hardness-testing apparatus with a vertically movable needle or spindle. MIDDLETON BOWL WORKS, LTD. and E. W. HUNT. Brit. 236,500, April 25, 1925.
- Thermostat for controlling gas valves. L. W. EGGLESTON. Brit. 235,130, June 9, 1924.
- Thermostatic device for controlling electric circuits. P. W. BAKER. U. S. 1,571,104, Jan. 26.
- Thermostatic regulator for air and gas mixtures fed to burners. SELAS AKT.-GES. Brit. 235,163, June 3, 1924.
- Thermostatic valve for controlling flow of air from radiators, etc. A. LIJESKI. U. S. 1,570,899, Jan. 26.
- Röntgen-ray apparatus. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 235,892, June 18, 1924.
- X-ray tubes and the like. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 235,141, June 4, 1924.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

- The Antioch plan of coöperative education as it affects students in chemistry. C. S. ADAMS. *J. Chem. Education* 2, 900-6(1925). E. H.
- The organization and work of the United States Bureau of Standards. G. K. BURGESS. *J. Chem. Education* 3, 7-28(1926). E. H.
- A test of achievement in college chemistry and results obtained by its use in both

high-school and college classes. F. C. MABEE. *J. Chem. Education* 3, 70-6(1926). E. H.

Some problems of curriculum and of method of instruction in high-school chemistry. S. R. POWERS. *J. Chem. Education* 2, 998-1007(1925). E. H.

How we teach freshman college chemistry. B. C. HENDRICKS. *J. Chem. Education* 2, 1187-91(1925). E. H.

Forgotten chemists. E. F. SMITH. *J. Chem. Education* 3, 29-40(1926). E. H.

The life and chemical services of Fredrick Accum. C. A. BROWNE. *J. Chem. Education* 2, 829-51, 1008-34, 1140-9(1925). E. H.

Seventy years of the life of Pieter van Romburgh. The man. ERNST COHEN. *Chem. Weekblad* 23, 22-39(1926). His scientific work. C. F. VAN DUIN. *Ibid* 39-57. E. H.

Wilhelm Traube on his sixtieth birthday. H. PRINGSHEIM. *Z. angew. Chem.* 39, 61(1926). Organic work of W. Traube. H. LEUCHS. *Ibid* 61-3. Inorganic work of W. Traube. F. HAHN. *Ibid* 63-5. Publications of W. Traube. W. LANGE. *Ibid* 65-7. E. H.

Chevreul: the chemist, the philosopher, the man. E. H. TRIPP. *J. Oil Colour Chem. Assoc.* 8, 289-304(1925). F. A. WERTZ

Induced oxidation. W. P. JORISSEN AND C. VAN DEN POL. *Rec. trav. chim.* 44, 805-9(1925). (In English.)—Mittra and Dhar (C. A. 19, 3531) report that NaNO_2 , $\text{K}_2\text{C}_2\text{O}_4$, Na_3AsO_3 , Ni(OH)_2 , etc., can be oxidized by air or O_2 at room temp. in the presence of Na_2SO_3 , which in its turn is itself oxidized. In connection with Ni(OH)_2 but 2 qual. results are described, while the results of Haber and Brann (*Z. physik. Chem.* 35, 84(1900)) and Reinders and Vles (C. A. 19, 2441) are not mentioned. J. and v. d. P. give data in full (cf. C. A. 19, 205), showing that Na_2SO_3 does not "induce" the oxidation of $\text{Na}_2\text{C}_2\text{O}_4$ and NaNO_2 solns. by air or O_2 under ordinary conditions. Na_2SO_3 does not "induce" the oxidation of Na_3AsO_3 solns. when the alky. passes a certain limit.

E. J. WITZEMANN

A modern theory of alchemy. A. J. HOPKINS. *Isis* 7, No. 21 (reprint) (1925).—The ancient philosopher believed that (1) matter is one; (2) nothing exists except as it is good; (3) all nature is striving towards improvement; and (4) all nature is living. Artisans at first made artificial products to simulate the natural, such as pearls and Tyrian purple; later they prepared alloys and learned how to bronze metals. "Artificially such alloys were transmuted into more noble ones." The new theory of alchemy assumes that the alchemist inherited the above ideas and emphasized the importance of color changes. "The alchemist, like the artist, stressed the changeable Aristotelian qualities where we stress weight and fixed qualities. He changed color; therefore, (according to his definition of gold) transmutation was effected." W. C. EBAUGH

A didactic representation of the elements. ARNALDO PUOTTI. *Gazz. chim. ital.* 55, 754-6(1925).—The periodic representations of the elements used in chem. teaching are not satisfactory. P. has adopted a modification of the spiral representation as a wall chart. E. J. WITZEMANN

"Glykose" or "Glucose," "Glykosid" or "Glucosid?" ERNST DEUSSEN. *Z. angew. Chem.* 37, 508(1924). Comments on the article of Dr. E. Deussen. C. OFFENHEIMER; B. HELFERICH; K. FREUDENBERG. *Ibid* 831-2. Reply. E. DEUSSEN. *Ibid* 832. The letter Y in chemical nomenclature. "Glykose" or "Glucose," "Baryum" or "Barium." K. DAMMANN. *Ibid* 38, 232-3(1925). "Glykose" or "Glucose?" G. BRUHNS. *Ibid* 38, 351. The letter Y in chemical nomenclature. THEODOR STECHE. *Ibid* 911-3.—Deussen argues for "Glykosid," etc., as philologically correct. O. would use these as class names but retain "Glucose," "Glucosid," etc., for the particular series of compds. H. and F. also favor retaining "Glucose." Dammann prefers "Glykose" and cites Beilstein and other works. B. finds "Glucose" ambiguous in industry and proposes to return to the old "Dextrose" or "Traubenzucker," "Lävulose" or "Fruchtzucker" and "Invertzucker" (their mixt.). S. would regard "Glucose" frankly as an artificial word, using it and "Fructose" in science and "Traubenzucker" and "Fruchtzucker" in industry. Other German spellings are discussed. A. M. P.

Search for element 93. I. Examination of crude manganese compounds and the isolation of element of atomic number 75. J. G. F. DRUCE. *Chem. News* 131, 273-7(1925).—Element 93, if it exists, should have properties similar to those of Mn and, therefore, would most probably be found assocd. with Mn. Other new elements in this family, Nos. 43 and 75, have recently been announced by Noddack and Tacke (C. A. 19, 3178), while a search by Bosanquet and Kelley (C. A. 19, 768) for new elements of the group by X-ray methods was unsuccessful. D. investigates the "impurities" in com. MnSO_4 by pptg. Mn, Fe, Al, Cr with NH_4OH and H_2S . The filtrate

was evapd. to dryness and Ca removed. The residue (0.075 g. from 100 g. sample) was a light brown oxide giving a white nitrate. This impure oxide was examd. by the X-ray method. Besides weak lines for Fe and Mn, strong $\text{CuK}\alpha$ and $\text{CuK}\beta$ lines were found and also lines at $\lambda = 1.43$ A. U. and $\lambda = 1.233$ A. U., which are the wavelengths of the $\text{L}\alpha$ and $\text{L}\beta$ lines for element 75, rhenium, as detd. by Berg and Tacke (*C. A.* 19, 3178). Besides these lines the line $\lambda = 1.125$ A. U. was found but no line corresponding to element 93 was observed. **II. Examination of crude divi-manganese.** F. H. LORING AND J. G. F. DRUCE. *Ibid* 337-8.—The yield of crude oxide of divi-manganese or rhenium (Re) or element 75 by the above methods was 0.075% from "pure" MnSO_4 ; 0.120% from "pure" MnCl_2 ; and 0.015% from crude MnO_2 . The hydroxide of Re is white and flocculent, gradually becoming darker. The oxide is not sol. in caustic alkalis in soln. and turns to a chocolate color with Na_2O_2 . Fused with caustic alkalis or Na_2O_2 it gave a bluish green product resembling Ni compds. This product is sol. in water, giving a deep green soln., possessing oxidizing properties and is decolorized by solns. of FeSO_4 , $\text{H}_2\text{C}_2\text{O}_4$, SO_2 and by CO_2 . The soln. of K divi-manganate is unstable and forms the hydrated oxide in the course of a day. The brown oxide is sol. in dil. HCl and in H_2SO_3 . The chloride in soln. gives gray-brown ppts. with $\text{K}_4\text{Fe}(\text{CN})_6$ and with $\text{K}_3\text{Fe}(\text{CN})_6$ but no ppt. with Na_2HPO_4 or $(\text{NH}_4)_2\text{C}_2\text{O}_4$. The salt on a Pt wire gives a bright green flame persisting for only a second. An equiv. weight detn. by reducing the higher oxide to the lower in H corresponds to the reduction of ReO_3 to ReO if Re is taken as 188. **III. Foreshadowing elements 75, 85, 87, 93.** F. H. LORING. *Ibid* 338-41.—This is a crit. examn. of the X-ray results in this and in abstracts following. It appears that the evidence for the elements 75 and 85 is good, while the evidence for elements 87 and 93 is only fair as yet. JAMES M. BELL

Eka-caesium. F. H. LORING AND J. G. F. DRUCE. *Chem. News* 131, 289(1925).—On one of the photographic films of the X-ray spectrum (above abstr.) a line was found at $\lambda = 1.032$ A. U. which is exactly between the theoretical La_1 and La_2 lines of element 87. The $\text{L}\beta$ line was not found. The spectrograph does not sep. the La_1 and La_2 lines. The intensity of the line was a little less than the La line of Re. It is believed that the evidence points to the eka-caesium of Mendelyeev. **II.** F. H. LORING. *Ibid* 371.—The film contg. the La line of element 87 was projected on a scale for accurate measurement. A new faint line at the position of $\text{L}\beta$ for the element was found. JAMES M. BELL

Eka-caesium and eka-iodine. F. H. LORING AND J. G. F. DRUCE. *Chem. News* 131, 305(1925).—Further X-ray expts. on the same crude oxide of Re gave again the La line of element 87 and also the faint lines $\lambda = 1.086$ A. U. and $\lambda = 0.895$ A. U. These seem to correspond with the radiation of element 85, eka-iodine. **II.** *Ibid* 321.—The line $\lambda = 0.895$ A. U. might also be associated with $\text{La}\alpha$ of the suspected element 93. Another line at $\lambda = 0.693$ A. U. was indistinct but is apparently the $\text{L}\beta$ line of element 93. JAMES M. BELL

The discovery of eka-manganeses. IDA TACKE. *Z. angew. Chem.* 38, 1157-60 (1925); cf. *C. A.* 19, 3178, 3391.—The phys. and chem. properties and the relative occurrence in the earth's crust of the elements of at. nos. 43 (*masurium*) and 75 (*rhenium*) were predicted from the periodic table. A mixt. of the oxides was obtained from Pt ores and columbites. They are easily sol. in NaOH, more difficultly in NH_4OH . A yellow melt, due to Na_2MaO_4 , is obtained on fusion with KNO_3 and NaOH. Pb, Ag and Hg form difficultly sol. salts. The highest oxide of rhenium sublimates at 400° and dissolves in H_2O to form a colorless soln. from which white needles may be crystd. H_2S darkens the solid oxide but causes no ppt. in aq. soln. D. S. VILARS

Qualitative relationship between the molecular weight of metals and their specific gravity in the liquid state. A. JOUNIAUX. *Bull. soc. chim* 37, 1534-6(1925).—If the mol. vol. V is plotted against temp. t the mol. is shown to be monoat. when d^2V/dt^2 is pos., and polyat. when neg. With Al, Na and Hg, the curve is nearly straight; the mol. is monoat. in the observed range of temp. G. CALINGAERT

Influence of temperature on the molecular weight of copper. A. JOUNIAUX. *Bull. soc. chim.* 37, 1525-33(1925).—The mol. wt. of Cu has been calcd. from existing data by use of Clapeyron's formula and Trouton's rule for temps. above 2000° abs., and by cryoscopy in Sn, Bi, Pb, Cd, Sb, Al, Mg, Ag, Fe and Co for lower temps. If mol. wts. are plotted vs., temps., the curve shows the mol. to be diat. below 400° abs., monoat. between 650° and 1356° abs. (m. p.). Polymerization occurs at higher temps. Near the b. p. the mol. contains 8 atoms. The figures obtained by cryoscopy in Ag are not consistent with those given by the other metals. G. CALINGAERT

Molecular and atomic volumes. VIII. The volume of metaheulandite. WILHELM BILTZ AND FRANZ SPECRT. *Z. anorg. allgem. Chem.* 150, 10-9(1926).—The

at. vol. of salts which have lost part or all of their H_2O of crystn. cannot always be detd. by weighing in a non-aqueous liquid, as these sometimes replace the H_2O of crystn. In this case Hg can be used and the same method can be applied to detg. the *at. vol.* of zeolites such as heulandite. If the material is finely ground, however, the apparent *d.* of the heulandite is sometimes 100% low, as a result of changes in surface tension which prevent the Hg from wetting it. In this case petroleum can be used, or the value obtained in Hg can be corrected by evacuating and measuring the *vol.* of air liberated. The value obtained is somewhat high, indicating the condensation of air in the material. If the H_2O has been partly driven off, as in metaheulandites, then petroleum cannot be used, since it takes the place of the H_2O and Hg must be employed. A series of expts. is described in which H_2O is driven off and the *d.* detd. at various states of dehydration in both Hg and petroleum. There is no change in *mol. vol.* as detd. in Hg until 3 mols. of H_2O have been removed, when it drops suddenly from about 280 to about 250. The authors conclude from this that zeolitic H_2O does not enter into the crystal lattice. With petroleum there is no sharp break but a gradual falling off in *mol. vol.* as H_2O is driven off. Up to 3 mols., change in H_2O content affects the *mol. vol.* considerably, but from 3 to 6 mols. there is no appreciable effect.

IX. Isomers of chromic chloride hydrate and chromous chloride hexahydrate. ERWIN BIRK AND WILHELM BILTZ. *Ibid* 20-5.—The *ds.* of the 3 isomers of $CrCl_3(H_2O)_6$ were detd. by weighing in petroleum, and gave *at. vol.* as follows: for the dark green salt $[CrCl_2(H_2O)_4]Cl \cdot 2H_2O$ 145.2; for the gray salt $[Cr(H_2O)_6]Cl_2$ 148.1; for the bright green salt $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$ 151.4. The dark green salt is the most stable and the bright green the least stable of the 3, going over to the dark green salt even in the dry state. The gray salt liberates 2.7 cal. in going over to the dark green salt. From this, stability seems to increase with *d.*, which is in agreement with the behavior of org. isomers. The solid *chromous chloride hexahydrate* was prepd. by cooling a highly satd. soln. in absence of air and sepg. the crystals from the liquor under the same conditions. It has the formula $CrCl_2 \cdot 6H_2O$, *d.* = 1.783, *mol. vol.* = 129.6. The *hexammines* of the bromide and iodide of Cr^+ have the same *mol. vol.* as the hexammines of Cr^+ , but this is not true of the chlorides. Since the *mol. vol.* of $CrCl_2$ is 42.7, the *mol. vol.* of hydrate H_2O is 14.5, which is in good agreement with the value obtained with the dark green chromic salt 14.7. The formula of the Cr^+ salt is, therefore, probably $[CrCl_2(H_2O)_4] \cdot 2H_2O$. Similar ammoniacal derivs. exist, and have smaller *at. vol.* for NH_3 in the trivalent salts than in the corresponding derivs. of Cr^+ . H. STOERTZ

The crystal lattice of solid carbon dioxide. J. DE SMEDT AND W. H. KEESOM. *Z. Krist.* 62, 312-3(1926).—The general structure as detd. by Mark and Pohland (C. A. 19, 2892) is verified, but the distance C—O should be 1.05 Å. U. instead of 1.60 Å. U.

L. S. RAMSDELL

The crystal structure of hafnium. W. NOETHLING AND S. TOLKSDORF. *Z. Krist.* 62, 255-9(1925).—Hf is hexagonal, with the close packing at. arrangement. Unit cell dimensions are $a = 3.32$ Å. U. and $c = 5.46$ Å. U., $c/a = 1.64$. The structure of zirconium, as reported by Hull is confirmed.

L. S. RAMSDELL

The lattice of carborundum type I. H. OTT. *Z. Krist.* 62, 201-17(1926); cf. C. A. 19, 1212, 3393; 20, 130.—Trigonal SiC (Baumhauer type I) is rhombohedral, with $a = 3.095$ Å. U. (same as types II and III) and $c = 37.95$ Å. U. Unit cell contains 15 mols. C atoms are at 000 , $00^2/16$, $00^4/16$, $00^6/16$, $00^8/16$, $00^{10}/16$; 5 more with same arrangement shifted through $-1/3$, $1/3$, $1/3$, and the remaining 5 shifted through $1/3$, $-1/3$, $2/3$. The Si atoms are similarly arranged, except that they are moved through $00p$, where $p = 1/20$. The same tetrahedral arrangement is found as in the other types.

L. S. RAMSDELL

Laue photographs of crystallized benzene. B. BROOMÉ. *Z. Krist.* 62, 325 (1926).—Laue photographs confirm the previous work of B. (C. A. 17, 2069) on benzene by the powder method. The best plates gave values for $a:b:c = 1:0.769:0.724$.

L. S. RAMSDELL

Contribution to the kinetic theory of vaporization. II. S. C. BRADFORD. *Phil. Mag.* 50, 1147-58(1925); cf. C. A. 19, 592.—The vapor pressure of liquids is a function of *mol. attraction. vol.* and *motion only* and is expressed in *atms.* by $p = 81.84 (T\lambda / -$

$$A\phi)c^{-\frac{9.656SvA^{2/3}}{T\delta'\lambda^2}}$$
 in which T is *abs. temp.*, λ the ratio of velocity of mols. in the liquid to that in the gas; A is the actual aggregation of the mols. in the liquid, ϕ the *cp-vol.* of the liquid, S the surface tension; v the *vol.* of 1 g.-mol., and δ' the nearest distance of approach of the *mol. centers* in the liquid. The ratio λ is a function of *temp.* and *d.* only and the relation between these three variables is discussed and given for 18 liquids at different temps. The vapor pressures for the same liquids are calcd. by the

formula for widely differing temps. and remarkable agreement with exptl. value is found.
S. C. L.

The crystalline structure of hexachlorobenzene and hexabromobenzene. W. G. PLUMMER. *Phil. Mag.* **50**, 1214-20(1925).—The spacings for C_6Cl_6 were detd. by the powder method using a Shearer X-ray tube with a Cu anti-cathode. For 2 mols. per cell the dimensions of the cell are: $a = 8.10$; $b = 3.86$; $c = 16.68$ A. U. Centrosymmetry is indicated for the C_6Cl_6 mol. Perfect cleavage along one plane (001) and imperfect cleavage approx. parallel to the (102) plane are not improbable. Assuming the "diameter" of Br as 2.38 A. U. and replacing the Cl atoms by Br but otherwise retaining the same structure as for C_6Cl_6 gives graphically, $a = 8.50$ and $c = 17.6$ A. U., which agrees with the theoretically calcd. structure for C_6Br_6 . The b -axis is about 4.1 A. U. Little success attended efforts to make good powder photographs of C_6Br_6 , but some spacings were obtained proving the general correctness of the proposed structure.
S. C. L.

Crystal structure of barytes, celestine and anglesite. R. W. JAMES AND W. A. WOOD. *Proc. Roy. Soc. (London)* **109A**, 598-620(1925); *Mem. Proc. Manchester Lit. & Phil. Soc.* **69**, 39-51(1924).—"The structures of the isomorphous sulfates of Ba, Sr and Pb have been investigated and all are found to be very similar. The structure is based on a simple orthorhombic lattice having 4 mols. to the unit cell, and the space group is V_4^6 . The positions of the atoms in the structure have been detd. by a study of intensities. In calcg. the structure factors, the figures for the diffracting power of ions at different angles, calcd. by Hartree, have been employed with slight modifications. A comparison of the abs. intensity of reflection actually observed with that calcd. on the classical theory has been made. The observed intensity is in all cases lower than, although of the same order of magnitude as, the calcd. A possible reason for the structure which is common to a no. of crystals is discussed."
BRIAN MEAD

X-ray investigation of the constitution in the liquid and solid states of substances at low temperatures. W. H. KEESOM. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 117-20a(1924).—Brief discussion of the importance and advantages of such X-ray investigations with an outline of the work done by K. and de Smedt (*C. A.* **16**, 4135; **17**, 2822) and of work at present under way or completed but as yet unpublished.
A. PAPINEAU-COUTURE

The bending of crystals. C. H. BOSANQUET. *Proc. Phys. Soc. London* **38**, 88-91(1925).—A rock-salt crystal of approx. dimensions $15 \times 5 \times 2$ mm. was bent after immersion in strong brine at $50-70^\circ$ and then used to reflect X-rays. The spectrum lines of Mo $K\alpha$ and $K\beta$ are arcs about twice as long as the specimen, indicating that the orientation of the lattice varies from one part of the crystal to another. No crystal gave any reflection which indicated a change in the lattice const. The conclusions are in agreement with the idea that the process of bending consists of the breaking down of the crystal into small units which slip along rhombododecahedral planes and in addn. turn through narrow angles. The slip behaves as if it consists of a no. of small perfect crystals embedded in a very viscous fluid, presumably amorphous NaCl.
GEORGE L. CLARK

The arrangement of the atoms in the tetragonal crystals of Hg_2Cl_2 , Hg_2Br_2 , Hg_2I_2 and the calculation of the optical double refraction of Hg_2Cl_2 . EGIH HYLLEAAS. *Physik. Z.* **26**, 811-4(1925).—With the use of the powd.-crystal method of X-ray analysis, a structure is obtained for the mercurous halides which agrees with that of Havighurst (*C. A.* **19**, 2763). On the assumption that the lattice points are occupied by singly charged ions Hg^+ and Cl^- and on the basis of Born's theory of crystal lattice optics, the double refraction of Hg_2Cl_2 is calcd. By a proper choice of the parameter which det. the position of the Cl^- ions on the c axis, formulas are obtained which represent the double refraction and dispersion accurately.
R. J. H.

Amorphous carbon and graphite. OTTO RUFF, GERHARD SCHMIDT AND WERNER OLBRICH. *Z. anorg. allgem. Chem.* **148**, 313-31(1925).—The opinions of other workers that only 2 forms of C, diamond and graphite, exist, are discussed. The authors believe that amorphous C is a sep. modification and base their claims on X-ray spectra, a no. of which are shown for various types of C, graphite and C-graphite mixts. They find that amorphous C exists as an independent form, combined with graphite by means of paracryst. intermediate forms. Only amorphous C is active or capable of being activated and this property is lost at high temp., the amorphous form slowly changing to graphite. The significance of röntgenographs and their variation with various forms of graphite is discussed in detail. The conditions of transformation of certain types of amorphous C into graphite are given, including effect of catalysts, temp. required, time of heating and sp. resistance of product. B

was the best catalyst, the graphite formed by it showing a sp. resistance of 178 ohms, equal to that of Acheson graphite. The temp. was 2500°. Al was next and good results were obtained with Fe and Mn. The effect of catalysts depends on the degree of disson. of their carbides. Oxidizing agents can be used to det. amt. of graphite in a mixt. of graphite in C, fuming HNO₃ at 80°. Fused Na₂SO₄ heated in atm. of N at 1100° oxidized C readily but also attacked graphite strongly. CaCl₂ soln. at 100° is satisfactory. Chromic acid was found to be most successful. Curves are given showing soly. of C—graphite mixt. in various solvents. Resistance figures are also given, most of the graphites produced showing sp. resistance around 500 ohms.

H. STOERTZ

Influence of strain on the Thomson effect. H. E. SMITH. *Proc. Phys. Soc. London* 38, 1-9(1925).—The influence of tension on the Thomson effect in wires has been investigated by Nettleton's method (*C. A.* 19, 1984). For pianoforte steel, charcoal iron, constantan and Ni, the Thomson coeff. numerically decreases with tension until the elastic limit is reached, after which it increases. With removal and restoration of tension a new definite cycle is followed. The Thomson effect in W, here measured for the first time, increases with tension and also follows a cycle. No change in the Thomson effect is noticed in brass or German silver. Heterogeneity was not present in the specimens investigated.

GEORGE L. CLARK

Changes in the states of aggregation and polymorphism. V. KARL SCHAUW AND WALTHER NAUMANN. *Z. anorg. allgem. Chem.* 148, 217-24(1925); cf. *C. A.* 19, 57.—The conception of anisotropic mols. in fresh melts or "space lattice fragments" (*C. A.* 16, 1528) has been extended to abnormal phenomena produced by vigorous and prolonged heating. Expts. with undercooled vapors, satd. solns. and melts of several tautomeric and polymorphic substances are in conformity with the hypothesis advanced.

H. R. MOORE

Compressibilities of gases. S. F. PICKERING. Bur. of Standards, *Miscellaneous Publ.* No. 71 (Nov. 21, 1925).—Graphs are given for computing the compressibilities of air, A, He, H, CH₄, Ne, N and O and for computing the vols. delivered from cylinders contg. A, He, H, N and O at high pressures.

E. J. C.

Demonstration of the kinetic properties of a gas jet. J. S. G. THOMAS. *Proc. Phys. Soc. London* 38, 92(1925).—Brief description of expts. with a ping-pong ball and a toy balloon to illustrate the Bernoullian property of a gas jet which has a central region of low pressure.

GEORGE L. CLARK

The viscosity of ammonia gas. R. S. EDWARDS AND B. WORSWICK. *Proc. Phys. Soc. London* 38, 16-23(1925).—The viscosity of NH₃ gas has been detd. at 3 different temps. by transpiring the gas through a capillary tube which had previously been calibrated with air. Sutherland's const. is found to be roughly 370, and the mean collisional area of the NH₃ mol. 0.633×10^{-18} sq. cm.

GEORGE L. CLARK

Affinity and reaction velocity in perfect gases and vapors. G. VAN LERBERGHE. *Bull. acad. sci. roy. Belg.* 11, 241-8(1925).—A math. discussion, equations being developed for the relative rate of evapn. and condensation of a vapor in the presence of its liquid in terms of the sp. affinity of the system.

W. B. PLUMMER

The cryoscopy of solutions of gas in various solvents. FELICE GARELLI. *Atti accad. Lincei* [6] 2, 120-4(1925).—The study of the cryoscopy of gaseous solns. (G. and Falcicola. *Atti accad. Lincei* 1904, I, 110; Falcicola, *C. A.* 4, 407) was continued. The detns. were made in the Beckmann cryoscope into the side of which a tube was sealed low down to bubble the gas through. The cryoscopic tube was hermetically sealed and the mixt. was agitated with an electromagnet and a metronome interrupter. C₂H₂ is sol. to the extent of 0.737 g. in 100 g. PhNMe₂ as simple mols.; 0.800 g. is sol. in 100 g. PhNH₂; 0.3107 g. is sol. in cyclohexane and 0.5537 g. in 100 g. PhNO₂. The f. p. of H₂O remains unchanged when NO is passed through after expelling the air with N₂. The lowerings of the f. p. for N and NO in C₆H₆, CHBr₃, PhNO₂ and cyclohexane were too small to be of much significance in detg. the soly., which in these cases appeared to vary from 0.02 to 0.06 g. per 100 g. of solvent. In PhNO₂, C₆H₆, CHBr₃, C₆H₁₂, AcOH and HCO₂H he does not produce any measurable lowering of the f. p. with the 1st 4 solvents and is, therefore, practically insol. With AcOH and HCO₂H the small lowering observed may have been due to moisture absorbed. CO is practically insol. in C₆H₆, PhNO₂ and CHBr₃.

E. J. WITZEMANN

The vapor pressure of metals; a new experimental method. W. H. RODEBUSH AND A. L. DIXON. *Phys. Rev.* 26, 851-8(1925).—A vessel contg. the liquid and surrounded by a furnace for maintaining a uniform temp. is connected by one tube C to manometer M and by another tube B to an intermittent pump. Outside the furnace tubes C and B are connected by a differential manometer D. Successive portions of

an inert gas are pumped off through *B* until the manometer *D* begins to show a small but permanent difference. The pressure at *M* is the vapor pressure desired. The principles of the method are discussed and exptl. procedure is described. The vapor pressure of *Pb* is detd. from 1118° to 1235°, the accuracy of the method having been demonstrated for *Hg*.
D. C. BARDWELL.

Mercury vapor pressure at low temperatures. F. E. POINDEXTER. *Phys. Rev.* **26**, 859-68(1925).—The vapor pressure of *Hg* was measured for 20° to -80° by a modified Buckley ionization gage, with a range from 10^{-2} to 4×10^{-9} mm. Correction was made for thermal effusion. The gage was calibrated at 0° from Knudsen's value. Heats of vaporization and fusion are calcd.
D. C. BARDWELL.

Kinetic theory of the viscosity of liquids. MITSUO SU SATO. *Sci. Repts. Tohoku Imp. Univ.* **14**, 403-44(1925).—Mathematical.
BRIAN MEAD.

Viscosity and chemical analogy, in relation to the viscosity of aqueous solutions of metallic acetates. L.-J. SIMON. *Compt. rend.* **181**, 862-4(1925).—Earlier investigations on viscometric neutralization (*C. A.* **18**, 2098, 2452; **19**, 1079, 2439) have been extended to include *N* *HCO₂H*, *CH₃CO₂H*, *C₂H₅CO₂H*, *CH₂ClCO₂H* and *CCl₃CO₂H* neutralized at 15° with *N* *NaOH* and *KOH*, as well as *N*, 0.5 *N* and 0.25 *N* solns of *CH₂ClCO₂Na* and acetates of *K*, *NH₄*, *Na*, *Li*, *Ba*, *Sr* and *Ca*.
EUGENE C. BINGHAM.

The change of viscosity with the rate of shear in disperse systems. A. DE WAELE. *Kolloid-Z.* **36**, 332-3(1925); cf. *C. A.* **19**, 2288.—The disappearance or diminution of "shortness" on agitation of flocculated systems, e. g., mineral earths in light petroleum, suggests an amendment to the original plastic-flow equation of the author (*C. A.* **18**, 3501) in order to show the progressive loss of "yield value" with shear, thus: $[g\pi R^4(P - f e^{-K})]/8Vt = \eta$, wherein *f* = the yield value of the system at rest (static yield value), *e* = log base, *K* = the stress applied = *PR/2l*, the other symbols having the significance of those in the earlier equation. The regain of yield value or "shortness" on rest after shear or deflocculation can be shown by substitution of η/t for the *PR/2l* exponent in the above equation.
A. DE W.

The p_H of water. A. KLING AND A. LASSIEUR. *Compt. rend.* **181**, 1062-4(1925).—*H₂O* was distd. in a completely enclosed Pt still, and the p_H detd. colorimetrically and the results were checked electrometrically. A single distn. gave *H₂O* with p_H 5.8, which is unaffected by the method and degree of purification used. The p_H does not change when this *H₂O* is allowed to stand in Pt or Jena-glass bottles, stoppered or not, in contact with an atm. of normal compn. If the acidity observed were due to the presence of *CO₂*, its concn. would be of the order of 0.00001 *N*. Admitting the presence of this concn. of *CO₂*, acidimetric titration with standard *Ba(OH)₂* requires 5-6 times the calcd. amt. of alkali. *K.* and *L.* conclude that, either *H₂O* has an acid reaction with p_H 5.8, which cannot be attributed to *CO₂*, or else present p_H detn. methods are erroneous, at least for highly purified *H₂O*.
A. PAPINEAU-COUTURE.

Precipitation. III. SVEN ODÉN. *Ark. Kem. Min. Geol.* **9**, No. 23(1925).—The formation of ppts. consists of the following stages: (1) Condensation of ions and mols. into more stable groups or unit-cells. The total no. of primarily formed nuclei is a function of the type $n = \text{const.} (C_1 C_2)^{\alpha}$ in which *n* is the no. of nuclei, *C₁* and *C₂* are the concns. of the reacting ions, α is a no. greater than 3 and dependent on the no. of ions in the unit-cell, and *t* the time. (2) The velocity of growth of these nuclei is $-dc/dt = [D/\delta] \cdot O_t(C_1 - C_{\infty})$ where *dc/dt* is the velocity of growth, *D* the coeff. of diffusion, δ the thickness of the layer of diffusion or adhesion, *O_t* the total surface of the primary particles, *C_t* the concn. at the time *t*, and *C_∞* the soly. concn. at the time ∞ . (3) The aggregation of the primary particles to secondary aggregates is analogous to the coagulation of colloids and may be summarized as follows: (a) With decreasing charge of the particles, owing to the ions in the system, a crit. point will be reached when the primary particles will aggregate. (b) Passing below this charge, there will be a greater no. of particles in the aggregate the smaller the charge of the individual particles, thus tending to form aggregates of unlimited size with a zero-charge of the particles. (c) In the reversible aggregate there is no amalgamation of the individual particles and probably no equalization of the charge on the particles. The aggregates retain a certain charge or p. d. towards the fluid. (d) The time required for the complete formation of these aggregates is great compared with the formation of nuclei and their growth and inversely proportional to the no. of primary particles per cc. if the electrolytes are present in the same amt., but decreasing rapidly with increasing concn. of the electrolytes, being less than one minute in most cases. (4) In the formation of irreversible aggregates of the primary particles (a) of a definite structure as in snow-flakes, *BaSO₄*, *TiCl* etc., or (b) spherulites such as *CaCO₃*, or (c) an irregular shape due to external influences, the layers of water covering their surfaces are broken through,

resulting in contact between crystal surfaces. (5) The growing of bigger crystals at the expense of smaller ones is due not only to the difference in soly. with size but also the variation in size. The more marked the latter, the more rapidly recrystn. takes place.

Freezing points. H. W. FOOTE AND GENEVA LEOPOLD. *Am. J. Sci.* **11**, 42-6 (1926).—A review and a discussion of the effect of dissolved air on the f. ps. of compds. and solns. F. p. should be defined as the temp. at which solid and liquid are in equil. when satd. with dry air at a pressure of 1 atm. The effect of dissolved air on the m. p. of org. compds. is usually greater than its effect on the m. p. of water. A list is given of f. ps., which are probably accurate within $\pm 0.05^\circ$. W. H. BOYNTON

Interfacial tension and emulsification. I. Effects of bases, salts, and acids upon the interfacial tension between aqueous sodium oleate solutions and benzene. II. Extremely small interfacial tensions produced by solutes. WM. D. HARKINS AND HENRIETTA ZOLLMAN. *J. Am. Chem. Soc.* **48**, 69-80 (1926).—The interfacial tension between phases of water and benzene has been detd. in the presence of different concns. of Na oleate alone, or with NaOH, NaCl or oleic acid in addn. If NaCl of 0.1 N concn. and 0.1 N NaOH are in the aq. phase, the tension has the remarkably low value of 0.04 dyne per cm. Similar results are obtained with 0.001 N Na oleate. CaCl₂ largely overcomes the effect of NaCl even though it is fifty times more dil. A calcn. of the area per mol. in the const. film of Na oleate gives about 47 A. U., when sodium oleate alone is present, but sodium chloride of the same concn. reduces the area to 40 A. U. When the interfacial tension was below 10 dynes per cm. the benzene emulsified easily in the aq. phase, while when below 1 dyne it appeared to emulsify spontaneously.

Influence of thin surface films on the evaporation of water. E. K. RIDGAL. *J. Phys. Chem.* **29**, 1585-8 (1925).—Contrary to the results of Hedestrand (*C. A.* **19**, 759) it is found that fatty acids spread on the surface of water reduce its speed of evapn. greatly. The expts. are made in an evacuated inverted U-tube, one limb of which is held at 25 or 35° and the other immersed in ice. The % reduction goes parallel with the rate of surface compression by the resp. fatty acids. The fallacy of Hedestrand's method is pointed out theoretically and the results are given in tables. J. T. S.

Superficial solutions—fluids of two dimensions. ANDRÉ MARCELIN. *Ann. phys.* **4**, 459-527 (1926).—The term "fluids of two dimensions" is justified by the analogies between three-dimensional fluids and surface films of materials, such as oleic acid, which spread spontaneously. Such films were studied exptly. by two types of balances in which the surface energy (equiv. to reduction of the surface tension of the water) was balanced by a torsion element acting on a floating barrier between the film and pure water, and by chronograph records of the motion of paper floats or talc. in cases where the forces were too low for direct measurement. Films of oleic acid were shown to be capable of spreading as far as 14 times the area previously considered the limit of homogeneity. Pressure, area and temp. are connected by an equation of the gas-law type; $ps = kT$. The relation between p and s is clearly shown by expts. of M.; variation with T was measured for one case by Delaplace. K depends on the substance, and is much less than R . When p is increased, reversible condensation to droplets occurs at a definite value (40 dynes/cm. for oleic acid); M. considers that the thickness of film at which this occurs represents a monomol. layer with contact. The value of 2.5 μ for the length of the oleic acid mol. obtained in this way agrees well with the results of X-ray detns. on the crystal. B. H. CARROLL

Negative adsorption. The surface tensions and activities of some aqueous salt solutions. A. K. GOARD. *J. Chem. Soc.* **127**, 2451-8 (1925).—"The neg. adsorption at the surface of aq. solns. of LiCl, NaCl, KCl, CdCl₂ and AgNO₃ has been detd. over wide ranges of concn., employing original surface tension detns. by the drop-weight method (*C. A.* **19**, 3405) and activity data from various sources. The results obtained are not in harmony with the supposition that the surface of these solns. consists of a single layer of oriented water mols., as has been supposed by Langmuir (*C. A.* **11**, 2849), since the mean thickness of the adsorbed layer varies with the concn. of the soln. and with the nature of the salt. Evidence is adduced which indicates that in concd. soln. of CdCl₂ and possibly of AgNO₃, the adsorption is detd. by undissoc. mols. as well as by ions."

The adsorption of ions on a mercury surface. W. A. PATRICK AND P. W. BACHMAN. *J. Phys. Chem.* **30**, 134-5 (1926).—Fine drops of Hg falling through a soln. of mercurous sulfate or acetate adsorb more Hg than anion. B. H. CARROLL

Activated charcoals and their adsorptive power. OTTO RUFF. *Z. angew. Chem.* **38**, 1164-9 (1925).—Data are given which show the greater adsorptive power of "ac-

tivated" charcoal towards phenol in soln. and the gases NH_3 , A and CO_2 , and a variety of org. compds. Analyses show that the difference is not due to ultimate compn. The apparent d. and surface development are considered important factors. Temps. much above 1000° cause a decrease in both d. and activity. Activation was produced by carbonization of a great variety of org. materials at about 1000° with and without the addition of an alkali or salt, or by heating in CO_2 . The C must be kept in a highly amorphous state. Graphite could not be activated. R. considers that groups of about 12 atoms of C act as units, having one atom each with a free valence, which effects the adsorption of the C mass.

C. G. KING

The adsorption of barium chloride by colloidal hydrous manganese dioxide in aqueous solution. VITALIUS CHLOPIN AND A. BALANDIN. *Z. anorg. allgem. Chem.* 149, 157-66(1925).—"In the adsorption of BaCl_2 from aq. soln. by hydrous MnO_2 a chem. reaction is involved in which 2 mols. of HCl are formed from 1 mol. of BaCl_2 ; that is, the reaction is subject to the law of mass action. A partial adsorption, in the narrow sense of the word, of HCl and probably also of BaCl_2 takes place, which for the concns. studied is proportional to the amt. of MnO_2 employed. These two processes go on together, the first predominating at higher concns. of the salt and the second at lower concns. The results obtained for the adsorption of BaCl_2 permit the enunciation of the following hypothesis concerning the enrichment of Ba in Ra content by its adsorption by hydrous MnO_2 . Because of the exceedingly small concn. of Ra its adsorption probably follows the rule for adsorption in the narrow sense, while for the much higher concn. of Ba the adsorption is conditioned primarily by a chem. reaction. The enrichment can, therefore, be regarded as a consequence of the differences in the consts. for these two processes."

F. L. BROWNE

The adsorption of gases by wood charcoal at pressures above one atmosphere. F. A. HENGLEIN AND M. GRZENKOWSKI. *Z. angew. Chem.* 38, 1186-8(1925).—A sample of a com. gas-adsorption charcoal was used in detg. the adsorption of NH_3 , SO_2 and Cl_2 . The isobars for NH_3 up to 6 atm. are of the ordinary type. At the higher pressures the isobars are flatter at the lower temps. At 30° , the amts. of NH_3 adsorbed per g. of charcoal are the same for the 2 isobars, 8.19 and 9.01 atm. This charcoal at 30° adsorbs a max. of 30% of its wt. of NH_3 . The isotherms and isobars for SO_2 are all of the ordinary type. At 25° and 3.35 atm., this charcoal adsorbed 62% of its wt. of SO_2 . An apparent chem. reaction between Cl_2 and the charcoal was observed. At 15° and 4 atm. the charcoal adsorbed 70% of its wt. of Cl_2 . A simple demonstration expt. [to show: (1) The effect of temp. and pressure on adsorption; and (2) the liquefaction and vaporization of a gas] is described.

J. H. PERRY

The mobility of the particles in gold hydrosols. P. A. THIESSEN AND J. HEUMANN. *Z. anorg. allgem. Chem.* 148, 382-90(1925).—In Au hydrosols prepd. by reduction the mobility of the particles in an elec. potential gradient was found to be independent of the degree of dispersion and of the method of prepn. and was not altered by dialysis for 1 week. The mobility was about 3×10^{-4} cm./sec. per v./cm. The addn. of protective colloids had no influence on the mobility. Addn. of electrolytes to the Au sols reduced the mobility and in some cases reversed the direction of migration. Na_2CO_3 added to a dialyzed Au sol increased the mobility of the particles markedly, indicating an important connection between hydroxyl ions and the charge on the Au particles.

F. L. BROWNE

The influence of electrolytes on the life period of dispersoid solutions of sulfur prepared by mechanical methods. P. P. v. VEIMARN AND S. UTZINO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 8, 291-306(1925); cf. *C. A.* 19, 2585. (In German.)—The exptly. established 2nd max. in the life curve of dispersoid solns. of S under the influence of the KCNS and $\text{Ca}(\text{CNS})_2$ present adequately supports the theory that adsorption and chem. forces are essentially identical. The fact that the life curves for dispersoid cellulose solns. in H_2O with progressive increasing concns. of salts are identical in form (not only qual. but almost quant.) with the life curves of dispersoid S solns. under the same conditions is sufficient to indicate the very general application of the theory.

H. M. McLAUGHLIN

The influence of substances added on the life period of dispersoids. I. P. P. v. VEIMARN. *Kolloid-Z.* 37, 151-8(1925); cf. *C. A.* 19, 2585.—A theoretical discussion preliminary to a series of articles is given. The life period of dispersoid solns. is considered to be a function of many variables. Elec. energy is only 1 of these and elec. charges of themselves exclusively cannot regulate the life period of dispersoid systems. The variables include all possible transformations of atoms of the disperse phase with the disperse medium and all that it contains. Probably no completely free ions exist and what is adsorbed by the disperse particles is not free individual ions but strongly

solvated mols. with greatly weakened bonds between the individual atoms and atom groups. The difference between adsorption and chem. forces is only in the intensity. A dispersoid soln. can be destroyed by (1) complete soln. of the particles of the disperse phase, (2) flocculation and deposition as micro- or macro-aggregates, (3) soln. of the particles of the disperse phase and deposition of other particles. Added substances may increase or decrease or have no effect on the life period or the same substance may produce each of these effects at different concns. In the sense of the theory coagulation is nothing but a shortening of the life of a dispersoid soln. to such a small period of time as we have agreed upon.

H. M. McLAUGHLIN

Determination of the size of colloidal particles by means of alternating electric fields. E. F. BURTON AND MISS B. M. REID. *Phil. Mag.* 50, 1221-6(1925).—For particles below a certain crit. size Brownian movement completely masks gravity and prevents settling. If an alternating elec. field be applied to a vertical colloidal soln. so that direction of migration is for alternate periods with and opposed to gravity, the rate of settling shows a difference which may be used to relate the size of the particle with the velocity. The final formula is $a^2 = (9/2) \eta \nu / (\rho - \rho') g$, in which a is the particle radius, η the coeff. of viscosity of water, ρ and ρ' are the ds. of particle and medium, resp., and g is the force of gravity. The method was applied to a Cu colloid to which addnl. amts. of electrolyte (KOH) were successively added. Velocity of settling increased from 0.89×10^{-5} to 1.29×10^{-5} cm./sec. from a neutral soln. to one contg. 24 drops of 0.01 N KOH in 200 cc. of colloidal soln. The calcd. diam. of particle rose from 7.14×10^{-6} to 8.60×10^{-6} cm.

S. C. L.

The stability of colloidal solutions. IV. The antagonistic action of electrolytes on concentrated and dilute sols and a general theory of ion antagonism. K. C. SEN. *Z. anorg. allgem. Chem.* 149, 139-49(1925); cf. *C. A.* 19, 2291.—"Mixts. such as $\text{FeCl}_3 + \text{KCl}$, $\text{Al}(\text{NO}_3)_3 + \text{K}_2\text{SO}_4$, etc., exert a marked antagonistic effect in the coagulation of pos. Fe_2O_3 hydrosol. The same relation was observed toward As_2S_3 sol with the salt pair $\text{K}_4\text{Fe}(\text{CN})_6 + \text{KCl}$. This effect can be obtained with practically all colloids by choosing suitable salt pairs. With As_2S_3 the antagonistic action is more pronounced for dil. sols than for concd. The abnormal relation between the diln. of this sol and the pptg. power of certain univalent ions is due to the great stabilizing action of ions of the same charge as the colloid. Ion antagonism in two-phase systems in general is explained as follows: If any ion of the same charge as that of the colloid is strongly adsorbed, or becomes concd. at the interface through increased concn. of electrolytes, there is a tendency for the charge and the dispersity to increase, opposing the action of any oppositely charged, coagulating ion which is already present or is added later. If on the other hand the oppositely charged ion is adsorbed the more strongly, there results either coagulation, discharge, or in the case of emulsions a reversal of phase. The equil. finally attained depends therefore upon an equalization between the anions on the one hand and the cations on the other."

F. L. BROWNE

Colloidal rhodium. A. GUTBIER AND EDITH LEUTHEUSSER. *Z. anorg. allgem. Chem.* 149, 181-90(1925).—*Prepn. of pure Rh*—The finely divided com. metal was heated in H_2 , then mixed with twice its wt. of NaCl and heated in dry Cl_2 until melted. On cooling it was powd. and remelted in Cl_2 . The Na_3RhCl_6 so produced was dissolved in H_2O to a concd. soln., sepd. from unattacked metal, and the soln. satd. with HCl gas. The NaCl (contg. some Rh) pptd. was filtered off by means of glass wool and used in further treatments of the com. metal. The filtrate was evapd. to dryness and redissolved in a little H_2O contg. HCl. Excess NH_4OH was then added and the soln. evapd. on the water bath with NH_4OH several times. It was finally brought nearly to dryness, treated with concd. HCl, and kept at the temp. of the water bath several hrs. The residue was washed, dissolved in hot water, and filtered into cooled, concd. HCl to ppt. $\text{Rh}(\text{NH}_3)_5\text{Cl}_3$. This was dissolved and pptd. several times. It was then converted to Rh either by reduction of the aq. soln. with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ or by heating in H_2 . Pure $\text{Na}_3\text{RhCl}_6 \cdot 12\text{H}_2\text{O}$ was then prepd. as the starting material for making the colloid. Colloidal Rh prepd. by reduction is unstable, coagulating completely in less than 24 hrs. A stable colloid can be made by adding 2 parts of a 1% soln. of the aq. ext. of gum arabic to 1 part of 1% Na_3RhCl_6 , heating to 90° , and reducing with an excess of a soln. of $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ of a concn. between 1:1000 and 1:10, cooling and dialyzing until no more Cl passes into the dialyzate. The stability of the colloid is not increased by using solns. of Rh salt of less concn. The $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ must be added all at once because as soon as some colloidal Rh has formed $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ subsequently added is decomposed catalytically before it has time to react with the rest of the Rh salt. The dark brown colloid is stable for months. It still contains a large amt. of Cl. It is negatively charged and requires comparatively large amts. of electrolytes for its coagu-

lation. Heating to boiling for a short time does not affect it, but prolonged heating reduces its stability. Reversible solid preps. can be made by concn. over H_2SO_4 under reduced pressure.

F. L. BROWNE

Colloidal bismuth. A. GUTHIER, THEO. KAUTER AND ROLF GENTNER. *Z. anorg. allgem. Chem.* **149**, 167-80(1925); cf. *C. A.* **19**, 3192.—Colloidal Bi was made by adding to $\text{Bi}(\text{NO}_3)_3$ soln. glycerol and NaOH and then reducing with HCHO at 90° . The sol was very unstable. Stable colloids were made by adding a protecting colloid to the soln. before reduction. These Bi sols were purified by dialysis. The sols on evapn. to dryness gave a powder contg. 8 to 34% Bi which dissolved in water again very readily. Suitable protective colloids are the water exts. of agar-agar, *semex psyllii* and gum arabic. The colloidal Bi oxidizes again on contact with air rather readily.

F. L. BROWNE

Colloidal tellurium. A. GUTHIER AND BERTA OTTENSTEIN. *Z. anorg. allgem. Chem.* **149**, 223-9(1925).—A soln. of 1 g. H_2TeO_3 in 500 cc. H_2O was mixed with 2.6 g. of dextrose dissolved in a little H_2O , made alk. with NH_4OH , and concd. on the water bath to a sirup. As the evapn. continued, H_2O and NH_4OH were added from time to time. On dilg. finally to 100 cc. a dark brown colloid resulted which was purified by dialysis. The sol was exceedingly stable, neg. charged, and was frozen and remelted without change.

F. L. BROWNE

Studies on barium dithionate and the solubility of calcium dithionate. FUSAO ISHIKAWA AND GEN KIMURA. *Bull. Inst. Phys. Chem. Research* **5**, 1-16(1926).—Soly. of Ba and Ca dithionates is measured and the dehydration and the thermal decompn. of BaS_2O_6 are studied. Soly. and the sp. gr. of the soln. of BaS_2O_6 are as follows: 7.75 g. of BaS_2O_6 in 100 g. of the soln. at 0° , d_4^{20} 1.0702; 11.56 g. at 10° , d_4^{10} 1.1049; 15.63 g. at 20° , d_4^{20} 1.1430; 19.70 g. at 30° , d_4^{30} 1.1839; 23.55 g. at 40° , d_4^{40} 1.2207; 26.91 g. at 50° , d_4^{50} 1.2560; 30.13 g. at 60° , d_4^{60} 1.291; 33.08 g. at 70° , d_4^{70} 1.324; 35.69 g. at 80° , d_4^{80} 1.355; and 38.42 g. at 90° , d_4^{90} 1.387. The solid phase coexistent with each soln. is $\text{BaS}_2\text{O}_6 \cdot 2\text{H}_2\text{O}$. 2.24 g. BaS_2O_6 in 100 g. of the soln. causes the lowering of f. p. by 0.240° , 3.98 g. by 0.340° , 5.70 g. by 0.480° and 7.55 g. by 0.640° , which is the cryohydric point of the soln. Soly. of CaS_2O_6 and the sp. gr. of the solns.: 13.86 g. of CaS_2O_6 in 100 g. of the soln. at 0° , d_4^{20} 1.1213; 17.20 g. at 10° , d_4^{10} 1.1505; 20.18 g. at 20° , d_4^{20} 1.1772; 23.12 g. at 30° , d_4^{30} 1.2015; 25.80 g. at 40° , d_4^{40} 1.2248; 28.48 g. at 50° , d_4^{50} 1.2470; 30.94 g. at 60° , d_4^{60} 1.2684; 33.14 g. at 70° , d_4^{70} 1.2900; 35.91 g. at 80° , d_4^{80} 1.3116 and 38.04 g. at 90° , d_4^{90} 1.3338. The solid phase in each soln. is $\text{CaS}_2\text{O}_6 \cdot 4\text{H}_2\text{O}$. 2.04 g. of CaS_2O_6 in 100 g. of the soln. lowers the f. p. by 0.32° , 5.84 g. by 0.85° , 9.00 g. by 1.38° , 9.23 g. by 1.41° and 13.40 g. by 2.09° , which is the cryohydric point of the soln. The dehydration of $\text{BaS}_2\text{O}_6 \cdot 2\text{H}_2\text{O}$ has been examd. at different temps., it is changed into BaS_2O_6 without producing $\text{BaS}_2\text{O}_6 \cdot \text{H}_2\text{O}$. When the crystal is kept over P_2O_5 at $18-23^\circ$, 99.96% of the dehydration is observed in 79 days and 100.00% in 83 days. When the dehydration is conducted at 50° , 99.02% of the water is lost at 276 hrs and 99.95% at 291 hrs. At 90° , the dehydration is completed by a few hrs., but in this case a very minute amt. of BaS_2O_6 is decompd. into BaSO_4 ; at lower temp. almost no decompn. occurs, unless the dehydrated substance is kept for long time at the temp. The decompn. of BaS_2O_6 by heat is irreversible, producing $\text{BaSO}_4 + \text{SO}_2$. It goes quickly at first, but slowly at the end.

K. K.

Solubility influences. I. The effect of some salts, sugars and temperature on the solubility of ethyl acetate in water. SAMUEL GLASSTONE AND ALBERT POUND. *J. Chem. Soc.* **127**, 2660-7(1925).—The soly. of AcOEt in aq. solns. of various concns. of chlorides, bromides and iodides of all the alkali metals and NH_4 , and in solns. of dextrose, levulose, sucrose and lactose has been detd. at 25° and 50° . The results may be expressed by the formula, $\log w = km/w + a$, where m = no. of g. mols. salt, and w = no. g. mols. water per g. mol. AcOEt and k and a are consts. for a given salt. In g. AcOEt per 100 g. pure H_2O the soly. is at 0° , 10.40; at 10° , 8.96; at 25° , 7.39; at 37° , 6.65; at 50° , 6.04. From the soly. results the degrees of hydration of the salts in soln. are calcd. and shown to agree with the values of previous investigators. The hydrations of the salts at infinite diln. are found by extrapolation. Non-electrolytes, such as sugars, reduce the soly. of AcOEt in H_2O . The paper is one of a series on the "salting out" effect and the results are discussed from this standpoint.

R. E. G.

Solubility of barium propionate. H. J. WING AND T. J. THOMPSON. *J. Am. Chem. Soc.* **48**, 104-6(1926).—Over the whole range of temps., 0° to 100° , the solid phase is the monohydrate. The soly. is as follows: at 0.3° , 36.5 in 100 g. soln.; 5.1° , 36.2; 15.0° , 36.0; 24.8° , 36.2; 34.8° , 36.2; 34.8° , 36.2; 34.8° , 36.6; 44.8° , 37.1; 55.0° , 38.0; 65.3° ,

38.9; 75.6°, 39.8; 80.4°, 40.2; 85.6°, 41.2; 90.5°, 42.2; 95.4°, 43.2; 100.7°, 44.7.

JAMES M. BELL

Solubility relations of isomeric organic compounds. VI. The solubility of the nitroanilines in various liquids. A. R. COLLETT AND JOHN JOHNSTON. *J. Phys. Chem.* **30**, 70-82(1926).—Solubilities of the 3 isomers in EtOH, C_6H_6 , $CHCl_3$, CCl_4 , Et_2O , $EtOAc$ and Me_2CO were detd. nearly to the m. p. by the synthetic method, with improved technic; the analytical method was used for check detns. and for water and 95% EtOH at 25° and 40°. The relative soly. in the liquids is generally, but not entirely the same for the 3 isomers; soly. in the liquids used was generally greater than the ideal value. CCl_4 is best for sepn. of ortho and meta.

B. H. CARROLL

The chemistry of gold. VICTOR LENHER AND C. H. KAO. *J. Phys. Chem.* **30**, 126-9(1926).— $HgAuCl_4$ may be extd. from aq. solns. by a large no. of aliphatic esters. The best results are obtained with $EtOAc$ from solns. contg. 10% HCl . By this method, Au may be quant. sepd. from the chlorides of Na, K, Mg, Ba, Fe, Al, Sr, Ca, Cr, Mn, Co, Ni, Zn, Hg, Cu, Cd, Pb, Bi, Sb, Sn and from H_2AsO_4 .

B. H. CARROLL

The activity coefficient of lithium hydroxide in water and in aqueous lithium chloride solutions, and the dissociation of water in lithium chloride solutions. H. S. HARNED AND F. E. SWINDELLS. *J. Am. Chem. Soc.* **48**, 126-35(1926).—From measurements on the cells $H_2 | LiOH(m_2) | Li_2Hg | LiOH(m_1) | H_2$; $H_2 | LiOH(m_2), LiCl(m) | Li_2Hg | LiOH(m_1) | H_2$; and $H_2 | HCl(m_0), LiCl(m) | AgCl | Ag$, H. calcs. the activity coeff. of $LiOH$ in aq. and $LiCl$ soln., of HCl in $LiCl$ soln., and the ionic activity coeff. of water in $LiCl$ solns., by methods described in *C. A.* **19**, 1365, 1802. The activity of $LiOH$ is less than that of $NaOH$ or KOH at the same concn., and $LiCl$ in high concn. increases the dissocn. of water by more than $NaCl$ or KCl .

B. H. CARROLL

The osmotic pressure of aqueous solutions of cerous chloride. ALFREDO CHISTONI. *Arch. farm. sper.* **40**, 161-3(1925).—Lowering of f. p. was detd. for various concns. of $CeCl_3$ soln. from 4.0 to 0.5%. The concn. isotonic with 0.75% $NaCl$ is 2.57%. This value may be applied in biological expts.

A. W. DOX

Dissociation constants of organic molecular compounds. H. v. HALBAN AND E. ZIMPELMANN. *Z. physik. Chem.* **117**, 461-77(1925).—The photoelec. compensation method developed by H. and Siedentopf (*C. A.* **16**, 2078) is used to est. the extinction coeffs. of org. compds. at various concns. Degree of dissocn. is given by the equations $E_1 = \epsilon c_1(1 - \alpha_1)$ and $E_2 = \epsilon c_2(1 - \alpha_2)$, in which E_1 and E_2 are extinctions of solns. 1 mm thick of concns. c_1, c_2 , resp. Since light absorption is only slightly influenced by temp., the true equil. consts. are easily derived from these extinction measurements. The following mean values of K were obtained for λ 's in the neighborhood of 510 μ : acenaphthene-*s*-trinitrobenzene in $C_2H_2Cl_4$, 0.497; acenaphthene-*m*-dinitrobenzene in $C_2H_2Cl_4$, 3.51; acenaphthene-picric acid in $C_2H_2Cl_4$, 0.524; anthracene-picric acid in $CHCl_3$, 0.219. The mass-action law is obeyed for these substances to relatively high concns. From the values of the dissocn. consts. detd. at different temps., the heats of formation of the compds. are detd. with accuracy.

H. R. MOORE

The rate of reaction of bromine with aqueous formic acid. D. L. HAMMICK, WM K. HUTCHISON AND F. R. SNELL. *J. Chem. Soc.* **127**, 2715-20(1925).— $HCOOH$ is completely oxidized to H_2O and CO_2 in aq. soln. by Br_2 and the reaction is of the second order, but the rate is retarded by the HBr produced. The Ostwald isolation method was used. There was always excess of HBr in the reaction mixt. It is shown that the rate of reaction is inversely proportional to the active concn. of H ion and that the retarding effect of the bromide ion is due to its tendency to remove free Br_2 as the complex ion Br_3 . From these 2 results it is deduced that the reaction takes place between the formyl ions and the Br_2 mols. The const. for the equil. between Br_2 , bromide ions and tribromide ions in aq. solns. of $HCOOH$ is given as 0.070, in terms of the ionic activities, as against 0.048 (recalc. in terms of activities) given by Jakowkin (*Z. physik. Chem.* **20**, 19(1896)) for aq. solns. of slightly higher Br concn.

R. E. G.

The unimolecularity of the inversion process. S. W. PENNYCUICK. *J. Am. Chem. Soc.* **48**, 6-19(1926).—The unimol. inversion coeff. has been detd. by the polarimetric method from the equation $dx/dt = k(\text{sucrose mols. per mol. } H_2O) (H \text{ activity})$. The steady increase in the coeffs. up to 4% is explained by the decrease in H_2O content and the increase in H activity (1-3%). Four concns. of HCl were used: 0.02 *N*, 0.099 *N*, 0.507 *N*, 0.905 *N*, while the concn. of sucrose was always 17.1%. The zero time readings were detd. experimentally.

E. R. SCHIERZ

Catalysis. C. A. COPMAN-NICORESTI. *Pharm. J.* **115**, 345-7(1925).—The researches of Langmuir, Bone and others are quoted to show that the action of a catalyst is that of "a separator of heat from the other elements in the reaction." S. WALDBOTT

Catalysis. C. F. BAYLEY. *Pharm. J.* **115**, 433-4(1925).—A criticism of C. A. Cofman-Nicoresti's paper (preceding abstract).

The toxicity of thiophene for nickel catalyzer; a new action of copper catalyzer. BENNOSUKE KUBOTA AND KIYOSHI YOSHIKAWA. *Japn. J. Chem.* **2**, 45-62(1925). (In French).—The toxicity of C_4H_4S was studied by detg. the amt. required to inhibit completely the action of the catalyst. From the results, which are tabulated and plotted, K. and Y. conclude that the activity is due to the formation of various Ni hydrides, of which there are at least 4, and probably more: $HNiHH$ (I), $HNiH$ (II), HNi_2H (III), HNi_3H (IV), HNi_4H , etc., down to inactive Ni. The activity decreases from I down to the last member of the series. I catalyzes hydrogenation of the C_6H_6 ring; II, though less active, can also catalyze hydrogenation of aromatic compds.; III catalyzes hydrogenation of double bonds and IV that of nitro compds. "Poisoning" by C_4H_4S is caused by the reaction $C_4H_4S + Ni + 3H_2 = C_4H_{10} + NiS$, from which K. and Y. calcd. the proportion of active Ni in the total reduced Ni obtained at different reduction temps. and found: 250° 0.5%, 350° 0.2%, 450° 0.1%, 550° 0.04%, 650° and over 0.00. The effect of the temp. of ignition of the Ni salt (previous to reduction) is not as great as had been thought, the max. being about 800°. Contrary to catalysis with Cu, variations in the rate of the current of H have but very little effect. Differences in the toxicity of various compds. is attributed to the fact that some of these compds. react with all the forms of active Ni while others act selectively only on the most active forms. C_4H_4S has no action on reduced Cu, which does not catalyze hydrogenation of the C_6H_6 ring. Cu catalyzes hydrogenation of *phorone* to *valerone*, showing that both the α and β double bonds are hydrogenated, whereas Sabatier and Senderens had obtained hydrogenation of the α double bond and doubted the possibility of hydrogenating the β bond (*Compt. rend.* **134**, 1127(1902)). The m. p. of *valerone semicarbazone* was found to be 121°, instead of 106-15° previously reported by Nef (*Ann.* **313**, 169(1901)) and by G. Ponzio (*Gazz. chim.* **35**, II, 365-9).

A. PAPINEAU-COUTURE

Selenium as a chlorine carrier. OSWALD SILBERRAD AND C. A. SILBERRAD. *J. Chem. Soc.* **127**, 2449-50(1925).—To reconcile the conclusion of Willgerodt (*J. prakt. Chem.* **31**, 539(1885); **34**, 264(1888)) that Se does not act as a Cl carrier in chlorination reactions and the work of S. S. and Parke (*C. A.* **19**, 3197) that Se is probably a Cl carrier with SO_2Cl_2 , Cl was passed into boiling PhMe with and without addn. of $SeCl_4$, in darkness and in light and the amts. of ClC_6H_4Me and $PhCH_2Cl$ were detd. The results show that contrary to Willgerodt, Se acts as a carrier in direct chlorination, and that its presence not only increases the ratio of nuclear to side-chain substitution, but also to a lesser extent increases the amt. of Cl combining in a given time. C. C. DAVIS

Catalytic decomposition of hydrogen peroxide in a bromine-bromide solution. III. The interpretation of rate measurements as a function of the activity product of hydrobromic acid. R. S. LIVINGSTON. *J. Am. Chem. Soc.* **48**, 53-8(1926); cf. *C. A.* **17**, 3442.—The steady-state rate of decompn. of H_2O_2 in a bromine-bromide soln. can be represented by an empirical equation of the following form for all solns., including those contg. sulfates, the ionic strength of which is less than unity: $-d[H_2O_2]/dt =$

$0.043[H_2O_2][\bar{H}][\bar{B}r]\gamma^2$. γ is the activity coeff. of HBr. The constancy of the steady-state function for this catalytic reaction can be greatly improved by substituting activities for concns. of all electrolytes involved. The av. value of the steady-state function so converted is 1.7. J. M. B.

Dehydrogenation of methanol and formaldehyde with copper as catalyst. A study of the conditions of the equilibrium in the system: $HCHO \rightleftharpoons CO + H_2$. J. C. GHOSH AND J. N. CHAKRAVARTY. *Quart. J. Indian Chem. Soc.* **2**, 142-9(1925).—The equil. of the reaction $CH_3OH \rightleftharpoons HCHO + H_2$ (I) and $HCHO \rightleftharpoons CO + H_2$ (II) were detd. by a static method, with Cu-pumice catalyst. For I the value found for K_p at 155° was 0.37 and at 205°, 0.65; these values differ widely from those calcd. by a Nernst-type equation. For II the values of K_p from 155° to 340° (ranging from 0.032 to 2.20) were represented fairly well by the equation: $\log_{10} K_p = -(11,800/4.571T) + 1.75 \log_{10} T - 0.001T + 0.3$. DONALD W. MACARDLE

Catalytic formation of methane from carbon monoxide and hydrogen. I. K. M. CHAKRAVARTY AND J. C. GHOSH. *Quart. J. Indian Chem. Soc.* **2**, 150-6(1925).—A sugar-charcoal-Ni catalyst for the reaction $CO + 3H_2 \rightarrow CH_4 + H_2O$ retained its activity undiminished for months when the ratio of H_2 to CO was 3:1. The crit. space velocity (cc. gas mixt./cc. catalyst/min.) below which CO disappeared was fairly great (1.3 at 300°, 1.7 at 335°, 3.6 at 358°, >4.3 at 400°). This catalyst entirely suppressed the reaction $2CO \rightarrow C + CO_2$ and prevented deposition of C on the Ni

surface. CeO_2 acted as a promoter for this catalyst (cf. Medsforth, *C. A.* 17, 3271), increasing the crit. space velocity at 355° from 3.5 to 4.4. Some CO_2 (about 9 vol. % of exit gas) was produced, due mainly to the reaction $2\text{CO} + 2\text{H}_2 \rightarrow \text{CO}_2 + \text{CH}_4$ and partly to the reaction $\text{C} + 2\text{H}_2\text{O} \rightarrow \text{CO}_2 + 2\text{H}_2$. II. Production of fuel gases rich in methane. *Ibid* 157-64.—The use of a sugar-charcoal-pumice-Ni catalyst for the formation of CH_4 was studied with equimolar mixts. of H_2 and CO with view to its use in enriching blue water gas (H_2 49%, CO 42%). This catalyst was not as efficient as a sugar-charcoal-Ni catalyst (see above) for promoting the reaction $2\text{CO} + 2\text{H}_2 \rightarrow \text{CH}_4 + \text{CO}_2$ (I), and was little improved by addn. of CeO_2 . Pumice- V_2O_5 -Ni (A) was at first very effective, but rapidly lost its activity; as reaction I was retarded, the undesirable reaction $\text{CO} + 3\text{H}_2 \rightarrow \text{CH}_4 + \text{H}_2\text{O}$ (II) was favored, though with a smaller total conversion. A sugar-charcoal-pumice- V_2O_5 -Ni catalyst (B) at 400 – 50° retained for months the initial activity of A; increasing space velocity favored reactions II, but even with a space velocity of over 25 cc. gas/cc. catalyst/min. only 20% of the CH_4 was formed by reaction II. If sugar charcoal was replaced by coconut charcoal the catalyst deteriorated rapidly; Fe_2O_3 in place of V_2O_5 made II the chief reaction. The gas obtained by use of catalyst B was comparable in calorific value to carbureted water gas, though much less poisonous; removal of CO_2 (present in amts. as great as 33%) would give a gas of very high calorific value. DONALD W. MACARDLE

The decomposition of carbon monoxide in the corona due to alternating electric fields. I. MIGUEL CRESPI AND R. W. LUNT. *J. Chem. Soc.* 127, 2052-7 (1925).—Pure CO is prep'd. *in vacuo* from warm H_2SO_4 and H_2CO , freed from CO_2 by KOH and dried over P_2O_5 . This CO is exposed to a dark elec. discharge in an app. similar to the Siemens ozonizer. Single-phase a. c. of frequency 250 is used under 4500 or 9000 v. r.m.s., 1 or 2.5 milliamp. passing through the system. The mean temp. of the chamber is calcd. by an empirical formula from the electrode temps. The pressure is recorded and the time to reach sensible equil. The resulting gas mixt. is analyzed and always found to be close to 1 vol. CO_2 + 12 vols. CO , with varying small amts. of O_2 . A solid brown substance is deposited as described by others, which is hygroscopic. It consists of C and O in ratios varying from 1.2 to 1.4 with decreasing pressure.

JOHN T. STERN

A reversible reaction between an organic bromide and potassium iodide. ERIK HANNERZ. *Svensk Kem. Tids.* 37, 124-7 (1925). (In German).— $\text{MeCHBrCO}_2\text{H}$ and $\text{MeCHICO}_2\text{H}$ were treated with KI and KBr , resp., at 50° in aq. solns. KI was det'd. and plotted as concn. against time. When the Br was replaced the KI dropped from 1 mol. to 0.190 mol. and when I was replaced the KI increased from 0 to 0.195 mol. For equil. $K = 17.8$. A. R. ROSE

The forces between atoms and ions. J. E. LENNARD-JONES. *Proc. Roy. Soc. (London)* 109A, 584-97 (1925); cf. *C. A.* 19, 756, 757, 1093; 20, 319.—Extension of previous work on Ne and A to Kr - and Xe -like ions. Applications of the results are made to evaluate the interat. distances of a no. of crystals. In all, 32 crystals have been dealt with, including 16 alkali halides. For the latter, the calcd. values lie, with one exception, within 1 or 2% of the observed distances. Calcns. are also made of the compressibilities and crystal energies of these crystals; they are in satisfactory agreement with the values observed. BRIAN MEAD

Molecular combinations. J. MARTINET AND LOUIS BORNAND. *Rev. gen. sci.* 36, 569-77 (1925).—Mol. combinations are definite compds. produced by union of 2 or more mols., are essentially unstable and cannot be represented by ordinary valence structure. The mols. making such combinations are usually unsat'd. and may be classified as (1) auxochromes, or substances atomically unsat'd., such as $-\text{OH}$, $-\text{SH}$, $-\text{NH}_2$, etc., (2) chromophores, or substances constitutionally unsat'd., such as CO , CN , NO_2 , etc., and characterized by the presence of multiple valence bonds. M. and B. designate as "basoids" and "acidoids" those compds. that contain auxochromes and chromophores, resp. Examples of combinations with nitro acidoids, carbonyl acidoids, triphenylmethane and benzohydrol are given and discussed. The stability of combinations increases with the depth of color produced. The effect of various groups is discussed, for example, the nitro or carbonyl group introduced into a hydrocarbon, gives it an acidoid character while OH , CH_3O , or NH_2 increases the basoid tendencies. By classification of org. mols. into acidoids and basoids, polarity is admitted and a theory of their elec. attraction is developed. A bibliography is given. P. B. P.

(A) Isotherms of helium at 4.2°K. and lower. (B) Variation of density of liquid helium below its boiling point. H. KAMERLINGH ONNES AND J. D. A. BOKS. *Proc. Fourth Intern. Congress of Refrigeration* 1, 189-200a (1924); *Leiden Comm.* No. 170b.—

Isotherms of He were detd. at 4.21° , 3.72° , 3.40° and 2.57° K. The app. used is described in detail. The app. (special form dilatometer) and method of operation used in detg. the d of He are described. The following values are reported. 4.22° 0.1249, 3.90° 0.1305, 3.30° 0.1388, 2.56° 0.1451, 2.37° 0.1459, 2.30° 0.1462, 2.29° 0.1462, 2.21° 0.1459, 2.10° 0.1458, 1.93° 0.1455, 1.92° 0.1455, 1.59° 0.1453, 1.28° 0.1452, 1.20° 0.1452. A. PAPINEAU-COUTURE

Isotherms of helium from 20° to 259° . J. D. A. BOKS AND H. KAMERLINGH ONNES. *Proc. Fourth Intern. Congress of Refrigeration* 1, 81-7a(1924); *Leiden Comm. No. 170a*.—The procedure is described and the results obtained at $+20.00^\circ$, 0.00° , -37.40° , -70.32° , -103.64° , -142.01° , -183.32° , 201.51° , -225.01° , -235.91° , -249.87° , -252.63° , -256.04° and -258.78° are tabulated. A. PAPINEAU-COUTURE

Report on various researches on the isothermals and isometrics of oxygen, nitrogen and helium and the mixtures of nitrogen and oxygen. C. A. CROMMELIN. *Proc. Fourth Intern. Congress of Refrigeration* 1, 61-3a(1924).—Brief outline of the work carried out in the Leiden Cryogenic Lab. between the 3rd (1913) and 4th Intern. Congresses of Refrigeration on measurements regarding the equation of state of O, N, He and N-O mixts. A. PAPINEAU-COUTURE

Isotherms of oxygen at low temperatures. H. KAMERLINGH ONNES AND H. A. KUYPERS. *Proc. Fourth Intern. Congress of Refrigeration* 1, 65-7a(1924); *Leiden Comm. No. 169a*; cf. C. A. 18, 1219.—Isotherms are plotted for 20° , 0° , -40.05° , -80.03° , -102.46° , -109.97° , -113.97° , -116.01° , -116.99° . The results confirm the previously drawn inference that no chem. reaction occurs. A. P.-C

Isotherms of hydrogen from -217° to -240° at pressures up to 60 atmospheres. C. A. CROMMELIN AND J. C. SWALLOW. *Proc. Fourth Intern. Congress of Refrigeration* 1, 53-9a(1924).—Values obtained for θ , T , p , v_A , $p v_A$, d_A are tabulated and plotted and the results briefly annotated. A. PAPINEAU-COUTURE

The heat capacities of some metallic oxides. G. S. PARKS AND K. K. KELLEY. *J. Phys. Chem.* 30, 47-55(1926).—The heat capacities of MgO , CaO , Al_2O_3 , Fe_2O_3 and Fe_3O_4 were measured with an accuracy within 1% at temps between 87° and 295° K. by the method of Parks (C. A. 19, 1085). The view that a low heat capacity is a concomitant of exceptional hardness is borne out in the case of Al_2O_3 in the sapphire form. A finely divided and somewhat amorphous powder possesses a higher heat capacity than large crystals. A heat absorption occurs in magnetite between the temps. $113-7^\circ$ K. The neg. free energies of formation of the above oxides in the order named, at 298° K. are, resp., 137,000, 145,300, 356,300, 178,400 and 246,800 Cal. Their entropies at 298° K. are, resp., 6.6, 9.6, 12.8, 21.5 and 35.1 cal./degree. D. S. V.

The periodic flow of heat and the thermal stress in the wall of a long hollow cylinder. MICHIJIRO MAEKAWA. *Tech. Repts. Tôhoku Imp. Univ.* 5, No. 4, 1-24(1925). E. J. C

Remarks on W. Jaeger and H. V. Steinwehr's article entitled "The establishment of standard heat of combustion values." W. SWIENTOSLAWSKI. *J. chim. phys.* 22, 583-8(1925); cf. Jaeger and Steinwehr, C. A. 19, 1085.—A defence of the action of the international commission on a thermochem. standard in adopting Dickinson's value for the calorific value of $BzOH$. Fischer and Wrede's value for $BzOH$ is about 0.2% low; the $BzOH$ they used must have contained some unknown impurity. J. and S.'s detns. of the heat equiv. of Fisher's app. consistently show an error resulting in an increase of +0.3% in the calorific value detns. A. PAPINEAU-COUTURE

Report on the international temperature scale of low temperatures. W. H. KESSOM AND H. KAMERLINGH ONNES. *Leiden Comm. Suppl. No. 51* (In French); *Proc. Fourth Intern. Congress of Refrigeration* 1, 15-43a(1924).—The abs. thermodynamic or Kelvin scale, theoretical Avogadro scale, Avogadro scale for a definite gas, international Kelvin scale, international He thermometer scale, international correction table, Celsius scales and fundamental points are defined, and the reduction of the scales of the gas (H, He) thermometers to the international temp. scale is discussed. Essentially math. A. PAPINEAU-COUTURE

Vapor tension and heat of vaporization at low temperatures. J. F. VERSCHAFFELT. *Arch. néerland. sci.* [IIIA], 8, 109-35(1924); *Leiden Comm. Suppl. No. 49*; *Proc. Fourth Intern. Congress of Refrigeration* 1, 13-4a(1924).—It is generally taken for granted that at very low temps. the well-known equation of Clapeyron-Clausius takes the more simple form $d \log p/dT = \lambda/RT^2$, which may be considered as a limit relation between vapor tension and heat of vaporization near 0° abs. A 2nd thermodynamic equation, which is considered as a limit formula at low temps., is the relation $d\lambda/dT = C_2 - C_1$, between the heat of vaporization and the sp. heats of the vapor and of the condensed

state. Both relations are based on the assumptions that at very low temps the sp. vol. of the condensed state may be neglected against that of the vapor, and that the vapor behaves as a perfect gas. This last assumption, though probable, is still questionable. From the known variation of the sp. heat of the condensed state with temp. down to 0° abs., from the known exptl. values of the vapor tension and the heat of vaporization at temps. sufficiently low that the relations above are applicable with rather great approximation (e. g., at the triple point), and the theoretical value of the chem. const., the variation of the vapor tension and of the heat of vaporization of Hg, A, H and He was found by integration of the equations. For He the sp. heat of the condensed state may be considered practically = 0, and $\log_{10} p = -(3.1/T) + 2.5 \log_{10} T - 0.69$ (p in atm.), $\lambda = 14 + 5T$ (mol. heat).

A. PAINEAU-COUTURE

An application of spectrophotography to the measurement of high temperatures.

I. O. GRIFFITH *Proc. Phys. Soc. London* **38**, 85-7(1925).—The spectrum of the source is photographed through a neutral wedge placed immediately in front of a photographic plate. The curved boundary of the spectrum varies in height, the variation depending upon the distribution of energy in the source, i. e., upon its temp. It is assumed that the source radiates as a black body or a gray body, but with certain limitations the method is applicable to bodies which are neither black nor gray.

GEORGE L. CLARK

The measurement of temperatures by thermocouples in unequally heated enclosures. W. MANDELL. *Proc. Phys. Soc. London* **38**, 47-68(1925).—In measuring temp. by thermocouples in unequally heated enclosures the recorded temp. depends upon the thickness of the couple, the nature of the walls of the enclosure and the nature of the gas. An explanation is suggested based upon the fact that the amt. of radiation received and emitted by a couple depends upon its position in the enclosure, and that the amt. of energy transferred to it by mol. impact varies with the nature of the gas.

GEORGE L. CLARK

Thermal study of the paramagnetism of salts of cobalt in solution. CHATILLON. *Compt. rend.* **181**, 778-80(1925).—Sols. of CoCl_2 , CoSO_4 and $\text{Co}(\text{NO}_3)_2$ of varying concns. were studied at temps. ranging from 10° to 140° . The Curie point for these sols. was computed to be -12° . The results indicate that in every case the at. magnetic moment corresponds to 25 magnetons instead of to 24.5 as indicated by the results published by Trumplers and by Miss Brandt. The values were independent of the concn. The anhydrous sulfate gave -33° for the Curie point and 26 magnetons for the magnetic moment but on recrystg. and redissolving, the Curie point was found -10° with 25 magnetons. Apparently either form could be produced at will.

W. W. STIFLER

Specific heat variations in relation to the dynamic action of gases and their equation of state. WM. J. WALKER. *Phil. Mag.* **50**, 1244-60(1925).—Some preliminary expts. are first described relating to the detn. of the variable sp. heat function for highly superheated steam. It is emphasized that the neglect of any explicit incorporation of such a function in the thermodynamic equations for vapors obscures the reasons for many otherwise apparently anomalous results. The exptl. data so far obtained are few, because of difficulties encountered in the exptl. method, but they indicate the probable existence of an inflexion point on the const.-pressure sp. heat-temp. curve at the crit. temp. An analytical investigation into the problem of incorporating the variable sp.-heat function into the equations of state for gases and vapors occupies the latter portion of the paper. By a combination of fundamental thermodynamic relations with the most probable adiabatic relation for gases and vapors, as revealed by expt., an equation of the Dieterici-Jeans type has been derived, the qual. agreement of which with the behavior of gases and vapors in general appears to be good. By its form, the evidence also appears to be strong that the partial disagreement of this and other earlier types of equation with the phys. consts. of gases and vapors is due to the absence of any term in such equations directly involving sp. heat variations.

S. C. L.

Notes on the new law of mass action. I. Application of the new equations. RICHARD LORENZ. *Z. anorg. allgem. Chem.* **150**, 99-104(1925); cf. *C. A.* **19**, 3412.—The equation of the law of mass action for condensed systems contains the consts. r and r' , which as it is shown may be calcd. from the at. and mol. vols. of the compds. of the system at the temp. of the equil. Further it is shown that in the case of systems in which the initial and the reaction products contain the same no. of mols., the new form of the law of mass action results when the algebraic sum of the simple thermodynamic potentials of the individual phases of the equil. is considered as equal to 0; in systems where the no. of mols. of the initial and reaction product are different, e. g., $\text{Cd} + \text{Ti}_2\text{Cl}_2 \rightleftharpoons \text{CdCl}_2 + 2\text{Ti}$, the thermodynamic potentials are to be multiplied with the

no. of mols. in order to have the equations correspond with the general statement $\Sigma(\nu\mu) = 0$, where μ is the thermodynamic potential and ν the no. of mols. E. K.

Potential difference and equilibrium across a semipermeable collodion membrane in the case of sodium chloride and Congo red. KYOTARO AZUMA AND NAOTO KAMEYAMA. *Phil. Mag.* **50**, 1264-76(1925).—The potential differences and ionic equil. across a semipermeable collodion membrane in aq. solns. of NaCl and of NaCl plus Congo red have been measured. If Congo red in the range of concns. measured be assumed to ionize as a uni-univalent electrolyte, and if the ionic-strength principle of G. N. Lewis be assumed to hold good for the mixts. of Congo red and NaCl used, the exptl. results are in general agreement with the thermodynamical requirement of the equality of the activities of NaCl on either side of the membrane. Because of the difficulty of eliminating liquid-liquid potentials in solns. contg. Congo red, it has not been possible to prove that the potential difference across the membrane is in agreement with the thermodynamic requirement for a system in equil. S. C. L.

Behavior of nitrogen according to the law of corresponding states. A. TH. VAN URK. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 79-80a(1924); *Leiden Comm. No. 169c*.—The investigation was carried out in the same manner as that of Kuypers on O (following abstract). The curves show a bend in the neighborhood of the crit. temp. and d. As the bend of the deviation curve displaces itself towards greater values of $\log \lambda_v$ with increasing temp., it is probable that the same bend exists also at higher temps., if measured at greater ds. The deviation curve of the points measured by Bridgman (*C. A.* **18**, 1219) cuts the zero axis with a pos. slope, while U.'s curves show that the slope at smaller ds. is neg. A. PAPINEAU-COUTURE

Behavior of oxygen according to the law of corresponding states. H. A. KUYPERS. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 69-71a(1924); *Leiden Comm. No. 169b*.—By means of the equation of state in which the normal vol. has been taken a unit of vol. the pv_A -values of all isotherms have been calcd. for the ds. of all isotherm points measured. The differences of the measured and calcd. pv_A expressed in % of the latter are represented graphically. For the numerical results the *Leiden Comm.* should be consulted. A. PAPINEAU-COUTURE

Dielectric constants of liquids. I. Method of measuring dielectric constants of liquids. TOSHIKATSU MATSUIKE. *Sci. Repts. Tohoku Imp. Univ.* **14**, 445-52(1925).—An app. for the measurement of dielec. consts. of liquids by means of the resonance of 2 high oscillators. Dielec. consts. of Et_2O , CS_2 , CHCl_3 , Me_2CO , EtOH , H_2O are given with an accuracy of approx. $1/1000$ BRIAN MEAD

Breakdown of liquid dielectrics. A. GYEMANT. *Physik. Z.* **26**, 686-7(1925).—G. explains the breakdown of liquid dielectrics on the assumption that the mols. are oriented in rows and that they become capable of exchanging electrons under the influence of a high potential. The presence of "chains" of H_2O mols. would explain the great influence of moisture on the breakdown potential of transformer oils. G. C.

Electric resistance of sodium and potassium in the temperature region of liquid helium. H. R. WOLTJER AND H. KAMERLINGH ONNES. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 183-7a(1924).—Merck and Kahlbaum Na and K tested to temps. down to 1.5°K . showed no supercond. such as had previously been observed for Hg, Pb, Sn, In and Th. A. PAPINEAU-COUTURE

The liquid-helium equipment of the Physikalisch-Technischen Reichsanstalt and some measurements made using liquid helium. W. MEISSNER. *Physik. Z.* **26**, 689-94(1925); cf. *C. A.* **19**, 3178.—M. describes the equipment and detcs. the elec. resistance of Co, Pb, Sn and Au wires from 91.5° to 1.61°K . A correctly aged wire of polycryst. Au has, down to the lowest temp., the same resistance as a monocrystal wire. G. CALINGAERT

Electromotive behavior of aluminium. C. J. DEGRUYTER. *Rec. trav. chim.* **44**, 937-69(1925). (In English).—The passivity of Al is briefly reviewed. A. Smits suggested that the problem of Al could be best attacked with the help of Hg and for that reason this work was undertaken. Fogh (*C. A.* **17**, 3153), Kremann and Müller (*C. A.* **15**, 2771) studied amalgamated Al, while N. R. Dhar (*C. A.* **16**, 1356), Muller and Hölzl (*C. A.* **16**, 3580) and Heyrovsky (*C. A.* **14**, 1773) published papers on the potential of Al in salt solns. The melting diagram of the system Hg-Al was detd. No evidence was obtained for the existence of a compd. between Al and Hg nor for the existence of a transition point. Expts. showed that mixed crystals exist up to about 8% Hg at room temp. The above investigation permitted of deciding upon the E_s diagram for Al-Hg (A. Smits, *Theory of Allotropy*, p. 386). The passivity of Al must be ascribed to the tardiness of the reaction; $\text{Al} \rightarrow \text{Al}''' + 3\text{e}_e$. So far Hg is the best known catalyst for this reaction. It is assumed that $\text{Al}(\text{OH})_3$ is a neg. catalyst

for the internal equil. of metallic Al. Under the conditions used in this work the Al was never covered with an insulating coating of oxide. E. J. WITZEMANN

The physical chemistry of dyes. I. A new method for the determination of the electric charge of dyes in solution. R. FÜRTH. *Kolloid-Z.* 37, 200-4(1925).—An app., designed with the view of avoiding the errors encountered in the detn. of the elec. charge of the particles in colloidal solns. by means of cataphoresis, consists of 2 electrodes, long thin plates made from a clay material which is insol. in the liquids and possesses a white surface so that any coloring of the electrodes can be easily observed. The electrodes are mounted on an insulator support so that the distance between them can be varied. A glass vessel contg. the soln. for measurement rests on a stand and can be raised or lowered to bring the liquid in contact with the electrodes. The d. c. with the necessary high voltage is best obtained by an a. c. transformer in combination with an electrolytic rectifier (Greinacher's). A glowing cathode rectifier was sometimes used. Before an expt. the electrodes were covered with distd. H₂O until all the air was removed and the pores of the stone were completely filled with H₂O. The electrodes were usually 5 cm. apart and stood at a depth of 1 cm. in the soln. About 500 v. was used. For all the aq. or alc. solns. of dyes investigated only a few seconds or min. was required to color one of the electrodes while the other remained uncolored. By a change of polarity in almost every case the color deposited on the one electrode could be removed while the opposite electrode became colored. H. M. McLAUGHLIN

The determination of very small conductivities with the vacuum electrometer. G. HOFFMANN. *Physik. Z.* 26, 913-4(1925). E. J. C.

Magnetostriction in iron crystals. W. L. WEBSTER. *Proc. Roy. Soc. (London)* 109A, 570-84(1925).—Rods about 1.8 cm. long and 1.2 mm. in diam. were cut parallel to the (1, 0, 0), (1, 1, 0) and (1, 1, 1) directions from exceptionally pure crystals of Fe. Simultaneous measurements were taken of the change in length, intensity of magnetization, and strength of magnetic field when these rods were magnetized longitudinally. The (1, 0, 0) axis gave an increase in length and the (1, 1, 1) axis gave a decrease in length for all values of the magnetizing field. For the (1, 1, 0) axis an increase in length was observed for weak fields but an increase was found as satn. was approached. A similar effect was observed for a rod of soft iron and it is suggested that this can be explained by a suitable combination of the effects obtained for the single crystals. The reciprocal relation between magnetostriction and the effect of stress on magnetization was also investigated; the exptl. results agreed satisfactorily with theory (cf. C. A. 19, 1809). W. W. STIFLER

A light filter for polarimetry. N. SCHOORL. *Pharm. Weekblad* 63, 21-3(1925).—The light from an ordinary 50-candle-power filament lamp when filtered through a 2-cm. layer of a soln. contg. 8.8 g. CuSO₄·5H₂O and 9.4 g. K₂Cr₂O₇ in 200 cc. H₂O is monochromatic and has practically the same wave length as the Na spectrum. This filter soln. is recommended in polarimetric detn. of sugars, c. g., glucose in urine and sucrose and lactose in foods, also for the identification of certain optically active oils, e. g., oleum santali. A. W. DOX

Optical constants. II. Lateral scattering from a gas. C. G. DARWIN. *Proc. Cambridge Phil. Soc.* 22, 824-31(1925).—A math. paper. E. R. SCHIERZ

Velocity of sound in mixtures of gases. H. B. DIXON AND GILBERT GREENWOOD. *Proc. Roy. Soc. (London)* 109A, 561-9(1925).—By Kundt's double-tube type of app. the following types were investigated: (I) Mixts. with γ practically const. but with varying d., H₂ and O₂. (II) Both d. and γ variable, CO₂ and H₂. (III) CO₂, H₂ and air. (IV) Const. γ and d., CO₂ and N₂. (V) Single gas compared with gas mixt. of same d., NH₃, and H₂:O₂:1:1. BRIAN MEAD

Observations of systematic movements within the sun. H. W. NEWTON. *Science Progress* 20, 439-49(1926).—A concise summary of the chemistry and physics of the sun. JOSEPH S. HEPBURN

Crystal structure of α - and β -CdS and wurtzite (ULRICH, ZACHARIASEN) 8. Paramagnetism and the electronic configuration of the atom (JACKSON) 3. Color and molecular geometry (MOIR) 10.

Das Materialprüfungswesen. 2nd Ed. revised and enlarged. Edited by 'K. Memmler. 660 pp.

KÜSTER, F. W.: **Logarithmische Rechentafeln für Chemiker, Pharmazeuten, Mediziner und Physiker.** 30th-34th Ed., revised and enlarged by A. Thiel. Berlin

and Leipzig: Walter de Gruyter & Co. 146 pp. Price, unbound, M. 4.80; bound, M. 6. Reviewed in *J. Am. Chem. Soc.* **48**, 540(1926).

MELLOR, J. W.: **A Comprehensive Treatise on Inorganic and Theoretical Chemistry.** Vol. VI. [C (Pt. II), Si, Silicates.] London: Longmans, Green & Co. 1024 pp. £3, 3s. net. Reviewed in *Chem. News* **131**, 413(1925).

MICHAELIS, LEONOR: **The Effects of Ions in Colloidal Systems.** Baltimore, Md.: William & Wilkins Co. Cloth. 5 × 8 in. Pp. 108. \$2.50. Reviewed in *Eng. News Rec.* **95**, 848(1925).

Popular Research Narratives. Vol. II. New York Engineering Foundation, 29 W. 39th St. \$1. Reviewed in *Mech. Eng.* **48**, 87(1926).

STOERMER, RICHARD: **Oxidation and Reduction.** Rostock: Urban and Schwartzberg. 456 pp. Reviewed in *J. Am. Chem. Soc.* **48**, 539(1926).

TAMMANN, GUSTAV: **The States of Aggregation.** Translated from 2nd German ed. by Robert Franklin Mehl. New York: D. Van Nostrand Co. 297 pp. \$5. Reviewed in *Chem. and Met. Eng.* **32**, 943(1925).

VEIMARN, P. P.: **Die Allgemeinheit des Kolloidzustandes.** 2nd Ed., revised and enlarged. Dresden and Leipzig: Theodor Steinkopff. 504 pp. M. 25. Reviewed in *Chem. News* **131**, 301; *Chem. Age* **13**, 374(1925).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Recent advances in science: Physics. L. F. BATES. *Science Progress* **20**, 392-400 (1926).—Review of recent work on the collision of electrons and atoms in gases.

JOSEPH S. HEPBURN

Recent advances in science: Physical chemistry. W. E. GARNER. *Science Progress* **20**, 400-5(1926).—Review of recent work in photochemistry and on radiation

JOSEPH S. HEPBURN

X-rays and the constitution of matter. DE BROGLIE. *Bull. soc. ind. Mulhouse* **91**, 663-70(1925).—An address.

A. PAPINEAU-COUTURE

Positive rays produced in thermionic vacuum tubes containing alkali-metal vapors. H. E. IVES. *J. Franklin Inst.* **201**, 47-69(1926).

MARIE FARNSWORTH

Recent progress in the manufacture and theory of ionic valves. P. DRUMAUX. *Rev. questions scientifiques*, July, 1924; *Bull. soc. Belge Elec.* **39**, 56-67(1925); *Science Abstracts* **28B**, 327.

H. G.

Transition from glow to arc discharge at atmospheric pressure. J. SLEPIAN. *J. Franklin Inst.* **201**, 79-90(1926).

MARIE FARNSWORTH

The length of life of the metastable s_3 and s_2 state of neon. H. B. DORGELO. *Z. Physik* **34**, 766-75(1925).—See *C. A.* **20**, 335.

F. R. B.

Optical constants. I. Optical behavior of certain atomic models. C. G. DARWIN. *Proc. Cambridge Phil. Soc.* **22**, 817-23(1925).—A mathematical paper.

E. R. SCHIERZ

Generalizations of the Rayleigh formula for molecular scattering. J. Q. STEWART. *J. Optical Soc. Am.* **11**, 581-97(1925).—A unified treatment of the Rayleigh, Einstein-Smoluchowski and Cabannes-King formulas is developed from the point of view of classical electrodynamics.

H. R. MOORE

Paramagnetism and the electronic configuration of the atom. L. C. JACKSON. *Nature* **115**, 981(1925).—J. suggests tentatively that the different magnetic states of the ions of iron (Fe^{++}) and cobalt (Co^{++}) may correspond to different internal configurations of the electrons. Thus the ordinary ferrous ion would possess the configuration 2, 8, 14, 0 and the other magnetic state might be produced by the transference of one of the 14 electrons in the incomplete 3rd quantum orbit to the 4th quantum orbit, or by a redistribution of the 3rd quantum orbit electrons among the various levels, 3_1 , 3_2 , and 3_3 , of this orbit. This is analogous to the assumption made by Russell to explain the active and passive states of Fe, Ni and Co. (Cf. *C. A.* **19**, 2773; **20**, 165.)

FLORENCE N. SCHOTT

The metastable $2p_1$ -state of mercury atoms. S. LORIA. *Proc. Nat. Acad. Sci.* **11**, 673-9(1925).—A method is developed, with the aid of the microphotometer, for estimating the duration of metastable $2p_1$ Hg atoms from the intensity increase of the T1 line 5350 Å. U. The value deduced is 5×10^{-12} sec., in fair agreement with Webb's detn (*C. A.* **18**, 3532). It is pointed out that the time of existence in the $2p_1$ state is not const., since it is a function of collisions with other atoms.

H. R. MOORE

Absorption in excited gases. K. W. MEISSNER. *Physik. Z.* **26**, 687-9(1925).—M. det. photometrically the intensity of absorption of the various A lines in the excited gas. All the lines attributed to the $1s_2$ and $1s_3$ states show strong absorption, the $1s_2$ and $1s_4$ little or no absorption, showing that the former have a comparatively much longer life.

G. CALINGAERT

Supplementary remarks to the paper: Regularities in the rare earths groups. G. v. HEVESY. *Z. anorg. allgem. Chem.* **150**, 68(1925); cf. *C. A.* **19**, 3211.—An error in the mol. wts. is corrected and a recalcd. table given of the mol. vols. of octahydrated sulfates of the elements with the at. no. 39 to 71.

EMIL KLARMANN

Structure and size of the non-metallic hydrides. H. G. GRIMM. *Z. Elektrochem.* **31**, 474-80(1925).—If the union between the O ion and the H nucleus were complete, the F ion would result; but since the H nucleus remains at a finite distance from the nucleus of the O ion, there results the OH ion, which is similar to the F ion. Atoms in the periodic system anywhere up to 4 places before an inert gas change their properties by uniting with 1, 2, 3, or 4, H atoms, so that the resulting complexes behave like pseudoatoms, which are similar to elements of the groups standing before them in the periodic table. The energies of dissociation of O_2 and N_2 were calcd. and the results applied in estg. that energy for non-polar mols. The true dimensions of the simpler pseudoatoms were calcd with the use of graphs. By means of these and previous data models of the simpler organic mols. were constructed to show their true relations in size and phys. properties. There are extensive references to the literature of structural chemistry. Discussion follows.

ROSALIE COBB

The continuous spectrum and the γ -ray spectrograph of J. Thibaud. A. PICCARD. *J. phys. radium* **6**, 334(1925).—It is suggested that the continuous background observed in a γ -ray spectrograph by Thibaud (*C. A.* **19**, 2910) may be explained by the absorption of secondary rays in the secondary radiator itself and the possibility of eliminating it by using a sufficiently thin secondary radiator is discussed.

W. F. MEGGERS

The secondary spectra of gamma rays: the origin of the continuous background and the variation of the relative intensity of the lines. JEAN THIBAUD. *J. phys. radium* **6**, 334-6(1925).—The continuous background found on spectrograms of secondary β -rays excited by γ radiation in various elements is not explained by the absorption of the corpuscles in the secondary radiator (cf. preceding abstr.). Expts. on the retardation of β -particles in matter are made by employing high-speed photoelectrons. Their speeds decrease linearly with the thickness of Al traversed. In the spectrograph under discussion all the electrons coming from the lower layers are absorbed and only those form a ray which come from a superficial layer probably less than 0.01 mm. thick for heavy elements. The continuous radiation is, therefore, not an effect of retardation; the origin of this continuous γ -radiation may be nuclear, but it is simpler to admit that it comes from a degradation of the quantum by Compton effect of diffusion in the mass of the radiator. In addn. to a large difference of intensity between the natural and excited spectra, attention is called to the fact that the relative intensities of neighboring β rays are not the same in the 2 spectra.

W. F. MEGGERS

The absorption due to scattering of the canal rays of hydrogen in passing through hydrogen and helium. RICHARD CONRAD. *Z. Physik* **35**, 73-100(1926).—The observed absorption of canal rays of velocities of the order of 2×10^8 cm./sec. in H_2 and He at 0.05 mm. Hg is shown to be due to scattering. A formula for the scattering is worked out especially for the case where the initial beam is conical. In accordance with this formula it is found that the scattering coeff. is proportional to the pressure of the gas and inversely proportional to the fourth power of the velocity of the ray, at least under pressures of 0.02 mm. Hg.

F. R. B.

Atomic number of a radioactive element at the moment of emission of the γ -ray. C. D. ELLIS AND W. A. WOOSTER. *Proc. Cambridge Phil. Soc.* **22**, 844-8(1925).—By measuring the distance between the lines of the corpuscular spectra produced on a photographic plate simultaneously by natural electrons and those excited in Pt, E. and W. show that the emission of γ -ray, which usually accompanies the β -type disintegration actually occurs after the ejection of the electron from the nucleus. The app. used consisted of a thin-walled glass tube 0.4 mm. in external diam. filled with radon and fitted closely into a Pt tube with walls 0.25 mm. thick. Before use this Pt tube was exposed to a source of Ra B and C. The spectra were obtained in the usual way.

E. R. SCHIERZ

The β -type of disintegration. C. D. ELLIS AND W. A. WOOSTER. *Proc. Cambridge Phil. Soc.* **22**, 849-60(1925).—This is a crit. review of work concerning the moment of emission of the γ -ray and the mechanism of emission of these rays and the disintegra-

tion electron, resp. A provisional detailed hypothesis is advanced explaining the mechanism of emission which agrees in general with the conclusions of Meitner except for the moment of emission of the γ -ray. An interesting feature of the hypothesis is that it suggests the existence of a generic connection between the nuclear electronic structure of successive bodies in a family whether the changes be α or β . E. and W. believe that the continuous spectrum of β -rays consists of electrons of disintegration. These electrons are emitted from the nucleus with varying velocities. E. R. S.

A rapid and accurate method of correcting measurements with emanation electroscopes for ordinary changes in temperature and pressure. O. C. LESTER. *J. Optical Soc. Am.* 11, 637-40(1925).—A chart is constructed, by means of which the const. of the electroscopes, corresponding to other readings of temp. and pressure, can be obtained graphically. H. R. MOORE

Extraction and purification of the active deposits of radium of slow rate of evolution. MILLE, IRENE CURIE. *J. chim. phys.* 22, 471-87(1925).—General report upon the recent work of Mme. and Mlle. Curie, with review of methods for detg. the amt. of radiation from active substances. A curie of radioactive substance is defined as the amt. of that substance which emits the same no. of α -rays per sec. as does a g. of Ra. Purification is carried out in carefully cleaned quartz vessels, volatile reagents being used. Gross impurities, as alk. salts and Cu, are removed by pptn. Final purification is effected by electrolysis, by fractional crystn., or by deposition on metals in acid or alk. soln. ROSALIE COBB

Electron paths. A. GÜNTHER-SCHULZE. *Z. Physik* 34, 639-44(1925).—A calcul. on the classical assumptions of the path limits of electrons ejected from a cylindrical filament placed in the center of a plate condenser. The calcul. is applicable to electron tube construction. F. R. B.

Evaporation of electrons. W. SCHOTTKY. *Z. Physik* 34, 645-75(1925).—A discussion of the fundamental of the thermodynamics of thermal emission of electrons, especially in connection with the work of Raschevsky (*C. A.* 19, 3062) leads to the conclusion that the important factor is not the heat capacity of the electrons but the variation in the sp. heat of the metal due to the electrons. This quantity which is Lewis and Randall's partial molal heat capacity is not directly measurable but is connected with the Thomson heat and with the temp. coeff. of thermoelec. force. S.'s equation does not allow of immediate calcul. but is of theoretical interest. F. R. B.

The flashing of certain types of argon-nitrogen discharge tubes. WM. CLARKSON. *Proc. Phys. Soc. London* 38, 10-5(1925).—An account of investigations on the flashing of discharge tubes which had various types of electrodes, and in which the filling gas, a mixt. of A and N, had a wide pressure range. At higher pressures the discharge was no longer of the "glow" type, but took place between definite points on the electrodes. MARIE FARNSWORTH

The influence of temperature on the photoelectric effect of the alkali metals. H. E. IVES AND A. L. JOHNSRUD. *J. Optical Soc. Am.* 11, 565-79(1925); cf. *C. A.* 19, 603.—A new technic is developed for investigating the variation of photoelec. current with temp. for Na, K, Rb and Cs point by point within the temp. interval -180° to $+20^{\circ}$. The temp. was maintained uniformly over all parts of the illuminated electrode and the deleterious effects of occluded gases avoided by condensation on the outer alkali-coated walls. The decrease of photoelec. current with temp. was continuous for all metals, and was greater for yellow than either blue or white light. A special study of annealed and roughened K surfaces has disclosed the importance of this factor. It is concluded that variations in photoelec. effect are intimately connected with strains produced in the surface by expansion and contraction with temp. H. R. MOORE

Some experiments on collisions of the second kind. H. D. SMYTH. *Proc. Nat. Acad. Sci.* 11, 679-82(1925).—When free electrons come within the fields of force of excited atoms about to revert to the normal state, they rebound with kinetic energies equiv. to the activation energy of the atoms concerned. This effect is demonstrated with monat. I, which possesses an electron affinity of 3.5 v. When the current flowing in a 3-electrode tube is plotted as a function of the retarding field between the grid and anode, a stream of electrons is detected with velocities 3.0-5.0 v. greater than the main group. A similar effect is found for the decompn. of O_2 at 300° . With more refined methods it may be possible to demonstrate the existence of 3 beams of electrons, produced by collisions of the second kind, of velocities 0.52, 1.73 and 4.3 v. The corresponding crit. increments of activation of the O_2 mol. are 12,000, 40,000 and 110,000 cal., resp. H. R. MOORE

The generally accepted explanation of the Zeeman triplet on a quantum basis.

W. M. HICKS. *Nature* 115, 978(1925).—In applying Larmor's theorem to the explanation of the simple Zeeman triplet on the basis of the quantum theory the assumption is made that after the imposition of the magnetic field the rotating system is the same as before with simply the rotation superposed. This assumption is incorrect and leads to two further objections that (1) the new orbit ceases to be quantized and (2) the total energy is supposed to be altered by the action of a magnetic field on a moving electron.

FLORENCE N. SCHOTT

New determinations in the electric field. W. STEUBING. *Physik. Z.* 26, 915-9 (1925).—A field of 57 kv./cm. failed to produce any effect on the negative CO bands, 97 kv./cm. failed to alter the moisture bands in the ultra-violet. S. concludes in general that a Stark effect cannot exist for band spectra to an extent detectable by our present methods.

F. O. A.

Heating effect of the anode in a glow discharge. II. F. M. PENNING. *Physica* 5, 217-33(1925).—The app. with the double calorimetric anode, as described in a previous article (*C. A.* 19, 1372) was improved. Two anode blocks constructed of Cu, contg. heating element, thermocouple, etc., were suspended from 3 thin iron wires, inside the vacuum tube. The cathode consisted of a circular plate surrounded by a flat ring; the measuring method was the same. The results are given in v - p and v - i_a curves (v is heat effect expressed in v. for const. i_a ; p is pressure of Ne, i_a is current density). At pressures of 10 to 20 mm. 2 forms of anodic light are possible, depending on p and i_a , the usual thin yellow layer and a red hemisphere; either one is stable, red between 2 and 10 mm. Oscillations are excluded on account of the low current values: 2 or 5 ma. The v values for red light are lower than those for yellow light. As the pressure is diminished the red ball gradually changes its shape and color, giving the yellow layer again. Simultaneously the v - p curve for red goes through a min. (4.5 mm., 22 v.) and rises up to 29 v., this being the value for yellow light. Below 2 mm. v drops suddenly to 5 v. with disappearance of all anodic light. These results are in agreement with conclusions of Günther-Schulze (*C. A.* 19, 1091), the anodic glow being due to a negative space charge, lack of sufficient positive ions. Potential for the dark discharge is only 1 v. more than ϕ for copper (4.0 v.). The increase in v accompanying the anode glow is of the order of $\phi + v_i = 25.5$ v. In the red discharge the anode fall is extended over a larger distance, more chances for the electrons to collide and ionize, consequently smaller potential drop. Another explanation of the red ball on the basis of stepwise ionization seems less plausible. The author, contrary to G.-S., ascribes the lack of positive ions near the anode to excessive diffusion; a slightly negative potential of the auxiliary anode or even of the glass walls, caused an anodic potential drop to appear by capturing the ions. Variation of the electrode distance (d) gave results similar to those of G.-S.; for const. i_a and p , increasing d , v rises rather suddenly over 20 v., yellow glow appears ($i_a = 0.6$ ma., $d = 15$ mm.); d still larger (31 mm.) gives the red ball with a 3 v. potential drop. More evidence for an anode fall of about 20 v. was obtained in a different type of tube with two circular electrodes and a small "test" electrode (S) near the anode in the sidewall (method of Langmuir, *C. A.* 19, 1531). This method is, however, less reliable, the dimension of the space charge before the collector may not be small with regard to the electron free path. Curves of $\log i_s = f(v_s)$ for $i_a = 20$ ma. (yellow glow) and for $i_a = 5$ ma. (dark anode) show that a difference of about 19 v. in v_s is necessary to bring about the same collector current i_s . The potential of the anode relative to the surrounding space has increased with this amt.

B. J. C. VAN DER HOEVEN

Photoelectric conductivity at low temperatures. B. GUDDEN AND R. POHL. *Z. Physik* 34, 248-54(1925).—The photoelec. cond. of NaCl crystals which have been colored by exposure to X-rays is measured over the range 20-80° Abs. At the lower temps. the max. cond. is shifted to the shorter wave lengths; at zero Abs. the max. is approx. at 380 m μ . A possible connection of this value with the ionization potential of metal Na is pointed out.

F. R. B.

Proof of the selective photo effect. B. GUDDEN AND R. POHL. *Z. Physik* 34, 245-8(1925).—A coating of Na or K deposited on an insulator such as quartz and NaCl when illuminated by ultra-violet and violet light loses electrons which under high elec. fields pass through the insulator producing a photoelec. change in resistance. This phenomenon is presumably connected with the photosensitivity of NaCl crystals that have previously been colored by exposure to X-rays.

F. R. B.

The reported $K\alpha$ line in the X-ray spectra of molybdenum and palladium. S. K. ALLISON. *Nature* 115, 978-9(1925).—No evidence for the β_1 line reported by Leide (cf. *C. A.* 19, 1987) was found. A discontinuity in the general radiation always appeared due to the absorption by the target of its own radiation. The effect produced by this

absorption might be mistaken for a faint line on the short wave-length side of the γ -line.

Spectroscopic evidence of J-transformation of X-rays. MANNE SIEGBAHN. *Nature* 116, 11(1925).—Khaustgir and Watson (cf. *C. A.* 20, 146) plotted the wave lengths of the X-ray line *K* against the at. no. of the elements nos. 48–60 and noted irregularities at $n = 52$ and 56, which they ascribed to the J transformation of X-rays. They refer to the work of Siegbahn for these data. S. disclaims some values given. Recent work done by S. and Leide (cf. *C. A.* 14, 689) gives values for wave lengths which when plotted against the at. no. show no trace of discontinuities as described by Khaustgir and Watson. W. W. NIPPER *Ibid* 12(1925).—N. points out that the values used by Khaustgir and Watson (*C. A.* 20, 146) were obtained in 1915 by Malmer (See "Atomic Structures," Sommerfeld, p. 153). When values of λ according to Siegbahn's latest work ("Spektroskopie der Roentgenstrahlen," 1924, p. 101–2) are plotted against the at. no. the curve obtained is smooth and no discontinuities are obtained. There is, therefore, no spectroscopic evidence of the so-called J-transformation of X-rays. S. R. KHAUSTGIR AND W. H. WATSON. *Ibid* 47(1925).—Controversial and explanatory.

FLORENCE N. SCHOTT

The spectra of ionized lithium. Y. SUGIURA. *J. phys. radium* 6, 323–33(1925).—The spark spectrum of Li has been obtained from a discharge tube provided with a perforated cathode, the inner walls of which are covered with LiCl. The discharge is produced by an induction coil with 50,000 to 80,000 v., the circuit contg. also a condenser in parallel and an external spark gap in series. The same arrangement permitted observations of the Stark effect on certain Li-arc lines and produced 55 lines of the first and second spark spectra of Cl. The wave lengths of about 40 spark lines of Li are measured between 2607 and 5485 Å. Most of these lines are classified in series analogous to those of He and the quantum defects corresponding to each series term are compared in the 2 spectra. The values of the terms are calc., that of the term $1s$ is found to be 546,703 cm^{-1} which corresponds to a second ionization potential of 67.5 v. The crit. potentials deduced from the spectroscopic measurements are in agreement with the potentials observed by Mohler and with the theoretical values calc. from the at. models of Bohr and Kramers.

W. F. MEGGERS

The absorption spectra of various aldehydes and ketones and some of their derived compounds. J. E. PURVIS. *J. Chem. Soc.* 127, 9–14(1925).—Spectral absorption measurements of various org. compds. with a Cd spark as source have lead to the following conclusions: (1) all aldehydes and ketones exhibit selective absorption in the ultra-violet which disappears when the CHO or C=O groups are neutralized or eliminated; (2) substances with unsatd. centers such as C=C or C \equiv C bonds in straight chain and aromatic compds. give sp. absorption; (3) with progressive elimination of the oscillatory centers the absorption is shifted to the more refrangible regions. A special study of CH₂O and its polymers (cf. P. and McClelland, *C. A.* 7, 564–5) in various solvents, has enabled P. to demonstrate interaction with the solvents by shifts in the absorption bands.

H. R. MOORE

Band spectra of lead isotopes. E. S. BIELER. *Nature* 115, 980(1925).—It has been shown (cf. *C. A.* 16, 679) that in the case of U Pb, the lines of the band at 4270 showed an av. shift to the violet of 0.055 Å.U., as compared with those of ordinary Pb and that the lines were much sharper in the former case than in the latter. A satisfactory explanation is obtained by assuming that the lighter PbH mol. is the carrier of the band rather than the heavier Pb₂ mol. (Cf. *C. A.* 17, 3135; 19, 1223, 1985)

FLORENCE N. SCHOTT

Photochemical reaction between bromine and tartaric acid in aqueous solution. I. JNANENDRA CHANDRA GHOSH AND JADULAL MUKHERJEE. *Quart. J. Indian Chem. Soc.* 2, 165–78(1925).—The dark reaction between C₄H₆O₆ and Br₂ manifests an induction period of 2 days or more; in intense light no induction period is observed. In blue light (wave length 450–90 μ) of intensity 5400 ergs/sq. cm./sec. an induction period of 120–50 min. was observed at 34.3°, after which the disappearance of Br₂ followed a monomol. equation. The reaction velocity was found to be independent of the state of polarization of the incident light; unlike most photochem. reactions, a temp. coeff. (for 10°) of as much as 1.7–2.0 was found. Five min. initial exposure to bright sunlight caused a reaction which was initially very rapid, but which had almost ceased at the end of 1 hr.; this was explained by postulating the formation of a compd. of C₄H₆O₆ and Br₂ which decompd. with a reaction velocity relatively much greater than that of the reaction between C₄H₆O₆ and Br₂ in the dark.

DONALD W. MACARDLE

The photochemical synthesis of hydrochloric acid. J. CATHALA. *J. chim. phys.* 23, 78–95(1926).—See *C. A.* 19, 2915.

E. H.

The photochemical oxidation of leuco-bases. B. H. CARROLL. *J. Phys. Chem.* 30, 130-3(1926).—The leuco-bases of triphenylmethane dyes were incorporated in collodion films; the oxidation is accelerated by N bases. Sensitivity is low, but there is no evidence of induction; reaction is proportional to intensity. B. H. CARROLL.

The mechanism of photochemical reactions. MAX BODENSTEIN. *Trans. Faraday Soc.* 1925 (advance proof).—The quantity of light absorbed is the principal factor in controlling the velocity of photochem. reactions. Conc'n. is an important factor, however, since the simple law $dx/dt = nI_{\text{abs.}}$ connecting energy with mass is applicable only when the process of energy transference to other mols. is negligible. The researches of Cario and Franck and of Wood on the extinction of fluorescence by foreign gases show that the ordinary laws of kinetics must be modified for chem. reactions at low pressures; that is, when the period between collisions is greater than the av. duration of excitation (10^{-8} sec.). Chain reactions are possible when the const. n in the above expression assumes values higher than 1 and Einstein's law is invalidated. Studies of the influence of foreign gases on the decompn. of HI (Warburg, *C. A.* 12, 2490) and of O_3 by Cl_2' (where Cl_2' denotes an activated mol.) are deemed pertinent in this connection. The recent expts. of Kistiakowski (*C. A.* 20, 711) have shown that He and other indifferent gases inhibit the decompn. of O_3 . In all probability the excitation energy of the O_3 is retained as surplus "flight energy" by the colliding He mols. A knowledge of secondary photochem. processes is contingent on the exact definition of unstable intermediate products and a means of estg. their velocity of conversion. H. R. M.

Chemical changes produced by light energy. G. W. PUCHER. *Buffalo General Hospital Bull.* 3, 76-82(1925).—A review with bibliography of 65 references.

NATHAN VAN PATTEN

Photosensitization by optically excited mercury atoms; the hydrogen oxygen reaction. A. L. MARSHALL. *J. Phys. Chem.* 30, 34-46(1926).—The reaction between H_2 and O_2 was sensitized to ultra-violet light of wave lengths shorter than 2900 Å. U. by using the method of Taylor and Marshall (cf. *C. A.* 19, 3418). A light filter which absorbs all radiation between 2900 and 5000 Å. U. was used (Cl_2 at 2 atm. + Br_2 at 60 mm.). When the amt. of H_2 exceeds that necessary for complete combination with the O_2 present, the reaction rate (pressure decrease at 50° is 24.7 mm./min.) is independent of total pressure down to a partial pressure of H_2 and O_2 of a few mm. When O_2 is in excess, HgO is formed from the Hg present and this results in variable light absorption and consequently variable combination velocities. The kinetic equation favored is: $d[H_2O]/dt = K[H_2]/([H_2] + [O_2])$. To account for the reaction rates observed, a chain mechanism is postulated. D. S. VILLARS

Dissociation and fluorescence of iodine vapor. E. G. DYMOND. *Z. Physik* 34, 553-61(1925).—I vapor may be made to fluoresce by light of wave lengths greater than 4995 Å. U. For wave lengths shorter than this, e. g., in the region of the continuous absorption band of I, no fluorescence takes place. This D. interprets as due to the fact that in this region the energy absorbed (2.5 v.) is great enough to dissociate the atom (1.4 v.) and to excite one of the atoms to the $2p_2 - 2p_1$ state. He was not able to prove this assumed dissociation by measuring the density of resonated I vapor but he believes this is due to the fact that the activated atom is adsorbed by the walls. A new group of fluorescent lines was discovered by exciting the vapor with Cd, $\lambda = 5086$, Cu, $\lambda = 5218$ and Na, $\lambda = 5893$. F. R. B.

Polarized fluorescent light in dye solutions. S. I. VAVILOV. *Z. Physik* 32, 721-9(1925); cf. *C. A.* 19, 1663.—The measurements of polarized fluorescence are made with a König-Martens spectral photometer, adapted for use as a spectro-polarimeter. Data procured on the degree of polarization in glycerol solns. of fluorescein and rhodamine B show conclusively that polarization is independent of wave length throughout the fluorescent band. Solns. of fluorescein in H_2O and MeOH show no measurable polarization at high concns. Further fluorescent depolarization is examd. for increasing concns. of fluorescein in glycerol and erythrosin in H_2O . In the former case, the degree of polarization is diminished from 38.5 to 0.2% and the diminution of polarization begins prior to the extinction. V. concludes that not every collision between dyestuff mols. which produces depolarization, produces extinction at the same time. H. R. MOORE

Studies in luminescence. DOROTHY G. ENGLE AND B. S. HOPKINS. *J. Optical Soc. Am.* 11, 599-615(1925).—An app. is described for measuring directly the intensity of luminescence with a Cs photoelec. cell. Cathode rays are used for excitation. The color of fluorescence is influenced by the following factors: (1) nature of the sensitizing agent, (2) amt. of sensitizer, (3) temp. of fusion, (4) time of fusion, (5) nature of exciting

agency, (6) at. wt. of base used. The substances ZnS , $\text{Ca}(\text{PO}_3)_2$, ZnSiO_3 are studied in detail. H. R. MOORE

Dissociation constants of organic molecular compounds (HALBAN, ZIMPELMANN) 2.

ALLEN, H. STANLEY: **Photo-Electricity**. 2nd Ed., revised. London: Longmans, Green and Co. 18s. net. Reviewed in *Engineering* 120, 758(1925).

ASTON, FRANCIS WILLIAM: **Mass Spectra and Isotopes**; being the 26th Robert Boyle lecture. London, New York: H. Milford, Oxford University. 16 pp.

SHEARCROFT, WALTER FRANCIS FAIRFAX: **The Story of the Atom**. London: E. Benn, Ltd. 79 pp.

Radium emanation. V. F. HESS and E. D. LEMAN. U. S. 1,570,834, Jan. 26. A portion of the gases is removed from Ra emanation, the partially purified emanation is passed to a tube contg. an absorbent to obtain the emanation in a state of substantial purity and the portion of the tube contg. the absorbent is sealed off, so that the remaining portion of the tube contains only substantially pure emanation.

4—ELECTROCHEMISTRY

COLIN G. FINK

Some applications of electric heat in chemical industries. R. M. KEENEY. *Chem. Met. Eng.* 32, 922-5(1925); cf. C. A. 20, 338, 339.—The last instalment of a series dealing with important applications of industrial heating. It covers the *baking industry*, the *manuf. of chemicals and driving paper*. Indications are that the industrial heating load will soon exceed that of the elec. furnace in the U. S. The *glass industry* offers a promising field for investigation for the use of elec. heat. W. H. BOYNTON

Electrical application in the steel industry during the year 1925. J. D. WRIGHT. *Blast Furnace & Steel Plant* 14, 89-91(1926). E. H.

Electric furnace progress in 1925. FRANK HODSON. *Blast Furnace & Steel Plant* 14, 66-71, 108(1926).—Metallurgical applications of the elec. furnace are reviewed. E. H.

Laboratory electric furnaces. ANON. *Elec. World* 87, 179(1926).—Small elec. furnaces have been designed for special lab. heats, ranging in capacity from 500 lbs. (22.7 kg.) down to a ladle or crucible type furnace of 50 lbs. (2.27 kg.). In most of the furnaces the superstructure and roof refractories are so designed that the furnace can be operated on direct or indirect arc circuits. Micrometer cranks are used in hand adjustment of electrodes, while for automatic control winch motors are employed. W. H. BOYNTON

Graphite-tube vacuum electric furnace. ANON. *Engineering* 121, 42-3(1926).—See Partington and Anfilogoff (C. A. 20, 551). A. D. S.

Producing clear fused quartz electrothermally. E. R. BERRY. *Chem. Met. Eng.* 32, 915-6(1925).—B. reviews the discoveries which led up to the production of clear fused quartz. B.'s method consists in fusion of SiO_2 crystals *in vacuo*, permitting most of the bubbles to escape, followed by fusion in N at high pressures to diminish the vol. of the remaining bubbles. Expts. are described comparing glass and quartz thermometers, in which the glass thermometer shows an error of 1.5° on being brought back to 0° after being heated to 510° , while the quartz thermometer reads correctly. A gallium-in-quartz thermometer is described (Boyer, C. A. 20, 538). Held at 1000° for 24 hr. it was not injured, and it appears to bridge the gap between 500° and 1000° satisfactorily. It is not advisable to hold quartz above 1000° for any considerable period. A process of drawing sheet quartz directly from the elec. furnace has been perfected. H. S.

The present situation of the electric melting furnace for non-ferrous metals. M. TAMA. *Z. Metallkunde* 18, 7-15(1926). E. H.

Electrolytic zinc production in America. H. LUNDIN. *Tekn. Tids.* 55 (Kem. afd.), 55-6, 62-4(1925); cf. C. A. 19, 2302. A. R. ROSE

The electrolytic production of heavy metals from fused salts. I. The production of iron. F. SAUERWALD AND G. NEUENDORFF. *Z. Elektrochem.* 31, 643-6(1925).—In the production of Fe, carefully purified oxide, contg. 25.1% FeO and 74.6% Fe_2O_3 , is used as well as ordinary oxide contg. 44.7% Fe^{++} and 23.8% Fe^{+++} . A mixt. of 75% of the first with SiO_2 (98.2%) m. 1220° and is a clear liquid at 1260° . By using the purified oxide, with a current of 25-50 amp., 39.8 g. of Fe are obtained in 30 min., the

cell being kept at a temp. of 1300°. In another cell the anode was C and the cathode Fe, spaced 7 cm. apart; with the purified Fe oxide, 10–13 v., 400–800 amp. being used, 258 g. of Fe were sepd. in 3 hr., the temp. being kept at such a point that the Fe separates in the solid state. By repeating this expt. at a cell temp. of 1700°, 109 g. of liquid Fe are deposited in 2 hrs. at 400–700 amp., 20–50 v. Microscopic examn. showed the Fe to be quite pure with only traces of Si. Photomicrographs are shown. The ordinary type of oxide was treated in this cell at 200–400 amp., 30–40 v., electrode spacing 6 cm. The temp. could not be raised above 1500°, without injury to the lining of the cell. H. STOERTZ

The formation of alkali amalgam by alternating current electrolysis. SVEN BODFORSS. *Z. Elektrochem.* 31, 646–9(1925).—When caustic alkali soln. with Hg electrodes is electrolyzed with a. c., although the av. potential of the electrodes is below that at which alkali amalgams are formed, the potential rises above that momentarily and a small quantity of the amalgam is formed. This diffuses into the Hg and is somewhat protected against oxidation when the current is reversed. The presence of *hydrazine* gives further protection against oxidation during the anodic pulsation. B. avails himself of this fact to prep. *K-amalgam*, using for electrolyte 1 N KOH with varying quantities of hydrazine hydrate or sulfate, 48 cycles a. c., and 0.2 to 0.4 amp. The presence of K in the Hg is demonstrated by measuring its potential against Zn. The potential fall of K-amalgam is plotted with varying amts. of hydrazine, the curves indicating the formation of an intermediate product of K and hydrazine. H. STOERTZ

Refrigeration in the electrolysis of liquor (salt solutions). J. & E. HALL, LTD. *Proc. Fourth Intern. Congress of Refrigeration* 1, 912–7(1924).—Discussion of the advantages of refrigeration in electrolysis of solns., more particularly in the production of electrolytic NaOCl in hot climates, with a description of refrigerated electrolyzers. A. PAPINEAU-COUTURE

Simple method for the preparation of fluorine. P. LEBEAU AND A. DAMIENS. *Compt. rend.* 181, 917–9(1925).—In the method of Argo, *et al.* (*C. A.* 13, 1188) there is considerable loss of HF from the molten bath, resulting in a rise in temp. of the bath and greater danger of attack of the graphite anode and Cu container and of contamination of the F with CF₄. These drawbacks are overcome by using a bath of KF·3HF (instead of KF·HF), m. 56°, and electrolyzing at not over 150°. The anode may be of Fe, or preferably Ni (because of its greater purity, especially as regards C content). The KF·3HF, prepd. by adding the theoretical amt. of HF to KF·HF, is placed in a Cu or Ni container which acts as cathode. The anode is an 8-mm. Ni rod placed vertically through the neck of a bottle-shaped Cu jacket, over which is the F outlet tube, and the bottom and sides of which are perforated to allow circulation of the electrolyte. The F partly adheres to the Cu bottle, forming a film which insulates it from the circuit. Higher yields are obtained than heretofore. A. PAPINEAU-COUTURE

The electrodeposition of metals. I. Theory of the mechanism. PER K. FRÖLICH AND G. L. CLARK. *Z. Elektrochem.* 31, 649–55(1925).—In the first type of polarization phenomena, as with Hg and Cu in simple salt soln., the c.d.-cathode potential curves are smooth, bending slightly, and show only concn. polarization. With the second type, when complex salts are used, the c.d.-potential curves show an increase in the cathode potential in addn. to that due to concn. polarization because of chem. polarization. Previous authors postulate an intermediate colloidal or hydrated phase, particularly in the third case of deposition in the presence of a colloid. The present authors found that concn. polarization simply increased, since convection, diffusion and migration decrease. The Fe group metals are considered. No proof was found for the existence of an intermediate state in electrodeposition and the formation of the deposit is not an independent crystn. process. After giving up its charge, the metal ion immediately takes its place in the space lattice of the crystals already upon the cathode. (With the exception of the case where the metal ion set free serves as the nucleus for a new crystal.) The discharge of ions and the crystn. of the discharged ions are so closely interwoven that they must be considered as 1 process. Considerable evidence is adduced in support of the hydride theory of H overvoltage. The series: Pd, Pt, Ta, Ni, Co, Fe, Zn, Cu, Au, Hg is given in the order of increasing H overvoltage and of decreasing metal overvoltage. Metal overvoltage is the greatest with the metals at which the H overvoltage is the least and vice versa. The greater the tendency of the metal to form hydride, the greater is the resistance which is opposed to its deposition. Alloying metals seems to exert an influence similar to H in resisting the formation of the normal space lattice of a metal. True metal overvoltage is caused by the action of H during the building up of the normal space lattice of a metal, while the discharge process itself is reversible for all metals. II. X-ray investigation of electrolytic

nickel. G. L. CLARK AND PER K. FRÖLICH. *Ibid* 655-8.—Previous work is reviewed. The authors give their findings in the X-ray examn., by 3 methods, of Ni deposited on Pt, Ni and Al from 8 different baths at various c. ds and temps. The av. thickness of Ni deposited was 0.006 in. (0.15 mm.) thick. Ni deposited upon Ni and Pt showed the structure of the base metal plainly. Low c. d. is favorable to the formation of the fibrous structure. Higher temp. is less favorable for the orientation than low and produces larger grains. The p_H of the soln. and the electrode potential have a certain influence which could not be ascertained from the X-ray diagrams. H evolution hindered the uniform arrangement of the grains. The influence of C in the deposit is not clear; although gelatin disturbs deposition it still assists the uniform arrangement of the Ni crystals. In several cases another orientation normal to the rolled surface of the electrode was observed. Under certain conditions the deposit has the tendency to reproduce the underlying structure. Greasing the electrode, cleansing and preliminary prepn., whether the base metal is cold rolled or cast, influence the structure of the deposit. Ni is deposited in completely unoriented arrangement upon Al because of the oxide layer. The nature of the deposit is detd. by the base metal as well as by the conditions of electrolysis. The X-ray results indicate that the discharge of Ni ions and the deposition of metal are simultaneous processes and that there is no intermediate state of a colloidal nature. A proof of hydride formation for the purpose of explaining overvoltage could not be obtained because of the instability of the solid soln. of hydride in metal after removing the electrode from the bath. G. DURPERNELL

The electrolytic deposition of nickel. R. SAXON. *Chem. News* 132, 4(1926).—Electrolyzing a soln. contg. NiSO_4 400 parts/l., K_2SO_4 100 parts/l. for 5 hrs with the "lighting" current through 3 lamps for resistance gives 21% H_2SO_4 , and an abundant deposit of Ni hydrate followed by a deposit of the metal G. DURPERNELL

Standard electrical cells. MARION EPPLEY. *J. Franklin Inst.* 201, 17-46(1926).—The principle cells used as practical standards for comparison of e. m. f. are discussed, as also the conditions which various investigators believe should be fulfilled by a satisfactory standard. A. D. S.

The seat of the electromotive force in the galvanic cell. J. A. V. BUTLER. *Chemistry & Industry* 45, 3-5(1926); cf. *C. A.* 19, 611.—The relation of galvanic action to the *Pellier effect* is indicated and the relation to the existence of large metal contact p. ds. is discussed. Metal contact p. d. is of the same order of magnitude as the e. m. f. of the cell. The metal junction contributes largely to the e. m. f. Energy changes at the metal electrodes are considerably less in magnitude than at the metal junctions. Metal ions in a cryst. lattice are vibrating about their equil. positions in accordance with their thermal energy. A means of calcg. the no. of ions in the metal surface which will acquire sufficient energy in their thermal agitation in a given time to overcome the attractive force of lattice and escape into the soln. is pointed out. In this discussion free metals, ions and electrons are regarded as normal constituents of a metal. The Nernst theory is shown to give a satisfactory representation of the process at the metal electrodes. Unsolved problems of the galvanic cell concern chiefly the relation between free energy and total energy. W. H. BOYNTON

Electrolytic condenser. A. SOULIER. *Bull. soc. franc. electriciens* No. 46(1925); *Elec. World* 86, 1166.—An arrangement consisting of certain metals used as electrodes in an electrolyte and below a voltage which is sufficient to cause electrolytic action exhibits the characteristics of a condenser. This peculiarity is ascribed to a film of oxide or gas which forms on the electrodes and has a life of about 1 day. Accordingly the condenser has to be charged daily. It is applicable to power factor correction, motor starting, etc. Al electrodes were used in making a com. electrolytic condenser with a crit. potential of 350 v. per cell. A. D. SPILLMAN

Electrical breakdown of air. F. FERNIE. *Electrician* 96, 59-65(1926).—A theory is discussed of energy distance from 2 points of view. "Energy distance" as applied to breakdown of a gas seems to mean the distance which an ion, in an elec. field, requires to accelerate sufficiently to acquire a velocity which will enable it to create new ions by collision with gas mols. The ionic theory is shown to be unsatisfactory and an alternative theory derived which is based on the assumption that ions in the elec. field are negative, i. e. electrons. Exptl. results on needles and spheres are shown. The d. of electrons depends on the voltage gradient at the surface of the electrode. The flux of electrons will vary as the potential gradient at the surfaces of the spheres, and as the surface areas of the spheres. As the radius of the sphere increases the flux d. (gradient) necessary to produce the breakdown decreases. One objection to the energy distance theory is that it fails to connect the tube theory with the open tube theory.

The theory developed is for high elec. pressure and atm. air pressure. Application is shown to concentric electrodes. The breakdown between concentric electrodes with solid insulation depends on the gradient at the cylinder surface. The theory explains how the crit. gradient may be at the surface of the cylinder and yet the actual breakdown begin at the surface of the inner electrode. The theory has crudities but may serve to suggest further exptl. work.

W. H. BOYNTON

Conductivity tests of wires and cables. H. M. FRIEND. *Elec. World* 87, 151-2 (1926).—By measuring the resistance and the temp. of the cable, and by reference to tables showing the resistance in ohms of pure Cu, for solid conductor, or for soft annealed Cu of 1 circular mil cross-section, if stranded, a value is secured which is sufficiently accurate for com. tests. By this means the theoretical value for pure Cu is obtained. By dividing this value by that secured by the bridge on the cable being tested, the % cond. is obtained. The derivation of the tables for solid and for stranded conductors is shown. A slight inaccuracy enters, because of the fact that the temp. coeff. of Cu varies with the cond., results being higher at temps. above 20° and lower at lower temps.

W. H. BOYNTON

Hydrogen for hydrogenation of oils (KNOWLES) 18. Cleaning steel sheets (Brit. pat. 236,241) 9.

Incandescent lamps. A. DE GRAAFF and D. LELY, JR. U. S. 1,560,981, Nov. 10 P₄O, BaN₂ or a similar non-hygroscopic substance, adapted when heated to a certain temp. to be decomposed with consequent formation of a hygroscopic substance, is placed in a lamp enclosure which is then exhausted and sealed at a temp. below that at which the added substance decomposes. The substance is then subjected to a decomposing temp. to form a compd. within the lamp which serves to eliminate traces of H₂O vapor.

Electric battery of the Leclanché type. B. NEWTH and O. NEWTH Brit. 236,531, July 7, 1924.

Dry batteries. G. B. ELLIS. Brit. 235,302, March 11, 1924. Zn battery cups are made by extrusion at a temp. of 150°, with soft blanks (preferably under 23 scleroscopic hardness) contg. less than 0.6% Pb and 0.5% Cd, formed free from grain, as produced by pack rolling or by transverse rolling of a 1 in. ingot down to 0.15 in.

Gas vents for electric batteries. THREE STAR ACCUMULATORS, LTD. and C. KENDALL. Brit. 236,398, Aug. 1, 1924. Structural features.

Storage batteries. W. B. STONE. Brit. 234,954, April 14, 1924. Structural features.

Storage batteries. F. J. BROWN. Brit. 234,921, March 12, 1924. Separators for storage batteries comprise woven wood strips and a porous diaphragm of wood, perforated ebonite, celluloid or the like.

Storage battery. W. H. SIMMS. Brit. 236,316, April 17, 1924. Structural features

Storage battery. R. A. HOFFMAN. U. S. 1,571,333, Feb. 2.

Storage battery. J. C. BALDWIN. U. S. 1,570,722, Jan. 26. Structural features.

Storage battery. SOC. ANON. LE CARBONE. Brit. 235,530, June 14, 1924. An active material for Pb batteries comprises a mixt. of 60% of powd. Pb or oxide of Pb and a porous conductor in small grains (e. g., charcoal of different finenesses mixed together) which has a large gas-absorbing capacity. The active material may be impregnated with 10-15% Bé. H₂SO₄. Various structural features also are specified.

Composition of lead and mercury. A. MILLER. U. S. 1,570,763, Jan. 26. A compn. adapted for making storage battery plates comprises Pb 90 and Hg 10%.

Electric resistance furnace. L. SATCHWELL. Brit. 235,921, Oct. 21, 1924.

Electric resistance muffle furnace. L. W. WILD, E. P. BARFIELD and J. D. COLEMAN. Brit. 235,993, April 24, 1924.

Electric resistance furnace for annealing. AKT.-GES. BROWN, ROVERI, ET CIE. Brit. 235,490, Aug. 13, 1924.

Electrolytic cell for deposition of metals such as iron, nickel and cobalt. T. W. S. HUTCHINS. Brit. 235,123 and 235,272, March 4, 1924. Special app. is described adapted for use in the process of Brit. 197,066 (C. A. 17, 3646).

Selenium cells. R. HART. Brit. 236,266, March 31, 1924. Details are given of sublimation of Se for deposition on a grid in cryst. form and prep. cells for photoelec. use.

Auxiliary cadmium electrode, etc., for testing secondary batteries. A. W. RAYWORTH. Brit. 236,284, April 3, 1924.

Furnace electrodes. INTERNATIONAL GENERAL ELECTRIC CO., INC. Brit. 235,596, June 14, 1924. Sectional electrodes are formed with a C core and a shrunk-on metal tube over the core. For a steel furnace, an Fe tube 4-10 mm. thick is shrunk on a C core 250 mm. in diam.

Electrodes for electric furnaces. NORSKE AKTIESELSKAP FOR ELEKTROKEMISK INDUSTRI NORSK INDUSTRI-HYPOTEKBANK. Brit. 235,894, Jan. 17, 1924. Structural features of electrodes, which, if used for Al manuf., may have a mantle and ribs of Al.

Electrodeposition of cadmium and nickel. UDYLITE PROCESS CO. Brit. 235,159, June 5, 1924. See U. S. 1,537,047 (C. A. 19, 1824).

Tungsten. NAAMLooZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 236,152, June 27, 1924. W powder is deposited by electrolysis of tungstates, e. g., Li tungstate or a eutectic mixt. of Li and K tungstates m. 500° or a mixt. of Na and K tungstates m. 650°. An excess of WO_3 may cause the pptn. of "W bronzes" and to prevent this alkali peroxides or other alkali oxides or hydroxides may be added. A SiO_2 crucible and W electrodes may be used for the electrolysis. The temp. should be above 900°. Brit. 236,153 specifies electroplating with W, similarly.

Apparatus for electric precipitation of suspended particles from gases. SIEMENS-SCHUCKERTWERKE GES. Brit. 235,582, June 12, 1924. Pptn. electrodes are formed of asbestos slate, asbestos cement, magnesia, $MgCl_2$, asbestos mixt. or of a semi-cond. binder such as cement or gypsum and a fibrous material such as asbestos, slag wool, hairs or wood fibers. Graphite, C powder, metal powders or metal oxides may be added to increase the cond.

Electroplating. B. BART. U. S. 1,570,819, Jan. 25. A series of anodes is used and the article plated is moved through the bath so as to expose it repeatedly to elec action of various intensities from the different anodes.

Electrolytic rectifier. FANSTEEL PRODUCTS CO., INC. Brit. 235,658, March 22, 1924. A Ta electrode and an electrolyte of 1.2 sp. gr. H_2SO_4 are used, the other electrode being Pb or C. The temp. of the cell is kept low.

5--PHOTOGRAPHY

C. E. K. MEES

Fading of the latent image. P. STRAUSS. *Das Atelier* 32, 76-7(1925); cf. C. A. 19, 445.—The latent image of an exposed film is very stable if the film is stored in a dry state and kept dry throughout the period of storage. It is reduced if the film is moist or is allowed to take up moisture during packing. The latent image is often entirely destroyed by vapors of various acids, such as hydrochloric, sulfurous and carbonic. Reduction of the latent image proceeds in a manner similar to persulfate reduction. The rate of fading is greatest in areas which received the most exposure. J. F. R.

Toning sulfided silver prints with silver. A. STEIGMANN. *Das Atelier* 32, 72-3 (1925).—Some of the Ag_2S in a sulfide-toned print is very finely divided. The particles can act as nuclei for the pptn. of Ag from Lumière's Ag intensifier. In practice a sulfided print is treated with the intensifier until the tone changes from brown to chocolate brown and then is washed and dried. The image contains finely divided Ag which can be bleached and toned with Au or Se. The process can be modified by the use of a mixt. of Lumière's Hg and Ag intensifiers. This soln. is recommended for prints made on $AgCl$ papers. J. F. ROSS

Mercury printing. A. STEIGMANN. *Das Atelier* 32, 65-8(1925); cf. C. A. 19, 2306, 3436.—A method is described for making prints with Hg salts which give results similar to the dichromated gum process. Hg printing has the advantage in that it is possible to make 2 successive printings, one for the shadows and one for the halftones. The process consists in first coating the paper with a soln. for printing shadow detail, after printing and developing it is coated with a second soln. which is suitable for printing the halftones. The paper is then given a second exposure and development. The sensitizing soln. is essentially a mixt. of 1 part of 4-6% soln. of $HgCl_2$ and 2 parts of a 4% $(COOH)_2$ soln. The light-sensitiveness of this soln. is increased by addn. of increasing amts. of NH_4OH . The soln. used for shadow printing consists of 5 cc. of the sensitizing soln. and 3 drops of NH_4OH . For printing the halftones a mixt. of 5 cc. of sensitizing soln., 1 drop of $FeCl_3$ and 5 drops of NH_4Cl is used. Development and fixation are carried out immediately after exposure, without previous washing, by means of Lumière's Hg intensifier in daylight. The shadows develop in 15-20 min. and the halftones in about 10 min. The following developer is recommended: soln. A: 1000 cc. H_2O , 180 g. Na_2SO_3 and 75 cc. of a 5% soln. of $HgCl_2$; soln. B: 1000 cc.

H₂O, 20 g. Na₂SO₃, and 20 g. *p*-phenylenediamine (or 10 g. metol). For use 50 parts of soln. A are mixed with 5 parts of soln. B. J. F. ROSS

Enlarged positives or negatives direct. R. READE. *Amat. Phot.* **60**, 694(1925).—The method recommended consists in replacing the developed but unfixed Ag image by a U image, using this image as a negative and printing through this on to the unaltered emulsion beneath. The U image is removed by the alkali in the second developer, thus leaving a positive image. Working formulas are given. J. I. C.

The baryta coating of photographic papers. I. T. BENTZEN. *Phot. Ind.* **1925**, 783-5; cf. *C. A.* **19**, 1994.—Specific instructions are given for prepg. a baryta coating for photographic paper, with a method of testing the finished product. A typical coating contains 12 kg. of BaSO₄ (56%), 550 g. medium hard gelatin, 6500 cc. distd H₂O, 100 cc. 10% citric acid, 500 cc. denatured alc., 350 cc. 10% Cr₂(SO₄)₃ soln. mixed with 67 cc. glycerol and 100 cc. milk. M. L. DUNDON

The desensitizing action of mercuric salts. G. KÖGEL AND A. STEIGMANN. *Phot. Ind.* **1925**, 70(1925).—Hg salts desensitize AgBr gelatin emulsions strongly, but cannot be used as desensitizers in development because the effect is not sufficiently permanent. Negatives bleached with HgCl₂, washed and pressed against a Ag halide paper cause a selective desensitizing, so that when the paper is given a flash exposure and developed, a positive copy from the negative is produced. HgI also causes selective desensitizing but a negative, instead of a positive image results. M. L. DUNDON

A method for the intensification of a photographic image by mordanting dyes on the silver. A. AND L. LUMIÈRE, AND A. SEYEWETZ. *Rev. franç. phot.* **6**, 1-2(1926).—The image is bleached for 3-4 min. in: CuSO₄ 40, K₂C₆H₅O₇ H₂O 60, AcOH (glacial) 30, NH₄CNS, dissolved separately 20 g., water to make 1 l. After washing, the negative is immersed for 15 min. in a mixt. of: methylene blue, 1% 287 cc., Rhodamine D, 1% 333 cc., Phosphine M, extra concn., 1% 380 cc., washed in running H₂O for several min. and dried. O. W. COOK

Photographic emulsions. KODAK, LTD. Brit. 235,209, June 6, 1924. Increase of the sensitiveness of photographic emulsions formed of various colloidal substances is effected by incorporating in them substances such as are extd. from gelatin by standing for several days with H₂O in moderate excess over the quantity which is absorbed by the gelatin. PhOH may be added to prevent injurious bacterial action and the extn. may be effected at a temp. of about 30°. Brit. 235,210 specifies addn. to colloidal photographic emulsions of sensitizing material extd. from org. tissues such as hides, bones, cereal, grains and leguminous plant seeds, which may be obtained as by products of the treatment of hides or bones as in gelatin manuf., from deliming solns., etc. Numerous examples and details of procedure are given. Brit. 235,211 specifies the use, as sensitizing agents, of "any compd. contg. a bivalent atom of the S group joined by a double bond to a single non-metal atom to which at least 1 other group of atoms is attached." Even less than 10 grains of thiosinamine may be used with 130 lbs. of dry ingredients of the emulsion. Among the compds. which may be used are carbamide carbimides and their "sub-series" contg. alkyl, aryl, acyl, hydroxy, aryl-oxo, or other groups, allyl isothiocyanate, phenyl isothiocyanate, phenylthiourea, thiocarbanilide, Na₂S₂O₃, di-*o*-tolyl thiourca, allyl isoselenocyanate, thioacetamide, thioformamide, thioarbituric acid, telluro-mustard oils (allyl isotellurocyanate), K tellurocyanide and allyl tellurourea. Gelatins which are substantially inert may be rendered active by use of these compns.

Photographic pigmentary printing paper. J. SURY. U. S. 1,571,103, Jan. 26 See Brit. 216,860 (*C. A.* **19**, 18).

Waterproofing motion-picture films, etc. V. A. STEWART. U. S. 1,569,151, Jan. 12. Exposed and developed photographic film is subjected to the action of vapors which will render the colloid substances on the film insol. For this operation a film is wound in a roll with an intervening layer of open-textured fabric which permits penetration of the vapors between the convolutions of the roll.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

The stereochemical configuration of cobalt complexes with anomalous coördination numbers. KICHIMATSU MATSUNO. *J. Coll. Sci. Imp. Univ. Tokyo* **45**, No 8, 1-16(1925). (In English).—Co complex salts having coördination numbers greater than 6 are as follows: [Co(NH₃)₅C₂O₄]X, [Co(NH₃)₅CO₃]X, [Co(NH₃)₅SO₄]X, [Co(NH₃)₅-

SO_3X M discusses various theories of the configuration of these salts. According to Werner's hypothesis, when salts have coordination numbers greater than 6, if 8 atoms or atom groups combine directly with the central atom, they would take up the position of the 8 corners of a cube. This structure of a complex radical admits of 2 pairs of isomers each in optical antipodes. Werner's theory is tested out as follows. As the number of ions of cobaltamines is proportional to the cond. of the salts, the detn. of the mol. conductivities was carried out, in Ostwald's app. The results are tabulated. The mol. cond. of *pentammine-oxalato-cobaltic sulfate* is given as 86.78 at a diln. of 200, while that of *tetrammine-carbonatocobaltic sulfate* at the same diln. is 87.18, practically equal, which is evidence of the substitutional reaction: $[\text{Co}(\text{NH}_3)_5\text{C}_2\text{O}_4\cdot\text{SO}_4\cdot\text{C}_2\text{O}_4\cdot(\text{NH}_3)_3\text{Co}] + 2\text{H}_2\text{O} \longrightarrow [\text{Co}(\text{NH}_3)_5\text{C}_2\text{O}_4\text{H}_2\text{O}]_2\text{SO}_4$. The mol. conductivities of *pentammine-carbonato-cobaltic nitrate, iodide and bromide* at a diln. of 1600 are, resp., 221.3, 226.8 and 225.9, all greater than that of *tetrammine-oxalato-cobaltic chloride*, 136.5. These numbers correspond to the cond. of 2 ions rather than 3, therefore the substitution takes place thus: $[\text{Co}(\text{NH}_3)_5\text{CO}_3\text{X}] + \text{H}_2\text{O} \longrightarrow [\text{Co}(\text{NH}_3)_5\text{CO}_3\text{H}_2\text{O}]\text{X}$. From these results and data on *pentammine-sulfato-* and *sulfito-cobaltic salts*, the following type equation for the substitution is written: $[\text{Co}(\text{NH}_3)_5\text{X}''\text{X}'] + \text{H}_2\text{O} \longrightarrow [\text{Co}(\text{NH}_3)_5\text{X}''\text{H}_2\text{O}]\text{X}'$. The resolution of $[\text{Co}(\text{NH}_3)_5\text{C}_2\text{O}_4\text{SO}_4\text{H}]\text{H}_2\text{O}$ was effected by treatment with $\text{BaC}_4\text{H}_4\text{O}_6$, filtering out BaSO_4 , crystallizing the tartaric acid salts and eliminating the tartaric acid radical by adding BaCl_2 . *d-* and *l-Pentammine-oxalato-cobaltic chloride* were produced and gave $[\alpha]_{26}^{20}$, $+16^\circ$ and -16° . The resolution of $[\text{Co}(\text{NH}_3)_5\text{SO}_4\text{SO}_4\text{H}]\text{H}_2\text{O}$ also yielded 2 optically active isomers. The *absorption spectra* of these complexes were studied; the curves obtained from $[\text{Co}(\text{NH}_3)_5\text{C}_2\text{O}_4\text{X}]$ and $[\text{Co}(\text{NH}_3)_5\text{CO}_3\text{X}]$ are similar. The curves of $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{C}_2\text{O}_4$ and $[\text{Co}(\text{NH}_3)_5\text{C}_2\text{O}_4]\text{Cl}$ are of entirely different types, from which it is evident that the oxalato group of the second is attached to the central Co and the acid radical outside the first sphere of complex has no effect upon the light absorption. The absorption curves show further that the SO_4 radical coordinates symmetrically with Co while the SO_3 radical does so asymmetrically. All these facts are considered a strong verification of the theory that the configuration of these salts is cubic.

H. STÖRTZ

Oxidation of metallic iron by a current of air in presence of iron salts. PETER FIREMAN. *Ind. Eng. Chem.* **18**, 262-3(1926).—Some observations on the conversion of Fe into a hydrated ferric oxide show that it is expedited by blowing air through a bundle of metal strips suspended in a soln. of ferrous salt. There are marked changes in color during the transformation, particularly when a sulfate soln. has been used, and the reddish brown oxide is shown to be a monohydrate of ferric oxide. W H B

Formation and decomposition of the sodium complexes of platinum and iridium chlorides. LOTHAR WÖHLER AND PH. BALZ. *Z. anorg. allgem. Chem.* **149**, 353-8 (1925).—The disson. of the Na complexes with increasing temp. may be followed by detg. the pressure of free Cl_2 . In the disson. of the Na complex of PtCl_4 and PtCl_3 , the Cl pressure changes continuously with the Cl content of the residue; at a Cl pressure of 1 atm., the Cl content of the residue varies with the temp. Therefore, the dissociating complex forms a bivalent soln. with the disson. products. This behavior is the same as that of the metals, chlorinated in the presence of NaCl . The curves for these relationships show no break. By chlorination of the metals in the presence of NaCl or by disson. of the complexes the new *compds.* PtCl° , PtCl_3 and IrCl and IrCl_2 are obtained. The Na complex of PtCl_4 forms below 660° ; above 800° only the complex of the bivalent metal exists. The complex of IrCl_4 forms up to 570° , but over 800° only the complex of IrCl_3 exists in the melt. IrCl can be titrated in the presence of IrCl_3 in soln. of the complexes by means of $\text{Na}_2\text{S}_2\text{O}_8$; the end point is conveniently detd. electrometrically.

ROSALIE M. COBB

The complex compounds of the ruthenium chlorides. RAYMOND CHARONNAT. *Compt. rend.* **181**, 866-7(1925); cf. *C. A.* **19**, 2176.—C. believes that the coordination no. of Ru is 6 in the K chlororuthenites. He has prep'd. $[\text{RuCl}_6]\text{K}_3$ from $[\text{RuCl}_5(\text{OH})_2]\text{K}_2$ with HCl gas: orthorhombic plates, with 1 mol. of H_2O of crystn. The hitherto unknown $[\text{RuCl}_6]\text{Na}_3$ has been prep'd. by reduction with alc. of a dil. acid soln. of the brown chloride of Ru (Howe's method). If the addn. of alkali chloride is omitted there is obtained by concn. *in vacuo* $\text{RuCl}_3\cdot\text{HCl}\cdot 2\text{H}_2\text{O}$. Ru presents, in all, 5 chloro salts (I) $[\text{RuCl}_5(\text{OH})_2]\text{K}_2$, (II) $[\text{RuCl}_5(\text{OH})_2](\text{NH}_4)_2$, (III) $[\text{RuCl}_6]\text{K}_3\cdot\text{H}_2\text{O}$, (IV) $[\text{RuCl}_6](\text{NH}_4)_3\cdot\text{H}_2\text{O}$, (V) $[\text{RuCl}_6]\text{Na}_3\cdot 12\text{H}_2\text{O}$ analogous to the corresponding Rh and Ir salts.

M. O. LAMAR

Double sulfates and chromates of guanidine with the bivalent and trivalent metals. G. CANNERI. *Gazz. chim. ital.* **55**, 611-5(1925).—The double sulfates of guanidine $(\text{CN}_2\text{H}_5)_2\cdot\text{H}_2\text{SO}_4$ $\text{R}''\text{SO}_4\cdot 6\text{H}_2\text{O}$ (in which $\text{R}'' = \text{Mg}, \text{Zn}, \text{Cd}, \text{Fe}, \text{Ni}, \text{Co}, \text{Mn}$,

Cu and UO_2) were obtained by crystg. at room temp. solns. obtained by dissolving the component salts in equimol. amts. in the minimum amt. of H_2O . With the Fe salt it was necessary to protect the soln. against oxidation. Mixed crystals contg. 19.2% of the Zn and 80.8% of the Ni double salts were obtained as bright green crystals on evapg. mixts. of solns. of the 2 salts. Equimol. amts. of the component salts in soln. when mixed and evapd. spontaneously gave *magnesium guanidine double chromate*, $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{CrO}_4 \cdot \text{MgCrO}_4 \cdot 6\text{H}_2\text{O}$, isomorphous with the corresponding sulfate. The *chromium guanidine alum*, $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$, and *ferrous guanidine alum* were obtained similarly. Solns. of $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{SO}_4$, $\text{Cr}(\text{SO}_4)_3$ and $\text{Al}_2(\text{SO}_4)_3$ mixed and evapd. spontaneously sepd. mixed crystals contg. 21.6% $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{SO}_4$, $\text{Cr}(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$ and 78.4% $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$. A soln. of $\text{V}_2(\text{SO}_4)_3$ was prepd. by a method described in detail and when $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{SO}_4$ was added sepd. on spontaneous evapn. *vanadium guanidine alum*, $(\text{CN}_3\text{H}_5)_2 \cdot \text{H}_2\text{SO}_4 \cdot \text{V}_2(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$.

E. J. WITZEMANN

The double sulfates of the rare earth metals and of the alkaline metals. IV. Double sulfates of neodymium and sodium. F. ZAMBONINI AND G. CAROBBI. *Atti accad. Lincei* [6], 2, 374-7 (1925).—In continuing this study (Z. et al., C. A. 19, 2309, 2920; 20, 346) the system $\text{Nd}_2(\text{SO}_4)_3$ - Na_2SO_4 - H_2O was studied at 25°. Four compds. were obtained as follows: $\text{Nd}_2(\text{SO}_4)_3 \cdot \text{Na}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ (I); $4\text{Nd}_2(\text{SO}_4)_3 \cdot 5\text{Na}_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$ (II); $3\text{Nd}_2(\text{SO}_4)_3 \cdot 4\text{Na}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ (III); $2\text{Nd}_2(\text{SO}_4)_3 \cdot 3\text{Na}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$ (IV). These substances were all obtained as fine microcryst. pale rose-violet powders. I is stable in contact with solns. contg. 0.0-0.3% $\text{Nd}_2(\text{SO}_4)_3$ and 0.5-5% Na_2SO_4 . The field of existence of II is more limited, i. e., in solns. contg. 5.5-9% Na_2SO_4 . For III the compn. of the solu. may vary from 14 to 9% Na_2SO_4 and for IV from 15 to 17%. In the case of $\text{La}_2(\text{SO}_4)_3$ only one compd. $\text{La}_2(\text{SO}_4)_3 \cdot \text{Na}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ is formed. E. J. WITZEMANN

Chromates of the metals of the cerium group. F. ZAMBONINI AND G. CAROBBI. *Rend. accad. sci. Napoli* [iii], 31, 17-24 (1925). The anhyd. chromates of La, Pr and Nd were obtained by heating intimate mixts. of the chlorides of these metals with K_2CrO_4 to temps. above 600°. A similar attempt to prep. anhyd. Ce chromate at 1000° resulted in the formation of a mixt. of Cr_2O_3 and CeO_2 . In addn. to the octahydrates of the above salts prepd. by Britton (C. A. 19, 19), the following new hydrates were prepd. by pptn. methods from cold solns. $\text{La}_2(\text{CrO}_4)_3 \cdot \text{H}_2\text{O}$, $\text{Nd}_2(\text{CrO}_4)_3 \cdot 10\text{H}_2\text{O}$, $\text{Pr}_2(\text{CrO}_4)_3 \cdot 10\text{H}_2\text{O}$, $\text{Sm}_2(\text{CrO}_4)_3 \cdot 9\text{H}_2\text{O}$. B. C. A.

Inorganic magnesyl derivatives. QUINTINO MINGOIA. *Gazz. chim. ital.* 55, 713-21 (1925).—Recently Oddo and Calderaro (C. A. 17, 2264) began the study of NH_2MgX obtained by passing NH_3 into an Et_2O soln. of EtMgI . This 1st example of an inorg. magnesyl deriv. used in org. synthesis suggested the prepn. of others to be used in both org. and inorg. synthesis. The work is to be extended in various directions. In this paper results obtained with HSMgX are described. EtMgBr was obtained as usual. A stream of pure dry H_2S was bubbled through the Et_2O soln. for 0.5 hr. in the cold and then 0.5 hr. with warming. A white ppt. sepd. and C_2H_6 was evolved. The gas evolved was passed through 10% NaOH in order to measure the C_2H_6 produced, and it was found that a mol. of H_2S liberates 1 mol. C_2H_6 . In H_2O *magnesyl sulfhydrate* (I) decomps. thus: $\text{BrMgSH} + \text{H}_2\text{O} \rightarrow \text{H}_2\text{S} + \text{MgBr(OH)}$. I in Et_2O reacts with quinoline giving the addition compd. $(\text{C}_9\text{H}_7\text{N})_2 \cdot \text{SHMgBr}$, which is decompd. by H_2O giving quinoline, H_2S and Mg(OH)_2 . The soln. of I treated with BzCl in Et_2O gives α -thiobenzoic acid. With AcCl , however, I reacts giving Ac_2S and not AcSH . An Et_2O soln. of EtOCOCl with I gives $(\text{Et}_2\text{OCO})_2\text{S}$ instead of EtOCOSH as was expected. With alkyl iodides I reacts giving the corresponding mercaptans. I reacts with AcH in Et_2O , giving a white ppt. from which trithioacetaldehyde, $(\text{CH}_3\text{CHS})_3$, m. 45-6°, was isolated. The primary product is MeCH(SH)OMgBr , which was isolated as the quinoline addition product, $\text{C}_{20}\text{H}_{14}\text{N}_2\text{MgOBr}$. I with isovaleraldehyde gives thioisovaleraldehyde, b. 114-5°.

E. J. WITZEMANN

Mixed basic silver-copper salts. G. MALQUORI. *Atti accad. Lincei* [vi], 1, 392-6 (1925).—Investigation of the system Cu(OH)_2 - AgNO_3 - H_2O at 20° indicates the existence of only 1 basic salt, $3\text{Cu(OH)}_2 \cdot 2\text{AgNO}_3 \cdot 3\text{H}_2\text{O}$, which is decomposed by H_2O but is stable in presence of AgNO_3 solns. having concns. not less than 0.78%. B. C. A.

Complex formation in lead nitrate solutions. II. The quaternary system: potassium nitrate-lead nitrate-barium nitrate-water. SAMUEL GLASTONE AND E. J. RIGGS. *J. Chem. Soc.* 127, 2846-54 (1925); cf. C. A. 17, 3844.—The ternary systems KNO_3 - $\text{Ba(NO}_3)_2$ - H_2O and $\text{Pb(NO}_3)_2$ - $\text{Ba(NO}_3)_2$ - H_2O were investigated at 25° and 50°. The system KNO_3 - $\text{Pb(NO}_3)_2$ - H_2O has previously been investigated (C. A. 17, 3844). Finally the quaternary system was studied at 25° and 50°. There is some evidence that a double salt $2\text{KNO}_3 \cdot \text{Pb(NO}_3)_2$, which has no sep. stable existence at room temp.,

exists in soln. and seps. as a mixed crystal with the known double salt $2\text{KNO}_3 \cdot \text{Ba}(\text{NO}_3)_2$.

The solid hydrides of arsenic, antimony and bismuth. R. J. WEEKS AND J. G. F. DRUCE. *Rec. trav. chim.* **44**, 970-4 (1925).—The solid hydride of As (As_2H_2) was found by Janovsky (*Ber.* **6**, 216 (1874)) and Reckleben and Scheiber (*C. A.* **5**, 2227) and Thoms and Hess (*C. A.* **15**, 1471) prepd. it by other methods. Moser and Bruhl (*C. A.* **19**, 20) obtained As_2H_2 by passing AsH_3 into a soln. of SnCl_2 in HCl . W. and D. confirmed this but could not obtain the corresponding compds. of Sb and Bi. W. and D. (*C. A.* **19**, 2310) obtained Sb_2H_2 but have now prepd. it thus: $2\text{SbCl}_3 + 8\text{H} \rightarrow \text{Sb}_2\text{H}_2 + 6\text{HCl}$ ($\text{Zn} + \text{H}_2\text{SO}_4 + \text{SbCl}_3$ in H_2O give Sb_2H_2 as a gray insol. ppt.). Sb_2H_2 is sol. in HNO_3 and when heated to redness reacts thus: $3\text{Sb}_2\text{H}_2 \rightarrow 4\text{Sb} + 2\text{SbH}_3$. BiH_3 was prepd. by Paneth and Winternitz (*C. A.* **13**, 1430, 1431) but Bi_2H_2 was unknown. BiCl_3 treated with $\text{Zn} + \text{HCl}$ gave Bi_2H_2 as a gray ppt.; decomp. when heated *in vacuo*, giving $\text{H} + \text{Bi}$. Sb_2H_2 and As_2H_2 heated *in vacuo* give $\text{H} +$ the metal and some SbH_3 and AsH_3 . If the hydrides are heated in a current of H and the gas is passed through AgNO_3 soln., Ag_3Bi , Ag_3Sb and Ag_3As , resp., are pptd. Heated in air As_2H_2 decomp. at about 45° , Sb_2H_2 at about 170° and Bi_2H_2 at a higher temp. E. J. WITZEMANN

Lead dihydride and lead tetrahydride. E. J. WEEKS. *J. Chem. Soc.* **127**, 2815-6 (1925).—To a soln. of alkali plumbite, pure Al was added. The gray ppt., lead dihydride, was washed with KOH soln. and water, then filtered and dried over H_2SO_4 in an atm. of H . The reaction follows the equation: $2\text{KHPbO}_2 + 2\text{Al} \rightarrow 2\text{KAlO}_2 + \text{Pb}_2\text{H}_2$. To obtain the tetrahydride, the dihydride was heated in a silica tube in an atm. of H , and the issuing gas deposited Pb in a heated tube. It is concluded that the dihydride was reduced according to the equation: $\text{Pb}_2\text{H}_2 + 3\text{H}_2 \rightarrow 2\text{PbH}_4$.

R. J. HAVIGHURST

The constitution of chloride of lime. BERNHARD NEUMANN AND FREDERICK HAUCK. *Z. Electrochem.* **32**, 18-31 (1926).—All previous attempts to det. the constitution of chloride of lime have failed on account of the impurities in the materials used. In Odling's formula, ClCaOCl , the ratio of OCl to Cl is equal to 1. In pure, fresh chloride of lime there is never any free Cl . The ratio of the chlorinated lime to the unchlorinated portion is a practically const. ratio of 3 to 1. In the sunlight, an intramolecular change takes place according to the equation: $6\text{CaOCl}_2 \rightleftharpoons 5\text{CaCl}_2 + \text{Ca}(\text{ClO})_2$. If freshly prepd. chloride of lime is completely freed from adhering Cl_2 with dry N_2 , air or CO a chloride of lime is obtained with an always reproducible Cl_2 content of 39.0%, which is the highest attainable amt. The ratio of the chlorinated lime to the unchlorinated is always found to be 3:1. Hence, the chloride of lime must exist as a basic salt, $3\text{ClCaOCl} \cdot \text{CaO}$. The optimum chlorination is reached when the hydrated lime contains 3.75% excess H_2O . Moist CO_2 reacts with chloride of lime to form CaCl_2 . It can be shown that the existence of CaCO_3 in the chloride of lime is sufficient to cause the formation of CaCl_2 and to cause the complete transformation of the bleaching Cl_2 into CaCl_2 . It is not possible to chlorinate all the hydrated lime even if the chlorination is carried out under pressure. Some chlorate and chlorite are formed. By heating chloride of lime in the presence of air to around 60° , the formation of chlorate is started, the rate of formation being most rapid between 70° and 80° ; above 85° , decomposition occurs. By chlorination, in the absence of air at 65° to 70° , increasing amounts of chloride and chlorate are formed, which are always obtained in the ratio of 5 to 1. This is evidence that these products originate only through the intramolecular change $6\text{CaOCl}_2 = 5\text{CaCl}_2 + \text{Ca}(\text{ClO})_2$. Odling's formula is proved by heating pure chloride of lime, in the absence of air, to 70 - 80° , from which there is obtained a complete transformation into CaCl_2 and $\text{Ca}(\text{ClO})_2$ and in the ratio of 5 to 1. The formula for pure chloride of lime is concluded to be $3\text{ClCaOCl} \cdot \text{CaO} \cdot 6\text{H}_2\text{O}$.

J. H. PERRY

The preparation of beryllium. ALFRED STOCK, PAUL PRAETORIUS AND OTTO PRIESS. *Ber.* **58**, 1571-80 (1925).—Previous efforts to obtain Be in a pure condition by electrolytic methods were unsuccessful. The authors' method is based upon the electrolysis of Be salts at such a temp. that the metal will sep. in a liquid, and therefore compact, form. Crude oxide is used as a raw material. Digest 100 g. under a reflux condenser with 0.75 l. concd. HCl . Evap. the soln. in a porcelain dish at 130 - 140° with const. stirring. Cool and dil. the viscous residue of basic chloride to 1 l. Pour slowly into a mechanically agitated soln. of 2000 g. Na_2CO_3 in 9 l. H_2O , at the same time conducting a rapid stream of CO_2 into the soln. The NaHCO_3 formed dissolves the greatest part of the basic Be carbonate at first formed, while Al and Fe remain insol. as oxyhydrates. Continue this for 12 hrs., then let the liquid stand for 24 hrs. in tall cylinders, siphon off the soln. and discard the ppt. To remove the small amt. of Fe still present treat with H_2S , filter after several days and carefully add HCl to the

filtrate to form a basic carbonate, contg. the greatest part of the Be and still considerable alkali. Wash the ppt. with H_2O and then covered with H_2O in a 5-l. flask, heat, and carefully add HCl until a permanent red color is obtained with methyl red, steam being passed in until the mix is near boiling. Filter the residue, wash with H_2O until free from Cl and dry at 150–160°. The material obtained contains 55–65% BeO, not more than a trace of alkali, about 0.1% Al_2O_3 and traces of Fe_2O_3 . Dissolve the theoretical quantities of $Be(OH)_2$, pure Na_2CO_3 and pure $BaCO_3$ to give $NaBeF_3$, $BaBeF_4$ and $BaBe_2F_6$ in pure HF in a Pt dish, evap. to dryness over a small flame and heat to fusion. $NaBeF_3$ melts at about 500° and vaporizes strongly at 900°, $BaBeF_4$ melts over 1000° and vaporizes considerably at 1150°, while $BaBe_2F_6$ melts at about 900° and vaporizes appreciably at 1100°. To contain the electrolyte and serve as anode use an Acheson graphite crucible; use a H_2O -cooled Fe cathode. Heat the crucible to 700–800°, add 150 g. powdered $NaBeF_3$, immerse the cathode, add slowly 150 g. $BaBeF_4$ and raise the current to 60 amp. When 1350° has been attained, remove the cathode, clean it with a wire brush and again immerse, regulating the current to hold 1350°. About every 4 min., add 10 g. of $BaBe_2F_6$ until a total of 420 g. is reached. After 3 hrs. stop the current and remove the cathode. The Be adheres to it but is easily removed; again immerse the cathode in the electrolyte. Add 75 g. $NaBeF_3$ and 10 g. $BaBe_2F_6$ every 4 min., and continue the electrolysis for 3 hrs. as before. Repeat still again; the total yield of Be is 47–55 g., a yield of 38–44%, with an energy consumption of 60 kw. hr. The Be obtained was freed of slag and oxide by immersing in fused alkali chlorides and then washing with H_2O , alc. and ether, and cleaning with emery paper. It contains no oxide inclusions and shows a bright cryst. fracture. It is very stable, remaining unaffected for a year in a loosely stoppered flask. It is darkened slightly by heating with a blast lamp; it scratches glass but is polished by emery. Its d is 1.842 at 18°. The purity was detd. by measuring the vol. of H_2O liberated on treatment with HCl. Al was detd. colorimetrically by the formation of an alizarin lake which is removed by centrifuging, dissolved in NaOH and compared with a standard. This method proved reasonably accurate in the presence of large quantities of Be. If Fe is present it is included in the Al detn., but can be estd. separately by formation of a thiocyanate and comparing this colorimetrically with a standard. H. S.

Preparation of pure titanium, zirconium, hafnium and thorium metal. A. E. VAN ARKEL AND J. H. DEBOER. *Z. anorg. allgem. Chem.* **148**, 345–50 (1925).—These metals prepd. by reducing pure tetrachloride with Na and treating with H_2O and then HCl always contain traces of oxide and nitride. Electrolysis of the double fluoride produces no better results. The authors tried the following method. A W filament is heated to glowing in a mixt. of H and tetrachloride vapor. Only a very small deposit was found on the filament and it consisted of a mixt. of nitride, carbide and oxide rather than metal. This was due to impurities in the H_2 . It was found impossible to eliminate all of these. The method, however, is useful for prepg. compds. of the metals, such as carbides, nitrides and sulfides. A requisite condition for prepg. the metals is that a temp. exists below the m. p. of the metal at which its vapor pressure is smaller than the partial pressure of the metal in the gas phase. Since iodides dissociate at lower temp. than chlorides, the following method was used. A W filament is heated to 2000° in the tetraiodide vapor in a glass chamber kept at 650°. A layer of 2–4 mm. of metal can be deposited under these conditions in a few hrs. and is found to be very pure. Zr obtained by this method is extraordinarily ductile and flexible, similar to Cu in these properties. It can be hammered or drawn into wire without difficulty. This is not a different modification from ordinary Zr, but is hexagonal and has the same lattice const. as Zr prepd. by any other method. By the same method, Hf, Hf-Zr alloys, Ti and Th can be prepd., both Th and Ti being very ductile. Hf shows high m. p., high sp. gr. and high electron emission. The authors state that Fischvoigt and Koref could not have obtained pure metals by their method. H. STOERTZ.

Metallic uranium. J. F. GOGGIN, J. J. CRONIN, H. C. FOGG AND C. JAMES. *Ind. Eng. Chem.* **18**, 114–6 (1926).—By carrying out the reaction between UCl_4 and Ca (10% excess of the latter) in an Al_2O_3 crucible placed in an elec. heated bomb which is contained in a vacuum chamber, the metallic U is obtained as a fused mass. With the use of ordinary "pure" Ca the U contained 0.57% Fe, 0.09% C, 0.03% O, trace Al and no Ca or Si, but by the use of resublimed Ca the Fe content could be reduced to less than 0.01%. The prepn. of UCl_4 from UO_2 by the action of Cl_2 and S_2Cl_2 is also described. W. B. PLUMMER •

Preparation of metal tellurides from hydrogen telluride and solutions of salts. A. BRUKL. *Monatsh.* **45**, 471–84 (1925).—A no. of tellurides of the metals have been prepd. by pptn. of solns. of salts with H telluride or, in certain cases, with Na telluride

soln. The compds. PdTe, Cu₂Te, PbTe, BiTe, NiTe, CoTe, As₂Te₃ are described in greater detail than hitherto; the following tellurides have been isolated for the first time: *mercuric, auric, ferrous, stannous, stannic, antimonious, thallous and platinic*. Most of these compds. are unstable in air and tend to reduce solns. of substances such as mercuric or cupric salts. They are sol. in dil. acids with the exception of the Pb, Ni, Co, Au, Pt, As and Sb tellurides. There is in all cases a progressive deepening of color from the sulfide to the selenide and the telluride. B. C. A.

The thermal decomposition of alkali perborates. H. MENZEL, J. MECKWITZ AND W. KRETSCHMAR. *Oesterr. Chem.-Ztg.* **28**, 162-3(1925).—Alkali perborates were made by the action of H₂O₂ on the corresponding monoborates and then—except with the Na salt—the addition of alc. A distinction is drawn between true perborates, which yield I₂ or develop O₂ with concd. KI soln. and pseudoperborates with H₂O₂ present in the role of "H₂O₂ of crystn." Difficultly sol. pseudo-NaBO₂·H₂O₂·3H₂O may be dried almost to NaBO₂·H₂O₂, and at a higher temp. *in vacuo* forms NaBO₂, which evolves O₂ rapidly with H₂O. This labile O is written (NaBO₂)₂·O₂. LiBO₂·H₂O₂·H₂O is described as a new compd. of the pseudo class. It may be dried to LiBO₂·H₂O₂; with H₂O or when heated to 250° it behaves like the Na salt. KBO₂·0.5H₂O is always obtained as a mixt. of the true and pseudo forms; it loses most of its H₂O in a vacuum between 100° and 200°, becomes yellow to brown, and its O goes into a labile form. NH₄BO₂·0.5H₂O acts as a true perborate. It does not give up H₂O completely below 100°. In a vacuum at 120° it decomposes with almost explosive violence. If heated carefully under a suction pump it gives up active O and NH₃. If the reaction occurs in evacuated, sealed vessels about 50-55% of the O, N and NH₃ remain in the gaseous phase; the remainder of the O is used to oxidize NH₃ to free N₂ and HNO₂. W. C. E.

The action of silica on electrolytes. II. A. F. JOSEPH AND H. B. OAKLEY. *J. Chem. Soc.* **127**, 2813-8(1925); cf. C. A. **18**, 6.—The action of an alk. hydroxide on pure silica results in the formation of a solid silicate, part of which passes into soln. In accordance with the solubilities of the silicates concerned, the amt. of solid silicate is very small with Na and K hydroxides, about 30% with Ba and nearly 100% with Ca. In the case of Na and K, the amt. of solid silicate produced is roughly proportional to the amt. of silica used, although the amt. of silicate in soln. is only slightly affected. This proves that the solid phases (silica and silicate) are directly concerned in the equil. The addn. of a neutral salt increases considerably the amt. of solid silicate formed. R. J. HAVIGHURST

The chemistry of phosphorus. I. Colorless phosphorus. LUDWIG WOLF AND KÄTHE RISTAU. *Z. anorg. allgem. Chem.* **149**, 403-12(1925).—An improved, whole glass app. is described for purification of P with an arrangement to carry out reactions under exclusion of air, moisture and fatty impurities. An app., for prepn. of pure *nitrogen* with the aid of TiN₂ (950-1000°) is also attached for carrying out reactions under pressure. The principle of the purification is repeated fractional distn. Recrystn from benzene is also used. The P modification m. 44.1° distils and is sol. in CS₂ with out residue. Only this should be called *colorless P*. JOHN T. STERN

The action of gaseous ammonia on phosphorus chlorides. H. PERPÉROT. *Bull. soc. chim.* **37**, 1540-8(1925).—See C. A. **20**, 348. E. H.

Molecular and atomic volumes (BILTZ, *et al.*) **2**.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Thiocyanogen and its application in volumetric analysis. H. P. KAUFMANN. *Arch. Pharm.* **263**, 675-721(1925).—An address descriptive of early and recent expts. looking to the isolation and study of free (SCN)₂ with respect to its chem. and phys. properties. For purposes of titrimetric application, based on its power to liberate I quantitatively from iodides, solns. of the reagent were prepd. by utilizing the behavior of Pb(OAc)₄ toward HSCN, namely, Pb(OAc)₄ + 2HSCN = Pb(OAc)₂ + (SCN)₂ + 2AcOH. Because of its tendency to polymerize and hydrolyze, expts. are described showing the relativest ability of (SCN)₂ in various org. solvents such as CS₂, CCl₄, Et₂O, MeOH and AcOH. The rhodanometric analysis of fats and oils was studied, as well as the addn. of (SCN)₂ to unsatd. fatty acids and glycerides. W. O. E.

The use of bromate in titrations, with special attention to the indicator question. OSCAR COLLENBERG. *Tids. Kemi Bergvaesen* **5**, 220-4, 239-43(1925).—A careful

study was made of the various factors affecting the decolorization of methyl orange in HCl solns. by a slight excess of KBrO_3 . From many expts., the following conclusions were drawn: The KBrO_3 titration should be carried out at 40–65°. In 100 cc. of soln. which is 0.36–1.6 N in HCl the decolorization is accomplished in 5 sec. as soon as 0.1 mg. in excess of KBrO_3 is present. At 40° the HCl concn. should lie between 0.5 and 1.7 N , provided 10 cc. or less of 0.1 N KBrO_3 is used in the titration. When more KBrO_3 is required, the concn. of the HCl should not exceed that of a normal soln. When less than 1.5 milli-equivs. of KBrO_3 are used, the titrated soln. should have a vol. of about 100 cc. but greater diln. is advisable with solns. contg. more of the oxidizable substance. No other indicator was found better than methyl orange. C. A. R.

Determination of the nitrate ion. K. KURSCHNER AND K. SCHARER. *Chem.-Ztg.* **49**, 1077–8(1925).—In agricultural chem. labs. the methods of Ulsch, of Arnd and of Devarda are used mostly for the detn. of N present as nitrate. The following method gives results which agree well with those of these methods. To not over 0.5 g. KNO_3 in a Kjeldahl flask, add a little water, a roll of Fe wire (such as is used for the standardization of KMnO_4) weighing 3.5 g., 0.5 g. of powd. CuO and 30 cc. of 12 N H_2SO_4 . Let stand an hr. at room temp., then heat for 30 mins. Finally cool, add an excess of NaOH and distil off NH_3 in the usual way. W. T. H.

Testing bicarbonate of soda. E. ISNARD. *Ann. fals.* **18**, 595–7(1925).—From a comparison of the tests prescribed in various pharmacopeas for the detection of NaHCO_3 I. concludes that the tests prescribed in the French Codex are valueless and suggests replacing them by the Moreau test (addn. of excess of standard NaOH and titration of the excess) and detn. of total Na_2O by titration with standard acid in presence of helianthine. A. PAPINEAU-COUTURE

Calculation of probabilities applied to sampling (of packaged materials). L. VALLERY. *Ann. fals.* **18**, 597–605(1925).—V. shows mathematically that with shipments of less than 200 packages the no. of packages which should be sampled are appreciably higher than what is generally considered sufficient, while with over 250 packages it tends to a limit. When the quality or compn. of the contents of each package, as well as the av. of the whole shipment, must meet given specifications, the samples from the different packages must be grouped into a no. of composite samples which should be analyzed separately, according to the tolerances and accuracy of the detns. This is also discussed mathematically. A. PAPINEAU-COUTURE

Methods and apparatus for chemical analysis with X-rays. R. BERTHOLD. *Z. angew. Chem.* **38**, 1188–91(1925).—The application of X-ray spectroscopy to quant. chem. analysis is described. R. J. HAVIGHURST

A simple quantitative method for the determination of cholesterol. L. SURÁNYI AND A. KORÉNYI. *Biochem. Z.* **160**, 178–82(1925).—To 0.1 cc. of a soln. of cholesterol in 96% EtOH add 0.1 cc. H_2O . Then add EtOH soln. until the pptd. cholesterol is redissolved. A table is presented showing the relation between the cholesterol present and the amt. of EtOH soln. necessary to effect soln. of the cholesterol under the above conditions. This scheme may be used in the detn. of cholesterol. F. A. CAJORI

A light filter for polarimetry (SCHOORL) 2.

HENDEL, JAMES M.: **Quantitative Analysis.** Boston and New York. Ginn and Co. 137 pp. Reviewed in *Gen. Sci. Quart.* **10**, 432(1926).

LARKIN, WILLIAM A.: **Laboratory Manual of Qualitative Chemical Analysis.** Albany, N. Y.: F. H. Savary & Co. 196 pp.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Recent advances in science: geology. G. W. TYRRELL. *Science Progress* **20**, 408–17(1926).—Review of recent work on the chemistry of the igneous rocks.

JOSEPH S. HEPBURN

The method of Spring applied to the problem of the diamond. L. DUPARC AND P. KOVALEFF. *Compt. rend. soc. phys. hist. nat. Genève* **41**, 108–12(1924); *Mineralog. Abstracts* **2**, 523.—Equil. relations between the diamond and graphite are discussed with the conclusion that the stability of the diamond increases with pressure and diminishes with temp. CS_2 and a metal with strong affinity for S were subjected to 8000 atm. pressure for 15 min. On dissolving the metal in acid a min. residue of colorless irregular

grains 0.5 mm. across remained. They were birefringent with high refraction and readily scratched glass but after a few days became covered with an opaque crust and fell to a fine powder. The suggestion is that diamond was formed in the expt. J. F. S.

Native sulfur in the coast zone of southwest Africa. E. RØUNING. *Centr. Mineral. Geol.*, A 1925, 86-94.—The nature and relations of the deposits are described. Conclusion: The S developed mainly in quiet water in closed basins or lagoons, in the presence of decaying org. matter. Bacteria assisted in the process. J. E. GILL

The crystal structure of α and β cadmium sulfide and wurtzite. F. ULRICH AND W. ZACHARIASEN. *Z. Krist.* 62, 260-73 (1926).—The dimorphism of CdS is entirely analogous to that of ZnS. Greenockite (α CdS) is hexagonal, C_{6v}^{4-} , with $a = 4.142$ and $c = 6.724$ A. U. Xanthochroite (β CdS) is cubic, zincblende type, with $a_0 = 5.820$ A. U. The unit cell for wurtzite (hexagonal ZnS) has the dimensions $a = 3.836$ and $c = 6.277$ A. U. I. S. RAMSDELL

Etch experiments on chalcopyrite from Botes. L. TOKODY. *Földtani Közlemény* (Budapest) 1924, 53 pp., 34-42 (Hung.). 126-8 (German); *Mineralog. Abstracts* 2, 500.—Crystals of chalcopyrite were etched with H_2SO_4 , HNO_3 and HCl, aqua regia and concd. solns. of NaOH and Na picrate. The etch-figures conform with the symmetry of the tetragonal-scalenohedral class. The action of acids is quite rapid. After etching, the faces show no luster except on the negative sphenoids where the action is slowest. J. F. SCHAIRER

The behavior of a mineral of the salt deposits under high pressure at changing temperatures, from researches by A. Geller. O. MÜGGE. *Nachrichten Ges. Wiss. Göttingen* 1924, 207-17.—The flow-pressures of halite, sylvite, bischofite, carnallite and mixed crystals of KCl and NaCl at several temps. were detd. The m. p. curves of kainite, bischofite and carnallite at various pressures were also detd. These detns. are applicable in an interpretation of the geological history of salt deposits in depth. J. F. SCHAIRER

Pseudomorphs of quartz after apophyllite and mesolite, in the vicinity of Kalageran. A. A. TVALCHRELIDZE. *Bull. Univ. Tiflis* No. 2, 148-55 (1922); *Mineralog. Abstracts* 2, 526.—Pseudomorphs of chalcedony, heulandite, celadonite, laumontite, stilbite, mesolite and quartz after apophyllite are found in geodes in weathered porphyryite. A mean of 4 analyses of mesolite gave SiO_2 44.40, Al_2O_3 25.63, CaO 10.97, Na_2O 5.02, H_2O 13.93, sum 99.95%; formula $(Ca, Na_2) Al_2 Si_3 O_{10} \cdot 3H_2O$. Large white heulandite crystals showed the presence of Sr. J. F. SCHAIRER

Analytical-synthetic studies of zincite. E. DITTLER. *Z. anorg. allgem. Chem.* 148, 332-44 (1925).—Analyses of the deep red zincite from Franklin Furnace, N. J. show the presence of Mn and Fe. Mixts. of ZnO with oxides of Mn were heated and crystd. D. concludes that the red color is due to only traces of a manganite. J. F. S.

Wad from the Waderalpe, Tyrol. E. DITTLER. *Centr. Mineral. Geol.*, A 1925, 101 5.—Analyses of specimens from 2 neighboring occurrences are given. The ratios of $MnO_2:MnO = 15:1$ and $11:1$. The impurities are limonite, barite and carbonates. J. E. GILL

Theories on the constitution of natural silicates. G. N. RIDLEY. *Chem. News* 131, 305-8 (1925).—R. reviews different theories, and favors that of W. and D. Asch, that silicates contain 10- or 12-membered rings of alternate Si or Al and O atoms. Classifying them into anhydrosilicates and hydrosilicates dispenses with uncertain details concerning the functions of Al_2O_3 and SiO_2 . The anhydrosilicates are less reactive, harder and probably of a coarser mol. texture. M. O. LAMAR

Rock-forming pyroxenes and zeolites from Mt. Tzkhra-Tzkhro in Trans-Caucasia. N. N. SMIRNOV. *Works Min. Inst. Moscow Univ.* 1923, 1-47; *Mineralog. Abstracts* 2, 527.—Measurements on 19 crystals of pyroxene found in coarse-grained andesite gave $a:b:c = 1.0925:1:0.5911$; $\beta = 74^\circ 13.5'$; $\gamma:c = 38-45^\circ$. Two analyses are given. Analyses of analcite, natrolite and mesolite, fresh and altered, are given. The zeolites have been derived from the labradorite of the rock by post-volcanic action of (1) H_2O alone, giving analcite + mesolite + heulandite, or analcite + laumontite; (2) H_2O + CO_2 , giving analcite or natrolite + calcite + free SiO_2 + $Al(OH)_3$; (3) H_2O and SiO_2 , giving analcite + heulandite, natrolite + heulandite, or all 3. J. F. S.

The relation of neptunite to the pyroxene group. B. GOSSNER. *Centr. Mineral. Geol.*, A 1925, 73-7.—Neptunite, $[SiO_2.SiO_3Na_2.TiO_3Fe].2SiO_2$, is a member of the alk pyroxene group, differing from aegerine in that all the Fe_2O_3 is replaced by $FeTiO_3$. Al_2O_3 and Fe_2O_3 enter to form mixed crystals to only a slight degree. G. emphasizes the value of resolving the bulk compn. of silicates into smaller complexes and considering them as double compds. as a method for disclosing relationships between different silicates. J. E. GILL

Mineral deposits in the serpentine of the Fichtelgebirge. H. LAUBMANN. *Centr. Mineral. Geol.*, A 1925, 79-86, 106-13.—The origin of the serpentine is discussed. Descriptions of various minerals and their occurrence in the serpentine and intrusive gabbro are given. New analyses of *vesuvianite*, *prehnite*, *chanozoisite* and *garnet* are included.

J. E. GILL

Kossmatite, a new member of the brittle-mica group and its paragenesis. O. H. FERDMANNSDORFFER. *Centr. Mineral. Geol.*, A 1925, 69-72.—A dolomitic marble in western Macedonia yields a mineral whose formula is calcd. to be $\text{Si}_2\text{O}_4\text{Al}_6\text{Mg}_3\text{Ca}_7\text{H}_{18}\text{F}$. It is believed that corundum \rightarrow diaspore \rightarrow kossmatite \rightarrow Mg-Al silicate constitute a reaction series with falling temp.

J. E. GILL

The formation of natural aluminium hydrosilicates. ROBERT SCHWARZ AND RUDOLPH WALCKER. *Z. anorg. allgem. Chem.* 145, 304-10(1925).—By means of the reaction between various Al salts with Na silicate in acid soln. it is shown that a p_{H} 4.8-5.0 is necessary to obtain an Al hydrosilicate in which the ratio $\text{Al}_2\text{O}_3:\text{SiO}_2$ is 1:2. The formation of kaolin (which has $\text{Al}_2\text{O}_3:\text{SiO}_2$ 1:2) from feldspars takes place only in those regions where this p_{H} 4.8-5.0 prevails. Values for CO_2 -saturated distd. water of p_{H} 3.8 at 20° and p_{H} 4.2 at 70° are given.

W. H. STRAIN

Beidellite, a new mineral name. E. S. LARSEN AND E. T. WHERRY. *J. Wash. Acad. Sci.* 15, 465-6(1925).—Restricting the name *leverrierite* as a species name to vermicular material with the $\text{Al}_2\text{O}_3:\text{SiO}_2$ ratio 1:2, a compact-cryst. compd. with a 1:3 ratio from Beidell, Colo. previously described under that name (C. A. 11, 1806) is now named *beidellite*. It is probably orthorhombic, and belongs to a mineral group lying, with respect to the Al-Si ratio, between the kaolinite and the pyrophyllite groups.

(cf. following abstr.)

L. W. RIGGS

Chemical composition and optical properties of beidellite. C. S. ROSS AND E. V. SHANNON. *J. Wash. Acad. Sci.* 15, 467-8(1925); cf. preceding abstr.—Analyses and optical data are reported of beidellite or closely related minerals from 4 localities. As Fe replaces the Al the *ns.* increase.

L. W. RIGGS

Mineralogical notes from the collections of the public museum of natural history of Genoa. A. D'AMBROSIO. *Ann. Mus. Civ. Stor. Nat. Genova* 51, 249-56(1924); *Mineralog. Abstracts* 2, 521.—(1). *The barettite of Traversella*—Two analyses of a green, radially-fibrous material with the external appearance of the barettite of L. Bombicci (1868) show no Ca (CaO 33.665% in the original analysis) and are mixts. of serpentine and brucite. (11). *Traversella, new variety of chrysocolla from Arenas in Sardinia*—This forms bright blue amorphous masses and ranges from compact to porous. Analyses gave

	SiO_2	Al_2O_3	CuO	CaO	H_2O	Sums
I	21.04	21.84	21.72	2.28	32.84	99.72
II	5.04	38.36	5.08	19.08	32.08	99.64
III	8.20	38.32	5.99	13.80	33.56	99.87

The variation in compn. is explained by admixture of chrysocolla and gibbsite.

J. F. SCHAIRER

The phosphate minerals and ores of the Amberg-Auerbach deposits. A contribution to the knowledge of Bavarian mineral deposits. H. LAUBMANN. *Geognostische Jahreshefte, Geol. Landesunters. München* 35, 193-204(1922); *Mineralog. Abstracts* 2, 522.—The Fe ore of Amberg and Auerbach, Bavaria consists of limonite contg. about 2.20% P_2O_5 . Wavellite, apatite, vivianite, cacozenite, beraumite, duferenite and the new species *weinschenkite* and pseudo-wavellite (cf. Henrich and Hiller, C. A. 17, 706) are found in the limonite. *The weinschenkite*, (Er, Yt) $\text{PO}_4 \cdot 2\text{H}_2\text{O}$, forms brilliant white radiating encrustations on limonite. It is monoclinic; partial crystallographic data are given. Its $n =$ about 1.6, birefringence about 0.03⁺. *Pseudo-wavellite* forms white radiating encrustations on limonite or wavellite. The colorless needles have triangular cross-section, and perfect basal cleavage. It is uniaxial + with $n =$ about 1.63, birefringence about 0.015. Analyses by Kieffer gave: Al_2O_3 28.18, (Yt_2O_3 , Er_2O_3) 1.02, Fe_2O_3 5.79, CaO 16.86, BaO 0.67, P_2O_5 30.10, H_2O 18.76, sum 101.38%.

J. F. SCHAIRER

The relationship between lautarite and dietzeite. B. GOSSNER. *Centr. Mineral. Geol.*, A 1925, 101-3.—Dietzeite is believed to be $\text{CaCrO}_4 \cdot \text{CaI}_2\text{O}_6$ instead of $8\text{CaCrO}_4 \cdot 7\text{CaI}_2\text{O}_6$ as held by Dietze. Any variation from the 1:1 proportion is accounted for by limited miscibility with lautarite (CaI_2O_6). Crystallographically these minerals are closely similar.

J. E. GILL

Genesis of sulfide ores. HORACE FREEMAN. *Eng. Mining J.-Press* 120, 973-5 (1925).—The reactions of alkali sulfides with those of the alkali earth metals and heavy

metals offer an explanation of the mode of formation of primary sulfide ore deposits and associated non-metallic minerals. The following fusing points were determined in the electric furnace: PbS 1130° , FeS 1000° , ZnS 1650° , Cu_2S 1100° , $\text{PbS} \cdot \text{Na}_2\text{S}$ 650° , $\text{FeS} \cdot \text{Na}_2\text{S}$ 660° , $\text{ZnS} \cdot \text{Na}_2\text{S}$ 620° , $\text{Cu}_2\text{S} \cdot \text{Na}_2\text{S}$ 560° . The melts have low viscosities and high sp. gr. Sulfates and carbonates of the alkaline earth metals (gang fillings) are formed by hydration, carbonation or oxidation of the sulfides of these metals. Colloidal silica is obtained from $\text{Na}_2\text{S} \cdot \text{SiO}_2$ by oxidation of the Na_2S . Hydrolysis of the double sulfides ppts. colloidal sulfides. Diffusion, osmotic pressure, gravity and differential soly. explain the differentiations. J. F. SCHAIERER

Alkaline sulfides as collectors of metals. J. R. SPURR. *Eng. Mining J.-Press* 120, 975-7 (1925).—A review of some geological facts with substantiating chem. evidence for theories of sulfide ore deposition. S. concludes that H_2O was not the universal solvent of ore magmas, F and B were not the principal carriers, and that the formation of double sulfides of heavy metals with alkali metals followed by hydrolysis and deposition of the heavy metal sulfides is a possible explanation of sulfide ore deposits. J. F. SCHAIERER

The role of colloidal solutions in the formation of mineral and metalliferous deposits. RENÉ VAN AUBEL. *Rev. gen. sci.* 36, 671-80 (1925).—This review considers (1) nature and localization of the colloidal minerals, (2) structure of the colloidal minerals of the deposits, and (3) the colloidal solus. and certain classic mineralized deposits. This last topic is developed under 16 sub-topics. Apparently the theory of colloidal solns. gives a working hypothesis for further study of the deep deposits. L. W. R.

The Tre Monti manganese mines above Sestri Levante. GAETANO CASTELLI. *Russ. min. met. chim.* 63, 101-13 (1925).—The Mn ore is of chem. sedimentary origin and occurs in phthamite-jasper formations accompanying serpentine rock. It may be classified in 4 chief com. types which contain: MnO_2 48.98-66.20, SiO_2 41.14-26.00, Fe_2O_3 3.01-1.52, Al_2O_3 1.45-3.35, CaO 4.50-2.00, MgO 0.38-0.38, P 0.05-0, H_2O at 100° 0.35-0.35%. The geology, methods of exploitation and equipment and valuation of the properties are described in detail. C. C. DAVIS

A manganiferous deposit at Monte Aquilaia, Province of Grosseto. L. SANNA. *Russ. min. met. chim.* 63, 129-30 (1925).—The ore is probably a mixt. of braunite, manganite and limonite. C. C. DAVIS

Report on the Batavia gold fields. P. A. WAGNER AND W. O. C. ROSS. *South African J. Ind.* 8, 543-64 (1925).—Au is distributed throughout a bed of conglomerate which is thin and of low or very erratic Au content. J. F. SCHAIERER

The geology and ore deposits of Mt. Stewart, Leadville, N. S. W. T. L. WILLAN. *Proc. Australasian Inst. Mining and Metallurgy* 1925, No. 47, 27 pp.—Ag was carried by hot ascending solns. of $\text{Fe}_2(\text{SO}_4)_3$ and deposited by cooling, H_2S and sulfides. There is a genetic relation between the ores and an intrusive granodiorite. Analyses of the Ag, Pb, Fe, Cu and Zn ores are included. The main ores are pyrite, Pb carbonates, Zn sulfide, chalcopyrite and a mixed Zn-Pb sulfide ore. Ag and Au in the pyrite are obtained as by-products in the utilization of the pyrite for H_2SO_4 manuf. J. F. S.

Chemistry of deposition of native copper from ascending solutions. R. C. WELLS. U. S. Geol. Survey, *Bull.* 778, 69 pp. (1925).—About 180 expts. are described with sufficient detail for reproduction in a well-appointed lab. The leading topics are: the reactions of Cu and of its compds., especially sulfides, sulfates and chlorides, with other elements and compds. associated with the Cu ores of the Lake Superior region, soly. of Cu and its compds. under varying conditions, transportation and pptn. of Cu, formation of native Cu through oxidation of S by ferric compds., equil. studies with Fe_2O_3 , Cu_2S and acid, and the reaction of Cu compds. on each other. The theories to account for the deposition of native Cu from ascending solns. are: (1) by cooling, (2) diln., (3) fractional oxidation of Cu_2S , and (4) neutralization and reduction. The 3rd theory appears to fit the Lake Superior district best in that the sp. influence of Fe_2O_3 in the rocks is taken into account in detg. the character of the Cu mineral deposited. For many details the original must be consulted. L. W. RIGGS

The influence of superimposed strata on the deposition of certain lead-zinc ores. R. A. MACKAY. *Bull. Inst. Mining Met.* 1925, No. 254, 14 pp.—The presence of certain Pb-Zn ore bodies may be explained by assuming that the impounding strata have acted as a semi-permeable membrane, permitting the H_2O of the ore-bearing solns. to pass but keeping back the minerals. The process has been that of osmosis. Evidence from ore-bodies in the Carinthian Alps is brought forward. J. F. SCHAIERER

Molybdenum, its metallurgy, uses, occurrences, mining and ore concentration. V. L. EARDLEY-WILMOT. *Can. Dept. Mines, Mines Branch No.* 592, 285 pp. (1925).—Deposits of Mo throughout the world are described, those of Canada in greater detail.

Costs, analyses and methods of concn. are treated at length, as are the uses of Mo in the various steels. L. W. RIGGS

Asbestos deposits of Arizona. JOHN MELHASE. *Eng. Mining J.-Press* 120, 805-10 (1925).—The asbestos was formed through the hydrothermal alteration of magnesian limestone induced by the intrusion of diabase sills. Confined gases and thermal solns. from the diabase acted on the first-formed serpentine to produce asbestos seams or, if unconfined, escaped without forming asbestos. J. F. SCHAIRER

Pre-Cambrian rocks of Gunnison River, Colorado. J. FRED HUNTER. U. S. Geol. Survey, *Bull.* 777, 94 pp. (1925).—This study is mainly petrographic. Chem. analyses are reported or quoted of 12 samples of the rocks. L. W. RIGGS

A carbonatite from the Lake Laach region. ADELE BRAUNS AND R. BRAUNS. *Centr. Mineral. Geol.*, A 1925, 97-101.—The rock consists of 90% calcite with small quantities of alkali feldspar, nosean, acgirine, biotite, apatite, pyrrhite and zircon. It is believed to be a magmatic differentiate belonging to the series of calcite-rich rocks (nosean-syenite, cancrinite-syenite, calcite-syenite, syenite-pegmatite) found in the region. J. E. GILL

The formation of limestones in fresh water lakes and in seas. A comparison. HANS KLAHN. *Z. deut. geol. Ges.*, B 1925, 3-24.—Lake-chalk is mostly formed from physiologically sepd. CaCO_3 . The weight of evidence indicates, though less certainly, that marine limestones are also dominantly of org. origin. J. E. GILL

Theory of coal measure fire clays. E. LOVEJOY. *J. Am. Ceram. Soc.* 8, 756-61 (1925).—It is "reasonable to assume that these beds are altered sedimentaries instead of residuals." C. H. KERR

The Cambrian sediments of the Karelisch Isthmus. B. FROSTERUS. *Bull. comm. geol. Finlande* No. 75, 5-52 (1925). Analyses of clay-slate, clays, phosphorite nodules and waters leached from clays are included. J. F. SCHAIRER

The presence of sulfate-reducing bacteria in oil field waters. E. S. BASTIN, F. E. GREER, C. A. MERRITT AND GAIL MOULTON. *Science* 63, 21-4 (1926).—No valid evidence has yet been obtained of the reduction of sulfates and the formation of sulfides by the agency of dead org. material at ordinary temps. At high temps. such reductions do take place. Reduction of sulfates in oil field waters through the agency of anaerobic bacteria does take place at ordinary temps. J. W. RIGGS

Radioactivity and the earth's thermal history. IV. A criticism of Parts I, II and III. ARTHUR HOLMES. *Geol. Mag.* 62, 504-15 (1925); cf. *C. A.* 9, 1293, 2052; 10, 2085.—The theory that the earth has continuously cooled down from a former molten state is shown to lead to limitations of temp. and to a distribution of rock-types at moderate depths which make it impossible for igneous activity to have taken place as it is known to have done. This conclusion proves the theory wrong. V. **The control of geological history by radioactivity.** *Ibid* 529-44.—Instead of deducing the distribution of rock-types in depth from their radioactive contents an attempt is made to det. the distribution independently so that the radioactive effect may be deduced without reference to any limiting hypothesis of a steadily cooling earth. J. F. S.

The composition of the earth's interior. L. H. ADAMS AND E. D. WILLIAMSON. *Smithsonian Rept. for 1923*, 241-60 (1925).—The sources of information concerning the interior of the earth are discussed:—constant of gravitation, astronomic and geodetic data, flattening of the earth and seismologic data. A. and W. conclude that the earth's core is metallic Fe or Ni-Fe. Surrounding the Fe core there is a fringe of mixed Fe and silicate, and finally a silicate shell. The earth, except for the small surface shell, consists almost entirely of Fe, Mg, Si and O. J. F. SCHAIRER

Nature of the interior of the earth. E. WIECHERT. *Nachrichten Ges. Wiss. Göttingen* 1924, 251-6.—A discussion of the possible phys. and chem. conditions in the various zones of the earth's interior. J. F. SCHAIRER

Making thin sections of rocks. MARY G. KEYES. *Am. J. Sci.* 10, 538-50 (1925).—A detailed review. L. W. RIGGS

GRUBENMANN, U. and NIGGLI, P.: **Die Gesteinsmetamorphose.** Berlin: Gebirger Borntraeger. 539 pp. Reviewed in *Econ. Geol.* 21, 99 (1926).

QUIRKE, T. T.: **Elements of Geology.** New York: Henry Holt and Co. Cloth. 6 × 9 in. 414 pp. 102 halftones, 45 line cuts \$3.50. Reviewed in *Eng. News Record* 95, 644 (1925).

VEN, R. W. VAN DER: **Minerography and Ore-deposition.** Vol. I. The Hague: G. Naeff. £1, 1s. Reviewed in *J. Chem. Met. Soc. S. Africa* 26, 117 (1925).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

Fifty-seventh annual review and year book number. *Eng. Mining J.-Press* **121**, No. 3(1926); cf. *C. A.* **19**, 809.—This number contains mining and trade information for the year 1925 on Cu, Pb, Zn, Au, Ag, Fe, petroleum, Mn, Ni, chromite, W, Co, Mo, Pt, Hg, As, Sb, Bi, bauxite, Al, Ra, U, V, Cd, Ce, Se, Te, Ti, Th, Zr, asbestos, mica, graphite, talc, tripoli, diatomite, SiO₂, feldspar, kaolin, gypsum, magnesite, barytes, fluor spar, borax, phosphate rock, nitrate, potash, S and pyrites; regional summaries of the mining industry are given; and papers on *Milling and Flotation* by C. E. LOCKE, *Hydrometallurgy* by A. W. ALLEN, *Pyrometallurgy* by E. H. ROBIN and *Iron and steel metallurgy* by BRADLEY STOUGHTON. E. H.

The non-ferrous metals industry in 1925. ANON. *Ind. Chemist* **2**, 13(1926). E. H.

Lead and zinc in eastern Canada. F. J. ALCOCK. *Mining and Metallurgy* **7**, 51-6(1926). E. H.

Platinum and allied metals in 1924. J. M. HILL. U. S. Geol. Survey, *Mineral Resources of U. S., 1924*, Part I, 45-57(preprint No. 7, published Oct. 19, 1925). E. H.

Silver, copper, lead and zinc in the Central States in 1924. J. P. DUNLAP AND F. BEGEMAN. U. S. Geol. Survey, *Mineral Resources of U. S., 1924*, Part I, 59-88(preprint No. 8, published Jan. 12, 1926). E. H.

Regenerative gas-fired furnaces. Equipment at a new French non-ferrous works. ALFRED HARVEY AND H. W. JACKSON. *Metal Ind.* (London) **28**, 9-13(1926).—A brief illus. description of a regenerative gas-fired furnace installation for the melting of Cu, brass and Zn. Advantages claimed for this type of furnace are: (1) increase of life of the crucible, (2) flexibility of temp., and (3) economy of fuel, which averages a saving of 1/3. Annealing is conducted in a muffle type of furnace, which has a movable bed on wheels, with 1/2 the bed inside the furnace holding the strips or plates being annealed, and the other outside where it is unloaded and reloaded. Time is saved by having the unloading, loading and annealing simultaneous. The existence of a critical temp. at about 400° is here shown on a commercial scale. W. H. BOYNTON

Engineering and science in the metal industry. ZAY JEFFRIES. *Mech. Eng.* **48**, 8-16(1926).—An address in which are reviewed the growth of the metal industry since 1885, the selection of an alloy or metal for a given purpose, factors governing the properties of an alloy, prevalent theories of the causes of hardness in steels and the effect of science on the metal industry. ALBERT THOMAS FELLOWS

Manufacture and use of die castings. FR. IHRMANN. *Z. Metallkunde* **17**, 329-33(1925).—A brief description of the machinery used in die casting, and of the articles made from Pb, Sn and Al alloys by means of this process. H. S. v. K.

Improving plate amalgamation. IRA LEMMON. *Eng. Mining J.-Press* **121**, 70(1926).—Blowing air on the plate, by means of a pair of parallel pipes pierced with small holes at 1-in. centers and placed across the plates so as to direct the air streams up the plate, will remedy flouing of Hg. and is better than a shaking plate. A. BUTTS

Treatment of metal residues and scrap. I. Treating white metal residue in the melting pot. (B) Production of white metal alloys, zinc and lead. II. Treatment of tin residues. E. R. THEWS. *Metal Ind.* (London) **27**, 307-10, 453-5(1925). III. The treatment of aluminium scrap. *Ibid* **28**, 29-33(1926). W. H. BOYNTON

Possible improvements in metallurgical practice relating particularly to the zinc industry. GILBERT RIGG. *Bull. Inst. Mining Met.* **1925**, No. 254, 2-26; cf. *C. A.* **20**, 163.—A discussion. The possibilities of establishing a superphosphate industry to utilize the excess H₂SO₄ from the Zn smelting industry is brought out. Cheap water power is not absolutely essential for economic success of the electrolytic process. More should be known of the phys. chemistry connected with the condensation of Zn vapor. Strong points of the electrothermic and the electrolytic processes are pointed out. W. H. BOYNTON

The metallurgy of quicksilver. I. H. DUSCHAK AND C. N. SCHUETTE. *Bur. Mines, Bull.* **222**, 167 pp.(1925).—A treatise including history, ores, roasting, concn., drying, sampling, assaying, roasting and distn. furnaces, retort furnaces, condensation, wet treatment, health hazards (by R. R. SAYERS), and bibliography. The design of leading furnaces and condenser systems is given in detail. It is concluded that in the direct furnace treatment of ores the major problem in the extn. of Hg has been solved, methods being available whereby low-grade ores can be treated with remarkably high

recovery and at low cost. The greatest opportunity for increasing economy in Hg production lies in more attention to geology of deposits and improvement of mining methods.

A. BURRS

Metallurgy of silver-lead ores at the Transvaal Silver and Base Metals, Ltd. W. G. GENTLES. *J. Chem. Met. Soc. S. Africa* 25, 265-95 (1925).—A very detailed description with flow sheets and cost data is given of the ore dressing and smelting of the concentrates obtained from the Ag-Pb mine of the above company near Pretoria. The ore vein contains galena, pyrite, chalcopyrite, blende, jamesonite and traces of Ag minerals, associated with quartz, chlorite, calcite and dolomite. The coarse ore from the mine is roughly broken, screened and the oversize hand-picked by native labor; the residue is coarsely crushed and concd. by jigging, followed by fine grinding of the jig tailings and subsequent flotation together with slimes produced earlier. The concentrates from the mill and the hand-sorted ore are pre-roasted in a Godfrey furnace until they contain 9-11% S, sintered in Huntington-Heberlein pots, and smelted in a blast-furnace to obtain argentiferous Pb for sale. The mat produced contains 10-14% Cu, and is roasted, sintered and smelted to yield a richer mat contg. 45-50% Cu, which is sold to Cu refiners.

B. C. A.

Application of pulverized coal to copper-refinery furnaces. E. W. STEELE. *Trans. Am. Inst. Min. Met. Eng.*, May, 1925 (advance copy) 10 pp.—Pulverized coal can be used in reverberatory Cu-refining furnaces with the same thermal efficiency as oil, and the upkeep of the furnace brickwork is generally less than with oil, as the flame action is not so severe. In full-scale trials the furnaces were heated by 3 burners, each 12 in. diam. and delivering 67 lb. of coal per min. at the max. rate of firing during the melting period, with a max. gas velocity of 3550 ft. per min. at the burner tip. A pressure of 2 oz. per sq. in. in the air main was sufficient, and during the charging and tapping periods 1 burner only was in use. The fuel supplied should not contain more than 8% of ash and 2% of S, and with suitable design of flues and regulation of draught it is estd. that not more than 25% of the ash remains in the furnace. During a period of 20 days 20 charges averaging 185 tons of Cu were refined with an av. coal consumption of slightly less than 200 lb. per ton of Cu, as compared with 250 lb. with good hand-firing practice.

B. C. A.

Recovery of arsenic and other valuable constituents from speiss. C. P. LANVILLE. *Trans. Am. Inst. Min. Met. Eng.*, May, 1925 (advance copy) 13 pp.—For the recovery of the constituent metals from a speiss contg. on the av. Pb 21.4, Cu 30.1, Fe 10, Ni 7.3, Co 1.8, As 18.7, Sb 4.6, S 3.4, Zn 2.1%, etc., Au 0.76 oz. and Ag 201 oz. per ton, the coarsely crushed material was melted rapidly with 20% of S on a sloping magnesite hearth of an oil-fired reverberatory. The molten product sepd. into 2 layers, a lower layer, 53% of the original speiss, consisting of enriched speiss and an upper layer (65%) of mat. The speiss assayed Pb 4.3, Cu 12, Fe 10, Ni 13, Co 3, As 35, Sb 8.6, S 7%, Ag 37 oz. and Au 1.3 oz. per ton, and the mat, Cu 36, Pb 29, Ni + Co 0.8%, Ag 335 oz. and Au 0.1 oz. per ton. The latter was returned to the blast furnace and the former crushed to pass a 20-mesh sieve, roasted to expel as much As as possible, and fused with 16% of S and sufficient coal to reduce the oxides. The new speiss (26% of original) assayed Pb 2, Cu 10, Fe 7, Ni 25.7, Co 5.9, As 34, Sb 10, S 7%, Au 2.3 oz. and Ag 36 oz. per ton; the mat (10%) contained Pb 17.6, Cu 37.3, Ni and Co 1.8%, Ag 145 oz. and Au 0.7 oz. per ton at the same time 9 1/2% of As was recovered as trioxide in the fume plant. The new speiss was finely ground and again roasted until all the S was expelled, more As being recovered from the fume. The roasted product contained about 16% As and 0.3% S; sufficient Na carbonate was added to combine with all the As and S remaining and roasting was continued in a Godfrey single-hearth furnace until all the As was converted into trisodium arsenate, which was extd. by leaching the material on the counter-current principle, a small quantity of Na₂S being added to the leach liquor after filtering to remove the small quantity of Cu that dissolved. The liquors were evapd. until they solidified on cooling to a product assaying about 56% Na₂AsO₃, 1.3% Na₂SO₄, 1.9% Na₂CO₃, 40% H₂O. The residue from leaching was about 21% of the original speiss and contained Pb 2.5, Cu 12.5, Fe 8.7, As 1.3, Sb 11.7, Ni 31.3, Co 7.4%, Au 2.9 oz. and Ag 46 oz. per ton. This mud was mixed with H₂SO₄ (d. 1.8), passed through a heated rotating drum in a thin stream and into a conical dissolving tank contg. water agitated by a current of air. The overflow from the tank passed to a settling tank. The slimes were thickened by addn. of lime to neutralize acidity and returned to the blast furnace; they contained Pb 5, Sb 25, Cu 3, Co and Ni 2.3%, Au 6 oz. and Ag 97 oz. per ton. The sulfate soln. was electrolyzed for Cu, concd. by steam coils in lead-lined vats to d. 1.45, and finally evapd. in open cast-iron pans to d. 1.65. On cooling the bulk of the metal sulfates sepd. out in the anhyd form and the

supernatant acid was returned to the dissolver. The sulfates were carefully roasted until the Fe and As were rendered insol. and the mass was leached to obtain a soln. of Ni and Co sulfates from which Co was recovered by treatment of the soln. first with limestone to sep. Fe, then with H_2S to remove Cu and Zn, and finally with $NaClO$ to ppt. the Co.

B. C. A.

New reverberatory smelting plant of the United States Metals Refining Co. F. R. CORWIN. *Eng. Mining J.-Press* **121**, 197-205(1926).

E. H.

Pouring ingots by a new method. ANON. *Iron Age* **117**, 128-9(1926).—The reservoir and multiple-pouring float method is designed to reduce pipes and blowholes in steel. The delay in descent of the metal in the reservoir has the effect of filling up more of the pipe, thereby yielding a sounder steel. In addition to the sounder castings, other advantages claimed are: a longer life from stools, buggies and ingot molds. The no. of stool stickers is reduced and broken buggy axles rarely occur. Little refractory material reaches the soaking pits and practically none is encountered beneath the roll trains, insuring cleaner scale for use in the blast furnace. Several illustrations are included.

W. H. BOYNTON

Relation of carbon consumption to material smelted in the blast furnace. S. P. KINNEY. *Blast Furnace & Steel Plant* **14**, 15, 25(1926).—Operating data are tabulated which show the relation of C consumption to the quantity smelted and the effect of high-ash coke. There is a fixed relation between the amt. of C consumed and the amt. of material smelted. According to the calens., an av. of 2.67 lbs. of material was smelted per lb. of C consumed. A check run showed 2.64 and another furnace showed 2.68

W. H. BOYNTON

Genuine open-hearth iron. F. J. CROLIUS. *Blast Furnace & Steel Plant* **14**, 25-36, 48(1926).—An illus. description of the Andrews Steel and Newport Rolling Mills in the Cincinnati, Ohio district. The same kind of coal is used: in gas producers for the open-hearth; pulverized on sheet and pair, and annealing furnaces; and in the finer screenings for steam purposes on stokers. The pulverized-fuel layout is discussed in detail.

W. H. BOYNTON

Production and application of oxygen-enriched air in foundry practice. A. BRÜNINGHAUS. *Stahl u. Eisen* **45**, 737-48(1925).—Various methods for the production of O by liquefaction and sepn. from air are discussed and the necessary equipment for a foundry installation is described. In blast-furnace practice the advantages of using O-enriched air are greater output, elimination of blast preheater, diminution in size of blowing machines, better regulation by changing the compn. of the air. The coke consumption increases, but the temp. at the throat falls. Heat balances are given for 2 furnaces with hot blast and O-enriched air, resp.; the total heat consumption is less for the latter but there is a greater amt. of waste gas which can be used in gas engines, and lower-grade ores can be treated. In the converter process the heat loss due to the N in the blast is reduced, the time of blowing is shortened, and a greater proportion of scrap can be used. The output of 4 converters with O-enriched air was the same as that of 6 converters with ordinary blast, the quality of steel being the same. A higher temp. was obtained at the beginning of the blow and pig iron low in P could be blown. The Fe content of the slag was somewhat higher. In the Siemens-Martin process, using O-enriched air, regenerators are not necessary and the use of coal-dust firing is made possible. Greater heat is brought to the hearth and heat is also made available for steam raising. The heat consumption per ton of steel by 4 different methods of firing was investigated: coke-oven gas with atm. air gave the most favorable results. Expts. at the Hoesch Works are described using coke-oven gas with air enriched to 28% of O, the N being pumped into the compressed-air system. A special type of burner used is described. Refining proceeds rapidly in the furnace, which is advantageous in the pig iron-ore-process. Favorable results were obtained by firing with coal dust and air with a 40% O content. A diagram is given of the heat flow through the furnace.

B. C. A.

Factors affecting the elimination of sulfur in the basic open-hearth process. C. H. HERTY, JR., A. R. BELYEA, E. H. BURKART AND C. C. MILLER. *Am Inst. Min. Met. Eng.*, May, 1925 (advance copy) 21 pp.—The distribution ratio of S between the furnace gas and Fe oxides formed on melting a charge and slags containing lime, resp. and the rates of sulfurization and desulfurization of slags by gases have been detd. In an exptl. furnace of 1-4 lb. capacity illuminating gas to which pure SO_2 was added as desired was used as the heating agent and the slag was a synthetic mixt. free from S. Expts. on com. furnaces were also made. The ratio vol. % SO_2 in gas: % S in oxide was found to be about 0.9 and the ratio vol. % SO_2 in gas: % S in lime slags was 0.27. The use of a gas free from S allows a charge contg. more S to be used in the furnace

and will prevent the loss of time due to high-S heats, so being economical under certain conditions. Coke-oven gas free from S is economical under most conditions and is more so than producer gas on account of the larger vol. required of the latter. It has been calcd. that unless the time lost on high-S heats is more than 1.5% of the working time there is a direct loss in using producer gas free from S. Waste gases from an open-hearth furnace should not contain more than 0.035% of SO_2 if absorption of S is to be avoided.

B. C. A.

Smelting with small coke. A. WAGNER. *Stahl u. Eisen* 45, 929-35 (1925).—Comparative tests have been made in a small iron blast furnace to ascertain the relative merits of smelting with very large coke as practiced in Germany and with coke of medium size (20% > 4 in., 25% 3-4 in., 25% 2-3 in., and 30% finer than 2 in.) as practiced in America. Other things being equal, the finer coke produced a flue gas poorer in CO, showing better utilization of the fuel, and a higher percentage (1.3-1.6 against 0.8-1.1) of Si in the Fe, while slightly less coke was required to produce 1 ton of pig-iron. Further tests on an iron ore which contained Pb showed that iron perfectly free from Pb could be made by smelting this ore with the finer coke because of the high temp. in the combustion zone causing complete volatilization of the Pb; with coarse coke, Pb accumulated in the hearth of the furnace. When small coke is used care should be taken that it has sufficient strength and hardness not to crumble in the throat of the furnace, and preferably all lumps smaller than 20 mm. should be sieved out before use.

B. C. A.

Effect of zinc oxide on the formation temperatures of some ferrous slags. H. T. MANN. *Trans. Am. Inst. Mining Met.* 1925 (preprint) No. 1474 D, 25 pp.—Slagging of Zn in Pb blast-furnace smelting is often of great importance. Under proper conditions slags as high as 38% in ZnO have been run, but 15-18% was formerly regarded as the upper limit. Results are here tabulated and plotted of detns. of formation temps. of ferrous slags contg. from 0 to 60% ZnO, with variations in SiO_2 , FeO and CaO as in practical smelting. Weighed mixts in the desired proportions were molded into cones of the Seger type and heated to fusion in a gas muffle. Replacement of FeO by ZnO lowers the slag-formation temp. up to a certain percentage of ZnO, then increases it. The same is true in general of replacement by SiO_2 by ZnO and to a small extent of replacement of CaO. Many combinations can be smelted and produce a high-Zn slag, but careful regulation is necessary to avoid serious trouble, especially in the ratio of FeO to ZnO. Charges must be carefully proportioned and mixed to avoid a burden with a slag formation temp. higher than the furnace can attain. A. B.

Granulation of blast-furnace slag. G. HARTMANN. *Stahl u. Eisen* 45, 529-30 (1925).—In the process in use at Ilsele the slag is granulated by falling from a height into water contained in a chamber at the base of a wooden tower, which carries away the water vaporized, contg. SO_2 . The product is elevated to a storage hopper when it is discharged contg. 8-9% of moisture. The speed of the elevator and the amt. of water used are regulated by the quantity of slag. The process may be modified to deal with slag from any type of furnace.

B. C. A.

Drying blast-furnace slag on a suction drainer. A. KOERFER. *Stahl u. Eisen* 45, 530-1 (1925).—The slag, granulated in water, is elevated by an air lift and distributed evenly over the suction bed. This consists of perforated metal plates through which the water is drawn, while rotating scrapers prevent clogging of the bed and deliver the material continuously into storage hoppers. The water is used again after allowing the fine sand it carries to settle out.

B. C. A.

Drying granulated blast-furnace slag. A. LIEBRICH. *Stahl u. Eisen* 45, 531-2 (1925).—In the process in use at the Roland foundry the slag is plunged into water so that it becomes spongy in texture and is then delivered to a rapidly rotating table where it is sepd. from the water; a product of any desired compactness or water content can be obtained. The material possesses the same hydraulic properties as granulated slag prep'd. by the usual methods.

B. C. A.

Drying blast-furnace slag. F. SCHNEIDER. *Stahl u. Eisen* 45, 532-3 (1925).—In the process used by the Gelsenkirchener Bergwerks A.-G. the slag is delivered into a specially designed mill where it is disintegrated by rotating blades in a water spray the amt. of which is regulated to give a dry product. A considerable proportion of finely divided material is produced which is very suitable as a raw material for cement manuf. while the power required to grind the product is about $\frac{2}{3}$ of that required for slag granulated by a wet process.

B. C. A.

Air drying of blast-furnace slag. M. ZILGEN. *Stahl u. Eisen* 45, 533-6 (1925).—In the Buderus process, the molten slag is delivered to a tower where it is disintegrated by an air blast in conjunction with a water spray which is regulated to produce a dry

product. The material passes through a screen before reaching the storage hopper. The product is at least equal to that obtained by the wet process for use in the manuf. of cement. B. C. A.

Heats steel hotter. D. M. AVEY. *Foundry* **54**, 88-91, 124(1926).—A description of a new type of open hearth with self-contained gas producers and its operation. Temps. above 3500° F. are attained. F. H.

Tests for molding sand. A résumé of tentatively adopted methods of tests developed by the Joint Committee on Molding Sand Research of the American Foundrymen's Association. *Metal Ind.* (N. Y.) **23**, 99-102, 277-9, 493-5(1925).—Tests include: binding strength, fineness, permeability, chem. analysis, dye absorption and method of sampling. The procedure and equipment used are outlined. W. H. BOYNTON

Metal mold by a new process. M. S. CLAWSON. *Iron Age* **116**, 1310-3(1925).—Accurate castings are claimed possible by the "Plastic Process" using a new elec. resistance furnace and permanent molds. They may be made to almost exact size and form. Steel and Ni alloys require only grinding and finishing to obtain complete dies for stamping or a mold for forming materials. Another advantage is the possibility of using non-corrosive alloys. The process is not described but several illustrations of applications are mentioned. When air pocketing is once eliminated in the permanent molds no further trouble is experienced with the filling of the mold and the structure of the metal in the molds is fine-grained and possesses a more uniform surface. W. H. BOYNTON

A description of the Perlit process. H. J. YOUNG. *Iron & Steel Can.* **8**, 242-3(1925); cf. *C. A.* **19**, 2799.—A new method of producing grey iron castings under new condition is outlined. Lower Si and lower P contents are possible by this method. W. H. BOYNTON

The recrystallization of rolled plate silver. R. GLOCKER, E. KAUPP AND H. WIDMANN. *Z. Metallkunde* **17**, 353-7(1925); cf. *C. A.* **19**, 1682.—A bar of cast Ag contg. 99.7% Ag and 0.2% Cu was used. X-rays gave valuable information on the recrystn. of Ag plate and on grain growth. Up to 200° the crystallite was extraordinarily small, but at 212° a considerable change took place and a large increase in newly formed crystals was indicated. Up to 700° no further change was indicated but above that temp. changes occurred and great numbers of crystallite particles seemed to have taken the recrystn. position. At 850° the no. of particles seemed to be greatly increased and at 910° complete transformation into the regular orientation had taken place and all the particles lay in the same direction. There is a corresponding increase in grain size. Röntgenographs and photomicrographs are shown. A mixt. of NH₄OH and H₂O₂ was most suitable for etching. The results are confirmed by mech. tests, curves for Brinell hardness and elongation being shown. H. STOERTZ

A further note on bright drawn steel. R. T. ROLFE. *Iron Foundry, Metal Ind.* (London) **27**, 343-4(1925).—Examples show the defective compn. of some bright drawn steels. The assistance to "free machinability" given by S and P is insufficient to warrant excess of these elements over the min. to give the property desired. More attention should be given to the service requirements. The compns. of typical grades of bright drawn steel bars are tabulated. Much bright drawn steel of "free cutting" quality contains too much S and is liable to fracture. Special attention must be given where the steel is subject to shock. W. H. BOYNTON

Improvements in automotive steels. W. G. HILDORF. *Iron Age* **116**, 1378-80, 1447-50(1925).—Points discussed include: difficulties due to seams and dirty steel, normal and abnormal steels, the effects of heat treatment, the need for greater uniformity from heat to heat, detn. of fatigue values by fractures, variations in grain size and fracture testing. Fracture testing is important in automotive lines. Normal and abnormal steels are distinguished by metallographic examn. Abnormal steel exists in all classes and is more liable to give soft spots and warpage. No fatigue machine gives results exactly comparable with those obtained in service. Impact values and Brinell hardness are shown with various drawing temps. W. H. BOYNTON

Density measurements at high temperatures. VI. The volume changes occurring during the melting of pig iron. F. SAUERWALD AND J. WECKER. *Z. anorg. allgem. Chem.* **149**, 273-82(1925); cf. *C. A.* **18**, 3346.—Pellets of white pig Fe were made in a magnesia crucible by melting under an atm. of H the proper proportions of pure Fe, Mn and Acheson graphite. The sp. vol. at 20° was 0.1293 ($\pm 0.2\%$). The m. p. was 1155° and the solidification p. 1137°. Ac₁ and Ar₁ points were 738° and 663°, resp. The sp. vol. of the Fe before and after melting and over the temp. range 1082-1209° was detd. by measuring the weight of the pellet when immersed in molten NaCl. The previously detd. values for the d. of NaCl were used in the calcn. The sp. vol.

of grey pig Fe, samples of which were prepd. in an earlier investigation, was detd. in the same way. The evolution of gas that invariably accompanied the immersion of the untreated Fe pellets in molten NaCl was avoided by coating the pellets electrolytically with a thin Ni film. It was found that white pig Fe increased in vol. on melting, while grey pig Fe decreased. The liquids differed in sp. vol. by only 1%. The figures are for white pig Fe: before melting ν , 0.139, d. 7.15; after melting ν , 0.1418, d. 7.05; for grey pig Fe: before melting ν , 0.1449, d. 6.90; after melting ν , 0.1435, d. 6.97.

R. L. DODGE

Ferro-nickels. PESCHARD. *Rev. métal.* 22, 490-514, 581-609, 663-85 (1925); cf. C. A. 19, 2773, 2907.—After a review of previously published work, P. describes in detail his own work on the magnetism of Fe-Ni alloys contg. 0-100% Ni, which leads to the following conclusions. Alloys contg. more than 34.4% Ni are completely reversible at all temps.; those contg. less than 34.4% Ni are irreversible below a temp. which varies with the Ni content and which probably represents the beginning of the allotropic $\beta \rightleftharpoons \gamma$ transformation of Fe-Ni. The variation in magnetic properties is continuous from 100% Ni to 100% Fe, but with 3 discontinuous points, which are the angular points on the at. moments curve, the Curie const. curve and the Curie point curve. The corresponding proportions of the metals can be represented by a simple formula, suggesting the presence of definite compds. in the alloys: Fe_2Ni , Fe_3Ni_2 , FeNi_2 , of which nothing is known and 2 of which are not revealed by the other phys. properties. The at. moments of these compds. satisfy the law of whole nos. of magnetons; FeNi_2 probably contains 20 magnetons per mol. At 0° abs. and very low temps. reversible Fe-Ni forms 3 series of solid solns. contg. Ni and FeNi_2 , FeNi_2 and Fe_3Ni_2 , Fe_3Ni_2 and Fe_2Ni , resp. With irreversible alloys, the exptl. results would indicate that the stable equil. is represented by a solid soln.; but the structure of nickeliferous meteorites would indicate that with extremely slow cooling there are formed 2 phases, camacite and taenite, the segregation of which is possibly facilitated by the impurities present. The segregation accompanies a physico-chem. transformation the nature of which is uncertain but can be linked up with the compd. Fe_2Ni . P. suggests that at very low temps. the irreversible alloys contain 3 constituents, α -Fe, Fe_2Ni with 9 magnetons and Fe_3Ni_2 with 12 magnetons. This displacement of the equil. between the 2 varieties of Fe_2Ni might account for the peculiarity of the law of magnetization as a function of temp. At high temps. (900° and over) all the ferro-nickels are solid solns. when stable, the constituents of which (Fe_2Ni , Fe_3Ni_2 , FeNi_2) are apparent on the curve of Curie's const. The irreversible ferromagnetic and paramagnetic changes are not independent of one another and doubtless accompany the $\beta \rightleftharpoons \gamma$ transformation of the Fe. Bibliography of 48 references.

A. PAPINEAU-COUTURE

Developments in alloy steels and heat treatments. S. J. HEWITT. *Ind. Chemist* 2, 12 (1926).

E. H.

Progress in the chromium and chromium-nickel corrosion-resisting steels industry. W. H. HATFIELD. *Ind. Chemist* 2, 11-2 (1926).

E. H.

The metallurgical aspects of modern boiler practice. L. P. SIDNEY. *Chem. Age* (London) 14, 2-3 (1926).—The growing necessity of fuel economy is causing changes in boiler pressures and temps. and, therefore, on boiler construction. As regards static and dynamic stresses, the question of ultimate elasticity is bound up with the time factor. The question of the behavior of metals, particularly at high temps., involves conditions the exact opposite of those embodied in the classical conception of elasticity, namely, plasticity and viscous flow. The consensus of opinion is that the strength of boiler plate can be satisfactorily increased by the use of steel of high quality contg. certain ams. (as yet undetd.) of Ni and Cr.

W. H. BOYNTON

Tensile tests of crystals of an aluminium zinc alloy. C. F. ELAM. *Proc. Roy. Soc. (London)* 109A, 143-9 (1925).—By the method of straining and heat treatment large crystals were grown in an alloy of Al contg. 18.6% Zn. The crystals rarely exceeded 2 in. in length and 0.5 in. in diam., and the test pieces were smaller. The breaking load varied from 15.08 to 21.70 tons per sq. in. with elongations around 20%. The strength depends on the orientation of the crystal and the consequent type of fracture. The addition of the Zn to Al does not destroy the cubic symmetry of the crystal. The hardness is very much increased. Fracture occurs on planes nearly at 45° to the axis and may occur along the slip-plane, but not necessarily. The tensile strength of single crystals appears to be higher than that of the polycrystalline material. A. W. K.

"Koltchougolumin." V. BOUTALOV. *Messenger de l'industrie des métaux russe* Nos. 1-3, 109-28 (1924); *Rev. métal* 22 (Extraits), 426-9 (1925).—By addn. of Ni to Al alloys, B. obtained an alloy similar to duralumin, contg. small quantities of Cu, Ni, Mn and Mg, the exact compn. of which is not disclosed. It has d. 2.8, tensile strength

up to 60 kg. per sq. mm., can be rolled immediately after casting without heat treatment, and can be machined, forged, etc. On quenching from 500° (not below 490°) it is hardened, but the improvement does not occur immediately, but only after about 8 days. Hardening can be accelerated by immersing in boiling water after quenching. Quenching increases both the tensile strength and elongation. Repeated quenching does not further affect its mech. properties. Fusion is carried out in a crucible furnace, overheating being avoided. Slag is eliminated by addn. of 0.1% ZnCl_2 , either solid or fused, stirring and removing the scum. Mn and Cu (in the form of Al alloys) and Ni (as German silver) are placed in the crucible together with the Al, and the Mg is added just before pouring. The m. p. of the alloy is 650° and it is poured at 750°. B. succeeded in keeping the compn. of the alloy const. after repeated fusions, even avoiding loss of Mg. The mech. treatment of the alloys (rolling, drawing, manuf. of pipes) is described and the official Russian specifications are given. A. P.-C

Boron in aluminium and aluminium alloys. PAUL HAENNI. *Compt. rend.* **181**, 864-6(1925).—Results of tensile and hardness tests are tabulated for: 7 Al-B alloys contg. 0-4% B; 12 Al-Cu-B alloys contg. 4.8 and 12% Cu and 0-8% B; 20 Al-Si-B alloys contg. 2.5, 5, 7.5 and 13% Si and 0-1.6% B; 6 Al-Zn-B alloys contg. 5, 10 and 20% Zn and 0-1.4% B; and 4 complex alloys. On the whole B improves the tensile strength and hardness and decreases the elongation. The addn. of B to Al-Si alloys of the nature of "Alpax" seems to produce a refining similar to Na and alkali fluorides. A. P.-C

The effect of artificial aging on age-hardened aluminium alloys. K. L. MEISSNER. *Metal Ind.* (London) **27**, 333-8(1925); cf. *C. A.* **19**, 3469. M. replies to Gayler (*C. A.* **19**, 3470). Additional proof as to the existence of MgZn_2 and to its age-hardening properties is given.

Influence of aging temperature upon the physical and chemical properties of Lantal. K. L. MEISSNER. *Z. Metallkunde* **17**, 369-73(1925).—Lantal is an Al alloy contg. 4% Cu and 2% Si, but no Mg, in contrast to the *Duralumin* group. The chief difference is that Lantal, after being heated to 500° and quenched, does not acquire desirable properties until it has been aged at elevated temp. The authors det. the effect of aging at various temps. for 16 or 24 hrs. upon Brinell hardness, elastic limit, strength, elongation, bending, etc. With 16 hr. aging, max. hardness is obtained at 150°, Brinell No. 115; max. elastic limit at 165°, 23.8 kg./mm. sq.; max. strength at 160°, 38.0 kg./sq. mm.; max. elongation at 100°, 21%. With 24 hr. aging max. elastic limit is obtained at 165°, 24.7 kg./sq. mm.; max. strength at 140°, 38 kg./sq. mm.; max. elongation at 125°. Curves are shown. In alloys which contain Mg, such as Duralumin, hardness and strength increase at the expense of workability. With this alloy *plasticity* is reduced on aging. Chem. resistance decreases with increase in temp. Thus with NaCl, samples aged 16 hrs. show a loss in wt. of about 11 g./sq. m. at 100° and 69 g./sq. m. at 150°, while when aged 24 hrs. the sharp rise in the curve takes place between 50° and 100°. Photographs are shown. H. STOERTZ

Temperature limits for the deformability of bronze with 20% tin. O. BAUER AND O. VOLLENBRUCK. *Naturwissenschaften* **13**, 1030-1(1925).—It was found from welding expts. at different temps. of Cu-Sn alloys with 20% Sn that between 587° and 798° in the region of ($\alpha + \beta$) crystals they are easily malleable; between 520° and 587° (γ crystals) less easily and not malleable at all below or above these limits. This explains the manuf. of the antique Chinese gongs. B. J. C. VAN DER HOEVEN

The hardness of the ternary alloys of lead, bismuth and cadmium. CLARA DI CAPUA. *Gazz. chim. ital.* **55**, 582-94(1925).—In the system of Pb-Cd (*C. A.* **18**, 3591) Cd enters in solid soln. in Pb and increases the hardness of the Pb considerably but for 2-100% Cd the hardness is a linear function of the compn. In Cd-Bi (*C. A.* **18**, 3034) the unannealed alloys show a max. in the hardness at the eutectic (40% Cd) which disappears on annealing. The same is true of Bi-Pb but the max. lies at 34% Bi. The hardness of ternary alloys Pb-Bi-Cd was studied in 9 sections on the ternary diagram. The results are given in detail in tables and diagrams. The more characteristic result obtained was the low hardness shown by the ternary eutectic in the alloy obtained by casting; at the binary eutectics the cast alloys showed a max. in hardness. The same characteristic is shown in Bi-Sn-Cd and in Pb-Bi-Sn alloys. Cf. the following abstr. E. J. WITZEMANN

The hardness of the ternary alloys of lead, bismuth and tin. CLARA DI CAPUA. *Gazz. chim. ital.* **55**, 594-604(1925).—The binary systems of which this is composed have been studied (*C. A.* **18**, 2320, 3034, 3594) and show different hardness curves depending on whether the alloys were cast or annealed for a long time. Seven sections of the ternary diagram were studied in detail. The results show again (cf. preceding abstr.) that the binary and ternary eutectics can give rise to anomalies in the diagram repre-

senting the changes in hardness in terms of the compn. of the alloy. The anomalies in the 1st case are often in the sense of a greater hardness and in the 2nd of a lesser hardness than that expected. Annealing always eliminates this anomaly. Annealing increases the concn. of the satd. solid solns. of Pb and Bi in Sn. E. J. WITZEMANN

The temperature determination of non-ferrous alloys. R. L. BINNEY. *Metal Ind.* (N. Y.) **23**, 405-7 (1925).—The application of the following types of temp. detn. as applied to non-ferrous alloys is discussed. optical pyrometers, radiation pyrometers, temp. cones, base-metal pyrometers (a) in protecting tubes and (b) for direct immersion, and protected rare metal couples. The potentiometer type is compared to the high and low resistance meters. A combination of the 2 methods is applied. To gage the furnace temp. Pt couples are imbedded in the bottom and connected to a central potentiometer station and an unprotected base metal couple is attached to a portable meter to det. the casting temp. A brief discussion follows. W. H. BOYNTON

Tungsten elgrain wire and a theory of recrystallization. SHIGETAKE OHASHI. *Nagoya Univ. Vol. 1925*, 117-22, *Japan J. Physics* **4**, 23A. When a metal solidifies or recrystallizes the atoms between the boundaries of 2 grains would be arranged chiefly according to the joint action of these 2 and the arrangement would probably be different from that of either grain, being more regular near either boundary. There is no discontinuity in regularity and no sharp boundary surface can be drawn between the regular and the irregular arrangements. Factors which affect the recrystn. temp. are explained and it is shown for W that an approx. relation of recrystn. temp. to the duration of heating may be given by $T = 1250 - 250 \log H$, where T is the abs. temp. and H the duration of heating in hrs. When a metal has just recrystd. the joint action of all the regularly arranged atoms in a grain would influence irregularly arranged ones at the boundary to rearrange to the same orientation as the former. This effect would perhaps be greater as the grain is greater. These rearranged atoms would in turn disturb the equil. of atoms situated near the boundary in the neighboring small grains and force them into an irregular arrangement. Thus the boundary will migrate to the interior of the smaller grain further and further until the latter disappears. As a result of such a process going on everywhere in the interior of metals, the av. size of a grain will increase with time. The recrystn. started from a nucleus is probably hindered by those which have started from the other nuclei, the metal thus being divided into many crystals with different orientations. If one could eliminate all nuclei but 1, or if one could suppress the power of starting rearrangement from all nuclei except 1, the whole mass of the metal would become 1 single grain. In view of the above idea an app. is described which is devised to transform an ordinary drawn W wire to a wire composed of 1 or more exceedingly elongated grains. The wire is heated by passing an elec. current through it between 2 terminals filled with Hg. The heated zone is displaced by traversing wire with a uniform speed less than that of the growth of a grain. The treatment is called "elgraining." Several phys. properties of "elgrain wire" are mentioned. C. J. WEST

Tensile strength of tungsten wires at high temperatures. RYOZO TAJIME. *Nagoya Univ. Vol. 1925*, 413-6; *Japan J. Physics* **4**, 23A.—Tensile strength of drawn W wires, contg. about 1% of thoria, was measured for various temps. The wire (0.076 mm. in diam. and 25 cm. long) was heated *in vacuo* by passing a direct elec. current through it; with a given load, the temp. at which the specimen should be kept in order that rupture would result in a specified time interval was detd. The results of expts. in which the time for rupture was 10 min., are shown by a curve. The tensile strengths in kg./sq. mm. at the following abs. temps. are: 300°, 310; 800°, 200; 1600°, 70; 2000°, 20; 2400°, 9; 2800°, 4.5; 3150°, 1.5. A few expts. were made to det. the effect of size and of heat treatment on the specimen before test. C. J. WEST

Rustless steel V2A and its use in apparatus construction. B. STRAUSS. *Apparaturbau* **37**, 309-11, 321 4 (1925).—See C. A. **19**, 3239. J. H. MOORE

The nature of the protective film of iron. T. FUJIHARA. *Trans. Am. Electrochem. Soc.* **49** (preprint) (1926); cf. C. A. **18**, 1970, 2677.—When a drop of distd. water is placed on a polished Fe surface an uncorroded rim appears at the edge of the drop. F. finds that the liquid on this uncorroded portion has an alk. reaction due to the presence of sol. $\text{Fe}(\text{OH})_2$. The presence of CO_2 destroys this protective film by neutralizing the alk. liquid. This permits corrosion to continue. C. J. BROCKMAN

The rustproofing of materials. M. E. McDONNELL. *Mech. Eng.* **47**, 875-80 (1925).—Data from tests in 1913 by the Penn. R. R. show steels which contain 0.25% Cu to be twice as resistant in the atm. as non-copper-bearing steel. Freight car sides of Cu steel are expected to last 15 years. The present life is 10 years. Cost and operating data for the cars are given. Paint on steel coaches is baked on in steam sheds at

120° and lasts 3 years as against 1.5 years for air-dried finishes. Details of painting are given.

Coating sheet iron with lead. ANON. *Apparaturbau* 37, 327-8(1925).—Pickel in a H_2SO_4 bath, wash free from acid, immerse in a SbCl_3 soln. until the surface turns deep black, wash, treat with ZnCl_2 , dip in molten Pb and cool in oil. The coating is so firmly attached that bending and hammering will not detach it. Cf. C. A. 16, 1068, 2104, 3627; 18, 524, 2679.

J. H. MOORE

Methods for testing the thickness of zinc coatings. HEINZ BABLIK. *Metal Ind.* (London) 28, 33-5(1926); cf. C. A. 19, 2629.—Exptl. results show the increase in wt. after Zn-coating is no measure of the amt. of coating. The various methods of finding the thickness are examd.; B. concludes that the reagents proposed by Bauer (cond. H_2SO_4 20 g., 500 cc. water and 2 g. As_2O_3) and by Aupperle (cond. HCl 100 cc. and 5 cc. of a soln. prep'd. by dissolving 20 g. Sb_2O_3 in 1000 cc. cond. HCl) are the best. Defects of gas-evolution and temp.-increase methods are pointed out.

W. H. B.

Sodium silicate as a corrosion preventive. R. P. RUSSELL. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 47-51, *Am. Dyestuff Rept.* 15, 61-5.

L. W. RIGGS

A new burner for lead soldering. L. QUACK. *Chem. App.* 13, 17(1926); 1 cut.—The "Assa" burner.

J. H. MOORE

The properties and testing of magnetic materials. Effect of heat treatment. T. SPOONER. *Elec. J.* 22, 610(1925).—By annealing rolled elec. sheet the hysteresis loss may be reduced to 1% that of the unannealed sheet and its permeability increased many fold. Oxidation, which tends to reduce induction permeability, may be lessened by covering the sheets and by the use of a reducing atm. After punching, a second anneal is common practice where further reduction of hysteresis losses and increase of permeability is desired, as for transformers and rotating machines. In discussing "aging," it is indicated that this is entirely a temp. effect and is the % increase in Fe losses for 60 cycles and a max. induction of 10 kilogausses after the material has been subjected to a temp. of 100° for 600 hrs. A good 4% Si steel "ages" slightly. S. discusses C and alloy steels with the aid of diagrams and the changes in structure that occur at various temps. He shows that Si has a tendency to increase the A_s point, and that at 2% Si this point disappears. Reference is made to the work of Sauvour, Honda and others, on structural changes. By introducing alloying elements, such as Cr, Mn, Ni, etc., the transformation rate of Fe-C alloys is altered. Induction and hysteresis data for C steels quenched in water and in oil are included, and the effect of drawing on some of the properties of such 1% C steels is explained. Cf. C. A. 19, 2799.

A. D. S

Rust-preventive materials (SWOBODA) 26. Molybdenum, its metallurgy, uses, etc. (EARDLEY-WILMOT) 8.

GEIGER, KARL, BAUER, O. and BECK, L.: *Handbuch der Eisen- und Stahlgiesserei*. Edited by C. Geiger. 2nd ed. revised. Berlin: J. Springer.

Treating sulfide ores. R. D. PIKE. U. S. 1,570,777, Jan. 26. Sulfides in ores or concentrates of Cu, Zn and Fe or of other metals are decomposed by a soln. contg. FeCl_3 or $\text{Fe}_2(\text{SO}_4)_4$ at a temp. at or above the m. p. of S.

Extracting metals from ores. L. V. BROWN. U. S. 1,571,502, Feb. 2. A finely divided ore such as one contg. Pb, Zn, Cu or Ag is treated with moisture and with HCl gas to form sol. chlorides and the mass is dried and heated to convert base substances such as Fe and As into compds. insol. in non-acid solns. and to volatilize any uncombined As. The remaining sol. chlorides are leached out with a non-acid leaching liquor such as a soln. of NaCl, CaCl_2 or MgCl_2 and the resulting soln. is treated for recovery of its contained metals and for the recovery of the Cl as Fe chloride.

Leaching ores. W. G. PERKINS. U. S. 1,570,858, Jan. 26. In leaching Cu or Zn ores or similar materials with ammoniacal solns., the material, after leaching, is treated with a mixt. of steam and NH_3 (with or without CO_2) to prevent repptn. of Cu.

Ore reduction and cement manufacture. A. FERGUSON. Brit. 235,606, Dec. 19, 1923. See U. S. 1,567,934 (C. A. 20, 574).

Tin, molybdenum, bismuth, etc. from ores. GUGGENHEIM BROS. Brit. 235,157, June 7, 1924. Metals such as Sn, Mo and Bi, which form volatile compds. with S, are recovered from ores by heating them with a gas contg. S; e. g., S vapor, H_2S or CS_2 may be passed over Sn ore at a temp. of 800-900°. The gas is dild. with H_2O vapor, N , CO_2 , CO or mixed combustion gases to prevent reduction of Fe compds. and sweep the volatile Sn sulfide through the app. Sn may be obtained from the sulfide by electrolysis or by reduction with H, CO or the like.

Extracting copper and other metals. J. C. HOAL and METALS PRODUCTION, LTD. Brit. 235,641, March 19, 1924. Wet metal-bearing material such as the ppt. of oxidized Cu compds. described in Brit. 185,242 (C. A. 17, 53) is mixed with wood tar, coal tar or the like to effect agglomeration and facilitate sepn. from H_2O . The product may be smelted to obtain Cu contg. some Cu_2O , which can be further purified by poling.

Rotating receptacle for precipitating copper from solutions by use of iron, etc. A. RAMEN. Brit. 235,902, June 20, 1924.

Extruding magnesium. R. L. TEMPLIN. U. S. 1,570,868, Jan. 26. Mg is subjected to die-expression at a temp. of $340-425^\circ$ to form rods, wire, etc.

Blast furnace. C. H. F. BAGLEY. Brit. 235,316, March 14, 1924. In order to maintain the temp. of the hot blast, heat-insulating material is used as a lining for the H_2O -cooled tuyère, removable blow-pipe and connecting elbow.

Cupola furnace. F. VANDERSTEIN. Brit. 234,967, May 1, 1924.

Regenerative open-hearth furnace. N. F. EGLER. U. S. 1,570,954, Jan. 26.

Regenerative open-hearth steel furnace. B. TALBOT. Brit. 235,346, April 24, 1924.

Superposed hearth furnace for reducing iron ore, etc. J. G. AARTS. Brit. 234,951, April 10, 1924.

Slag pocket for open-hearth furnaces. F. ORTH. U. S. 1,570,704, Jan. 26.

Coal-dust and air supply for Siemens-Martin and similar furnaces. R. KRAUSS. U. S. 1,571,418, Feb. 2.

Furnace for heat-treatment of wire. A. F. JACQUEMIN. U. S. 1,571,839, Feb. 2.

Iron and steel manufacture. INTERNATIONAL METAL PRODUCTS CO. Brit. 236,273, April 1, 1924. Ingot Fe in which the aggregate of C, Si, Mn, S and P does not exceed 0.14% is produced by charging an open-hearth furnace with a mixt. of pig Fe and heavy scrap Fe contg. 35-45% of the pig Fe, together with $CaCO_3$ or other flux, melting down the charge at a relatively high temp. and adding Fe ore after the charge has sufficiently heated that this will not produce solidification, continuing the heating and finally tapping off the metal and treating it with Al or other deoxidizer (as described in the following pat.). After this treatment in a ladle the metal is run into ingot molds at a temp. of about 1600° to prevent the formation of skull in the ladle. Brit. 236,274 specifies the use of Al for deoxidizing metal in a ladle after production by a process of this character and gives details of ingot molds, etc.

Iron and other metals. L. P. BASSET. Brit. 234,853, June 2, 1924. In the manuf. of metals such as Fe or its alloys in a rotary furnace, ore is mixed with coal and fluxes, fed into the furnace and heated by injection of fuel in subdivided state with air. The fineness of the fuel and the proportion of air supplied are so regulated that 2 zones of combustion are produced in the furnace, a first or fusing zone where the coal burns to CO_2 and a second or reducing zone where the CO_2 from the first zone is converted into CO by excess fuel not burned in the first zone. The coal used may be very finely powd.

Cleaning steel sheets, etc. MADSENELL CORPORATION. Brit. 236,241, June 27, 1924. In order to remove surface C or occluded H or other gases from steel sheets or the like they are first treated with hot NaOH to remove grease, then rinsed in H_2O , pickled with dil. HCl or H_2SO_4 , again rinsed (if an acid other than H_2SO_4 is used for pickling) and treated as anode in a bath of H_2SO_4 of preferably over 84.5% strength with a cathode of Pb, Fe or steel. Brit. 236,242 specifies following up this electrolytic treatment by a treatment with Na_2CO_3 or other alk. solu. which is allowed to dry on the article and then removed with H_2O which may be slightly acidulated. It is stated that the alk. treatment causes black or dark blue substances to ooze from the metal which are removed by subsequent rinsing.

Heat-treating drill steels. G. H. GILMAN. U. S. 1,571,329, Feb. 2. The bit end of a drill steel is heated while the adjacent metal is kept relatively cool by a draft of air or other cooling fluid directed along the steel toward the heated end. The cutting end of the drill is then hardened by immersing it only in a cooling liquid and the remaining heated portion is finally quenched by gradually immersing it in the cooling liquid.

Preventing steel or other metals from adhering to molds during casting. F. VON BICHOWSKY. U. S. 1,570,802, Jan. 26. Nitrides such as those of Ti, Al or Si are used for coating molds.

Quenching bath. W. J. MERTEN. U. S. 1,571,290, Feb. 2. A bath for quenching steel after heat treatment is formed of H_2O , alkali metal chloride and cyanide and an alk. earth metal oxide, e. g., H_2O 48, NaCl 24, lime 16 and NaCN 12%.

Penetrator for testing the penetration hardness of steels or other materials. C. H. WILSON. U. S. 1,571,310, Feb. 2.

Apparatus for compacting iron, steel or similar metals. C. SCHANANDOAH. U. S. 1,571,737, Feb. 2.

Steel and iron alloys. T. G. SRIG and J. F. L. SRIG. U. S. 1,571,382, Feb. 2. An alloy is bessemerized to reduce the C content to the required degree (but not lower than that required to retain a sufficient quantity of Si to avoid the formation of nitrides), the product is pulverized and is mixed with metal oxides to oxidize the remaining Si and the mixt. is alloyed with melted Fe or steel.

Steel alloys. GLOCKENSTAHLWERKE AKT.-GES. VORM. R. LINDENBERG. Brit. 235,401, June 30, 1924. Steel alloys contain Cr 8-25, C 0.1-1.2, and Mo 0.2-4%, with or without Ni 0.5-2 or Co 0.5-2% (or Ni and Co together up to 3%). Small quantities of Si and Mn and up to 1% of V or Ti also may be present.

Aluminium-silicon alloy castings. D. B. HOBBS. U. S. 1,570,893, Jan. 26. A non-chilling mold is filled with molten Al-Si alloy, the casting is removed from the mold promptly after initial solidification, and is then rapidly chilled.

Coating with silicon. L. D. HOOPER. Brit. 234,969, May 3, 1924. Si or its alloys or silicides, either in finely divided solid form or in heated plastic or molten form, is used for spray coating various materials either directly or after a previous coating of Pb, Sn, Cu or Al is applied. Air or N or CO may be used for supplying the Si material and fluxes such as alk. metals or their halides, aluminates, borates, oxides or hydroxides or Al or Zn halides may be employed.

Coating other metals with chromium and aluminium alloys. P. F. SUMMERS. Brit. 236,033, June 17, 1924. Articles of Fe, steel or non-ferrous metals are heated (preferably in a rotating receptacle) with a mixt. of finely divided Cr-Al alloy, oxide of Cr and Al and small quantities of NH_4Cl or NaCl (if these are desired to accelerate the action), at temps. of 950° or higher, to produce a coating of a ternary alloy of Al, Cr and the metal under treatment.

Plated metal articles. V. D. DAVIGNON. U. S. 1,571,540, Feb. 2. A relatively thick and soft base metal such as brass or Ni silver is coated with a layer of Fe-Ni-Cr alloy or similar metal which is relatively hard, tenacious and resistant to HNO_3 and with an overlying surface layer of Au or other precious metal. U. S. 1,571,541 specifies a similarly coated metal article in which steel is used for the intermediate layer.

Casehardening. W. C. BASSETT. U. S. 1,571,084, Jan. 26. A casehardening compn. is formed from sawdust 12, charcoal 8 and NaHCO_3 1 part. The presence of either free or combined S is avoided.

Casehardening. W. J. MERTEN. U. S. 1,571,289, Feb. 2. A cyanide such as NaCN is heated to produce cyanogen gases and these are allowed to come into contact with the article to be treated. The cyanide is agitated by bubbling unabsorbed gases through it.

Tungsten rods, etc. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 235,213, June 6, 1924. In making rods, blocks and the like from W or similar metals, the metal powder is pressed under such a pressure that during the sintering process crystals are formed which have dimensions of more than 1 cm.

Testing fatigue of materials. INTERNATIONAL GENERAL ELECTRIC CO., INC. Brit. 235,225, June 7, 1924. Alternating stresses are produced in the specimen by an electromagnet excited by an a. c. the source of which is the anode current of 1 or more thermionic valves.

Metal for permanent magnets. J. F. GEE AND F. S. GEE. Brit. 235,947, March 25, 1924. Before magnetizing, castings for magnets are first softened and then hardened by successive heatings and coolings. Steel contg. Co is heated to 650° for $\frac{1}{2}$ hr., cooled, heated to 1200° , cooled and allowed to stand for 18 hrs., reheated to 750° and cooled and finally heated to 1000° for 10 min., cooled and allowed to stand for 12 hrs. before magnetizing.

Coating permanent metal molds. F. MAYER. U. S. 1,570,969, Jan. 26. A colloidal soln. of graphite or the like is used for coating molds for casting Al.

Foundry molds. C. E. LEHR. U. S. 1,571,014, Jan. 26. Molds for casting steel or like metals are formed of comminuted slag 4, foundry sand 1 part and fireclay in small quantity.

Soldering flux. T. GUTTERIDGE. Brit. 235,503, Feb. 27, 1925. Anhyd. ZnCl_2 2, NH_4Cl 16, NaF $2\frac{1}{2}$ and laundry blue 2 parts are ground and mixed.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

X-ray analysis of organic compounds. G. SHEARER. *Science Progress* 20, 450-60 (1926).—A concise summary of the results obtained by the application of X-ray analysis in org. chemistry.

JOSEPH S. HEPBURN

The action of anhydrous aluminium chloride on nonane and on cyclopentane. MILDRED V. COX. *Bull. soc. chim.* 37, 1549-53 (1925).—Nonane when heated for 8 hrs. at 110-120° with AlCl_3 gives butane. The pentene left as a residue seems to polymerize partially into cyclopentane. This idea is supported by the fact that the latter substance is not affected by heating with AlCl_3 .

REYNOLD C. FUSON

Halogen-containing allyl halides. JULIUS V. BRAUN AND MARTIN KUHN. *Ber.* 58B, 2168-73 (1925).—From dibromohydrin (I) treated with 1.5 mols. POBr_3 , first in the cold, then on the H_2O bath and finally in boiling H_2O until the evolution of HBr ceases and then distd. under atm. pressure are obtained tribromohydrin (40% of the I) and 35-40% $\text{CHBr:CHCH}_2\text{Br}$ (II), b. 156°, d_4^{19} 2.061; with POCl_3 instead of POBr_3 is likewise obtained 40% of a nearly pure II, b. 155-6°, d_4^{19} 2.039, contg. only about 1-2% Cl instead of Br; the higher boiling fraction (210°) in this case is richer in Cl and in part doubtless consists of $\text{CHCl}(\text{CH}_2\text{Br})_2$. The addn. products of II with tertiary bases have little tendency to cryst. and are hygroscopic but the NMe_3 compd., $\text{C}_6\text{H}_{13}\text{NBr}_2$, although hygroscopic, crystals well, softens 140° and m., not sharply, 190°; the corresponding hygroscopic quaternary chloride yields an ochre-yellow chloroplatinate decomg. around 250°. The equally hygroscopic γ -chloroalkyl chloride-trimethylamine compd., m. 130-75°. These quaternary salts, which theoretically should exist in stereoisomeric forms, cannot be sepd. into products of sharp m. p. by fractionation from $\text{Et}_2\text{O-EtOH}$. The best ratio of the components for the reaction between $\text{CH}_2\text{:CHBr-CH}_2\text{Br}$ (III), Mg and PhBr (Lespicau, *C. A.* 15, 3074) is 1.1:4.1:1.5, giving 40% β -bromoallylbenzene (IV), b_{14} 94-5°; with $p\text{-MeOC}_6\text{H}_4\text{Br}$ is obtained in somewhat smaller yield 1-methoxy-4- β -bromoallylbenzene, b_{14} 140-5°. II reacts with PhMgBr like III but the isolation of the γ -bromoallylbenzene (V), b_{13} 106°, which boils nearer Ph_2 , is accompanied with greater loss. γ -Chloroallylbenzene, from $\text{ClCH:CHCH}_2\text{Cl}$, b_{13} about 76°. 1-[β -Bromoallyl]naphthalene, from III and 1- $\text{C}_{10}\text{H}_7\text{MgBr}$, b_{12} 165-70°. V with Mg in Et_2O and then with CO_2 yields a substance, m. 45-50°, which is undoubtedly a mixt. of *cis*- and *trans*- $\text{PhCH}_2\text{CH:CHCO}_2\text{H}$. Similarly, IV yields an isomeric acid, $\text{PhCH}_2\text{C}(\text{CH}_2\text{CO}_2\text{H})_2$, m. 73°. $\text{CHBr:CHBrCH}_2\text{Br}$ (VI), b_{10} 90°, in alc. with NMe_3 in Et_2O forms the addn. product, $\text{C}_6\text{H}_{12}\text{NBr}_3$, m. 150-80°, sepd. by means of alc. and Et_2O into a half m. 215° and another m. 165-70° (a mixt. of the 2 softens about 150° and m. 180°). Similarly with $\text{C}_6\text{H}_5\text{N}$ is obtained a product $\text{C}_6\text{H}_5\text{NBr}_3$, m. 140-60°, sepd. into 2 parts, m. 203° and 106-7°, resp. If either of the above 4 quaternary bromides is heated *in vacuo*, it decomps. (together with considerable decompn. in another sense) into the base and VI; the latter with NMe_3 gives again the same mixt. of quaternary salts, so that in the distn. an isomerization of VI resulting in an equl. undoubtedly occurs.

C. A. R.

The chemical manufacture of alcohol. ED. GIROD. *Rev. chim. ind.* 34, 206-9, 238-43, 273-5, 306-8, 341-4, 373-6 (1925).—A review of the manuf. of EtOH from cellulose, C_2H_2 , C_2H_4 , and of a few methods which have been proposed but have not yet been applied commercially.

A. PAPINEAU-COUTURE

Does bismuth cacodyl exist? D. GANASSINI AND U. SANTI. *Boll. chim. farm.* 64, 289-93 (1925).—By heating 2 mols. NaOAc with 1.35 mols. Bi_2O_3 a noncombustible, fuming gas with a slight garlic odor is formed. When heated alone or with H or H_2S it gives the Bi rings. It is possibly the Bi analog of cacodyl, or of cacodyl oxide. Its identity with any of the known Me derivs. of BiH_3 is excluded by its properties and mode of prepn. Kobell's test for Bi is improved by substituting $\text{C}_2\text{H}_5\text{O}_4$ for S.

M. J.

The preparation of aliphatic aldehydes of high molecular weights. L. VALLI-DOUAU. *Rev. parfumerie* 5, 329-33, 369-71 (1925); cf. *C. A.* 19, 34.—Brief outline of the prepn. of aldehydes in C_8 to C_{12} , and of some of their substitution derivs.

A. PAPINEAU-COUTURE

Reduction of aliphatic and aromatic aldazines and ketazines by aluminium amalgam. H. MAZOUREVICH. *Bull. soc. chim.* 37, 1155-67 (1925).—Reduction of aldazines from EtCHO and Me_2CHCHO gave more secondary than primary amine. (RR':N)₂ ($\text{RR}' = \text{Me}_2, \text{Et}_2, \text{MePr}, \text{Pr}_2, \text{EtPh}$) gave chiefly RR'NH . Formation of hydrazines was slight or doubtful. Dipropyl ketazine, yellow, oil, b_{102} 177-81°. PhEt ketazone,

yellow-orange, m. 66–7°. Oxalates ($\text{H}_2\text{C}_2\text{O}_4 = \text{A}$): (Me_2CHCH_2)₂ NIH_2A , m. 245–8°; $\text{Et}_2\text{CHNH}_2\text{A} \cdot \frac{1}{2}\text{H}_2\text{O}$, softens 102–4°, m. 122–4°, $2\text{Et}_2\text{CHNH}_2\text{A}$, m. 218–20°; $2\text{PhCH}_2\text{NH}_2\text{A}$, m. 202°, $2\text{PhEtCHNH}_2\text{A}$, m. 193–5°. $\text{PhNHCON}(\text{CH}_2\text{CHMe}_2)_2$, m. 104–6°; (PhEtCHNH_2)₂ PivCl , m. 202° (decompn.). B. H. NICOLÉ

Bromosulfoacetic acid. H. J. BACKER. *Rec. trav. chim.* **44**, 1056–63 (1925).—Two methods are available for the synthesis of $\text{HO}_3\text{SCHBrCO}_2\text{H}$ (I): (1) $\text{CH}_2\text{BrCO}_2\text{H} + \text{SO}_3 \longrightarrow \text{HO}_3\text{SCHBrCO}_2\text{H}$, (2) $\text{HO}_3\text{SCH}_2\text{CO}_2\text{H} + 2\text{Br} \longrightarrow \text{HO}_3\text{SCHBrCO}_2\text{H} + \text{HBr}$. SO_3 was added drop by drop to $\text{CH}_2\text{BrCO}_2\text{H}$ and gave $\text{CH}_2\text{BrCOOS}_3\text{H}$. This when heated gave I, with the liberation of much heat (in 70% yield as the Ba salt). A small quantity of $\text{CHBr}(\text{SO}_3\text{H})_2$ was obtained as a by-product by the action of SO_3 on I, as was shown by special expts. Reaction (2) was 1st carried out in the presence of P_2O_5 but better results (76% yield) were obtained by brominating in the presence of $\text{H}_2\text{O} + \text{HBr}$, using I as catalyst, at 80° in a sealed tube. At 120° or even 100° decompn. with CO_2 formation occurs. The Na salt may also be brominated in H_2O . Free I was obtained as crystals, m. 119–5°, the Na, NH₄, Ag, Tl and Ba salts are described. It was desired to obtain $\text{CH}_2\text{BrSO}_3\text{H}$ by decompn. of I but when heated at its m. p. it decomps. by a kind of a Cannizzaro reaction thus: $2\text{HO}_3\text{SCHBrCO}_2\text{H} \longrightarrow \text{HO}_3\text{SCH}_2\text{CO}_2\text{H} + \text{HO}_3\text{SCBr}_2\text{CO}_2\text{H}$ and $\text{HO}_3\text{SCHBr}_2\text{CO}_2\text{H} \longrightarrow \text{CHBr}_2\text{SO}_3\text{H} + \text{CO}_2$. Both $\text{HO}_3\text{SCH}_2\text{CO}_2\text{H}$ and $\text{CHBr}_2\text{SO}_3\text{H}$ were isolated as the Ba salts. Andreasch (*Monatsh.* **7**, 167 (1886)) obtained the latter thus: $2\text{CH}_2(\text{SO}_3)(\text{CO}_2)\text{Ba} + 8\text{Br} \longrightarrow (\text{CHBr}_2\text{SO}_3)_2\text{Ba} + \text{BaBr}_2 + 2\text{HBr} + 2\text{CO}_2$. The aq. solns. of I may be boiled without decompn. but in the sealed tube at 200° it decomps. thus: $\text{HO}_3\text{SCHBrCO}_2\text{H} \longrightarrow \text{CH}_2\text{BrSO}_3\text{H} + \text{CO}_2$. The bromomethanesulfonyl acid was isolated as the Ba salt. With bases I is less stable than $\text{HO}_3\text{SCHClCO}_2\text{H}$. K. K.

A new reaction between triacetin and phenol and an improved method for the preparation of triacetin. SHIN ITI KAWAI. *Bull. Inst. Phys. Chem. Res.* **5**, 43–6 (1926).—After heating a mixt. of PhONa , prepd. from 28.2 g. of PhOH and 6.9 g. of Na, and 21.8 g. triacetin at 110–50° for 2 hrs., the cooled product is extd. with Et_2O (C_6H_6 is better) and distd. at 178–97° under 13 mm. It is then treated with a large amt. of H_2O : from the oily layer 2.9 g. of $\text{HOCH}(\text{CH}_2\text{OPh})_2$ is isolated as plates, m. 81–2°. Triacetin is obtained in 81% yield by shaking 70 g. of dehydrated glycerol and 525 g. of Ac_2O until a homogeneous mixt. is obtained. When the elevation in temp. of the mixt. has ceased, it is refluxed for 2 hrs. and subjected to distn. Further distn. is sufficient for purification; it b₇₆₀ 258–9°. K. K.

Compounds of formaldehyde with glycine. HUGO KRAUSE. *Z. physiol. Chem.* **150**, 306–8 (1925).—A discussion of the constitution of the glycine- CH_2O compd.; cf. Bergmann and Ensslin, *C. A.* **19**, 2809.

Absorption spectra of pyruvic acid; existence of tautomeric forms. VICTOR HENRI AND CLAUDE FROMAGEOT. *Bull. soc. chim.* **37**, 845–53 (1925).—Absorption spectra of MeCOCH_2H (I) (b₇ 58°) in H_2O were examd. with a Hilger spectrograph, an Fe-Cu arc being used, concn. and p_{H} were varied. With diln., or with increasing alky. the concn. of the enolic form, $\text{H}_2\text{C}=\text{C}(\text{OH})\text{CO}_2\text{H}$, increased greatly (for est. of rate of increase, see original article). Attention is called to the fact that the presumably more reactive enol exists in high concns. under just those conditions which occur under biol. conditions, where I is supposed to play a part in metabolism. B. H. NICOLÉ

Mucic and allomucic acids. R. HAC AND B. HODINA. *Bull. soc. chim.* **37**, 1242–5 (1925).—A normal salt of saccharic acid, when added to a borax soln., causes the development of acidity, because of the formation of a boric complex of considerable acidity. Na mucate (I) does not behave in this manner; nor does Na allomucate (II). I and II would not be expected to act alike; either allomucic acid (IV) does not have the supposed configuration, or the configuration of the asym. C atom next to the CO_2H group is not the only factor affecting the acidity of the boric complex. Possibly *cis-trans* isomerism is involved. The presence of Cu or a compd. of Cu is necessary for the prepn. of IV from mucic acid (III) by the E. Fischer method. Analysis of III and IV by titration gives irregular results, which depend on the age of the prepn. The m. p. of III varies between 208° and 225°, depending also on the age of the prepn. M. W. MCP.

The reaction between sodium hypobromite and urea. MAXWELL BRUCE DONALD. *J. Chem. Soc.* **127**, 2255–9 (1925).—Of the numerous theories offered to explain why the reaction: $\text{CO}(\text{NH}_2)_2 + 3\text{NaBrO} \longrightarrow \text{CO}_2 + \text{N}_2 + 3\text{NaBr} + 2\text{H}_2\text{O}$, does not complete itself, only that of Fenton (*J. Chem. Soc.* **33**, 300 (1878); *Proc. Chem. Soc.* **1895**, 138) is supported by the present work of D. Neither the concn. of the NaBrO at moderate concns. nor an excess of NaBrO influences the reaction. The chief factor which influences the approach to completeness of the reaction at room temp. is the degree to which the NaOH is brominated. The effect of this was studied for bromina-

tions from 0 to 100%. The reaction is incomplete because of the formation of NaOCN. The amt. of NaOCN formed increases with increase in the ratio NaBrO/NaOH until it corresponds to 75% bromination, when it is oxidized by a secondary reaction. NaCNO solns. are not appreciably oxidized by 75–90% NaBrO solns. except when CO(NH₂)₂ is present. With NaBrO contg. no excess NaOH, NaOCN solns. are vigorously decompd. and the expts. of Margosies and Rose (C. A. 17, 3520) showing that NaOCN is not formed, are inconclusive since they did not take into account the effect of the compn of the NaBrO. The use of 10 N NaOH for estg. CO(NH₂)₂ gasometrically gives inaccurate results, and it is preferable to est. the NaBrO decompd. by adding the CO(NH₂)₂ to the NaBrO, shaking some time, dilg., adding 3 N HCl and aq. KI and titrating with Na₂S₂O₃ (starch), the difference in the Na₂S₂O₃ for this titration and for the NaBrO alone giving the equiv. quantity of NaBrO consumed. C. C. DAVIS.

Action of phenyl isocyanate on methylurea. H. BILTZ AND A. BECK. *Ber.* 58B, 2187–90(1925).—By the action of PhNCO on MeNHCONH₂, B and Jeltsch obtained a methylphenylbiuret, m. 183° (I), in which the Ph must be in the ω -position and it was assumed that the Me was in the ω' -position (C. A. 18, 529). Gatewood, however, synthesized the true PhNHCONHCONHMe (II) and found it to m. 133° and to be certainly different from I (C. A. 19, 972); moreover, in attempting to repeat the work of B. and J. she was never able to obtain their I but only her II. B. and B. have now made a renewed study of their reaction and find that at 80–90° the product is in fact II but if a large excess of PhNCO is used I first crystals from the heated mixt., on cooling, and the filtrate then yields II in greater amt. G. was able to obtain I from PhNHCONHCONH₂ with Me₂SO₄ and, as it differs from II, assigned to it the structure PhNHCONHCONH₂, a conclusion now confirmed by B. and B. According to earlier experience the alphanido groups of biurets can be nitrosated but not their amido groups, and 1 g. II in cold MeOH with N₂O₃ gives 0.7 g. ω -phenyl- ω' -methyl- ω' -nitrosobiuret, decomp. 126°, gives a positive Liebermann reaction, while I remains unchanged under the same conditions. C. A. R.

3-Ethyluric acid and 3-ethylxanthine. HEINRICH BILTZ AND ERNST PEUKERT. *Ber.* 58B, 2190–9(1925).—*o*-Cyanooethyl- ω' -ethylurea (16 g. from 10 g. EtNHCONH₂, 10 g. NCCl₂CO₂H and 20 g. Ac₂O at 75°), m. 167°, soly. in boiling H₂O about 6 (parts in 100), 10 g. with NH₄OH on the H₂O bath gives 6.5 g. 1-ethyl-6-aminouracil, decomp. 282°, soly. in hot H₂O about 2, 10 g. of this with NaNO₂ at 60° slowly treated with AcOH gives 11 g. of the 5-NO deriv., decomp. 249°, soly. in hot H₂O about 1, easily sol. in acids and, with yellow color, in alkalies, forms an *NH₄ salt*, decomp. 255°, which is stable for several days in the air when dry but when moist regenerates the free NO compd. From 10 g. of the NO compd. heated 0.5 hr. at 80° in freshly prepd. (NH₄)₂S is obtained 7 g. 1-ethyl-5,6-diaminouracil, yellow, begins to darken 250°, decomp. 270°, soly. in hot H₂O about 0.8 with yellow color and green fluorescence, insol. in acids and alkalies, readily regenerates the NO compd. in the air. 1-Ethyl-6-aminouracil-5-ethylurethan (6.5 g. from 5 g. of the di-NH₂ compd. in 2 N HCl and ClCO₂Et slowly treated with NaOH), soly. in hot H₂O about 0.67 with faint greenish fluorescence, changes at 230–40° into 3-ethyluric acid (I), prisms with 1 H₂O, slowly decomp. 360°, soly. in hot H₂O 1:190, gives with CH₂N₂ its own wt. of 3-ethyl-1,7,9-trimethyluric acid, m. 240°, sublimes at higher temps. 3-Ethyl-5(4)-chlorouric acid (II), from I in cold AcOH-Ac₂O with Cl, very hygroscopic, reddens from 150° on, extraordinarily unstable towards H₂O, traces of which produce deliquescence and decompn.; Et₂O exts. nothing from the aq. soln. of the resulting sirup, hence no caffolide is formed in the decompn. On the other hand, 0.5 g. of II in H₂O with H₂S gives 0.15 g. diethylalloxantine, m. 209°, giving with FeSO₄ and NH₄OH a deep blue color. II is, therefore, decompd. by H₂O into urea and ethylalloxan. With 10% KI, 0.3 g. II at once gives I and 0.2 g. I. 3-Ethyluric acid glycol Me hemiether (0.3 g. from 0.5 g. freshly prepd. II under 5 cc. cold anhyd. MeOH evapd. in a vacuum desiccator), slightly reddens from 180° up, decomp. 195°, soly. in boiling H₂O about 5, 0.3 g. with fuming HI and PH₃I on the H₂O bath gives 0.1 g. hydantoin. Et hemiether, reddens 160°, decomp. 189°, soly. in boiling H₂O about 5. Even in anhyd. MeOH-C₆H₅N cooled with ice-salt or solid CO₂, II does not give the glycol di-Me ether but only the hemiether, and the same is true of I and anhyd. MeOH treated with Cl. 3-Ethyl-8-chloroxanthine (III) (4 g. from 5 g. I heated 12 hrs. with POCl₃ at 130–5° in sealed tubes, evapd. *in vacuo* and refluxed in anhyd. alc.), decomp. 295°, soly. in boiling H₂O about 0.77, easily sol. in AcOH, dil. alkalies and NH₄OH, reprecipd. by mineral acids, dissolves in hot mineral acids (e. g., 30% HClO₄) and seps. unchanged on cooling, regenerates I with hot alkalies, even when very dil. (0.2 N NaOH); with fuming HI and PIH₄ it yields 3-ethylxanthine, reddens 275°, decomp. 299°, soly. in hot H₂O about 0.4, sol. in mineral acids, alkalies and NH₄OH.

3-Ethyl-8-thiouric acid (3 g. from 3 g. **III** and KSH on the H_2O bath and subsequent acidification with HCl), decomps. $365-70^\circ$, soly. in hot H_2O about 2, sol. in alkalis and NH_4OH at room temp., in dil. mineral acids on heating. *3-Ethyl-1,7-dimethyl-8-chloroxanthine* (**IV**), from **III** with $NaOH-Me_2SO_4$, m. 112° , soly. in hot H_2O about 7, only slightly sol. in 10% $NaOH$, dissolves in Me_2SO_4 , 1 g. with HI gives 0.5 g. *3-ethyl-1,7-dimethylxanthine*, m. 128° , whose perchlorate explodes violently above 300° . *3-Ethyl-1,7-dimethyl-8-thiouric acid* (0.8 g. from 1 g. **IV** with KSH), m. 272° , easily sol. in alkalis and NH_4OH and reprecipitated by acids, also dissolves in hot dil. mineral acids. In KOH with $EtBr$ in sealed tubes at 100° , 1 g. **III** gives 0.7 g. *3,7-diethyl-8-chloroxanthine*, m. 238° , easily sol. in alkalis and mineral acids, converted by boiling dil. $NaOH$ into *3,7-diethyluric acid*, m. 350° , while 1 g. with HI and PI_4I gives 0.5 g. *3,7-diethylxanthine*, m. 183° , sublimes at higher temps., easily sol. in acids and alkalis. C. A. R.

The yellow wing pigment of the brimstone butterfly (*Gonepteryx rhamni*). HEINRICH WIELAND and CLEMENS SCHOPF *Ber.* **58B**, 2178-83 (1925); cf. Hopkins, *Nature*, **45**, 581 (1901-2). The air-dried wings of 500 male butterflies (7.4 g.) were freed of fat and wax in a Soxhlet with Et_2O , then twice digested 4 hrs. in cold 2 N NH_4OH and the exts. concd. *in vacuo* over KOH and H_2SO_4 . The residue was rubbed up 4 times with H_2O and centrifuged and the crude dirty yellow pasty pigment (*xanthopterin*(**I**)) extd. with 20% HCl and pptd. with $NaOAc$, the soln. and pptn. being repeated once more and the **I** washed free of acid and halogen by repeatedly rubbing with H_2O and centrifuging. The **I** so obtained is an amorphous, hygroscopic, ochre-yellow mass, practically insol. in H_2O but easily sol. in dil. NH_4OH and $NaOH$ with yellow color and in excess of 2 N HCl without color. Neither the alk. nor acid solns. nor the aq. soln. obtained by acidifying a very dil. NH_4OH soln. with AcOH fluoresces, but a green fluorescence appears when the **I** is dissolved in a little hot H_2O or the Ba salt is repeatedly recrystd. from H_2O . The aq. soln. of **I** does not redden litmus. **I** is ash-free and has the compn. $(C_8H_5O_2N_4)_n$. Yield, about $\frac{2}{3}$ mg. per butterfly. *Ba salt*, $C_8H_5O_2N_4Ba \cdot 3H_2O$, intensely lemon yellow needles (a photomicrograph of which is given), does not lose in wt. in a microdesiccator even at 140° ; from 23.4 mg. of this salt in 5 cc. dil. HCl added to 2 g. recrystd. $NaOAc$ in 50 cc. H_2O and allowed to stand some days was obtained 8.1 mg. **I** in thick, round, orange-brown cryst. aggregates (photomicrograph) which lose 7-10% in wt. in a microdesiccator at 110° , gradually darken from 270° on and slowly carbonize from about 360° but do not melt 410° . **I** gives the murexide reaction, although not as intensely as an equal wt. of uric acid, it is apparently quite stable towards concd. HCl, is easily attacked by oxidizing agents (Br , H_2O_2) and is reduced by Zn dust in acid or alk. soln. to a leuco compd. pptd. by AcOH or $NaOAc$ in colorless flocks. The structure $\left[\begin{array}{c} NH \cdot CO \cdot CH \cdot N \cdot C \\ CO \cdot NH \cdot CH \cdot NH \end{array} \right]_2$ is suggested for **I**. C. A. R.

Products of condensation between glucose and *p*-phenetidine. **I.** MARIO AMADORI. *Atti accad. Lincei* [6] **2**, 337-42 (1925).—Irvine and Gilmour (*C. A.* **4**, 747) heated *p*-phenetidine (**I**) and glucose (**II**) with 83% $EtOH$ and obtained a compd. (**III**) $C_{14}H_{21}O_6N$. A. found that 2 compds. are obtained from **I** and **II**. In the 1st series of preps., the **I** and **II** were allowed to react in boiling $EtOH$ and in the cold **III**, m. 118° , was obtained without H_2O of crystn. In the 2nd series of preps. **I** and **II** were first heated at $50-80^\circ$. The mixt. melts and then solidifies. The mass is easily sol. in hot $EtOH$ and on cooling seps. a compd. (**IV**) m. 155° . **IV** was also obtained without heating the mixt. 9.6 g. **I** + 12.5 g. **II** with 70-100 g. 99% $EtOH$ were heated 3 hrs. After cooling the soln. is seeded with **III** and 70% of **III** seps. **I** and **II** reacting in various ratios gave the same product. **III** was prepd. by the method of I. and G. and sepd. with 1 mol. of H_2O ; from 99% $EtOH$ it sepd. in the anhyd. form, m. 118° . **IV** was obtained as stated and also from the mother liquors of **III**. **IV** is an isomer of **III** and was described by Claus and Ree (*C. A.* **7**, 2431). E. J. WITZEMANN

Constitution of lichenin and of cellulose. HANS PRINGSHEIM, WERNER KNOLL and ERICH KASTEN. *Ber.* **58B**, 2135-43 (1925).—Lichenin (**I**) heated in glycerol at 210° is broken down into its elementary substance, *lichosan* (**II**), which, obtained in 30% yield, is an amorphous powder appreciably sol. in cold H_2O , forming a true soln. Its inability to cryst. is due to the fact that in the only solvent of it (H_2O) it soon again associates; after a few hrs. the soln. becomes turbid and in a couple of days, especially in the ice chest, sets to a gel corresponding to the original **I** which, after pptn. with alc., yields a ppt. now sol. only in hot H_2O . Röntgen-spectroscopic examn. of the original **I** and of the polysaccharide regenerated from the **II** shows 3 very broad interference rings at $5^\circ 45'$, $10^\circ 6'$, $13^\circ 24'$, and at $5^\circ 50'$, $10^\circ 15'$, $13^\circ 20'$, resp.; the very faint

bands at $17^{\circ} 25'$ and $21^{\circ} 25'$ in the original **I** are not visible in the associated **II**, but the comparison indicates that the 2 substances are identical. This shows that as in the case of inulin (C. A. 18, 2527) in the degradation with glycerol no change in the constitution of the structural mol. occurs. A further confirmation of this conclusion is the fact that both **I** and **II** are optically inactive in H_2O . Acetolysis of **II** under the same conditions as with **I** (Karrer and Joos, C. A. 17, 3323) gives octaacetylbirose. Unlike the other hitherto known glucose anhydrides, **II** is fermented to glucose by dialyzed malt ext. Attempts to obtain cellobiose with a cellobiase-free malt ext. have not thus far given decisive results, as it has not yet been possible satisfactorily to sep. lichenase from cellobiase by adsorption. Assuming structural identity of **I** and **II** and since almost completely methylated **I** yields 2,3,6-trimethylglucose, **II** can be only a glucose (1,4)(1,5)-anhydride, $O.CH.CH(OH).CH(OH).CH.CH(CH_2OH).O$. In its ability to take up

Me, too, **II** behaves like **I**; the di-Me stage is reached only after 4 operations. New evidence of the analogous chem. behavior of **I** and cellulose (**III**) is found in the action of cold concd. HCl. **I** allowed to stand, with stirring, 4 hrs. at room temp. with 37% HCl, then concd. *in vacuo* over KOH, freed from the rest of the HCl with Ag_2CO_3 and pptd. with alc. gives a *biose A* (**IV**) with $[\alpha]_D^{20} 36^{\circ}$ and after 4 days a *biose B* (**V**) with $[\alpha]_D^{20} 110^{\circ}$. From **III** treated with superconc. HCl according to Willstätter and Zechmeister (C. A. 7, 3412) and pptd. with ice before it has been completely degraded to H_2O -sol. products is obtained a substance which does not reduce Fehling solu. and which with 37% HCl gives **V**; **IV** is obtained with 37% HCl from **III** pptd. from its Cu-ammine soln. with HCl (this also gave **V** on long continued treatment with fuming HCl). **IV** has the same optical activity as cellobiose but differs from it in having a materially weaker reducing power and in that, like **V**, in the osazone reaction under the influence of dil AcOH it always yields glucosazone. Attempts to apply the glycerol degradation to **III** led to no results with previously untreated **III** and to uncertain results with Cu-ammine **III**. Cellulose A (Hess, Weltzien and Messner, C. A. 18, 1384) on energetic degradation with glycerol gives, in poor yield, a H_2O -sol., non-reducing, optically inactive depolymerizate. Mol. wt. of **II** in H_2O 190, 177 (c 0.72, 0.99, resp.). Acetate of **II**: mol. wt. in PhOH, from 316 for c 1.001 to 446 for c 2.36; $[\alpha]_D^{20} -31.7^{\circ}$ to -32.7° ($CHCl_3$). Mol. wt. of **IV** from **I**, in H_2O 350, 361 (c 1.136, 1.660), reducing power 25% that of cellobiose; acetate, $[\alpha]_D^{20} 43.5^{\circ}$ ($CHCl_3$). **V** from **I**, mol. wt. in H_2O 340, 313 (c 0.67, 0.37), $[\alpha]_D^{20} 108.7$ - 112° (H_2O), reducing power 9% that of cellobiose; acetate, $[\alpha]_D^{20} 114.6^{\circ}$ ($CHCl_3$). **V** from **III** previously treated with superconc. HCl, mol. wt. in H_2O 338 (c 1.055), $[\alpha]_D^{20} 102^{\circ}$ (H_2O). **IV** from Cu-ammine **III**, mol. wt. in H_2O 386 (c 1.954), $[\alpha]_D^{20} 36.4^{\circ}$ (H_2O); **V**, mol. wt. 361 (c 1.942); $[\alpha]_D^{20} 104.4^{\circ}$. C. A. R.

Odor and molecular asymmetry. **II.** JULIUS V. BRAUN AND WILHELM TEUFFERT *Ber* 58B, 2210-5(1925); cf. C. A. 18, 969.—Et 3-methyl-1-hydroxycyclohexylacetate Wallach and v. B., *Ann.* 414, 168(1901)), b_{18} 126-8°, d_4^{15} 1.004, $[\alpha]_D 1^{\circ} 44'$; the inactive ester has the same b. p. and d. Both esters, heated 3 hrs. at 160° with 2 parts $KHSO_4$, are dehydrated and partially sapond., giving about 40% of the unsatd. ester and 30% of the acid. Active Et 3-methyl-1-cyclohexenylacetate, b_{18} 107-9°, d_4^{14} 0.9644; acid, b_{18} 116°, d_4^{14} 1.0253. Inactive ester, b_{18} 107-10°, d_4^{16} 0.9626; acid, b_{18} 146°, d_4^{16} 1.023. The unsatd. esters are almost quant. hydrogenated in MeOH with H and Pd to the satd. esters. Inactive Et *m*-methylcyclohexylacetate, b_{18} 107-10°, d_4^{14} 0.9338, n_D^{14} 1.4434, hydrolyzed by aq. alc. alkali to the acid, rather thick liquid of faint odor, b_{18} 148°, d_4^{15} 0.9911, n_D^{15} 1.4607. Active ester, has the same b. p. as the inactive ester, d_4^{15} 0.9322, n_D^{15} 1.4442, $[\alpha]_D -7^{\circ} 25'$; acid, same b. p. as the inactive form, d_4^{20} 0.9847, n_D^{20} 1.4595, $[\alpha]_D -9^{\circ} 26'$. Both esters have a strong fruity odor which, however, is so little characteristic that a difference between the 2 cannot well be established. Bromination of the 2 satd. acids with Br and P and treatment with abs. alc. gives 70% of the Et *m*-methylcyclohexylbromoacetates, b_{18} 139-40°, faintly yellow liquids of pleasant odor; inactive ester, d_4^{16} 1.255, n_D^{15} 1.4771; active ester, d_4^{18} 1.2528, n_D^{18} 1.4775, $[\alpha]_D -6^{\circ} 3'$. Heated 100 hrs. in dry C_6H_6 with 2.5 mols. $NHMe_2$ they give 60% of the Et *m*-methylcyclohexyldimethylaminoacetates, liquids of strong basic odor, b_{18} 127°; inactive ester, d_4^{20} 0.943, n_D^{16} 1.4544; active ester, d_4^{20} 0.9398, n_D^{20} 1.4553, $[\alpha]_D -5^{\circ} 13'$; the hygroscopic HCl salts, m. 189° and 187°, resp., and the methiodides 177° and 161°; the picrates are oily. The Ladenburg reduction with well-dried alc. and a 2.5-fold excess of Na gives

70% of the β -*m*-methylcyclohexyl- β -dimethylaminoethyl alcs., b_{16} 128°; inactive alc., d_4^{18} 0.9351, n_D 1.4740 (picrate, oily; *HCl* salt, very hygroscopic; methiodide, m. 173–4°); active alc., d_4^{18} 0.9351, n_D^{18} 1.4742, $[\alpha]_D$ –6° 10' (picrate, oily; *HCl* salt, hygroscopic; methiodide, m. 160–1°). The methiodides, treated with Ag_2O , evapd. to dryness *in vacuo* and heated over a free flame, give 60% of the *m*-methylcyclohexylethylene oxides, b. 72–3°; inactive oxide, liquid of pleasant ethereal odor, d_4^{18} 0.9165, n_D^{18} 1.4527, slowly gives a very faint pink color with fuchsin- SO_2 ; active oxide, has an odor similar to but milder than that of the inactive form, d_4^{18} 0.9165, n_D^{18} 1.4527, $[\alpha]_D$ –10° 54'. Heated 4 hrs. at 160–70° with 10 parts H_2O both oxides give about 50% of the glycols, b_{16} 138–40°, which are converted by H_2SO_4 into the *m*-methylcyclohexylacetaldehydes.

C. A. R.

Dihydrazines. VI. Further experiments in the sugar series with diphenylmethanedimethylhydrazine. JULIUS v. BRAUN AND OTTO BAYER. *Ber.* 58B, 2215–22 (1925); cf. *C. A.* 4, 2639; 8, 924; 11, 2785.—It has been shown that (*p*- $H_2NNMeC_6H_4$)₂- CH_2 (I) reacts in a markedly different way with different sugars (e. g., ketoses do not react with it at all and of the aldoses only those react in which at least 2 adjacent CHOH groups of the 3 following the aldehyde radical have the same configuration). The present paper is a report of a study of the use of I in the prepn. of sugars by taking advantage of the rearrangement which monosaccharides, according to the work of Lobry de Bruyn and his pupils, undergo under the influence of HO ions in very small concns. (dil. alkalis, $Pb(OH)_2$). Under such conditions an aldose gives, together with ketoses, which do not react with I, an epimeric aldose; if the original aldose does not react with I, the rearrangement product should, so that from such a mixt. the new aldose should easily be isolated by means of I, provided it can be regenerated from the dihydrazone; if both aldoses react with I, they still might be simply sepd., after removal of the ketoses and either before or after regeneration from the hydrazone mixt., by some difference in their properties (e. g., on fermentation). Two points had first to be settled: (1) Is it possible to regenerate at all smoothly the sugar from the extraordinarily difficultly sol. dihydrazones? (2) Since with a soln. of unknown aldose content a considerable excess of I must always be used, is it possible that instead of or along with dihydrazones of the type $CH_2(C_6H_4NMeN:R)_2$ (II) (R = sugar residue) the easily sol. hydrazones of the type $R:NMeC_6H_4CH_2C_6H_4NMeNH_2$ (III) are also formed and escape detection? Both questions have been answered satisfactorily. With arabinose, mannose and galactose, hydrazones of type III are formed, to be sure, when a large excess of I is used, but in much smaller amt. than those of type II, and although they are much more sol. in alc., they are quite insol. in dil. AcOH. Regeneration of the sugar from the dihydrazones is a more difficult matter; it cannot be effected with HCl , BzH , enanthial, etc., nor even with aq. $HCHO$, and only $HCHO$ solns. contg. much C_6H_5N proved effective, owing to the much greater soly. of the dihydrazones in this medium. With glucose, fructose or invert sugar v. B. and B. were able to obtain easily and in about the amts. detd. by L. de B. the only sugar (mannose) which reacts with I. In the case of *d*-galactose, both it and its epimer, *d*-talose, would be expected to react with I and such proved to be the fact, but as talose is not fermentable, the unchanged galactose was fermented away and the talose was easily sepd. by means of I from the ketoses formed by the action of the alkali, thus making it now a comparatively readily available sugar. Galactose in dil. AcOH with 5 mols. I gives after 1 hr. a mixt. sepd. by means of C_6H_5N -alc. into the insol. dihydrazone (II), m. 215° (yield, 75% of the calcd.) and 24% of the sol. *mono-compd.* (III) (pptd. by H_2O from the concd. soln.), m. 175°. With 2 mols. I the yield of the III is 20% and with 1 mol. 13%. Arabinose with 6 mols. I gives 15% of the *mono-compd.*, m. 155°; with 2 mols., 5%. Mannose gives, even with a large excess of I, only traces of the *mono-compd.*, m. 165°. The optimum conditions for the regeneration of the sugar from the dihydrazones are 10 parts dihydrazone, 25 vols. C_6H_5N , 25 vols. H_2O and 15 vols. of 30% $HCHO$ warmed over a small flame until clear and then 0.5 hr. on the H_2O bath. Arabinose in this way was recovered in 62% yield, galactose in about 30% yield. From 100 g. galactose heated 1 hr. at 100° with $Pb(OH)_2$ and then treated as outlined above is obtained 5–7 g. *talose dihydrazone* (II), faintly brownish powder, m. 185°: the free talose (2–3 g.), light sirup which could not be made to cryst., shows, contrary to previous observers, *l*-rotation (–32.5° in 0.5% soln. in a 0.5-dm. tube), whence it is to be represented as *d*(–)-talose; its whitish yellow phenylhydrazone m. 178° (decompn.); *p*-bromophenylhydrazone, yellow, m. 205°; benzylphenylhydrazone, faintly yellowish, m. 199°; methylphenylhydrazone, m. 220–2° (Blanksma and van Ekenstein, *C. A.* 3, 779, give 154°).

C. A. R.

Rule of alternation of radicals in aromatic derivatives. J. PASTAK. *Rev. gén. sci.* 36, 70-6(1925).—Radicals are divided into 2 classes: basic, H, alkyl, Cl, Br, OH, NH₂; acid, HSO₃, NO₂, CO₂H, N:NAr, Cl, Br, etc. Substituents of the same class as the group already present, enter *meta*; those of a different class enter *ortho* or *para*. P. finds it necessary to include halogens in both groups to explain results consistently. No new exptl. work is given. B. H. NICOLET

Some derivatives of toluene. RAOUL POGGI. *Atti accad. Lincei* [6], 2, 423-7 (1925).—Some new derivs. of PhMe are described. 1-Iodomethyl-3-nitrobenzene, obtained by boiling the corresponding Cl compd. in EtOH with a slight excess of KI, yellowish, m. 84.5-86°. 1-Iodomethyl-2,4-dinitrobenzene, m. 75.5-76°, was obtained similarly from the Cl deriv. (cf. Jackson and Whitmore, *C. A.* 9, 2531). *p*-O₂NC₆H₄-CH₂SCN treated with 10 parts of concd. H₂SO₄ for 6 hrs. at 0° and then poured into ice H₂O sepd. the *p*-nitrobenzyl mono-thiocarbamate, O₂NC₆H₄CH₂SCONH₂, m. 140-1°, boiled with 20% HCl, H₂S, NH₃, CO₂ and *p*-O₂NC₆H₄CH₂SH, m. 55°, are formed. *m*-NCC₆H₄Me brominated at 160° by Sandmeyer's method gave 1-bromomethyl-3-cyanobenzene, m. 94-5.5°. This compd. with KCNS gave the corresponding thiocyanate deriv. (Hörllich, *Ber.* 34, 3370(1901)). 1-Iodomethyl-3-cyanobenzene, m. 113-4° and 1-iodomethyl-2-cyanobenzene, m. 77-8°, were obtained by boiling the corresponding Cl compds. with KI in EtOH; *p*-CNC₆H₄CH₂Cl boiled 0.5 hr. with Na₂S₂O₅ in 50% EtOH sepd. on cooling the thiosulfate NCC₆H₄CH₂S₂O₂Na, which in concd. H₂SO₄ at 70° gave *p*-cyanobenzyl mercaptan (I) NCC₆H₄CH₂SH as an oil that solidifies, m. 43°. I oxidized with I in EtOH gave the corresponding disulfide, m. 147.5°. E. J. W.

Syntheses in the aliphatic-aromatic series. XV. *o*- γ -Bromopropylbenzyl bromide. JULIUS V. BRAUN and WILHELM KAISER. *Ber.* 58B, 2162-4(1925); cf. *C. A.* 18, 829; 20, 391.—*o*-ClCH₂CH₂CH₂C₆H₄CN with 1.3 atoms Na in boiling alc. gives almost 90% of the cyano ether EtO(CH₂)₃C₆H₄CN, slightly yellow liquid of faint odor, b₁₆ 150°, which in decalin at 100° with N under 30 atm. yields almost 60% of the amine EtO(CH₂)₃C₆H₄-CH₂NH₂ (I), b₁₄ 155-8°, quickly absorbs CO₂ from the air; *HCl salt*, m. 112°. Together with I is formed about 0.5 its wt. of a fraction b₁₄ 180-280°, which on repeated distn. yields more I (bringing its total yield to above 70%) and a N-free substance which is probably C₆H₄.CH₂.CH₂.CH(OEt).CH₂. In AcOH with NaNO₂ I gives 90%

of the HO ether EtO(CH₂)₃C₆H₄CH₂OH (II), mobile, almost odorless liquid, b₁₆ 165-70° (still slightly impure; found, C 73.63, H 9.34%). When II is heated 4 hrs. in a sealed tube at 100° with 6 parts of 60% HBr it yields a faintly yellow oil, b₁₆ 168-75°, affecting the eyes like PhCH₂Br, whose Br content indicates that a Br atom has, for the most part, replaced the 6-HO group, but the product is not homogeneous and already contains about 20% of the dibromide; if the heating is continued 17 hrs., much EtBr is evolved and the Br content of the product rises to almost 51% (calcd. for *o*- γ -bromopropylbenzyl bromide (III), 54.74%); another 5 hrs. heating gives products b. 175°, with almost 54% Br, which may be considered as practically pure III; they are heavier than H₂O, irritate the mucous membranes, are faintly yellow and can be distd. without decompn. but cannot be crystd. Heating longer than 22 hrs. results in secondary reactions; the b. p. rises, the Br content increases beyond 55% and much less homogeneous products are obtained. With 2 mols. NHMe₂ in C₆H₆, III evolves heat and yields almost quant. *asym*-homotetrahydroisoquinoline methobromide, m. 241-2°; chloroplatinate, m. 257-8°. C. A. R.

Cyclic sulfides. III. JULIUS V. BRAUN. *Ber.* 58B, 2165-8(1925); cf. *C. A.* 5, 696.—It has been pointed out that the tendency to the formation of a polymethylene sulfide, (CH₂)_nS, from Br(CN)_nBr and S runs approx. parallel to the tendency to the formation of a N ring with 1 more CH₂ group, (CH₂)_{n+1}NR, whereas in the benzo derivs. of the polymethylene imines the differences in the tendency to the formation of the individual derivs. of the series practically disappear. In the present paper it is shown that in the benzopolymethylene sulfides the no. of members in the S ring does not have a marked influence on the ring formation but, unlike the imines, the direct or indirect union of the S to the aromatic nucleus does. *o*-Xylylene sulfide, obtained in 40% yield from C₆H₄(CH₂Br)₂ in alc. with 1.5-3.0 mols. aq. Na₂S on the H₂O bath, b₁₄ 108°, m. 26°, is stable for months when protected from the air, d₄²⁶ 1.143, has a thiophene-like odor, becomes discolored rapidly in the air; methiodide, m. 175° (Hjelt, *Ber.* 22, 2904(1889), gives 155°) and is snow-white. 2,3-Dihydrothionaphthene, obtained almost quant. from diazotized *o*-ClCH₂CH₂C₆H₄NH₂.HCl and KOCS₂Et and subsequent heating with alc. KOH, faintly yellow, b₁₁ 104°, d₄²¹ 1.129, has a styrene-like odor, adds MeI with exceeding sluggishness, is oxidized by the calcd. amt. of KMnO₄ to the sulfone, m. 98°, and

with 1.1 atoms S at 200° gives H₂S and thionaphthene. *Homoisothiochroman*, obtained in only 40% yield from *o*-Br(CH₂)₂C₆H₄CH₂Br (preceding abstr.) and Na₂S, b₁₄ 141–5°, m. 95–6°; *methiodide*, m. 154°; *sulfone*, m. 176°.
C. A. R.

The introduction of two atoms of bromine in *m*-acetotoluidide. S. C. J. OLIVIER. *Rec. trav. chim.* **44**, 1109–12(1925).—*m*-Toluidine treated in AcOH with 2 mols. of Br gave much tribromotoluidine (I). When a 6–7% soln. of aceto-*m*-toluidine in AcOH was treated with 2 mols. of Br₂, no I was formed, but 93% of a mixt. of 2 isomeric di-Br derivs., m. 30–5°, was obtained. This crystd. from EtOH first sepd. a 4,6-dibromo-3-acetamino-1-methylbenzene (II), m. 171.5–2.5°, which on sapon. gave the *free base* (III), m. 76–7°. III oxidized (cf. C. A. **19**, 1259) gave 2,4-Br₂C₆H₃CO₂H, thus proving its constitution. The mother liquors from II gave 2,6-di-Br isomer (IV) of II, m. 117–28°, of which the *free base* (V), m. 66.5–67°. The latter on oxidation gave 2,6-Br₂C₆H₃CO₂H, m. 150–1°, thus proving the constitution of IV. The m. p. diagram for mixts. of II and V was detd. The crude product was thus found to contain 73% of III and 27% of V. The product m. 33–5° obtained by Neville and Winter (*Ber.* **13**, 971(1880)) was a eutectic mixt. of III and V.
E. J. WITZEMANN

The reaction between methanol and phenol at high temperature and under pressure. Preliminary paper. V. IPATIEV, I. ORLOV AND G. RAZOUBAIEV. *Bull. soc. chim.* **37**, 1576–7(1925).—When 1 part of PhOH is heated in the presence of Al₂O₃ in the app. of I. for 24 hrs. at 44° and 200 atm. with 6 parts of MeOH, there result *o*-HOC₆H₄Me and small quantities of PhH and its homologs and a little PhOMe. Expts. with EtOH give similar results. PhOMe is probably an intermediate product. Heated under similar conditions it gives *o*-HOC₆H₄Me.
REYNOLD C. FUSON

Some ketonic alcohols of the general formula PhCH(OH)COR. TIFFENEAU AND J. LEVY. *Bull. soc. chim.* **37**, 1247–51(1925).—T. and L. studied the prepn. and properties of PhCH(OH)COR in which R = Me, Et, Pr, iso-Pr, Bu, iso-Bu and benzyl. These were prepd. by the action of alkyl-MgBr or alkyl-MgI on PhCH(OH)CONH₂ (I) or PhCH(OH)CN (II), preferably I because pure products were more easily obtained from it. They reduce hot Fehling soln., are usually volatile in steam, give cryst. semicarbazones, sometimes give solid oximes and give, with org. Mg derivs., secondary tertiary glycols. I, m. 132°, was obtained from NH₃ and PhCH(OH)CO₂Et. II was obtained from NaCN and the bisulfite compd. of BzH. From I was obtained PhCH(OH)COEt (III), b₁₁ 124–8°, m. about 32–3°, in 40% yield; from II, in 27% yield. Semicarbazone, m. 89–90°, gives III with H₂SO₄. Oxime, m. 97°. From I was obtained PhCH(OH)COiPr (IV), b₂₈ 159–62°, d₄ 1.064, in 30% yield. Semicarbazone, m. 157–8°. From I was obtained PhCH(OH)COCHMe₂, b₃₈ 160–70°, m. 44–5°, in 28–30% yield; from II, in 20% yield. Semicarbazone, m. 158–9°. From I was obtained PhCH(OH)COBu, b₁₈ 145–60°, d₄ 1.045, in 20% yield; from II, in 12% yield. Semicarbazone, m. 152–3°. Oxime, m. 95–6°. From I was obtained PhCH(OH)COCH₂CHMe₂, b₃₈ 155–7°, d₄ 1.048, in 17% yield. Semicarbazone, m. 123°. Oxime, m. 99–100°. From I was obtained PhCH(OH)COCH₂Ph, m. 115–6°; more easily from II, in 30% yield. Semicarbazone, m. 189–90°.
MARGARET W. MCPHERSON

Isomerization of diphenylallyl alcohol into benzylaceto-phenone. HIROSHI NOMURA. *Bull. soc. chim.* **37**, 1245–7(1925).—PhCH₂CHCH(OH)Ph (I) (21 g.), m. 56.5–7.0°, was obtained from 25 g. PhCH:CHCHO and excess PhMgBr. I decolorizes Br in CHCl₃ and also KMnO₄. Its acetate (II) b₉ 211°. I and Na and EtOH give PhCH₂CH₂COPh (III), m. 72°, whose oxime, m. 84.5–5.0°, instead of 87° or 82° as given in the literature. II and alc. KOH give III. I (2 g.) and alc. KOH give 1.9 g. III.
MARGARET W. MCPHERSON

Phenol: its synthesis, uses and derivatives. G. M. DYSON. *Chem. Age* (London) **14**, 70–3(1926).—A review.
E. H.

The alkylation of phenols. M. BUSCH. *Z. angew. Chem.* **38**, 1145–6(1925); cf. C. A. **19**, 2038.—The tendency of benzyl radicals toward C-alkylation of phenols increases with the increasing substitution of the methane C. While it is possible to obtain ethers with PhCH₂Cl in non-dissociating media, Ph₂CHCl yields only the C derivs. Of the deeply colored intermediate addn. products the red 1-hydroxy-2-diphenylmethyl-6-diphenylbromomethyl-4-benzaldehyde was isolated. On recrystn. from hot alc. it yields the colorless 1-hydroxy-2,6-bis-[diphenylmethyl]-4-benzaldehyde. PhOH homologs behave like PhOH; polyphenols are disubstituted. Of the nitrophenols *o*- does not react, *m*- forms the ether, *p*- is disubstituted. In alk. soln. all 3 give ethers. A great no. of phenols yield with Ph₂CN₂ 10–90% ether. Negative substituents seem to favor the reaction. The ethers cannot be rearranged by migration of the alkyl

into the nucleus. Polyphenols are not etherized but catalyze the decompn. of Ph_3CN_2 to diketazine.

MARY JACOBSEN

Interactions of tellurium tetrachloride and aryl alkyl ethers. I. G. T. MORGAN AND H. D. K. DREW. *J. Chem. Soc.* **127**, 2307–15(1925); cf. *C. A.* **20**, 413.—A mixt. of TeCl_4 (12 g.), PhOEt (17 g.) and dry CHCl_3 (75 cc.) heated with reflux evolved HCl and pptd. from the soln. 92% of *p*-phenetyltellurium trichloride (I), glistening yellow, m. $182-3^\circ$ to a red liquid, gives yellow solns. in hot CHCl_3 and in C_6H_6 and a colorless soln. (due to hydrolysis) in EtOH . I (6 g.) reduced at 0° with KHSO_3 (11.3 g.) and H_2O (50 cc.) yielded almost quant. *bis*-*p*-phenetyl ditelluride (II), brilliant orange-red, m. $107-8^\circ$ to a deep red liquid, gives red solns. in org. solvents, unattacked by boiling NH_4OH , decompd. by MeI and forms *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{OEt}$ when evapd. with cold concd. HNO_3 . I heated with PhOEt (1.4 by wt.) at $180-90^\circ$ evolved HCl and on addn. of petroleum pptd. *bis*-*p*-phenetyltellurium dichloride, colorless, m. 108° . The formation of I and II proves to be erroneous the data of Rust (*Ber.* **30**, 2829(1897)), Rohrbach (*Ann.* **315**, 9(1901)) and Lederer (*C. A.* **10**, 769; **11**, 2670), all of whom obtained what were supposedly $(\text{EtOC}_6\text{H}_4)_2\text{TeCl}_2$ and $(\text{EtOC}_6\text{H}_4)_2\text{Te}$. TeCl_4 (2.9 g.), *m*- $\text{C}_6\text{H}_4(\text{OMe})_2$ (III) (1.5 g.) and dry CHCl_3 (30 cc.) heated at 100° evolved HCl , forming a deep-brown-yellow soln., which on removal of CHCl_3 , stirring the resulting crystd. sirup with CCl_4 , and addn. of CHCl_3 pptd. 2.7 g. 1,3-dimethoxyphenyl-4-tellurium trichloride (IV), primrose-yellow needles or golden yellow prisms, m. $155-6^\circ$ to a yellow liquid turning immediately red, evolves III when warmed with aq. KOH . With TeCl_4 (4.2 g.), III (4.2 g.) and CHCl_3 (10 cc.) at 100° the product (4.9 g.) was a mixt. of IV and *bis*-1,3-dimethoxyphenyl-4-tellurium dichloride (V). With TeCl_4 (6.7 g.), III (1.8 g.) and CHCl_3 (12 cc.) at higher temps. a 2nd atom of Te was not introduced in the aromatic nucleus and only a mixt. of IV, V and unchanged TeCl_4 was obtained. Reduction with excess aq. KHSO_3 decompd. IV but not V, the latter being then extd. with boiling EtOH , colorless pearly, m. $204-5^\circ$, decompd. by hot aq. KOH with liberation of III. The difference in the condensation of PhOEt and of III with TeCl_4 is due to the comparative insoly. in CHCl_3 of I, which is pptd. as fast as formed. IV (1.2 g.) reduced by KHSO_3 (2.1 g.) and H_2O (10 cc.) gave quant. *bis*-1,3-dimethoxyphenyl-4,4-tellurium trichloride (VI), orange-brown needles or prisms, m. $134-5^\circ$ to a red liquid, does not react with aq. alkalis, gives an intense red-purple color with cold concd. H_2SO_4 . TeCl_4 (1 mol.), guaiacol (2 mols.) and dry CHCl_3 (5 cc. per g. of TeCl_4) at 100° evolved HCl and gave a deep yellow-green soln. which, concd. *in vacuo* and the unchanged guaiacol extd. with petroleum, gave on boiling with CHCl_3 or C_6H_6 2 products, (1) an unidentified amorphous, insol. mustard-yellow powder decompg. at about 180° and (2) 2-hydroxy-1-methoxyphenyl-4-tellurium trichloride, deep yellow, m. $157-9^\circ$ (decompn.), hydrolyzed in soln. by moist air. Reduced with aq. KHSO_3 at 0° it formed *bis*-2-hydroxy-1-methoxyphenyl-4,4-ditelluride (VII), orange-brown prisms, slowly darkens above 114° , m. $117-8^\circ$ (liberating Te), decompd. by boiling EtOH , yields with aq. NaOH or Na_2CO_3 (but not NaHCO_3) the Na salt, yellow-orange in soln., from which VII is reprecipd. by mineral acids. Addn. of $\text{ClCH}_2\text{CO}_2\text{H}$ to VII in aq. NaOH pptd. purple-blue flakes of a substance which gave a red soln. in dil. aq. NaOH but decompd. on removal from soln. *Bis*-*p*-anisyl ditelluride (VIII) (5 g.) in MeI (78 g.) heated at 100° with reflux pptd. *p*-anisyl dimethyltellurium iodide (IX), salmon-color, m. $170-2^\circ$, almost insol. in org. solvents, hydrolyzed by boiling EtOH , not reduced by aq. alkali bisulfites, decompd. by warm aq. Na picrate (contg. free picric acid) with formation of 2 products: (1) the picrate obtained by Lederer, m. $126-7^\circ$ and (2) a substance which was probably an addn. compd. of picric acid and *p*-anisylmethyl telluride, pale yellow, changes slowly at 160° and decompd. with effervescence at 176° to a clear yellow liquid. The MeI mother liquor from the prepn. of IX contained only *p*-anisylmethyltellurium diiodide (X), red, m. 109° , reduced by KHSO_3 in presence of Et_2O to *p*-anisylmethyl telluride, yellow oil with nauseating odor. Part of the X was retransformed to VIII by partial reduction, followed by intra-mol. loss of MeI , the reactions being: (1) $\text{MeOC}_6\text{H}_4\text{TeMeI} \rightarrow 2\text{HI} + \text{MeOC}_6\text{H}_4\text{TeMe}$ and (2) $2\text{MeOC}_6\text{H}_4\text{TeMeI}_2 \rightarrow 2\text{HI} + \text{MeOC}_6\text{H}_4\text{TeMeI} \cdot \text{TeMeIC}_6\text{H}_4\text{OMe} \rightarrow 2\text{HI} + 2\text{MeI} + \text{MeOC}_6\text{H}_4\text{Te} \cdot \text{TeC}_6\text{H}_4\text{OMe}$. The expts. show in several more cases (*loc. cit.*) defects in the work and conclusions of Lederer.

C. C. DAVIS

Nitration of creosol, acetylcreosol and homoveratrole. MAX OBERLIN. *Arch. Pharm.* **263**, 641–68(1925).—Nitration studies were carried out on creosol, acetylcreosol and homoveratrole, and the following new derivs. prepd. and characterized: 2,6-Dinitroacetylcreosol, $\text{C}_{10}\text{H}_{10}\text{N}_2\text{O}_7$, from acetylcreosol or 6-nitroacetylcreosol with fuming HNO_3 (d. 1.52) at 5° to 20° , m. $101-2^\circ$, converted by 10% NaOH into 2,6-dinitroacresol, $\text{C}_8\text{H}_8\text{N}_2\text{O}_6$, pale yellow granular crystals, m. $107-8^\circ$, which yield *via* Schotten-Baumann 2,6-dinitrobenzoylcreosol, $\text{C}_{18}\text{H}_{12}\text{N}_2\text{O}_7$, pale yellow, m. $111-2^\circ$;

2,6-dinitrohomoveratrole, $C_9H_9N_2O_6$, from 2,6-dinitrocreosol, 15% NaOH and Me_2SO_4 , m. 90–1°; 5-nitrocreosol, $C_8H_8NO_4$, from creosol and HNO_3 (1.52), both in cold dry Et_2O , m. 81–2°, yielding with Ac_2O 5-nitroacetylcreosol, $C_{10}H_{11}NO_6$, m. 89–90°, converted by HNO_3 (d. 1.52) into 5,6-dinitroacetylcreosol, $C_{10}H_{10}N_2O_7$, m. 151–2°, which on soln. in concd. H_2SO_4 yields 5,6-dinitrocreosol, $C_8H_8N_2O_6$, yellow, m. 163–4°. 2,5,6-Trinitrocreosol, from dry 2,6-dinitrocreosol in concd. H_2SO_4 with KNO_3 in the cold, deep yellow granular crystals, m. 83–4°, yielding with Ac_2O 2,5,6-trinitroacetylcreosol, $C_{10}H_9N_3O_8$, pale yellow, m. 109–10°, or with Me_2SO_4 2,5,6-trinitrohomoveratrole, $C_9H_9N_3O_8$, m. 100–1°, reduced by H_2S in NH_4OH to 2-nitro-6-aminohomoveratrole, $C_9H_{12}N_2O_4$, deep yellow, m. 104–5° (*Bz* deriv. $C_{10}H_{11}N_2O_6$, m. 170–1°), yielding on diazotization 2-nitrohomoveratrole, $C_9H_{11}NO_4$, b₁ 148–8.5° (decompn.) b₁ 115–7°, b_{0.5} 108–10°.

W. O. E.

The preparation of catechol-*o*-carboxylic acid and the condensation between catechol and glycerol. SN-ITI KAWAI. *Bull. Inst. Phys. Chem. Res.* 5, 47–9 (1926).—Five g. of catechol are mixed well with 20 g. of $KHCO_3$ in a mortar, then with 15 g. of glycerol, dehydrated at 170°, and poured into a Cu flask of 500 cc. After 1 day the mixt. is heated in a Victor Meyer dryer in a current of CO_2 for 16.5 hrs., $PhOH$ being used as a heating liquid. After cooling the reaction product is dissolved in HCl and extd. with Et_2O , which is then washed with $KHCO_3$ soln. several times. From the alkali soln., 1.6 g. of 1,2-dihydroxybenzene-3,6-dicarboxylic acid and 3.37 g. of catechol-*o*-carboxylic acid are isolated. From the Et_2O soln., 1.47 g. of catechol and 0.09 g. of catechyl glyceryl ether are obtained. By treating 5 g. of catechol, 10 g. of $KHCO_3$ and 70 g. of glycerol by the same method, 0.49 g. of catechol-*o*-carboxylic acid, 0.34 g. of catechol and 4.45 g. of catechyl glyceryl ether is obtained. By the same method, no reaction is observed between pyrogallallic acid and glycerol and between mannitol and catechol.

K. K.

A practical method for the preparation of perbenzoic acid. J. LÉVY AND R. LA-GRAVE. *Bull. soc. chim.* 37, 1597–600 (1925).— Bz_2O_2 in $PhMe$ is treated with $EtONa$ at –5°. The resulting BzO_2Na gives 85% of BzO_2H when treated with acid in the cold.

REYNOLD C. FUSON

The chlorination of *o*- and *p*-aminobenzoic acids. L. ELION. *Rec. trav. chim.* 44, 1106–8 (1925).—The prepn. of 3,5,2- $Cl_3(H_2N)C_6H_3CO_2H$ (I) from anthranilic acid with SO_2Cl_2 was described by Eller and Klemm (*C. A.* 16, 2317) and Durrans (*C. A.* 17, 2875). The following method is more convenient: com. anthranilic acid was dissolved in 10 parts of $AcOH$, filtered and treated with the calcd. amt. of Cl while cooling in H_2O . A ppt. was formed at once. An equal vol. of Na_2SO_3 soln. was then added, and the ppt. was filtered off. Acidifying the filtrate pptd. 75% of I, m. 231°. I boiled 15 min. with 5 parts Ac_2O gave 3,5-dichloroacetyl anthranil (II), m. 151°. II boiled with NaOH is slowly dissolved and on acidifying the soln. 3,5-dichloro-2-acetylaminobenzoic acid, m. 203°, is pptd.; this is sapond. by HCl, giving I. In a previous paper E. (*C. A.* 17, 3488) described the prepn. of 3,5,4- $Cl_3(H_2N)C_6H_3CO_2H$ (III) by chlorination of *p*- $H_2NC_6H_4CO_2H$ in $AcOH + HCl$ with $KClO_3$. Better results are obtained in chlorinating as with I above. 35% III is obtained and much *sym*- $Cl_3C_6H_3NH_2$ (IV), indicating that the *p*- CO_2H group is more easily replaced than the *o*- CO_2H in I since in this case only a little IV is obtained.

E. J. WITZEMANN

An addition product of mandelic acid and benzene. C. W. ZAHN. *Rec. trav. chim.* 44, 1048–50 (1925). (In English).—When mandelic acid is crystd. from boiling C_6H_6 and the crystals are allowed to stand with the mother liquor for several days at room temp. a 1:1 addn. product of the acid with C_6H_6 is formed. This product is indefinitely stable at room temp. in contact with C_6H_6 but dissociates easily in air, leaving the soft white powder of ordinary C_6H_6 -free mandelic acid. It is not formed at 45° which suggested that it has a transition point lying below this temp. and this was found to lie between 32.6° and 32.7°.

E. J. WITZEMANN

Formation of coumarins from citric acid and phenols. ARNO MÜLLER. *Ber.* 58B, 2202–9 (1925).—Hydrated citric acid (I) (100 g.), 50 g. *m*-cresol and 300 g. H_2SO_4 (d 1.84) heated to 130° in the course of 25 min. yield 6.2 g. (crude product) of 4,7-dimethylcoumarin (II), m. 132° (cor.); judging from the odor, coumarone-like substances are formed at the same time. I dehydrated according to v. Pechmann (*Ann.* 261, 155) under the same conditions gives 2.8 g. crude II, 73% H_2SO_4 yields resinous products and 10% oleum gives only 1 g. crude II. *p*-Cresol gives 1 g. of crude product from which can be isolated a small amt. of leaflets having the same m. p. as 4,6-dimethylcoumarin, while *o*-cresol yields 0.6 g. of a crude product from which no cryst. substance can be isolated. I (50 g.) and 25 g. crystd. orcinol heated 30 min. at 110–30° with concd. H_2SO_4 give 40 g. of a brick-red product, from 0.5 of which is isolated about 10 g.

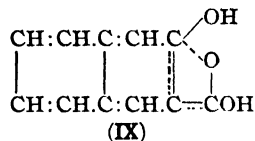
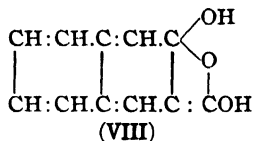
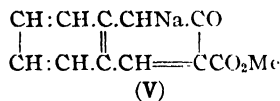
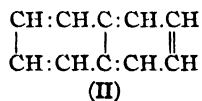
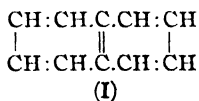
5-methylumbelliferoneacetic acid (III), difficultly sol. in hot alc., and an alc.-sol. product, orcinolaurin (IV) (obtained by Nencki, *J. prakt. Chem.* [2], 25, 277, from orcinol, HCO_2H and ZnCl_2). III was also prepd. in 7 g. yield by converting com. I (300 g.) into $\text{CO}(\text{CH}_2\text{CO}_2\text{H})_2$ (80 g.) by v. Pechmann's method (*Ann.* 261, 152) and allowing 18 g. of the latter to stand 1 day in concd. H_2SO_4 ; it is a pale yellow odorless powder difficultly sol. in most of the usual solvents except hot PhNO_2 , from which it seps. in needles, m. $267-8^\circ$ (gas evolution) on rapid heating, sol. in 10% Na_2CO_3 with golden yellow color and reprecip. by acids, gives a brown color in alc. with FeCl_3 ; heated at $300-30^\circ$ until the evolution of CO_2 ceases it gives 4,5-dimethylumbelliferone (V), m. 249° , which is best prepd. (7.3 g.) from 7 g. orcinol, 15 g. $\text{AcCH}_2\text{CO}_2\text{Et}$ and 100 g. of 73-5% H_2SO_4 heated 45 min. at $75-80^\circ$. IV is obtained directly in 3 g. yield from crystd. orcinol (2.5 g.) and HCO_2H (5 g.) heated 20 min. at $110-30^\circ$ with concd. H_2SO_4 . The condensation of orcinol with I under the influence of concd. H_2SO_4 , therefore, undoubtedly proceeds mainly according to the schemes $\text{I} \rightarrow \text{CO}(\text{CH}_2\text{CO}_2\text{H})_2 (+ \text{orcinol}) \rightarrow \text{III}$ and $\text{I} \rightarrow \text{HCO}_2\text{H} (+ \text{orcinol}) \rightarrow \text{IV}$. That V can be formed directly from I and concd. H_2SO_4 is highly improbable; 100 g. I heated 1 hr. at 130° with 300 g. concd. H_2SO_4 gave a small amt. of a green fluorescent dye having the properties of IV and a substance difficultly sol. in alc. and apparently identical with III. Attempts to prep. a toluidi- $[\beta\text{-methyl-}\alpha\text{-pyrone}]$ analogous to the β -dimethylbenzodi- $[\alpha\text{-pyrone}]$ of Hantzsch and Zürcher (*Ber.* 20, 1328(1887)) from orcinol and concd. H_2SO_4 with 2 mols. $\text{AcCH}_2\text{CO}_2\text{Et}$ at 80° or with an excess of $\text{CO}(\text{CH}_2\text{CO}_2\text{Et})_2$ at room temp. failed; in the 1st case was obtained V, in the 2nd III. C. A. R.

Relations between organic rings and the properties of unsaturation. B. K. MEREJKOWSKY *Bull. soc. chim.* 37, 1174-87(1925).—Carvenone with N_2H_4 formed a pyrazoline which was decompd. by dropping on to solid KOH (and some Pt black) at $210-20^\circ$, instead of the expected thujane, 80% of inactive 3-menthane was formed. The pyrazoline from carvone similarly decompd. at 240° gave a little isolimonene, which was hydrogenated to p -menthane; and an undecompd. portion which at $300-50^\circ$ yielded isolimonene and dipentene. The pyrazoline from cyclopentenone (obtained in poor yield by distn. of Ca dihydromuconate) formed, at 180° , only a little cyclopentene. M. concludes that this decompn., which often leads to 3-membered-ring formation, does not form rings within other rings. B. H. NICOLET

The chemistry of pinene. I. L. KONDAKOV. *Caoutchouc & gutta-percha* 22, 12952 (1925); cf. C. A. 20, 407.—A critical discussion of the derivs. of pinene. Past expts render it probable that in nature nopinene is the source of derivs. of fenchene and of sylvestrene and that α -pinene is the source of derivs. of borneol, of terpineol and of terpinol. C. C. DAVIS

Constitution of naphthalene and its derivatives. RUDOLF LESSER, ERICH KRANZPUHL AND GEORG GAD. *Ber.* 58B, 2109-24(1925).—The authors undertook to throw light on the question whether C_{10}H_8 has the sym. (I) or the unsym. (II) structure by detg. with certainty the position of the double bonds in 1 of its derivs. and for this purpose they chose the yellow 2,3-hydroxynaphthoic acid (III) which Möhlau (*Ber.* 28, 3100 (1895)) considers to be 1,2-dihydro-2-keto-3-naphthoic acid and the corresponding NH_2 compd., likewise yellow, to be the 2-ketimido deriv. According to him, replacement of the H in the HO group attached to the nucleus or in the 2 salt-forming groups destroys the quinonoid bond and leads to colorless compds. while he explains the soly. of the Me ester (IV) of III in alkalis with yellow color by assigning the structure V to its Na salt. That this is wrong L., K. and G. have shown by prepg. in pure state a whole series of yellow salts not only of IV but also of the Me ester of 1-bromo-2,3-hydroxynaphthoic acid (VI), which proved to be quite stable; this could not be true if the Br and metal were on the same C atom. On the other hand, they confirmed his conclusion that replacement of the H of the HO group on the nucleus or in the 2 salt-forming groups by any other group yields colorless substances without exception. Thus, the Ac (VII), Bz, MeO_2CO and Me derivs. of III are colorless. When the chlorides of VII and the corresponding 1-Br deriv. are treated with NH_3 there are obtained isomeric colorless O-Ac and yellowish N-Ac derivs. of the amides of III and VI. On the other hand, while there are absolutely colorless derivs. of III with a free HO group (such as the anilide and N-methylanilide), the salts of these and all other derivs. with a free HO group are always yellow. The yellow color of the salts can be explained only on the basis of a quinonoid union, and since such a union between C atoms 1 and 2 (formula I) is excluded, it can be only between C atoms 2 and 3 (formula II) and the structure which seems best to fit the facts is one (VIII) or (IX) analogous to that suggested by Anschütz (C. A. 19, 1416) for the yellow salts of the N-acylsalicylamides. In any case, the facts above establish that in III and many of its derivs. there is a double bond between C

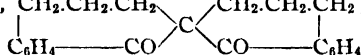
atoms 2 and 3 (formula II). The bearing of this conclusion on some hitherto apparently puzzling observations made on $C_{10}H_8$ derivs. is discussed. The data at hand are not sufficient to permit of detg. with certainty whether all $C_{10}H_8$ derivs. have the asym. structure II: L., K. and G. believe that it is true of all derivs. substituted in only 1 nucleus, while Weinberg's arguments for the sym. structure (I), which, however, are all based on the behavior of derivs. sym. substituted in both nuclei (C. A. 16, 1090), are quite convincing. An attempt was made to obtain direct proof of the sym. position of the double bonds in $2,7-C_{10}H_6(OH)_2$ by introducing 2 different acyl radicals in inverse order (e. g., in 1 case Ac first and then Bz, in the order Bz first and then Ac); in all cases (Ph_2NCO was also 1 of the acyl radicals used), the products proved to be identical, independently of the order of acylation. III, purified through the Me ester (m. $75-6^\circ$; all m. ps. are cor.), m. $222-3^\circ$ and is distinctly yellow; its chloride m. $95-6^\circ$ (Meyer, *Monatsh.* 22, 791(1901), gives 192°), and whether the yellow color is peculiar to it or is due to an impurity could not be detd., as it easily decomps. on recrystn. from benzene. The amide, yellow, m. $217-8^\circ$ (given as $185-8^\circ$ in the literature); yield, 12 g. from 20 g. chloride in C_6H_6 with dry NH_3 . Acetate (VII), obtained almost quant. from the acid boiled a short time in 1.5–2.0 parts Ac_2O with 1 drop concd. H_2SO_4 , m. $184-6^\circ$ (Anschütz, C. A. 3, 2979, gives $176-7^\circ$). Benzolate, m. $208-9^\circ$. 3-Acetoxy-2-naphthamide (X) (6.3 g. from 11.5 g. VII boiled in C_6H_6 with $SOCl_2$ until dissolved, dild. with C_6H_6 and satd. in ice with dry NH_3 , the product being crystd. from Me_2CO), needles, becomes yellowish about 160° , m. $180-90^\circ$ (quite sharply at 185° if plunged into a bath at 180°); the Me_2CO mother liquors yield *N*-acetyl-3-hydroxy-2-naphthamide, faintly yellowish tables, m. $203-5^\circ$. The *O*- partially isomerizes into the *N*-deriv. on slow heating or recrystn. from alc., completely on refluxing 1 hr. in $AcOH$. The amide of III with $AcCl$ in C_6H_5N gives only the *O*-acetate. Both isomers give with Ac_2O the same *O,N*-di-1-*c* deriv., m. $159-60^\circ$. 1-Bromo-2,3-acetoxynaphthoic acid, m. 183° ; with $SOCl_2$ and then NH_3 it yields only 1-bromo-2,3-acetoxynaphthamide, needles, m. $204-6^\circ$, gradually becoming more and more yellow from about 180° up, completely rearranges on heating at 206° or refluxing in $AcOH$ into the *N*-Ac isomer, yellow needles, m. $204-6^\circ$. Amide of VI, from the *O*-acetate and 2 mols. KOH in cold $MeOH$, yellow, m. $258-9^\circ$. 2,3-Acetoxynaphthonitrile (2.1 g. from 3 g. X refluxed in $SOCl_2$), m. 118° , also obtained by treating with cold Ac_2O the K salt of the nitrile of III which cannot be prepd. directly from the amide (in C_6H_6 there is no reaction with $SOCl_2$ and without a solvent there is formed a red, very unstable substance, probably an addn. compd.) but is obtained in 1.2 g. yield from 2 g. of the acetate with KOH in cold $MeOH$; it seps. in not quite colorless rodlets, m. $188-9^\circ$, converted back into the acetate by $AcCl$ in $CHCl_3-C_6H_6N$ and into the amide by cold concd. H_2SO_4 . Me 2,3-methoxynaphthoate (41 g. from 60 g. of the Me ester of III with KOH and Me_2SO_4 in $MeOH$), m. $63-5^\circ$ (given in the literature as $45-9^\circ$), b_{11} $197-8^\circ$; free acid, entirely colorless, m. $134-5^\circ$, reacts with neither $FeCl_3$



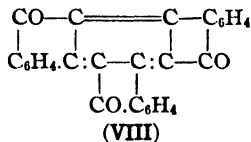
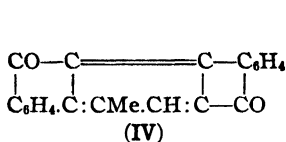
nor diazobenzenesulfonic acid (the slight yellow color observed by v. Auwers and Frühling (C. A. 15, 2085) was due to the presence of traces of III which cannot be removed by repeated crystn. or by reduction with Zn dust or $SnCl_2$, but only by treating in Na_2CO_3 with diazobenzenesulfonic acid as long as a red color is produced, letting stand, pptg. with HCl and extg. the MeO acid with C_6H_6); amide, m. $172-3^\circ$; nitrile, m. $132-3^\circ$. Me ester of VI (45 g. from 40 g. of the ester of III in $AcOH$ suspension with Br), faintly yellow, m. 115° . Salts of the Me ester of III; K, Na, Rb, Cd, Cu (too sol for isolation), Ag (yellow ppt. completely decomp. in a few sec.). K, Na, Rb and Cd salts of the Me ester of VI. K salt of the amide of VI. K and Ag salts of the nitrile of III, stable in H_2O ; the Ag salt with MeI gives 2,3-methoxynaphthonitrile, m. $132-3^\circ$. 2,3-Hydroxynaphthyl Ph ketone (1.5 g. from 10 g. of the chloride of VII with $AlCl_3$ in C_6H_6), orange-yellow, m. $161-2^\circ$; K salt, orange-red, dissociated by H_2O . *N*-Methylanilide of III (prepd. according to Ger. pat. 264,527), m. $192-3^\circ$ (Rosenberg, Ber. 25,

3625(1892), gives 150°, dissolves in alkalis with intense yellow color. **2,7-Dihydroxy-naphthalene derivs.:** *Acetate*, m. 171–2°, insol. in cold dil. NaOH but hydrolyzed on warming (even in H₂O alone), gives no color with FeCl₃, gives only 2,7-C₁₀H₆(OMe)₂ with Me₂SO₄; *benzoate*, m. 199°, insol. in KOH even on addn. of alc., gives no color with FeCl₃, cannot be methylated with Me₂SO₄, MeI or CH₂N₂; *acetate benzoate*, m. 136–7°; *benzoate diphenylcarbamate*, m. 179°; *diphenylcarbamate* (5.3 g. from 8 g. C₁₀H₆(OH)₂ and Ph₂NCOCI in Me₂CO refluxed with aq. KOH), m. 261° (at the same time is formed a little of the *bisdiphenylcarbamate*, m. 176°); *benzyl ether*, m. 151–2°, gives no color with FeCl₃; *dibenzyl ether*, m. 141°. C. A. R.

Spirans. XII. Preparation of [benzo-Δ⁶-suberen-1-one]-2,2'-spiran. HERMANN LEUCHS AND PAUL SANDER. *Ber.* 58B, 2200–2(1925); cf. C. A. 19, 61.—PhCH₂CH₂·CH₂OPh, b₁₄ 180–5°, solidifies –15° to fine needles which again liquefy 10–5°, is obtained from PhOCH₂CH₂Br refluxed 3 days in xylene with 1.5 mols. PhCH₂MgCl, 22 g. with 30% HBr in AcOH at 100° in a sealed tube yields 16 g. Ph(CH₂)₃Br, b₁₄ 115°; 10 g. of this boiled 6 hrs. with 1.15 g. Na in abs. alc. and 16 g. CH₂(CO₂Et)₂, gives 10.8 g. Ph(CH₂)₃CH(CO₂Et)₂, b₁₃ 190–2°, 10.8 g. of which in Et₂O dissolves 1.03 g. Na and on boiling in PhMe with 9.5 g. Ph(CH₂)₃Br yields 9.5 g. *di-Et di-[γ-phen-propyl]malonate*, b₁₃ 262°, m. 56–7°; 7.92 g. boiled 2 hrs. in 50 cc. alc. with 5.33 cc. 7.5 N KOH, evapd. to dryness, treated with NaHCO₃ and extd. with Et₂O, the unsapon ester being put through the same process once more, gives 2.2 g. of the free *acid*, m. 160–4° (decompn.), insol. in hot ligroin, and 2.4 g. of the *mono-Et ester*, sol. in ligroin, m. 86–7°, loses CO₂ 160°, sol. in KHCO₃ but soon sepg. as the K salt. The acid (1 g.) converted into the chloride with PCl₅ in CHCl₃ and, after removal of the CHCl₃ and POCl₃ in *vacuo* at 100°, slowly heated to 150° with 0.1 g. FeCl₃ and then quickly distd. in *vacuo* at 300–50°, gives 0.015–0.02 g. *bisbenzo-Δ⁶-suberen-1-one 2,2'-spiran*, CH₂·CH₂·CH₂—C(CH₂·CH₂·CH₂)₂—CO—C₆H₄, yellowish, m. 142–4°. C. A. R.



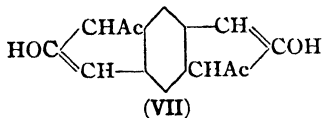
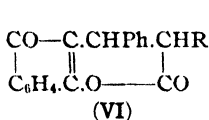
Derivatives of indandione and of biindone. II. Condensation products of aldehydes with biindone. DAN RADULESCU AND VICTOR GEORGESCU. *Bull. soc. chim.* 37, 1187–94(1925); cf. C. A. 19, 3486.—EtCHO and 2 mols. indandione (I) in C₆H₅N at room temp. give propylidenebiindone (II), m. 256–7°, also similarly obtained from biindone (III). When either mixt. is heated, or when II is warmed with KOH, 5-methyl-*o*-trans-fluoracenedione (IV), yellow, m. 289–91°, is formed. The K salt of III with excess H₂CO gives methylenebisbiindone (V), olive, m. 239°; using 2–3 mols. KOH and heating forms, besides V, *indandionylbiindonylmethane*, greenish yellow, m. 210–2°, gives a bordeaux-red color with KOH. V heated in MeOH with a large excess of PhN₂H₁ gives *methylenebis[phenylhydrazinoindandione]*, m. 218–9°. BzH and III in C₆H₅N



to form benzalbiindone (VI), deep garnet needles, m. 235°; in alc. KOH they give *phenylbiindonylmethanol*, m. 238° (decompn.). BzH and 4 mols. I, allowed to stand for days in C₆H₅N, give *phenylindandionylbiindonylmethane*, yellow, m. 303°, also formed from VI and I in hot abs. alc. with a little C₆H₅N. Methylenebisindandione (VII) gives no pyran derivs. with Ac₂O. Heated in air above its m. p., or in PhNO₂, it loses 2H and forms a *methenyl deriv.*, blood-red, m. 203°; Na salt, with NaOEt, also formed when the Na salt of VII is boiled several days in alc. Treated at 0° in AcOH with concd. H₂SO₄, and poured into ice water, VII gives yellow needles (from hot xylene), m. 234°; from AcOH the product, supposed to be *anhydrobisdiindandionylmethane*, seps. with 1 mol. AcOH (not lost in *vacuo* at 114°), m. 180–1°, gives an intense blue-violet color with KOH. 5.5 g. III and 3 g. I in 30 g. C₆H₅N ppt. on long standing *truxene quinone* (VIII), sol. only in hot PhNO₂, yellow, m. > 300°. B. H. NICOLET

Addition characteristics of heterogeneous conjugated systems. MIRCEA IONESCU. *Bull. soc. chim.* 37, 913–6(1925).—2-Benzalindandione (I) condenses with CH₂(CO₂Et)₂ in abs. alc. (C₆H₅N present) to give Et β-indandionyl-β-phenyl-α-carbethoxypropionate (II), m. 108°; using NaOEt, they give the *acid ester* (III), m. 112°, which hydrolyzes to the *acid* (IV), m. 169° (decompn.). IV loses CO₂ to give β-indandionyl-β-phenylpropionic acid (V), m. 173°, colorless, but becomes orange with alkalis. II or III, on heating or with cold concd. H₂SO₄, gave a yellow *lactone* (VI, R = CO₂Et), m. 106°. Heating

IV or treating V with cold H_2SO_4 gave a lactone (VI, $\text{R} = \text{H}$), m. 154° . $\text{H}_2\text{C}_6\text{H}_5$ (VII) and I, with NaOEt , formed γ -[α -indandionylbenzyl]acetylacelone, m. 111° ; this heated under pressure with HCl in AcOH gave 1-phenyl-3-hydroxyfluorenone, yellow, m. 266° ,



and its dihydro deriv., m. 200° . Quinone and VII, with NaOH , formed diacetyldihydroxy-indacene (VIII), green, m. above 300° , and gives an intense violet color with alkalis.

B. H. NICOLET

The nature of melanogen. PIETRO SACCARDI. *Atti accad. Lincei* [6] 2, 346-9 (1925).—The melanogen (I) of the urine is an extremely labile compd. Melanotic urine may be cleared with $\text{Pb}(\text{OAc})_2$ without changing I in it. I may be extd. from acidified urine with Et_2O or AmOH . The Et_2O was evapd. The ext. was taken up in a few drops of HCl . On adding $m\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ in EtOH and evapg. an intense violet color was obtained. Melanotic urine reacts with Ehrlich's diazo reagent and so S. used this to fix I from the Et_2O exts. of urine from rabbits injected with pyrrole. The complex was dissolved in 96% EtOH and evapd. The residue was dissolved in cold NaOH and treated with CO_2 . A red-brown compd. sol. in EtOH was pptd., m. 113° , gives a Bz deriv. easily. This compd. is not the bisdiazopyrrole of Fischer and Hepp. It was concluded that pyrrole does not pass through the organism unchanged and that the azo deriv. isolated is derived from a hydroxylated polymer of pyrrole which constitutes melanogen. Analogously C_6H_6 , indole and C_{10}H_8 when injected are excreted in the hydroxylated forms. The oxidation of pyrrole to I is not due to ferments in the urine. These preliminary results are briefly discussed in relation to the views of other workers.

E. J. WITZEMANN

The preparation of N-methylpyrrolidine by catalytic hydrogenation of N-methylpyrrole. J. P. WIBAUT. *Rec. trav. chim.* 44, 1101-5 (1925).—W. reviews the older results on the reduction of pyrrole derivs. to pyrroline and pyrrolidine derivs. None of these methods is satisfactory and so the catalytic method with Pt black + H_2 in AcOH was used (Willstätter, *C. A.* 6, 2613; Hess, *C. A.* 8, 127, 934; 16, 1250; Adams, *C. A.* 17, 3489). 8.1 g. N-methylpyrrole in 40 cc. glacial AcOH + 0.500 g. Pt oxide (Adams, *l. c.*) in H atm. (with 20 cm. H_2O positive pressure) were placed on a shaking machine so that it could be warmed electrically. The brown oxide was reduced to black Pt black and 4.5 l. H_2 was absorbed (calcd. 4.48 l.). The mixt. was dild. with H_2O , the Pt was filtered off, the soln. was alkalinized with strong KOH and distd., a portion of the distillate acidified with HCl pptd. the N-methylpyrrolidine chloroaurate, m. $216-7^\circ$ (Ciamician, Piccinini, *Ber.* 30, 1789 (1897)). The main portion was satd. with K_2CO_3 and extd. 3 times with Et_2O . The Et_2O was evapd. and the residue was treated with picric acid which pptd. N-methylpyrrolidine picrate (I), m. 221° (Löffler, Freytag, *C. A.* 4, 174). N-Methylpyrrolidine (II) is easily volatile with Et_2O vapors and additional I was pptd. on adding picric acid in Et_2O . A 75% yield of II was obtained. I was decompd. with HCl ; the HCl salt was decompd. with KOH and pure I, b. $78-80^\circ$, obtained from this.

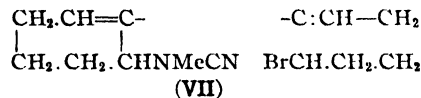
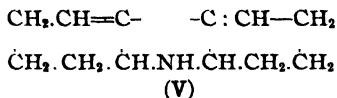
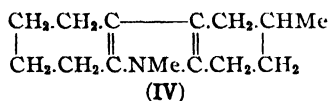
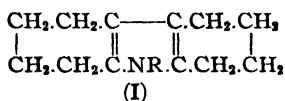
E. J. WITZEMANN

Preparation of indole from ω -o-dinitrostyrene. T. VAN DER LEE. *Rec. trav. chim.* 44, 1089-92 (1925) (In English).— ω -o-Dinitrostyrene (I) was prepd. by nitrating o-nitrocinnamic acid with abs. HNO_3 (v. d. L., *Diss. Leiden* 1925, 37). To 0.7 g. I in 75 cc. 30% AcOH , 1.5 g. Fe powder was added and the mixt. was warmed to 90° . Na_2CO_3 was added to alkalinity and the mixt. was then distd. with steam. The distillate was tested qual. for indole (II) and a 9.4% yield was obtained according to Moraczewski's method (*C. A.* 2, 2578). I reduced with Zn dust + AcOH gave 11% of II. Some II was also obtained on reducing I in Et_2O with Al-Hg. Nenitzescu (*C. A.* 19, 2666) has just published the same method of prep. II and Weerman (*C. A.* 4, 1483; 8, 64), used a somewhat similar method. The reaction mechanism is thought to be as follows: $\text{o-O}_2\text{NC}_6\text{H}_4\text{CH}:\text{CHNO}_2 \rightarrow \text{H}_2\text{NC}_6\text{H}_4\text{CH}:\text{CHNH}_2 \rightarrow \text{H}_2\text{NC}_6\text{H}_4\text{CH}:\text{CHOH} \rightarrow \text{H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CHO} \rightarrow \text{II}$.

E. J. WITZEMANN

Hydrogenated carbazoles. JULIUS V. BRAUN AND LUDWIG SCHÖRNIG. *Ber.* 58B, 2456-61 (1925).—Perkin and Plant (*C. A.* 18, 3189) have cast doubt on the structure I assigned by v. B. and Ritter to the octahydro compds. they obtained by catalytic hydrogenation under pressure with Ni of N-methyl- and N-ethylcarbazole. The structure I is supported, however, by the extensive study of the hydrogenation of indole

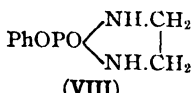
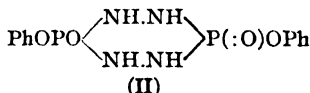
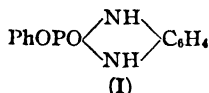
derivs. recently made by v. B. and Bayer (*C. A.* 19, 1862) and v. B. and S. now present what they believe is decisive proof of its correctness. 1,2,3,4-Tetrahydro-6,9-dimethylcarbazole (II), m. 90°, was synthesized from cyclohexanone and *p*-MeC₆H₄NMeNH₂ and the 3,9-Me₂ isomer (III), m. 74°, b₁₂₋₁, somewhat above 190°, from PhNMeNH₂ and *p*-methylcyclohexanone; on hydrogenation both gave the same octahydrodimethylcarbazole (IV), which can be only a pyrrole deriv. and not a compd. with the double bonds unsym. distributed as in the formulas suggested by P. and P. The octahydrocarbazole obtained by P. and P. from cyclohexanonazine with HCl at a high temp. and for which they proposed the structure I, is probably, as already suggested, the sym. compd. V; when its *N*-Me deriv. (VI) is treated with BrCN it does not give MeBr but a quaternary compd. having the empirical compn. 2VI.BrCN; probably 1 mol. VI reacts with the BrCN to form the compd. VII which then adds like a simple alkyl bromide on the tertiary N atom of a 2nd mol. of the VI. IV, m. 36–7°, b₁₂ 165–70°, is very unstable, soon changes in the air into a dark smear, gives with picric acid and HCl in Et₂O first a green color and then an amorphous green ppt., is indifferent towards MeI, giving only a faint brown color. Together with IV is formed the dodecahydro deriv., faintly yellow oil, b₁₂ 130–5°, stable in the air; methiodide, m. 174–5°. 1,2,3,4-Tetrahydro-9-methylcarbazole (VIII), b₁₂ 180°, m. 50–1°, which with Sn and HCl gives the hexahydro deriv. (IX), b₁₅ 144°, b₂₄ 162°, takes up somewhat less than 2 atoms H on catalytic hydrogenation, yielding unchanged VIII, the octahydro deriv., m. 94–5°, and about 30% of P. and P.'s dodecahydro deriv., b₁₂ 125°, whose ethiodide m. 223° (P. and P., 217°) and methiodide, m. 245°. These 2 quaternary salts can conveniently be used to detect the small amts. of dodecahydro derivs. formed when *N*-methyl- and *N*-ethyloctahydrocarbazole are treated with H and Ni in autoclaves with stirring. IX with H and Ni in decalin in an autoclave is at first dehydrogenated, with formation of VIII, which in 1 expt. was isolated in 70% yield. The yield of V can be increased to 30% by simply shaking out the base, after treatment of the azine in decalin with HCl, with HCl instead of removing the decalin with steam. The compd. from VI and BrCN sinters 98°, m. 103°, darkens and gradually evolves a HCN odor in a desiccator.




C. A. R.

P-Oxidiazphospholes and experiments with trimethylenedisulfonyl chloride. W. AUTENRIETH AND ERICH BÖLLI. *Ber.* 58B, 2144–50 (1925); cf. *C. A.* 19, 2325.—Compds. of the type OP(OR)Cl₂ condense with bivalent bases to form cyclic compds. contg. both P and N in the ring. Thus OP(OPh)Cl₂ with *o*-C₆H₄(NH₂)₂ gives the compd. I and with N₂H₄.H₂O the compd. II. OP(NHPh)Cl₂ behaves in the same way. The ring in these compds. is stable towards boiling dil. acids but is ruptured by alkalis. That II has not the structure OP(OPh):NNH₂ or the corresponding dimol. form is shown by the fact that it yields no benzal deriv. with BzH: heated for some time with alc. BzH II gives (N:CHPh)₂, PhOH and H₃PO₄. The OP(OR)Cl₂ and OP(NHPh)Cl₂ are quite stable towards cold H₂O; only on boiling are they completely hydrolyzed to H₃PO₄, HCl and ROH or PhNH₂. Unlike the compds. SP(OR)Cl₂, the OP(OR)Cl₂ exchange both Cl atoms for PhO even with dil. aq. alc. solns. of PhOH. Trimethylenebissulfonyl chloride (III) yields the bisulfonamide (IV), -anilide (V) and -phenylhydrazide (VI), but all attempts to convert it into cyclic compds. with N₂H₄.H₂O or *o*-C₆H₄(NH₂)₂ failed; the former always gave VI, the latter the bis[sulfon-*o*-aminoanilide] (VII). OP(OPh)Cl₂ b₁₄ 138–40°. *p*-Toloxylphosphorus oxydichloride, from *p*-cresol and 1 mol. POCl₃ at 140°, b₁₂ 145–50°, liquid of a not unpleasant odor which, when free of dissolved HCl, does not fume in the air, only slowly hydrolyzed by cold H₂O. OP(NHPh)Cl₂, m. 84°, is obtained by heating PhNH₂.HCl and somewhat more than 1 mol. POCl₃, protected with a CaCl₂ tube, on a sand bath until the originally almost solid mixt., which evolves HCl in abundance, has changed to a thick liquid, then adding AlCl₃ and heating only on the H₂O bath. Phenoxy-*P*-oxidihydrobenzodiazphosphonium (I), from OP(OPh)Cl₂ and 2 mols. *o*-C₆H₄(NH₂)₂ at 170° or, in better yield, from the components shaken in C₆H₆ and then refluxed 0.5 hr., m. 185°, mol. wt. in freezing AcOH

194-233. *P,P'*-Diphenoxy-*P,P'*-dioxoletrahydrotetrazadiphosphonium (II), from OP(OPh)Cl₂ in cold H₂O treated dropwise with 2 mols. aq. N₂H₄·H₂O, m. 132°, mol. wt. in freezing AcOH 318-63. *Phenoxy-P-oxoletrahydrodiazaphospholium* (VIII), from OP(OPh)Cl₂ and 3 mols. (CH₃NH₂)₂·H₂O in cold H₂O, m. 196°. *p*-Tolyl homolog of I, m. 158°; of II, m. 168°, mol. wt. in freezing AcOH 423; of IV, m. 204°. *Anilino analog* of I (PhNH instead of PhO), m. 214°; of II (0.3-0.4 g. from 6 g. OP(NHPh)Cl₂, m. 208-10°, mol. wt. in freezing C₁₀H₈ 335-82; of VIII, m. 232°. III, from CH₂(CH₂Br)₂ refluxed in 2 mols. satd. aq. Na₂SO₃ until dissolved (3-4 hrs.), evapd. and heated on the H₂O bath with 2 mols. PCl₅, m. 48°, gives with concd. aq. NH₄OH IV, m. 165°; with 2 mols. N₂H₄·H₂O V, m. 168°; with PhNHNH₂ in boiling C₆H₆ VI, m. 190°, easily sol. in alkalis and reprecipitated by acids; with *o*-C₆H₄(NH₂)₂ in boiling C₆H₆ VII, yellowish, m. 152°, sol. in dil. acids and reprecipitated on cautious neutralization with Na₂CO₃.



C. A. R.

Experiments with thiophosgene. W. AUTENRIETH AND HEINRICH HEFNER. *Ber.* 58B, 2151-6 (1925); cf. preceding abstr.—With *o*-C₆H₄(NH₂)₂, CSCL₂ readily yields the cyclic compd. SC(NH)₂C₆H₄ (I), and with [3,4-(H₂N)₂C₆H₃]₂ it forms SC(NH)₂C₆H₃(NH)₂CS (II), but N₂H₄·H₂O gives only CS(NHNH₂)₂, m. 168°. Neither could a cyclic deriv. be obtained from (CH₂NH₂)₂, although *o*-C₆H₄(OH)₂ in Na₂CO₃ smoothly yielded C₆H₄  CS. As CSCL₂ is itself quite stable towards hot H₂O and cold dil

alkalies it can be used generally for the conversion of phenols into the corresponding Ph esters of CS(OH)₂ and of thiophenols into the esters of CS(SH)₂; on the other hand, no ring formation with bivalent thioalcs. can be effected. With PhNH₂ and other primary aromatic amines CSCL₂ reacts with special ease. OP(OPh)Cl₂ and OP(OH)₂Cl easily yield the corresponding di- and monoanilides with aq. satd. PhNH₂, and with PhOH in dil. aq. NaOH both give PO(OPh)₂. In general, the principle of the Schotten-Baumann benzylation method can be advantageously applied with CSCL₂, OP(OPh)Cl₂ and OP(OH)₂Cl; with primary and probably also with secondary bases, no NaOH need be added. The CSCL₂, m. 73-3.5°, was obtained in 42% yield from CCl₃SCl, which, in turn, was obtained in 60% yield from CS₂ and Cl essentially according to Klason's method (*Ber.* 20, 2376 (1887)). If a cooled mixt. of CSCL₂ and EtOH is at once treated with ice water, SC(OEt)Cl, b. 136°, is obtained in 46% yield. SC(OPh)₂, m. 106°, is obtained almost quantit. from 2 mols. PhOH in a slight excess of dil. NaOH slowly treated with 1 mol. CSCL₂. *Di-β-naphthyl thiocarbonate*, almost white, m. 212° (attempts to prep. the α-isomer in the same way always yielded amorphous, non-homogeneous products). *Pyrocatechyl thiocarbonate* (yield, 25%), faintly pink, m. 154°. SC(SPh)₂ (yield, 90%), yellow-red, m. 95°. *Di-p-tolyl trithiocarbonate*, yellow, m. 115°. CS(NHPh)₂ (yield, 90%) from 4 mols. satd. aq. PhNH₂ treated dropwise with 1 mol. CSCL₂ and shaken vigorously, m. 153-4°, I, colorless or faintly yellow, darkens from 270° on, m. 295-8°. *Diphenylenedithiurea* (II), yellow, amorphous, m. 233°. OP(OH)₂(NHPh)₂, m. 125°. *Diphenyl phosphite monoanilide*, m. 129°. C. A. R.

Some hydroxylated derivatives of 1,2,4-thiazole. H. J. BACKER AND C. H. K. MULDER. *Rec. trav. chim.* 44, 1113-7 (1925).—NH₂CONMeNH₂, prepd. by electro-reduction of NH₂CONMeNO (Backer, *C. A.* 7, 1703), condenses in H₂O with anisic aldehyde, giving MeOCC₆H₄CH:NNMeCONH₂ (I) (Michaelis, Hadanck, *C. A.* 3, 172), m. 192°. This in EtOH with FeCl₃ in the sealed tube for 1 hr. at 110-20°, gave 2-methyl-5-*p*-methoxyphenyl-3-hydroxy-1,2,4-triazole (II), m. 223.5°. I condensed with piperonal gave piperonal-2-methylsemicarbazone, m. 226°, which oxidized as with II gave 2-methyl-5-[methylenedioxyphenyl]-3-hydroxy-1,2,4-triazole (III), m. 273°. II suspended in AcOH treated with N₂O₅ gas gave unchanged II. When II was heated for a moment in HNO₃ + H₂SO₄ and then poured on to ice it gave 2-methyl-5-*p*-nitrophenyl-3-hydroxy-1,2,4-triazole (IV), of which the Na, K and Ag salts were prepd. IV with K₂Cr₂O₇ + H₂SO₄ gave *p*-O₂NC₆H₄CO₂H, m. 238°. PhCH:NNPhCONH₂ (Busch, *Ber.* 36, 1357 (1903)) oxidized as above in EtOH with FeCl₃ gave 2,5-diphenyl-3-hydroxy-1,2,4-triazole, m. 234.5°. NH₂NHCONHPh with BzH gave benzylidene-3-phenylsemicarbazone, m. 177°, which when oxidized gave 4,5-diphenyl-3-hydroxy-1,2,4-triazole, m. 260-1°.

E. J. WITZEMANN

A new synthesis of ricinine. IV. ERNST SPÄTH AND GÖRG KOLLER. *Ber.* 58B,

2124-30(1925); cf. *C. A.* **18**, 1500.—The present synthesis of ricinine (**I**) confirms the structure $\text{MeC}:\text{CH}:\text{C}(\text{OH}):\text{C}(\text{CO}_2\text{Et})\text{C}(\text{OH})\text{:N}$ for the ester (**II**) obtained by Knöven-

agel and Fries by condensing $\text{CH}_2(\text{CO}_2\text{Et})_2$ and $\text{MeC}(\text{NH}_2):\text{CHCO}_2\text{Et}$ with NaOEt (*Ber.* **31**, 768(1898)). From 0.5 g. **II** with CH_3N_3 is obtained 0.4 g. of an oil giving on sapon. 0.1 g. with boiling aq. alc. NaOH 0.1 g. nearly pure *2,4-ametenoxy-6-methylpyridine-3-carboxylic acid*, m. 174–6° (gas evolution); found, 29.54% MeO . *6-Methyl-2,4-dihydroxypyridine-3-carboxamide*, from **II** with NH_3 in abs. alc. at 130°. m. 280–1° (decompn.); 9 g. with POCl_3 at 100° yields 2.5 g. *6-methyl-2,4-dichloro-3-cyanopyridine*, m. 101–2°, 4 g. of which with BzH and ZnCl_2 in an evacuated bomb at 125° gives 2.5 g. *6-styryl-2,4-dichloro-3-cyanopyridine* (**III**), yellow, m. 168–9°; the operations should be carried out in the dark as on illumination **III** changes into a colorless dimer, m. 213–4.5°. *2,4-Dichloro-3-cyanopyridine-6-carboxylic acid* (0.622 g. from 1 g. **III** with KMnO_4 in Me_2CO), m. 180°, decamps. 183°; this, refluxed in MeOH with NaOMe gives *2,4-dimethoxy-3-cyanopyridine-6-carboxylic acid*, m. 205–6°, 0.05 g. of which, cautiously heated over a free flame or in a bath at 260°, loses CO_2 and yields 0.0089 g. *2,4,3-C}_6\text{H}_7\text{N}(\text{OMe})_2\text{CN}, m. 145–6°; this last compd. was converted into **I** as in the earlier synthesis.*

C. A. R.

Color and molecular geometry. IV. Explanation of the colors of the cyanine dyes.

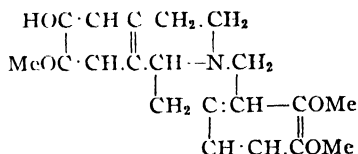
JAMES MOIR. *J. Chem. Soc.* **127**, 2338–43(1925).—The principle that the height of color depends chiefly on the distance between 2 positive centers in the mol. (cf. *C. A.* **19**, 2595) is applicable to all classes of colored compds. In many dyes, however, the mol. contains extensive inactive parts, lying outside the 2 positive centers, which produce a "loading" effect on the color and raise the position of the absorption band 0.5–10.0%. The cyanines, isocyanines ψ -isocyanines, azocyanines and carbocyanines belong to this class and to explain their colors the effect of the "load" had to be quant. detd. To this end several parent substances were studied. There is a minute difference between the colors of ψ -isocyanine salts and of activated di-2-quinolylmethane (cf. Scheibe and Rossner, *C. A.* **15**, 3110), the observations showing a Mc color-factor of 1.005. Similarly the color-factor of activated diquinolylmethane and activated dipyridylmethane is 1.105, a value much like the naphthol/phenol color-factor, indicating that the extra "loading" with part of a C_6H_5 ring has the same effect in each class. All the cyanines have 2 bands close together and the ratio of the adsorption-center wave lengths for the 2 bands of each compd. is almost always 1.065. The change of linking from *ortho* to *para*, i. e., from 2' (or ψ -iso) to 2:4' (or iso) and from iso to ordinary (2:4' to 4:4'), also involves the factor 1.065. These factors, therefore, cancel one another in certain cases, the lower band of a 4:4'-cyanine being in the same position as the higher band of the corresponding 2:4'-cyanine and the lower band of the latter being in the same position as the higher band of the corresponding 2,2'-cyanine. Using these principles, calcn. of the distance between the position centers is shown in detail for di-2-pyridylmethane. The factor 1.065 for calcg. the positions of the bands of cyanines from isocyanines and of isocyanines from ψ -isocyanines also holds true in the carbocyanine series. The concept of 2 positive centers in conjunction with that of comparative mol. rigidity is probably capable of explaining all color phenomena.

C. C. DAVIS

Action of phenyl isocyanate on 2,5-diketopiperazines. MAX LÜDKE. *Z. physiol. Chem.* **150**, 215–9(1925).—Peptides and diketopiperazines behave differently toward PhNCO . The primary amino group of peptides reacts with formation of a substituted urea while the secondary group forms a hydantoin. With diketopiperazines, on the other hand, both secondary amino groups add PhNCO with formation of a phenylurea grouping. By using an excess of PhNCO (3–5 mols.) and a temp. of 170° a yield of 94% may be obtained. The product is purified by washing with Et_2O , boiling with H_2O or EtOH and recrystg. from AmOH . *2,5-Diketopiperazine-1,4-di[phenyl isocyanate]*, decamps. 270°, was prepd. in 67% yield from glycine anhydride and PhNCO ; *3-methyl-2,5-diketopiperazine-1,4-di[phenyl isocyanate]*, m. 158–9°, in 94% yield from glycylalanine anhydride, and *3-benzyl-2,5-diketopiperazine-1,4-di[phenyl isocyanate]*, m. 154° (decompn.), in 93% yield from phenylalanylglycine anhydride. None of these gave the picric acid reaction.

A. W. DOX

Corydalis alkaloids. V. Constitution of corypalmine. ERNST SPÄTH AND ERICH MOSERTIG. *Ber.* **58B**, 2133–5(1925); cf. *C. A.* **19**, 2959.—The position of the HO group in corypalmine (**I**) has now been established. The **I** (0.2 g. from 5 kg. dry buds of *Corydalis cava*), m. 235–6°; 0.093 g. with $\text{EtN}(\text{NO})\text{CO}_2\text{Et}$ and NaOEt in alc. gives 0.079 g. of the amorphous Et ether which in dil. H_2SO_4 treated with Na_2CO_3 to permanent turbidity and immediately oxidized with KMnO_4 yields 7-methoxy-6-ethoxy-1-keto-1,2,3,4-tetrahydroisoquinoline, m. 173–5°. **I** therefore has the structure

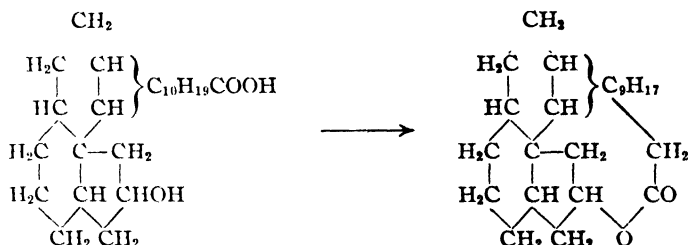


Tetrahydrojatrorrhizine (II) has the same struc-

ture, as will be shown in a paper by S. and Duschinsky to appear soon in the *Ber.* I is, therefore, the dextro-form of II. C. A. R.

Calycanthine. ERNST SPATH AND WILHELM STROH *Ber.* 58B, 2131-2(1925).—The formula $\text{C}_{22}\text{H}_{28}\text{N}_2$ assigned by Gordin (*C. A.* 6, 354) to calycanthine (I) should be doubled, I m. 245° (evacuated tubes), mol. wt. in freezing camphor 331, in boiling C_6H_6 351, in the Bleier and Kohn app. at 340° (boiling phenanthrene) in H under 12 mm. 310 (calcd. for $\text{C}_{22}\text{H}_{28}\text{N}_4$, 318). The HI salt contains 41.78-42.29% I; calcd. for $\text{C}_{22}\text{H}_{28}\text{N}_4 \cdot 2\text{HI}$, 42.02. The active H (Zerevitinov method) in I is 0.44%; calcd. for $\text{C}_{22}\text{H}_{28}\text{N}_2 \cdot (\text{NH})_2$, 0.57. I (0.1222 g. in 10.748 cc. abs. alc.) shows $[\alpha]_D^{18}$ 684.3° . From I heated 10 hrs. at 100° with MeI in an evacuated tube, the process being repeated several times, is obtained a *compd.* m. $261-2^\circ$, contg. 38.97% I; calcd. for $\text{C}_{22}\text{H}_{26}\text{N}_4\text{Me}_2 \cdot 2\text{MeI}$, 38.47; heated a long time at 140° it perceptibly loses MeI. C. A. R.

The bile acids. XXIV. The process of dehydration with formation of neutral substances. HEINRICH WIELAND AND OTTO SCHLICHTING. *Z. physiol. Chem.* 150, 267-75 (1925), cf. *C. A.* 19, 1854.—Vacuum distn. of desoxycholic acid gives in addn. to cholanenic acid an unsatd. isomeric lactone which may be hydrogenated to a satd. lactone, $\text{C}_{27}\text{H}_{48}\text{O}_3$. Hydrolysis with KOH converts the latter into *isolithocholic acid*, $\text{C}_{24}\text{H}_{40}\text{O}_3$, m. $90-5^\circ$ (I), which on oxidation with CrO_3 loses 2H to form the known 7-ketocholic acid. *Me ester* of I, m. $119-20^\circ$; *Et ester*, m. 136° . At 220° I loses H_2O and reverts to the lactone without alteration of the ring structure. The lactone then b. $270-5^\circ$ and solidifies to a vitreous mass. The ring closure is believed to occur as follows:



Similar lactone formation occurs with cholic acid and with pyrodesoxybiliaric acid. Thermal decompn. of 7-ketocholic acid at $320-30^\circ$ gives 50% of a hydrocarbon $\text{C}_{23}\text{H}_{36}$, m. 117° . A. W. DOX

The action of phenylhydrazine and hydrazine on fats and fatty acids (VAN ALPHEN) 27. "Glykose" or "Glucose," "Glykosid" or "Glucosid" (DEUSSEN, *et al.*) 2. Dehydrogenation of methanol and formaldehyde with Cu as catalyst (GHOSH, CHAKRAVARTY) 2. Catalytic formation of methane from CO and H (CHAKRAVARTY, GHOSH) 2. Molecular combinations (MARTINET, BORNAND) 2. Biochemical study of phycoerythrin and phycocyanine (KITASATO) 11A. Dissociation constants of organic molecular compounds (HALBAN, ZIMPELMANN) 2. Apparatus for the determination of active H in organic compounds (BINAGHI) 1. Inorganic magnesyl derivatives (MINGOLA) 6.

BRUNN, J. VON: *Lehrbuch der organischen Chemie.* Leipzig: S. Hirzel. 508 pp. M. 24. Reviewed in *Chem. News* 131, 302(1925).

Sulfurizing organic compounds. F. W. ATACK. U. S. 1,571,181, Feb. 2. Indophenols or other material to be sulfurized is heated with S and Na sulfide or other sulfurizing agent in the presence of BuOH or other inert solvent having a b. p. about the same as that of normal BuOH so that the sulfurization is effected at about this temp.

Nitration of organic compounds. J. B. MENKE. Brit. 235,698, May 23, 1924. o-Nitroacetanilide is made by treating aniline with Cu nitrate and Ac_2O , pouring into

H₂O, triturating the pptd. mass with H₂O and recrystg. from dil. alc. Among the other org. compds. which may be nitrated with Cu nitrate and Ac₂O, glacial HOAc or acetyl halide are: acetoacetic ester, malonic ester, isosuccinic ester, glycerol or other polyhydric alcs., phenol (with which ferric nitrate also may be used), dimethylaniline, diphenylamine, toluene, benzoic acid and C₁₀H₈. Nitrates of Ce, Mn, Zn, Ni and Co may also be used and the nitrations are generally carried out at temps. below 60°. Nitrates of the alk. earths and alkali metals have a relatively feeble action.

Halogenated alcohols. FARBENFABRIKEN VORM. F. BAYER & CO. Brit. 235,584, June 12, 1924. Halogenated alcs. are produced from halogenated aldehydes by treating them in an alc. soln. with an alcoholate or halogenated alcoholate of Al or with Al alcoholate and AlCl₃; e. g., an alc. soln. of chloral or butylchloral is heated to the b. p. with Al ethylate while H or N is continuously passed through, the alc. is distd. off and dil. H₂SO₄ added, after which trichloroethyl alc. or trichlorobutyl alc. may be obtained by steam distn. Bromal and monochlorocrotonaldehyde may be similarly treated.

Chlorohydrins. CARBIDE AND CARBON CHEMICALS CORPORATION. Brit. 235,044, Aug. 13, 1924. Chlorohydrin solns. in concd. form are obtained by introducing caustic alkali and Cl into a weak chlorohydrin soln. and then passing a gaseous olefin in to combine with the HClO formed. An app. is described.

Carbocyclic ketones and dicarboxylic acids. M. NAEF ET CIE. Brit. 235,540, June 16, 1924. Carbocyclic ketones with more than 9 ring members are prepd. by treating dicarboxylic acids having more than 10 C atoms or their salts, by ketone prepn methods, preferably by employing the Th or Ce salts. E. g., the Th salt of tetradecane-1,14-dicarboxylic acid is heated to above 400°, preferably *in vacuo* and with the addn of Cu or Fe turnings or other good conductor of heat and the cyclopentadecanone produced is obtained from the distillate by fractionally distg. and then forming the semicarbazone. Manuf. of cyclic ketones from cyclodecanone to cyclooctodecanone is described. From the mother liquor of the semicarbazone a mixt. of semicarbazones yielding mixed ketones may be obtained. Cyclopentadecanone may also be obtained by heating tetradecane-1,14-dicarboxylic acid alone or with Th oxide or Ce or Ac₂O or by passing the vaporized acid over Th oxide, or by gradually heating its anhydride alone or with Th oxide. The cyclic ketones on oxidation with chromic acid give a dicarboxylic acid, e. g., by the oxidation of cyclodecanone, octane-1,8-dicarboxylic acid is formed. The cyclopentadecanone has an odor resembling that of musk or civet.

Arylsulfonic esters. FARBENFABRIKEN VORM. F. BAYER & CO. Brit. 235,598, June 14, 1924. 4-Nitro-1-aminobenzene-2-sulfonic acid phenyl or *o*-methoxyphenyl ester is prepd. by condensing 4-nitro-1-chlorobenzene-2-sulfonylchloride with PhOH or guaiacol in the presence of alkali and heating the product with aq. NH₃ or alc. NH₃ under pressure. 2-Nitro-1-aminobenzene-4-sulfonic acid *p*-cresyl ester is obtained from 2-nitro-1-chlorobenzene-4-sulfonic acid and *p*-cresol. Related nitroaminobenzene-sulfonic esters may be similarly formed.

Organomercury compounds. ABBOTT LABORATORIES. Brit. 236,538, July 2, 1924. 3,5-Diacetoxymercuri-4-nitro-*o*-cresol is prepd. by treating a hot soln. of 4-nitro-*o*-cresol in caustic alkali with an HOAc soln. of Hg(OAc)₂ and neutralizing. The pptd. product is freed from the Hg deriv. of nitroindazole by treating with caustic alkali or NH₄OH, acidifying and washing the ppt. with MeOH and ether. It is a germicide. 4-Nitro-*o*-toluidine is made by nitrating *o*-toluidine in H₂SO₄ at a low temp. and decomposing the sulfate with NaOH. 4-Nitro-*o*-cresol is formed by diazotizing a hot H₂SO₄ soln. of 4-nitro-*o*-toluidine with NaNO₂ and injecting steam into the product, sepg. black tarry oil of nitroindazole, and cooling to effect crystn.

Organoarsenic compounds. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Brit. 235,864, June 18, 1924. Benzaldehydearsonic acid, treated with acetone semicarbazone, yields the semicarbazone of benzaldehydearsonic acid and liberates acetone. *p*-Acetophenonearsonic acid by reaction with acetone hydrazone produces the hydrazone of *p*-acetophenonearsonic acid and free acetone and by reaction with acetone semicarbazone form the corresponding semicarbazone and free acetone. The As compds. thus produced may be used as therapeutic agents.

Metalddehyde. ELEKTROTRIZÄTSWERK LONZA. Brit. 235,867, June 23, 1924. Polymerization of AcH to metalddehyde is catalyzed by compds. such as NH₄Br, hydrazine hydrochloride, pyridine hydrobromide and perborate, halogenated pyridines, urea hydrochloride, diphenylthiourea hydrobromide, the hydrohalides of alkylamines and (CH₃)₃N₄, tetraethylammonium trichloride, quinoline tribromoacetate, anisaldehyde hydrochloride, benzalacetophenone hydrobromide, thiophene and hydroxylamine or nitrilo-sulfonic acid together with a strong inorg. acid.

Olefin oxides. J. N. BURDICK. Brit. 236,379, July 9, 1924. A 10% ethylene

chlorohydrin or propylene chlorohydrin soln. or other chlorohydrin soln. of less than 40% concn. is heated with alkali, *e. g.*, with NaOH at the b. p., and the resulting ethylene oxide or other olefin oxide produced is removed and condensed as formed. Cf. C. A. 19, 657.

Alkyl chlorides. T. GOLDSCHMIDT AKT.-GES. Brit. 235,547, June 10, 1924. Alkyl chlorides, other than EtCl, are obtained by treating gases contg. the lower olefins with HCl in the presence of a catalyst which may be Fe oxide or chloride, preferably at ordinary temp. Any C_2H_4 present is not attacked under these conditions, but chlorides may be produced from C_3H_6 and C_4H_8 in mixed olefinic gases.

Ethyl chloride. CHEMISCHE FABRIKEN VORM. WEILER-TER MEER. Brit. 235,521, June 12, 1924. C_2H_4 is combined with HCl under pressure in the presence of an inert solvent which may be EtCl itself. Gases contg. C_2H_4 may be used and $AlCl_3$ or its double compd. with C_2H_4 is used as a catalyst. A pressure of 60 atm. may be used.

Hexamethylenetetramine. S. KARPEN & BROS. Brit. 235,015, June 24, 1924. Methylene chloride is heated for several hrs. at 80–120° in an autoclave with sufficient aq. NH_3 to give an excess of 300–400% of theoretical proportions. The resulting soln. of $(CH_2)_6N_4$ and NH_4Cl may be evapd. with addn. of NH_3 to prevent hydrolysis, and the $(CH_2)_6N_4$ sepd. by use of a solvent such as $CHCl_3$ or CCl_4 . Or, if the process is conducted to give a satd. soln. of the products, the hot soln. may be cooled to crystallize NH_4Cl and NH_3 then added to ppt. $(CH_2)_6N_4$. Cf. C. A. 20, 768.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The bile acids. XXIII. The composition of human and beef bile. The constitution of anthrope-desoxycholic acid. HEINRICH WIELAND AND RICHARD JACOBI. *Z. physiol. Chem.* 148, 232–44 (1925); cf. C. A. 19, 1854.—From the mother liquor remaining after crystn. of the Na salt of anthrope-desoxycholic acid, lithocholic acid was obtained by acidifying and fractional shaking out with Et_2O and 0.2 N NaOH. The amt. obtained was 0.6 g. from 20 l. of human bile. All 3 acids previously isolated from beef bile have now been found in human bile. Anthrope-desoxycholic acid (I) was isolated from beef bile by means of the Ba salt. Ethyl anthrope-dehydro-desoxycholate, m. 133°, was prepd. by oxidation of I and esterification of the dehydro acid. I may be converted into lithocholic acid by prepn. of the semicarbazone, heating this with NaOEt at 180° and acidifying with HCl. Both I and its dehydro acid may be oxidized to anthrope-choloidanic acid (II), $C_{24}H_{36}O_{10}$, m. 213° by means of HNO_3 . By heating II at its m. p. in an atm. of N, 1 mol. of CO_2 is split out and a tetracarboxylic acid, $C_{23}H_{30}O_8$, is formed in 30% yield; hence II contains a malonic acid grouping. Distn. of II in a high vacuum above 300° yields a pyro-anthrope-choloidanic acid, $C_{22}H_{28}O_4$, m. 142°. This is probably a diketocarboxylic acid. The same positions are assigned to the 2 OH groups in I as by Wieland and Jacobi for cheno-desoxycholic acid which is identical with I. A. W. Dox

Depolymerization of proteins and re-synthesis of protein-like substances from the fission products. K. SHIBATA. *Acta Phytochim.* 2, 39–47 (1925).—Carefully dried casein, serum albumin, fibroin, gelatin, or Witte's peptone when heated with glycerol at 180–190° passes into a mixt. of anhydrides of the simple amino acids. Human hair, wool, feathers, tortoise-shell and horn are similarly depolymerized, but they require more glycerol and longer heating. The conversion of amino acid anhydrides into protein-like substances is accomplished by heating with glycerol, *e. g.*, glycyltyrosine anhydride gives a product showing the Millon and xanthoproteic acid reactions. Free amino acids behave similarly, since they are converted into anhydrides under the conditions of the expt. Asparagine yields an amorphous powder giving a colloidal soln. which shows the carbonyl and biuret reactions. Asparagine with tyrosine gives a product showing the Millon test and with cystine a product showing the Pb sulfide test. The action of proteolytic enzymes is discussed. B. C. A.

Biochemical study of phycoerythrin and phycocyanine. Z. KITASATO. *Acta Phytochim.* 2, 75–97 (1925).—Phycoerythrin and phycocyanine are obtained in cryst. form by salting out the aq. ext. of a Bangiaceae, *Porphyra tenera* Kjellm., with $(NH_4)_2SO_4$ and are purified by repeated soln. and salting out followed by dialysis to remove adhering salts. Analysis then gives the following results, for phycoerythrin, C 50.87,

H 7.04, N 15.34, S 1.76, O 24.99% and for phycocyanine, C 50.60, H 6.90, N 15.76, S 1.69, O 24.97%. These substances are decomposed by acids, alkalis and proteolytic enzymes into a protein and a colored substance. The protein from phycoerythrin resembles a globulin in its general properties and that from phycocyanine is very similar. Phycoerythrin on digestion with pepsin gives a reddish violet, water-sol. pigment, $C_{48}H_{120}O_{18}N_{12}$, which on warming with acids gives an amino complex, $C_{18}H_{60}O_6N_4(NH_2)_2$, and a blue pigment sol. in org. solvents, insol. in water and acidic in character, $C_{30}H_{64}O_{12}N_8 \cdot 1.5H_2O$. Phycocyanine on peptic digestion gives directly a protein constituent and the blue pigment, the reddish violet intermediate substance not being formed. It appears, therefore, that the amino compd. det. the difference between phycoerythrin and phycocyanine and with the former gives the more basic character and the resistance to alkali and acids. Spectrographic investigation of phycoerythrin, phycocyanine and their decompn. products confirms these views. B. C. A.

Specific nature of lipases with respect to configuration. R. WILLSTÄTTER. *Sitzb. Akad. München* 1924, 1-2.—Lipase from the pancreas hydrolyzes glycerides 10-20 times as rapidly as that from the liver; the explanation may be that the soaps produced in the process cause a large increase in activity of the former enzyme only. The influence of proteins on these 2 enzymes is also different. The 2 enzymes are proved to be definitely distinct by the observation that the enzyme from pig's liver produces *d*-mandelic acid in hydrolyzing Et *dl*-mandelate, whereas that from the pig's pancreas yields the *l*-stereoisomeric under the same conditions. B. C. A.

Salt formation between creatine and sodium hydroxide. A. HAHN AND H. FASOLD. *Z. Biol.* 82, 473-84(1925).—A satd. aq. soln. of creatine at 10° contains 10.9 g. of creatine per l.; at 12°, the amt. lies between 14.4 and 14.9 g. The amt. dissolved in NaOH increases from 12.72 g. per l. in 0.2 *N* soln. to 23.20 g. in *N* soln. K_a for creatine is 5.2×10^{-15} . Since K_b is 5×10^{-12} (C. A. 15, 867) creatine is about a thousand times stronger as a base than it is as an acid. The hydrolysis of the Na salt of creatine increases with diln., being almost complete in 0.05 *N* to 0.025 *N* soln. The velocity of the conversion of creatine into creatinine by NaOH increases slowly with the concn. of the alkali. B. C. A.

New protein derivatives with a high bromine content. A. J. J. VANDEVELDE. *Bull. acad. roy. med. Belg.* [5], 5, 472-85(1925); cf. C. A. 19, 2502.—A 3% soln. of Br₂ in CCl₄ is shaken with the dry protein, at ordinary temp., for several days or weeks (15 g. of protein with 100 g. of the soln.). In this way a bromocasein is obtained with 35.2% of Br, a bromofibrin with 41.6% Br, a bromoöovoprotein with 37.5%, a bromogluten with 30%, a bromopeptone with 37.5%, a bromotyrosine with 57.3%. Only in the case of tyrosine is HBr formed in a considerable amt.; in all the other cases an addition without a substitution appears to take place; the bromotyrosine is also the only compd. corresponding to a definite formula, viz., $C_9H_{10}O_3Br_3$. The taking up of the large amts. of Br by the proteins is likely to be due to double bonds or to residual valencies of N atoms. The bromoprotein compds. are decomposed by water at ordinary temp., a part of them going into soln., another part remaining insol.; both the sol. and the insol. part contain Br, the amt. of which largely depends on the duration of action of the water. Also the amt. of bromoprotein which remains insol. depends on the time of action. At higher temps. a larger portion of the bromoprotein goes into soln. If NaOH is added to the water acting upon the bromoprotein, the bromocasein, *e. g.*, is dissolved completely, but a larger part of the Br is liberated; the sol. portion contains less Br. Alc. acts similarly to water, decomposing the bromoprotein into a sol. and an insol. portion; in bromocasein the insol. portion contains 14.7% Br. The decompn. with water, alkali and alc. is studied for all the bromoproteins mentioned, under similar conditions of time and temp. and found to vary widely for all of them. These bromoproteins are yellow, have an irritating odor and are very hygroscopic, especially the bromopeptone. Bromotyrosine is without color and odor and is sol. in water without decompn. R. BEUTNER

The influence of hydrogen-ion concentration on the dextrinizing of starch by purified malt diastase. T. CHRZASZCZ, Z. BIDZINSKI AND A. KRAUSE. *Biochem. Z.* 160, 155-71(1925).—No definite optimum p_H was found in the dextrinizing of starch by amylase. The optimum p_H depends on the temp., the diastatic action, the buffers present and the protective action of the starch. A range of p_H 4.4 to 5.4 was optimum at a temp. range of 20° to 75°. The temp. of inactivation is in part detd. by the existing p_H . F. A. CAJOMI

Quinine- and atoxyl-fast lipases in organs of internal secretion. E. HERZFELD AND W. ENGEL. *Biochem. Z.* 160, 172-7(1925).—By observing the effect on the surface tension of tributyrin solns., lipases were demonstrated to be present in the exts. of

pig liver, thymus, ovary, testicle, hypophysis, etc. The lipases were about equally resistant to quinine and atoxyl. F. A. CAJORI

Investigation on blood proteins. II. The action of coagulation-diminishing salts on plasma and serum. H. HUECK. *Biochem. Z.* 160, 183-98(1925); cf. *C. A.* 20, 609.—Na citrate when added to whole blood or plasma affects the readings of the refractometer and viscosimeter. The calcd. protein content of plasma or serum may vary significantly when this calcn. is made from refractometer and viscosity data, depending on the amt. of citrate present. F. A. CAJORI

The physiological behavior of acetoin. I. The behavior of acetoin towards yeast. C. NEUBERG AND M. KOBEL. *Biochem. Z.* 160, 250-5(1925).—Acetoin was added to an actively fermenting yeast and sugar mixt. After some days, when sugar was no longer present, β , λ -butylene glycol was extd. from the mixt. with EtOH and Et₂O and identified as such. F. A. CAJORI

Thiocyanates and cellular respiration. N. TARUGI. *Ann. chim. applicata* 15, 416-26(1925).—It has already been shown (*Gazz. chim. ital.* 32, ii(1902); 34, ii(1904); Venturoli and Pinzi, *C. A.* 5, 849) that thiocyanates form peroxides when oxidized; Fe⁺⁺⁺ give FeHC₃N₃SO₃. When a few drops of concd. HNO₃ were added to a mixt. of a few cc. each of satd. aq. KSCN and Et₂O the reaction became violent, but if kept cold the Et₂O became intense red. After sepn. this Et₂O soln. on standing at room temp. became warm spontaneously owing to decompn. of the red compd. to a pseudothiocyanate (cf. Tarugi, *Intorno alla colorazione rossa che i sali ferrici producono coi solfocianuri*, Istituto chim. farm. Pisa 1907). After filtration of this soln. a violet-red soln. was obtained which was identical to that obtained from Fe⁺⁺⁺ salts and was stable for a few min. Spectroscopic examn. showed a broad band extending from the D to the F line, the spectrum being identical with that of an Et₂O soln. obtained by oxidation of the thiocyanate with HNO₃ or with Fe⁺⁺⁺. The red compds. obtained from Fe⁺⁺⁺ salts and rhodaninic acid (cf. Miolati, *Ann.* 262, 84) and thioglycolic and thiolactic acids (cf. Meyerhof, *C. A.* 18, 2349) are probably also peracids. Acid solns. of the Fe⁺⁺ and Fe⁺⁺⁺ salts of the last two are colorless, but become red when aerated. On standing this red again disappears, owing to oxidation of the thioglycolic or thiolactic acid at the expense of the red compd., with formation of dithioglycolic or dithiolactic acid. This last transformation proceeds to completion. The red compd. is therefore, an *intermediate peracid* formed by a transfer of O by the Fe⁺⁺ salts. On making alk. either the Fe⁺⁺ or Fe⁺⁺⁺ thioglycolate or thiolactate the color becomes amethyst-red because of formation of this peracid, which in turn disappears through formation of the dithioglycolate or dithiolactate. Ferric dithioglycolate or dithiolactate was obtained from the Fe⁺⁺⁺ compds. and ferrous dithioglycolate or dithiolactate from the Fe⁺⁺ compds., which disagrees with the theory of Warburg in which oxidation of Fe⁺⁺ is presupposed (cf. *C. A.* 19, 3277). Cystein likewise forms an *intermediate peracid*, which decomp. rapidly through oxidation of the cystein to cystine. Various references are cited to show that there are Fe⁺⁺ salts of peracids and, therefore, doubt of the existence of this red compd. because of the necessary coexistence of Fe⁺⁺ and peroxidized groups is invalid. As further evidence of the coexistence of Fe⁺⁺ and peracid, Na perbenzoate (cf. Baeyer and Villiger, *Ber.* 33, 858) when mixed at a low temp. with its equiv. of FeSO₄ still gives the reaction of Fe⁺⁺. Likewise solns. of peroxymonophthalic acid and Fe⁺⁺ salts give an amethyst colored soln. which in turn gives, after long standing, the reactions of Fe. Since, as has been shown, the -SCN group has the power of forming intermediate peroxidized compds. with the aid of oxidizing agents such as Fe⁺⁺⁺ salts, it is probable that its presence accelerates every oxidation process and because of the wide diffusion of HS-CN in the animal organism it plays an important role in respiration. Moreover, since this peracid of the -SCN group can be formed in the absence of Fe compds., it is probable that together with Fe compds. it plays a part in cellular respiration. C. C. DAVIS

The oxalacetic acid fermentation. C. NEUBERG AND G. GORR. *Ergebnisse Physiol.* 24, 191-5(1925); cf. *C. A.* 19, 2683.—Oxalacetic acid was decarboxylated to the extent of 70% at room temp. by dry yeast while 93% of the calcd. CH₃CHO was obtained. In the presence of Na₂SO₃, acetaldehyde alone is formed, while in its absence the latter condenses to MeCH(OH)COMe. H. J. DEUEL, JR.

Biology and dielectric constants. E. A. HAFNER. *Ergebnisse Physiol.* 24, 566-87(1925). H. J. DEUEL, JR.

Ultrafiltration and compensation dialysis. A. AUGSBERGER. *Ergebnisse Physiol.* 24, 618-47(1925).—A formula is derived and worked out graphically for the ultrafiltrate (dialyzate and residue). By the use of this and from published data on the ionization in blood serum the following new conclusions are drawn: (1) A part of the

serum sugar is in colloidal soln. (2) The portion of the Ca in colloidal soln. is about 10% higher than previously assumed. (3) Mg is from 20 to 30% colloidal. (4) K yields in acid medium a complex salt with protein but not in neutral or alkaline soln. (5) About 10% of the Na is in colloidal form. It seems promising by the use of this method to det. the ratio of the salts between blood corpuscles and plasma.

H. J. DEUEL, JR.

Recent work on the configurational relationships of biologically important substances. P. A. LEVENE. *Ergebnisse Physiol.* **24**, 663-89(1925); *C. A.* **20**, 577, 579.—A discussion of the configurational relation of hydroxy acids, amino acids, simple sugars and sugar acids established on the basis of van't Hoff's superposition system, the influence of external conditions on configurationally related substances, the effect on optical rotation of change of polarity of one of the groups attached to the asymmetric C atom, and the configurational relationships between 2-aminohexoses and 2-amino-hexonic acids.

H. J. DEUEL, JR.

Invertase. XII. RICHARD WILLSTÄTTER, KARL SCHNEIDER AND IRWIN WENZEL. *Z. physiol. Chem.* **151**, 1-30(1926); cf. *C. A.* **20**, 770.—The method for obtaining a highly active invertase has been still further improved. The more energetic treatment of undild. yeast under suitable conditions leads to a less destructive and more selective liberation of invertase than the milder and more prolonged treatment of dild. yeast. The new preps. of the same degree of activity are much more stable and suffer no loss during the final evapn. and electrodialysis. In the previous preps. a limit of activity was attained beyond which no further purification resulted by adsorption on kaolin or $\text{Al}(\text{OH})_3$. It appears that the enzyme was so firmly bound to its co-adsorbents that the complex behaved like an individual substance. At this stage, however, a fractional pptn. with tannin was found to be effective. The purer invertase preps. give at ordinary temp. no ppt. with tannin, but are pptd. at 0° . Although this treatment does not effect a complete sepn. of enzyme from its impurities, especially tryptophan, it is possible to isolate a purer enzyme from the tannin ppt. and leave a less pure form in the mother liquor. A considerable advance in technic consists in a process of fractional adsorption on an adsorbent developed in the soln. in the presence of the enzyme. When the point is reached where no increase in activity is obtained by the kaolin and $\text{Al}(\text{OH})_3$ treatment, a further purification results by a progressive pptn. of PbHPO_4 . In this way it is possible also to sep. the enzyme from its inactivated form. The 1st portions of ppt. contain only inactivated enzyme. Although a tryptophan complex so frequently remains in the purified enzyme that Euler and Josephson considered it an integral component, it is now shown that this is of no sp. importance so far as enzyme stability is concerned. As a "colloid carrier" it stabilizes the enzyme, but it can be displaced by other peptides which serve the same purpose. Fractional pptn. with PbHPO_4 in the presence of added leucylglycine or leucylglycylglycine diminishes the tryptophan content of the enzyme, whereas without the addn. of peptide no diminution occurs. In 1 instance a tryptophan-free product was obtained. If a sp. protective substance is required to maintain stability, the substance is neither yeast gum nor a peptide contg. tyrosine or tryptophan.

A. W. DOX

The specificity of animal proteases. V. Intestinal erepsin. ERNST WALDSCHMIDT-LEITZ AND ANTON SCHAEFFNER. *Z. physiol. Chem.* **151**, 31-55(1926); cf. *C. A.* **20**, 212.—Intestinal erepsin, when purified from all trace of trypsin by adsorption on $\text{Al}(\text{OH})_3$, is sp. for di- and tripeptides of naturally occurring amino acids and does not hydrolyze peptic peptone, protamine, histone, casein or any other protein. It is identical with pancreatic erepsin in every respect, including specificity, adsorption phenomena and p_{H} optimum. For the detn. of erepsin the most satisfactory method consists in titration of the COOH group liberated from a dipeptide at p_{H} 7.8 (phosphate buffer), adding MeOH to make 85% and using thymolphthalein as indicator. The amt. of enzyme used should be so chosen that the measured reaction const. lies between 0.005 and 0.0005 and the hydrolysis should not exceed 60%. The "erepsin unit" is 1000 times the amt. of enzyme for which a reaction const. of 0.001 is obtained under the conditions prescribed, and the "erepsin value" is the no. of units in 1 g. of material. On account of the low stability of erepsin, purification by pptn. methods is not feasible except in the preliminary pptn. by AcOH. The most stable preps. are glycerol exts. with or without H_2O . At p_{H} 4.7, especially in the presence of EtOH , the enzyme is adsorbed by $\text{Al}(\text{OH})_3$, leaving the trypsin in the mother liquor. Elution is then performed with faintly alk. phosphate soln. This treatment does not increase the enzyme activity but effects a complete sepn. from trypsin. Kaolin also adsorbs erepsin in acid soln. and from the adsorbate the enzyme may be recovered by elution with alk. phosphate, but without increase in activity.

A. W. DOX

An attempt to explain oligodynamic action. J. VOIGT. *Klin. Wochschr.* **4**, 2387-8 (1925).—A globule of Hg was imbedded in aq. gelatin for 14 days. The gelatin was then covered with formalin for 4 weeks. Metallic Hg was pptd. in the gelatin layer, which shows that the original globule of Hg must, to some extent, have passed into soln. in the ionic form.

MILTON HANKE

The influence of ultra-violet light on the acidity of gastric juice. PHILIPP KELLER AND MELITA LOEB. *Klin. Wochschr.* **4**, 2390-2(1925).—The variations in the acidity of the gastric juice from day to day without treatment were fully as great as those obtained after irradiation. Definite conclusions cannot be drawn from the experimental data.

MILTON HANKE

Demonstration of the hypophyseal hormone in the fluid of the human cisterna cerebello-medullaris. JULIUS JÁNOSSY AND BÉLA HORVÁTH. *Klin. Wochschr.* **4**, 2397-8(1925).—The hypophyseal hormone is secreted into the third ventricle. It can be found, regularly, in the fluid of the cisterna cerebello-medullaris.

M. H.

The significance of carotin for the animal organism. F. GOEBEL AND A. STERN. *Klin. Wochschr.* **4**, 2434-5(1925).—Carotin has no effect upon cellular respiration.

MILTON HANKE

The hormone of the parathyroid gland. HANS SCHULTEN. *Klin. Wochschr.* **4**, 2487-8(1925).—Largely a bibliographical review. The exptl. work is a repetition of the work of others. S. concludes that it is possible to ext. a substance from parathyroid glands with HCl, that simulates what is believed to be the *in vivo* action of the gland

MILTON HANKE

Recent advances in science: Biochemistry. R. K. CANNAN. *Science Progress* **20**, 405-8(1926).—Review of recent work on biochem. oxidation and reduction.

JOSEPH S. HEPBURN

The theory of salt craving. N. J. HARRAR. *J. Chem. Education* **2**, 1054-8(1925).—Bunge's theory is refuted. Probable factors in salt craving are the chloride content and potential acidity or basicity of the diet and the comparative water content with its effect on the osmotic pressure of the body fluids.

E. H.

General introduction to a discussion of the hormones. E. M. K. GEILING. *J. Chem. Education* **3**, 41-4(1926).

E. H.

The hydrogen-ion concentration and basicity of egg yolk and egg white. D. J. HEALY AND A. M. PETER. *Am. J. Physiol* **74**, 363-8(1925).—The p_H of the yolk of new-laid eggs is 6.36 (I), that of the white 8.24 (II). I remains practically const. for 3 weeks; II is rapidly altered. A CO_2 atm. does not affect I but distinctly increases II. Both are diminished in the first few days of incubation. II increases later with the development of the chick. The behavior of II toward indicators suggests the presence of $NaHCO_3$ or $KHCO_3$ with excess CO_2 . The phenolphthalein reaction of II is suggested as a test for freshness.

MARY JACOBSEN

Sulfatase. VI. The occurrence and behavior of sulfatase in human organs. L. ROSENFELD. *Biochem. Z.* **157**, 434-7(1925); cf. Neuberg and Simon, *C. A.* **19**, 2674. —Sulfatase is present in various organs. Potassium phenyl sulfate is split from 26.78% by the kidney to 5.83% by the pancreas in 18 days. The activities of the different organs decrease in the order: kidney, brain, liver, duodenum, suprarenals, spleen, lung, muscle, small intestine and pancreas.

W. D. LANGLEY

Physicochemical investigation of uric acid. III. The nature of the hydropic supersaturated uric acid solution. R. STERN. *Biochem. Z.* **159**, 192-8(1925); cf. *C. A.* **19**, 1578, 3496.—In a supersatd. soln. of uric acid, all of the uric acid dissociates to give H ions; this is evidence that the acid does not exist in colloidal form, but rather as a true solution.

W. D. LANGLEY

Influence of bile upon the hydrolysis of albumin by pancreatic juice. L. P. ROSENOW. *Biochem. Z.* **159**, 240-4(1925).—Zymogenous pancreatic ext. was obtained from a dog with a Pavlov fistula, and was activated by intestinal juice from the same animal. The addn. to albumin of either fresh or heated bile with this ext. doubled the rate of digestion, and prolonged the activity of the enzyme, probably by preventing the action of trypsin upon itself.

W. D. LANGLEY

Permeability of lipid mixtures. A. SCHÄFER. *Biochem. Z.* **159**, 250-6(1925).—The distribution coeff. of $Fe(CNS)_3$ between H_2O and Et_2O , C_6H_6 , oil, and mixts. of the same are not const., but depend upon the nature of the oil mixt. and upon the amt. of $Fe(CNS)_3$ used.

W. D. LANGLEY

Metabolism of phosphorus. I. Hexose-phosphatase in human organs and body fluids. F. DEMUTH. *Biochem. Z.* **159**, 415-23(1925).—A phosphatase is found in kidney, nerve, spleen, muscle, pancreas and liver tissues. The optimum p_H for the enzyme is from 6 to 7.3. The same enzyme is apparently present in bile, gastric juice,

milk, urine, cerebrospinal fluid, and blood serum. Its activity in cerebrospinal fluid during meningitis and in serum during rickets and tetany is sub-normal. W. D. L.

Methylglyoxalase. O. MEYERHOF. *Biochem. Z.* 159, 432-43(1925).—The rate of formation of lactic acid from methylglyoxal by glyoxalase is accelerated by tissues and tissue exts. Brain tissue is much more active than muscle or liver and the speed is independent of the presence of O or NaF. Narcotics such as urethan, phenylurethan, thymol and heptyl alc. slow the reaction. Tissue exts. are more active than tissues themselves, and it is shown that there is no ultrafilterable coenzyme present. HCN, in concns. of 2×10^{-6} to 1×10^{-4} M, acts in neutral soln. as a catalyzer of the reaction, but not because of an addn. of HCN to the aldehyde. W. D. LANGLEY

Physiology and chemistry of plant phosphatides. V. GRAFE. *Biochem. Z.* 159, 444-8(1925).—Phosphatides and cerebrosides seem to be the mother substances of vitamins. W. D. LANGLEY

Pringsheim's complement of amylases. K. SJÖBERG. *Biochem. Z.* 159, 468-71 (1925).—S. is able to confirm the finding of Pringsheim that a complement from yeast aids the action of amylase upon starch, but the hydrolysis is increased only about 10 or 20%, instead of being carried to completion. W. D. LANGLEY

The isolation of Schardinger's enzyme from milk. A correction. F. G. HOPKINS AND M. DIXON. *Biochem. Z.* 159, 482-3(1925).—H. and D. believe that their enzyme, prep'd. by pptn. with $(\text{NH}_4)_2\text{SO}_4$ (cf. *C. A.* 19, 303), was purer than that of Sharsky and Michelin, who ppt'd. theirs with $(\text{CH}_3)_2\text{CO}$ (cf. *C. A.* 19, 3277). W. D. LANGLEY

Heat of combustion and elementary analysis of animal fat. F. W. KRZYWANIEK. *Biochem. Z.* 159, 507-9(1925).—To secure an accurate respiratory quotient, the nature of the fat being burned must be considered. The CO_2 production, O consumption and heats of combustion of fats from the horse, sheep, cow, swine and dog are given. W. D. LANGLEY

Effect of metal salts upon the decomposition of hydrogen peroxide by blood. L. BLEYER. *Biochem. Z.* 161, 91-103(1925).—The effects of different salts (27 in all) at various concns. upon the rate of decompn. of H_2O_2 by blood catalase from rabbits are studied. Those salts whose solns. gave acidities outside of the optimum p_{H} ($=6.2$) for catalase were titrated to this point. Most of the salts retard the action of the catalase. The rate of decompn. showed the reaction to be monomolecular. The poisoned enzyme could not be reactivated. W. D. LANGLEY

Chemical composition of insulin. E. GLASER AND G. HALPERN. *Biochem. Z.* 161, 121-7(1925).—A com. insulin, of which the method of purification is not given, was dialyzed to free it of salts and hydrolyzed with HCl. The various forms of N present in the hydrolysate were then det'd. by the method of Van Slyke. The amino acids found to be present were lysine, arginine, histidine and leucine. These were united in peptide linkages. W. D. LANGLEY

Influence of different preparations of quinine upon the enzymic function of organisms. III. Influence of some quinine and urea compounds upon pancreas lipase. I. A. SMORODINTZEV AND V. A. DANILOV. *Biochem. Z.* 161, 178-94(1925); cf. *C. A.* 18, 1156.—An ext. of pancreas is allowed to act upon triacetin in the presence of quinine and urea and mixts. of the same and the amt. of hydrolysis which occurs is measured by titration with alkali. Quinine-HCl in concns. up to 0.05 N increases the rate of hydrolysis, but when urea-HCl is added with the quinine the effect is reversed. W. D. LANGLEY

Effect of different preparations of the quinine group on the enzymic functions of the organism. V. Effect of the concentration of the substrate on the hydrolysis of triacetin by pancreatic lipase. I. A. SMORODINTZEV AND V. A. DANILOV. *Biochem. Z.* 164, 394-400(1925); cf. preceding abstract.—Quinine-HCl accelerates the hydrolytic decompn. of 0.5-1% triacetin by pancreatic lipase. With higher concn. of the triacetin (3-5%) the quinine has no effect at all during the first hrs., but after 3-4 hrs. there is a slowing of the process. The velocity of the hydrolysis of the triacetin by pancreatic lipase both in the presence or absence of quinine and independently of the substrate concn. follows the equation of the monomol. reaction. But the velocity const. is much smaller for high concn. of the substrate than for low concn. S. MORGULIS

Apozymase and cozymase: Phosphorylation. C. NEUBERG AND A. GOTTSCHALK. *Biochem. Z.* 161, 244-56(1925).—Dried bottom yeast or its acetone prepn. can convert salts of H_3PO_4 and sugar quant. into hexosephosphate, but by washing the yeast with H_2O , a coenzyme may be removed with a consequent inhibition of the reaction. Dry top yeast, on the other hand, is unable to synthesize hexosephosphate even with added coenzyme. However, the acetone prepn. of top yeast with added coenzyme is able

to esterify the phosphate and sugar. Therefore, phosphorylation depends upon the presence of a cozymase, and some other zymase constituent. An ext. of rabbit muscle, when added to non-esterifying top yeast, enables it to form hexosephosphate to the extent of 50-60% of the theoretical amt. W. D. LANGLEY

Tryptic digestion at low concentrations of enzyme. III. R. EHRENBERG. *Biochem. Z.* **161**, 348-60(1925); cf. *C. A.* **19**, 3497.—The rates of action of a given amt. of trypsin upon casein, peptone and gelatin are different. The N compds. formed during hydrolysis are detd. by the method of Van Slyke. W. D. LANGLEY

Preservation in vitro and elective poison sensitivity of red blood corpuscles. O. LAVES. *Biochem. Z.* **161**, 416-45(1925).—To preserve blood without hemolysis, a soln. contg. 0.90% NaCl, 0.098% KCl, 0.098% CaCl₂ and 0.049% NaHCO₃ is best. The chlorides of morphine, methyl- and ethylmorphine hemolyze blood in increasing order. Added sucrose, reduces and replacement of the chlorides by the corresponding sulfates or phosphates stops, this hemolyzing action. With codeine, dionine, or quinine, the behavior of the cells is different. W. D. LANGLEY

The occurrence of a sulfur-containing amino acid in an alcoholic extract of yeast. S. ODAKE. *Biochem. Z.* **161**, 446-55(1925).—Besides the adenylythiomethylpentose, C₁₁H₁₆N₂SO₃, isolated by Suzuki, Otake and Mori (cf. *C. A.* **19**, 1867), another S contg. amino acid is now isolated. From 6000 kg. fresh yeast is obtained 0.6 g. of the pure acid, C₈H₁₁SNO₂, m. 272-3°. It is sol in H₂O and dil. alc., $\alpha_D^{16} = -11.77^\circ$. The Millon, biuret and FeCl₃ color reactions are neg. The acid gives white HgCl₂ or HgSO₄ salts, and is not pptd. by picric acid. Boiling with strong alkali does not remove the S. The salt, C₈H₁₀SNO₂, forms plates insol. in cold H₂O; the α -naphthyl isocyanate, C₁₀H₇NHCONH(C₈H₁₀S)COOH, m. 187°. This amino acid shows identical properties with that isolated by Muller (cf. *C. A.* **18**, 705) from casein and egg albumin. W. D. LANGLEY

The maltase of barley malt. H. PRINGSHEIM AND J. LEIBOWITZ. *Biochem. Z.* **161**, 456-8(1925); cf. *C. A.* **19**, 82.—A maltase is obtained which is active in the range of acidity $p_H = 3$ to 7.5, with its optimum activity at 4.5 to 5. W. D. LANGLEY

The role of the Donnan membrane equilibrium in osmotic processes in the living cell. VI. S AND V. V. BURKEVICH. *Biochem. Z.* **161**, 468-87(1925).—An application of the Donnan membrane equil. to the diffusion of salts through plant cells is studied. H₂SiO₃ favors the passage of the PO₄ ion into the plant root. H₂SiO₃ cannot functionally replace H₃PO₄ in plants. W. D. LANGLEY

The influence of temperature on the equilibrium between oxygen and hemoglobin of various forms of life. IVO MACELA AND ALBIN SELISKAR. *J. Physiol.* **60**, 428-42 (1925).—Oxygen dissocn. curves of dild. solns. of frog and human hemoglobin at 15°, 25° and 35° were detd. with some additional observations on fowl, tortoise and *Planorbis* hemoglobin. The affinity of frog hemoglobin for O₂ is much lower than that of human hemoglobin. The value of the equil. const. and the value of the tension of unloading, which is proportional to the const., increases for an increase of 10° 2.5 times in frog hemoglobin and 5.6 times in human hemoglobin over a range of temp. from 15° to 35°. The heat of reaction between 1 g. mol. of hemoglobin and O₂ is 27.4 cal. in human hemoglobin and 13.6 cal. in frog hemoglobin. J. F. LYMAN

Enzymic studies on the paired reactions in fat and carbohydrate metabolism. I. HANS V. EULER. *Biochem. Z.* **164**, 18-22(1925) S. MORGULIS

The destruction of hemoglobin by tissue extracts. V CALVO-CRIADO. *Biochem. Z.* **164**, 61-75(1925).—The destruction of hemoglobin by exts. of various tissues has been detd. with the spectrophotometer. Liver exts. were most potent in this respect; exts. from human skin were almost as active; other organs according to their effect on hemoglobin were lungs, kidneys and muscles. The addition of spleen ext. to the liver ext. greatly increased its destructive action. All organs can thus decompose hemoglobin, a fact which has an important bearing upon the extrahepatic origin of the bile pigments. S. MORGULIS

The separation of enzymes in barley malt. HANS PRINGSHEIM, ALEXANDER GENIN AND RAHEL PEREWSKY. *Biochem. Z.* **164**, 117-25(1925). S. M.

Chemical study of the age problem. RUDOLF EHRENBERG. *Biochem. Z.* **164**, 175-82(1925).—Very extensive material, both human and animal, has been analyzed for alc.-ether-sol. matter, N, P and Ca as well as the various amino acids. This material was taken from individuals of different ages, from intrauterine existence to extreme senility. A very extensive mass of data is presented but few general conclusions can be drawn with regard to the effect of age on chem. constitution. S. MORGULIS

Studies in the chemical topography of the brain. I. The lipid and total nitro-

gen of the cerebral cortex of man. HENRIETTE GORODISSKA. *Biochem. Z.* 164, 446-80(1925).—Functionally different portions of the human cerebral cortex have a distinct chem. compn. The greatest difference topographically is shown by the cholesterol, then by the alc.-sol. lipoids (cerebrosides and satd. phosphatides), total N and P of the unsatd. phosphatides. The motor area of the cortex (Gyrus centr. ant.) has the highest lipid and total N const. The smallest lipid content is found in the anterior association center (Polus front.). The sensory divisions (Cuneus and Gyrus centr. post.) are very similar in chem. compn., while the right and left parts are unlike and may even vary greatly in chem. constitution. At the age of about 50 years and later there is an increase in cholesterol and a slight diminution in total N and P content of the unsatd. phosphatides in the cerebral cortex. S. MORGULIS

The glucolytic power of blood. V. Experiments on adsorption of glucose by animal charcoal and erythrocytes, with special reference to glucolysis. YOSHIKANE KAWASHIMA. *J. Biochem. (Japan)* 5, 113-31(1925); cf. *C. A.* 19, 352.—Merck's animal charcoal adsorbs glucose at 9-13° very readily and abundantly, but at 37° this no longer occurs. The glucose is not oxidized catalytically under the influence of the surface. Erythrocytes remove only a small amt. of sugar at room temp. but at 37° they adsorb quickly an appreciable quantity. Old erythrocytes which have lost their glucolytic action still adsorb considerable amts. of glucose, so that glucolysis must be primarily associated with vital functions of the cell. S. MORGULIS

The mode of combination and determination of arginine in the protein molecule. SHOYO SAKAGUCHI. *J. Biochem. (Japan)* 5, 133-42(1925); cf. *C. A.* 19, 3506.—A colorimetric method is presented for the detn. of arginine. The best results are obtained with 5 cc. of a 1% protein soln., 2 cc. 15% NaOH, 5 cc. 0.15% α -naphthol soln. and an amt. of NaOCl appropriate for each protein. (Edestin 2.4-2.6 cc. 0.3 N; fibrin 1.8-2.0 cc.; gelatin 1.4-1.6 cc.; gliadin 1.6-1.8 cc.; glutenin 1.8-2.0 cc.; casein 1.8-2.0 cc., etc.) This reaction is obtained with a free guanidine group, and since the total arginine content of a series of proteins runs parallel with the amt. of free guanidine it is concluded that in the protein mol. the guanidine portion of the arginine must be free. S. MORGULIS

Arginine-free protein. SHOYO SAKAGUCHI. *J. Biochem. (Japan)* 5, 143-57 (1925).—Arginine-free protein has been prepd. by treating various proteins with NaOCl in the presence of an excess of free alkali. The excess of NaOCl is apparently without any effect. Arginine-free protein made from casein, ovalbumin, edestin, etc., has certain characteristics in common. It is insol. in acidified water and gives practically no biuret test or the author's color reaction with α -naphthol. It is hard to digest with pepsin but is much more easily digested by trypsin. All the arginine-free proteins show a very similar elementary compn.: C 50.41-51.97, H 6.38-6.50, N 13.75-14.11, S 0.45-1.78%. The base-binding capacity (phenolphthalein being used) was 21.08 cc. 0.1 N Ba(OH)₂ for 1 g. of arginine-free casein, 21.91 cc. for ovalbumin, and 24.48 cc. for edestin. In the hydrolytic decompn. of the arginine-free proteins alanine, valine, leucine, proline, phenylalanine, aspartic and glutamic acids and lysine were demonstrated. S. MORGULIS

Hydrolysis of protein with alkali. SHOYO SAKAGUCHI. *J. Biochem. (Japan)* 5, 159-69(1925).—The guanidine portion of the arginine in protein is less easily detached by the action of alkali on the protein than on the free amino acid. Arginine in gelatin is more easily attacked than in other proteins, which may be due to the fact that guanidine is readily hydrolyzed from this protein, or that gelatin under the action of alkali breaks up into peptides of much smaller size. The guanidine is completely removed from the arginine of several proteins acted upon by alkali while the peptide linkage of the protein mol. itself remains unaffected. Guanidine-free proteins have been prepd. from casein, ovalbumin, edestin, etc., which all possess certain characters in common. Although these all fail to give Sakaguchi's NaOCl color reaction, they give positive tests with most other color reactions. S. MORGULIS

Studies in comparative biochemistry. I. Occurrence of arginase in different organisms. YUZO SENDJU. *J. Biochem. (Japan)* 5, 229-44(1925).—Arginase was found in birds only in the kidneys. In amphibians this enzyme is present in the liver and to a limited extent also in the kidney. In reptiles arginase is found in several organs but in diminishing aints. as follows: kidney, liver, spleen and pancreas. Fish liver contains an enzyme which causes hydrolysis of arginine. This enzyme is also present in *Aspergillus oryzae*, but not in *B. coli comm.* S. MORGULIS

Composition of human brain. L. LEMATTE AND L. BEAUCHAMP. *Compt. rend.* 181, 578-80(1925).—Analysis of the brains of 1 man of 80 years and of 3 adults showed that the quantities of the different mineral constituents vary within narrow limits. P

is the dominant inorg. element. Age has little effect on the compn. of the brain, that of the 80-year-old subject being slightly richer in Na, K and P. L. W. RIGGS

The reaction of potassium ferricyanide with blood pigments. MAURICE NICLOUX AND JEAN ROCHE. *Compt. rend.* **181**, 823-6(1925); cf. *C. A.* **19**, 3302, 3505, 3530.—When carbonylhemoglobin (HbCO) is treated with $K_3Fe(CN)_6$ for each cc. of O received by the HbCO, 2 cc. of CO are produced. Conclusion: The formula of methemoglobin is HbO or Hb(OH)₂ and this pigment contains half the O of oxyhemoglobin. L. W. RIGGS

Aluminium in organic life. JULIUS STOKLASA. *Intern. Rev. Sci. Practice Agr.* **3**, 654-62(1925).—Plants which prefer dry surroundings have a low Al content. The hygrophytes on the contrary are noted for a high Al content, especially in the root. A sp. porosity of the cells of the root system to Al appears to exist. An excess of Fe causes plasmolysis in the plant, but if Al is present this plasmolysis does not occur. The Al appears to hinder the entrance of Fe and Mn compds. into the cell. Al participates in the formation of coloring matter of flowers. In the animal world both beetles and birds had more Al if the colors were blue, violet, red and blue-green than was the case with other colored pigments. In the mineral kingdom Al is a constituent of the brightest colored gems. Al appears to be injurious to plants if SO_3 or SO_4 ions are present. L. W. RIGGS

Solubility of proteins in fat solvents. D. DEUTSCH. *Magyar Orvosi Archivum* **26**, 525-6(1925); cf. *C. A.* **19**, 1216. —In the presence of certain electrolytes, such as H_2SO_4 , HNO_3 , etc., non-aq. solns. of albumins were produced. Whether the albumin is sol. only in water, or also in fat solvents, depends on the presence of electrolytes and on their quantity. L. W. RIGGS

Present pigmentary problems. I. Formation of the melanins. JEAN VERNE. *Rev. gen. sci.* **36**, 621-43(1925).—In this review animal and vegetable pigments are classed in 7 groups according to chem. origins. The relations of these groups to each other are described, and the formation of melanins from the chem. point of view, both *in vitro* and *in vivo*, is discussed. Also the formation of melanins from the histologic point of view is considered. L. W. RIGGS

Enzymes of the stomach of infants. K. WALTHER. *Magyar Orvosi Archivum* **26**, 522-4(1925).—The stomachs of healthy new-born infants contain chymosin. The quantity increases with age and is independent of individual acidity. It is less in breast-fed than in artificially fed infants. The lipolytic action of the stomach contents of breast-fed children is intense. Here the lipase of the mother's milk plays a large part. The lipase varies with the amt of fat in the food. The amylase content of the stomach arising from swallowed saliva behaves similarly to the chymosin. Amylase is found in very young infants and it increases with age. In diseased infants the rennet content remains about the same, the lipase decreases and the amylase varies with the lipase. L. W. RIGGS

Imitations of cell division and of the germination of spores with calcium fluosilicate. A. L. HERRERA. *Atti. accad. Lincei* [6], **2**, 387-93(1925).—A detailed illustrated description of these imitations. E. J. WITZEMANN

The bile acids (WIELAND, SCHLICHTING) 10.

FOLIN, OTTO KNUTE: **Laboratory Manual of Biological Chemistry.** New York, London: D. Appleton & Co. 308 pp.

LUCKIESH, MATTHEW and PACINI, AUGUST JOHN: **Light and Health.** A discussion of light and other radiations in relation to life and to health. Baltimore: The Williams & Wilkins Co. 302 pp.

MORSE, WITHROW: **Applied Biochemistry.** Philadelphia and London: W. B. Saunders Co. 958 pp.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Some special features of blood sugar determination. D. G. COHEN TERVAERT. *Nederland. Tijdschr. Geneeskunde* **69**, II, 1110-2(1925).—The following reduction table for calculating glucose from reduced copper is given (referring to the method of Shaffer and Hartmann, *C. A.* **15**, 1328).

Mg. Cu	0.05	0.10	0.15	0.20	0.3	0.4	0.5	0.6
Mg. glucose	0.09	0.116	0.142	0.168	0.221	0.273	0.327	0.395

R. BEUTNER

The microestimation of glucose after the method of L. Bang. E. COHN AND A.

WAGNER. *Biochem. Z.* **160**, 43-51(1925).—A critical study of the conditions necessary for accurate results with Bang's method. F. A. CAJORI

The determination of nitrogen after D. Acél. F. HIMMERICH. *Biochem. Z.* **160**, 105-12(1925).—With Acél's micro method (*C. A.* **15**, 3649) total N was detd. with an error of 2 to 3% when all precautions as to purity of reagents, nesslerization and colorimetry were carefully observed. F. A. CAJORI

Preparation of the ovarian hormone in aqueous solution. BERNHARD ZONDEK AND BENNO BRAHN. *Klin. Wochschr.* **4**, 2445-6(1925).—Methods are described for obtaining the ovarian hormone from placenta and from the ovary. The placenta is dried and extd. with alc., Et_2O and CHCl_3 . The combined exts. are concd. The oily residue is extd. with AcOH , the ext. clarified, neutralized with Na_2CO_3 and concd. to a suitable vol. It contains the hormone. Follicular fluid is freed from protein by heating at 80° in the presence of acid, filtering and concg. the filtrate to a suitable hormone content. MILTON HANKE

Functional stomach diagnosis. I. E. WOENCKHAUS. *Z. klin. Med.* **100**, 135 (1924).—The Cl values in the gastric juice are discussed. II. *Z. ges. expl. Med.* **44**, 369-77(1925).—A description is given of 2 colorimetric methods for the detn. of the secretion of gastric juice. Acetylindoxyl, which gives an indican reaction, was used in 0.005% soln. The second method, using FeCl_3 , was preferred as the FeCl_3 is more stable, very sensitive and non-toxic. HARRIET F. HOLMES

A simple process for the preparation of the new oxalate from human urine. W. O. MOOR. *Biochem. Z.* **159**, 245-6(1925); cf. *C. A.* **19**, 2215.—The substance which occurs in urine, and is designated by U, may be isolated as the oxalate from an amyl alc. soln. Its properties are not described. W. D. L.

Simple method for taking blood in the Hagedorn-Jensen blood sugar determination. G. FRITZ AND B. PAUL. *Biochem. Z.* **159**, 247-9(1925).—A centrifuge tube with a micro pipet inserted is used to collect both the blood, and the alk. ZnSO_4 soln. The whole is then centrifuged to obtain a clear soln. for the titration. W. D. L.

The sodium nitroprusside test for the presence of and for the determination of total acetone in urine and in certain other body fluids. N. O. ENGFELDT. *Biochem. Z.* **159**, 257-75(1925).—The sensitivity of Na nitroprusside in Legal's test for $\text{AcCH}_2\text{CO}_2\text{H}$ is 6 mg. per l. and for $(\text{CH}_3)_2\text{CO}$, 100 mg. per l. Applied as the Rothera test, the sensitivities are 1 and 100 mg. per l., resp. The color with $\text{AcCH}_2\text{CO}_2\text{H}$ develops to its max. intensity in 10 min. and then changes after $\frac{1}{2}$ or 1 hr. to a yellow or green, while with Me_2CO , the color reaches its max. in $\frac{1}{2}$ to 1 hr. and fades after 3 hrs. Both tests must be applied to urine directly, not to a distillate. The Rothera test is superior to Legal's test. A roughly quant. colorimetric method for the detn. of total acetone in urine is developed, with solns. of KMnO_4 as standards of comparison. W. D. L.

The determination of small quantities of arsenic in animal organs. F. PRIBYL. *Biochem. Z.* **159**, 276-9(1925).—Strips of copper foil, when placed in solns. contg. known amts. of As, become coated with As. The darkness of each deposit depends upon the concn. of As present. The deposits may be compared with those obtained from solns. with known amts. of As, and an est. of the As content of each made. Then the deposited As may be dissolved in 0.1 N I soln. as in the method of Rein and titrated with $\text{Na}_2\text{S}_2\text{O}_3$. The soln. thus obtained may also be used in the Marsh test. W. D. L.

A colorimetric method for the determination of bile salts in blood. P. SZILÁRD. *Biochem. Z.* **159**, 325-6(1925).—Into 50 cc. abs. alc. are dropped without stirring 5 cc. blood serum. The whole is heated on the H_2O bath to boiling, animal charcoal is added, the soln. is filtered and the residue washed with abs. alc. The filtrate is concd. on a H_2O bath to 15 cc., cooled, and 100 cc. Et_2O added to ppt. the bile salts. After the Et_2O soln. has been chilled for 3 hrs. the soln. is filtered, and the residue dissolved in 5 cc. of AcOH with warming. This soln. is then carried through the Lifschütz color reaction, i. e., BzO_2 is added, the soln. heated to boiling, cooled quickly and 1 cc. of $\text{H}_2\text{SO}_4\text{-AcOH}$ (1:10) mixt. added whereupon the soln. becomes green. The max. color occurs in about 15 min., and it may be hastened by the addn. of a drop of 2.5% FeCl_3 in AcOH soln. The colored soln. is now compared by the use of a colorimeter, with a soln. of pure bile salts similarly prepd. W. D. L.

A method for the determination of protein in 0.1 cc. of serum. S. HOLM AND H. TÓMASSON. *Biochem. Z.* **159**, 472-81(1925).—A diluted serum is treated with HNO_3 (sp. gr. = 1.18) so that a bottom layer of HNO_3 is formed. The turbidity which appears in a definite time is compared with that produced in a soln. of known protein content and similarly treated. W. D. L.

A micro-method for the determination of chlorides in body fluids. A. NIRSCHKE.

Biochem. Z. **159**, 489-90(1925).—The method of Bang is modified so that instead of pptg. the Cl as AgCl and weighing, it is titrated with AgNO₃, with KCrO₄ as an indicator.
W. D. I.

Determination of enzymes in microorganisms. I. Catalase content of bacteria. A. I. VIRTANEN AND H. KARSTRÖM. *Biochem. Z.* **161**, 9-46(1925).—As a measure of the activity of cells with respect to catalase, the ratio catalase activity = reaction const. K /no. cells is used. K is independent of the concn. of substrate. The catalase is buffered to $p_H = 6.5$, and the excess H₂O₂ is detd. by titration with KMnO₄. The age or growth temp. of the bacteria has no relation to their catalase content. Increase of temp. lowers the value of K and for a number of strains K is not const., but decreases with time. Buffer at a concn. of $M/150$ is more effective than at a concn. of $M/15$. Protoplasmic poisons such as CHCl₃ and xylene are without effect upon the catalase activity. The enzyme becomes inactivated above 60°. Added glucose does not affect the reactivity. Under anaerobic conditions, the activity is increased.
W. D. I.

Hematoporphyrin. RENÉ FABRE. *Compt. rend.* **181**, 623-5(1925).—A spectrophotometric study was made for the purpose of identifying hematoporphyrin in various products of the organism.
L. W. RIGGS

Salivary index of renal function. G. PACETTO. *Riforma Medica* **41**, 649(1925); *J. Am. Med. Assoc.* **85**, 934 —Concordance between the percentage of urea in the blood and in the saliva was complete in 89% of 55 subjects. In the others the salivary index showed retention while the blood showed only normal figures. As the sources of error tend to raise the salivary index, a normal figure excludes retention.
L. W. RIGGS

Methods for the determination of the total quantity of blood. GY. PETRÁNYI. *Magyar Orvosi Archivum* **26**, 346-59(1925).—The following methods are described: (1) Welcker's, the so-called abs. method which det. the total blood from the hemoglobin content of the total blood obtained by bleeding and by the washing of the blood vessels *in vivo* with physiol. saline. (2) Plasma methods which calc. the blood quantity from the degree of diln. of a certain injected soln. This soln. may be a dye, hemoglobin or a colloidal soln., in which case the refraction of the serum is detd. (3) The CO method, with which a detd. quantity of CO is inhaled and from the CO content of a known quantity of blood are calcd. the degree of dispersion and the quantity of blood. (4) The relative detn., from which after the injection of a NaCl soln. from the changes found in the concn. of the blood (hemoglobin, red blood cells and lowering of the f. p.) the total quantity is calcd.
L. W. RIGGS

Micro-method for the determination of the globulin content of the spinal fluid. I. NÁDOR. *Magyar Orvosi Archivum* **26**, 519-21(1925).—For this diaphanometric method 10 tubes are prepd. contg. 0.01-0.1% of serum globulin dilns. To an eleventh tube is added 2 drops of the fluid in question, then all of the tubes receive 1 cc. of 6.75% phenol and the corresponding opacity is noted.
L. W. RIGGS

Conditions of validity of Macallum's microchemical test for calcium. MYRA M. SAMPSON. *Science* **62**, 500-1(1925); cf. following abstr.—Purpurin forms a distinctive reddish purple compd. with Ca only in alk. solns. *Paramecia* transferred from an alk. medium contg. Ca and treated with purpurin are stained locally, while those transferred from a medium contg. NaCl, KCl or sucrose are diffusely stained.
L. W. RIGGS

Purpurin method of localizing calcium. A. B. MACALLUM. *Science* **62**, 511(1925); cf. preceding abstr.—M. states that the method was first advanced by Grandis and Mainani (cf. *Arch. ital. biol.* **34**, 73; **38**, 143(1902)).
L. W. RIGGS

CONN, HAROLD JOEL: **Biological Stains**, a handbook on the nature and uses of the dyes employed in the biological laboratory. Geneva, N. Y.: The Commission. 151 pp.

MOREAU, ED.: **Guide pratique d'analyses médicales par des méthodes simples et rapides.** Paris: Vigot. 188 pp., 10 francs. Reviewed in *Bull. soc. hyg. aliment.* **13**, 534(1925).

C—BACTERIOLOGY

A. K. BALLS

Reduction experiments with bacteriophages. L. GÓZONY AND L. SURÁNYI. *Magyar Orvosi Archivum* **26**, 301-5(1925).—The reduction power is a characteristic property of living cells. Expts. have shown that the bacteriophage alone is not able to reduce. Young bouillon cultures with bacteriophages reduce better than cultures with boiled phages, because the bacteria grow better in the first 2 hrs. in the presence of phage.
L. W. RIGGS

A study of various strains of *Bacillus radiculicola* from nodules of alfalfa and sweet clover. J. W. STEVENS. *Soil Science* 20, 45-65(1925).—Thirteen strains of nodule bacteria of the alfalfa-sweet clover group were distinctly divisible into 2 groups by cross-agglutination tests. One strain (A) produced abundant raised, pearly white growths, the other (B) moderate, thin, whitish growths. No change in the organisms was noticed in 3 yrs. The "fast growers" of group A were acid sensitive, growing equally well from p_H 6.5 to 9.0 while the "slow growers" of group B grew best at p_H 6.5 and showed growth at p_H 5.5 after 4 weeks, an acidity which completely prevented the growth of group A. Alfalfa grown in sand cultures fixed almost twice as much N when inoculated with organisms of group A as with group B. RICHARD BRADFIELD

The nodule bacteria of soy beans: I. Bacteriology of strains. WM. H. WRIGHT. *Soil Science* 20, 95-129(1925).—All strains of *Pseudomonas radiculicola* of *Soja max* studied were identical morphologically but differed physiologically. There are 2 rather well-defined groups, each characterized by a different critical p_H ; different inhibiting consens. of the dyes are characteristic of the type, especially crystal violet; different gum-producing ability and different serological reactions are obtained. No single lab. test was sufficient to differentiate the 2 types, but all known properties had to be detd. The 2 groups do not represent 2 species but distinct biotypes, each of which varies around a mean of its own. **II. Nitrogen-fixation experiments.** *Ibid* 131-41.—Greenhouse and field studies were carried on for 3 yrs. with 6 strains of the above organism on 3 varieties of soy beans. Two strains (Type B) consistently fixed less N than the rest (Type A). The size, no. and distribution of nodules produced by type A are different from those of type B. The field and greenhouse studies confirm the lab. studies in indicating 2 biotypes in the 6 strains studied. R. BRADFIELD

Modifying *Rhizobium radiculicola*. VICTOR BURKE AND LLOYD BURKEY. *Soil Science* 20, 143-7(1925).—The tolerance of *R. radiculicola* for gentian violet was greatly increased by growing it for several generations on a 1-10,000 gentian violet agar. The dye-tolerant culture made as good growth in a 1-1000 as the original did in a 1-10,000 culture. This tolerance was lost after growing only 3 generations on a dye-free agar. The modification of bacterial cultures by the process of exposure and selection or dissociation offers a promising field for experimentation. R. BRADFIELD

Growth stimulation of *Aspergillus niger* by a vitamin B preparation. NELLY J. SCHELLING. *Bull. Torrey Bot. Club* 52, 291-310(1925).—Vitamin B from yeast stimulated both vegetative growth and reproduction. Excess of the vitamin was used as a source of N. There is a slight increase in gain in dry weight per gram sugar consumed when vitamin is present. The effects of the vitamin are two-fold: increase of org food supply and stimulation analogous to that produced by small amts. of such toxic substances as Zn salts. JOSEPH S. CALDWELL

Fermentation of galactose by yeast after previous treatment with this sugar. HANS V. EULER AND RAGNAR NILSSON. *Z. physiol. Chem.* 143, 89-107(1925).—Fresh yeast which has been cultivated in the presence of galactose and has acquired the property of fermenting it, does so more rapidly on the addn. of biocatalyst Z but not on addn. of purified co-zy-mase. Expts. where the preliminary treatment occurred in the presence of PhOH confirm the earlier work of Euler and Laurin in which the adaptation to galactose occurred also when the yeast is not capable of propagation. Sterile dried yeast can acquire the property of fermenting galactose by preliminary treatment with galactose and then attains equal fermenting power with respect to both hexoses. A. W. DOX

Acetic acid fermentation and allied phenomena. CARL NEUBERG AND FRITZ WINDISCH. *Naturwissenschaften* 13, 993-6(1925).—Review of recent work. *Bacterium ascendens*, *pasteurianum* and *xylinum* under anaerobic conditions all convert AcH into equal parts EtOH and AcOH (dis-mutation). This reaction also takes place in acid medium or in the presence of air; in the last case a rather slow alc. oxidation occurs simultaneously. Similar dismutation was found for higher aldehydes (isovaleric and isobutyric); the aldehydemutase is also present in *Bacterium coli*, *lactis aerogenes* and *propionicum*. The great biological significance of dismutation instead of simple oxidation is emphasized. B. J. C. VAN DER HOEVEN

Influence of thyreoidin, cerebrin and cordin upon the anaerobic respiration of yeast. L. P. ROSENOW. *Biochem. Z.* 159, 235-9(1925).—Blood serum >cordin>cerebrin> and thyreoidin stimulate in the order given the production of CO₂ by the action of yeast on beet sugar. W. D. L.

Fungi and bacteria using quinic acid. V. BUTKEVICH. *Biochem. Z.* 159, 393-413(1925); cf. C. A. 19, 91.—The fungi which can utilize quinic acid convert it into phenolic substances and those which grow best can utilize the quinic acid as a source of C. The

no. and relative positions of the OH groups in phenols det. whether or not they may be utilized. Catechol in moderate concns. is toxic, but at low concns. may be completely utilized by *Aspergillus niger* and *Citromyces glaber*. Certain bacteria which grow upon quinic acid can oxidize glucose to gluconic acid. There seems to be a similarity between the metabolism of quinic acid and of carbohydrates. W. D. LANGLEY

Formation of acetylmethylcarbinol and 2,3-butylene glycol in the metabolism of yeast. A. J. KLUYVER, H. J. L. DONKER AND F. V. HOOFT. *Biochem. Z.* **161**, 361-78 (1925); cf. *C. A.* **19**, 3510.—To show the presence of $\text{CH}_3\text{COCH}(\text{OH})\text{CH}_3$ in a yeast mash, protein is removed by boiling, and the dissolved $\text{CH}_3\text{COCH}(\text{OH})\text{CH}_3$ oxidized with FeCl_3 to $\text{CH}_3\text{COCOCH}_3$, which is distd. and converted to Ni dimethylglyoxime. It is shown that pure $\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_3$ isolated from a mash is not converted by Br to $\text{CH}_3\text{COCOCH}_3$ as was formerly believed, although in the presence of ferric salts and NaOAc the reaction does take place provided unchanged sugar or certain easily oxidizable compds. are absent. The excess Br is removed with NaHSO_3 and the $\text{CH}_3\text{COCOCH}_3$ formed distd. as before. In the presence of a H acceptor, such as methylene blue or S, $\text{CH}_3\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_3$ is formed from accumulated AcH during yeast fermentation of glucose or fructose. No mannitol was formed from fructose. With aeration some AcH is blown off so that its reduction products are formed to a smaller extent, and there is less butylene glycol than in non-aerated yeast.

W. D. LANGLEY

Studies in the biochemistry of *Bacterium pyocyaneum*. Contribution to the problem of its metabolism and its relation to intramolecular respiration. OSKAR ACKLIN. *Biochem. Z.* **164**, 312-70 (1925).—The growth activities of biologically well-defined strains of *B. pyocyaneum* have been carefully studied in chemically simple nutritive solns. of different p_{H} . It was thus demonstrated that one of the catabolic products, especially in a nitrate-lactic acid system, is pyruvic acid which is converted into alanine (combining with NH_4^+) and becomes incorporated into the protein of the bacterium. It has also been shown that CH_3CHO plays the usual important role in the intermediate metabolism of these organisms. In an NH_4Cl lactic acid system the organisms convert only $1/3$ of the N present as nitrates into their body protein. *B. pyocyaneum* retains its virulence and ability to produce toxic substances even on chemically simple media free from protein N.

S. MORGULIS

Effect of radium on pathogenic protozoa in culture. R. BRUYNOGHE AND A. DUBOIS. *Compt. rend. soc. biol.* **93**, 849-50 (1925).—Exposure to Ra radiation of a 5-millicurie dose for 48-62 hrs. produced no definite results on cultures of *Leishmania tropica*; it retarded *Trypanosoma inopinatum* non-infectious and not cultivable; *Spirochaeta ictero-hemorrhagiae* from rabbit serum retained its motility but lost the ability to be cultivated under similar treatment, and became non-infectious for the guinea pig.

S. MORGULIS

Effect of radium on filterable virus. R. BRUYNOGHE AND LE FÉVRE DE ARRIC. *Compt. rend. soc. biol.* **93**, 852-4 (1925).—Ra emanation destroys the filterable virus of rabbits as well as other filterable viruses.

S. MORGULIS

A study of anaerobic bacteria. J. H. BROWN. *J. Bact.* **10**, 513-42 (1925).—No toxin-forming anaerobes were found in the intestinal tract of the calf studied. Both proteolytic and saccharolytic anaerobes were found at all levels, but the former were more abundant in the cecum and large intestine. More than half the strains studied could hydrolyze the fat of cow milk. The titratable acidity is unreliable for detn. of fermentation by anaerobes, since they often produce large increases in the buffer index of media. Disappearance of carbohydrate from the medium is the best index of fermentation, and as much as 3% is sometimes necessary. Neither NH_3 nor amino-acid production is a good index of proteolysis. The formol titration is much better. Some of the proteolytic organisms produce more gas than *C. welchii* though more slowly. The proportion of CO_2 to other gases above the medium is least at the beginning of gas formation, increases often to 100% of the gas given off during the intermediate period, and again decreases toward the end of the gas-forming period. Whether all the gas comes from carbohydrates is questionable.

JOHN T. MYERS

The electric current (apart from the heat generated), a bacteriological agent in the sterilization of milk and other fluids. J. M. BEATTIE AND F. C. LEWIS. *J. Hyg.* **24**, 123-37 (1925).—In an elec. lethal tube bacteria are destroyed much below their thermal death point.

JOHN T. MYERS

The bacteriology of subacute infective endocarditis. H. D. WRIGHT. *J. Path. Bact.* **28**, 241-78 (1925).—Media for blood cultures which contain trypsin or Na citrate are slightly superior to those which do not. If 20% trypsin is added to whole blood streptococci are not killed.

JOHN T. MYERS

The antiseptic action of salicylic and benzoic acids and of paper impregnated with salicylic acid against molds. M. BORNAND. *Tech. Ind. Schweiz. Chem.-Ztg.* 1925, 239-41.—In beef ext. a concn. of 0.05% of BzOH or $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ prevents the development of *B. coli* or *B. subtilis*, but 0.15% is required to inhibit that of *Saccharomyces cerevisiae*. The development of molds in beer wort is stopped only by 0.25% of either acid. Paper impregnated with either, used for covering preserves, was found to be without action. W. B. PLUMMER

Bacteriophage of d'Herelle. V. Effect of electrolytes on the rate of inactivation of bacteriophage by alcohol. JACQUES J. BRONFENBRENNER AND CHARLES KORB. *J. Exptl. Med.* 43, 71-86(1926); cf. *C. A.* 19, 3512.—Addn. of neutral salts to the lytic filtrate results in an increased rate of inactivation of the latter when EtOH is added to it. This effect of salts is the more marked the higher the valency of the cation. Conversely, removal by dialysis of salts originally present in the lytic filtrate tends to render lytic agents less sensitive to EtOH. Restitution of the original salt content to the dialyzed filtrate tends to bring the sensitiveness to EtOH in the dialyzed filtrate to the level of the non-dialyzed control. Inactivation of the lytic agent by EtOH thus appears to depend directly on the rate of pptn. of the coagulable constituents of the medium and is not the result of a direct toxic action of EtOH on "*bacteriophagum intestinale*." Considered in association with earlier work, these results speak in favor of the chem. nature of the agent of transmissible lysis. C. J. WEST

The presence of sulfate-reducing bacteria in oil-field waters (BASTIN, *et al.*) 8.

D—BOTANY

B. M. DUGGAR

Antagonism of the walnuts (*Juglans nigra* L. and *J. cinerea* L.) in certain plant associations. A. B. MASSEY. *Phytopathology* 15, 773-84(1925).—Wilting and subsequent death of potatoes, tomato, alfalfa and other crop plants in a circular area about walnut and butternut trees extending beyond the longest branches are not due to insufficient water supply nor to accumulation of toxic products from decaying leaves and shells. The root systems of affected plants were, in all cases, in immediate contact with the tree roots. Water cultures of tomato with bits of walnut bark or roots added showed prompt wilting and death of roots. No such effects occurred when bits of root or bark were added to soil pots in which plants were grown. The toxic effects are probably due to juglone. JOSEPH S. CALDWELL

Recent advances in science: Plant physiology. WALTER STILES. *Science Progress* 20, 417-23(1926).—Review of recent work on permeability. JOSEPH S. HEPBURN

Experiments on carbon dioxide assimilation. OTTO WARBURG. *Naturwissenschaften* 13, 985-93(1925).—A review of work done in recent years by W. and Negelein on CO_2 assimilation by *Chlorella* suspensions. The $v-i$ curve (velocity of assimilation against light intensity) consists of two parts; at low i values v goes up linearly with i and is independent of temp. θ ; at high i values $dv/di = 0$ and $dv/d\theta > 0$ (Blackman reaction). For the first reaction the specific photochem. action (cc. CO_2 decomposed/cal. light energy absorbed by the chlorophyll) runs from 117 ($\lambda = 660 \mu\mu$) to 67 ($\lambda = 436 \mu\mu$). This means that in the red 4.4, in the yellow 4.3 and in the blue 5.1 quanta of light energy are necessary per mol. CO_2 for complete reaction into glucose. The higher value in blue may be explained from absorption by secondary pigments, xanthophyll and carotins. From the narcotization of the cells by chemically indifferent, but highly adsorbable, substances it is concluded that the photochem. reaction takes place on solid surfaces. The Blackman reaction is as strongly influenced by narcotics (at least 10 times more than the cell respiration) and also (contrary to the photochem. reaction) by HCN and H_2S ; it probably is essentially a catalysis by some heavy metal (Fe). This reaction has between 10° and 30° an almost linear $v-\theta$ curve. These properties are all similar to those of H_2O_2 decompn. by *Chlorella* catalase; for these reasons the reaction scheme of Willstätter and Stoll, formaldehyde peroxide $\rightarrow \text{O}_2 + \text{formaldehyde}$, gives the best explanation of the facts. B. J. C. VAN DER HOEVEN

The water-soluble phosphatide from the root of the sugar beet. I. V. GRAFE AND V. HORVAT. *Biochem. Z.* 159, 449-67(1925).—A phosphatide from the sugar beet was pptd. and purified as the Pb salt. It was hydrolyzed with 5% H_2SO_4 and oleic and palmitic acids, choline, and glycerophosphoric acid were isolated. Hydrolysis with 20% H_2SO_4 gave in addn. glutaric acid, but the carbohydrate could not be detected. The empirical formula obtained for the Pb salt of the phosphatide is $\text{C}_{77}\text{H}_{153}\text{O}_{16}\text{P}_2\text{-NPb}_4$, which indicates a dimolecular structure. A second substance, called a B phos-

phatide, is obtained and this does contain a reducing substance which seems to be a carbohydrate; it has not yet been isolated from the hydrolysis products. W. D. L.

Some alleged Philippine poison plants. M. M. KALOW AND F. M. SACAY. *Philippine Agr.* **14**, 421 7(1925). - Field tests for HCN and saponin were made upon many Philippine plants and the results with other properties of certain poisonous plants are listed. A. L. MEHRING

Temperature and metabolic balance in living plant tissues. FRANKLIN KIDD AND CYRIL WEST. *Proc. Fourth Intern. Congress of Refrigeration* **1**, 170-85(1924). - From a brief review of results obtained in many fields of investigation with regard to the reaction of plant tissues to temp. and also from purely theoretical considerations K and W. conclude that: (1) Temp. not only affects the speed of metabolism, but also controls the metabolic balance and hence influences directly the chem. constitution of plants, their structure and the precise course of their developmental sequence in growth, maturation and senescence. (2) There is probably an optimum av. temp., differing in different cases, for yield of particular plant products arbitrarily acquired by man. (3) The range of temp. within which plants can complete their life-cycle is limited. (4) Beyond these limits, differing in different cases, displacement of the metabolic balance results sooner or later in injury and death. (5) No general conclusion can be given at present as to the effect of change of temp. on metabolic balance and chem. compn. The effect may differ in different cases, but investigations agree in showing that in carbohydrate metabolism the balance alters with fall in temp. in the direction of increased hydrolysis. (6) Both the change in chem. compn. at low temp. in regard to such substances as sugars, pectins, substances responsible for flavor, etc., and the possibility of injurious effects at low temps. above the f. p. are factors of importance in the cold storage of fruit and vegetables needing further study. Bibliography of 21 references. A. PAPINEAU-COUTURE

Heritable chlorophyll deficiencies in seedling cotton. G. N. STROMAN AND C. H. MAHONEY. Texas Agr. Expt. Station, *Bull.* **333**, 22 pp.(1925).—The hereditary behavior of 2 deficiencies in green coloring matter in seedling cotton is reported. These 2 characters, one of which is yellow seed leaves instead of the usual green and the other the lack of green color in certain portions of the seed leaves, are important defects not only because of their fundamental scientific interest but also because the presence of these characters in a field of cotton lessens the stand and vigor of the plants. The 2 characters mentioned are shown to be inherited and the relations of the genetic factors concerned have been discovered. These factors thus form a true basis for future genetic work in cotton. J. J. SKINNER

A new form of iodine in Laminaria. I. P. FREUNDLER, Y. MÉNAGER, Y. LAURENT AND J. LELIÈVRE. *Bull. soc. chim.* **37**, 1466-82(1925).—If freshly harvested *Laminaria* (especially *L. flexicaulis*) is stored in a closed container for 10 to 30 days, it will then show 50 to 150% more I on analysis than did the fresh material. It is thought that in the living tissue under the influence of sunlight part of the I is intimately bound with certain org. and inorg. constituents and that it is thus rendered incapable of analysis. Three methods of analysis are given. J. J. WILLAMAN

E -NUTRITION

PHILIP B. HAWK

The nomenclature of the vitamins. E. C. VAN LEERSUM. *Nederland. Tijdschr. Geneeskunde* **69**, II, 2418-20(1925).—L. points to the confusion existing in naming the vitamins; "vitamin D," e. g., signifies different substances according to Funk and according to Steenbock. R. BEUTNER

The influence of the Degerma process on the antiscorbutic properties of milk. ERICH LOEWY. *Klin. Wochschr.* **4**, 1776(1925).—The Degerma process appears to involve heating the milk for 30 min. to 63-5°, cooling and adding Al in safe (?) amts. The milk is deficient in vitamin C. MILTON HANKE

Blood picture of rats with experimental rickets. E. MAURER, ST. DIEZ AND TH. BERENDT. *Klin. Wochschr.* **4**, 1869-70(1925).—The blood of rats, kept for 7 weeks on a rickets-producing diet, contains nucleated erythrocytes, erythroblasts and myelocytes. The erythroblasts occur, after 3 weeks, in 50% of the animals and after 5 weeks in all of the animals. MILTON HANKE

Scurvy in guinea pigs. KARL SCHMITT. *Klin. Wochschr.* **4**, 2104-5(1925).—Fresh goat milk protects guinea pigs perfectly against scurvy. Buttermilk is only partially protective. The animals live 6-7 weeks as compared with 3-4 weeks on an identical diet but without buttermilk. Children do not develop scurvy when butter-

milk is given as the only source of vitamin C. The guinea easily that facts accumulated for this animal cannot be tr reservations.

Vitamin content of human milk. L. F. MEYER AND E. 4, 2380-3(1925); cf. C. A. 19, 1293.—Infant guinea pigs die exclusively with human milk. There is no evidence of scurv starvation. Human milk which contains 1.5% protein, 3.5% fat and 6.0% carbohydrate is especially adapted to an animal that develops slowly. The guinea pig doubles in wt. in 13 days; hence it requires a diet rich in protein such as guinea pig milk which contains 4.7% protein, 7.4% fat and 2.3% carbohydrate. Human milk, augmented by the addn. of protein, gives normal growth curves for guinea pigs. Human milk is not deficient in vitamin C.

Recent advances in science: Animal nutrition. H. E. WOODMAN. *Science Progress* 20, 429-35(1926).—Review of recent work on vitamins, growth, nutrition and the cooking of stock foods.

Vitamin B. P. A. LEVENE AND B. J. C. VAN DER HOEVEN. *Chem. Weekblad* 22, 575-6(1925).—A review (cf. C. A. 18, 3638; 20, 224).

Egg white vs. casein as source of protein in the diet of rats. HELEN S. MITCHELL. *Am. J. Physiol.* 74, 359-62(1925).—Egg white is only slightly less adequate than casein. When it furnishes 18% of the protein in a standard diet supplemented by yeast it is an adequate source of protein especially adapted for low mineral diets.

Irradiation of chicks with cod-liver oil. C. W. CARRICK. *Am. J. Physiol.* 74, 534-8(1925).—Chickens kept on a highly rachitic diet and fed near irradiated cod-liver oil in Pyrex flasks developed rickets later and in a less severe form than the controls. It is assumed that the antirachitic substance is some form of ultra-violet energy.

The distribution of vitamin B in the maize kernel. HILDA M. KROLL AND L. B. MENDEL. *Am. J. Physiol.* 74, 674-94(1925).—Feeding expts. have shown that in yellow maize practically all vitamin B of the whole grain is found in the embryo, while the bran contains only traces and the endosperm no vitamin at all. Loss of vitamin B through milling of white corn embryo appears possible.

Biochemistry of avitaminosis. VI. The influence of corn upon the nitrogen, creatinine, and creatine excretion of rabbits and upon the weight curve of guinea pigs. A. PALLADIN AND KATHARINA KRATINOWA. *Biochem. Z.* 159, 179-91(1925); cf. C. A. 19, 2364.—Growing rabbits placed upon a diet of corn lived for 50 to 70 days, and, during this interval, lost about 1/2 of their wt. The N excreted per unit of body wt., however, remained about const., whereas the creatinine coeff. increased from 21.7 to 24.8 in 3 weeks, fell to 13.4 in 3 more weeks and then increased again. No true avitaminosis was observed. The wt. of guinea pigs upon the same diet decreased quite uniformly and death again resulted in about 50 days. When the corn was heated in an autoclave, however, the wt. dropped suddenly and death occurred in 15 days. Corn was not a complete food and the death of the animals was thought to be due to the inadequacy of the proteins, as well as to the deficiency of vitamins C and A.

Influence of injected solutions of plant secretin upon the intermediary carbohydrate metabolism. M. DOBREFF. *Biochem. Z.* 161, 80-90(1925).—The amt. of sugar in the blood of pigeons is about doubled as a result of the injection of an ext. of spinach. This is true both of polyneuritic as well as normal birds. The same ext., however, when injected into dogs, raises the blood sugar level only slightly.

The relation of creatine to the metabolism of carbohydrates. A. PALLADIN. *Biochem. Z.* 161, 139-56(1925).—Dogs kept upon a carbohydrate-free diet with no excess of protein excreted creatine whereas with excess of protein over normal requirement they did not. This difference is probably due to the conversion of protein to carbohydrate. In the rat, the excretion of total N is hardly affected by lack of carbohydrates, but the excretion of creatine is again increased. The same changes occur when fresh meat, which contains creatine, is fed. Guinea pigs respond similarly. Glycerol and lactic acid, when fed in place of carbohydrate, also reduce the excretion of creatine. Rabbits kept cold and fed sugar showed a lower creatine excretion than when not fed sugar. Therefore, creatine is concerned with the metabolism of carbohydrates.

Vitamin potency of cod-liver oils. XVIII. Effect on vitamin potency of solid-pressing cod-liver oils. A. D. HOLMES AND M. G. PIGOTT. *Ind. Eng. Chem.* 18, 188-9(1926); cf. C. A. 19, 3520.—Six typical crude cod-liver oils were pressed under com. conditions by refrigeration in a brine-cooled tank and the solidified stearin was

sepd. from the non-freezing oil. The analyses of the crude oil and the pressed oil showed a slightly higher I no. and a higher n for the pressed oil although the differences were not marked. From a practical standpoint the vitamin A tests on white rats failed to indicate significant differences in the potency of the 2 types of oils.

H. B. LEWIS

The value of the minerals in fish meal for fattening pigs. H. R. DAVIDSON. *J. Ministry Agr.* 32, 708-13 (1925).—Cereals alone cannot supply all the food requirements of the pig. The value of fish meal as a supplement to a diet of cereals is largely due to the mineral elements it supplies, since similar beneficial results were obtained when an equiv. salt mixt replaced the fish meal.

H. B. LEWIS

Recent advances in the laws of animal nutrition and reproduction. I. Mineral metabolism and the effect of various dietary factors. B. SJOLLEMA. *Z. Tierzücht. Zuchtungsbiol. Tierernähr.* 5, 1-74 (1925).—Review with excellent bibliography under the following heads: mineral metabolism and the influence of various dietary factors; the influence of sunlight on mineral metabolism; the relation between nutrition and reproduction. The relation of Ca and P to lactation and the question of the reproductive vitamin (I) are discussed in particular detail.

H. B. LEWIS

The vitamin contents of canned peas. E. F. KOHMAN. *Canning Age* January, 1926, 48.—Exhaustive tests with canned and home-cooked peas again emphasize the wholesomeness of the factory product. The vitamin contents of canned peas are affected materially by the maturity of the product as well as by the length of the blanch.

THEO. MARKOVITS

The content of fat-like substances in cocks fed on vitamin B-free diets. EIICHIRO KODAMA. *J. Biochem. (Japan)* 5, 185-200 (1925).—The wt. of the individual organs of cocks fed on vitamin B-free diets decreases parallel to the general loss in body wt., though certain organs like spleen and testicle diminish very much more so, while in the case of pancreas and kidney although their absolute wt. decreases their ratio to the total body wt. rather increases. The changes in lecithin, cholesterol and total fatty acid content during this diet vary for each individual organ. Generally, the amt. of lecithin in the organs decreases while that of the cholesterol and total fatty acid increases in the following order: lecithin—kidney, pancreas, heart, liver, spleen, muscle, lung; cholesterol—pancreas, testicle, kidney, heart, lung; fatty acids—testicle, spleen, pancreas, liver, kidney, heart, lung, muscle. The blood lecithin in cocks fed on vitamin B-free diets decreases while the cholesterol and total fatty acid increase as compared to the controls.

S. MORGULIS

A physiological and economic study of the diets of workers in rural areas as compared with those of workers resident in urban districts. A. B. HILL. *J. Hyg.* 24, 189-240 (1925).

JOHN T. MYERS

Value of albuminous milk as a medicinal food. H. NEUKIRCH. *J. praticiens* 39, 602 (1925); *Bull. soc. hyg. aliment.* 13, 527 (1925).—Albuminous milk consists of butter-milk dild. with 1 vol. of H_2O and 2 vols. of milk and to which casein has been added. The lactose which has been removed by this prepn. is replaced by 5% of dextrin-maltose. N. considers it to be pre-eminently an antifermentative, and the best substitute of human milk as a complete diet.

A. PAPINEAU-COUTURE

Variations in the basal metabolism in infantile denutrition and debility. A. FOUET. *Rev. franç. pédiatrie* 1, 183 (1925); *Bull. soc. hyg. aliment.* 13, 521-2 (1925).—Observations on 22 children, 2 weeks to 16 months old, 8 of whom were congenitally weak and the others nearly all atrophic or athreptic, led to the following conclusions: until the deficiency in wt. (difference between the actual wt. and the wt. of a normal child the same age) reaches 35-38%, the basal metabolism, expressed in cal. per 24 hrs., remains const. allowing for the possible variation of $\pm 15\%$ recently estd. by Benedict. When the deficiency in wt. exceeds this limit there is a sharp drop in basal metabolism. There are thus 2 stages in the slow denutrition of infants: in the first stage, inanition and the cellular reduction which it brings about have not seriously affected the assimilating power of the organism, which, though overworked, still functions normally and can restore normal conditions if a suitable diet is supplied; in the 2nd stage prolonged inanition causes such deep-seated modifications in the physico-chem. equil. of the protoplasm that the power of assimilation can be very considerably reduced, even to such an extent as to prevent all growth. The 1st stage corresponds to what is generally known as 1st and 2nd degree atrophy or hypothyresy, and the 2nd stage to athrepsy. In the former, when a suitable diet is given the organism can assimilate it in sufficient quantity to raise the wt. to that which is normal for its age; while in the 2nd stage extreme caution is required and the qual. and quant. compn. of the diet will depend on the wt. curve and the general reactions of the child. Human milk is essential, and

if it is not tolerated ass's milk should be given. Parenteral introduction of horse serum, or even injection of artificial serum contg. a suitable proportion of amino acids essential to growth and metabolism, may be advisable.

A. PAPINEAU-COUTURE

Thyroid feeding and secondary sex characters in Rhode Island Red chicks. H. B. TORREY AND BENJAMIN HORNING. *Biol. Bull. Marine Biol. Lab.* **49**, 365-74(1925).—When male Rhode Island Red chicks were fed desiccated thyroid in daily doses increasing with the wt. of the birds: (1) Their plumage appeared precociously, but differentiated later than usual, so that at the end of 12 weeks they were feathered like females. (2) Their adult plumage though prevailing male in type exhibited characteristics of form and structure especially in the hackle, saddle, back and shoulder feathers.

L. W. RIGGS

Nutrition of fish by raw and by cooked meat. CHARLES RICHEL, ÖXNER AND J. RICHARD. *Compt. rend.* **181**, 637-9(1925); cf. *Compt. rend.* **180**, 405.—Six specimens of *Cantharus griseus* Cuv. were divided into 2 groups of 3 each and fed raw and cooked meat, resp., for 205 days. The fish were weighed at 10-day intervals and those receiving raw food increased their wt. from 100 to 208, while those receiving cooked food increased their wt. from 100 to 165. The diets were then reversed when the fish that had received cooked meat were fed raw meat and after 20 days of slow growth these fish recovered about the normal rate of growth for fish fed raw meat during the first period. But the fish which had been fed raw meat for 205 days, when fed cooked meat, lost wt. during the first 10 days, gained slightly, then lost wt. again and died on the 58th day. Thus for fish as well as mammals, cooking of meat diminishes its nutritive value.

L. W. RIGGS

Maximum metabolism and the suprarenals. I. GIAJA AND X. CHAHOVITCH. *Compt. rend.* **181**, 885-6(1925); cf. *C. A.* **18**, 1522, 2025.—Rats from which the suprarenals had been removed were not able to adapt their heat production or raise it above the level of basal metabolism. In this case the max. metabolism is lowered to a point to blend with the basal metabolism, while the metabolic quotient becomes unity. The injection of adrenaline into rats from which the suprarenals are removed increases the value of thermal energy output yet without attaining the max. metabolism of the normal rat. The suprarenals appear to play an important and perhaps a fundamental role in the adaptations of heat production.

L. W. RIGGS

Disturbances in calcification in rickets. E. GLANZMANN. *Schweiz. med. Wochenschrift* **55**, 683(1925); *J. Am. Med. Assoc.* **85**, 857.—Rats were kept on McCollum's diet which regularly produces rickets. On these rats was tested the antirachitic action of certain foods. The ratio between the Ca and the inorg. P in the blood is considered the most important factor in the pathogenesis of rickets. Normally this ratio is 1.95 to 1. McCollum's diet does not contain enough P. If the P is increased without the addn. of Ca, or if the Ca is reduced in this diet, rickets does not develop. An excess of Ca in the diet results in a lowering of the inorg. P and in rickets. Vegetables prevent rickets when they contain certain compds. (lecithin, K salts) which correct the disturbed Ca-P ratio in the blood. Consequently it was found that vitamin-free ovo-lecithin or vitamin-poor beef (which reduces the excretion of the phosphoric acid through the intestines) had a very efficient antirachitic action. That overfeeding with cow milk predisposes children to rickets may be explained by the high CaCO_3 content, which lowers the percentage of P in the blood, by the high protein content, which leads to an increased excretion of P, and by the fact that the fats in milk have not the same protective quality against the rachitic factors in milk as the fats in cod-liver oil, for example. The regulation of the blood P is especially dependent on the liver, which discharges continually P-contg. fats into the blood stream, on the pancreatic islands, and on the parathyroids. Insulin decreases the content of P in the blood. Removal of the parathyroids increases the content of P in the blood. Irradiation of rachitic rats results in an increase of P in the blood.

L. W. RIGGS

Chloride-free milk in edema. CARRAYROU. *Bull. Acad. Med. (Paris)* **94**, 943 (1925); *J. Am. Med. Assoc.* **85**, 1997.—Milk freed from chlorides by Puglia's dialyzing method is greatly superior to ordinary milk for persons on a milk diet during treatment for edema and ascites from a failing heart. A small quantity of lactose is added to the milk after dialyzing, to replace that retained by the dialyzer, and the milk is then sterilized.

L. W. RIGGS

The use of high carbohydrate diets in the treatment of diabetes mellitus. W. D. SANSUM, N. R. BLATHERWICK AND RUTH BOWDEN. *J. Am. Med. Assoc.* **86**, 178-81 (1926).—With the use of high carbohydrate diets, insulin-treated patients were kept with the urine sugar free and with a normal blood sugar. The patients were restored to a more nearly normal state of phys. and mental activity, and were freed from the

slightest traces of the acetone type of acidosis. The potatoes, milk and fruits eliminated the acid ash type of acidosis, which, it is believed, has been the cause of the high incidence of blood vessel disease. The diets are more palatable and the patients lose their craving for forbidden foods. A somewhat lower caloric intake apparently is required for full maintenance. The diets are cheaper as they contain no special food and much less of expensive fats.

L. W. RIGGS

Mechanism of antiketogenic action. I. WEISS AND M. ALTAL. *Magyar Orvosi Archivum* 26, 485-96(1925).—The expts. confirm the results of Lundin (cf. C. A. 18, 1684, 3203; 19, 3516) that yeast cells decompose to a slight degree the Na acetoacetate. This ability of yeast cells can be increased by adding to the yeast emulsion fermentable carbohydrates. The same result can be reached by adding the decompn. products of fermentation, such as glycerol, AcH and pyruvic acid. If the AcH produced by fermentation is combined with Na_2SO_3 , the antiketogenic action of the carbohydrate ceases.

L. W. RIGGS

Effect of mineral supplements on reproduction of the albino rat. W. D. SALMON. *Science* 62, 420-1(1925); cf. C. A. 19, 670.—When an improved ration consisting of white corn 30, wheat 30, peanut meal 25, dried meat 12, and cod-liver oil 3 was supplemented with 1% NaCl and 1.5% acid phosphate, reproduction was not more successful than on the acid phosphate ration in the former expts. None of the litters reached the age of weaning. The addn. of 0.5% NaHCO_3 , sufficient to neutralize the excess of H_2SO_4 carried by the acid phosphate, resulted in a marked improvement. Already rats to the 3rd. generation are being raised. A small quantity of H_2SO_4 may limit the growth of the rat in the 2nd. generation even when little or no effect on the growth of the first generation was apparent.

L. W. RIGGS

Ultra-violet light and antirachitic vitamin in the hen egg. J. S. HUGHES, R. W. TITUS AND J. M. MOORE. *Science* 62, 492-3(1925).—In this study eggs from 4 pens of hens receiving varying amts. of ultra-violet light were tested by feeding the eggs to 4 lots of growing chicks. The chicks in lots 1 and 3 which received eggs from hens receiving direct sunshine developed normally as shown by their general appearance and by analysis of their blood and bones. Chicks in lot 2 which were fed eggs from hens that received sunlight filtered through glass and light for 30 min. per day from a Hg-arc lamp developed some rickets, but they were in a much better condition than the chicks in lot 4 which were fed eggs from hens which received no ultra-violet light except that which came through the glass window. A repetition of the expt. confirmed the foregoing results.

L. W. RIGGS

Concentration of the growth-promoting principle obtained from yeast (vitamin B). P. A. LEVENE AND B. J. C. VAN DER HOEVEN. *Science* 62, 594(1925); cf. C. A. 20, 224.—The starting material is the fraction of yeast ext. prepd. according to Osborne and Wakeman. The aq. soln. of this material is brought to p_H 4. Some inert matter settles out. From the soln. the active material is pptd. with alc. The soln. of this material is treated with HNO_3 , and by this treatment a substance is obtained which is active in daily doses of 1.8 mg. The max. loss in active units is 10%. Often such material is prepd. without any loss in active units. The compn. of this material is C 38.2, H 6.0, N 10.3, P 7.6, S 1.46 and amino N none. The S was present mostly in the form of SH groups. From this material the active principle was extd. with silica gel. From the gel by extn. at p_H 9.5 a material was obtained which was active in daily doses of 0.08 mg. and contained about 4% S. The tests were made with the white rat.

L. W. RIGGS

Rickets, ultra-violet light and milk. J. W. GOWEN, J. M. MURRAY, M. E. GOOCH AND F. B. AMES. *Science* 63, 97-8(1926).—Expts. were made by feeding chickens with milk from cows which had been exposed to ultra-violet light and from cows which had not been exposed to ultra-violet light. The chickens were allowed to develop rickets before the feeding expt. began. The results show that more of the substance necessary to cure rickets is absorbed by the cow exposed to ultra-violet light and secreted by her in her milk. The cows prevented from receiving ultra-violet light are not able to secrete this anti-rachitic substance in sufficient quantities to cure or allay the progress of clinical rickets. This suggests that the high incidence of rickets in children during the late winter months is due to their mothers not receiving enough ultra-violet light either during pregnancy or while in lactation, also that cow milk produced especially for baby feeding should be from cows which have had access to ultra-violet light either from the sun or some other source.

L. W. RIGGS

Alimentary kidney disturbance in rabbits. RICHARD V. BODÓ. *Arch. explil. Path. Pharm.* 109, 185-97(1925).—When rabbits are fed on oats deprived of their outer covering a kidney disturbance occurs, accompanied by an albuminuria, a retention

of NaCl, and by hyposthenuria. Degenerative changes in the kidney occur. Acidosis is not responsible for the condition, and whether it is of the nature of an avitaminosis is not certain, although it is definitely not due to a lack of B vitamin. G. H. S.

The assay of cod-liver oil for vitamin A. S. G. WILLIMOTT AND F. WOKES. *Pharm. J.* 115, 718-20(1925).—A detailed discussion of the various factors which influence the accuracy of the physiol. assay of cod-liver oil for vitamin A and their bearing on the assay method of the new U. S. P. Among certain defects of this method are the possible variation of the vitamin content of the diet prescribed; the use of single animals instead of group testing; failure to specify selection of the more steadily growing male rats (*C. A.* 19, 3295); omission of fat in the basal diet and lack of precision in providing for the mineral balance. The Osborne-Mendel and McCollum-Davis salt mixts. given as types to be used differ widely from each other in general compn. and their K/Na, Ca/Mg and Ca/P ratios; hence they cannot yield identical results. Finally, the standard unit as compared with that of Zilva and Miura (cf. *C. A.* 15, 2903) and of Poulsson (*C. A.* 18, 410, 3077) is ten times too low. S. WALDBOTT

Iodine fertilizing and iodine feeding (VON FELLEBERG) 15.

MCLEAN, STAFFORD and FALES, HELEN L.: **Scientific Nutrition in Infancy and Early Childhood.** Philadelphia: Lea & Febiger. 404 pp. \$3.75. Reviewed in *J. Am. Med. Assoc.* 86, 299(1926).

12—PHYSIOLOGY

ANDREW HUNTER

The kidney and amino-acid excretion. E. SCHMITZ AND P. SIWON. *Biochem. Z.* 160, 1-19(1925).—Larger quantities of amino-acid N were excreted in the urine by man when wheat proteins or peas were added to the basic diet than when casein or cod-fish was fed, the N intake being the same in all the expts. Diuresis following excessive H₂O intake caused an increase in amino-acid excretion. Urea, but not NaCl increased the amino-acid output in the urine. F. A. CAJORI

Pigment studies in connection with a case of curly hair. K. KLINKE. *Biochem. Z.* 160, 28-42(1925).—No correlation was found between the color of hair and the total S or cystine-S content of the hair. With the exception of red hair all the S present could be accounted for as cystine S. The tyrosine content of hair more nearly paralleled pigmentation, being higher in red, dark and curly hair than in blond hair. The genetic relation between tyrosine and melanine is suggested. 5.4% O₂ and 2% CO₂ were found in the gas present in the hollow hair cylinders of curly hair. F. A. CAJORI

The content of some materials in the hedgehog during hibernation. E. WEINLAND. *Biochem. Z.* 160, 66-74(1925).—The glycogen, fat, total N and H₂O were detd. in the bodies and livers of hedgehogs at different times during the winter's sleep. A large decrease in glycogen and fat was found as a result of hibernation, with smaller changes in N and H₂O content. F. A. CAJORI

The relative viscosity of the proteins of human blood serum and the method of their determination. W. STARLINGER AND K. HARTL. *Biochem. Z.* 160, 225-36(1925).—The relative and specific viscosity of serum proteins, the relative and specific viscosity-concn. quotients of serum proteins and the viscosity-refraction quotient of serum proteins and of whole serum, after deduction of the H₂O value, were detd. for 39 human serum specimens. F. A. CAJORI

The action of calcium on the acid-base balance of man. GYULA HOLLÓ AND ISTVAN WEISS. *Biochem. Z.* 160, 237-41(1925).—Intravenous injection of 10 cc. of 10% CaCl₂ soln. in patients caused a slight fall in plasma bicarbonate content and rise of alveolar CO₂. Hypertonic NaCl failed to cause the same results. Oral feeding of CaCl₂ and Ca lactate caused a fall in plasma bicarbonate but only slight effect on the alveolar CO₂ and blood acidity. F. A. CAJORI

The carbohydrate of the blood and its behavior in the organism. ALFRED GIGON. *Ergebnisse Physiol.* 24, 196-215(1925).—After the oral administration or subcutaneous injection of glucose or maltose in fasting rabbits, there is a prompt drop in the p_H of the blood, as detd. by the Michaelis method, which returns to normal in 2-4 hrs. Fructose behaves similarly but the fall in p_H is not so rapid, while sucrose, casein and olive oil cause no effect thereon. After the feeding of glucose by mouth, the sugar content of the lymph as well as the portal blood is increased. Glycogenesis does not begin for 3-4 hrs. and reaches the max. 16 hrs. after its introduction. These results are discussed in relation to their effect on protein metabolism, to diabetes and insulin.

H. J. DEUEL, JR.

The temperature of the human skin. F. G. BENEDICT. *Ergebnisse Physiol.* 24, 594-617(1925). H. J. DEUEL, JR.

Water balance. I. Blood dilution after ingesting fluids. HELLMUT MARX. *Klin. Wochschr.* 4, 2339-42(1925).—Ingestion of 50 cc. of H_2O transitorily increases the blood vol. 350-400 cc. Normal conditions are reestablished within 5 hrs. A diuresis need not occur and, when it does, may often appear after the blood vol. has returned to normal. MILTON HANKE

Decalcification of human tooth enamel. J. R. MCCLELLAND. *Dental Cosmos* 68, 127-32(1926).—Human tooth enamel is not decalcified in H-ion concns. between p_H 6.5 and p_H 11.0. Decalcification occurs at p_H 6.0 and less; the speed of decalcification increases with the degree of acidity. JOSEPH S. HEPBURN

Muscular exercise, lactic acid and the supply and utilization of oxygen. XIII. The gaseous exchanges of restricted muscular exercise in man. K. FURUSAWA. *Proc. Roy. Soc. (London)* 99B, 155-66(1926); cf. *C. A.* 19, 2844.—The gaseous metabolism was studied for a type of exercise involving only a limited portion of the musculature of man, by a simple ergometer capable of being worked at any speed by the arms. The amt. of O_2 required to perform a given amt. of work varied with the speed at which the work was done; a marked optimal speed existed. With const. speed and varying load, the O_2 requirement increased as a linear function of the work done; a marked optimal load did not exist. The O_2 intake increased to its max. value far more slowly than in exercise involving most of the musculature, e. g., running; it was still increasing rapidly, in some instances, after 6 min. of exercise. The O_2 -requirement curve diverged at quite low speeds from the O_2 -intake curve. A large O_2 debt was produced by exercise for a few min. with only a small fraction of the total musculature. The excess of lactic acid produced by violent activity of a localized group of muscles may diffuse into the blood, be carried to other parts of the body, especially the resting muscles and liver, and there be removed or converted into glycogen. Exhaustion may occur as a result of complete utilization of the precursor of lactic acid in exercise localized in a small group of muscles. XIV. **The relation in man between the oxygen intake during exercise and the lactic acid content of the muscles.** C. N. H. LONG. *Ibid* 167-72.—In men, as in isolated muscle, the rate of removal of lactic acid, as measured by the O_2 intake, is proportional to the square of the concn. of lactic acid in the fluids which are in contact with the muscle fibers. During the process of recovery in muscle, lactic acid apparently acts as a governor of oxidation. JOSEPH S. HEPBURN

The behavior and action of bile acids in the organism. A. ADLER. *Z. ges. expil. Med.* 46, 371-424(1925).—*In vitro* the addition of increasing amts. of bile salts to blood serum, urine or bile does not cause a continuous lowering of surface tension. This is true also when bile salts are added to colloidal cholesterol solns, while in a lecithin soln. there is a continuous lowering of surface tension. Injection of bile salts in man also brings no regular lowering of surface tension. Methods for demonstrating bile acids, depending on surface tension, are unreliable. Bile acids in addition to an action on surface tension also increase the viscosity of the medium as may be shown on adding bile salts to cholesterol solns., blood serum, bile and urine. The cholesterol or other hydrophilic colloids bind H_2O and adsorb the bile acids in part. Lecithin does not act in this manner. Bile acids when intravenously injected cause a marked increase in secretion of bile. The bilirubin and cholesterol content of the blood decrease and there is an increased excretion of bilirubin in the urine. The excretion of tetrachlorophenolphthalein in the bile is hastened by simultaneous injection of bile acids. Intravenous injection of tetrachlorophenolphthalein causes an increased excretion of bile and when injected in combination with bile acids is an excellent stimulant of biliary secretion. HARRIET F. HOLMES

Insulin and gastric secretion. I. DETRE AND R. SIVÓ. *Z. ges. expil. Med.* 46, 594-9(1925).—Six-unit doses of insulin 3 times a day for 7 days led to an increase of gastric secretion with an increase of free HCl and of total acidity. A single 10-unit dose of insulin usually increased the acidity of the gastric secretion but was occasionally without effect. HARRIET F. HOLMES

Studies on the physiology of sleep. III. Effect of muscular activity, rest and sleep on the urinary excretion of phosphorus. NATHANIEL KLEITMAN. *Am. J. Physiol.* 74, 225-37(1925).—Short periods of muscular work cause retention of P which is excreted after exercise. The excretion of P and total acid is increased during sleep and in the afternoon hrs., while prolonged administration of KBr has no influence. Conclusion: Increased excretion during sleep is due not to mental but to muscular relaxation. MARY JACOBSEN

Studies on the physiology of the liver. XII. Muscle glycogen following total re-

removal of the liver. J. L. BOLLMANN, F. C. MANN AND T. B. MAGATH. *Am. J. Physiol.* **74**, 238-48(1925); cf. *C. A.* **20**, 778.—In hepatectomized dogs intravenously injected glycogen was utilized. The same was true for muscle glycogen to a certain extent only. In spite of the presence of glycogenase in the blood muscle glycogen was not released from the cell rapidly enough to obviate hypoglycemia. The liver must, therefore, be considered as the main source of blood sugar. Glucose injections were followed by immediate recovery, continued injections by regeneration of muscle glycogen.

MARY JACOBSEN

An inhibition in ovulation in the fowl by the intraperitoneal administration of fresh anterior hypophyseal substance. A. T. WALKER. *Am. J. Physiol.* **74**, 249-56(1925).—The inhibition in ovulation is not due to a systemic toxic effect, since the fowl remained in excellent health. It seems to be due to an injurious effect of the excess hormone on the developing ova.

MARY JACOBSEN

Studies on the condition of activity in endocrine glands. XVII. The nervous control of insulin secretion. S. W. BRITTON. *Am. J. Physiol.* **74**, 291-307(1925).—Evidence is brought forth that insulin secretion is controlled by the right vagus nerve. Hypoglycemia of a course similar to that under insulin administration was induced by elec. stimulation of the right vagus in cats under amylal anesthesia in which sugar equil. was previously established by inactivating the left adrenal or severing the left splanchnic. Return to normal or hyperglycemia followed cessation of the stimulus. The circulation through the pancreas is unaffected during the stimulation. If the vessels and nerves of the pancreas are tied stimulation of the vagus does not lower the blood sugar. Exhaustion of glycogen reserve was excluded in the expts. Severing of the hepatic nerves or stimulation of the sympathetic innervation of the pancreas does not influence the blood sugar.

MARY JACOBSEN

Studies on muscular exercise under low barometric pressure. I. The consumption of oxygen and the oxygen debt. E. C. SCHNEIDER AND R. W. CLARK. *Am. J. Physiol.* **74**, 334-53(1925); cf. *C. A.* **19**, 674.—O consumption is reduced at barometric pressures below 410 mm, especially during phys. work. The reduction of O consumption by overload work is also accentuated at low pressure and the deviation from the linear relation between load and O consumed is greater. In the period of recovery the O consumption and CO₂ output are the same as those at normal pressure, showing that the O debt or "acidosis" is not larger at a low pressure.

MARY JACOBSEN

Is prolonged bed rest a prerequisite for the measurement of basal metabolism? F. G. BENEDICT AND ELIZABETH E. CROFT. *Am. J. Physiol.* **74**, 369-80(1925).—The basal metabolism after exercise and exposure to cold with a subsequent rest of 30 min is only slightly higher than that after a night's rest. Since the actual loss of heat does not affect the heat production, the absence of interdependence between these processes may be concluded.

MARY JACOBSEN

The site of formation of bilirubin. F. C. MANN, CHARLES SHEARD, J. L. BOLLMAN AND E. C. BALDES. *Am. J. Physiol.* **74**, 497-510(1925).—Of all large organs and vascular areas examd. spleen and bone marrow contained more bilirubin in the venous than in the arterial blood. These organs are, therefore, considered as the site of bilirubin formation.

MARY JACOBSEN

Studies on the physiological action of light. II. Depression of arterial blood pressure. III. Effects on arterial blood pressure of direct irradiation of blood in vivo. IV. Effects on the blood of the irradiation in vivo. C. I. REED. *Am. J. Physiol.* **74**, 511-7, 518-24, 525-33(1925).—Irradiation of the eyes of an anesthetized dog or of blood in a quartz tube interposed in the carotid artery caused a considerable drop in arterial blood pressure. There was no positive evidence of a depressor substance being liberated into the blood. The blood showed an abs. leucopenia, a lymphopenia but a relative lymphocytosis. Evidently photodynamic effects stimulate biological oxidation.

MARY JACOBSEN

Contributions to the physiology of gastric secretion. VII. An attempt to prove that a humoral mechanism is concerned in gastric secretion by blood transfusion and cross-circulation. A. C. IVY, R. K. S. LIM AND J. I. MCCARTHY. *Am. J. Physiol.* **74**, 616-38(1925); cf. *C. A.* **19**, 2077. **VIII. The proof of a humoral mechanism. A new procedure for the study of gastric physiology.** A. C. IVY AND J. I. FARREL. *Ibid* 639-49; cf. *C. A.* **19**, 2077.—Blood transfusion and cross circulation were found inadequate for the purpose. Expts. with a subcutaneously transplanted gastric pouch proved definitely that a humoral mechanism is concerned in the stimulation of gastric secretion. The hormone hypothesis is neither proved nor disproved. The transplanted pouch has a steady, acid-free or slightly acid continuous secretion. Two to 6 hrs. after a meal or 1 hr. after a histamine or gastrin injection gastric juice contg.

acid is secreted. The glands of the pouch were also stimulated by distending with a balloon, which proves that a local mechanism is, at least partly, involved. M. J.

The source of energy in muscular work. F. FALTA. *Biochem. Z.* **159**, 286-7 (1925).—A reply to Lusk (*C. A.* **19**, 2695). W. D. L.

Investigation of thrombin according to Alexander Schmidt. Blood-clotting. X. H. WOHLISCH. *Biochem. Z.* **159**, 288-97(1925); cf. *C. A.* **19**, 3302.—By comparison of the clotting time of fibrinogen by plasma and serum thrombins both from the same animal, it is shown that the 2 thrombins are not identical. This confirms the statement of Schmidt, but repudiates the work of Stuber and Lee. W. D. L.

The glycogen and cerebroside metabolism of the central nervous system. H. WINTERSTEIN AND ELSE HIRSCHBERG. *Biochem. Z.* **159**, 351-69(1925); cf. *C. A.* **19**, 2694.—From detns. of glycogen and cerebroside sugar present in the nervous system of frogs the following is found: the amt. of glycogen and cerebroside sugar present varies from 1.4% in winter to 0.1% in summer. In salt soln., in presence of O, the carbohydrate content of the nerve material may decrease as much as 50% of its original concn. in 8 hrs. Without O, the decrease is smaller. Elec. stimulation causes an increase in the glycogen content. Insulin markedly increases the glycogen and cerebroside levels. Greater effects can be noted with addn. of sugar or by stimulation in the presence of insulin, *e. g.*, glycogen increases 100 and cerebroside sugar 200% of the normal values. The results with strychnine are less definite. W. D. L.

Changes of metabolism with irradiation. I. Changes of the potassium and calcium content of blood with irradiation. L. PINCUSSEN. *Biochem. Z.* **161**, 61-6(1925).—After irradiation, the K content of serum from man decreases about 10%, unless a sensitizer such as anthracene is used, when the decrease is less. Ca, on the other hand, decreases only about 5%. The ratio K/Ca, therefore, decreases. **II. Influence of sunlight upon mineral metabolism.** *Ibid* 67-70.—The excretion by rabbits of K, Ca and Mg in the urine varies with the intensity of light in which they are kept, *e. g.*, upon a diet of carrots the K/Ca ratios in the dark, reflected light and sunlight are 19, 25.3 and 33.5, resp., while the Ca/Mg ratios are 1.73, 0.57, 0.62. A similar variation in these ratios is found upon a diet of oats. W. D. L.

Changes of the enzyme content of blood. I. L. PINCUSSEN. The variability of nuclease and lipase. E. COELHO. *Biochem. Z.* **161**, 71-9(1925).—A study is made of the effect of injected drugs, such as adrenaline and pilocarpine and of salts, such as KCl and CaCl₂, upon the amt. of nuclease and lipase in rabbit blood. The changes are not well defined. W. D. L.

Spleen and metabolism. I. Influence of splenectomy upon the excretion of nitrogen and creatinine. A. PALLADIN AND LYDIA PALLADIN. *Biochem. Z.* **161**, 104-13 (1925).—Contrary to the findings of other investigators, there is no increased excretion of N after splenectomy, but after 4 days a slight but progressive decrease was apparent, which continued for 2 or 3 months. But the excretion of creatinine is increased so that the creatinine coeff. becomes high, *e. g.*, from 18.6 to 27.0 in a month. W. D. L.

Influence of artificial venous obstruction upon the weight, diameter and volume of red blood corpuscles. L. PEZZOTTI. *Biochem. Z.* **161**, 114-20(1925).—Artificial venous obstruction does not uniformly influence the size or wt. of corpuscles. W. D. L.

The autolytic decomposition of organic phosphorus compounds in tissues. P. GYÖRGY. *Biochem. Z.* **161**, 157-77(1925).—The hydrolysis of the org. PO₄ compds. which occur in tissues is called autolysis. The conditions under which hydrolysis is favored or prevented are described for blood, liver, kidney, brain and muscle. In the case of blood, the decompn. is enzymic, is prevented by NaF or Na₂C₂O₄ and is favored by hemolysis, although saponin soon slows down the reaction. Both acids and alkali retard the reaction. Much of the urine PO₄ is due to the hydrolysis of these org. PO₄ compds. by the kidney. W. D. L.

The reducing and iodine-absorbing power of urine. I. The normals. H. K. BARRENSCHEEN AND L. POPPER. *Biochem. Z.* **161**, 210-8(1925).—There does not occur a reducing substance (the U substance of Moor, *C. A.* **19**, 2215) in normal urine other than the coloring materials present. When acidified with AcOH, the I-absorbing power of urine is decreased 9 to 29%, but the reducing power toward FeFe(CN)₆ remains unchanged. The decrease of absorption of I goes parallel with the amt. of urobilinogen pptd. and is probably due to this substance. W. D. L.

The role of the phosphates in carbohydrate metabolism in skeletal muscle. FLOR-ENCE BEATTIE AND T. H. MILROY. *J. Physiol.* **60**, 379-401(1925).—Normal mammalian muscle *in vitro* treated with NaF can synthesize 80 to 90% of the preëxisting free phosphate with the glycogen present to form *hexosephosphate*. The synthesis is always

accompanied by a greater consumption of glycogen than is required for esterification, but the lactic acid production is always checked or there may be a disappearance of the acid. The beneficial effect of added glycogen was more evident after the addition of more phosphate. The muscle of insulin-treated cats behaved in much the same way as normal muscle except there seemed to be a tendency in the insulinized muscle to hold up glycogen. In the muscle of adrenalized cats the synthesis under the influence of NaF was much diminished. Lactic acid production always accompanied the synthesis even when the glycogen that disappeared was sufficient to account for the synthesis. Glycogen addition to adrenalized muscle improved the synthesis slightly or not at all. Adrenalized muscle always showed an initial low glycogen content and a much lower lactic acid percentage than normal or insulinized muscle. The muscle of insulin-treated adrenalized animals, compared with the untreated, showed a marked improvement in the synthesis of both the intrinsic and the added phosphate although it was seldom so good as in the normal or insulin normal cases. J. F. I.

The effect of thyroid feeding on sugar tolerance. II. P. MARKS. *J. Physiol.* 60, 402-10(1925).—The thyroid-fed rabbit, whose liver still contains glycogen, shows a secondary hyperglucemia following the injection of glucose or a small dose of insulin. When the liver is depleted of glycogen, a small dose of insulin, or an injection of glucose, produces a fatal hypoglucemia in the thyroid-fed animal. The maintenance of the normal blood sugar level seems to involve a no. of opposing factors. The liver compensates for a fall in blood sugar by an accelerated output of glucose; the pancreas compensates for a rise by an accelerated output of insulin. The thyroid hormone sensitizes the liver to influences promoting glycogenolysis. Excessive thyroid feeding may lead to hypertrophy of the islet tissue of the pancreas, accompanied by atrophic changes in the pituitary. All these factors taken together may account for the results obtained. J. F. LYMAN

Physiology of the glands. LXXXIII. LEON ASHER. Demonstration of the formation of carbohydrate from fat and its dependence upon the liver. V. CALVO-CRIADO. *Biochem. Z.* 164, 76-96(1925).—Rats were made carbohydrate-free through preliminary dietary prepn. with the use of peptone, then by more or less prolonged treatment with thyroid substance and phlorhizin injections, all of which prevented the deposition of glycogen and caused a continuous elimination of sugar. The addition of fat to the food called forth either immediately or soon afterwards a considerable increase in the urinary output of sugar. On the days of max. sugar excretion the N elimination remained unchanged or diminished somewhat so that the D/N ratio reached max. values. A very small addition of sucrose to the diet increased the formation of sugar from fat markedly, which is explained as being due to an improvement of the synthetic function of the liver by the extra sugar in the diet. LXXXIV. The respiratory exchange during work in its relation to glands of internal secretion. G. M. CURTIS. *Ibid* 97-109.—The performance of the same amt. of work (running 1 km. per hr.) causes in the adult male rat an increase of 81% in the CO₂ production and of 64% in the O consumption. The increased respiratory quotient leads to the conclusion that carbohydrates furnish a considerable part of the energy necessary for the work. S. MORGLIS

Studies of intermediary carbohydrate metabolism. X. Contribution to the problem of glucolysis. TH. BRUGSCH AND H. HORSTERS. *Biochem. Z.* 164, 191-8 (1925); cf. C. A. 20, 226.—In the dry liver or muscle substance there is no evidence of the presence of a glucolytic enzyme. The muscle and liver glycogenase are not inhibited by insulin. XI. The hexosediphosphatase of muscle and liver and its cleavage product, the monohexosephosphoric acid. TH. BRUGSCH, M. COHEN AND H. HORSTERS. *Ibid* 199-206.—The dry substance of muscle and liver from rabbit or dog contains hexosediphosphatase, which changes the hexosediphosphoric acid into a dextrorotatory hexosemonophosphoric acid. The latter gives a strong Seliwanoff reaction. The fresh muscle, unlike the dry substance, can split hexosediphosphoric acid into H₂PO₄ and *d*-fructose, then into monohexosephosphoric acid, and finally into hexose and lactic acid. Hence the intermediate sugars of liver and muscle must in part represent a mixt. of hexosediphosphoric and hexosemonophosphoric acids. The α - and β -hexosediphosphatases are not identical, since dry muscle contains only the β , while fresh muscle contains both enzymes. XII. The effect of insulin on the respiration of muscle and liver. TH. BRUGSCH, H. HORSTERS AND J. VORSCHÜTZ. *Ibid* 207-46.—The muscle or liver was taken from animals immediately after they were killed and freed of blood. The substance was at once weighed and broken up in a mortar, then washed about 15 min. once or several times with distd. water. The material was now sepd. from the water by filtration and suspended in Ringer soln. without NaHCO₃.

Two 30 cc portions were then placed in 300 cc. flasks, one of which also received a definite quantity of insulin. A 3rd flask contg. unwashed tissue suspended in Ringer soln. but without insulin served as control. All 3 flasks were shaken 50 min. in a thermostat at 40° and the air was analyzed for CO₂ and O₂. It was found that insulin has a stimulating influence on the respiration of washed muscle which, however, may also become inhibitory. The expts. give no clue as to the conditions which one or the other effect. It was also found that the boiled out juice of muscle depresses the respiration of muscle tissue while the boiled out juice from yeast or liver and especially thyroxin augment the respiration. Expts. were also performed to det. the rate of O₂ consumption of muscle substance, a modified Barcroft app. was used for this purpose. In large, unphysiol. quantity insulin causes an increased O₂ intake of both washed and unwashed muscle tissue. In smaller doses the insulin either does not act at all, or when active may produce either a stimulating or depressing effect. In fasting condition and especially in the hypoglycemic complex, insulin acts depressingly on the muscle respiration, which is thought to be due to the induced carbohydrate synthesis.

XIII. Experiments on the formation of lactic acid in the liver from acetic, tartaric, malonic and succinic acids. TH. BRUGSCH, H. HORSTERS AND S. NARITA. *Ibid* 247-56.—Perfusion expts. on livers show that acetic acid does not form lactic acid either in the livers from normal or diabetic (depancreatized) dogs, while malonic, tartaric and succinic acids do give rise to lactic acid.

XIV. Effect of insulin on the muscle dehydrodrases. *Ibid* 257-70.—Expts. are carried out with muscle tissue suspension by Thunberg's methylene blue method. The washed guinea pig muscle has no effect on the methylene blue unless a small amt. of Na succinate is added to it; then the dehydrodrase manifests itself through the discoloration of the dye. There is a similar result when lactic acid or *d*-fructosediphosphoric acid is added. The addition to washed muscle of insulin also exerts a definite dehydrodrase action, so that it may be definitely regarded as the activator of the lactic acid dehydrodrase of muscle. Muscle from animals treated with insulin shows the presence of a dehydrodrase effect on galactose, glucose, *d*-fructose, *d*-fructosediphosphoric acid and benzaldehyde. S. MORGULIS

The nature of the so-called serum antipepsin. W. MOZOLOWSKI AND H. HILAROWICZ. *Biochem. Z.* 164, 295-311(1925).—The inhibitory action which blood serum has on a peptic digestion in acid medium and which has been regarded as being due to a binding of pepsin by an antipepsin present in serum is shown to be entirely caused by a change in the H-ion concn. resulting from the addn. of the serum. S. M.

Studies on the injection of follicular fluid. J. WATRIN. *Compt. rend. soc. biol.* 93, 772-3(1925).—Follicular fluid produces remarkable vaso-dilator effects. This may even cause rupture of the vessels of the myometrium. S. MORGULIS

Studies on the diffusion of urea through the peritoneum. MARCELI LANDSBERGER AND HENRYK GNOINSKI. *Compt. rend. soc. biol.* 93, 787-8(1925).—Ringer soln. is allowed to flow through the peritoneal cavity of rabbits. The outflowing soln. contains the various nitrogenous and non-nitrogenous components of the blood which are removed by diffusion. In rabbits made uremic this artificial ascitic fluid contains large amts. of urea (352 and 680 mg. in 2 expts.). S. MORGULIS

Cholesterol in the cerebrospinal fluid during pregnancy and delivery. M. GAROFEANU AND N. LAZAR. *Compt. rend. soc. biol.* 93, 791-2(1925).—There is no cholesterol in the cerebrospinal fluid in the normal condition, during pregnancy or delivery. S. MORGULIS

Cholesterolemia in pellagrins. I. ORNSTEIN. *Compt. rend. soc. biol.* 93, 793-5(1925).—A hypercholesterolemia has been found in pellagrins which is interpreted as a sign of disintegrative process in tissues comparable to that observed in aged people. S. MORGULIS

Properties of the active substances of the right auricles of the heart. JEAN DE MOOR AND PIERRE RYLAKT. *Compt. rend. soc. biol.* 93, 814-6(1925).—An aq. ext. of the right auricles from hearts of several species used 4-5 hrs. after trituration, or a 4-hr. alc. ext. from material previously treated for 2 hrs. with Me₂CO, causes rhythmic reaction of the left auricle, which starts immediately, lasts for a long time and terminates suddenly. The H₂O ext. heated for 20 min. at 53° retains its activity and produces more regular results than the unheated. Heated to 60° it loses its ability to produce rhythmic contraction but it still sensitizes the auricle to adrenaline, while heating at 70° makes it entirely inactive. The alc. ext. gives less const. results. S. M.

The influence of fats on tar cancer in mice. J. LECLOUX. *Compt. rend. soc. biol.* 93, 832-3(1925); cf. *C. A.* 19, 1308.—Fe or Co compds. of oleic and stearic acids in paraffin-oil suspension were injected intraperitoneally into mice with tar tumors. In all mice thus treated there appeared a softening of the tumor within 15-25 days fol

lowing the injection. The paraffin oil alone did not produce the same effect. **Study of the mechanism of the action of fats on the development of tumors in mice.** *Ibid* 834-5(1925). S. MORGULIS

Reflex secretion of adrenaline. B. A. HOUSSAY AND E. A. MOLINELLI. *Compt. rend. soc. biol.* **93**, 881-3(1925).—The enervated heart of dogs shows regular acceleration under the influence of adrenaline injections. The acceleration varies from 4 to 60 beats per min., the av. being 30, which can be evoked by a rapid intravenous injection of 0.007 mg. of adrenaline. The heart reaction is a good measure of the adrenaline quantity. S. MORGULIS

Adrenaline discharge caused by muscular activity. B. A. HOUSSAY AND E. A. MOLINELLI. *Compt. rend. soc. biol.* **93**, 884-5(1925).—The acceleration of the enervated heart depends upon adrenaline secretion provoked by the products of muscle activity. This effect is exerted upon the adrenaline secretory center because it disappears after both large splanchnics are cut. During the first 15 sec. there is a slight diminution in the rate of the heart beat which is not, however, to be attributed to inhibition of adrenaline secretion as it also occurs and even in a more marked degree when the adrenals are absent. S. MORGULIS

Synthesis and destruction of phosphatides in the animal organism. KOKICHI KOIZUMI. *J. Biochem. (Japan)* **5**, 171-84(1925).—Exptl. procedures: The lymph is collected from the thoracic duct by means of a special metal canula which permits the operator to introduce $MgSO_4$ while drawing off the lymph and thus prevent its clotting. The amt. of added $MgSO_4$ is carefully calibrated and can be deducted from the mixed lymph collected. The fat fed to the dogs was usually 50-100 g. of liver oil which was previously thoroughly emulsified with 2 g. $NaHCO_3$ by rubbing in a mortar with enough water to give a final vol. of 350 cc. This emulsified fat was administered to the dogs in small quantities. The lymph was collected both before and after the fat feeding. The total fat and phosphatide content was detd. by extn. in a Soxhlet app. with alc., Et_2O and after dissolving in petroleum ether the material was filtered, evapd. and weighed. The lecithin portion was calcd. from the P detn. Also the total N was detd. by the micro-Kjeldahl method, and the choline by the method of Maclean. Five to eight hrs. after the feeding the dogs were killed and the fat and lecithin content of various organs and tissues also detd. The I no. was detd. for both the fatty acids fed and for the organs. After a preliminary extn. for 4-5 hrs. at 50° with abs. alc. completely to dehydrate the material, then with Et_2O , the combined exts. were filtered, evapd. and the lecithin Cd salt was prepd. on which the I detn. was made according to Hubl's method. By this direct study of the lymph K showed that after feeding of fat there was an increase in the phosphatide content as well as a synthesis of phosphatide in the intestinal mucosa. The phosphatide increases in the lymph parallel to the increase in fat, and this appears about 2-3 hrs. after the feeding, but the phosphatide does not increase quite so much as the fat but remains at a high level for a longer period. According to the N, P and choline the increase of lipid in the lymph must be due to a monoaminophosphatide similar to lecithin. The substance differs, however, from lecithin in that it fails to form a ppt. with alc. $CdCl_2$ soln. or on addn. of acetone. The feeding of fat seems also associated with an increased fat content of the organs, especially the liver, and the same is true for the lecithin content. Judging by the I no. of the liver lecithin after fat feeding this organ is regarded as the principal lecithin-forming organ. Three to five hrs. after the injection of lecithin into a vein there is a definite increase of lecithin, fat and of P in the liver. The latter is supposed to be derived from the inorg. P of the serum of the blood. There is thus a building of fat from fatty acids and glycerol after the introduction of lecithin, and there is also evidence of an inter-conversion of fat and lecithin in the liver. S. MORGULIS

Investigations on the biological chemistry of the living cell as a basis for the treatment of arteriosclerosis. H. PÉRICAUD. *Vie médicale* **6**, 1433(1925); *Bull. soc. hyg. aliment.* **13**, 520(1925).—Mayer's and Schaeffer's numerous analyses justify the conclusion that the amts. of cholesterol and phosphatides in a given cellular species are practically const. and that the lipocytic coeff. cholesterol/lipoid-P is characteristic of each organ. Arteriosclerosis is admitted to be due to cholesterol deposits in the walls of the vessels resulting from intoxications or infections, and $CaCO_3$ is subsequently deposited on the cholesterol. KI, long recommended for the treatment of arteriosclerosis, would appear to act rather as a sclerosing agent. A more rational therapeutic treatment would be to distribute freely phosphatides or colloidal phosphorous lipoids. Expts. carried out by P. on animals confirmed his hypothesis. A. P.-C.

The activity of an isolated turtle heart irrigated with Ringer solutions of varying hydrogen-ion concentration. HENRI FREDERICQ. *Bull. sci. acad. roy. Belg.* [5], **11**,

308-22(1925).—The activity (chronaxie) of a turtle heart irrigated with NaCl solns. of varying H-ion concn., *i. e.*, the time of contractile response to the exciting elec. impulse, increases with increasing H-ion concn. and *vice versa*. Expts. are described in detail and a bibliography of 30 references is appended. W. B. PLUMMER

Azotemia during mountain sickness. H. GUILLEMARD. *Compt. rend.* 181, 628-9 (1925).—During an ascension of Mt. Blanc, samples of blood were taken from G. and from his 14-year-old son at different elevations, and the N was detd. by standard methods. The results in mg. of N per l. blood of G. from Chamonix to Alger ranged from 306 to 358, at Grand Mulets (3050 m.) 345, 4 samples during 3 days at Vallot Observatory (4395 m.) 471, 483, 503 and 496, resp. For the son the figures were: at Alger 297, Grand Mulets 291, and at the Observatory 441, 472 and 449, resp.

L. W. RIGGS

The behavior of blood platelets in new-born and quite young infants. I. FARNOS. *Magyar Orvosi Archivum* 26, 513-8(1925).—The no. of blood platelets increase up to 14-21 days. With jaundice the increase is greater, and there is a proportional decrease of red blood cells. With infections the no. of platelets decrease. L. W. RIGGS

Another outlook on the chemical regulation of respiration. ROBERT GSELL. *Science* 63, 58-62(1926); cf. *C. A.* 18, 291.—The theory of respiratory control is summarized as follows: Changes in the H-ion concn. of the respiratory center rather than of the blood constitute the prime factor in respiratory control. Since the supply of O dects. the abs. and relative amts of lactic acid and CO₂ formed in living tissues and since it controls the efficiency of transport and elimination of acid, it constitutes the normal and indirect regulator of pulmonary ventilation. The effects of lactic acid and CO₂ are additive. They are exerted indirectly by way of the blood from the tissues, and more directly through their formation in the respiratory center itself. Diminished oxidation in the respiratory center leads to an accumulation there of the relatively poorly diffusible lactic acid in a relatively poorly buffered cytoplasm and lymph, no longer fully protected by the potential alkyl. of the blood, the dual function being disturbed by the diminution in the reduction of hemoglobin and the liberation of alkali as it passes through the center. By virtue of its own metabolism and its extreme sensitivity to minute changes in its own H-ion concn. the respiratory center is sensitive to minute changes in its own oxidations and, therefore, to changes in the tension of O in the arterial blood. The capacity of the center to respond to changes in the arterial CO₂ tension consequent on fluctuations in the general metabolism, however, must also be a factor. Also in *Physiol. Rev.* 5, 551-95(1925). L. W. RIGGS

Transformation of glycogen. LUNDGAARD AND HOLBØLL. *Ugeskrift for Læger* 87, 881(1925); *J. Am. Med. Assoc.* 85, 2060; cf. *C. A.* 20, 440.—The glycogen in fresh and finely chopped liver is split into α - β -glucose. Insulin does not effect this cleavage. It is assumed that glycogen in the living subject undergoes the same transformation. The carbohydrates under the action of insulin are partly oxidized and partly deposited as glycogen. When the insulin is no longer in the blood, the deposits of glycogen are split into glucose, which explains the higher sugar content of the blood in the morning. The question is raised: Is the new glucose (called "ny glucose") with a lower sp. rotatory power an intermediate link in the production and deposition of glycogen? **Action of liver tissue and insulin on glucose.** *Ibid* *Ugeskrift for Læger* 87, 905; *J. Am. Med. Assoc.* 85, 2060.—From this later study it is concluded that the liver serves in carbohydrate metabolism as a storage place for glucose in the form of glycogen and has no direct importance for the metabolism of glucose in the organism. Contrary to muscle tissue, liver tissue is not able to form new glucose out of α - β -glucose under the influence of insulin. L. W. RIGGS

G—PATHOLOGY

H. GIDEON WELLS

The secretion antecedents and mitochondria in pathologic thyroids. J. A. KEY. *Arch. Surg.* 11, 254-303(1925).—Chromophil granules and chromophobe vacuoles can be demonstrated in cells of normal and of pathologic thyroids. It is believed that they are the secretion antecedents and that the intracellular colloid is a mixt. of the two. The vacuoles contain the active principle of the gland. No abnormal secretory antecedents were found in toxic adenomas or exophthalmic goiters. Mitochondria are not concerned with secretion in the thyroid. J. T. MYERS

Anaerobic life of tumor tissue. Y. OKAMOTO. *Biochem. Z.* 160, 52-65(1925).—By measuring CO₂ production, it was demonstrated that Flexner-Jobling rat carcinoma, Jensen rat sarcoma and Rous hen sarcoma can live under anaerobic conditions. F. A. CAJORI

The recognition of enzyme processes determined by immunization. III. E. KUPELWIESER AND E. NAVRATIL. *Biochem. Z.* **160**, 75-87(1925); cf. *C. A.* **19**, 342.—In not a single expt. could a specific proteolytic enzyme action be detected in activated horse serum. Refractometric measurements were used to detect proteolysis. **IV.** E. KUPELWIESER AND I. WILHEIM. *Ibid* 88-100.—The negative results reported in the previous paper cannot be ascribed to errors of the refractometric method as a means of detecting proteolysis. F. A. CAJORI

Reversible hemolysis. L. BOGENDÖRFER AND B. HALLE. *Biochem. Z.* **160**, 199-209(1925).—Under suitable conditions reversible hemolysis was observed in every blood studied and with hemoglobin and stroma from different animal species. The phenomenon is ascribed to adsorption of hemoglobin on the stroma. F. A. CAJORI

Blood sugar studies during pregnancy. HANS GUGGISBERG. *Ergebnisse Physiol.* **24**, 718-27(1925). H. J. DEUEL, JR.

Blood sugar and carcinoma. F. SILBERSTEIN, JOHANN FREUD AND TIBOR RÉVÉSZ. *Klin. Wochschr.* **4**, 2252(1925).—The immediate effect of insulin on the blood sugar in carcinomatous patients is normal; the blood sugar is reduced. Continued injection, however, lead to an elevation of the fasting blood sugar value. Thus, in one case, the fasting value was 0.139 g. % before treatment and 0.212 g. % after 10 days of treatment. The increased reducing power of the blood may be due to something other than glucose. MILTON HANKE

Activation of insulin by protein. II. FERDINAND BERTRAM. *Klin. Wochschr.* **4**, 2285-8(1925); cf. *C. A.* **19**, 2532.—A mixt. of insulin with a protein soln., either animal or vegetable, is more active, when injected intramuscularly, than the insulin itself. As activator, the person's own serum is most effective, the action being intensified 3 to 4 times. Whole blood is far less effective than serum. The intensification factors of a number of proteins are as follows. Diabetic serum, 2+, human serum, caseosan, albumin and globulin, 2, novoprotein < 2. A ppt. is obtained when insulin is mixed with certain of the protein solns. which is greatest with caseosan and least with serum. The ppt. adsorbs some of the insulin. For a max. effect, the mixt. should be injected. The action of insulin is not intensified when the insulin-protein mixt. is injected intravenously. The intensification is, therefore, not due to a new compd. formation. It must be associated with a modified *absorption* of the insulin with, perhaps, a decreased rate of destruction. MILTON HANKE

The significance of the atoxyl-resistant lipase in the serum of patients afflicted with diseases of the pancreas or with pernicious anemia. HANS SIMON. *Klin. Wochschr.* **4**, 2295-8(1925).—Demonstration of an atoxyl-resistant lipase in the serum by the method of Rona (*C. A.* **17**, 1077; **18**, 1530) is a fairly certain proof that the pancreas is diseased. The method is rapid and so delicate that the pancreatic disturbance can be diagnosed before it has progressed very far. Pernicious anemia is associated with an injury to the pancreas. Whether or not the involvement of the pancreas is the cause of, or is caused by the anemia, could not be detd. MILTON HANKE

Adrenaline blood-pressure curves in essential hypertension. ISTVAN HETÉNYI AND ISTVAN SÜMEGI. *Klin. Wochschr.* **4**, 2298-303(1925).—Essential hypertension is characterized by an unusual reaction toward adrenaline. The blood pressure rises rapidly and then, within an hour, drops below the initial value only to rise again almost to its highest value. This is followed by another drop below normal, another, though less elevated rise and a final settling down to its initial value. Essential hypertensives are hypersensitive to adrenaline. MILTON HANKE

Transfer of endogenous and exogenous dyes from the mother's blood into the liquor amnii in a case of acute yellow atrophy of the liver. W. JÜLICH. *Klin. Wochschr.* **4**, 2337-9(1925).—One case is described. The woman aborted after the administration of tetrachlorophenolphthalein. The dye was found in the blood of the umbilical cord and in the amniotic fluid. Bilirubin was also present in the amniotic fluid. M. H.

Resistance of the skin during pregnancy. HANS HINSELMANN. *Klin. Wochschr.* **4**, 2346(1925).—Pregnancy reduces the resistance of the skin to irritants such as formalin and HgCl₂. MILTON HANKE

A chemical diagnosis of malignant tumors. H. J. FUCHS. *Klin. Wochschr.* **4**, 2350(1925).—With 1 cc. of the serum from the suspected case of malignancy mix 2 mg. finely powdered, human blood fibrin and incubate for 24 hrs. at 40° under sterile conditions. Remove the proteins and analyze the filtrate for N by the micro-Kjeldahl method. Non-malignant serum does not digest human fibrin; Kjeldahl N is absent in the deproteinated filtrate. Malignant serum does digest fibrin; Kjeldahl N is easily demonstrable. MILTON HANKE

The effect of injected protein upon the metabolism of alkaptonurics. I. H.

BAAR AND P. FREUD. *Klin. Wochschr.* **4**, 2388-9(1925).—Protein, when injected into a child with alkaptonuria, temporarily reduces the excretion of homogentisic acid. Horse serum, beef serum and milk were used. MILTON HANKE

Skin capillary and secretion observations in diabetes mellitus. E. JÜRGENSEN AND K. H. NOORDEN. *Klin. Wochschr.* **4**, 2395-6(1925).—The subcutaneous administration of insulin leads to a dilation of the skin capillaries with a concomitant increased rate of blood flow through these capillaries. The early stages of diabetes are associated with an increased nervous irritability so that a given stimulus produces an excessive secretion of sweat. The later stages of the disease are characterized by a decreased irritability. MILTON HANKE

The surface tension of transudates and exudates. D. ADLERSBERG AND O. STERNBERG. *Klin. Wochschr.* **4**, 2398-9(1925).—Transudates have a surface tension above 870 and exudates have a surface tension below 870 ($H_2O = 1000$) MILTON HANKE

Differential diagnosis of diseases of the hematopoietic system. M. S. REUBEN. *Arch. Pediatrics* **43**, 15-49(1926) — An elaborate discussion. Special attention is paid to the chem. and other lab. tests. JOSEPH S. HEPBURN

Chemical analysis of teeth affected by dental caries and by pyorrhea alveolaris. J. L. ULRICH. *Dental Cosmos* **67**, 1204-8(1925).—In carious teeth and in teeth surrounded by pyorrhea alveolaris, the Ca content is less and the Mg content is greater than in sound teeth. The change in compn. usually is more pronounced in pyorrhea than in caries, and is due to necrosis and inflammation. JOSEPH S. HEPBURN

Relation of the hematopoietic system to the development of bone. ANDREA DE BOSÁNYI. *Dental Cosmos* **68**, 14-6(1926) —In rickets, the bone marrow is characterized by dysfunction in both osteogenesis and hematopoiesis; a const. decrease occurs in the hemoglobin content of the blood of rachitic rats. Addition of 4 to 5% of hemoglobin to a rachitic diet both prevents and cures rickets. Since the antirachitic action of hemoglobin is exerted in the absence of light, it is not due to sensitization to light; it is not a property of the hematin group. Apparently bone marrow produces hemoglobin and another protein; both proteins have a role in bone formation. J. S. H

The degree of acidity of the vaginal secretion. B. BEHRENS AND H. NAUJAK. *Z. ges. expit. Med.* **47**, 178-82(1925) —In detn. of the degree of acidity of the vaginal secretion, methods using indicators such as γ -di-nitrophenol or p -nitrophenol are not reliable on account of the presence in the vaginal secretion of proteins which form colored salts with the indicators. A potentiometric method, therefore, was used in detg. the acidity of the vaginal secretion in 50 women. The only relationship that could be made out confirmed the work of Schroeder (*Zentr. Gynäkol.* No. **38** (1921)) of 3 grades of acidity corresponding to the bacterial flora present. The normal vaginal secretion with vaginal bacilli predominating gave p_H values 3.86-4.45; when there was an admixture of cocci the p_H value was 4.6-5.34 while p_H values of 4.9-6.04 accompanied large numbers of cocci, particularly streptococci. HARRIET F. HOLMES

Chlorine metabolism in disturbances of gastric secretion. G. HOLLER. *Wiener Arch. inn. Med.* **11**, 251-66(1925).—The normal Cl and H_2O metabolism is altered in cases of ulcer of the stomach and duodenum. In general, in cases of duodenal ulcer there is a high acidity of the stomach contents with the elimination of much H_2O and chlorides. Chronic appendicitis with hyperchlorhydria acts like duodenal ulcer. In ulcer of the stomach there is a low acidity with the elimination of little H_2O but an abundance of chlorides. In carcinoma of the stomach there is usually a low elimination of H_2O and chlorides except that when there is a high chloride content of the stomach which sometimes accompanies an acidity, there is an abundant elimination of H_2O and Cl. HARRIET F. HOLMES

The reduction of idiomuscular irritability. The action of glucose and insulin on muscular activity. V. KOLLERT AND E. JOHN. *Wiener Arch. inn. Med.* **11**, 267-80(1925).—Idiomuscular irritability, as indicated by the occurrence of a local muscular contraction on mild percussion, occurs in fatigue or cachexia. The condition is improved by intravenous injection of glucose and there is still greater improvement if insulin is added, though insulin has no effect by itself. Levulose is less efficient than glucose, while an intravenous injection of a soln. contg. NaH_2PO_4 and Na_2HPO_4 is less efficient than glucose but more efficient than levulose. Glucose had little effect on the muscles of cachectic carcinomatous patients, perhaps because the tumor tissue readily absorbed the glucose. It is probable that the idiomuscular irritability indicates a disturbance of the carbohydrate metabolism of the muscles. HARRIET F. HOLMES

The influence of the spleen on iron metabolism. F. LAUDA. *Wiener Arch. inn. Med.* **11**, 292-310(1925).—Splenectomy in rats does not alter the Fe content of the

different organs as detd. by histochemical study. Siderosis of the organs follows splenectomy only in infected rats with a hemolytic anemia. HARRIET F. HOLMES

The pathology of respiratory metabolism. III. The specific dynamic action of carbohydrates and its dependence on the regulation of the intermediary water metabolism. H. POLLITZER AND E. STOLZ. *Wiener Arch. inn. Med.* 11, 319-56(1925); cf. *C. A.* 19, 2699.—Great variations in basal metabolism were noted in different individuals after the intake of carbohydrates. In the same individual bread and dextrose as the source of carbohydrates had quite different effects. Dextrose might be expected to increase basal metabolism more than bread but not infrequently dextrose caused a decrease of basal metabolism. This was particularly marked in some pathological conditions, as icterus catarrhalis, and seemed to be related to the water-regulatory function of the liver. Under the influence of carbohydrates two antagonistic stimuli are brought in play, one stimulating metabolism through increased oxidation and the other depressing metabolism through the water-regulatory function of the liver. There seems to be no specific dynamic action of food but the intake of food starts into action the complicated mechanism regulating the constancy of basal metabolism, of water metabolism and of temp. HARRIET F. HOLMES

The different behavior of so-called blood group agglutinins in native blood plasma and blood serum. W. STARLINGER AND U. STRASSER. *Wiener Arch. inn. Med.* 11, 399-404(1925).—Native plasma from subjects of group II agglutinated corpuscles from groups III and I less strongly than serum from the same subject. Native plasma from subjects of group III agglutinated corpuscles from groups II and I more strongly than the serum from the same subject. The next most frequent type was in subjects of group II where the plasma did not agglutinate any corpuscles while the serum agglutinated the corpuscles from groups III and I slightly. HARRIET F. HOLMES

The effect of the absence of kidney function on cholesterol metabolism. Experimental uremia. W. N. NEKLUDOW. *Z. ges. expil. Med.* 47, 70-6(1925).—In cats extirpation of the kidneys or tying off of the ureters is followed by an increase in cholesterol content of the blood, which increases progressively until the death of the animal. This cholesterolemia is independent of the adrenals and seems due to an increased formation of protein cleavage products which are accumulated in the organism when not eliminated through the kidneys. Uremic symptoms were noted. The absence of some of the symptoms when the kidney is extirpated indicate that the kidney itself produces various toxic substances. HARRIET F. HOLMES

Insulin and glucuronic acid. R. HURTHLE. *Z. ges. expil. Med.* 47, 141-4(1925).—Rabbits under the influence of insulin were given by mouth, chloral hydrate, amylene hydrate or menthol, a polarimetric study was made of the urine, and the findings were compared with those obtained in the same rabbits without insulin. Insulin caused no change in the amt. of glucuronic acid. The expts. also indicate that glucuronic acid is not a normal intermediate product in the oxidation of glucose. H. F. H.

A clinical and experimental study of the detoxicating function of the liver. II. Alkaloidal detoxication in diseases of the liver. M. HANDEL. *Z. ges. expil. Med.* 47, 145-55(1925).—In order to study the detoxication or the storing up of alkaloids in the liver, the excretion of quinine in the urine was detd. after the administration of 1 g. quinine by mouth. In normal persons the excretion of quinine began in the 3rd hour but in patients showing clinically injury to the liver of various sorts, the excretion of quinine was hastened. HARRIET F. HOLMES

Morphological studies on the importance of the reticulo-endothelial system in intravital hemolysis. C. NATALI. *Z. ges. expil. Med.* 47, 223-43(1925).—Intravital hemolysis was induced in rabbits by the injection of a hemolytic serum. In normal rabbits the cells of the reticulo-endothelial system gave a microchemical reaction showing an Fe-contg. pigment and also a second pigment which gave a negative reaction for Fe but probably was of hematogenous origin with Fe in a stable hemoglobin-like combination. In rabbits previously treated with electrocollargol, a decrease in activity of the reticulo-endothelial system was shown, the cells being able no longer to split up hemoglobin to hemosiderin. HARRIET F. HOLMES

Investigations into benign glucosuria and diabetes mellitus. J. E. HOLST. *Acta med. Scand.* 63, 47-98(1925).—An investigation of 150 persons rejected for life insurance on account of glucosuria; subsequent observation which extended over a period of 5-16 years shows that only 30% have actually had diabetes mellitus while in the remaining the glucosuria must be regarded as non-diabetic. The latter cases fall into 3 groups: glucosuria with cyclic hyperglucemia, renal glucosurias and transitional cases. The value of functional tests depending upon the production of alimentary

glucosuria is disputed. The blood sugar examn. is regarded of greater consequence. Glucosurias with a normal fasting blood sugar are all benign. S. MORGULIS

Experimental studies of anaphylaxis to white wine. V. DE LAVERGNE AND P. FLORENTIN. *Compt. rend. soc. biol.* **93**, 775-6(1925).—Exptl. corroboration of clinical observations that anaphylactic reactions are caused by white wine. S. MORGULIS

The volume of red blood cells in shock. EDGARD ZUNZ. *Compt. rend. soc. biol.* **93**, 863-4(1925); cf. *C. A.* **19**, 3309.—In the dog peptone shock usually causes a diminution of the vol. of the red cells, which is much less in serum anaphylactic shock. On the contrary, in the guinea pig, there is almost always an increase in the cell vol. in anaphylactic shock, or when shock is provoked by intravenous injection of electragol. S. MORGULIS

The precipitation of antitoxic proteins of antidiphtheria serum of the horse by electrodialysis. RAUL WERNICKE. *Compt. rend. soc. biol.* **93**, 879-80(1925); cf. *C. A.* **19**, 3538. S. MORGULIS

Anaphylactic and peptone shock in thyroidectomized dogs. B. A. HOUSSAY AND A. D. CISNEROS. *Compt. rend. soc. biol.* **93**, 886-7(1925).—Thyroidectomized dog sensitized after the operation develop less easily anaphylactic shock than the control dogs. They are likewise less sensitive to peptone shock. S. MORGULIS

Cholesterol in cerebrospinal fluid. GARCIA DEL DIESTRO. *Arch. españoles Pediatría* **9**, 601(1925); *J. Am. Med. Assoc.* **86**, 235.—In 2 cases of attacks of acetoneamia, with symptoms of encephalitis, there was no odor of acetone on the breath, but numerous cholesterol crystals were found in the cerebrospinal fluid. This acetoneamic acidosis encephalitis differed from the epidemic form in the lack of the ocular symptoms. It is suggested that in this recurring hemacidosis, the hypercholesteremia represents a defensive reaction against the acetoneamic intoxication. L. W. RIGGS

Uric acid in the cerebrospinal fluid. P. BAUMRITTER. *Arch. med. enfants* **28**, 681(1925); *J. Am. Med. Assoc.* **86**, 154.—The application of Grigaut's method for the detn. of uric acid in the cerebrospinal fluid in 32 cases showed that the amt. of uric acid was not increased with tuberculous meningitis, but that there is a considerable increase of uric acid in epidemic cerebrospinal meningitis. L. W. RIGGS

Variations in the quantities of nitrogenous substances, particularly urea, in the saliva. A. DESGREZ, R. MOOG AND (MME.) L. GABRIEL. *Compt. rend.* **181**, 755-7(1925)—Urea in the saliva is increased during renal insufficiency. This fact is of diagnostic value. In case the normal flow of saliva is not sufficient to furnish a sample for analysis, the flow may be increased by mech. or chem. excitation. The detn. of urea should be made immediately upon collection, as the saliva loses urea rapidly on standing. Patients with renal insufficiency show an increase of urea N compared with the total N of the saliva. L. W. RIGGS

Protein-fat ratio in diabetic blood. L. O. CHRISTENSEN. *Hospitalstidende* **68**, 969(1925); *J. Am. Med. Assoc.* **86**, 80.—The range in 3 diabetics in coma was, with protein, from 5.77 to 10.47%, while the fat varied only from 0.06 to 0.16%. The fat content was normal in all but 3 of 16 free from coma and of 7 in 11 with impending coma. No subnormal fat percentage was recorded in any instance, and an exceptionally high content only once. In cases of nephrosis the hydremia is more pronounced than in diabetes; possibly this may have something to do with the lipemia common with nephrosis. In one case of the latter the serum protein was 5.09 and the blood fat 0.4%. L. W. RIGGS

Characteristic changes in blood chemistry in whooping cough. J. C. REGAN AND A. V. TOLSTOOUHOV. *J. Am. Med. Assoc.* **86**, 191-2(1926).—A total of 200 analyses of the blood was made in whooping cough. The most characteristic changes were the lowering of the H-ion concn. and a diminution of the inorg. P content of the blood. L. W. RIGGS

Changes in the blood resulting from duodenal fistula. WALTMAN WALTERS, A. M. KILGORE AND J. L. BOLLMAN. *J. Am. Med. Assoc.* **86**, 186-91(1926).—This study of chem. changes in the blood accompanying clinical and exptl. duodenal fistula has shown that in all instances there are increasing alkalosis, decreasing concn. of chlorides in the blood serum, and progressive rise in blood urea. The intravenous injection of NaCl in concd. soln., even if sufficient in amt. to raise the blood chlorides to normal, has practically no effect in lengthening the life of an animal with duodenal fistula. However, if a sufficient vol. of water is added to the NaCl soln. and given twice daily, life may be maintained 3 weeks or longer, during which time the blood chlorides are raised to their normal level, and the accumulation of non-protein N in the blood is prevented. Intravenous injection of glucose solns. and of Na₂SO₄ solns., although they assist in the elimination of the retained non-protein N in the blood, have no effect on

the blood chlorides. These findings suggest that the fluid balance plays some part in the toxemia accompanying duodenal fistula. Parallel studies of changes in the blood coincident to exptl. gastric fistula show that, with an increase in the amt. of acid discharged through the fistulous tract, the increase in the blood alkali reserve is still greater. The total amt. of HCl and the amt. of chlorides discharged from the gastric fistula were sufficient to explain the increase in the alky. of the blood and the decrease in its chloride content. To det. how much of the effect could be attributed to loss of bile and pancreatic secretion, the common bile duct and both pancreatic ducts were transplanted into the jejunum in 2 dogs, the loss of bile and pancreatic secretions being thus prevented. These dogs showed the same chem. changes in the blood as the dogs with duodenal fistula whose ducts had not been transplanted, and pursued the same clinical course.

L. W. RIGGS

Trypsin studies with normal and diseased infants. J. LUKÁCS. *Magyar Orvosi Archivum* 26, 473-83(1925).—The feces of new-born infants contain 60-80 units of enzyme during the first few days, compared with 10-30 units for older children. After the meconium period the amt. of enzyme drops to 20 or lower, to rise again during the 2nd to 4th weeks to 20-40 and after 3 months to 40-60. In all cases of infections the enzymes decrease and remain on a much lower level than during health. Children with rickets have 160-600 units of trypsin. If such children develop an intercurrent infection, their trypsin units decrease to a less extent than is the case with children without rickets.

L. W. RIGGS

Histologic study of the sympathetic ganglia of rabbits fed cholesterol. Etiology of arteriosclerosis. P. ORMOS. *Magyar Orvosi Archivum* 26, 505-12(1925).—Rabbits with arteriosclerosis and fed with cholesterol develop lipoidal accumulations, swelling of the cell, and a destruction of nucleus and cytoplasm. Cholesterol produces arteriosclerosis and also an affection of the vegetative nervous system. The simultaneous presence of cholesterol and of oscillations of the blood pressure result in arteriosclerosis.

L. W. RIGGS

Investigations on the passage into the cerebrospinal liquid of the dye uranin. OTTO JERVELL. *Norsk Magazin Laegevidenskaben* 86, 757-811(1925).—To 43 patients, most of them suffering from various diseases of meningitic nature, were given about 2 g. of uranin (the Na salt of fluorescein) in the form of tablets or intramuscular injections and after 3 hrs. the spinal liquid was examd. There was a certain correspondence between the color of the liquid and the pathologic condition of the patient.

C. A. ROBAC

H—PHARMACOLOGY

ALFRED N. RICHARDS

Calcium and potassium chlorides in the treatment of arterial hypertension. W. L. T. ADDISON AND H. G. CLARK. *Can. Med. Assoc. J.* 15, 913-5(1925).—Three or 4 weeks' administration of CaCl_2 will produce a definite fall in blood pressure, with coincident improvement of symptoms, and disappearance of edema. If CaCl_2 is ineffective, subsequent administration of KCl is often successful.

A. T. CAMERON

The occurrence and activity of the rarer elements. K. SPIRO. *Ergebnisse Physiol.* 24, 474-516(1925).—The occurrence, the physiological properties, and the therapeutic value of Cu, Au, Ag, Hg, Mg, Mn, Fe, Pb, Sn, Zn, Si, As, Sb, Bi, V, S, Se, Cl, Br, I, F and NH_4 are discussed.

H. J. DEUEL, JR.

Influence of electrolytes on the action of insulin. J. ABELIN AND E. GOLDNER. *Klin. Wochschr.* 4, 2446-7(1925).—The effectiveness of insulin is reduced if Na_2HPO_4 is fed before the insulin is administered. NaH_2PO_4 , on the contrary, increases the effectiveness of insulin. From this it might be concluded that the H and OH ions are the detg. factors rather than the PO_4 ion. The matter does not, however, seem to be that simple because a mixt. of NaCl, Na_2SO_4 and NaHCO_3 increases the effectiveness of insulin.

MILTON HANKE

Action of chlorophyll on nerve-muscle preparations. T. GORDONOFF AND T. HOSOKAWA. *Z. ges. exptl. Med.* 46, 454-8(1925); cf. *C. A.* 19, 2241.—Addition of chlorophyll increases the activity of a nerve-muscle prepn. The result is the same whether the chlorophyll is applied to the muscle or to the nerve. An exhausted nerve-muscle prepn. commences to contract again when chlorophyll is added. Colloidal chlorophyll, Na chlorophyll and Na chlorophyll Siegfried were used.

HARRIET F. HOLMES

Further studies on the insulin problem. G. HETÉNYI. *Z. ges. exptl. Med.* 46, 600-6(1925); cf. *C. A.* 19, 2706.—The primary action of insulin is omniscellular. The hypoglycemic complex resulting from an overdose of insulin is dependent on the liver.

The overdose of insulin may produce a paralysis of the secretory cells of the liver or may produce changes on the surface of the cells interfering with the excretion of sugar.

HARRIET F. HOLMES

Factors influencing the excretion of urea. II. Diuresis and caffeine. HELEN BOURQUIN AND N. B. LAUGHTON. *Am. J. Physiol.* **74**, 436-50(1925); cf. *C. A.* **18**, 2758.—The ratio: urine urea N/ blood urea N is exceedingly high at the onset of diuresis, drops on continuation of diuresis to a level above that established at lower vols. and is depressed for a long period after diuresis has subsided. In dogs which have been without food and water for 12 hrs. the ratio varies with the vol. output within certain limits. Caffeine (0.5-1 mg./kg.) slightly increases the urea output. The changes in NH_3 and f. p. depression are similar, suggesting a lag in the readjustment of the concn. of excreted solids behind the change in vol. output. M. J.

Secretin. IX. Its relation to the activity of skeletal muscle. N. B. EDDY AND ARDREY W. DOWNS. *Am. J. Physiol.* **74**, 489-96(1925).—Secretin preps. increase the working power of the muscle and delay the development of fatigue. The effect may be influenced by, but does not depend on, the reaction of the soln. It is due neither to histamine nor to the vasodilator substance but to a substance which disappears during perfusion. The vasodilator agent also disappears during perfusion but at a different rate. The effect is considerably diminished in curarized dogs, which indicates action on the motor nerve endings. Glucose also diminishes the effect although secretin preps. cause an increased sugar output. MARY JACOBSEN

The heart poisons of the digitalis plant and related compounds. A. WINDAUS. *Nachrichten Ges. Wiss. Göttingen* **1924**, 237-45.—A review. MARY JACOBSEN

Effect of bismuth upon red blood corpuscles. A. SIMON. *Biochem. Z.* **159**, 424-31(1925).—On injection of K Bi tartrate into dogs, a decrease in red blood cells is noted. *In vitro* expts. upon the blood of humans show that the Bi soln. (except in very small concns.), causes hemolysis of the cells, or decreases their resistance to hemolysis. W. D. L.

Cholesterol studies in lead poisoning. KRETSCHNER AND FRIEDER. *Biochem. Z.* **164**, 44-6(1925).—The cholesterol content of the serum is diminished, while in whole blood it is increased, during Pb poisoning. Ordinarily the cholesterol content is greater in serum than in whole blood, but in the case of workmen suffering from plumbism the condition is reversed. S MORGULIS

Electrolytic study of the circulation of gold in the organism. SVEND LOMHOLT. *Compt. rend* **181**, 821-3(1925).—The electrolytic feature applies only to the detn. of Au in the tissues. The latter is treated with fuming HNO_3 and the ash from this treatment is dissolved in boiling aqua regia, the soln. is made slightly alk. with NH_3 and after the addn. of 0.75 g. KCN and diln. to 75 cc., the Au is deposited under an e. m. f. of 4 v. on a Pt cathode and is weighed. The production of Pt black must be avoided. After an intravenous injection of 26.25, 37.5 and 37.5 mg. of Au in 3 rabbits, resp., Au was found principally in the kidneys, large intestine and liver, with smaller amts. in other organs. Both the distribution and the elimination of Au by urine and feces resemble those of other heavy metals such as Hg, Bi and Pb. In 2 human subjects the injection of 187.5 and 150 mg. was followed in 9 and 14 days by the recovery of 30.9 and 42.46 mg., resp. One-third was eliminated in the feces, the remainder in the urine. L. W. RIGGS

I—ZOOLOGY

R. A. GORTNER

Conditions for calcareous metabolism in oysters and other marine animals. J. H. ORTON. *Nature* **116**, 13(1925).—A summary. There appears to be a min. temp. below which shell is not laid down, and above which shell-material may be produced automatically. In the good shell-growth of warm and relatively cold, wet seasons in Great Britain the corresponding hydrographical conditions are, resp., high estuarine salinities, alkalinities, and temps., and low fluctuating salinities with medium temps. and (probably) alkalinities, together with a smaller quantity of available food material in the latter case. B. C. A.

Changes in the protoplasm of Nereis eggs induced by β -radiation. ALEXANDER FORBES AND CATHARINE THATCHER. *Am. J. Physiol.* **74**, 567-78(1925).—A sediment zone or increased opacity and finer granulation was observed in *Nereis* eggs fertilized after β -irradiation. Decreased viscosity alone or chem. changes are responsible for the phenomenon. MARY JACOBSEN

Oxygen metabolism in Drosophila melanogaster. M. R. CLARE. *Biol. Bull.*

Marine Biol. Lab. **49**, 440–60(1925).—A knowledge of metabolism in *Drosophila* pupae cannot be attained if sole dependence is placed on the wt. of respiring tissues as a guide. Only in a rough way do pupal wts. show a correspondence with the trends of metabolic rates. Rates of O consumption are very irregular. No metabolic difference was found between the sexes or between inbred and non-inbred stocks. L. W. RIGGS

The influence of saline solutions on the resistance of young eels to fasting. UMBERTO D'ANCONA. *Atti accad. Lincei* [6] **2**, 443–9(1925).—Under the conditions of concn. and temp. used young eels resist fasting better in saline solns. (alkali and alkali earth metals) than in soft water and undergo less loss in total wt., in dry wt. and in inorg. substances (ash content). E. J. WITZEMANN

12—FOODS

W. D. BIGELOW

Display of the composition of foods for demonstration purposes. F. H. LORENTZ. *Z. Nahr. Genusssm.* **50**, 257–64(1925).—A description, with illustrations, of a method of demonstrating food values at an agricultural fair. WILLIAM J. HUSA

Iron in food products. C. MASSATSCH. *Pharm. Ztg.* **70**, 1790–1(1925).—The article deals mainly with the invalid food preps. Tropon and Iron Tropon relative to the amt. and nature of their Fe content. It is shown, contrary to the claims of the manufacturer, that the Fe of Iron Tropon is present essentially as inorg. hydroxide adsorbed by, or pptd. on, the protein base, being partially dissolved in the stomach by the HCl, but mainly expelled by the intestine, since the contents of this organ cannot on account of their alkalinity effect further soln. W. O. E.

Iron in food products. TROPONWERKE DINKLAGE & Co. *Pharm. Ztg.* **71**, 39–40(1926).—A refutation of the criticisms of Massatsch in preceding abstract. W. O. E.

Transformation of nitrogen compounds (proteins) in preserved food products. L. SETTIMI. *Atti accad. Lincei* [6] **1**, 396–400(1925).—Analyses at different times of fish sauce in a glass container, wheat flour, tinned meat and cheese, show, in all cases, progressive transformation of insol. N compds. into equiv. quantities of sol. N compds. B. C. A.

The use of the fermentation-reductase test for the grading of milk. E. R. HISCOX AND URSULA STARLING. *J. Hyg.* **24**, 164–75(1925).—This test is not reliable in distinguishing between grade A certified milk and commercial milk, or for detecting the presence of coliform organisms. JOHN T. MYERS

Chemical bacteriological factors in the ripening of cheese. I. J. ZAYKOWSKY AND N. SLOBODSKA-ZAYKOWSKY. *Biochem. Z.* **159**, 199–215(1925).—The effect of NaCl and lactic acid upon the action of rennet upon milk is observed. The changes of acidity of the milk and whey, and the total N in the whey obtained when various amts. of NaCl and lactic acid are used with the rennet are tabulated. W. D. L.

Determination of the hydrogen-ion concentration of cheese by the quinhydrone electrode. SÖNCKE KNUDSEN. *Z. Nahr. Genusssm.* **50**, 300–6(1925).—Cheese was carefully rubbed in a mortar with twice its wt. of H₂O and any undissolved material removed by centrifuging. The p_H of this liquid is not exactly the same as that of the cheese. A better method was to rub 5 g. of cheese with 0.1 g. of quinhydrone, pack this mixt. into a glass tube 30 mm. long and of 3–5 mm. inside diam., and place in it to a depth of 15–20 mm., a Pt wire or foil. 3.5 N KCl was used as intermediate liquid and the reference quinhydrone electrode was 0.01 N in HCl and 0.09 N in KCl. The accuracy is indicated by the results of 20 measurements on the same cheese with 5 different electrodes; the readings varied from 5.81 to 5.90 p_H . The p_H is markedly influenced by the salt content of the cheese. WILLIAM J. HUSA

Investigations of natural and synthetic sweet substances. I. Studies on the degree of sweetness of saccharin and dulcin. KURT TAUFEL AND BERNHARD KLEMM. *Z. Nahr. Genusssm.* **50**, 264–73(1925).—T. and K. confirm and extend the work of Paul (C. A. **15**, 1361, 3881; **16**, 973, 2558) and Pauli (C. A. **16**, 974). The degree of sweetness (compared with sucrose) of saccharin and dulcin (*p*-phenetyl carbamide) increases with increasing concn. of alc. in aq.-alc. solns. Interpolation formulas, and also a graphical method, are given for calcg. the compn. of all mixts. of saccharin and dulcin which would equal in sweetness a sucrose soln. of any given concn. WILLIAM J. HUSA

Treatment of flour with chlorine and the so-called Golo method of improving flour. M. P. NEUMANN AND H. KALNING. *Landw. Jahrb.* **61**, 305–19(1925).—Flour rapidly absorbs Cl or Cl with 0.5–1.5% of nitrosyl chloride, as in the Golo treatment, and for

normal concns. of Cl (0.015–0.02%) there is no odor and no HCl or HNO₃ can be detected. The treatment increases the swelling power of the colloidal substances and the strength of the flour, and also its acidity and the soly. of the N compds. The activity of the enzymes and the keeping qualities are not affected. Excessive Cl treatment of soft wheats has no beneficial effect. With the correct amt. of Cl the yellowish color of the flour becomes considerably paler, and an excessive treatment gives a grey chalky white color. B. C. A.

The organic acids of tomatoes, besides citric acid, and their state of combination. ARTHUR BORNTRÄGER. *Z. Nahr. Genussm.* 50, 273–300(1925).—B. concludes that the only org. acids present in sound green, half-ripe and ripe tomatoes are citric and malic acids. In softened but not entirely spoiled tomatoes succinic acid was found. In ripe tomatoes citric acid occurs chiefly in the form of primary citrates, with less secondary citrates; malic acid is present mainly as an acid salt. The content of free acid, calcd. as malic, was never over 0.05%. The % of phosphates in tomato juice increased with increasing ripeness. WILLIAM J. HUSA

Heat penetration in canned crabs. C. R. FELLERS. *Canning Age* November, 1925, 900.—Investigations indicate that the slow heat penetration of dry pack crab meat renders the ordinary com. exhausting and cooking processes inadequate to protect against spoilage. A high initial temp. and either the addn. of org. acids or an increased process are necessary for complete safety. THEO. MARKOVITS

Water-soluble solid content of fruit preserves and jams. C. P. LATHROP AND W. LOWE WALDE. *The Canner* September, 1925, 23.—The preserves are classified into 2 groups, based on their water-sol. solid content, in order to arrive at the best water-sol. solid figure for jams and preserves. The max. and min. water-sol. content of the more important fruit preserves are tabulated. THEO. MARKOVITS

Early autolytic and bacterial transformation of fish muscle proteins. G. B. REED. *Pub. Health J. (Can.)* 16, 568–77(1925).—There was a slight increase in non-coagulable N and N as NH₃ in macerated haddock muscle kept under C₇H₈ at 25° for 24 hrs. and a conspicuous increase in 48 hrs. Haddock fillets were heavily infected with bacteria similar to those of the gut and the slime of the fish. When these bacteria were permitted to develop in fish muscle at 25° there was only slightly greater increases in non-coagulable N and N as NH₃ during the first 24 hrs. than was produced by autolysis alone; but in 24–48 hrs. of incubation the bacteria produced very much greater protein transformation than was produced by autolysis during the same period. R. E. THOMPSON

Researches on cacao. I. Detection of shells. W. PLÜCKER, AD. STEINRUCK AND FR. STARCK. *Z. Nahr. Genussm.* 50, 307–15(1925).—During the process of manuf. in iron app., cacao may show an increase in Fe and in residual phosphates. Detns. of crude fiber and of residual phosphates give no accurate criterion of adulteration of cacao or chocolate with shells, but an accurate insight may be obtained by the microscopic detn. of stone cells, for which a procedure was devised. A bibliography is given of (1) chem., (2) microscopic, (3) phys. methods for detection of shells in cacao. WILLIAM J. HUSA

Whey research factory at Haslington: pig feeding experiments with lactose residues. J. GOLDING AND W. B. MORRIS. *J. Ministry Agr.* 32, 911–8(1926).—After the removal of the easily crystd. lactose from concd. whey, the residue, a paste of the consistency of butter (lactose paste), was fed to pigs directly or after mixt. with brewer's grain (lactose feed). Meat production was slightly more economical in pigs fed lactose feed than in controls in which equal amts. of bean meal were substituted for the lactose feed. Inclusion of 10% lactose paste also gave satisfactory results. Superior quality of flesh was obtained with lactose products in the diet. H. B. LEWIS

Lactose feed as a food for dairy cows; a preliminary experiment. K. W. D. CAMPBELL. *J. Ministry Agr.* 32, 918–9(1926).—Lactose feed (cf. preceding abstr.) has a value similar to that of bean meal in the diet of milch cows. H. B. LEWIS

The present status of forage preservation. K. SCHARRER AND A. STROBEL. *Z. angew. Chem.* 38, 1034–40(1925).—A review, with numerous references, of the action of microorganisms in the preservation of green fodder. Feeding expts. with silage by H. Niklas, S. and S. are summarized. Cf. *Landw. Jahrb.* 61, 321(1925); cf. C. A. 19, 1925. MARGARET W. MCPHERSON

Composition and food value of cane sirup (PAINE) 28. The electric current in the sterilization of milk and other liquids (BEATTIE, LEWIS) 11C. Purification of dairy wastes (DIENERT) 14. Apparatus for leaching and filtration [for coffee, etc.] (U. S. pat. 1,570,807) 1. Float and lever device for indicating the density of acids [for milk or cream] (U. S. pat. 1,570,717) 1.

PLIMMER, R. H. A. AND PLIMMER, VIOLET G.: **Food and Health**. London: Longmans, Green and Co. 64 pp. Paper 2s. net, cloth 3s. net, Food chart 3d. Reviewed in *Nature* 117, 44(1926).

Milk sugar. H. V. DUNHAM. U. S. 1,571,626, Feb. 2. Whey is boiled at atm. pressure, by direct fire heat, while air is blown on its surface to prevent excessive foaming, until a concn. of at least 20° Bé. at a temp. of 88° is attained. Pptd. albuminous substances are filtered out and the whey is then further concd. by boiling at atm. pressure.

Preserving milk, fruit juices, etc. P. M. HEYERDAHL. Brit. 236,247, Feb. 1, 1924. Milk, fruit juices and other non-oily liquid food substances are subjected to pressure reduction to remove air and then are sprayed into an inert gas such as CO₂ alone or mixed with N, preferably under 2 atm. pressure, heated to a pasteurizing temp. and packaged.

Carbonating milk and cream. D. SWEENEY. U. S. 1,570,975, Jan. 26. Mech. features.

Pasteurizing and deodorizing cream. C. F. ROGERS. U. S. 1,570,646, Jan. 26. Cream or milk is heated to a temp. (usually about 60°) below that productive of detrimental change in the butter-fat and at which the casein and curd content becomes hardened, passed while heated into an unheated vacuum chamber which causes an immediate drop of temp. and liberation of volatile substances and gases and withdrawn through the condenser.

Antirachitic vitamin development. H. STERNBOCK. Brit. 236,197, June 30, 1924. Actinic rays such as the ultra-violet rays from a Hg vapor lamp are used for increasing the antirachitic properties of foods and medicines such as yeast, cereals, grain, oils and fats, butter or milk.

Bread. T. B. WAGNER and C. A. GLABAU. Brit. 235,874, June 21, 1924. In order to eliminate the usual fermentation period in making leavened bread and the like, substances are added to the dough which serve as yeast activators, foods, or stimulants and gluten-maturing agents. Among the substances employed are NH₄ phosphate or sulfate, K persulfate, KClO₄ or a compn. obtained from acid steep water from maize which is neutralized with Ca(OH)₂, heated and the resulting ppt. washed and dried. Malt exts., buttermilk, acid salts or lactic, malic, mucic acids or HCl or H₃PO₄ also may be used.

Treating flour and other food materials with sterilizing gases. F. H. LORING. Brit. 235,930, March 15, 1924. N oxides, Cl or other halogen, SO₂Cl₂, phosphoryl chloride or mixts. of these gases with N oxides and air passed through an elec. arc are used to avoid rancidity and development of injurious organisms. An app. is described.

Baking powder containing yeast. A. POLLAK. Brit. 236,210, June 24, 1924. The usual constituents of baking powder are mixed with yeast which has been liquefied and dried at low temp. either before or after association with the other ingredients. The liquefaction of the yeast may be effected by use of dry sugar, concd. malt ext. or use of lactic or other org. acids, preferably with sugar or a similar substance. Other substances may be added, *e. g.*, albumin, fat, starch, flour, casein, dried milk, malt ext. or powder, phosphate or other salts, diastase from fungi, which are preferably added to the liquefied material before drying.

Food preparations from autolyzed fish, autolyzed yeast, etc. M. KAHN, E. LEBRETON and G. SCHAEFFER. Brit. 235,834, June 17, 1924. Yeast is autolyzed for 3–5 days at 40° and added to an equal or greater quantity of crushed fish contg. viscera. The autolyzed mass is sieved, filtered and dried. A residue is obtained adapted for use as a fertilizer or for the manuf. of phosphates, glues or gelatins. Greases, substances useful in tanning and a nitrogenous liquid from which food ingredients may be obtained are also produced.

Foods produced by autolysis of fish, etc. M. KAHN. Brit. 236,158, June 25, 1924. In processes such as described in Brit. 218,679 and 218,680 (*C. A.* 19, 548) non-miscible antiseptics are added which are of different sp. gr. to insure distribution through the material of the antiseptic, *e. g.*, CHCl₃ and toluene.

Foodstuff from corncobs. H. HEUSER. U. S. 1,570,891, Jan. 26. A food for animals is prepd. by mixing corncobs with germinated cereal material such as malt so that proteolytic and amylolytic conversion products are formed from the corncobs. The material may also be subjected to a lactic fermentation.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Chemical industry in 1925. MAX MUSPRATT. *Ind. Chemist* 2, 3(1926). E. H.
Progress in the fine chemical industry, 1925. F. H. CARR. *Ind. Chemist* 2, 9-10 (1926). E. H.

New tendencies in the development of the chemical industry of Italy. H. GROSSMANN. *Z. angew. Chem.* 39, 51-5(1926). E. H.

The application of research to industry. A. D. LITTLE. *J. Chem. Education* 2, 959-70(1925). E. H.

Chemical engineering progress during 1925. J. W. HINCHLEY. *Ind. Chemist* 2, 4-6(1926). E. H.

Economic and technical characteristics of chemical manufacturing. CHAPLIN TYLER. *Chem. Met. Eng.* 32, 938-41(1925).—A general discussion giving statistics, ratio of capital investment to value of products, etc., and showing the continuity of the major unit operations in the principal chem. engineering industries. W. B. PLUMMER

The problems of Muscle Shoals. C. H. MACDOWELL. *Separate*, 36 pp (1925).—A report accepted by the Executive Committee of the National Fertilizer Association for submission to the Muscle Shoals Inquiry. E. H.

Muscle Shoals report. ANON. *Ind. Eng. Chem.* 18, 196-7(1926).—A discussion of the 2 reports (majority and minority) made by the Muscle Shoals Commission on the utilization of the war-time N-fixation plants Nos. 1 and 2. W. B. PLUMMER

American Society for Testing Materials, Tentative Standards 1925. *Separate*, 876 pp.(1925); cf. *C. A.* 19, 3331.—Tentative specifications are given for: steel tie plates; C-tool steel; high-speed tool steel; low-C-steel track bolts; elec. cast-steel anchor chain; steel plates for forge welding; wire for concrete reinforcement; C-steel castings for railroads; structural Si steel; C-steel castings and alloy steel bolting material for high-temp. service; W powder; spiegeleisen; Fe-Mn; Fe-Si; Fe-Cr; Fe-V; hollow stay-bolt iron; hot-dipped galvanized sheets; P-Sn; P-Cu; Si-Cu; Al-base alloy sand castings; bronze trolley wire, soft rectangular Cu wire; hot-rolled Cu rods for wire drawing; Mn-bronze ingots and castings; Muntz-metal condenser tube plates; non-ferrous alloys for railway equipment; white-metal bearing alloys; Al ingots and sheets; Al for use in manuf. of iron and steel; non-ferrous insect screen cloth; compressive strength of cement mortars; crushing strengths of sewer pipes; CaO and hydrated lime for various uses; concrete aggregates; concrete building brick; hollow burned-clay tile for walls and floor; tung oil; soy-bean oil; foots permissible in linseed oil; purity of raw and boiled linseed oil; dry bleached shellac; Fe oxide and hydroxide; lithopone; lampblack; boneblack; chrome yellow; chrome green; stone and slag for highway construction; sand for asphalt and bituminous concrete pavements; CaCl₂ for dust prevention; asphalt cement; tar for road surface treatment, tar cement; pitch for stone block filler; structural Douglas fir; acid-resisting asphalt mastic; asphalt roofing materials; tar-satd. roofing felt; wooden shipping containers; rubber-insulated wire and cable; steam hose; rubber insulating tape; textile-testing machines; sieves for testing. Tentative methods are given for sampling and analysis of ferro-alloys; analysis of Al and its light alloys; analysis of limestone, quicklime and hydrated lime; sampling, inspecting, packing and marking quicklime products; testing resistance of fireclay brick to spalling action; sampling hardened concrete; testing shellac varnish; testing for coarse particles in paint pigments; analysis of white linseed-oil paints; distn. test of petroleum products and natural-gas gasoline; testing m. p. of petrolatum; analysis of grease; penetration test for grease; detn. of viscosity of petroleum products and lubricants; test for color of lubricating oils, of petrolatum and of refined petroleum oil; test for burning quality of kerosene and long-time burning oils; test for S in petroleum products; test for steam emulsion of lubricating oils; test for sapon. no.; test for neutralization no. of petroleum products and lubricants; test for C residue of lubricants; test for cloud and pour points of petroleum products; detn. of d., distn., S, C residue, pour point, viscosity and H₂O in gas oils; detn. of d. of road oils, tars, asphalt, asphalt cement and tar pitches; detn. of clay in highway construction materials; decantation test for fine aggregates; mech. analysis of subgrade soils; detn. of moisture equiv. of subgrade soils; detn. of consistency of cement concrete; detn. of bitumen; detn. of bitumen sol. in CCl₄; ductility of bituminous materials;

fibers; detn. of scoured content in grease wool, etc.; tension impression testing of metallic materials; Brinell hardness testing; verification of testing machines. Tentative recommended practice is given for carburizing and heat treatment of carburized objects; for thermal analysis of steel. Tentative definitions are given for terms relating to lime and to the gypsum industry; for sand; for terms relating to coal, to coke, to textile materials, to methods of testing, to sp. gr.; for screen (sieve). Tentative rules are given for inspection of concrete and reinforced concrete work. Tentative revisions are given for A. S. T. M. standard specifications for C-steel and alloy-steel forgings for various purposes; welded and seamless steel pipe and steel and iron boiler tubes; welded wrought-iron pipe; staybolt, engine-bolt and extra-refined wrought-iron bars; malleable castings; copper in various shapes; light Al casting alloys; bronze trolley wire; seamless admiralty condenser tubes and ferrule stock; high sheet brass; naval brass rods; cement; cement-concrete sewer pipe; fire tests of materials and construction; paving brick; hydrated lime; turpentine; broken slag. Tentative revisions are given for recommended practice in heat treatment of case-hardened steel objects; for standard methods of testing gypsum and gypsum products, of distn. test of bituminous material suitable for road treatment, of sampling and analysis of coke and coal, of sampling creosote oil and of testing molded insulating materials; for standard definitions of terms relating to paint specifications. E. H.

Third annual review number. *Chem. Met. Eng.* 33, No. 1 (1926).—Trade conditions are given for the following industries for 1925: fertilizer materials, S, wood-distn. products, by-product coke, pitch and road materials, insecticides, alcohols and volatile solvents, lithopone, ammonia, vegetable oils, dyes, lead compounds and H_2SO_4 . Distribution statistics for the important chemicals are given. E. H.

Plowshares from chemistry's swords. D. H. KILLEFFER. *Ind. Eng. Chem.* 18, 253-8 (1926).—The reconstruction of the smokeless-powder plants at Hopewell, Old Hickory and Nitro is discussed. E. H.

The utilization of volcanic steam in Larderello. OKRASSA. *Chem. App.* 13, 2-3 (1926); 4 cuts.—Description of the Bringham evaporator. Cf. *C. A.* 18, 300. J. H. MOORE

Recovery and use of waste products. III. In the paper and sugar industries. J. B. C. KERSHAW. *Ind. Chemist* 1, 513-7 (1925); cf. *C. A.* 20, 634.—This article is a digest of comparatively recent literature dealing with savings in the paper and sugar industries under the following heads: (1) fuel and heat losses, (2) waste lyes from the soda process, (3) waste sulfite liquors, (4) sugar from molasses, (5) potash from molasses, (6) reduction in amt. of molasses, (7) Steffens waste-water treatment, (8) scum and vegetable wastes, (9) recovery of diatomaceous earth and NH_3 from sugar waste. E. G. R. A.

The utilization of (legally) unprotected things. JULIUS EPHRAIM. *Z. angew. Chem.* 39, 20-3 (1926).—A lecture discussing the limits, under German law, to which one may go in imitating a competitor's product, or in marketing goods upon which patents have expired or other legal protection has been allowed to lapse. It is contended that to make a downright copy of a given thing is unfair competition, but if a new arrangement of the old ideas be utilized it is legal. W. C. EBAUGH

Losses in factories for inorganic chemicals. RUDOLF PÜRINGER. *Oesterr. Chem.-Ztg.* 28, 160-2 (1925).—A general discussion of losses in processes of extn., pptn. and crystn., with suggestions for improving operating conditions. W. C. EBAUGH

Progress in adsorption technic. R. KOETSCHAU. *Chem. Umschau Fette Oele Wachse u. Harze* 32, 280-1 (1925).—A general review of bleaching by means of such adsorbing agents as activated C and silica gel. P. ESCHER

The importance of chlorine in chemical warfare. A. A. FRIES. *Trans. Am. Electrochem. Soc.* 49 (preprint) (1926).—After a brief description of the first Cl gas attack in 1915, the disadvantages of Cl in chemical warfare are pointed out. Among these disadvantages is the high vapor pressure, necessitating containers of very rugged construction. Furthermore, about 10 times as much Cl is required to produce the same toxic effect as some of the other war gases. It is probable that Cl as such will not be used in the future as a standard chem. warfare agent. Cl is still used in conjunction with phosgene to increase the rate of vaporization. Cl forms the one essential raw material for a no. of war gases. The manuf. and properties of phosgene, mustard gas, lewisite, tear gases and toxic smokes are briefly touched upon. C. G. F.

ELLIOTT, C.: **Distillation in Practice.** New York: D. Van Nostrand Co. 188 pp. \$2.00. Reviewed in *Chem. Met. Eng.* 32, 943 (1925).

LISTER, J. E.: **The Screening and Grading of Materials.** London: E. Benn, Ltd. 144 pp. 6s. Reviewed in *Chemistry and Industry* **44**, 1253 (1925).

Unit Processes in Chemical Engineering. Edited by Chemical and Metallurgical Engineering. New York: McGraw-Hill Co., Inc. 91 pp.

Resolving emulsions. E. E. AYRES, JR. U. S. 1,570,987, Jan. 26. Emulsions such as those of cottonseed oil soap stock are treated with a reagent, *e. g.*, Ca oleate in alc. and glycerol, or CaCl_2 , which forms, by reaction in the continuous phase, a substance in a state of colloidal dispersion therein and which will act as an emulsifying colloid to reverse the form of the emulsion.

Purifying solutions containing titanium, thorium and other metals. SPENCER, CHAPMAN & MESSEL, LTD. and J. B. LIEBERT. Brit. 236,087, Oct. 20, 1924. Solns. obtained in the treatment of ilmenite or monazite with H_2SO_4 or other similar solns. are clarified by adding a small quantity of glue, gelatin, albumin or casein.

Separating liquids by gravity. C. F. HIGGINS. Brit. 234,875, Nov. 24, 1924. Liquids such as oil and H_2O are passed through a tank divided into compartments so that liquid flowing upward in one compartment passes over a weir into the next, in which the flow is downward and the lighter liquid seps. on the surface.

Dehydrating liquids. A. S. EISENBAST. U. S. 1,570,626, Jan. 26. In sepg. H_2O from oils, varnishes or from other non-aqueous liquids, substantially dehydrated diatomaceous earth is mixed with the material and the mixt. is subjected to filtration.

Liquefaction and rectification system for separating constituents of air or other gaseous mixtures. C. C. VANNUYS and W. WILKINSON. U. S. 1,571,461, Feb. 2.

Rubber electrical insulation. WESTERN ELECTRIC CO., LTD. Brit. 236,026, June 11, 1924. Rubber insulation after being applied to submarine cables or the like is heated at about 95° for several hrs. to drive out moisture and then treated with melted paraffin for 15 min. to fill the pores in the outer portion of the rubber.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

The science of ground water supplies. G. THIEM. *Z. Ver. Gas u. Wasserfach* **65**, 166-9 (1925).—Most German cities use ground water as civic supplies. B. H. P.

Kentucky health board rates water supplies. F. C. DUGAN. *Eng. News-Record* **95**, 957 (1925).—Based on the character of the raw water, methods of treatment, operation of the plant and analyses of the water supplied 30 of the 91 water systems inspected by the State Board of Health in Kentucky are rated as good, 28 doubtful, 29 bad and 4 no rating but probably good. A list of the cities inspected, with their classification, is given.

California railroad commission and the water works man. M. R. MACKALL. *J. Am. Water Works Assoc.* **15**, 64-79 (1926). R. E. THOMPSON

Effect of impounding reservoir on water at Greensboro, N. C. C. W. SMEDBERG. *J. Am. Water Works Assoc.* **15**, 62-3 (1926). D. K. FRENCH

How laboratory supervision saved Omaha (Neb.) \$9000 per year. K. C. ARMSTRONG. *Eng. News-Record* **96**, 119 (1926).—The quantities of chemicals required to effect coagulation of the water at Omaha are detd. by lab. trials in a series of jars. It is estd. that the employment of this method will effect a saving of \$9000 during 1925 as compared with previous 6 years, notwithstanding the fact that the raw water was more turbid than in 1924. Addn. of a small dose of FeSO_4 ($\frac{1}{4}$ grain per gal.) enables the alum dosage to be reduced from $2\frac{1}{4}$ to 1 grain per gal. If larger amts. of FeSO_4 are employed, more lime is required, and it is, therefore, more economical to increase the alum when higher dosage of coagulant is needed. Lab. expts. indicated that the FeSO_4 should be added first, but in practice it has been found satisfactory to mix the alum and FeSO_4 in soln. tanks and add the soln. contg. both chemicals to the water to which lime has been previously added.

Well flow measured by pitometer checked by orifice. JOHN N. BROOKS. *Eng. News Record* **95**, 683-4 (1925).—Brief details are given of measurements of yield of a well by the pitometer and orifice methods, which agreed to within 1.2%. The yield of the well was approx. 1000 gals. per min.

Foaming in coagulating basins and air-bound filters. G. D. NORCOM, *et al.* *J. Am. Water Works Assoc.* **15**, 42-51 (1926).—Foaming is considered to be due to suspended matter, air and CO_2 gas generated as part of the alum reaction, coupled with

temp., surface tension and other phys. phenomena. Aside from its appearance it is considered harmless. It is suggested that there is some connection between foaming, and air-bound filters.

D. K. FRENCH

Sterilization with freshly prepared hypochlorite. H. A. LILLY. *J. Am. Water Works Assoc.* 15, 60-1(1926).—L. describes an inexpensive device for prepg. hypochlorite, using Cl and an alkali and feeding it into water.

D. K. FRENCH

Progress in the purification of water supplies. N. J. HOWARD. *Contr. Rec.* 39, No. 52, 133-8(1925).—Extensive review of progress in water purification during 1925. The employment of double filtration in dealing with heavily polluted and turbid waters is extending. A soln. composed of alum, Na_2CO_3 and NaOCl , the concn. of the latter being varied in proportion to the Cl-consuming power of the water, is being employed in Ontario in the prepn. of certain acid waters for filtration. Prechlorination and CuSO_4 treatment of a slow sand filter at Toronto, Ont., recently, in an effort to increase the length of run between scrapings in the early spring when the microscopic content of the raw water was high, proved unsuccessful. Superchlorination and dechlorination has recently been experimented with at Toronto, Ont., as a means of eliminating the medicinal taste which occasionally occurs following chlorination, and this process will be tried on a large scale in the near future. Also in *Surveyor* 69, 55-8(1926). R. E. T.

Developments in water softening. W. J. McLELLAND. *Contr. Rec.* 39, No. 52, 138-9, 163(1925).—Discussion of hardness in water, its effect on boilers and in textile industry and its removal by the Clarke or lime-soda process or by base exchange. Scale $\frac{1}{30}$ in. in thickness in boilers causes fuel loss of 1-10% and $\frac{1}{10}$ in. 2-20% depending on the compn. of the deposit.

R. E. THOMPSON

Water-softening developments—Rock Island lines. P. M. LABACH. *Am. Railway Eng. Assoc. Bull.* 27, No. 277-87(1925).—Detailed lab. expts. and results in the water-softening plant at Council Bluffs, Ia., and Estherville, Ia., indicate that less material can be used with better results and reduction in hardness if com. solns. of Na aluminate are added to the water sep. from the lime and soda ash.

R. C. BARDWELL

The softening of boiler waters. P. WIEGLEB. *Chem.-Ztg.* 49, 835, 856-7(1925).—W. describes 2 methods of water softening: (1) treatment with lime and soda or with Permutit and (2) a mech. method consisting of preliminary removal of suspended matter followed by evapn. and condensation of the boiler water by means of a series of evaporators, heat exchangers and condensers.

BEN. H. PETERSON

Water filtration and softening as applied to clay-products plants. H. M. MARSH AND W. J. McLELLAND. *Contr. Rec.* 39, 1161-3(1925).—Description of the water purification plant of Don Valley Brick Works, which consists of a settling and coagulation basin, mechanical pressure filter and zeolite water softener.

R. E. THOMPSON

Sounding bottle for taking samples of water in reservoirs. C. F. KLAPP. *Eng. News-Record* 95, 1083(1925).—A device for sampling water at varying depths is described and illustrated.

R. E. THOMPSON

Recording the hydrogen-ion concentration of potable water. H. C. PARKER AND J. R. BAYLIS. *J. Am. Water Works Assoc.* 15, 22-34(1926).—After a summary of the value of the H detn. in water treatment, a recording potentiometer is described, with W electrodes and the calomel cell, which is considered reliable and virtually fool-proof. As a result of such control, more uniform chem. treatment should be possible.

D. K. FRENCH

Micro-determination of the oxygen content of water. C. RISCH. *Biochem. Z.* 161, 465-7(1925).—A sample of water in a collector of known vol. is treated without exposure to air, with KI, NaOH and MnCl_2 . The container is closed and shaken for 1 hr. in the dark. Then the whole sample is removed and the I formed is titrated with $\text{Na}_2\text{S}_2\text{O}_3$, with starch as an indicator.

W. D. L.

Sterilization of water mains after laying. C. W. ABSHER. *J. Am. Water Works Assoc.* 15, 52-9(1926).—It is recommended that after laying new water mains they be sterilized with Cl to remove possible contamination from dirt and refuse. Liberal discussion supports such a suggestion.

D. K. FRENCH

Leakage tests of cast iron force main at Columbus, Ohio. J. C. PRIOR. *Eng. News-Record* 95, 870-2(1925).—Data are given on the leakage test of a new 36- and 42-in. cast iron main in Columbus. The max. leakage allowed in the contract was 528 gals. per 24 hrs. per in.-mile of pipe and av. leakage (cor. to standard pressure of 110 lbs.) during a 6-day test was only 87.3 gals. per 24 hrs. per in.-mile.

R. E. THOMPSON

Half of Lowell service pipes changed within 52 years. R. J. THOMAS. *Eng. News-Record* 95, 1041(1925).—Almost half of the 15,695 services installed since 1873, the first year after initial operation of the water works, have been changed because of (1) corrosive action of the original infiltrated and river supplies on wrought Fe pipe;

(2) action of later driven-well supplies on Pb and Pb-lined wrought Fe pipe, which caused Pb poisoning; and (3) leakage from Sn-lined wrought Fe pipe used in place of Pb-lined services. Cement-lined, tar-coated and rubber-treated pipes have been experimented with. Pb now predominates. Galvanized Fe has been employed during the past 10 years, but little confidence is placed on its durability. If the CO_2 was removed from the well supplies, Pb pipe would be as effective as brass. Considerable difficulty was formerly experienced because of incrustation of pipe of all materials, including Pb, with Fe and crenothrix, but this condition has been remedied by the installation of an Fe removal plant.

R. E. THOMPSON

Electrically welded water pipe: Tacoma's experience. W. A. KUNIGK. *Eng. News-Record* 95, 968(1925).—The experience in Tacoma, Wash., with elec. welded 30–60-in. steel pipe is reviewed and data on the difficulties encountered are given. Test bars cut from a no. of sections of finished pipe, all of which were hand-welded, developed joint efficiencies of 80–100%, all breaks occurring $1/8$ – $1/2$ in. from weld, except in 1 instance.

R. E. THOMPSON

Pipe steel shipped flat, then rolled and welded. C. A. P. DUFFIE. *Eng. News-Record* 95, 872–3(1925).—Illustrated description of the construction of a water pipe line (16,000 ft. of 30-in. and 26,000 ft. of 24-in.), steel for which was shipped flat and fabricated by oxywelding. Each length of pipe was tested prior to placing and only 3 joints were returned to the shop for rewelding. After testing the pipe was passed successively through hot alkali to remove grease, hot dil. H_2SO_4 to clean off scale, alk. neutralizing bath and hot rinse water. The pipe was then dried by means of gas flames playing on the outside, capped at each end, dipped in asphaltum and rolled in grit.

R. E. THOMPSON

Developments in sewage treatment and disposal during the year. H. P. EDDY. *Contr. Rec.* 39, No 52, 145–7(1925).—Progress in sewage treatment is reviewed, particularly as regards the activated-sludge process. Descriptions are included of the new activated sludge plants at Milwaukee and Indianapolis and of the “skimming-detritus tank” at Akron, O. and brief data on studies of the Engineering Bd. of Review of the Sanitary District of Chicago on disposal by diln. are given.

R. E. THOMPSON

The tri-cities' activated sludge plant at Alhambra, California. R. V. ORBISON, et al. *Eng. News-Record* 95, 714–6(1925).—The plant, serving Pasadena, South Pasadena and Alhambra, was put into operation in Jan., 1924. Including improvements since completed, necessitated by under-estn. of capacity required, it consists of 2 Dorr fine screens, 18 aeration tanks, 4 Dorr clarifiers, 11 sludge re-aeration tanks and 2 Oliver sludge filters. The av. flow treated is 6 m. g. d., and max. over 12 m. g. d. The effluent, which is chlorinated, is frequently sterile and bacterial count never exceeds 200 per cc. That portion not required for irrigation is discharged into the Rio Hondo, a tributary of the San Gabriel River. The Oliver filters reduce the water content of the sludge, after treatment with 7–9 lbs. of $\text{Al}_2(\text{SO}_4)_3$ per 1000 gals., from 99.2 to 80–84%, and the product is easily distributed over the sewage farm with an ordinary manure spreader. When dried to 10% moisture the sludge contains 7.79% total N_2 calcd. as NH_3 , of which 3.18% is water sol., and 3.94% H_3PO_4 . The cost of dewatering is 35¢ per 1000 gals. of sludge treated, and the product is worth 50–75¢ per ton as fertilizer. The total cost of the plant to date is \$532,000, or, on the basis of 55 gals. per capita per day, approx. \$4.70 per capita served. At 0.8–0.9¢ per kw.-hr., the power consumed costs \$11 per m. g. of sewage treated. Exclusive of interest, depreciation and sludge disposal, cost of operation is rated approx. at \$26 per m. g.

R. E. THOMPSON

Utilization of sewage sludge. LANGDON PEARSE AND S. A. GREELEY. *Eng. News-Record* 95, 836–7(1925).—The report deals mainly with the utilization of activated sludge, which has been found valuable as fertilizer. As a temporary measure Indianapolis is digesting activated sludge in tanks with primary sludge produced by fine screening and rapid settling. Imhoff, in the Ruhr District, Ger., and the Sanitary District of Chicago discharge excess activated sludge into the sludge chamber of Imhoff tanks, where it mingles with digesting primary sludge and is digested. Imhoff proposes to dispose of sludge in primary digestion tanks and to utilize the gases formed as power for compressing air required for the purification process. S, $\text{Al}_2(\text{SO}_4)_3$ and H_2SO_4 have been successfully employed in assisting coagulation of sludge prior to filtration or pressing. Chicago appears to secure the best results with $\text{Al}_2(\text{SO}_4)_3$, Houston with S, and Milwaukee with H_2SO_4 . Recent expts. at Chicago indicate that Fe_2Cl_6 is more efficient but more expensive. Artificial heating of sludge prior to dewatering has not been found necessary at Chicago and Indianapolis as at Milwaukee.

R. E. THOMPSON

Effect of temperature on rate of deoxygenation of diluted sewage. R. E. GREENFIELD AND A. L. ELDER. *Ind. Eng. Chem.* 18, 291–4(1926).—The biochem. O demand

in sewage dild. with aerated distd. water and incubated at from 2° to 6° shows a lag phase during the first few days, followed by a fairly rapid rise in the rate of deoxygenation. The deoxygenation is slow until a number of bacteria tolerant to low temp. develop. The formulas must be modified to suit the changed conditions. Sewage dildn. with distd. water shows an action different from that of polluted river water.

EDWARD BARTOW

Separate sludge-digestion experience. L. R. HOWSON. *Eng. News-Record* 95, 802(1925); cf. *C. A.* 19, 368. —Observations on sep. sludge digestion at Madison and Hartford, Wis., Lincoln, Neb., and Great Lakes, Ill., have demonstrated the ability of this system to accomplish efficient clarification and sludge reduction, producing a product which can be dried readily. It is possible that rate of digestion may be increased by application of artificial heat. Difficulties experienced in the past have been probably due to intermittency and incompleteness of sludge removal from the settling to the digestion tanks.

R. E. THOMPSON

Sewage disposal for city of 3,000 persons. F. M. VEATCH. *Eng. News-Record* 95, 589(1925). The recently constructed treatment plant at Holdrege, Neb., consists of an Imhoff tank and sludge bed. The tank, which was designed for a flow of 300,000 gals. per day, provides a settling period of 3 hrs. in parallel flow chambers and has a sludge digestion capacity of 2 cu. ft. per capita. The capacity of the sludge bed is equiv. to 1 sq. ft. per capita. Sprinkling filters and a settling tank will be added at a later date.

R. E. THOMPSON

What is the best sewage disposal system? F. W. HARRIS. *Contr. Rec.* 39, 926-8 (1925).—Comparison of sewage treatment on continuous percolating filters and by the activated sludge process. Expts. showed that the practical limit of purification of Shieldhall sewage was attained in 4 hrs. in a compressed-air activated-sludge unit and in 8 hrs. in a mechanical-agitation unit. Further expts. indicated clearly that the bio. intensity of activated sludge is greater with diffused aeration than with surface aeration, and that a degree of elasticity is provided in the former which is unattainable in the latter system.

R. E. THOMPSON

Sewer lining experiments for Los Angeles County. A. M. RAWN. *Eng. News-Record* 96, 18(1926).—Expts. are outlined which are being conducted in connection with the construction of the Los Angeles Co. Metropolitan sanitary sewer system to determine the most effective method of lining or treating concrete to protect it from the action of septic sewage.

R. E. THOMPSON

Intercepting sewers and disposal plant at Laramie, Wyoming. F. M. VEATCH. *Eng. News-Record* 95, 794-5(1925).—The new sewage treatment plant at Laramie consists of an Imhoff tank and sludge filters. The tank capacity is equiv. to a settling period of 1.5 hrs. and the sludge compartment was designed on the basis of 2 cu. ft. per capita, provision being made for a long storage period owing to climate. The sand beds for sludge drying have a capacity equiv. to 0.4 sq. ft. per capita. Each year's production of sludge will be dealt with by 3 dryings made during the summer months.

R. E. T

Purification of dairy wastes. F. DIENERT. *Lait* 5, 873-81(1925).—Casein should be recovered from the waste skim milk and buttermilk and used for cheese-making or as a stock feed. Chem. purification, spreading on the soil, bacteriol. decompn. and activated sludge processes are dealt with in turn as helping to render dairy sewage unobjectionable.

H. F. ZOLLER

Sanitary control in the development of ground water supplies. *Eng. News-Record* 95, 626(1925).—Code of principles formulated by the committee of Conference of State Sanitary Engineers and adopted at Louisville, Apr. 25, 1925, is given. The subjects dealt with include suction and gravity piping, collecting and storage reservoirs, cross-connections, wells, well supplies, purification, springs, mine water and infiltration galleries.

R. E. THOMPSON

Some specific factors responsible for pollution affecting analysis of water supplies. H. A. WHITTAKER. *Contr. Rec.* 39, 1025-6(1925).—Tabulation of factors influencing sanitary quality of water supplies.

R. E. THOMPSON

Stream pollution by acid mine drainage. R. D. LEITCH. *Bur. of Mines, Repts. of Investigations* No. 2725, 7 pp.(1926).—Mine water wastes from the Pa., Ohio and W. Virginia districts average 16-34 tons water per ton of coal mined. From representative analyses an est. of 200 grains H_2SO_4 per gal. is assumed. This pollutes the streams to a serious extent. Few attempts at disposal have been made. Allowing the waste to run over crushed limestone or marl has been tried with fair success. The use of Ba salts has been suggested. The expenses of both processes are almost prohibitive. Pennsylvania has organized a Sanitary Water Board to study the situation.

B. H. P

Atlanta (Ga.) now sells excess steam from refuse incinerator. H. J. CATES.

Eng. News-Record 95, 922-3(1925).—During a 4-month period reviewed only 36% of the entire steam production was used for plant operation and the remainder was sold. Nearly 1 lb. of steam was produced per lb. of refuse delivered to pits. Data on operation of the plant are given.
R. E. THOMPSON

Relation of storage water supply lakes to malaria. J. A. LE PRINCE. *J. Am. Water Works Assoc.* 15, 35-9(1926).—Suggestions are given for reducing the opportunities of storage reservoirs for being breeding places for the malaria-bearing mosquito.
D. K. FRENCH

Liability for water-borne disease. H. O. BLAIR. *J. Am. Water Works Assoc.* 15, 80-3(1926).—In 2 cases verdicts were rendered against a municipality supplying water for domestic and drinking purposes, after the facts were established that, through negligence, polluted water was allowed to pass into the city mains and deaths from disease were the result. Failure properly to inspect the water was considered negligence even though no guarantee of purity was given.
D. K. FRENCH

KERSHAW, G. B. Sewage Purification and Disposal. 2nd ed. Cambridge University Press. 361 pp 18s., by post 18s. 9d. Reviewed in *Munic. County Eng.* 76, 470(1925).

Softening water. R. G. TELLIER. U. S. 1,571,891, Feb. 2. H_2O to be softened is treated with extended surfaces such as a clay from Fall River Co., S. D., or other clay-like material contg. alkali metal silicate. U. S. 1,571,892 specifies prep. a H_2O -softening reagent by hardening and dehydrating clay-contg. compds. of the alkali metal or alk. earth metals, by heat treatment such as will produce a product permeable and resistant to H_2O , and then treating this product with NaOH soln. or NaCl soln.

Apparatus for purifying water by chemical treatment and sedimentation. A. W. ANDERSON and J. R. HICKOX. U. S. 1,571,225, Feb. 2.

Preventing and removing incrustation in boilers. J. SICHERT. Brit. 235,506, March 27, 1925. See U. S. 1,557,349 (*C. A.* 20, 84).

Apparatus for settling and sludge digestion of sewage. M. PRÜSS. Brit. 235,872, June 19, 1924.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Recent advances in science: Pedology. G. W. ROBINSON. *Science Progress* 20, 423-9(1926).—Review of recent work on soil chemistry and related subjects.

JOSEPH S. HEPBURN

Methods of mechanical analysis of soils. D. J. HISSINK. *Proc. Internat. Soc. Soil Science* [N. S.] 1, 137-56(1925).—A modification of the method of mech. analysis of soils consists of preliminary treatment of the sample with 20% H_2O_2 , boiling with 0.2 N HCl, and decantation of the finest fraction with 0.1% NH_4OH .
I. A. DENISON

Pedological chemistry. I. Alkalinity of the soil in relation to its lithological constitution. U. PRATOLONGO. *Atti accad. Lincei* [vi], 1, 238-43(1925).—Aq. solns. of calcite and aragonite satd. at the ordinary temp. have alkalinities expressed by p_H 8.0-8.2, whereas for hydromagnesite the value is 9.2. Investigation of the soly. curve of the system $CaCO_3-Na_2CO_3-H_2O$ at the ordinary temp. shows that the conditions for the formation and stability of gaylussite are the presence in the soln. of about 5% of Na carbonate and the presence of Ca carbonate; under such conditions the soil would be rendered completely sterile. For satd. solns. of brucite at the ordinary temp., the value of p_H is 10. Conclusion: The high degree of constitutional alk. (p_H 8.8-9.2) exhibited by certain soils is attributable to the presence, not of aragonite or calcite, but of hydromagnesite.
B. C. A.

The use of fertilizer in Java. S. N. QUAR. *Facts about Sugar* 20, 924-5(1925).—Requirements of different soils which are very deficient in N and the time and method of applying the fertilizer.
T. MARKOVITS

Problems of phosphate fertilization in France. V. P. KORSEKOV. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 127-40(1924).—K. reviews the theories current in France on the influence of raw phosphates as a fertilizer, the influence of acid soils on phosphate utilization, the time period phosphates are effective in soils, composting of phosphates with org. materials, comparison of raw phosphates with other forms.
J. S. JOFFE

A solution of the phosphoric acid question for Germany. P. AD. PLAAS. *Z. Ver. deut. Ing.* 69, 490-500(1925).—The extensive and accessible phosphorite deposits of Russia offer great possibilities for exploitation to the mutual benefit of that country and Germany.

P. R. DAWSON

Phosphates in vegetation experiments. M. DOMONTOVICH. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 141-75(1924).—An analysis is given of the exptl. work on the utilization capacity of various phosphates by different plants for the last 30 years. The reactions involved in respect to the effect of other ions on the soly. of phosphates are discussed. D. takes up the equations and derives the following consts. for the phosphates of Ca and H: (1) $[Ca^{++}]^3 \cdot [PO_4^{---}]^2 = K$; (2) $[H^+].[PO_4^{---}]/[HPO_4^{--}] = K_3$; and (3) $[H^+].[HPO_4^{--}]/[H_2PO_4^-] = K_2$. Taking Z for the total concn. of phosphates in a satd. soln. and assuming a complete dissociation of all the dissolved salts of phosphoric acid $Z = [PO_4^{---}] + [HPO_4^{--}] + [H_2PO_4^-]$. Expressing each one of the above values as a function of [Ca] and [H] one gets: $Z = \sqrt{K/[Ca]^3(1 + ([H^+]/K_3) + ([H^+]^2/K_2K_3))}$ (4). [Ca] is in the denominator and [H⁺] in the numerator and naturally with the increase of H the amt. of P₂O₅ in soln. increases. Side reactions may interfere but since there is no exact formula for the soly. of Ca₃(PO₄)₂ it may be expressed thus: $Z = f[H^+]/\phi[Ca^{++}]$. D. further discusses the influence of the reaction on the assimilation of P₂O₅, effect of Ca on the utilization of raw phosphates, role of root excretions, root absorption and reaction of root sap. The different plants vary in their ability to utilize raw phosphates. Many factors enter, such as the differential utilization of Ca, ability to take up P₂O₅ from dil. solns., formation of org. acids, phosphatides (combined with Ca), etc.

J. S. JOFFE

The significance of phosphates for Russian agriculture and the extension of the possibilities of utilizing raw phosphates. D. N. PRYANISHNIKOV. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 19-30(1924).—P. discusses the possibilities of utilizing raw phosphate in different soils depending on various soil-plant reactions to decompose the phosphates and make them available. The soils adapted for such phosphate fertilization are grouped as follows: (1) The zone of debased chernozem, with the decay materials as a source of N and the unsatd. zeolite-like and humate compds. as the solubilizing agents. (2) The zone of blue lupines in the region outside of the chernozem with the atm. as source of N and lupine root excretions as the solubilizing agent. (3) The podzolized zone with the unsatd. complexes as the solubilizing agent and the atm. as a source of N. (4) The zone of peat with the org. acids of the peat as a solubilizing agent and the same peat as a source of N.

J. S. JOFFE

The significance of phosphates for the agriculture of the northern half of the chernozem soil. A. N. LEBEDIANTZEV. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 66-90(1924).—L. analyzes the reactions responsible for the solubilization of raw phosphates in chernozem soils. He stresses the point of nitrification as an agent in solubilizing the insol. mineral constituents. In some chernozem soils with a definite alk. reaction the nitrification process locks up the phosphates, releasing some at first.

J. S. JOFFE

The use of phosphates according to the data of the various Experiment Stations. A. KRASINSKII. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 91-126 (1924).—K. reviews the various studies on phosphate fertilization in the different Expt. Stations on soils of various chem. compn.

J. S. JOFFE

Phosphates and peat. F. PERETURIN. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 205-9(1924).—P. presents a discussion and exptl. evidence on the influence of peat on the soly. of raw phosphates. Peat seems to be an effective means to convert the insol. phosphate into available form.

J. S. JOFFE

The soil and raw phosphates. A. N. SOKOLOVSKII. Contributions Sci. Inst. Fertilizers (Leningrad), *Bull.* 12, 191-204(1924).—S. analyzes the dynamics of soil processes and their influence on the soly. of raw phosphates. It is a comprehensive theoretical discussion of the state of satn. and unsatn. of soils, the processes of decay of org. matter and the possible influence of these on the soly. of raw rock phosphate.

J. S. JOFFE

The solubility, decomposition and evaluation of the various forms of phosphoric acid and phosphatic fertilizers. K. SCHARER AND A. STROBEL. *Z. angew. Chem.* 38, 953-8, 988-92(1925).—A discussion of the nature of various phosphates, as to their soly. and availability to different plants, together with methods for evaluating them in these respects, as well as for estg. available P₂O₅ in soils.

P. R. DAWSON

Radioactive fertilizers. HANS EGNER. *Kungl. Landb. Akad. Handl. Tidskr.* 64, 737-62(1925).—E. concludes after an extensive examn. of existing literature relative

to influence of radioactive substance on growth and also making several trials with radioactive fertilizers, that nothing is to be gained by using radioactive preps. for fertilizing purposes. A bibliography on trials with radioactive fertilizers is given.

C. O. SWANSON

Manufacture of fertilizer urea on a tonnage basis. R. S. MCBRIDE. *Chem. Met. Eng.* **32**, 791-3(1925).—A description is given of the Lindholm process for manuf. of urea from CaCN_2 , as in operation in a pilot plant at the Niagara Falls Works of the Union Carbide Co.; some technological and economic aspects are discussed; and emphasis is placed upon the high efficiency of urea as a source of fertilizer N.

P. R. DAWSON

Fertilizer experiments: Methods of application and effect on germination, early growth, hardness, root growth, lodging, maturity, quality and yield. EMIL TRUOG, H. J. HARPER, O. C. MAGISTAD, F. W. PARKER AND JAMES SYKORA. *Univ. of Wis. Research Bull.* **65**, 55 pp.(1925).—The osmotic pressure of the cell sap of the sprouts of certain plants was: corn 7.180, rye 7.072, field peas 6.837, navy beans 6.628, oats 6.573, cowpeas 6.025, potatoes 6.150, cucumbers 3.779 and muskmelons 3.225 atms. Field crops were grown in sterile sand cultures, with various salts supplying the N. In every case as good and in most cases much better growth was obtained with NaNO_3 than with various NH_4 salts. Under these conditions the NH_4 radical seems to be toxic to oats. It is pointed out that the benefits derived from NH_4 salts in the field are due at least in part to conversion to nitrates by bacteria. The addn. of about 200 lbs. per acre of KCl or K_2SO_4 to Carrington silt loam increased the H-ion concn. from pH 5.71 to 5.15 and 5.40, resp., but when added to acid peat soil reduced it from 4.58 to 4.82 and 4.66, resp. A satisfactory explanation for the latter cannot be given. The addn. of large quantities of acid phosphate to Carrington silt loam greatly stimulated nitrification in it. A bibliography of 20 citations is appended.

A. I. MEHRING

The influence of the degree of soil moisture on the yield and composition of tobacco. A. V. OTRYGANIEV. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* **1924**, No. 22, 1-32.—Pot expts. are reported on the effect of moisture content on the growth and compn. of tobacco in light sandy and heavy clay (chernozem) soils. The lower moisture content in the sandy soils brought about a lower N content in the plants. The addition of fertilizers increased the nicotine content, total ash and total N. In the clay soils a concn. of salts in the soil soln. under conditions of a low moisture content increased the N content of the plants. The best yields were obtained on both soils when the moisture added equaled 60% of the total moisture-holding capacity of the soil. A French résumé is found at the end of the article.

J. S. JOFFE

The influence of nitrogen nutrition on the development and quality of tobacco. A. V. OTRYGANIEV. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* **1924**, No. 21, 1-18.—An increase in nitrogenous fertilizers increases the yield of tobacco. Parallel with the increase in yield goes the increase in nicotine content (0.31% without N and 0.77% with 1 g. N per pot (8000 g. of sand) and 2.59% with 2 g. N). The carbohydrate content falls from 24% with 1 g. N to 8.59% with 2 g. N. An extensive résumé in French is given at the end of the article.

J. S. JOFFE

Manganese and plant growth. J. S. MCHARGUE. *Ind. Eng. Chem.* **18**, 172-5 (1926).—Mn functions in the synthesis of chlorophyll and C assimilation in plant growth. One of the first signs of the lack of Mn in the growth of plants is the failure to synthesize chlorophyll. The young leaves and branches as they put forth are chlorotic and do not attain a normal green color. Their starch and sugar contents are less than in normal foliage grown in the presence of Mn. No other one of the common elements will replace the function of Mn in plant growth. It plays a role of importance equal to that of Fe in the synthesis of chlorophyll. It is pointed out that most chemicals contain small quantities of Mn and its effect in plants can only be demonstrated by using Mn-free chemicals and app. in culture expts.

J. J. SKINNER

Carbon dioxide as fertilizer. HENRIK LUNDEGÅRDH. *Kungl. Landt. Akad. Handl. Tidskr.* **64**, 710-26(1925).—L. used a greenhouse 30 m. long and 3 m. wide, divided into four parts, one of which was used as a control. To the other parts CO_2 was added in different amounts to growing cucumbers, beans, tomatoes and sugar beets. CO_2 was detd. in the air daily. The air of the control compartment contained an av. of 0.623 mg. CO_2 per 1000 cc. air. In the part which contained 0.808 mg. CO_2 per 1000 cc. air, the increase in the growth of beans was 79%, tomatoes, 6.7% and cucumbers from 12.4 to 36%. When the proportion of CO_2 was increased from 100 to 113.2 the proportional increase in the growth of sugar beets was from 100 to 138, and when the proportion of CO_2 was increased from 100 to 127.1 the proportional increase in the growth of sugar beets was from 100 to 155. Field trials were also made and while the

conditions were not under exact control, the results were pc depends on intensity of light, the CO_2 content of the air ar

Iodine fertilizing and iodine feeding. TH. VON FELL 210-24(1925).—The leaves of sugar beets grown in soils fert amts. of iodide, more, however, than the roots. The additi soil but little with iodide, as the KI was largely oxidized t constituents of the soil. The milk of cows fed on I-rich bec distinct increase in I.

A method for testing out dry (powder-form) fungicidal agents (for grain) in the laboratory. FRIEDRICH PICHLER. *Chem.-Ztg.* 49, 879-80(1925).—Specially prepd. boxes are filled with earth, planted with inoculated grain, covered with earth to a known depth, and kept in a thermostat at $16-18^\circ$. The grain is inoculated by shaking a known wt. of it with 1% its wt. of smut in a stoppered flask for 2-3 min. The smut spores must be from a recent harvest, and of good germinating quality. Five-g. samples of inoculated grain are placed in small flasks, treated with known amts. of the prepn. under investigation (with shaking) for 10 min., and 20 grains from each sample then planted in the boxes. Runs are made in triplicate, dry, moist and very moist; microscopie examns. are made of the grain at intervals up to 10 days and the germinating power of the grain itself is noted in addition. Smut spores germinate in about 5 days. Results are comparable to those obtained in practice with the same smut-preventives.

W. C. EBAUGH

The application of plant-protecting agents in dust form. E. RIEHM. *Z. angew. Chem.* 38, 1032-4(1925).—A discussion of the advantages and disadvantages of the application of insecticidal and fungicidal dusts, with special reference to recent German and American com. products.

P. R. DAWSON

California petroleum insecticides. Laboratory and field tests. G. P. GRAY AND E. R. DE ONG. *Ind. Eng. Chem.* 18, 175-80(1926).—Tests were made of 30 petroleum distillates to det. to what extent the various phys. tests are significant in detg. the toxicity of an oil to vegetation. The toxicity of the oils tested appeared to increase roughly in proportion to the amt. of unsatd. compds. present. The percentage of the oil sol. in 37 N H_2SO_4 may be used to est. the amt. of unsatd. compds. in an oil and is suggested as a useful guide in judging toxicity. The ability of an oil to penetrate plant tissue must be taken into account. Conclusion: Phys. tests alone are inadequate.

J. J. S.

Combating crop diseases with chemicals. A. KLAGES. *Z. angew. Chem.* 39, 3 10(1926).—A review with statistics of crop diseases and methods of grain treatment with especial reference to Hg compds.

MARY JACOBSEN

Effectiveness of calcium cyanide in poisoning the pocket gopher, *Geomys bursarius* (Shaw). F. L. WASHBURN AND C. E. MICKEL. Minnesota Agr. Expt. Sta., *Tech. Bull.* 27, 14 pp.(1925).—The use of Ca cyanide in poisoning gophers was no more effective on clay soils than sandy ones and it was found to be more expensive than the use of poison baits.

J. J. SKINNER

Sheep dips. Their composition and analysis. J. S. REMINGTON. *Ind. Chemist* 1, 525-8(1925).—The chief parasites to be killed are the scab mite, the tick, the ked, the maggot and the red louse. Total immersion is necessary in a soln. that will kill all the above, and that will not injure the sheep or the wool. The dips may be classified as (I) Dry yellow powders composed chiefly of S and $\text{Na}_3\text{AsO}_4 \cdot 12\text{H}_2\text{O}$ with small quantities of Na_2HAsO_3 and As_2S_3 . (II) Soft paste dips composed of the same materials as (I) but contg. in addn. resinous soft soap and sometimes coal tar and creosote. (III) Black viscous liquids composed of creosote and soft soap. Analysis of group I: (1) moisture at 105° , (2) S by extn. with CS_2 in a Soxhlet app., (3) As compds. 5 to 10 g. is heated with satd. NaHCO_3 to dissolve As_2S_3 , the filtrate is acidified with dil. HCl and any pptd. As_2S_3 weighed on a tared filter. The filtrate is made up to 300 cc., 100 taken and As^{V} detd. as $2(\text{MgNH}_4\text{AsO}_4) \cdot \text{H}_2\text{O}$. 25 cc. is now taken and As^{III} detd. by titration with 0.1 N I_2 and Na_2HAsO_3 calcd. Group II: (1) 50-100 g. is heated to 170° in a retort and the distd. H_2O is measured in cc. (2) 100 g. is ignited with concd. H_2SO_4 . The wt. of $\text{K}_2\text{SO}_4 \times 4.299$ gives the wt. of resinous potash soap. $\text{K}_2\text{SO}_4 \times 3.862$ gives the wt. of resin. From the wt. of Na_2SO_4 the arsenite is calcd. (3) S and arsenate are detd. as in group I. The creosote is obtained partly along with the S. Weigh S + creosote and det. the S by oxidation and pptn. as BaSO_4 . The resin, fatty acids and phenols are obtained with the As_2O_3 . Group III: A modification of the method on p. 262, Vol. II, Part II of Allen's Comm. Org. Anal. is given. Results of a number of analyses for each group are given. For further particulars the original must be consulted.

E. G. R. ARDAGH

Removing SiO_2 from ore leaches [for fertilizer manufacture] (U. S. pat. 1,571,054) 18.

Fighting Rust With Sublimed Blue Lead; an assemblage of facts concerning the properties and uses of sublimed blue lead. Edited by Eagle-Picher Lead Co. Chicago: The Eagle-Picher Lead Co. 82 pp.

Fertilizer. BADISCHE ANILIN & SODA FABRIK. Brit. 236,494, March 14, 1925. KNO_3 215, $(\text{NH}_4)_2\text{HPO}_4$ 190 and dry urea 70 parts are used together and may be pressed into tablets or cakes.

Phosphatic fertilizer. RHENANIA VEREIN CHEMISCHER FABRIKEN AKT.-GES. Brit. 235,860, June 23, 1921. A mixt. of natural phosphate, alkali sulfate or chloride, SiO_2 and an alk. earth compd. such as CaCO_3 is heated in the presence of steam to $900\text{--}1000^\circ$. Fe oxide or Al oxide may be used instead of SiO_2 and citrate-sol. phosphate is produced.

Fertilizer and insecticide. A. G. BRYON. Brit. 235,802, Jan. 22, 1925. A powd. mixt. of lime, NaCl and soot, with or without poultry manure.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The production of hydrogen by microorganisms. A. C. THAYSEN. *Chem. Age* (London) 14, 28(1926).—By the use of a bacterium belonging to the *Amylobacter* group, starch has been converted into a mixt. of 10.77% of acetone, 25.07% of butyl alc., 62.61% of CO_2 , 1.6% of H_2 , and 1.80% of org. acids. The H_2 is readily sepd. from the CO_2 and possesses high purity. Being a waste product, its cost of production lies in cost of collection and purification. During the World War it was shown that 1000 cu. ft. (28.3 cu. m.) could be produced for 25¢.

W. H. BOYNTON

Influence of certain colloids upon fermentation. II. R. GREIG-SMITH. *Proc. Linnean Soc. N. S. Wales* 50, 341–58(1925); cf. *C. A.* 19, 1321.—Colloidal SiO_2 induced a more rapid production of CO_2 in the fermentation of sucrose by distillery yeast. Asbestos and SiO_2 hastened the inversion of sucrose by yeast, and SiO_2 accelerated the fermentation of dextrose. Wood charcoal, talc, kaolin, fuller's earth, asbestos, kieselguhr, French chalk and $\text{Fe}(\text{OH})_3$ hastened the slow fermentation of dextrose. The differences in the relative amts. of fermented material were not so great as when dealing with bacteria, but were sufficiently marked to show that the yeasts as well as bacteria have their fermentative activities accelerated by the presence of certain minerals and other colloids and that the isolated enzymes are not influenced by the same colloids.

L. W. RIGGS

The fermentation of cacao shell. A. CHURCHMAN. *J. Soc. Chem. Ind.* 44, 540–2T(1925).—Cacao husks were hydrolyzed under pressure with dil. H_2SO_4 and the ext. was neutralized with CaCO_3 and filtered. The filtrate was fermented with *Saccharomyces cerevisiae*, and the alc. production detd. The max. yield of alc. (2.5%) was too low to be commercially valuable.

T. S. CARSWELL

Hop extractor. ANON. *Apparatebau* 38, 4(1926).

J. H. MOORE

The chemical manufacture of alcohol (GIROD) 10.

Carbonating beer or other beverages. J. L. BAKER. Brit. 235,646, March 20, 1924. "Aerated" beverages are "revivified" by adding to them a small quantity of "supergassed" beverage. An app. is described.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Studies on a plant from the Congo, belonging to the species of nitragyne (Rubiaceae) and its alkaloid, followed by some observations on gelsemine and yohimbine. MICHIELS AND LEROUX. *Bull. acad. roy. med. Belg.* [5], 5, 403–18(1925).—The bark of a tree from the Congo, closely resembling *Uncaria gambier*, contains 1% of an alkaloid, crystallizing from alc., m. 243° , the hydrochloride of which is pptd. by the reagents of

Bouchardat, Mayer and Dragendorf. With concd. $\text{H}_2\text{SO}_4 + \text{K}_2\text{Cr}_2\text{O}_7$ it yields a red color changing to green and a violet color with reagent of Mandelin. The reactions of this unknown alkaloid resemble to a certain degree those of gelsemine and yohimbine.

R. BEUTNER

The arsenobenzenes, their composition, their toxicity and their control. DE MYTTEAERE. *Bull. acad. roy. med. Belg.* [5], 5, 433-69 (1925).—De M. discusses, partly in a polemical way, the following publications which concern the analysis of arsenobenzene: Valeur and Launoy (*C. A.* 19, 1756), P. L. Moreau and Pontoizeau (*Arch. Med. Pharm. Militar.* Dec., 1924, 745), and Kahl, Tomczynski and Weil (*C. A.* 19, 1455). The deviations observed by these authors are due to a failure to comply exactly with the directions of De M. Arsenic should be between 19 and 21%; the ratio As:N should be between 5 and 5.6; the index D M should not be higher than 12. To det. As decompose 0.2 g. of the substance by means of concd. H_2SO_4 , oxidize to quinquevalent As and titrate iodometrically. Det. N by the Kjeldahl method. To det. the D M index dissolve 1 g. of the substance in 90 cc. H_2O and 10 cc. dil. AcOH, heat on a water bath until pptn. occurs and then 10 min. longer. After 12 hrs. filter, warm the filtrate to 60° , add 5 cc. HCl and sat. the soln. with H_2S at 60° . Filter and wash the ppt. to neutral reaction; take up in $(\text{NH}_4)_2\text{CO}_3$ soln., filter, evap. the soln. on a sand bath until all NH_3 has disappeared, add 10 cc. H_2O and 10 cc. 50% H_2SO_4 . Det. As in this soln. as described above; the no. of cc. of 0.01 N I soln. used is the D M index. A modification of Macallum's detn. of the partial and of the total reducing power is described.

R. BEUTNER

A comparative study of various insulin preparations. B. SYBRANDY. *Nederland. Tijdschrift Geneeskinde* 69, II, 2776-81 (1925).—The lowering of the glucose content of the urine in 3 patients with heavy diabetes is used to standardize a number of insulin preps. The action of the same prepn. in different patients is not parallel, however. The lowering of the acetone in the urine is not proportional to the lowering of the sugar content. Insulin seems to contain one factor acting on the glucose and another one on acetone.

R. BEUTNER

Desiccated gonadal substances. H. SHARLIT AND J. SAMET. *Med. J. and Rec.* Feb. 4, 1925 (reprint), 5 pp.—In the prepn. of gonadal substances for therapeutic purposes, care must be taken to avoid liquefaction of the fats, oxidation and reduction reactions and hydrolytic cleavage. This necessitates rapid desiccation at low temp. and pressure, and in presence of a min. of circulating air. Analysis of com. prepus. shows that these conditions are not always observed. In some cases defatting is resorted to with the object of facilitating pulverization.

B. C. A.

Color reaction of adrenaline. R. GUYOT. *Bull. soc. pharm. Bordeaux* 63, 214-6 (1925).—If 2 drops of a soln. of NaVO_3 (NaVO_3 0.5 g., NaOH soln. 20 drops, distd. H_2O 10 cc.) and 2 drops of NaOH soln. are added to 2 drops of adrenaline soln. in 100 cc. of distd. H_2O , there will develop a pink coloration changing to red. By this reaction, as little as 0.00001 g. of adrenaline can be detected.

A. G. DUMÉZ

Conservation of solution of arsenic triiodide. R. GUYOT. *Bull. soc. pharm. Bordeaux* 63, 217-22 (1925).— AsI_3 when dissolved in H_2O dissociates into As_2O_3 and HI. The HI is acted upon by O and free I is deposited in a short time. To overcome this, G. proposes that the freshly prepd. soln. be neutralized with NaOH soln. This really converts the AsI_3 into arsenite, viz.: $\text{AsI}_3 + 4\text{NaOH} = \text{NaH}_2\text{AsO}_3 + 3\text{NaI} + \text{H}_2\text{O}$. The arsenite soln. appears to be stable.

A. G. DUMÉZ

Alteration of glucose serum in ampules due to bacterial action. R. GUYOT. *Bull. soc. pharm., Bordeaux* 63, 222-3 (1925).—Decompn. of a soln. of glucose contained in ampules and sterilized in an autoclave at 105° for 20 min. was observed. The soln. was contaminated with *B. amylobacter*, the spores of which are able to withstand this temp.

A. G. DUMÉZ

Extemporaneous preparation of mercurial ointment. L. DUCASSE. *Bull. soc. pharm., Bordeaux* 63, 223 (1925).—The following are the ingredients used in this ointment: HgO (red) 0.60 g., balsam of Peru 2.0 g., soln. of H_2O_2 (12 vol.) 10 g., lanolin 50 g., vaseline 38 g., Hg (metal) 100 g. In a mortar of suitable size, triturate the HgO with the balsam, then pour on the Hg and incorporate gradually the previously mixed lanolin and vaseline. Titurate until the Hg has been extinguished.

A. G. DUMÉZ

Ash content of plantain (*Plantago lanceolata*). B. PATER. *Pharm. Monatshefte* 6, 217-8 (1925).—Notable among the findings reported are 38.8% K_2O in the ash of the entire plant and 39.2% for the ash of the aq. ext. (corresponding values for *P. major* being 39.4 and 38.1%), while SiO_2 is given as: total 1.35, insol. 0.91% (*P. major* total 2.16, insol. 1.41%).

W. O. E.

Oil of *Bifora radians* M. B. B. PATER. *Pharm. Zentralhalle* 67, 17-8 (1926).—

The green plant, which possesses an unusually marked odor and a habit not unlike coriander, yields a light green strong smelling oil (0.124%) having the consts.: d_{4}^{15} 0.870; α_D -0.2; n_{20} 1.4624; insol. in 25 parts of 80% EtOH; acid no. 23.8; sapon. no. 53.3; ester no. 29.5. The possible use of this oil in minute amt. in perfumes is suggested.

W. O. E.

Estimation of quinine. LUDWIG DAVID. *Pharm. Ztg.* **71**, 26-8(1926).—In estg. quinine in cinchona bark the following procedure is recommended: In a Jena Erlenmeyer flask provided with a rubber stopper weigh accurately 17 g. of 1% HCl, add 1.7 g. of the powdered sample (sieve No. VI), heating and stirring the mixt. $\frac{1}{2}$ hr. on the H₂O bath, apply the stopper after removal from bath and stir from time to time over a period of $\frac{1}{2}$ hr. Cool and weigh, replacing any loss in wt. with 1% HCl. Pass the liquid through an 8-cm. filter into a dry flask, finally pressing out the filter with the fingers. Transfer 10 g. (1 g. of the bark) of the filtrate to a 50-cc. beaker, stir in 10 drops of 0.1 N NaOH followed by 10 cc. of 20% Na₂HPO₄ soln., allowing the mixt. to stand 1 hr. with occasional stirring. Collect the ppt. on a 7-cm. filter, washing both beaker and ppt. in rotation with four 2.5-cc. portions of dil. Na₂HPO₄ soln. (1 cc. of 20% Na₂HPO₄ soln. + 9 cc. H₂O). Remove all traces of ppt. clinging to the beaker with a moist strip of filter paper (about 2.5 cm.), add to main ppt., transfer to a 50-cc. flask with large mouth, add 4 cc. 20% NaOH soln., close with cork and shake 1 min. vigorously, add 6 g. NaCl and again shake. Now add two 15-cc. portions of Et₂O, stopper well and shake vigorously 20 min. After $\frac{1}{2}$ hr. pipet 15 cc. of the clear Et₂O soln. into a 50-cc. Erlenmeyer flask, expel the solvent, add to the dry residue two 3-cc. portions of Et₂O, expelling the solvent each time after such addn., then dissolve the dry residue in 20 cc. neutral EtOH and titrate with 0.1 N HCl in the presence of laemoid (factor 0.0324) using a microburet for the operation and multiplying the no. of cc. of acid expended by 6.58 to obtain the %.

W. O. E.

Preparation of hydrogen sulfide in the pharmaceutical laboratory. F. OSWALD. *Pharm. Ztg.* **71**, 39(1926).—After reference to the customary use of FeS and Na₂S in the generation of H₂S the advantages of thioacetic acid for this purpose are pointed out, particularly in the absence of the erstwhile commonly available app. of Kipp and of Woulff.

W. O. E.

Notes on the U. S. P. X. J. W. ENGLAND. *Am. J. Pharm.* **98**, 37-52(1926).—A study of some of the more striking changes.

W. G. GAESSLER

Some anomalous tensions. D. W. HORN. *Am. J. Pharm.* **98**, 53-8(1926).—The results of recent measurements made with the duNouy app. upon the superficial tensions of aq. solns. of soaps, tannin, ext. of licorice and saponin are given in a table and discussed.

W. G. GAESSLER

A century of alkaloids. A. D. THORBURN. *J. Chem. Education* **2**, 886-99(1925)

E. H.

Spectrophotometric analysis of commercial insulin. E. J. BALDES AND S. F. ADAMS. *Am. J. Physiol.* **74**, 309-13(1925).—Com. and lab. specimens of insulin show no absorption bands in the visible spectrum. The curves obtained by plotting light transmission as a function of λ may be used for the detn. of insulin, as with the present prepn. methods the quantities of yellow pigment and insulin seem to run parallel.

MARY JACOBSEN

A new method of assaying the potency of the female sex hormone based upon its effect on the spontaneous contraction of the uterus of the white rat. R. T. FRANK, C. D. BONHAM AND R. L. GUSTAVSON. *Am. J. Physiol.* **74**, 395-9(1925).—An exact assay method of the female sex hormone is afforded by the slowing of the spontaneous uterine contractions under the action of sufficient hormone quantities. Potent exts. of follicular fluid, corpus luteum and placenta have the same effect.

MARY JACOBSEN

Studies on the ultrafiltration and electro dialysis of insulin. T. C. TAYLOR, C. E. BRAUN AND E. L. SCOTT. *Am. J. Physiol.* **74**, 539-65(1925).—The active principle of insulin can be ultrafiltered through collodion membranes of high and low permeability without loss of activity and with the N content unaltered. By electro dialysis at pH 3.6 (not at the isoelec. point: 5.6) insulin prepn. are sepd. into: (1) a sediment with doubled activity which gives protein reactions and contains S but no P and (2) a soln. nearly inactive showing protein reactions and contg. neither S nor P. When treated with equal vols. of 25% H₂SO₄ and 95% EtOH the sediment gives a microcryst. product.

MARY JACOBSEN

The presence of insulin in desiccated beef pancreas. VICTOR ROSS. *Am. J. Physiol.* **74**, 579-82(1925).—It was established by expts. on white rats that beef pancreas desiccated at (max.) 40° and 15 mm. contains approx. as much insulin as the corre-

sponding amt. of fresh material. The material is suitable as a standard for comparing insulin yields in different prepsns.

Ethereal oils of tobacco. A. SCHMUCK. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* 1924, No. 19, 1-16; cf. *C. A.* 19, 1031.—The ethereal oils were sepd. by steam distn. and extd. with ether. No relation was found to exist between the oil content and other org. constituents. The ethereal oils may be characterized by their physico-chem. const., which vary with the varieties of tobacco. In Dewbek (a high-grade cigaret tobacco) the sp. gr. is 0.8411, while in Bakoon (a poor grade of pipe tobacco) it is 1.0306. The sapon. no. of the former is 128.64, of the latter 58.79. From the ethereal oils of Dewbek furfural was isolated. Whether the furfural was present in the plant originally, or was formed in the process of steam distn. could not be detd. The oil was divided into 3 fractions; (1) boiling at 80° comprises $\frac{1}{2}$ of the oil, (2) boiling at 120°, a very small fraction and (3) is the residue, which upon distn. in a vacuum becomes resinous; this fraction crystallizes easily. Various tests with the first fraction indicates that it is an ester of butyl alc. The second fraction behaves like hexyl formate. The third fraction in its reactions resembles diallylcarbinol.

J. S. JOFFE

A study of the resins and aromatic substances of tobacco. A. SCHMUCK. *Inst. of Exptl. Tobacco Culture, Krasnodar (Russia)* 1924, No. 20, 5-13.—Hot benzene exts. from tobacco the resins with some traces of nicotine, leaving behind the carbohydrates, tannins, glucosides. The tobacco is then extd. with petroleum ether, Et_2O and finally with alc. From 100 g. dry tobacco the following amts. were extd.: with benzene 6.87 g., with petroleum ether 0.09 g., with Et_2O 3.65 g., with alc. 22.88 g. The benzene soln. was evapd. on a water bath and the residue was treated with ether; 0.46 g. of the substance did not dissolve. This insol. substance has a pleasant weak aromatic odor, and upon burning forms aromatic products which have an irritating influence on the mucous membranes of the respiratory organs. In H_2O , ether and petroleum ether it is insol.; dissolves with difficulty in hot EtOH and crystallizes upon cooling. It decolorizes Br water, forming a light yellow Br compd., m. 118-120°. The original substance m. 86°. The reaction is neutral; it contains no N or ash. It seems to be an unsatd. compd., $\text{C}_9\text{H}_{16}\text{O}_2$. It is insol. in acids or alkali. The compn. corresponds to the general formula $\text{C}_n\text{H}_{2n-2}\text{O}_2$. The next fraction (II) of the benzene ext., equiv. to 0.41 g., is a free acid, $\text{C}_{24}\text{H}_{40}\text{O}_6$, similar in its properties to kentukilic acid ($\text{C}_{23}\text{H}_{40}\text{O}_6$), isolated by Haid. The next fraction (III) is an acid combined with the ether corresponding to the formula $\text{C}_8\text{H}_{12}\text{O}_2$; then comes (IV) a resin alc. $\text{C}_6\text{H}_{10}\text{O}$ and (V) the phenols. Fractions III, IV and V comprise 5.03 g. of the benzene ext. and may be classed under the name of resin ether. The alc. ext. after distg. the alc. gave a thick mass weighing 22.89 g. An ether ext. of this mass gave a green coloration. The residue was dissolved in H_2O , from which upon standing there sepd. 1.4 g. of a brown cryst. ppt., m. 140°. It is hardly sol. in H_2O , ether, CS_2 , petroleum ether; is sol. in MeOH ; it contains no N and gives no ash; when burning it gives a pleasant smoke. With HCl upon heating it reduces Fehling soln. From its coloration properties it seems to be a glucoside, $\text{C}_{22}\text{H}_{36}\text{O}_{14}$. The petroleum-ether ext. gives 0.0978 g. of a substance without any aromatic odor. The Et_2O ext. gives 3.6561 g. of a substance with a sharp pungent odor resembling that of formic and acetic acid. The substance is volatile and complex in nature; has not been studied.

J. S. JOFFE

The distribution of resins in tobacco. N. A. TRANKVILITSKAYA. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* 1924, No. 20, 14-8.—This is a study of the quant. distribution of the various resin fractions, as outlined by Schmuck (preceding abstr.), in several varieties of tobacco.

J. S. JOFFE

An attempt to determine the character of the carbohydrate complex of tobacco. A. SCHMUCK. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* 1924, No. 20, 19-22.—In the variety of tobacco Dewbek were found no starch, dextrin 1.68%, complex and simple sugars 9.58%, of which 8.35% reduce Fehling soln. The author gives two methods for extg. the sugars and the standard procedure for their detn.

J. S. J.

The content of various forms of carbohydrates in tobacco. V. S. BALABOOCA. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* 1924, No. 20, 23-9.—Detns. were made of cellulose, hemicellulose (especially pentosans) and the carbohydrates sol. in water on 6 varieties of tobacco before and after fermentation. No starch was found. The better varieties of tobacco give a higher carbohydrate content. The cellulose content is about the same in all varieties. The methods of analysis are given.

J. S. J.

The chemical composition of some varieties of Russian tobacco. K. J. KREVS. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia)* 1924, No. 23 1-26.—Analyses are given for hygroscopic moisture, total N, nicotine, NH_3 , protein, glucose, starch and dextrin, total carbohydrates, acetic, oxalic, citric and malic acids, cellulose, pentosans,

resins, gums and fats, N_2O_5 , amido compds., pure ash, SO_3 . In the ash detns. were made of SiO_2 , Cl, SO_3 , P_2O_5 , Fe_2O_3 , MnO , CaO , MgO , K_2O , Na_2O . Also there are given amts. of K_2O , P_2O_5 , CaO , N and Cl taken up by the crop. Results on various soils with and without fertilizers are given in other tables. J. S. J.

The chemical composition of tobacco and methods for its investigation. A. SCHMUCK. *Inst. Exptl. Tobacco Culture, Krasnodar (Russia), Monograph 1924*, 156.—The work reported is a result of many investigations on the compn. of tobacco conducted at the Institute. The scheme followed in the tobacco analyses was as follows:

- | | | |
|---|---|-------------------------------|
| (1) Valuable component fractions | { | Alkaloid group < Nicotine |
| | | Ether alkaloids |
| | { | Etheral oils |
| | | Resins |
| (2) Indifferent fractions | { | Carbohydrates |
| | | Cellulose |
| | | Oxides |
| | | Tannins |
| (3) Fractions influencing tobacco negatively | { | Proteins |
| | | Several non-protein N compds. |
| (4) Substances influencing the burning of tobacco | { | Ash |

The chapter deals with (1) The alkaloid group in tobacco; methods of detg. nicotine; (2) aromatic substances, methods of detg. the etheral oils and resins of tobacco; (3) ash; (4) carbohydrates; (5) acids; method of detg. them; (6) N compds.; methods of detg. them; (7) chem. compn. of tobacco seeds; (8) compn. and investigations of tobacco smoke; (9) the objective classification of tobacco. J. S. JOFFE

Measurement of the effect of insulin. H. LANGECKER AND W. STROSS. *Biochem. Z.* **161**, 295-336 (1925).—The deviation from the av. in the detn. of the blood sugar values of normal rabbits is 11.5 mg. per 100 cc. whereas with rabbits treated with insulin, it is about 20 mg. In addn. there is an individual variation in the response of rabbits to insulin treatment which cannot be standardized. Mice show similar variations. A new unit is proposed, it is obtained by dividing the cramps-producing dose of the standard prepn. by what the dose should be and multiplying by the minimal cramps-producing dose of the unknown solns. for the individual. The conditions for working out the unit are described. It is more const. than the present accepted unit. W. D. L.

Analyses of organotherapeutic powders; their content of total, lipoidic and nucleic phosphorus. M. JAVILLIER, H. ALLAIRE AND MME. HINGLAIS-GROC. *Bull. sci. pharmacol.* **32**, 641-59 (1925).—Total P was detd. by a semi-microchem. method of Hinglais-Groc (thesis) and of Copaux (cf. *C. A.* **16**, 219). Lipoid P was extd. from the tissues by 95% alc., preferably in a Kumagawa app. (Soln. A), and was followed by a short extn. with ether (Soln. B). From Soln. A the alc. was distd. under reduced pressure and the residue was dried by 2 washings with 85% alc. and one washing with abs. alc. The dehydrated residue was taken up with anhyd. Et_2O , which dissolved the lipoidal fraction in part, the remainder being dissolved in anhyd. C_6H_6 (cf. Lemeland, *C. A.* **17**, 2436, 3036). The united Et_2O - C_6H_6 exts. were centrifuged and the clear soln. was decanted into a Kjeldahl flask which contained the residue of Soln. B. The liquid was then evapd. and P was detd. in the residue as under total P. Nucleic P was detd. by the method of Javillier and Allaire (cf. *C. A.* **19**, 3100). Thus detns. were made on 70 samples of tissues from horse, pig, ox, calf and sheep; the results are shown in a 2-page table. The comments and conclusions fill 7 pages. Total P ranged in the dry material from 0.156% in pig thyroid to 2.03% in calf thymus. Lipoid P ranged from 0.101% in sheep thyroid to 1.552% in ox spinal cord. Nucleic P ranged from about 0.01% in pig spinal cord to 1.25% in calf thymus. The ratios of the percentages of these different combinations of P in the various tissues are discussed at much length. Also in *J. pharm. chim.* (8) **1**, 513-25 (1925). L. W. RIGGS

Uranic combinations of hexamethylenetetramine. EUGENE ISNARD. *Bull. sci. pharmacol.* **32**, 659-61 (1925).—An attempt was made to combine $(\text{CH}_2)_6\text{N}_4$ with $\text{UO}_2(\text{NO}_3)_2$ to form a substance having antisiphilitic properties. The result was not altogether successful. L. W. RIGGS

The reputed medicinal properties of precious stones. F. PONDER. *Pharm. J.* **115**, 686-7, 750-1 (1925).—A list is given of rare "stones" of animal, mineral and imaginary origin, with their reputed healing powers. Their failure indirectly contributed to the advance of medicine. S. WALDBOTT

Note on some British Pharm. galenicals. H. COUCH. *Pharm. J.* **115**, 687-9 (1925).—Concise modifications of the official processes are given for the *practical* prepn. in larger quantities of: (1) dil. acids, (2) effervescent prepn.s, (3) *extractum ergotae liquidum*, (4) *ext. nucis vomicae liquidum*, (5) *glycerinum acidi borici*, (6) *syrrupus ferri iodidi*, (7) *syrr. toluanus*. S. WALDBOTT

Cotarnine hydrochloride. D. B. DOTT. *Pharm. J.* **115**, 757(1925); *Chemist & Druggist* **104**, 7-8(1926).—The alkaloid, generally thought anhyd., has the compn. $(C_{12}H_{15}NO_4)_2 \cdot 3H_2O$, proved by the yield of anhyd. HCl-salt after drying below 100° . The HCl-salt has the compn. $(C_{12}H_{13}NO_3 HCl)_2 \cdot 5H_2O$. S. WALDBOTT

Benzylmorphine hydrochloride. D. B. DOTT. *Pharm. J.* **115**, 757-8(1925); *Chemist & Druggist* **104**, 7-8(1926).—This salt when crystd. from H_2O has the compn. $C_{24}H_{27}NO_3 HCl \cdot H_2O$; a slightly higher loss on drying below 100° may be due to adsorbed H_2O , or it may point to the compn. $(C_{24}H_{25}NO_3 HCl) \cdot 4.5H_2O$. Soly. of the salt in H_2O 1:160, in 90% EtOH 1:140 (wt./vol.). S. WALDBOTT

Estimation of cinchona preparations. D. B. DOTT. *Pharm. J.* **115**, 758(1925); *Chemist & Druggist* **104**, 8(1926).—Extg. the alkaloids with a mixt. of C_6H_6 and Et_2O (3:2) yields a residue of lighter color than that obtained by the official method, with AmOH; the neutralizing values are the same in both cases. S. WALDBOTT

Red quebracho bark. E. M. HOLMES. *Pharm. J.* **116**, 4(1926).—A recent com. lot of "quebracho blanco" bark differed from the true *Aspidosperma quebracho-blanco*, Schlecht. mainly by having a bright red inner bark; it probably belongs to *A. quebracho-colorado*, Schlecht. As the true bark is used in dyspnea, a physiol. study of the new bark is desirable for comparison. Com. "red quebracho bark," used for prepg. tanning exts., belongs to an entirely different natural order, Anacardiaceae. S. WALDBOTT

Quebracho bark. G. R. A. SHORT. *Pharm. J.* **116**, 103-4(1926).—A recent com. sample had all the characters of that described by Holmes (cf. preceding abstr.). Both, however, must be referred to *Quebrachia lorentzii*, Griseb. (Anacardiaceae), on account of the identity of structure, and the known variation in the color of the bark of this tree; pieces of pink color may be found both among the com. and some authentic specimens. The naming of the species *Aspidosperma quebracho-colorado* by Schlechtendal (1861) was based on error. S. WALDBOTT

Further note on tinctura cardamomi composita, Brit. Pharm. 1914. J. GREEN-HALGH. *Pharm. J.* **116**, 4-5(1926); cf. *C. A.* **17**, 3749.—A sample made by the B. P. method (A), contained about 25% of a flaky ppt. on 2 days' standing in hot weather, while a sample made by the suggested method (B), gave only 8%. After filtering and setting aside for 6 months, B remained brilliant and without pptn.; A was cloudy. Exposure to frost increased pptn. in A, but left B entirely clear. The B. P. formula for A should be discontinued. S. WALDBOTT

Dispensing note: Bismuth subnitrate. W. S. STANNARD. *Pharm. J.* **116**, 33-4; W. S. GLASS. *Ibid* **96**(1926); cf. *C. A.* **17**, 2171.—Of 9 exptl. mixts. made to find the best method of suspending $BiONO_3$ (A), the mixts. A + glycerol + H_2O , and A + sirup + H_2O (both 1:4:32) showed ready diffusion and slow pptn. of A; in the mixt. A + H_2O (1:32), A ppts. more readily; in the mixt. A + compd. infusion of gentian (1:32), A readily diffuses and ppts. very slowly. If a suspending agent is ordered, use A + compd. powd. tragacanth + H_2O (1:0.5:32); the tendency of the ppt. to clot is not serious within 3 or 4 days. The suspending properties of the mixt. A + mucilage of starch + $CHCl_3 \cdot H_2O$ (1:8:32) gradually disappear completely; A then ppts. as if in H_2O . S. WALDBOTT

Some new, modified and tested formulas of the Brit. Pharm. Codex. F. BROWNE AND DOROTHY G. RANDLE. *Pharm. J.* **116**, 57-61, 65; *Chemist & Druggist* **104**, 81-5 (1926).—An exptl. reply to criticism on 34 prepn.s of the B. P. Codex, 1923. No change is needed in 13 formulas; improved methods for the others are suggested. To obtain the pearly aspect of *Pasta hamamelidis*, use Poucher's formula for the soap (*C. A.* **19**, 1753) and a temp. not above 80° . Evap. *Parogenum spissum* to 17 instead of 18 ounces for better hardness. To avoid pptn. in *Syr. glycerophos. comp.*, add citric acid in given proportion; the temp. should not exceed 40° . *Spir. sapon. kalini*, made from soft soap, is equally as detergent as that from linseed oil soap of the B. P. C. *Ung. oleoresinae capsici comp.* is too strong and requires a 1:8 diln. with soft paraffin to render it tolerable on the skin. To prevent rubbery consistency of *Ung. resorcini et bismuth. comp.* reduce its starch content to half. In *Ung. iodi denigrescens*, "vaseline" may be replaced by using the formula of Mackie and Sharman (*C. A.* **18**, 3253). For rapid prepn., heat to 50° for 1 hr. in a closed vessel. To assay the ointment for I, strongly ignite 2 g. in excess of Na_2CO_3 , and titrate the aq. soln. with $AgNO_3$ and NH_4CNS . In examg. elixirs, the *soly. of sugar in glycerol* was found to be 7:100 at 20° . S. WALDBOTT

Influence of homogeneous neutral and of neutral zinc glass on the preservation of sterilized preparations (BARO) 19. Organo-mercury compounds (Brit. pat. 236,538) 10. Organo-arsenic compounds (Brit. pat. 235,864) 10. Filtering hydrocarbon lubricating oils [for medicinal use] (U. S. pat. 1,570,890) 22.

BENTLEY, A. Q. and DRIVER, J. E.. A Textbook of Pharmaceutical Chemistry. London: Oxford University Press 456 pp. 18s.

EVERS, NORMAN. The Chemistry of Drugs. New York: D. Van Nostrand Co. London: E. Benn, Ltd. 247 pp. \$9 00 (32s. 6d.) Reviewed in *Am. J. Pharm.* 98, 71(1926).

The Chemist and Druggist Diary, 1926. London: The Chemist and Druggist. 460 pp. Reviewed in *Pharm. J.* 116, 38(1926).

Formaldehyde. K KAISER. Brit. 236,086, Oct. 17, 1924. In oxidizing CH_4 to CH_2O , a catalyst is used which may be prepd. by impregnating pumice or similar inert carrier with a soln. of Cu, Fe, Mn or Cr sulfate and heating with a soln. of Na_2CO_3 or NaOH. A nitrate also may be used and converted into oxide for catalytic use. Ppdt. products also may be formed from colloidal oxides, for use as catalysts.

C,C-Disubstituted barbituric acids. J D. RIEDEL AKT.-Ges. Brit. 236,146, June 28, 1924. The process of Brit. 223,221 (C. A. 19, 1179) is modified by the introduction of the β -chloroallyl instead of the β -bromoallyl group. β -Monochloroallyl-isopropylbarbituric acid is made by heating a soln. of isopropylbarbituric acid in NaOH with 1,2-dichloro-2,3-propylene or by treating the Na salt of isopropylbarbituric acid with 1-bromo-2-chloro-2,3-propylene.

Organic arsenic compounds. CHEMISCHE FABRIK AUF AKTIEN FORM. F. SCHERING. Brit. 236,563, July 2, 1924. An alkali soln. of *p*-hydroxy-*m*-aminobenzenearsonic acid is treated with phosgene (preferably in the presence of NaOAc), at a temp. of 50° ; on acidification, the symmetrical urea of *p*-hydroxy-*m*-aminobenzenearsonic acid is obtained. By reacting upon *p*-hydroxy-*m*-aminobenzenearsonic acid with *m*-nitrobenzoyl chloride, *m*-(*m*-nitrobenzoylamino)-*p*-hydroxybenzenearsonic acid is obtained, which yields the corresponding amino compd. on reduction with ferrous salt; treatment with phosgene produces the symmetrical urea of *m*-(*m*-aminobenzoylamino)-*p*-hydroxybenzenearsonic acid. *p*-Hydroxy-*m*-aminobenzenearsonic acid is first treated with *m*-nitro-*p*-tolyl chloride and reduced and the product is further treated with *m*-nitrobenzoyl chloride. On reacting on the resulting compd. with phosgene there is formed the symmetrical urea of *m*-(*m*-aminobenzoyl-*m*-amino-*p*-tolylamino)-*p*-hydroxybenzenearsonic acid. These compds. are therapeutic.

Immunizing substances from blood serum. ELECTRO-OSMOSE AKT.-GES. (Graf Schwerin Ges.). Brit. 236,535, July 1, 1924. Blood serum or a pathol. effusion from a tuberculous or otherwise diseased or convalescent patient is subjected to the action of a continuous elec. current in a 3-cell electroosmotic app. to ppt. eglobulin and antigens and leave a clear soln. from which substances which carry pseudoglobulin may be salted out with MgSO_4 or $(\text{NH}_4)_2\text{SO}_4$, dissolved in H_2O , purified by further electroosmotic treatment, evapd. *in vacuo* and dissolved in salt soln. for therapeutic use. Ascitic fluid from a tuberculous patient may be treated by this process.

Extracting henna. COTY SOC. ANON. Brit. 236,557, July 2, 1924. Coloring matter is extd. from henna leaves by treating the crushed leaves with a warm or cold aq. soln. of an alk. earth salt (e. g., Ca and Mg salts from the Solvay ammonia-soda process). The aq. soln. is acidified with HCl, filtered and extd. with an immiscible solvent such as gasoline or C_2HCl_3 . The soln. in the volatile solvent thus obtained is further extd. with an aq. soln. of an alk. earth salt, the coloring matter is pptd. with acid, filtered off and dried. An app. is described.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

The gypsum-sulfuric acid process. W. J. MÜLLER. *Umschau* 30, 28-30(1926).—A description with flow sheet of the plant of the Farbwerke vormals Friedrich Bayer and Co. in Leverkusen, for the manuf. of H_2SO_4 and cement from gypsum. J. H. P.

Nitric acid production by the submerged Brunler flame. OSCAR BRUNLER. *Chem. Age* (London) 14, 29(1926).—The internal-combustion boiler with submerged flame (C. A. 19, 1211) has been applied to the evapn. and concn. of chem. liquors. Expts.

have been made to det. if it is possible to manuf. $\text{Ca}(\text{NO}_3)_2$ and if so whether the cost is less than that by the present processes. In preliminary expts. 19.05 kg. HNO_3 per hr. was obtained from 60 kg. oil and 290 cu. m. air. The HNO_3 yields increase with increasing boiler pressure; hence com. installations must be designed for high pressures. At a boiler pressure of 56 lbs. per sq. in. 4% of the wt. of the combustible mixt. supplied to the boiler is converted to HNO_3 . At 200 lbs. per sq. in., approx. 8830 kg. of gas and air will produce 441 kg. HNO_3 . In addition to this HNO_3 there is also produced utilizable power, estd. at 2090 h. p. per 1000 cu. m. gas. It is concluded that $\text{Ca}(\text{NO}_3)_2$ can be produced very economically as a by-product by burning a flame submerged in lime water.

J. H. PERRY

Determination of strength of liquid hydrocyanic acid by specific gravity. MARK WALKER AND C. J. MARVIN. *Ind. Eng. Chem.* 18, 139-42(1926).—A sp. gr.-temp. table has been worked out by means of which the HCN content of a $\text{HCN-H}_2\text{O}$ mixt. contg. over 80% HCN can be detd. with an accuracy of $\pm 0.1\%$, given the sp. gr. and temp. of the mixt.

F. C. Z.

Calcium cyanide—"powdered hydrocyanic acid." A new product of manufacture. F. J. METZGER. *Ind. Eng. Chem.* 18, 161-3(1926).—A new compd., $\text{Ca}(\text{CN})_2 \cdot 2\text{HCN}$ or $\text{CaH}_2(\text{CN})_4$, is made by treating CaC_2 with HCN, C_2H_2 being evolved. This Ca cyanide contains about 55% CN and is useful as a fumigant. It is safer to handle, more stable and possesses a wider margin of safety in application than liquid HCN.

F. C. Z.

Note on "influence of reaction rate on operating conditions in sulfuric acid manufacture." W. K. LEWIS AND E. D. RIES. *Ind. Eng. Chem.* 18, 213(1926).—The explanation of the use of the equations in a former article (*C. A.* 19, 2111) is amplified.

F. C. Z.

Investigation of processes for the catalytic oxidation of ammonia under conditions used in practice. V. I. MALIAREVSKII AND N. A. MALIAREVSKA. *Z. angew. Chem.* 38, 1113-8(1925).—The air was preheated to 150-330° before mixing with the NH_3 . The Pt wire gauze was 1000 mesh per sq. cm., of 0.09 mm. wire. This gauze, in 2 to 4 layers, was placed flat over the cross-section of the 300-mm. diam. converter. Under otherwise identical conditions, the contact temp. is proportional to the NH_3 concn. of the entering gas mixt. (These temps. were not true gauze temps.) In practice, variations from this proportionality are due to the higher temps. used and the correspondingly higher radiation losses. The essential factors which influence the oxidation of NH_3 are contact temp., gas velocity, thickness of the contact layer. The % yield of NO as a function of the contact temp. has been detd. for 2, 3 and 4 layers of Pt gauze under the following conditions: gas velocity, 20-50 m./min.; contact temps., 375-750°; NH_3 concn. of entering gas, 3.3 to 12.0%. With the 3-gauze catalyst the optimum NO yield (92%) was obtained with a gas velocity of 40 m./min., giving a time of contact with the catalyst of 0.00034 sec.; NH_3 concn., 8.7%; and a temp. of 620°. With the 2-gauze catalyst, the optimum NO yield was reached at a considerably lower gas velocity, i. e., 20 m./min. With a 4-gauze catalyst, the max. NO yield (90.8%) was obtained with a gas velocity of 50 m./min.; 9.2% NH_3 gas mixt.; and at 666°.

J. H. PERRY

Potash in 1924. G. R. MANSFIELD AND LEONA BOARDMAN. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1924, Part II, 27-61(preprint No. 6, published Oct. 24, 1925).

E. H.

Phosphate rock in 1924. G. R. MANSFIELD. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1924, Part II, 77-112(preprint No. 8, published Nov. 7, 1925).

E. H.

Fluorspar and cryolite in 1924. H. W. DAVIS. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1924, Part II, 63-76(preprint No. 7, published Oct. 21, 1925).

E. H.

Magnesium and its compounds in 1924. J. M. HILL AND G. F. LOUGHLIN. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1924, Part II, 125-40(preprint No. 11, published Nov. 5, 1925).

E. H.

Arsenic in 1924. V. C. HEIKES AND G. F. LOUGHLIN. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1924, Part I, 35-43(preprint No. 6, published Oct. 17, 1925).

E. H.

Hydrogen for hydrogenation of oils. A. E. KNOWLES. *Chem. Age* (London) 14, 26-8(1926).—K. briefly traces the methods of prep. H_2 for oil hydrogenation, and concludes that pure electrolytic H_2 should always be used. Its cost is detd. by: (1) the price of electricity, and (2) the value of the by-product O_2 . An installation should be planned after the lowest combination of cost of electricity and interest and depreciation on capital cost of the plant has been detd.

W. H. BOYNTON

Carbon black produced from natural gas in 1924. G. B. RICHARDSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1924*, Part II, 121-3 (preprint No. 10, published Nov. 2, 1925). E. H.

Feldspar in 1924. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1924*, Part II, 19-25 (preprint No. 5, published Oct. 13, 1925). E. H.

Slate in 1924. G. F. LOUGHLIN AND A. T. COONS. U. S. Geol. Survey, *Mineral Resources of U. S., 1924*, Part II, 151-60 (preprint No. 13, published Dec. 16, 1925). E. H.

Graphite in 1924. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1924*, Part II, 13-7 (preprint No. 4, published Oct. 8, 1925). E. H.

Casein and its industrial applications. F. C. C. LYNCH. *Can. Chem. Met.* **9**, 264 (1925); **10**, 13-6 (1926); cf. *C. A.* **19**, 3568.—A short survey is given of the use of casein in the following fields and industries: medicinal foods, medicines, textiles, soap, asbestos products, insecticides and fungicides, photography. Reference is made to sundry uses of casein. A few figures on the production and use of casein in the U. S. A. are tabulated. The casein industry in Argentine, France, Germany, England, Denmark and other European countries, New Zealand, Australia and Japan are very briefly dealt with. E. G. R. ARDAGH

Carbonizing bones. GG. ILLERT. *Chem.-Ztg.* **49**, 881 (1925).—Bones freed from fat by extn with suitable solvents are ground, carbonized in air-tight vertical retorts at about 700°, cooled in suitable coolers, and then discharged into cars or upon conveyors. In the Otto Ruf (Munich) system described, evolved gases are passed through condensers for collecting NH_3 , and small quantities of bone oil are recovered also. The bone black is recovered cold, an advantage over the practice of discharging it into the air while red-hot. W. C. EBAUGH

The adsorption of gases by wood charcoal (HENGLEIN, GRZENKOWSKI) **2**. The production of H by microorganisms (THAYSEN) **16**.

Hydrocyanic acid. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Brit. 235,181, June 3, 1924. HCN is made by treating, in an elec. arc furnace of the "blown arc" type (preferably of the Birkeland-Eyde kind), a mixt. of N, H and a hydrocarbon under such conditions that the gases, after leaving the arc, have a temp. not above 600° and do not come in contact with walls of a temp. above 400°. The metal walls of the app. may be cooled and the cooling utilized for steam generation.

Hydrochloric acid free from arsenic. E. SCHMIDT. U. S. 1,571,648, Feb. 2. Activated charcoal is used for removing As and Fe from HCl solns.

Ammonia oxidation. I. W. CEDERBERG. Brit. 236,145, June 24, 1924. NH_3 -O mixts. for producing N oxides (or other gaseous mixts. for catalytic reactions) are forced through a small clearance space (about 1 mm.) between a catalyst and the wall of the reaction vessel.

Ammonium chloride. T. B. SMITH and SIMON-CARVES, LTD. Brit. 234,933, March 14, 1924. White "com'l." pure NH_4Cl crystals are obtained from crude NH_4Cl liquor by repeatedly circulating it over steam pipes until it is sufficiently concd. and then passing it to cooling and crystg. tanks.

Ammonium chloride and sodium sulfate. CONTINENTALE AKT.-GES. FÜR CHEMIE. Brit. 235,552, June 11, 1924. A solid mixt. of $(\text{NH}_4)_2\text{SO}_4$ and NaCl or KCl is heated in a stream of oxidizing gas, such as O, Cl or Cl peroxide, or with a peroxide, nitrate, chlorate, persulfate or hypochlorite. Pure white sublimed NH_4Cl and calcined Na_2SO_4 are obtained.

Ammonium sulfate. CHEMICAL ENGINEERING & WILTON'S PATENT FURNACE CO., LTD., T. O. WILTON and N. WILTON. Brit. 235,613, Feb. 20, 1924. $(\text{NH}_4)_2\text{SO}_4$ is fed onto a conveyor which carries it while it is being dried and neutralized by NH_3 or otherwise. The material passes successively through chambers in which it is neutralized, freed from excess moisture and delivered to a final drier. Many details of app. are described.

Sodium chloride. SALZBERGWERK NEUSTASSFURT and F. GROTOGINO. Brit. 235,020, July 3, 1924. NaCl is recovered by recrystg. rock salt from soln. by addn. of AlCl_3 , ZnCl_2 or KCl, alone or mixed, or mixts. of these salts with CaCl_2 or MgCl_2 .

Fluorides, etc. M. BUCINER. Brit. 235,588, June 14, 1924. A fluoride, e. g., NaF, is treated with CaCO_3 or other carbonate or hydroxide of a metal forming an insol. fluoride. Reaction is effected with heat and pressure and in the presence of a small

quantity of H_2O . The presence of CO_2 (which may be produced from added NaHCO_3) is advantageous in effecting the reaction between NaF and CaCO_3 .

Reducing phosphates, etc. H. MEHNER. Brit. 235,924, Jan. 1, 1924. Phosphates, silicates and other compds. reduced by C at high temps. are decomposed by heating them with C in the absence of air, with or without addn. of reagents such as SiO_2 or Fe, and the combustible volatile reaction products are burned in the reaction zone to supply sufficient heat to maintain the required temp. during the reaction and while a new charge is being introduced. Low-grade phosphate, leucite or feldspar, greensand, clay and other similar materials may be thus decomposed.

Borax from saline liquors. A. W. GAUGER and H. H. STORCH. U. S. 1,571,002, Jan. 26. Other salts which are present with borax in soln. are crystd. and the mother liquor is chilled and agitated after sepn., in contact with a finely divided material such as added borax to cause rapid crystn. of borax.

Removing silica from ore leaches. M. HOSENFELD. U. S. 1,571,054, Jan. 26. A powd. insol. substance such as barite 0.5% at a temp. of 70° is mixed with the jelly setting from an ore leach, H_2O is removed, and the resulting product is pulverized, to obtain a material adapted for fertilizer manuf.

Apparatus for drying and calcining gypsum. C. DRESSLER. U. S. 1,571,189, Feb. 2.

Lead salts. CONSORTIUM FÜR NASSMETALLURGIE. Brit. 236,440, Nov. 14, 1924. Pb ores, slags, sludges and similar materials are rendered acid with HCl , if necessary, and treated with a strong soln. of an alkali or alk. earth metal chloride to obtain a soln. of the Pb. The soln. is purified from Fe by pptn. after oxidation with air, Cl, Br, chlorates or nitrates; and Ag and like metals may be removed by use of granulated or spongy Pb. The purified soln. is then treated with a dichromate, arsenate, antimonate, molybdate, tungstate or uranate to obtain the corresponding Pb salt.

Lead oxides. G. SHIMADZU. Brit. 236,368, June 26, 1924. Pb suboxide mixed with some metallic Pb is produced by treating pieces of Pb in a rotating drum with air or other oxidizing gas. The product is very light and is readily converted into PbO by heating it locally to initiate the reaction. H_2O reacts with it to produce PbO and Pb hydroxide and the PbO may be converted into Pb_3O_4 by heating at temps. not exceeding 500° .

Zinc oxide. NEW JERSEY ZINC CO. Brit. 235,844, June 17, 1924. In ZnO manuf. by the retort volatilizing process, SO_2 is associated with the fume produced by oxidation of the Zn vapors, to form white compds. with impurities such as Pb and Cd in the fume. H_2SO_4 mist also may be used. An app. is described.

Iron oxide, etc. W. S. MILLAR. Brit. 236,256, March 7, 1924. Ores such as Fe pyrites or pyrrhotite are desulfurized by treatment with SO_2 at a gradually increasing temp. which, however, does not exceed 950° , thus forming Fe_3O_4 and free S. The porous Fe_3O_4 thus formed may be further subjected to electromagnetic concn. and the S is recovered in condensing chambers. Steam facilitates the desulfurization.

Hafnium and zirconium compounds. NAAMLOOZE VENNOOTSCHAP 'PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 235,217, June 6, 1924. A mixt. of Hf and Zr salts contg. 2 or more of the phosphates, phosphites, arsenates, arsenites, antimonates or antimonites of these metals is dissolved in a medium contg. free oxalic acid, concd. H_2SO_4 or H_3PO_4 , and the Hf may be sepd. from the Zr by fractional pptn. which may be induced by dilution, heating, addn. of alc. or of HCl or an alkali. Alternatively, the original salt mixt., in suspension, may be treated to effect fractional soln., e. g., by treatment with H_3PO_4 of 1.75 sp. gr., the filtrate after each addn. of H_3PO_4 being pptd. with soda.

Krypton and xenon. SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCEDES G. CLAUDE. Brit. 236,217, June 25, 1924. Kr and Xe are sepd. in an air liquefaction app. in which the richest liquid O is treated in a single receptacle arranged in the vaporizer and constructed so that progressive evapn. of the liquid takes place in its passage and a final small fraction is obtained for the subsequent extn. of the Kr and Xe.

Carbon disulfide. CHEMISCHE FABRIK GRIESHEIM ELEKTRON. Brit. 236,577, July 3, 1924. Carbonaceous material is heated to a glowing temp. (preferably in a sep. elec. furnace placed above the CS_2 -forming furnace) to degasify it before it is fed, with exclusion of air, to the CS_2 furnace. The CS_2 vapors produced do not pass through the preliminary degasifying furnace.

Recovery of filtration material. H. S. THATCHER. U. S. 1,571,074, Jan. 26. Material such as diatomaceous earth which has been used in the filtration of sugar solns. is dried in the form of filter-cake, finely divided and calcined at a temp. sufficiently high to remove part of the inorg. impurities. A temp. of about 1000° is suitable for calcination of diatomaceous earth.

Recovery of diatomaceous earth used for filtrations. P. A. BÖCK. U. S. 1,571,042, Jan. 26. After its use in purifying sugar solns. or other liquids, diatomaceous earth, with its associated impurities, is dried and heated to increase its filtration efficiency without removal of any substantial quantity of chem. combined H_2O .

Testing adsorbents for purifying liquids. F. G. P. REMFRY and A. E. DUNSTAN. Brit. 236,263, March 29, 1924. A mineral adsorbent such as bauxite is tested with respect to the amt. of heat given off when a sample of the material, immediately after roasting or ignition and without exposure to the atm., is moistened with oil or other liquid to be purified, and this test is taken as indicating the efficiency of the material for the purification of the oil or other liquid used in the test. The test may also serve to indicate the most suitable temps. for the roasting.

Stencil sheets. GREIFWERKE VORM. DEUTSCHE BÜROBEDARFS-GES. BRUER & CO. Brit. 235,516, June 10, 1924. A coating compn. for Japanese paper, etc., comprises a casein soln. emulsified with oils and fats, e. g., 1 kg. each of olive oil and a 10% alk. soln. of casein, 0.8 kg. of fixed white or $BaSO_4$ and sufficient H_2O to make a total of 3.5 kg.

Photomechanical printing surfaces. SACHSISCHES SERUMWERK AKT.-GES. AND A. GALETZKA. Brit. 236,532, July 1, 1924. An intermediate non-sensitive layer such as gelatin is interposed between a sensitive layer such as dichromated gelatin and the glass, stone, metal or other support, and is preferably coated with a thin coating of gelatin, waterglass and chrome alum. The H_2O during development penetrates through the unexposed parts and swells the intermediate layer, raising the exposed parts evenly.

Colloids for photomechanical printing plates. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 236,508, July 1, 1924. A gelatin layer having a m. p. of about 50° and dried at about 45° , when treated with washing H_2O at 30° , gives a pronounced grain, and, with H_2O at 25° , a fine grain.

Rubber printers' blankets. L. PEPE and D. DENAGY. Brit. 236,506, April 4, 1924. To protect fine-grained printing plates from the deleterious action of the S in rubber offset blankets they are coated with a compn. formed by dissolving casein in an alk. soln., pptg. with oxyglutaric acid, washing the ppt. and dissolving it with glutamic acid and dil. NH_3 soln. and mixing it with a soln. of liquefied gluten or serecin and with formaldehyde and propenyl alc.

Packing material. M. P. EBBESEN. U. S. 1,570,953, Jan. 26. A plastic, non-resilient packing adapted for use in pipe joints comprises soap, waterglass, starch, alkali carbonate, sugar, graphite and chalk. Cf. C. A. 19, 1477.

Friction lining material. N. KÜCHEN. Brit. 235,473, Dec. 8, 1924. A friction lining for brake shoes or the like comprises an alloy of Cu 58-64, Zn 32-38, Mn 0.5-2.5, Fe 0.5-2 and Al 0.01-2%.

Mixture for cleaning glass, etc. M. M. H. CUDWORTH. Brit. 236,436, Nov. 19, 1924. $KMnO_4$, guaiacum resin and borax $\frac{1}{4}$ oz. each, NaCl, alum, soda and H_3BO_3 $\frac{1}{2}$ oz. each, French chalk 1 oz., starch 2 oz., H_2O 5, vinegar $3\frac{1}{2}$, glycerol 1, turpentine 1 and "methylated spirit" $1\frac{1}{2}$ tablespoonfuls are used together.

Polish for brass, silver, etc. J. P. WILLIS. Brit. 235,986, April 8, 1924. Whiting $1\frac{1}{4}$, powd. "bathbrick" 1, venetian red $\frac{1}{4}$ and paraffin oil $3\frac{1}{2}$ oz.

Cooling internal-combustion engines. H. C. HAAK. U. S. 1,565,323, Dec. 15. A mixt. of CCl_4 5-15% with kerosene and lubricating oil or other mineral oil of high b. p. is used in the cooling system.

Wear-resisting surfaces of strawboard, etc. E. GANZ. Brit. 235,757, Sept. 19, 1924. Benches of strawboard for cutting up meat, leather, etc., are treated with rubber dissolved in linseed oil or with a chrome-treated glue soln. to render their surfaces resistant to wear.

Treating wood for use in boots and shoes. R. C. HAUSSLER. Brit. 236,429, Jan. 29, 1925. 3-Ply sheets are formed from Finnish birch or other wood low in acid. Before being glued together the sheets are treated with hot glycerol contg. $PhOH$ to soften the wood and render it antiseptic. The 3-ply product, after cutting to shape, may be exposed to formaldehyde vapor.

Inflating small balloons by chemically reactive substances. G. SCHÜTZLER. Brit. 236,505, March 21, 1925. Substances such as $NaHCO_3$ and tartaric acid are sepd. by a partition of paraffin or other readily frangible material, within a gas-tight envelope, such as that of a toy balloon so that the latter is inflated by the gas evolved when the partition is broken.

Apparatus for drying casein curd. E. FOSTER. U. S. 1,571,518, Feb. 2.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND METALS

G. E. BARTON, C. H. KERR

The physical properties of glass in relation to its composition. I. The electrical conductivity of glasses. G. GEHLHOFF AND M. THOMAS. *Z. tech. Physik* 6, 544-54 (1925).—In the majority of glasses there is some relation between the cond., the viscosity and the tendency to corrosion by chemicals. The degree of dissoen. decreases with increasing temp. Data and curves show the effect, on the cond. and the viscosity of a series of glasses, of the presence and amount of CaO, BaO, B₂O₃, Fe₂O₃, PbO, MgO, ZnO, SiO₂, Al₂O₃, K₂O and Na₂O. J. H. P.

Some factors involved in the preheating of glass pots with special reference to moisture control. W. W. OAKLEY. *J. Am. Ceram. Soc.* 9, 23-8 (1926).—"Heating in a humid atm. tends to equalize the rate of removal of moisture from the inside and the outside surface of the pot, at temps. above 212°, decreasing mech. strains set up" in the drying process. C. H. KERR

Antique glasses: their composition and coloring. BERNHARD NEUMANN. Analyses by GERTRUD KOTYGA. *Z. angew. Chem.* 38, 776-80, 857-64 (1925).—The necessity for lime in glass was not recognized until the 17th or 18th century apparently, it having previously been present through impure materials. In addition to 4 analyses of Old Egyptian glass and 29 of Roman glass found in the literature the authors have obtained 38 glasses which date from 1400 B. C. to 600 A. D., and publish the analyses of the same with comments. The color scale of the ancients comprised blue (from bright aquamarine to deep dark indigo), green (to a black green), rose, violet (to black), yellow (honey color, orange color to brown), red (sealing-wax color), white (transparent and opaque). These colors are had either with or without clouding. The coloring media were Cu, Pb, Sn, Mn and Fe oxides. Opaqueness is due either to insufficient melting or an excess of oxide. G. E. BARTON

The influence of homogeneous neutral and of neutral zinc glass on the preservation of sterilized preparations. A reagent for the identification of suitable glass. E. BARO. *Boll. chim. farm.* 64, 673-7 (1925).—Inhomogeneous glasses contg. ZnO are attacked by water at 134°. Phenolphthalein is not suitable for the detection of decompn. in these glasses. A reliable reagent was found in a freshly prepd. 0.1% alc. hematoxylin soln. which indicates 0.0005 N NaOH by a purplish rose color appearing within 2 hrs. The color varies with the nature and concn. of the bases from purple to azure for BaO, CaO, ZnO, Al₂O₃ and their mixts., and persists 48 hrs. Glass for ampules should give a negative hematoxylin test within 24 hrs. after 1 hr.'s heating with distd. water at 2 atm. MARY JACOBSEN

Clay in 1924. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S. 1924*, Part II, 113-20 (preprint No. 9, published Oct. 31, 1925). E. H.

Mineralogy of clay. I. The mineral constituents of clay. II. Rational analysis of clay. J. S. McDOWELL. *J. Am. Ceram. Soc.* 9, 55-65 (1926).—A review of literature and short bibliographies. The methods of detg. rational analysis are shown to be inaccurate. C. H. KERR

A deformation study of various aluminosilicates and borosilicates. KAI-CHING LU. *J. Am. Ceram. Soc.* 9, 29-54 (1926).—Five ternary "deformation eutectics" were found: PbO : 0.254 Al₂O₃ : 1.91 SiO₂; ZnO : 0.225 Al₂O₃ : 0.906 SiO₂; PbO : 0.238 B₂O₃ : 0.78 SiO₂; Na₂O : 1.29 B₂O₃ : 1.73 SiO₂; K₂O : 2.11 B₂O₃ : 2.585 SiO₂. The approx. deformation temps. were 650°, 1360°, 415°, 570° and 655°, resp. All eutectics developed are within the 2½ mol. % limit. Combinations of eutectics were also made but no further lowering of temp. was noted. Complete data and diagrams are given. C. H. KERR

United States Government master specifications for plastic fire-clay refractories. ANON. Bur. Standards, *Circ. No. 297*, 5 pp. (1925). E. H.

An eighteen months' high-temperature test on refractory test specimens. F. H. RIDDLE AND A. B. PECK. *J. Am. Ceram. Soc.* 9, 1-22 (1926).—The effects are noted of an 18 months' run in a continuous kiln at cones 17 to 18. SiC, under oxidizing conditions, oxidizes to cristobalite, with great expansion, at temps. as low as 600°. At high temps. the expansion is not so great but volatilization is great. Spark plug bodies were almost unchanged up to 1200°. Above 1200° the size of the mullite crystals increased slightly. Pyrometer tubes showed much greater increase in size of crystals and a tendency to blister and craze. A mortar of SiC used with SiC refractories showed swelling and good filling of the joints. SiO₂ glass, found in the water-smoking zone, was probably derived

from volatilization of SiC and SiO₂ brick in the hot zone with pptn. of SiO₂ glass when the SiO₂ gases came into contact with steam. Crystals of a mixt. of Fe₃O₄ and Fe₂O₃ were found in the cooling zone, indicating a possibility that the dissociation temp. of Fe₂O₃ is lower than previously supposed. C. H. KERR

Refractories for the open-hearth. I. S. LONGENECKER. *Iron Age* 116, 1735-8 (1925).—Conclusions drawn from a study of failure of magnesite brick are that: too soft burning causes failure; the kiln burning temp. is all-important; the modulus of rupture is the best means for the consumer to gage the "burn"; and the brick is greatly weakened by the use of a lumpy nonuniformly ground mix. Tentative specifications are given. The chem. analysis specified is: MgO, over 82%; CaO, under 5%; SiO₂, under 7%; Fe₂O₃, under 8%; Al₂O₃, under 3% and Fe₂O₃ + Al₂O₃, under 9%. W. H. BOYNTON

Theory of coal measure fire clays (LOVEJOY) 8. Water filtration and softening as applied to clay-products plants (MARSH, McLELLAND) 14.

Glass. A. H. COMPTON. U. S. 1,570,876, Jan. 26. Glass resistant to chem. action of vapors of metals of the Na group comprises B₂O₃, basic oxides including at least one of the alkali metal oxides and at least one of the oxides of Ca, Ba, Sr or Mg, and Al₂O₃, *e. g.*, Na₂O 13, Al₂O₃ 15, CaO 12 and B₂O₃ 60%.

Kiln and heating system for annealing glassware. V. MULHOLLAND. U. S. 1,571,137, Jan. 26.

Annealing and cooling sheet glass by gas currents. F. L. BISHOP. U. S. 1,570,822, Jan. 26.

Temperature and humidity regulation in drying bricks, pottery or other refractory ware. W. E. WILSON and H. G. LYKKEN. U. S. 1,570,659, Jan. 26.

Kiln for pottery, etc. H. T. PADELT. Brit. 235,459, Nov. 13, 1924.

Tunnel kiln with preliminary heating, burning and cooling zones. N. LENGERSDORFF. Brit. 236,229, Feb. 26, 1923.

Kiln adapted for burning ceramic ware. N. LENGERSDORFF. U. S. 1,571,058 Jan. 26.

Refractory articles from clay. B. BELL. Brit. 236,063, Aug. 13, 1924. Cores for Hg cut-outs or other refractory hard articles for elec. or other purposes are made from purified clay contg. 50% or more of SiO₂. Details of firing temps., etc., are given.

Steel and slag for making refractory articles. F. A. DESILVA. Brit. 236,255, March 6, 1924. In the direct treatment of Fe sand or titaniferous Fe ore in an elec. furnace, there is produced a high-grade steel of low C content and a highly refractory slag which may be run into molds and cast into bricks, tiles, crucibles, furnace linings, etc. Numerous details of procedure are given.

Refractory furnace linings. E. HOLLEY. Brit. 235,505, Jan. 10, 1925. A wash for repairing furnace linings is formed of fireclay or similar material 25, H₂O 70% and 5% of "C grade" Na silicate which may have the compn. 5(Na₂O).11(SiO₂).46(H₂O).

Hollow ware from refractory substances. C. C. SCHNUR. U. S. 1,571,607, Feb. 2. In working refractory material such as SiO₂ a tubular billet of the material is formed by fusion with an elec. arc, the arc is then extinguished and the material is drawn into elongated form, *e. g.*, tubing.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Ready means of estimating quantities of cement materials. F. E. GLASS. *Eng. News-Record* 95, 965-6(1925).—The method of estg. is based on the assumption that cements, coarse and fine aggregate, all weigh approx. 100 lbs. per cu. ft. and that the av. wt. of plain concrete is 145 lbs. per cu ft. The method provides means of detg. the approx. wt. of materials required for the odd proportions encountered when the mix is controlled by screening tests and fineness modulus. Accuracy is equiv. to that of methods used heretofore. R. E. THOMPSON

Influence of sugar on the properties of cement. ANON. *Sucr. belge* 44, 612 (1925).—Reference is made to expts. on the effect of sugar in the water used in cement mixing on the setting and hardening of cement. It was found that the resistance to compression of cement blocks that were made with water contg. 0.1% of sugar is superior to that of blocks made from cement mixed with pure water. It is also shown

that wet concrete coming in contact with sugar is stronger than concrete that is merely wet with water.

Concrete improved by the use of diatomaceous earth. C. N. CONNER. *Eng. News-Record* 95, 995-6(1925).—Expts. carried out by the N. Carolina State Highway Commission indicate that addn. of diatomaceous earth increases the strength and promotes workability of concrete. The diatomaceous earth used was a specially prepd. material known commercially as celite; it was of the plankton marine type.

T. MARKOVITS

Admixtures in concrete. T. P. WATSON. *Eng. News-Record* 95, 1084(1925).—The statements Conner (cf. preceding abstract) are at variance with the experience of W., which has been that compressive strength of concrete is dependent on the cement-water ratio of the mixt., irrespective of proportions, with or without powdered admixtures. Use of the latter necessitated in all cases additional water to obtain the same workability, which reduced the compressive strength accordingly.

R. E. THOMPSON

More on concrete admixtures. G. M. WILLIAMS. *Eng. News-Record* 96, 129(1926).—Discussion of Conner's work (cf. preceding abstracts), with special reference to "oversanded" mixts., which are shown to be superior under certain conditions, the fineness of the sand, expressed as surface area, being the controlling factor. Sands having a surface area of less than 700 sq. in. per 100 g. permitted the use of a sand-gravel ratio of 1.0, while sand approaching 1100 sq. in. gave the best results with a ratio of 0.5. In the case of a Saskatchewan sand of surface area of 350-500 sq. in., a ratio of 1.0-1.5 gave the best quality concrete, which was stronger and more easily placed than mixts. conforming to 2:4 and 3:6 ratios. These "oversanded" concretes require a greater quantity of mixing water and are less dense but more water-tight or impermeable.

R. E. THOMPSON

Concrete admixtures. G. W. HUTCHINSON. *Eng. News-Record* 96, 129-30(1926).—Criticism of Watson's discussion (preceding abstract).

R. E. THOMPSON

Predetermining concrete strength on Park Bridges. W. F. WELSCH. *Eng. News-Record* 95, 630-1(1925).—Details are given of the successful application of a scientific method of designing concrete mixts. based on the researches of Abrams. It was found desirable, as a factor of safety, to increase slightly the quantity of fine aggregate computed as a slight deficiency results in porous concrete.

R. E. THOMPSON

Water-cement theory as a fact in field control of concrete. J. G. AHLERS. *Eng. News-Record* 95, 674-5(1925).—Discussion of the cement-water ratio method of concrete control, which is shown to be very satisfactory and practical. Grading of aggregate need only be controlled by the workability of the mix.

R. E. THOMPSON

Concrete pit structure subjected to diverse stresses. A. E. WYNN. *Eng. News-Record* 95, 762-3(1925).—Description of the construction of a water-proof reinforced-concrete structure required to withstand possible external hydraulic pressure. For water-proofing, reliance was placed mainly on the quality of the concrete, with addn. of an integral water-proofing compd. Very dense homogeneous concrete was obtained by the use of crushed limestone aggregate with crushed stone dust substituted for sand. The construction joints were reinforced with 20-oz. Cu baffle strips bent over on each side of the joint. The structure has been in use 5 months and has proved entirely satisfactory.

R. E. THOMPSON

Was Gem Lake Dam disintegration due to underburned cement? LARS JORGENSEN. *Eng. News-Record* 95, 606(1925).—A very heavy white deposit of practically pure CaCO_3 , noticed on the downstream face of Gem Lake Dam prior to failure, which had increased to a thickness of $1\frac{1}{8}$ in. in places and appeared to continue to increase, cannot be explained by a study of the water, rock or sand and must have been due to decomposition of the cement. Small white deposits often seen on dams originating from the leaching out of the free lime of the cement or of laitance accumulated in construction joints is harmless and should stop when these materials are all leached out. In this case the action continued, the cement itself being affected. Although the cement employed conformed to the usual tests it may have been somewhat underburned and on the point of instability when exposed to severe low temps.

R. E. THOMPSON

Silicate protective coatings for artificial stone. F. HUTH. *Farbe und Lack* 1925, 606.—A review of the use of Na silicate for hardening concrete floors, artificial building stone, etc.

F. A. WERTZ

The gypsum-sulfuric acid process (MÜLLER) 18. Drying blast-furnace slag [for the manufacture of cement] (ZILLGEN) (SCHNEIDER) 9. Ore reduction and cement manufacture (Brit. pat. 235,606) 9.

LAKEMAN, ALBERT: **Elementary Guide to Reinforced Concrete.** London: Concrete Publications, Ltd. Paper, 6 X 9 in., 69 pp., 79 line cuts. 2s. Reviewed in *Eng. News-Record* 95, 645(1925).

Aluminous cements. C. PONTOPPIDAN and H. P. BONDE. Brit. 235,138, June 5, 1924. Cements with a high Al_2O_3 content are burned in a rotary kiln while protected from direct radiation from the flame, to prevent fusion. The flame may be surrounded by an annular jet of air or may be dild. by an excess of air, or a relatively cool and widely diffused flame such as that of producer gas may be used, or the kiln shell may be cooled at the point where the flame is formed.

Porous concrete. J. A. ERIKSSON. Brit. 235,006, June 17, 1924. In making porous concrete or "gas concrete" from cement or cement and lime, with or without slate-ashes, blast furnace slag, slate-lime, pumice or the like and metal powder which causes the generation of gas on mixing with H_2O , the solid constituents are mixed and finely divided and then stirred with H_2O and transferred to molds.

Fibrous materials in concrete. NOVOCRETES, LTD., G. O. CASE and J. R. GARROW. Brit. 236,450, March 27, 1924. See U. S. 1,537,406 (*C. A.* 19, 2118).

Concrete and mortar. R. SCHOENHOFFER. Brit. 235,257, Feb. 12, 1924. Materials such as ashes, flue dust, or slag are crushed and ground while moist and may be heated and mixed with small quantities of alk. hydroxides and salts, Mg, Ca or Al salts, alk. silicates, Fe oxides and salts and various inert fillers.

Impregnating fibrous material with metallic salts. J. R. GARROW. U. S. 1,571,048, Jan. 26. A soln. of a normal metallic salt such as FeCl_3 is treated with NaOH or other alk. substance so that a slight excess will produce a permanent ppt., sawdust or other fibrous material is impregnated with the soln. thus prepd. and the material is then treated with a further quantity of alk. substance to form a ppt. in and on the fiber and render it suitable for use with cement.

Roads. C. B. FILBERT. Brit. 234,891, March 3, 1924. A macadam road is repaired by removing dust and applying a penetrating primary coating of light oil contg. 45-65% asphalt, on which is placed a secondary coating of heavy oil contg. 65% or more asphalt and a surface dressing of fine mineral aggregate.

Forming roads with bituminous mixtures. J. RADCLIFFE. Brit. 236,050, Jan. 2, 1924. Pitch for use in road making is preferably ground with sand in an impact mill and can be transported without caking. Other details are specified.

Surface composition for tennis courts, paths, etc. W. EVERITT (BRITISH CHEMICAL PRODUCTS). Brit. 236,345, May 24, 1924. Sand, rosin, solvent naphtha, petroleum oil, terebene and Fe oxide or other pigments are used.

Preserving wood. C. DE ZUTTERE. Brit. 236,328, May 1, 1924. Creosote is mixed with phenolated bitumen from lignite tar, with or without C_{10}H_8 or petroleum, to reduce the proportion of phenol.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Experiments on a new low-temperature tar-recovery gas producer and plant. F. KAISER. *Braunkohle* 24, 673-8, 699-704, 718-24(1925).—A detailed description of a by-product producer for brown-coal briquets, of its accessory app. and of tests performed. The producer consists of a vertical carbonizing shaft superposed on and discharging immediately into the gasifying chamber. The following data are illustrative of the 3 tests performed. *Throughput* 1000 kg./hr. of brown-coal briquets having a heating value of 4795 kg. cal./kg., contg. 6.47% ash, 17.34% H_2O , 76.19% combustible. *Total mixed gas*, 1.915 cu. m./kg., heating value 1755 kg. cal./cu. m., contg. 7.4% CO_2 , 0.3% illuminants, 0.4% O_2 , 27.0% CO, 3.3% CH_4 , 18.4% H_2 . *Tar yield*, 7.92% (yield in lab. expts. 9.55%). Heat balances, etc., are given and the economics of the process discussed in detail.

WM. B. PLUMMER

Constitution of coal. R. THIESSEN. *Trans. Am. Inst. Min. Met. Eng.*, Feb., 1925, (advance copy), 50 pp.—The chemistry of plant substances, their decay and subsequent transformation into peat is reviewed. Cellulose, although constituting the bulk of the plant body, does not contribute materially to the peat bog. The relative progressive change of the C and O content begun during the biochem. stages continues during the successive changes into brown coal, lignite, bituminous coal, and anthracite. All of the components of peat, definitely recognizable, may be traced clearly through

the whole series of coals. The woody components—anthraxylon—of peat, converted into coal, give rise to "bright" coal; the attritus of peat partakes of a dull appearance and gives rise to "dull" coal. B. C. A.

Sulfur in coal and coke. J. W. MEUSER. *Het Gas* 45, 97-107(1925).—A phase-rule study of the C-S complex in equil. with C at elevated temp. proves that S exists (1) as free, adsorbed S, (2) in solid soln. in the coal, or attached to the surface in such a way that it is impossible to distinguish it from a solid soln. Coke, prepd. in the lab. by heating coal contains S in 3 forms: (1) free, adsorbed S, (2) in solid soln., (3) as FeS with some MgS and CaS. If the coke is heated for a long time, the adsorbed S will slowly pass into solid soln. A coke which has been prepd. by the ordinary com. process contains S in a solid soln. and as FeS, before cooling. After cooling, even with limited access of air, FeS is oxidized, according to the reaction: $4 \text{FeS} + 3 \text{O}_2 = 2 \text{Fe}_2\text{O}_3 + 4 \text{S}$. If the coke is quenched, this oxidation is incomplete because of the sudden drop of temp., but, even at 500°, the oxidation is complete. If H_2 , or a gas contg. H_2 , is run through the chamber contg. red-hot coke, the S is completely transformed into H_2S . R. BEUTNER

Characteristics of American lignites. M. DOLCH. *Braunkohle* 24, 918-24(1926).—A review of various data from the Canadian Lignite Board publications. W. B. P.

Study of the ash of lignites. UGO MONDELLO. *Rass. min. met. chim.* 63, 126-9 (1925).—If in the distn. of a solid combustible like lignite, no part of the mineral matter passes off as a result of decompn. or entrainment, then the % ash in the coke agrees with the theoretical value calcd. from the % coke and the % ash in the original combustible. Tests, however, on numerous different lignites, whereby the latter were distd. with superheated steam (cf. C. A. 19, 2268), showed that in most cases the actual % in the coke was less than the theoretical value, but in a small proportion of cases was higher. Furthermore, where it was lower or higher than the theoretical, these differences bore no relation to the % volatile or to the % coke. In most cases where the % ash in the coke was lower than the theoretical, this deficiency was the greater the lower the % ash in the original combustible. This loss or gain of mineral matter in coke is due partly to phys. or mech. causes such as occlusion of combustible material by a refractory ash or entrainment of the mineral matter by the steam, but also depends upon the chem. characteristics of the mineral matter of the original combustible. Also in *Riassunto sperimentali eseguiti nell'Officina di Sesto Fiorentino*, Relazione I, Ligniti Xiloidi Toscana. (Livorno 1925). C. C. DAVIS

Examination of coal; the grain size of analytical samples. D. J. W. KREULEN. *Chem. Weekblad* 22, 558-60(1925).—It is advantageous to use finely powdered coal (at least B20 mesh) for the Fischka sulfur detn. The Fischer (Z. angew. Chem. 1899, 564) method for detn. of self-heating tendencies of coal (Br value) depends on the grain size. Const. results can be obtained only for samples finer than B50 mesh.

B. J. C. VAN DER HOEVEN
Method proposed for determination of volatile matter in coal. S. DE WAARD. *Chem. Weekblad* 22, 525-30(1925).—Results are given and detailed description with drawings of the method adopted by the Dutch Institute for Fuel Economy. The errors are limited to 1%. A polished Pt-Ir (3-4%) crucible of 26×30 mm., 12 g., cover 6 g., in a triangle of Ni-Cr with Pt points is placed inside an open cylindrical oven (66 cm. wide). It contains one g. coal (B20 mesh) and is heated by a Meker burner, with gas pressure 38-42 mm., 300 l. per hour, with a flame 18-20 cm. high for 7 min., at 950°. The crucible is allowed to cool in a H_2SO_4 desiccator. B. J. C. v. d. H.

New methods for the examination of gas coal. J. H. STEINKAMP. *Het Gas* 45, 295(1925).—A description of the modification of the Strache method by Mezger and Müller (C. A. 15, 586) for detg. the volatile constituents of coal. R. BEUTNER

Mixing of coal samples and preparation of final samples. D. J. W. KREULEN. *Chem. Weekblad* 22, 560-1(1925).—The American method of mixing (spreading out of coal in a long bed) gives more reliable results than the method in use in Europe (turning the coal pile over). Samples are to be taken of B20 mesh coal. B. J. C. v. d. H.

The purification of coal by foam flotation. D. STAVORINUS. *Het Gas* 45, 266-70 (1925).—A review. R. BEUTNER

Radiation in boiler furnaces. B. N. BROIDO. *Mech. Eng.* 48, 133-8(1926).—Application of water-cooled furnace walls for absorbing heat by radiation is increasing. A certain relation exists between the amt. of fuel burned, the surface exposed to direct radiation in the furnace, and the total heat absorbed by this surface. A standard curve is shown which enables the designer to det. with fair accuracy what part of the total heat generated is absorbed by the water-cooled walls. The heat transmission by radiation per sq. ft. of heating surface for any given furnace condition is obtained

from this curve. The most advantageous arrangement of radiant-heat-absorbing surface for given conditions is suggested. The effect of radiation from gases on heat transmission and the influence of radiation upon the measurement of gas temp. are briefly outlined. A brief discussion is included. W. H. BOYNTON

Pulverized-fuel firing for boilers. R. DE TEMPLE. *Tech.-Ind. Schweiz. Chem.-Ztg.* 1925, 225-34.—A general discussion. W. B. P.

Explosion engines and the liquid-fuel problem (in France). PAUL DUMANOIS. *Bull. soc. encour.* 137, 730-6(1925).—For economic operation, gasoline substitutes such as EtOH, MeOH, C₆H₆, etc., should work at a compression of about 7 (as compared with 5 for gasoline), necessitating certain changes in the engine. Troubles due to self-ignition or to detonation ("knocking") with these fuels can be completely eliminated by addn. of a small proportion of a suitable anti-detonant, e. g., tetraethyl Pb, which also permits of using heavier petroleum products (e. g., gasoline-kerosene mixts.) at higher compression without "knocking" or self-ignition and with appreciably lower fuel consumption. A. PAPINEAU-COUTURE

Iron carbonyl as an anti-detonant. J. H. FRYDLENDER. *Rev. prod. chim.* 29, 1-4(1926).—Brief review of its prepn. and properties. A. PAPINEAU-COUTURE

Recent developments in European gas technology. C. H. S. TUPHOLME. *Gas Age-Record* 55, 701-2, 903-4; 56, 175-6(1925). H. G. BERGER

Malden's new coal-gas plant. R. S. CARTER. *Gas Age-Record* 55, 569-70(1925).—A description. H. G. BERGER

Use of Illinois coal with the pier process. M. P. NOVAK. *Gas Age-Record* 55, 441-4(1925).—See C. A. 20, 104. H. G. BERGER

Water gas from soft coal. L. J. WILLIEN. *Am. Gas J.* 123, 505-6, 516-7(1925); cf. C. A. 20, 105.—Gas analyses (11 tables) are given showing the following: final carbureted gas compn. with and without blow run, and with and without blow run and air purge, both for coke and coke-bituminous coal mixts; effect of blast pressure on final gas when using air purge with coke fuel; blue gas compn. with coke fuel, with and without blow run; gas compn. during blow and blow run for bituminous and anthracite coal; final gas compn. for each run between coalings with bituminous fuel. W. B. P.

The use of bituminous coal as generator fuel. I. L. GILLILAND. *Gas Age-Record* 55, 641-2, 644, 646(1925).—Operating data using W. Va. coal are compared with those from the use of coke and Illinois coal. W. Va. coal gives 30.5 to 54.5% capacity increase and fuel reduction of 1.67 to 3.05 cents per M. as compared to Illinois coal. W. Va. coal has advantages over Ill. coal as to no. of bar downs required. Coke is the cleanest fuel. H. S. PARKER. *Ibid* 899-900.—A discussion of operation. H. G. B.

Determining oil efficiencies in water-gas manufacture. L. J. WILLIEN. *Gas Age-Record* 55, 603-6, 663-6, 668, 670(1925). H. G. BERGER

The heating value of gas. E. R. WEAVER. *Gas Age-Record* 55, 833-4(1925).—The relative usefulness to the consumer of gases of different heating values and the relation to standards and rates are discussed. H. G. BERGER

Stratification of different gravity gases. T. W. WEIGLE. *Gas Age-Record* 56, 171-3, 205-8(1925). H. G. BERGER

Chemical and thermal reactions in generators. J. G. DE VOOCD. *Het Gas* 45, 343-9(1925).—Polemical against Korevaar (C. A. 19, 1622), the result of his calcs. is expressed inaccurately, he should have stated that with a const CO₂:CO ratio high temp. in the generator will result in a low H₂ concn. R. BEUTNER

Liquid fuels and the gas industry. ANON. *Gas World* 83, 8-9(Supplement 1925).—Liquid-fuel production should be taken over by the gas industry and not allowed to become a competitor in other hands. Synthetic NH₃ is cited as a com. undertaking lost to the gas industry. The production of liquid fuels from coal and water gas is discussed. A. E. GALLOWAY

Small by-product oven coal-gas plants. H. J. ROSE. *Gas Age-Record* 56, 5-8(1926).—A description. H. G. BERGER

Determination of specific gravity of gases. Thirteenth report of the Research Sub-Committee of the Gas Investigation Committee of the Institution of Gas Engineers. ARTHUR SMITHELLS, et al. *Gas J* 170, 891(1925).—The differential column method described in *Tech. Paper* No. 5, of the Fuel Research Board was studied. Details are given of the instruments and the methods adopted. Results show that the method is convenient, rapid and yields results correct within ± 0.002 (sp. gr. about 0.5). A crit. review is included of the methods of gas analysis adopted in the course of the investigations. A. E. GALLOWAY

Heating vertical retorts with coal gas. FRANK ELCOCK. *Gas J.* 171, 331-2. *Gas World* 83, 97(1925).—An account is given with data of the change from coke to

gas firing of vertical retorts with great economy of heat and increased profits in the sale of coke.

Waterless gas holders. F. H. WAGNER. *Gas J.* **171**, 336-9(1925).—A waterless gas holder is described and drawings and an illustration are given to show the construction and operation.

Internal corrosion of holders. RICHARD ENGLER. *Am. Gas J.* **123**, 509-10, 519-20(1925).—The method of application of "immunol, a bituminous preparation" for the prevention of the internal corrosion of gas holders is described.

Aeration of lighting burners. Thirteenth report of the Research Sub-Committee of the Gas Investigation Committee of the Institution of Gas Engineers. ARTHUR SMITHIELLS, *et al.* *Gas J.* **170**, 879-91(1925).—A detailed report (with tabulated results) concerned with the degree of aeration of typical low-pressure upright and inverted lighting burners.

Domestic and industrial heating with illuminating gas. F. MUHLERT. *Apparaturbau* **38**, 7-9(1926); 6 cuts.—Description of app. with data on consumption and costs (cf. *C. A.* **19**, 1937, 2405).

The regeneration of absorbing masses. K. F. TROMP. *Het Gas* **45**, 194-205 (1925).—The state of satn. of a mass is detd. approx. by testing its O_2 -absorbing power. In order to test for sulfides an acid soln. of $FeCl_3$ and dimethyl-*p*-phenylene diamine is added; if H_2S is discharged a formation of methylene blue occurs. For a detn of the absorbing power of a mass, the bivalent iron salts and the sulfides are detd. as follows: the mass is dissolved in $FeCl_3$ and HCl , which must be so strong that all the H_2S present is oxidized. After filtering, which removes organic substances, cyanides etc., the soln. is pptd. by KOH . The $Fe(OH)_2$, present in the ppt. is titrated with $K_3Fe(CN)_6$, with dimethyl-*p*-phenylenediamine and phenol as an indicator; this mixt is oxidized to a blue dye by $K_3Fe(CN)_6$. This blue dye, the compn. of which is not known, is distinctly visible although the ppt. in the soln. contg. the $Fe(OH)_2$ is quite dark. During the titration the alky. of the soln. must not be high; O_2 must be absent.

Apparatus for determining the benzene-absorbing power of washing oils. TH. P. L. PETTIT. *Het Gas* **45**, 192-4(1925).—The partial pressure of C_6H_6 over a 3% C_6H_6 soln. in the respective oil is detd. by satg. air with the vapor and burning the $C_{11}H_6$ to CO_2 , which is absorbed by KOH .

Removing lime scales from ammonia distillation columns. TH. HOFFMANN. *Chem. App.* **13**, 17-8(1926); 3 cuts.—The Menzel gas-liquor still is described.

Effluents from ammonia plants and their disposal. T. I. BAILEY. *Gas World* **83**, 48-51 and (Coking Sect.) **83**, 19(1925).—B. discusses NH_3 plant effluents, their origin and possibilities of treating them for the removal of noxious constituents. The storage of ammoniacal liquor effects an enormous drop in sulfides, a large increase in the thiocyanate and thiosulfate, and almost complete disappearance of cyanide. Coke-oven NH_3 plant effluents have a lower O absorption and much lower thiocyanate and thiosulfate than effluents from other plants. The scrubbing of liquors at 95° by flue gases reduced the phenol content to 0.71%. A liquor rich in NH_3 and relatively low in thiocyanate and thiosulfate would be obtained were the crude coal gas leaving the hydraulic main submitted to shock cooling with prompt removal of the condensed liquor for storage out of contact with air.

Treatment of effluent spent liquors from the distillation of ammoniacal liquor. II. T. I. BAILEY. From the Report for 1924 under the Alkali Works Regulation Act. *Gas J.* **171**, 282-5(1925); cf. *C. A.* **17**, 1129.—The progress made in treatment of liquors is reported. The discussion centers about the 4 sources of pollution; phenol, thiocyanate, thiosulfate and color-producing substances and other compds. Causes and effect of treatments with data to show the compn. of the liquors are given.

Low-temperature carbonization as a commercial process. WM. H. BLAUVELT. *Chem. Met. Eng.* **32**, 925-7(1925).—A general discussion of the economics of low-temp. carbonization in the U. S., with particular emphasis on the field available for semi-coke as a domestic fuel.

The rationale of coal carbonization. I. The carbonizing problem as it stands today. WM. E. DAVIES. *Gas World* **83**, 157-62. II. *Ibid* 176-9.—A comprehensive review.

Carbonization research in Australia with a continuous vertical retort. R. E. THWAITES AND J. PACKER. *J. Soc. Chem. Ind.* **44**, 519-25T(1925).—Expts. with a continuous, vertical (Thwaites) retort, for tests lasting 6, 3.5 and 5 weeks on Australian

caking coals, are described in detail. Mechanical difficulties are blamed for poor success in treating these caking coals in narrow, externally heated retorts, as the charge sticks in the retort and has to be poked down very often. W. C. EBAUGH

Combustibility and mechanical strength of furnace coke. F. HÄUSSER. *Stahl u. Eisen* 45, 878-85(1925); cf. C. A. 17, 3092.—The combustibility of coke is calcd. from the formula $(\text{CO}_2 + \text{CO})/2\text{O}_2$, from the analysis of the products of combustion in large-scale expts. The duration of combustion, size of furnace, nature of coal producing the coke and Fe content of the coke have only a small effect on the combustibility, which depends largely upon the size of the coke particles, increasing rapidly with decrease in size. The chief factor influencing the resistance of the coke to crushing and abrasion is the degree of fineness of the coal carbonized, the strongest coke being produced from the most finely ground coal. A study of the coke used in furnace practice shows that the strength of the coke is considered rather than the combustibility. B. C. A.

Coke ovens in a Canadian gas works. J. STEPHENSON. *Gas Age-Record* 56, 563-6, 574(1926). H. G. BERGER

Gas firing of retorts and coke production. ANON. *Gas World* 83, 134-5(1925).—A discussion of retort firing with gas and with coke. Instances of each type of firing are cited with a saving of heat in each case. Conclusion: Neither type of firing can be used to the exclusion of the other and the one to be used must be detd. by the economic conditions, etc. A. E. GALLOWAY

Catalytic formation of methane from CO and H (CHAKRAVARTY, GHOSH) 2.

GILL, AUGUSTUS HERMANN: **Gas and Fuel Analysis for Engineers.** 10th Ed. revised. New York: J. Wiley & Sons, Inc. 181 pp. \$1.75.

HASLAM, ROBERT T. and RUSSELL, ROBERT P.: **Fuels and Their Combustion.** New York: McGraw-Hill Book Co., Inc. 807 pp. \$7.50 net. postpaid.

STANSFIELD, E., HOLLIES, R. T., and CAMPBELL, W. P.: **Analyses of Alberta Coal.** Scientific and Industrial Research Council of Alberta. Report No. 14. Edmonton, Alberta: J. W. Jeffrey. 63 pp. 25¢.

WELLINGTON, S. N. and COOPER, W. R.: **Low Temperature Carbonization.** Philadelphia: J. B. Lippincott Co. 238 pp. \$9.50. Reviewed in *Chem. Met. Eng.* 32, 942(1925).

Burning powdered or gaseous fuels. H. ADAMS. U. S. 1,571,179, Feb. 2. Air or steam is projected substantially in the line of projection of burning fuel and under higher velocity than that of the fuel, so that burning fuel and gases are drawn along for controlling the combustion and for directing the heat generated, *e. g.*, for heating reverberatory furnaces.

"Anti-knock" liquid fuel. T. MIDGLEY, JR. U. S. 1,571,862, Feb. 2. A fuel ingredient adapted for use in internal-combustion engines comprises aniline 6, "unsatd. gasoline" 3 and a blending agent such as *o*-toluidine and xylydine 2 parts.

Fuel briquets. E. EDSEER and MINERALS SEPARATION, LTD. Brit. 235,634, March 18, 1924. Finely divided carbonaceous fuel suspended in H_2O is agitated with an emulsion of residuum from distn. of Mexican fuel oil or other bituminous material preferably heated to 60-100° to cause flocculation, and pressed to remove H_2O and form briquets.

Fuel briquets from peat. L. RUDEMAN. Brit. 236,366, June 25, 1924. The H_2O content of peat or a mixt. of peat and peat earth is reduced to 60-65% and the material is then agitated with waste sulfite liquor contg. phenols or with tar oils under the action of heat and pressure and formed into briquets. Coal or coke dust, tar and other fuel ingredients also may be added.

Drying peat with steam under pressure. W. DONALD. Brit. 235,607, July 9, 1924. An app. is described.

Treating coal for fuel. L. A. WOOD and MINERALS SEPARATION, LTD. Brit. 234,855, Feb. 29, 1924. Finely divided coal is agitated with aeration in aq. suspension with fine pitch so that a coal-pitch-froth is formed and sepd. from the bulk of the H_2O and gang. An aq. pulp of this mixt. is then heated with or without a flocculating agent to flocculate the coal particles which may then be briquetted. Various modifications and details are described.

Distillate from coal, etc. A. G. BLACK. Brit. 234,864, Jan. 30, 1924. Coal, shale, pelionite lignite and similar materials are rapidly heated in a closed retort from

which gases are withdrawn downwardly and delivered to a pipe leading at one end to a receiver and at the other end to a filter to retard passage of heavy vapors and permit passage of light vapors and gases. Gases and light products pass to a condenser and second filter and fractional condensation is effected.

Liquid products from coal. M. MELAMID. Brit. 235,828, June 17, 1924. Liquids for use as *fuels* or in *lubricating* are obtained by heating coal, lignite or similar materials at atm. or higher pressures in a protective atm. with metal catalysts having a m. p. below the reaction temp. A temp. of 300-600° is suitable and H_2O , mineral oils or tar oils may be added to the coal. The mixt. may be treated with H , CH_4 or steam in a Sn-lined vessel contg. Sn or Sn alloys.

Gasification of coal. K. P. McILROY. U. S. 1,571,877, Feb. 2. A vertical column of bituminous coal with a carbonized base is maintained, the base is blasted with hot air at a temp. at least sufficient to fuse and run ash components as slag, a regulated portion of the hot gases is withdrawn from the base and filtered through C and the heat of the filtered gases is transferred to the air used for blasting.

Purifying fuel gases. J. W. COBB and H. J. HODSMAN. U. S. 1,571,624, Feb. 2. Fuel gases are subjected to the action of Fe oxide or other contact materials which will effect partial oxidation of H_2S under conditions of temp. and humidity which will ensure that the free S formed shall be carried forward from the contact material. NH_3 is used to effect removal of SO_2 (present in the gas after the partial oxidation of the H_2S) by the subsequent condensation and washing operations and the NH_3 content of the gas is adjusted to ensure the removal of the acid compds. contg. S and O.

Purifying gas. KOPPEKS Co. Brit. 235,125, June 6, 1924. In removing H_2S and other impurities from coal gas or like gases, the impurities are transferred from the gas to a stream of air which is then washed with liquid contg. freshly pptd. Fe oxide. The reaction between the fouled air and the washing liquid is effected while both are moving in the same direction. An app. is described. Brit. 235,126 relates to a process in which about 90% of the H_2S is removed from gas by treating it with a Na_2CO_3 soln. and this soln. is then treated with air to revivify it. The air carrying H_2S is treated with a dil. Na_2CO_3 soln. contg. freshly pptd. $Fe_2(CO_3)_3$ and this soln. is regenerated as in Brit. 235,125. Brit. 235,127 specifies recirculating air from which impurities have been removing by the washing liquor with the stream of air to which impurities from the gases are transferred and also describes an app. for the gas purification process.

Water gas. A. G. GLASGOW. Brit. 234,929, March 13, 1924. Steam is superheated by passage in the reverse direction through the usual regenerative chambers and is used for an "up run" by being passed into the bottom of the generator. Resulting gases are passed off from the top of the generator to a holder without passage through the regenerative chambers.

Water gas. J. RUDE. Brit. 235,007, June 18, 1924. In producing water gas in externally heated retorts, steam is admitted to the charge at various points and levels of the retort and gases may be removed as formed. Various details of app. are specified.

Water gas. C. MARISCHKA. Brit. 236,579, July 5, 1924. The "blow" is burned in a superheater and the products are passed through a heating jacket surrounding an annular boiler forming part of the producer. Various other details of operation and of app. employed are also described.

Carbureted water gas. WOODALL-DUCKHAM (1920), LTD. and D. RIDER. Brit. 235,693, May 17, 1924. The products of oil cracked in the carburetor during the "blow" are introduced with the steam passed into the generator during the "run." App. details are described.

Apparatus for making carbureted water gas. T. F. HOLDEN. Brit. 235,427, Sept. 3, 1924. An app. is specified for making gas according to a process also involved in Brit. 235,428. A series of up and down runs produces gas in a generator and the gas formed is passed through an economizing chamber formed in the side of a carburetor to a primary mixing chamber where the gas is divided into streams by a wall which preheats the carbureting liquid.

Gas producer operation. POWER-GAS CORPORATION, LTD. and N. E. RAMBUSH. Brit. 235,958, March 26, 1924. A mixt. of water gas and coal gas (with a high yield of low-temp. tar, NH_3 and coke) is obtained by gasifying bituminous fuel so that semi-coke is formed in the lower zone of the fuel column and maintained incandescent by withdrawing it continuously at such a rate that up-streaming only can be maintained without displacing upwardly the incandescent coke. An app. is described.

Producer gas and water-gas plant. A. BREISIG. Brit. 235,891, June 18, 1924.

Gas producer with a rotary hearth. L. TREFOIS. Brit. 236,185, June 24, 1924.

Water-gas producer. J. RUDE. Brit. 235,087, Nov. 21, 1924.

Portable gas producer for use with internal-combustion engines. R. I. DENHAM and N. C. JONES. Brit. 235,045, Aug. 14, 1924.

Device for uniform charging of fuel into gas producers, etc. L. TREFOIS. Brit. 236,184, June 24, 1924.

Baffle and filter apparatus for cleaning producer gas. C. W. THORNE and FEROLITE, LTD. Brit. 235,987, April 9, 1924.

Gas bench and retort construction. H. J. TOOGOOD and R. DEMPSTER & SONS, LTD. Brit. 234,947, April 3, 1924.

Hydrogenating tar oils. W. DEMANN. Brit. 236,230, June 30, 1924. Tar oils are hydrogenated at ordinary pressure and elevated temp. by the use of coke-oven gas which has been previously dehydrated by refrigeration or treatment with CaCl_2 or with H_2SO_4 . At the temp. of the hydrogenation ($180\text{--}200^\circ$) the H_2O formed by the reaction is removed by the gas current. The tar oils are preliminarily desulfurized with Fe sulfate or Rasen Fe ore. A colloidal Ni catalyst may be used to facilitate the hydrogenation.

Purifying anthracene. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Brit. 236,170, June 28, 1924. The process of Brit. 233,734 (C. A. 20, 768) is modified by adding to the reaction mixt. lime or other alk. earth oxide or other substance capable of combining with H_2O under the prevailing conditions. A solvent b. $220\text{--}260^\circ$ may be used when lime is added.

Drying coal for coking. S. R. ILLINGWORTH and ILLINGWORTH CARBONIZATION CO., LTD. Brit. 235,627, March 17, 1924. A portion of wet coal, previous to coking is heated out of contact with air and mixed with another wet portion to form a mixt. contg. over 5% resinic substances and preferably 3% H_2O . If different coals are mixed, the coal of lower resinic content is preferably heated and mixed with the coal of higher resinic content. An app. is described.

Metallurgical coke from bituminous coal. J. C. JOLLY and R. V. WHEELER. Brit. 236,002, May 1, 1924. Bituminous coal for coking is mixed with a material which when heated will produce a high proportion of H or other reducing gas and which at $400\text{--}600^\circ$ will effect no binding or agglomerating action on the material. Anthracite or semi-anthracite coal, semi-bituminous coal as mined or weathered, bituminous coal after weathering or carbonizing below 600° or peat or lignite which may have been carbonized below 600° may be used. The material should have a S content not exceeding 1%.

Coking bituminous coal. ALLGEMEINE VERGASUNGS-GES. Brit. 236,151, June 24, 1924. Bituminous coal is first heated to a temp. below that at which it becomes pasty, e. g., at 325° , for a sufficient time to remove all substances volatile at that temp. preparatory to subsequent coking. Vertical retorts and an upward current of hot inert gas may be used for this treatment.

Plant for dry-cooling hot coke, and utilizing its heat. A. MOETTEL. U. S. 1,571,455, Feb. 2. Heat from the coke may be utilized for heating boilers.

Rectification and liquefaction system for obtaining hydrogen from coke oven or illuminating gas, etc. SOCIÉTÉ L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). Brit. 235,129, June 3, 1924.

Coke oven heated by internal flues. A. STREPPEL. Brit. 235,375, May 28, 1924.

Coke oven with vertical flues. E. COPPEE ET CIE. Brit. 235,546, June 12, 1924.

Regenerative coke-oven construction. J. BECKER. Brit. 235,250, Jan. 12, 1924.

Coke-oven batteries. J. VAN ACKEREN. U. S. 1,570,870-1, Jan. 26.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Progress in the mineral oil industry in 1924. R. KISSLING. *Chem. Umschau Fette, Öle, Wachse u. Harze* 32, 285-90, 297-303 (1925).—A general review with numerous references and a book list of 24 new titles. P. ESCHER

Sulfur compounds removed from Persian petroleum by means of sulfuric acid. I. B. H. THIERRY. *J. Chem. Soc.* 127, 2756-9 (1925).—By strong diln. of 12 l. of H_2SO_4 sludge from the refining of a Persian petroleum and removal of the sepd. oil, followed by extn. of the aq. mixt. with CHCl_3 , the total yield is 1.8 l. of oils. Repeated fractionation gave 8 fractions b_{760} $50\text{--}100^\circ$ and 21 fractions b_{128} $60\text{--}120^\circ$, of which 4 were

examd. thoroughly. The fraction b_{760} 68–70° contained 60% CHCl_3 remaining from the extn. and 40% MeEtS ; that b_{760} 89–92° was apparently a mixt. contg. mainly MePrS or iso- PrMeS , its quantity not being sufficient to permit complete identification. The fraction b_{125} 63–6° (after further fractionation b_{760} 120–1°) was mainly tetramethylene sulfide; that b_{125} 81–4° (after further fractionation b_{760} 138.5°) was mainly pentamethylene sulfide. These compds. were identified by their MeI , HgCl_2 , H_2PtCl_6 and sulfonium iodide mercuriiodide derivs. W. B. PLUMMER

Chemical nature of the crude oil of Gbely. R. VONDRÁČEK. *Petroleum Z.* 21, 1035–40 (1925).—The oil has the following characters d. 0.9407, viscosity (Engler) at 50° 2.98, closed flash pt. 102°, hard asphaltum none, soft asphaltum 0.05%, paraffin wax none, I value 19.2, ash 0.080%, C 87.5%, H 11.96%, N 0.18%, S 0.12%, gross heat value 10,600 cals. H_2SO_4 of d. 1.84 reacts with the crude oil with evolution of heat, but has little action on the lightest fractions. The oil is very nearly akin to that of Louisiana. The following mol. wts. and formulas were found for various fractions: d. 0.865, 166 to 180, $\text{C}_{12}\text{H}_{24}$ or $\text{C}_{13}\text{H}_{24}$; d. 0.915, 216 to 260, $\text{C}_{13}\text{H}_{26}$ or $\text{C}_{14}\text{H}_{28}$; d. 0.935, 272 to 286, $\text{C}_{20}\text{H}_{42}$ or $\text{C}_{21}\text{H}_{44}$; d. 0.957, 366 to 380, $\text{C}_{27}\text{H}_{54}$; d. 0.969, 512, $\text{C}_{40}\text{H}_{82}$. Many of the hydrocarbons found in this oil are of similar compn. to those obtained by the extn. of coal with pyridine. An attempt to fractionate the oil by soln. in pyridine gave fractions as follows: d. 1.008, mol wt. 316, $\text{C}_{23}\text{H}_{46}$; d. 0.956, 291, $\text{C}_{21}\text{H}_{42}$; d. 0.922, 317, $\text{C}_{23}\text{H}_{46}$, with in each case, the fraction of an atom of O. The crude oil contains water, which is removable only in part and with difficulty by settling B. C. A.

Naphthenic acids derived from gas-oil distillate of Californian petroleum. YOSHIO TANAKA AND SHOICHIRO NAGAI. *J. Soc. Chem. Ind. Japan* 29, 1–7 (1926).—By acidifying a waste lye produced in the refining of gas oil of the mixed oil from Long Beach and Santa Fe Spring fields in California, crude petroleum acid has been obtained, having d_4^{15} 0.9972, n_D^{15} 1.4979 and acid value of 51.2. Crude naphthenic acids (d_4^{15} 0.9797, n_D^{15} 1.4927 and acid value 191.4) were sepd. from the petroleum acid, and were changed into Me esters, d_4^{15} 0.9535, n_D^{15} 1.4806, 81% of which b_{8-9} 160–230°. The esters were sapond. into pure mixed naphthenic acids, d_4^{15} 0.9773, n_D^{15} 1.4893 and neutralization value 208.4. They distd. under 8.9–9.0 mm. at 136–260°, 82°C° under 8.9–9.0 mm at 200–260° with d. 0.976–0.985. The fraction at 210–220° had a max. sp. gr. 0.985. The sp. gr. (0.976–0.985) of the main fraction is a little lower than that (0.99) of naphthenic acids derived from the petroleum of Kurokawa origin (*J. Soc. Chem. Ind. Japan* 25, 1031–44 (1922)) and a little higher than that (0.97) of the acids from the petroleum of Nishiyama origin (*J. Soc. Chem. Ind. Japan* 27, 446–55 (1924)). There are two series of naphthenic acids having isomeric compn. which are differentiated chiefly by the sp. gr. The naphthenic acids here obtained are probably a mixt. of the two series of the acids. A white cryst. mass sepd. from the fractions of high. b. p. K. K.

Industrial requirements for dry-cleaner's naphtha. L. E. JACKSON. *Ind. Eng. Chem.* 18, 237–8 (1926).—A brief discussion of various dry-cleaners is followed by a specification for petroleum naphtha (gasoline) suitable for the purpose. The b. p. should range from 137.8° to 204.5°; unsatd. hydrocarbons should be low, undissolved water and suspended matter and aromatic hydrocarbons should be absent; the acidity and doctor tests should be negative. W. H. BOYNTON

Shale research. A. HALLBACK. *Tekn. Tids* 55 (Kem. afd.), 57–62, 67–8 (1925).—A report on the progress of research on shale under the direction of the Engineering Academy. A. R. ROSE

Distillation tests on West Goth shale. W. PALMAER AND E. NORLIN. *Tekn. Tids* 55 (Kem. afd.), 89–92 (1925).—Mostly tables. A. R. ROSE

Refining shale oil in Scotland. G. F. MCKILLOP. *Chem. Eng. Mining Rev.* 18, 101–2 (1925). E. H.

Oil shale and its uses. A. SANDER. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 281–2 (1925).—S. describes the efforts made in Estonia of utilizing oil shales which contain up to 24% of oil. Gasification expts. proved uneconomical but low temp. distn. is promising and yields up to 91% recovery. Much of the shale is used directly as fuel in place of coal in the industries and on locomotives. P. ESCHER

Control of technical production of oil-gas. W. GOLUB. *Nefljanoe slancevoje Chozjastvo* 7, 725–9 (1924).—Expts. on the thermal decompn. of petroleum in the University exptl. plant at Saratov are described. The temp. is kept at 800–900° and is regulated by an alteration in the heating and not by the rate of flow of petroleum. This rate is fixed empirically and the course of the process is followed from the gas meter reading. If the retort is filled with steel shavings the gas yield is in-

creased. The compn. of the gas also changes, CH_4 partially replacing the H_2 .

B. C. A.

Report of the surgeon general's committee on tetraethyl lead. W. H. HOWELL, *et al.* *Ind. Eng. Chem.* **18**, 193 6(1926).—No evidence of Pb absorption or storage has been found in drivers of cars operating on "ethyl gasoline" (PbEt_4 /gasoline ratio 1/1300) for a period of 2 years' exposure. Filling station and garage employees, for the same period of exposure, showed slight absorption in tests of the feces and blood, but in no case were any detectable symptoms of Pb poisoning produced. Despite the distribution of about 300,000,000 gals. of "ethyl gasoline (between Feb., 1923 and May, 1925) no recognizable cases of Pb poisoning or other disease arising from its use have been observed. The manuf. of PbEt_4 and the distribution of "ethyl gasoline," both under regulated conditions, are safe as far as can be detd.

W. B. PLUMMER

Petroleum asphalt and petroleum tar. A. SACHANOV. *Nefljanije slancevaje (hozjajstvo)* **7**, 933-53(1924).—The asphaltene content of various products varied from 0.25% in Grosny petroleum free from paraffins, to 32.3% in solid petroleum pitch. The products from the different sources contained C 85.5%, H 6.8%, O 7.7%, and some S, had d 1.145, and possessed similar properties. The properties of asphaltene from petroleum pitch were unchanged after blowing air through the pitch at 350°, but the asphaltene content rose from 13.7 to 32.3%. Asphaltenes are sol. in aromatic hydrocarbons, CHCl_3 , CCl_4 , and light petroleum, soln. being preceded by a swelling of the material, and resulting in the production of viscous solns. Asphaltenes are lyophilic colloids with respect to aromatic hydrocarbons, terpenes, halogenated hydrocarbons, CS_2 and petroleum tars, the colloidal solns. being highly dispersed and stable, comparable with aq. gelatin solns. Natural asphalt and petroleum pitch are colloidal solns. of asphaltenes in tars and heavy oils. Soln. of asphaltenes in the above solvents is exothermal, the heat of soln. in toluene being about 10 cal. per 1 g. Asphaltenes are lyophobic with respect to paraffin hydrocarbons and naphthenes. Rubber acts as a protective colloid towards asphaltenes, and prevents their flocculation in soln. The coagulation of asphaltenes is reversible. The relationship between asphaltenes and petroleum depends upon the content of lyophilic or lyophobic constituents. In cases where the lyophobic constituents predominate, as in Russian petroleum and masut, the asphaltenes are present mostly in the disperse state; on the other hand, Californian and Mexican petroleum and petroleum pitch contain a high proportion of tar which is lyophilic to asphaltene. The low soly. of asphaltenes in light petroleum fractions is caused by the presence of lyophilic solvents, such as aromatic hydrocarbons. During coagulation, asphaltenes readily absorb tar, and the properties of the material are affected considerably thereby. The soft asphaltenes described by Holde are asphaltenes contg. varying quantities of adsorbed tar. To sep. asphaltenes from adsorbed tar, the mixt. is dissolved in the smallest possible quantity of benzene or CHCl_3 and asphaltenes are pptd. by the addn. of light petroleum, the process being repeated once or twice as necessary. Paraffins sol. with difficulty, which are often pptd. together with asphaltenes, can sometimes be sepd. by the same method, but if it fails, the material must be extd. with boiling alc. or light petroleum.

B. C. A.

Liquid products from coal (Brit. pat. 235,828) **21**. Filter for gasoline (Brit. pat. 235,812) **1**. Distillate from coal, etc. (Brit. pat. 234,864) **21**. Purifying oil (Brit. pat. 234,886) **27**. Fractionating tower for distillation of oil (U. S. pat. 1,571,805) **1**.

LEVI, GEORGES: *Éléments de la technique du pétrole*. Paris: l'Université de Strasbourg, l'Institut du Pétrole. 97 pp.

Petroleum from oil sand deposits. P. DE CHAMBRIER. Brit. 234,979, May 16, 1924. After extg. from oil sands all oil obtainable by pumping or natural flow, galleries are formed through the oil sands from the foot of 1 or more shafts and gas is drawn off by aeration or ventilation, causing oil and gas emulsions to break down and oil to flow into the galleries.

Cracking hydrocarbon oils. MOTOR FUEL CORPORATION. Brit. 235,564, June 16, 1924. Heavy oils such as fuel oil or kerosene distillate are heated to a cracking temp. under sufficient pressure to maintain them in liquid phase, cooled to about normal temp. while still under pressure and the pressure is then released to permit escape of permanent gases. The remaining oil is distd. by heat exchange with the heated oil. An app. is described.

Purifying oils. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 235,861, June 23,

1924. Spent lubricating oil is treated with a resinate which may be prepd. by melting resin with an oxide of Mn, Cu, Pb or Zn and may be used in the form of a soln. in C_6H_6 or other solvent, with or without addn. of a small quantity of stearic acid. Sol. silicate is then added and the mixt. is floated on the surface of H_2O heated to 80° so that a sludge of impurities seps.

Distilling oil shale. JACKSON RESEARCH CORPORATION. Brit. 236,420, Sept. 23, 1924. Oil shale or similar material is heated to $500-600^\circ$ in an externally heated vertical retort with a perforated bottom beneath which there is a gas-collecting chamber whence liquid and vapor are withdrawn to a sepg. tank. Uncondensed gases may be returned, together with additional inert gases, to the top of the retort.

Oil gas. P. HAHN. Brit. 235,625, March 17, 1924. Liquid fuel, after preliminary vaporization, is passed through a series of nozzles formed by overlapping baffle plates in a heated chamber and may then be mixed, after complete gasification, with steam, O_2 or O_3 . Air is drawn into the app. described by suction nozzles.

Filtering hydrocarbon lubricating oils. F. W. HALL. U. S. 1,570,890, Jan. 26. Oil, substantially free from H_2O , is filtered upwardly through a mass of adsorbent clay, to produce a "water white" product suitable for medicinal use.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Detection of bleach damages by means of the copper number determination. HERMANN WENZL. *Wochbl. Papierfabr.* 56, 994-7, 1024-7 (1925).—The over-bleaching of fibers by mildly alk. hypochlorite solns. is shown equally well by the Cu no. detn. or the fiber-strength test. When the bleaching process occurs in a strongly alk. soln., such as in the case of Na_2O_2 , the alkali exerts a solvent action on the oxidized cellulose and the Cu no. is small, but the fiber strength is markedly decreased. The Cu no. detn. is thus considered unsuitable as a criterion for over-bleaching. The Braidy Cu no. procedure possesses no advantages over the Schwalbe procedure, which by using the Hägglund titrimetric method is recommended as the most rapid and reliable one to use. The decompn. of Fehling soln. may be almost entirely prevented by using pure reagents and an app. which does not lead to over-heating (cf. Bray and Liu, C. A. 19, 2129). The Kaufmann $KMnO_4$ no. is unsuitable for pulps. J. L. PARSONS

Observation on the cellulose and paper industry in U. S. A. OLOF OLSON. *Tekn. Tids.* 55 (Kem. afd.) 66-7 (1925). A. R. ROSE

Physicochemical study of cellulose fibers. ROGER BOUSSU. *Pulp Paper Mag. Can.* 23, 1505-6 (1925).—See C. A. 20, 287. A. PAPINEAU-COUTURE

Waste liquor and gases of the paper industry. A. SCHROHE AND C. J. WEST. *Paper Trade J.* 81, No. 14, 62-4; No. 15, 55-6; No. 17, 56-8; No. 18, 106-8; No. 19, 57-9; No. 20, 54-6; No. 21, 57-8; No. 22, 55-6; No. 23, 61-3; No. 24, 50-2; No. 25, 47-50; No. 26, 50-2 (1925).—Translation of Schrohe's article (C. A. 19, 2564) supplemented by numerous references which raised the number of patents from 202 in the original to 534 in the translation. A. PAPINEAU-COUTURE

The bleaching of papermaking pulps under pressure. M. J. BOEHM. *Paper Ind.* 7, 1421 (1925).—Sulfite can be bleached in an hour at about $70^\circ F.$ in closed rotating bleaching vessels, under the slight pressure developed by the chem. action. With a 4000-5000 lb. batch, only 6-8 h. p. is required. A. PAPINEAU-COUTURE

Durability of writing paper. S. KÖHLER AND G. HALL. *World's Paper Trade Rev.* 84, 1610-4; *Paper Makers' Monthly J.* 63, 419-21; *Paper Mill* 49, No. 50, 14, 16 (1925); cf. C. A. 19, 2745; 20, 288.—Tests carried out at the Swedish Govt. Testing Institute, Stockholm, show that: (1) the tensile strength is increased and the elongation decreased on increasing the speed at which the Schopper tester is run; (2) no difference in folding resistance is observed on running the machine at 80 and 110 double folds a min., and an increase of about 5% on running it at 140 double folds a min.; (3) better agreement is obtained in the detn. of tensile strength than in the detn. of folding resistance; (4) under the action of light or heat or both the folding resistance of paper made from bleached sulfite decreased much more rapidly than that of unbleached or bleached cotton or linen rag paper; (5) increase in the Cu no. of the fibrous material probably reduces the durability of the paper; (6) rosin sizing causes a decrease in the folding resistance and an increase in the acidity of the paper as compared with unsized paper; (7) deterioration in durability due to rosin sizing is probably not sufficient to render rosin sizing unsuitable for paper intended for keeping indefinitely, provided excess

of $\text{Al}_2(\text{SO}_4)_3$ is avoided; (8) $\text{Al}(\text{AcO})_3$ does not seem to present any advantage over $\text{Al}_2(\text{SO}_4)_3$ from the standpoint of durability of the paper; (9) sizing with animal glue increases the folding resistance as compared with unsized paper, but the increase is lost comparatively rapidly on exposure to light or heat or both and on storing at ordinary temp.; (10) the degree of acidity of tub-sizing within the limits generally accepted in practice has little or no effect on the durability of the paper; (11) loading with a mixt. of china clay, gypsum, chalk, agalite and Swedish talcum has a beneficial rather than detrimental effect on the durability of the paper. A method for detg. acidity is described (cf. K hler and Hall, *C. A.* 20, 286). A. PAPINEAU-COUTURE

Coated paper. G. K. HAMMILL. *Paper Mill* 49, No. 50, 18-9, 38-9 (1925).--A discussion of paper coating, bringing out the advantages of glue as an adhesive, as compared with casein, provided it is used under suitable conditions. A plea is made for co peration between the ink mfr., paper mfr. and printer. A. PAPINEAU-COUTURE

Application of dyeing to the reconstitution of washed (bleached) writing. R. MELLET AND M. A. BISCHOFF. *Compt. rend.* 181, 868-9 (1925).--On dyeing paper from which the writing has been removed by bleaching (generally with hypochlorites followed by washing with acid), the dye will be absorbed differently by the body of the paper and by that portion which had been covered by the writing. This is attributed to the fact that the ink protects the underlying paper for a certain time from the action of the hypochlorite, resulting in less superficial oxidation of the paper, which in turn involves a difference in affinity for the dye. The difference is masked by the intense adsorption of the dye by the filler, and is brought out by examn. with a Woods lamp (ultra-violet light suitably filtered). A. PAPINEAU-COUTURE

Papier m ch  compositions. A. LAMBRETTE. *Industrie papeti re* 4, 273-5, 302-8, 337-40 (1925).--Various formulas and processes are outlined. A. P.-C.

Comparison of heart and outer wood for paper making. E. HAGGLUND AND S. HANSEN. *Acta Acad. Aboensis Math. Phys.* 3, 45 pp. (1923).--The fiber of outer wood is longer than that of heart wood, but no appreciable differences in the yield or strength of paper, prepd. by the sulfite process, were found; it is possible that the ratio of length to width of fiber is important. B. C. A.

Recovery and use of waste products. III. In the paper industries (KERSHAW) 13. The chemical manufacture of alcohol (GIROD) 10.

HAUG, ALFONS M.: *Ueber die Natur der Cellulose aus Getreidestroh.* 77 pp. Berlin: Carl Hofmann. 6 M. Reviewed in *Pulp Paper Mag. Can.* 23, 1519 (1925).

SCHROHE, A.: *Die Verwertung der Zellstoff-Ablagen.* Patentliteratur 1912-24. Berlin: Otto Elsner Verlagsgesellschaft m. b. H. 140 pp. R. M. 2. Reviewed in *Chemistry and Industry* 44, 1169 (1925); *Pulp Paper Mag. Can.* 23, 1520.

Hydrated cellulose products. C. F. CROSS and VISCOSE DEVELOPMENT CO., LTD. Brit. 236,336, May 12, 1924. To prevent or control the shrinkage of hydrated cellulose products, e. g., artificial silk, films or bottle caps, the H_2O of hydration is displaced by glycerol and absorbed by deliquescent salts incorporated with the material, e. g., ZnCl_2 admixed with Zn acetate, or CaCl_2 or MgCl_2 .

Dissolving cellulose with hydrochloric acid. A. CLASSEN. Brit. 236,281, April 2, 1924. See U. S. 1,570,553 (*C. A.* 20, 822).

Composite sheets of casein and cellulose esters or ethers. SOC. ANON. L'OYON-NAXI NNE, FABRIQUE DE MATI RES PLASTIQUES. Brit. 235,350, April 28, 1924. Sheets are formed with alternate layers of casein and of a cellulose nitrate, acetate, xanthate or ether, united by the use of a solvent and of heat and pressure.

Acetic acid recovery from cellulose acetate solutions. VERREINIGTE GLANZSTOFF-FABRIKEN AKT.-GES. and F. PASCHKE. Brit. 235,727, July 3, 1924. A soln. of cellulose acetate contg. HOAc is mixed with a satd. soln. of NaOAc, KOAc, MgSO_4 or other suitable salt to form a jelly and this is then gently pressed to sep. liquid rich in HOAc. The jelly is repeatedly moistened and pressed to effect further sepn.

Coating cardboard and similar materials. H. FRIEDL NDER. Brit. 236,224, June 26, 1924. A substitute for ebonite, hard paper, etc., is prepd. by impregnating cardboard, felt, papier-m ch  or other fibrous material with carnauba wax, "mountain wax" or mixts. of these with resin or metallic salts or other auxiliary hardening agents, under vacuum or pressure.

Apparatus for producing acid liquor for sulfite pulp processes. J. D. J NSSEN U. S. 1,571,271, Feb. 2. A heater and mixer is placed between 2 towers for treating the liquor as it passes from one tower to the other.

Paper-making machine. A. ALDRICH. U. S. 1,571,362, Feb. 2.

Beating apparatus for making pulp from paper, rags, etc. E. B. FRITZ. Brit. 235,626, March 17, 1924.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

The influence of gases and inflammable and noninflammable vapors on the limits of explosibility of mixtures of gas and air. VI. Graphic representation. W. P. JORISSEN. *Rec. trav. chim.* **44**, 1039-47(1925).—Le Chatelier (*Ann. mines* [8], **19**, 393(1891)) in studying the inflammability of firedamp observed that when n and n' are the vols. of two combustible gases mixed with a sufficient amt. of air to make a total of 100 vols., and N and N' are the limits of inflammability of the 2 resp. gases then when the limit of inflammability is reached the relation, $(n/N) + (n'/N') = 1$, will exist. This formula has been applied with good success many times. The results of Coward *et al.* (*C. A.* **13**, 1150), of Price (*C. A.* **14**, 1043) and of White (*C. A.* **17**, 470; **19**, 1197) especially are reviewed in this connection. If the proportions of the 2 gases or inflammable vapors in the mixt. are taken as coordinates Le Chatelier's formula is the equation of a line. The segments that this line intercepts on the axes are the explosion limits of the gas or vapors taken alone. In the case of $C_2H_2 + CO$ and $H_2 + CO$ a straight line is obtained. This is nearly true for $CH_4 + H_2$ but with $C_2H_4 + H_2$ and $NH_3 + H_2$ interesting deviations begin to appear. Some of these results are also taken from previous papers in this series (J. *et al.*, *C. A.* **18**, 2251; **19**, 178, 2274, 3595). They are all given in 12 graphs. In general the results show that this graphical representation of the results (cf. also White, *l. c.*) is a more practical and instructive means of studying the results than tabulated data. E. J. WITZEMANN

Application of stone dust in coal mines. ALLAN GREENWELL. *Safety in Mines Res. Bd., Paper No. 2*, 4-58(1923).—This paper records the information now available on the application of incombustible dusts in coal mines to prevent the spread of coal-dust explosions. After an historical review the subject is treated in detail under the following headings: (1) methods of distributing stone dust; (2) methods of sampling the dust mixts.; (3) results of the application of stone dust as shown by sampling; (4) prepn. of stone dust; (5) character of various stone dusts; (6) lab. work. The last section is of special value to chemists who may have to deal with dusts and especially with grain size. A review of this collated material shows that divergent opinions or doubt exists as to the manner of application of the incombustible dust, the manner of sampling the dust on the roadways for analysis, and the manner of the analysis itself. It is held that the coal dust mixt., to prove effective as a preventive of spread of explosion, must contain at least 50% of ash, and that a method of analysis which gives the ash content within 2% of the actual content is as accurate as the method of sampling.

CHARLES E. MUNROE

Coal dust explosions. G. S. RICE. *Trans. Am. Inst. Min. Met. Eng.*, Feb., 1925 (advance copy), 32 pp.—The history of investigations since 1801 into the cause of coal mine explosions is reviewed, with mention of the chief disasters in England, America, France and Germany and it is shown how the varying opinions in these countries at different times concerning the possibility of explosions being due to coal dust alone affected the steps taken to diminish the risk of explosion, whether by watering the roadways, by stone dusting, or by regulating the compn. of the explosives used. The establishment of exptl. galleries for the investigation of the conditions under which coal dust would explode, or for the testing of explosives proposed for use in mines is then described with special reference to the work carried out at Altofts and Liévin and by the U. S. Bureau of Mines. For stone dusting the Bur. of Mines suggests that not less than 2-3 lbs. or preferably 4 lbs. per linear foot should be used, and that the dust should not contain more than 25% of free silica when used in places where it is liable to get into air breathed by miners. For this reason the use of pure limestone, gypsum, or dolomite is advocated.

B. C. A.

Lag on ignition of firedamp. C. A. NAYLOR AND R. V. WHEELER. *Safety in Mines Res. Bd., Paper No. 9*, 3-16(1925).—An essential condition for ignition of a mixt. of CH_4 and air is that the source of heat, besides being of sufficient temp., shall remain in contact with the mixt. during a sufficient length of time. This "lag" on the ignition of CH_4 has an important bearing on safety in coal mining. It accounts for the fact that it is very difficult to cause an external ignition of CH_4 by the gauze of a miner's flame lamp heated by CH_4 burning within it; and it provides grounds for the

belief that it should be possible to compd. explosives having flames of such brief duration that, despite their high temps., they could not ignite CH_4 . With many tables of data and graphs from them the subject is reviewed for mixts. of paraffin hydrocarbons with air, from CH_4 to C_8H_{18} . The exptl. methods used are described in detail and the app. is illustrated. The lag on ignition is of shorter duration the higher the temp. of the source of heat above the ignition temp. of the mixt. A mixt. contg. 6.5% CH_4 had a lag of 11 secs. when the temp. of the source of heat was 700° , and of but 0.01 sec. when the temp. of the source was 1175° . The mixts. of CH_4 + air most readily ignited by a sustained source of heat were those contg. an excess of O, for not only do these mixts. require that the source of heat to ignite them shall be at a lower temp. but they need not be in contact so long with a source of heat at a temp. well above their ignition temps. The mixts. of other paraffin hydrocarbons (C_2H_6 to C_8H_{18}) most readily ignited by a similar source of heat contain an excess of the combustible gas. Judged by their relative ignition temps., mixts. of CH_4 + air are the most difficult to ignite while the others become easier to ignite as they ascend in the series $\text{C}_n\text{H}_{2n+2}$. A similar conclusion can be drawn from the lags on ignition at a given temp. Thus, a lower-limit CH_4 + air mixt. had to remain in contact with a surface heated to 700° for 9.8 secs. before it would ignite, while a lower-limit C_2H_6 + air mixt. in contact with the same surface at the same temp. ignited in less than $\frac{1}{2}$ sec.

CHARLES E. MUNROE

The extinction of flames. W. P. JORISSEN. *Chem. Weekblad* 22, 576-7(1925).—A historical note.

B. J. C. VAN DER HOEVEN

Explosions of anesthetic gases. A method for the control of electrostatic conditions. ISABELLA C. HERB. *J. Am. Med. Assoc.* 85, 1788-90(1925).—The histories of a no. of explosions are given with their probable causes. Directions are given for the proper arrangement of objects in the operating room, particularly the operating table, floor and gas machine, for the purpose of eliminating elec. sparks.

L. W. RIGGS

Plowshares from chemistry's swords (KILLEFFER) 13.

Explosives. J. TAGLIABUE. *Brit.* 236,413, Sept. 4, 1924. NaNO_3 , KNO_3 or NH_4NO_3 , 40-70, sulfide of Pb, Sb or Fe 20-50 and coal 10-15 parts are used together.

Testing detonators. L. WÖHLER. *Brit.* 235,525, June 16, 1924. Tests are made by inserting a detonator into a detonating cartridge and exploding it against a Pb plate.

Paper cartridge for blasting powder. A. J. HIRTHLER and J. DREISTADT. U. S. 1,571,478, Feb. 2. Structural features.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Influence of naphthenesulfonic acids in the removal of impurities from cotton fibers. P. VICTOROFF. *Rev. gen. mat. color.* 29, 128-31, 162-4, 199-20(1925).—Several com. preps. under names such as "Kontakt," "Kontakt T," "Épiphassol," "Reactif de Petroff" and "acides naptène sulfonique" were analyzed and tested for efficiency in removing impurities from cotton fiber. These preps consist of sulfonaphthenic acids, H_2SO_4 and vaseline.

L. W. RIGGS

The dyestuff industry: progress in 1925. R. S. HORSFALL. *Ind. Chemist* 2, 7-8(1926).

E. H.

The development of dye chemistry in the last ten years. F. MAYER. *Naturwissenschaften* 14, 10-2(1926).—A short review.

B. J. C. VAN DER HOEVEN

New American, Continental and British dyestuffs of 1924. JAMES FERGUSON. *Textile Recorder* 43, No. 508, 65-7; No. 509, 68; No. 510, 67; No. 512, 71; No. 513, 76-7(1925); 44, No. 514, 65-7(1926); cf. C. A. 19, 2748.—A list of over 400 new dyes with some information regarding their application and properties.

CHAS. E. MULLIN

The dyehouse laboratory. J. FERGUSON. *Ind. Chemist* 1, 518-20(1925).—A discussion of detg. fastness to light and a plea for more coöperation in this field.

E. G. R. ARDAGH

Vat dyes for wool. C. A. SEIBERT. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 42-7; *Am. Dyestuff Rept.* 15, 56-61.

L. W. RIGGS

Vat dyes on cotton. M. E. TICE. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 35-7; *Am. Dyestuff Rept.* 15, 49-51.

L. W. RIGGS

Discharge of vat colors by reduction. JEAN KERN. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 38-42; *Am. Dyestuff Rept.* 15, 52-6.

L. W. RIGGS

U. S. Government general specifications for textile materials (methods of physical and chemical tests). ANON. Bur. Standards, *Circ.* No. 293, 8 pp. (1925).—The topics considered are: atm. conditions, fiber identification and detens., breaking strength grab method, breaking strength strip method, wt. per sq. yd., wt. per linear yd., thread count, and width.

Rayon by the viscose process. FOSTER DEE SNELL. *Rayon* 1925, 9-10, 33.—Many practical details are included.

Development of the rayon (artificial silk) industry. M. G. LUFT. *Paper Mill* 49, No. 51, 2, 14-8, 41; No. 52, 4, 10-6, 38 (1925); cf. *C. A.* 19, 3378.

L. W. RIGGS

E. R. CLARK

A. P.-C.

The physical chemistry of dyes. I. Determination of the electric charge of dyes in solution (FÜRTH) 2. The photochemical oxidation of leuco-bases (CARROLL) 3. Color and molecular geometry. IV. Explanation of the colors of the cyanine dyes (MOIR) 10.

LANGE, O.: *Die Schwefelfarbstoffe, Ihre Herstellung und Verwendung.* 2nd Ed., revised. Leipzig: Otto Spamer. 371 pp. Paper. G. M. 25., bound G. M. 28. Reviewed in *Chemistry and Industry* 45, 11; *Ind. Eng. Chem.* 18, 325 (1926).

Dyes. B. WYLAM, J. THOMAS and MORTON SUNDORF FABRICS, LTD. *Brit.* 235,247, Dec. 12, 1923. Anthraquinone vat dyes are reduced to their leuco compds. and caused to react with a chloroformic ester such as the Et or Ph ester or with phosgene. The products, when decomposed by alkali in the presence of a reducing agent, such as Na sulfide, yield vats which may be employed for dyeing and printing. Flavanthrone, anthraquinone-1,2,2',1'-hydroazine, dibenzanthrone, dimethoxydibenzanthrone and dichloroisodibenzanthrone are among the dyes which may be used.

Dyes. CHEMISCHE FABRIK GRIESHEIM-ILEKTRON. *Brit.* 235,169, June 7, 1924. Azo dyes are formed, either in substance or on the fiber, by coupling 2,3-hydroxynaphthoic β -naphthalide with an unsulfonated diazo compd. contg. in the 2- and 5- positions substituents at least one of which is halogen. The products are suitable for dyeing rubber as they are unaffected by the vulcanizing process. Among the starting materials which may be used are: 4-chloro-1,2 (or 1,3)-toluidine, 4-chloro-1,3 (or 1,2)-anisidine, 4-chloro-1,2 (or 1,3)-phenetidine, 2,5-dichloroaniline, 4-chloro-2-aminodiphenyl ether, and 4-chloro-2-aminophenyl benzyl ether.

Dyes. BRITISH DYESTUFFS CORPORATION, LTD. and H. H. HODGSON. *Brit.* 235,334, April 1, 1924. Aminothiophenol ethers are made by reducing *o,o'*-dithioaniline, in aq. or alc. soln., with Na sulfide and NaOH, or with Zn and HCl, and methylating or ethylating the *o*-aminothiophenol; or by similarly treating *p,p'*-dithioaniline, trithioaniline, 5,5'-dichloro-2,2'-dithioaniline, 4,4'- or 5,5'-dimethyl-2,2'-dithioaniline or 2,2'-dimethyl-4,4'-dithioaniline. The *o*-aminothiophenol ethers can be directly sulfonated but sulfonic acids of the *p*-aminothiophenol ethers are preferably prepd. by treating *p*-nitrochlorobenzenesulfonic acid with Na disulfide, reducing and alkylating. 5,5'-Dichloro-2,2'-dithioaniline is made by heating 2,5-dichloronitrobenzene with Na disulfide and oxidizing the aminochloromercaptan formed. 2,2'-Dimethyl-4,4'-dithioaniline is made by the action of Son *o*-toluidine and its hydrochloride. Monoazo dyes which dye wool in yellow to scarlet shades fast to milling are obtained by coupling diazo compds. of the unsulfonated aminothiophenol ethers with sulfonated azo dye components or by coupling the sulfonated diazo compds. with various specified usual dye components.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BÂLE and H. SCHOBEL. *Brit.* 234,956, April 16, 1924. Monoazo and diazo dyes are produced by coupling β -resorcylic acid with 1 or 2 mol. proportions of the same or different diazo compds. one at least of which is an *o*-hydroxydiazo compd. of the benzene series. When chrome-printed on cotton they produce fast yellow-brown, red-brown, violet-brown and similar shades. Among the starting materials which may be used are: 4-nitro-2-aminophenol, 4-chloro-2-aminophenol-5-sulfonic acid, 4-nitro-2-aminophenol-6-carboxylic acid and similar compds.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BÂLE. *Brit.* 235,862, June 17, 1924. Dyes giving yellow to orange to brown shades on animal fibers in an acid bath are obtained by treating with Cr formate, Cr fluoride, or other agent yielding Cr, the *o*-hydroxyazo dyes in which the second component is an acetoacetic acid deriv., e. g., "the dyes produced from 4-nitro-2-aminophenol or 4-chloro-2-aminophenol-6-carboxylic acid and Et acetoacetate. Various other examples are given.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BÂLE. *Brit.* 234,950, April 7, 1924. Azo-

triphenylmethane dyes which dye wool from an acid bath in yellow shades changed to fast green by after-chroming are prep'd. by diazotizing a comp'd. of the general formula $(R_2NC_6H_4)_2CHC_6H_4(SO_3H)NH_2$, in which R represents the same or different alkyl or aralkyl residues, and coupling with a 1-aryl-5-pyrazolone derived from an aminosalicic acid or a homolog or deriv. such as an aminocresotic acid. Triarylmethane derivs. of the general formula specified are obtained either by condensing 3-aminobenzene-sulfonic acid with the appropriate hydrol or by condensing 2-sulfo-4-nitrobenzaldehyde with a tertiary amine and reducing. 1-(2-hydroxy-3-carboxy-5-methylphenyl)-3-methyl-5-pyrazolone (used as one starting material for the dyes) is prep'd. from 2-hydroxy-3-amino-5-methylbenzoic acid, which is made by nitrating and reducing *p*-cresotic acid.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 235,877, June 21, 1924. Anils of 2,3-anthraquinonethioisatin or 2,3-anthracenethioisatin are prep'd. by condensing aromatic nitroso compds. with 2,3-anthraquinoneoxythionaphthene or 2,3-anthracenethionaphthene. Thioindigoid dyes are made by condensing these anils with the usual components such as indoxyls, thioindoxyls, acenaphthenones and the like. Numerous examples are given, producing dyes giving green, gray, heliotrope or lilac shades from a hyposulfite vat.

Dyes. CHEMISCHE FABRIK GRIESHEIM-HELEKTRON. Brit. 235,919, June 20, 1924. Pyrazoleanthrone and thiazoleanthrone dyes are halogenated, preferably by the action of Cl or Br in oleum or chlorosulfonic acid in the presence of I. Numerous examples are given.

Dyes. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 235,556, June 14, 1924. In prep'g. sulfureted dyes, the sulfurization is conducted in the presence of a Cu comp'd. which is not transformed into Cu sulfide during the reaction, to produce clearer shades. A yellow-green dye is formed from the leuco-indophenol obtained from 1-phenylaminonaphthalene-8-sulfonic acid and *p*-aminophenol by heating with Na sulfide, S and K cuprocyanide. A yellow-red dye is similarly obtained from 3-amino-6-hydroxydiphenazine.

Dyes. FÄRBERWERKE VORM. MEISTER, LUCIUS & BRUNING. Brit. 235,252, Jan. 28, 1924. Thioindigoid dyes are produced by heating a 2-anil of a 2,3-diketodihydro-1-thionaphthene with a hydroxynaphthothiophene, contg. only 1 thiophene nucleus or a nuclear substitution product. The products dye cotton, from the vat, red to blue-black shades. The products derived from hydroxy-2,3-naphthothiophenes may be halogenated, which increases their fastness and produces shades tending more toward violet. Numerous examples are given of producing the dyes and their intermediates.

Dyes. A. CARPMAEL and A. J. RANSFORD. Brit. 234,928, March 13, 1924. Hydroxythionaphthenes and thioindigo dyes are produced by treating with an acid condensing agent an *o*-substituted arylthioglycolic acid of the general formula $(1)XN-ARSCH_2COOY$ (2) in which Ar is a residue of a C_6H_4 or $C_{10}H_8$ ring, X is H_2 or H acyl or N:azo-component and Y is H or a metal (preferably a heavy metal). Examples are given of various dyes giving different shades of blue.

Dyes. A. CARPMAEL and A. J. RANSFORD. Brit. 234,962, April 22, 1924. Dichloro-*N*-dihydro-1,2,2',1'-dianthraquinoneazine is made by chlorinating the parent dihydroazine suspended in molten S at a temp. above the b. p. of SCl_2 and under ordinary pressure. I or $HgCl_2$ may be used as a catalyst and a temp. of 210–220° is suitable. The product is boiled with Na sulfide to remove S and reduce the green-colored azine to the hydroazine. It dyes cotton from the vat (even in hard H_2O) bright greenish blue shades fast to Cl.

Halogenated thionaphthisatins and dyes produced from them. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 236,332, May 8, 1924. Thionaphthisatins are treated with halogen in an inert diluent; e. g., monobromo derivs. of 1,2-, 2,1- and 2,3-thionaphthisatins may be formed by brominating in $PhNO_2$. Thioindigoid dyes dyeing cotton from the vat in Bordeaux-red, brown, violet and other tints are obtained by condensing the halogenated thionaphthisatins with hydroxythionaphthene, hydroxythionaphthencarboxylic acid, acenaphthenone or various compds. contg. a reactive cyclo methylene group.

Dyeing. A. J. ESCAICH and J. P. WORMS. Brit. 236,131, Dec. 22, 1923. Animal or vegetable fibers are dyed by treatment with metal salts or oxides, e. g., Cu or Co sulfates, in the presence of diaminophenol, dinitroresorcinol or diaminoresorcinol. Red-brown and reddish yellow dyeings are produced.

Dyeing cellulose acetates. R. CLEVEL. U. S. 1,571,320, Feb. 2. Artificial silk, films or other forms of cellulose acetates are treated, for production of development dyes on them, with 2 of the 3 dye-forming factors: base, diazotizing material and de-

veloper, in one bath, and with the third factor in another bath. A protective colloid is used in at least one of the baths.

Dyeing cellulose acetate. BRITISH DYESTUFFS CORPORATION, LTD., J. BADDILEY and J. HILL. Brit. 236,037, June 20, 1924. "Acetyl silk" is dyed with monoazo dyes from aniline or its homologs or derivs., *e. g.*, halogenated aniline, toluidine or 1,3-dihydroxyquinoline. The dyes may be used in aq. suspension or in colloidal form with a dispersing agent.

Dyeing cellulosic fibers. TEXTILWERK HORN AKT.-GES. Brit. 236,558, July 3, 1924. The process of Brit. 195,619 (*C. A.* 17, 3613) for treating cellulosic fibers with aromatic sulfonyl chlorides is applied to the treatment of vegetable fibers dyed with direct colors to render them immune from cross-dyeing with direct colors. The fibers obtained may be dyed with acid, basic or acid mordant colors.

Dyeing jute, etc. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 236,525, July 4, 1924. In dyeing jute, coconut fiber and similar materials with basic dyes there is added to the dye bath or to the wetting bath sulfite cellulose liquor or its active constituents or conversion products.

Dyeing wool. C. S. BEDFORD. Brit. 236,388, July 19, 1924. Wool is mordanted in a boiling bath of Na or K dichromate, glycerol, glucose, invert sugar, starch, dextrin, urine, tanning substances or their mixts. as reducing agents and HOAc, HCOOH, HCl, H₂SO₄ or lactic acid in slight excess. Examples are given of dyeing processes with different dyes.

Apparatus for dyeing wool or other materials wound on bobbins. OCTIROFFICINE COSTRUZIONI TESSILI E IMPIANTI RIUNITE SOC. ANON. Brit. 235,215, June 6, 1924.

Spray dyeing of textile fabrics. TWO-TONE CORPORATION. Brit. 236,539, July 5, 1924. Mech. features.

Spray dyeing of textile fabrics. TWO-TONE CORPORATION. Brit. 236,194, June 30, 1924. Mech. features.

Apparatus for dyeing "raw stock." F. M. MORTON and G. W. MORTON. U. S. 1,571,863, Feb. 2.

Dye vat. F. M. MORTON and G. W. MORTON. U. S. 1,571,864, Feb. 2.

Dyeing hair, etc. R. L. EVANS. Brit. 234,971, May 5, 1924. In dyeing hair, fur, feathers and the like, a compd. of an aromatic amine and an aldehyde or ketone is oxidized, *e. g.*, with H₂O₂. A compd. prepd. by mixing *p*-phenylenediamine and acetone-Na-bisulfite may be used.

Artificial silk. FÄRBFABRIKEN VORM. F. BAYER & Co. Brit. 235,850, June 18, 1924. To prevent formation of air bubbles in the pptn. bath, the app. in contact with the bath may be preliminarily boiled in H₂O to free it from air.

Spinning artificial silk. O. KOHORN & Co. and A. LEHNER. Brit. 235,527, June 12, 1924. Mech. features.

Apparatus for making artificial silk by the stretch-spinning process. J. BALTHASAR and A. VIOLA. Brit. 235,852, June 21, 1924.

Cleaning spinning funnels for artificial-silk manufacture. J. P. BEMBERG AKT.-GES. Brit. 235,853, June 18, 1924. Mech. features.

Apparatus for spinning artificial-silk filaments. M. HÖLKEN. Brit. 236,211, June 24, 1924.

Apparatus for making filaments of artificial silk by the dry-spinning method. SOC. CHIMIQUE DES USINES DU RHÔNE. Brit. 236,393, Jan. 10, 1924.

Spinning threads from cellulosic ester or ether solutions or similar viscous liquids. N. B. GRILLET. U. S. 1,571,474, Feb. 2. Mech. features.

Retting flax. G. AUSTERWEIL and L. PEUFAILLIT. Brit. 236,590, July 7, 1924. In retting flax, hemp or similar materials the material is heated in an autoclave under pressure for several hrs. in H₂O contg. a small proportion of an "alc. of high mol. wt.," *e. g.*, cyclohexanol, methylcyclohexanol, terpineol and alcs. such as benzyl alc. A small quantity of soap may be added near the end of the treatment.

Cutting and dressing wool. SEVERN MILLS Co. Brit. 236,428, Oct. 20, 1924. Wool which when spun and woven closely resembles the product from short merino type wool is obtained by cutting up long-fiber wool contg. grease, suint, etc., intermixing, washing and drying the fibers. An app. is described.

Moth-proofing fabrics. LARVEX CORPORATION. Brit. 235,914, June 21, 1924. A neutral soln. contg. fluosilicate of Na, K, Li, Zn or Al is used, with or without fluorides, alkali benzenesulfonates, naphthalenesulfonates or sulfates of alkali metals, Zn or Al. Brit. 235,915 specifies similar solns. also contg. an org. acid, *e. g.*, oxalic, tartaric, formic or HOAc.

Moth-proofing woolen fabrics, etc. LARVEX CORPORATION. Brit. 236,218, June

24, 1924. NaF, Na oleate, gelatin and citric acid may be used together and other org. colloids may be used to facilitate wetting and impregnation of the material under treatment.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Standardization of paints in the U. S. A. K. WÜRTH. *Chem. Umschau Fette, Oleo, Wachse u. Harze* 32, 277-9(1925).—A review of the efforts by the U. S. Bur. of Standards in standardizing industrial products, with favorable comments. P. E.

Progress in the paint and varnish industry during 1925. R. S. MORRELL. *Ind. Chemist* 2, 14-6(1926). E. H.

Applying modern production methods to paint manufacture. F. A. WESTBROOK. *Chem. Met. Eng.* 32, 911-4(1926).—A description of the design and operation of the Baer Bros. paint factory, Stamford, Conn. F. A. WERTZ

The need for research in the oil and color industry. H. H. MORGAN. *J. Oil Colour Chemists' Assoc.* 8, 255-68(1925).—Presidential address. F. A. WERTZ

The settling of paint pigments. ANON. *Farbe und Lack* 1925, 603-4.—A brief review of the causes of pigment settling in ready mixed paints; of its prevention by the addn. of various aq. alk. solns., of colloidal solns. of heavy metals in drying oils, of heavy metal soaps of fatty acids, etc. F. A. WERTZ

The settling and packing of mixed paints. WM. C. ARSEM. *Ind. Eng. Chem.* 18, 157-60(1926).—In a mixed paint the pigment grains are to some extent deflocculated and dispersed by the free acids in the vehicle, and the metallic soaps are maintained in the sol condition by the same agency. If no chemical changes take place in this system, the pigment grains may settle through the action of gravity, but will not adhere, and soft settling will result. In a stored paint slow chemical reaction between basic pigments and free acids forms basic soaps with little dispersing power. Some of the soap will be pptd. as a result of this loss of free acid from the vehicle, and the pigment grains which are thus freed from adsorbed dispersing agent tend to adhere to each other by virtue of the free surface valencies. When the removal of dispersing agent occurs after gravity has done its work in bringing the particles close together, they will adhere more or less strongly to each other and hard settling will be the result. F. A. WERTZ

The determination of volatile solvents in paints, varnishes, etc. HANS WOLFF. *Farben-Ztg.* 31, 746-7(1925).—A convenient receiver for detg. the volatile solvents in paint products by the steam-distn. method has a small side tube connected to it near the bottom in such a way as to allow the condensed H₂O to overflow. A receiver of very small diam. is useful to det. when all the solvent has been recovered. The solvent in certain basic paints of heavy consistency is carried over by the steam very slowly; the addn. of a small quantity of mineral acids to such paints will speed up the distn. Illus. F. A. WERTZ

The catalytic effect of lead and manganese on the drying of China wood oil. G. F. LUDWIG. *Ind. Eng. Chem.* 17, 1160-1(1925).—In a "25 gal." rosin-wood varnish, 0.26% Pb, or 0.03% Mn is the most efficient amt. of these metals when used alone, to secure the max. drying rate. The metals in the form of PbO and of Mn borate, resp., were incorporated hot into the varnish base. Drying-time curves for varying concns. of metal are given. F. A. WERTZ

An exposure test of water-line paints. E. F. FIGG. *J. Oil Colour Chemists' Assoc.* 8, 314-34(1925).—Steel plates were primed over half their surface with various priming paints, and the whole surfaces of the panels then given a coat of boot-topping paints of various compns. These were exposed from a pier at the water line and inspected after 18 weeks and 56 weeks exposure. Compn. of the paints and application and inspection data are tabulated, with photographs. A priming coat of red lead in raw linseed oil with a finishing coat of white lead in linseed oil tinted with lampblack and two coats of ZnO and Zn dust in raw linseed oil gave good protection. The rust inhibition expected from basic Pb chromate in raw linseed oil was not confirmed; better protection was obtained with iron oxide-raw oil paints. The use of varnishes, in general, decreased the durability of the paints. In one case the anomalous result was obtained of one coat of paint affording better protection than two coats. The bituminous paints in the test did not show up well. Only one of six com. paints specially intended for water-line protection included in the tests gave satisfactory results; this consisted

of ZnO in a slightly thickened linseed oil. It appears that the most important characteristic to be sought in a boot-topping paint is permanent elasticity. F. A. WERTZ

Important questions in the milling of dry colors. P. W. RICHTER. *Farben-Ztg.* 31, 748-50(1925).—A discussion of production problems, maintenance of mills, etc. F. A. WERTZ

Cadmium and cadmium yellow. FREITAG. *Farbe und Lack* 1925, 606.—A review of Cd production statistics and the resultant effect on the price and com. availability of the metal and of Cd yellow, with a review of recent patents for producing Cd pigments. F. A. WERTZ

Preparation of metal surfaces for painting and lacquering. W. J. MISKELLA. *Paint, Oil and Chem. Rev.* 80, No. 27, 10-1(1925).—The importance of thorough cleaning of surfaces to be painted and especially lacquered is emphasized; the removal of slushing compds. and the general cleaning of sheet metal are discussed. F. A. W.

Experiments on accelerated testing of rust-preventive paints. HANS WOLFF. *Korrosion und Metallschutz.* 1925, 85, 130; *Farben-Ztg.* 31, 706; cf. C. A. 19, 2418.—For accelerated testing, painted panels are placed in a glass cylinder through which air of various relative humidities, and temps., or contg. various amts. of corrosive gases, is circulated. The results are compared with those obtained on outdoor exposure. A certain cycle of the accelerated tests, e. g., produced the same loss in elasticity of an 80% white lead-20% barytes paint in 75 to 100 days, as was caused by 18 months' outdoor exposure. Exposure of a film shortly after drying, to strong sunlight or ultra-violet rays, is conducive to cracking; this is perhaps due to the action of the ultra-violet rays in altering the dispersion of the colloidal system of the film. High humidity has less effect on the drying of a white lead paint than on a ZnO paint. F. A. WERTZ

Rust-preventive paints from an electrolytic standpoint. H. LIEBREICH. *Farbe und Lack* 1925, 602.—That the use of an alk. salt in the priming coat of paint on metal, followed by two coats of a durable paint, gives better protection against rust than if the alk. salt is not present to inhibit electrolytic corrosion, has been shown by practical experience. The finishing coats prevent the H₂O-sol. alk. salt from washing out of the film. If ordinary paint coats were actually impermeable to H₂O, they would effectually prevent rusting. The manner in which moisture penetrates paint films by imbibition is discussed. F. A. WERTZ

Rust-preventive materials. JULIUS SWOBODA. *Chem.-Ztg.* 49, 977-9, 994-7 (1925).—A review of the theories of corrosion of iron, of metallic coatings, lacquer, asphaltic preps., portland cement, heavy mineral oils and greases, metallic soaps, paints, etc., used as rust preventives. F. A. WERTZ

Nitrocellulose lacquers. B. SCHEFFLE. *Farben-Ztg.* 31, 865(1926).—A very brief review. The dried lacquer film is not identical in structure with the original nitrocellulose; in the process of gel or film formation from the liquid lacquer certain polymerization and aggregation of mol. particles take place. The gloss of a film is influenced greatly by the type of solvent present. F. A. WERTZ

Accelerated weathering as applied to lacquer enamels. H. A. NELSON. *Can. Chem. Met.* 10, 11-3(1926).—Relative gloss retention, chalking tendencies, and susceptibility to cracking of paint films heretofore have been detd. by accelerated tests, but certain typical failures such as fine hair-line checking have not been reproduced. This deficiency has been largely overcome by increasing the O content of the air in the light-exposure chamber and by adding periodic exposure to humid air contg. SO₂ and CO₂. The increased O content has doubled the general deteriorating effectiveness of the test, has increased chalking and reproduced hair-line cracks. SO₂ and CO₂ have practically no effect in the presence of light, but produce H₂O-sol. products within the film, in the dark with high humidity. The relative ratings of a series of nitrocellulose lacquers after exposure to the accelerating cycle agree reasonably well with the outdoor exposure ratings. Pigmented enamels made with the cottons of higher viscosity showed greater durability and greater tensile strength and distensibility than those made with 0.5 sec. cotton. This may be due to the longer fibers used in the production of the cottons of higher viscosity, or to the freedom from suspended matter which usually is present in the 0.5 sec. cotton solns. Greatest durability resulted from a ternary mixt. contg. 50% of 0.5 sec. cotton, 24% of 4 sec. cotton, and 26% of leather dope. The last by itself showed the poorest durability of all the cottons tested. In weathering, light colored enamels contg. 19.5% of 0.5 sec. cotton yellowed more than those contg. 16% of the same cotton; the former contg. pigments transparent to ultra-violet light, were more durable than the latter, but with pigments opaque to ultra-violet light, the enamels contg. the lower cotton content were more durable. Increasing the gum content from 1.5% to 3% decreased durability and increased gloss when damar gum was

used, but with ester gum both these properties were increased. Comparative tests of tricresyl phosphate and triphenyl phosphate as plasticizers showed little preference except when the tests were run at 48°, when the films contg. the latter rapidly became weak and brittle apparently through crystn. of the triphenyl phosphate (C. A. 15, 2003). The addn. of clear lacquer to a pigmented lacquer in the finishing coat, or a finishing coat of clear lacquer or of varnish, always decreased the durability of the pigmented lacquer job. A wax finish stands up better than a buffed finish. Results and lacquer compns. are tabulated.

F. A. WERTZ

The determination of the color depth of varnishes, oils, etc. FELIX WILBORN. *Farben-Ztg.* 31, 747 (1925).—I-KI solns. are preferred as color standards, and the color comparisons may be made in a colorimeter with secondary standards of greater permanency if desirable. Comparisons must be made with a layer of oil and of standard soln. of equal thickness, the method suggested by Fonrobert (C. A. 20, 117). Comparing layers of different thicknesses gives incorrect results.

F. A. WERTZ

The standardization of driers. P. MÜLLER. *Farben-Ztg.* 31, 696-8 (1925).—A further discussion of the factors involved in the standardization of drier (cf. C. A. 20, 299).

F. A. WERTZ

Comparative examinations of various types of shellac. A. TSCHIRCH AND H. H. SCHÄFER. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 309-14 (1925).—Some 30 different types and grades of shellac, obtained from the Indian Inst. of Science in Bangalore, were analyzed for H₂O, H₂O ext. (sugar, albumin and H₂O-sol. salts), total wax, wax sol. in hot alc., wax insol. in hot alc., H₂O-sol. coloring matter, total resin, ether-sol and ether-insol. resin and residuc. The analytical methods are given in detail and results are tabulated. The following conclusions are arrived at: (1) Shellac from male insects contains a larger amt. of H₂O-sol. substance, H₂O-sol. color and residuc, but contains less wax and resin. (2) Shellac from female insects contains less sugar and ether-sol. resin but more wax and total resin. (3) All Siam shellacs contain much sugar. (4) There is a definite relation between sugar and H₂O content. (5) *Acacia catechu* shellac furnishes less laccic acid. (6) *Zizyphus xulophyus* shellac shows a high H₂O and sugar content but little laccic acid and resin. (7) A shellac from Java, the wax of which consists of about equal parts of alc.-sol. and alc.-insol. wax, behaves quite differently from Indian shellac.

P. ESCHER

Linoleum and triolin. A. SIMON. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 272-5, 308 (1925).—A comparison of the mech. and chem. properties of linoleum with those of triolin as floor-coverings gave the following results. Mech.: Linoleum, a mixt. of linoxyn, rosin and cork-powder, permits sliding of leather over its surface about 10% less readily than triolin which is a mixt. of gelatinized nitrocellulose with cork, sawdust, etc., and its tensile strength is slightly greater than that of triolin. Elasticity was detd. by measuring the depth to which a weighted plate sinks into the sample and noting the time of recovery to normalcy: if the linoleum recovery is called 100%, that of triolin is only 60%. Abrasion of linoleum is 20% less than that of triolin. Chem.: Triolin is sensitive toward acids while linoleum is sensitive toward alkalies. Steam of 130-135° left linoleum unchanged but blistered and decomposed triolin to a brittle mass. A Bunsen flame charred linoleum only superficially but triolin caught fire and spread decompn. beyond the flame area with formation of smoke and gas. Radiant heat confirmed the findings with regard to gas (at 57°) and smoke-formation (at 115°). Examn. of the gases showed the presence of 8.3-9.7 g. HCN per 1 g. of triolin, and analysis of the gas after removal of HCN showed 33.0% CO₂, 32.2% CO, 26.7% NO and 8.1% N₂. White mice died in a gas-air mixt. from triolin after a little more than 1 min.

P. ESCHER

Rustproofing of materials (McDONNELL) 9.

FALLOON, DALTON BOYLES: **Zinc Oxide; History, Manufacture and Properties as a Pigment.** New York: D. Van Nostrand Co. 145 pp. \$1.75. Reviewed in *Ind. Eng. Chem.* 18, 326 (1926).

MILLAR, ANDREW: **Scumbling and Colour Glazing.** 2nd ed. London: Trade Papers Pub. Co., Ltd. Reviewed in *J. Oil and Colour Chemists' Assoc.* 8, 305-6 (1925).

TOCH, MAXIMILLAN: **The Chemistry and Technology of Paints.** 3rd ed. revised and enlarged. New York: D. Van Nostrand Co. 413 pp. \$5.

Filling and priming composition for use with paints, etc. DEUTSCHE FORSCHUNGS-UND VERSUCHS-ANSTALT GES. Brit. 235,133, June 3, 1924. Al(OH)₃ is mixed with linseed oil, with or without Fe(OH)₃ or with oil paint or varnish.

Composition for removing paint. O. L. FLURGEL. U. S. 1,570,957, Jan. 26. KOH 1 lb., Na_3PO_4 $\frac{1}{2}$ lb., oxalic acid $\frac{1}{2}$ lb., $\text{Ca}(\text{OH})_2$ 1 lb., starch 3 oz. and H_2O about 1 gal.

Linoleum. LOBOSITZER AKT.-GES. ZUR ERZEUGUNG VEGETABILISCHER ÖLE AND G. DUBSKY. Brit. 235,590, June 16, 1924. Linseed oil or other drying oil is thickened by injecting air or heating (suitably with addn. of Pb resinate) and may be mixed with resin, ocher and cork or other usual fillers.

Nitrocellulose varnishes. ATLAS POWDER CO. Brit. 236,190, June 24, 1924. In dissolving nitrocellulose or mixts. of nitrocellulose and glycerol-resin-ester, "ethyl glycol," $\text{OH}:\text{CH}_2\text{CH}_2\text{OC}_2\text{H}_5$, is used as solvent, with or without non-solvent diluents such as C_6H_6 , toluene, xylene, gasoline and Et, Pr, Bu and Am alcs. Camphor, tricresyl phosphate and other modifying ingredients or pigments may be added.

Metallic gloss coating. DEUTSCHE FORSCHUNGS- UND VERSUCHS-ANSTALT GES. Brit. 235,134, June 3, 1924. A mixt. of Pb ore such as galena and varnish, lacquer, siccate or rubber soln. is used for coating and after drying is rubbed or burnished, preferably with a wire brush. Pigments may be added to the coating compn.

Composition for treating rail fabrics of pool tables. E. HAMBLIN, JR. U. S. 1,570,740, Jan. 26. $86\frac{2}{3}\%$ of a mixt. of varnish resin, Al resinate and thinner is mixed with $13\frac{1}{3}\%$ of another mixt. formed of glue, shellac and "banana oil" and this compn. is applied to rail fabric of pool tables or the like to render it more durable.

Synthetic resins. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 235,589, June 13, 1924. In order to produce a resin capable of being hardened by a short heating, the hardening of complex ester resins such as those formed from glycerol and phthalic anhydride or phthalic acid is interrupted when the resin is just short of the intermediate stage of condensation. The interruption may be effected by heating the fusible resin to $210\text{--}290^\circ$ in solvents such as diethyl phthalate or benzyl benzoate and a soln. such as formed with diethyl phthalate may be poured into C_6H_6 to ppt. the resin.

Synthetic resins. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 236,591, July 5, 1924. The hardening of synthetic resins such as those produced from glycerol and phthalic acid or anhydride is accelerated by admixing with the initial resin a "dehydration catalyst," *e. g.*, CaO , MgO , ZnO or finely divided metals such as Zn or Fe obtained from their oxides by reduction with H. Fillers, *e. g.*, marble dust, and solvents, *e. g.*, acetone, may be used in mixts. contg. the hardening agent.

Coloring synthetic resins, etc. QUAKER OATS CO. Brit. 234,862, Jan. 7, 1924. Materials such as S-phenol resins, phenol-formaldehyde resins, wood, lacquers, enamels, veneers, varnishes, "plastic compositions," shellac, rosin or asphalts (which are not already sufficiently black) are colored black by use of furfural and HCl or other acid, with or without heating. A small quantity of aniline oil may be added to facilitate coloring without undue heating. In making products such as those from PhOH and S chloride, the coloring may take place simultaneously with the reaction by which the material is formed or may be effected subsequently.

Resinous compositions. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 235,595, June 13, 1924. Complex ester resins such as those produced from glycerol and phthalic acid or phthalic anhydride are blended with China wood oil, linseed oil, soy bean oil, cottonseed oil, castor oil or other drying, semi-drying or non-drying oils and heated to make varnish or japan compns. in the presence of a non-volatile solvent such as benzyl benzoate, benzyl acetate, PhNO_2 , toluidine, benzyl alc, cresol, aniline, glycol diacetate, phenylhydrazine or *o*-cresyl benzoate. The resin oil blend may be freed from the solvent initially used and subsequently dissolved in a volatile solvent such as solvent naphtha.

Furfural resin composition for molded articles. T. S. HUXHAM. U. S. 1,571,447, Feb. 2. Furfural resin or similar material which has a tendency to stickiness during hot molding is mixed with a small proportion of a metallic soap, insol. in H_2O , *e. g.*, Zn stearate or Al palmitate.

Washing kauri gum and the like. S. P. EVANS. Brit. 235,079, Nov. 4, 1924. Kauri gum or similar material is sepd. from foreign substances by agitation with an aq. soln. (preferably a salt soln.) of such d. as to float the gum. An app. is described.

Ink. A. ROGERS AND MIMO CORPORATION. Brit. 235,922, Dec. 27, 1923. Sympathetic ink for printing on newspapers, etc., comprises alc., a thickening agent such as glycerol and a sensitive ingredient, *e. g.*, phenolphthalein, Co chloride, FeSO_4 , FeNH_4 sulfate or sugar. CCl_4 may be added and a mixt. of resin and soap may be used with phenolphthalein and sugar.

Printing ink. J. H. CAUGHLAN. Brit. 236,329, May 5, 1924. Air-blown asphalt is mixed with C black, Pb linoleate and a binder formed of liquid asphalt and petroleum oil of thick creamy consistency.

Printing patterns for garments, etc. H. COLLINS. Brit. 235,968, Dec. 28, 1923. Patterns for garments may extend uninterruptedly over several pages of a newspaper and are printed with sympathetic ink, *e. g.*, an ink formed with phenolphthalein, glycerol, alc. and CCl_4 which may be subsequently developed with a soln. of Na_2CO_3 or other alkali.

Ink remover. H. W. BECKER. U. S. 1,571,313, Feb. 2. Formic acid 21, glycerol 3, ethyl ether 1, bay oil 0.1 and cologne 0.05 part.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Oils and fats industries during 1925. REX FURNESS. *Ind. Chemist* 2, 17-8 (1926). E. H.

The oleic acid content of fatty acids in the foots of palm-kernel, babassu and licury oil. F. WITTKA. *Z. deut. Oel-Fett-Ind.* 45, 417-8(1925).—The frequent observation that the foots acids of palm-kernel, babassu and licury oil have a much higher I no. than their normal oils, indicating a high % of oleic acid finds an explanation in the insufficient removal of the brown rind from the nut meat. This rind carries an oil of I no. 37.5, 55.7 and 36.0, resp., for the 3 oils and their high lipase contents cause a ready decompn. The same facts have been observed for coconut oil. P. ESCHER

The action of phenylhydrazine and hydrazine on fats and fatty acids. J. VAN ALPHEN. *Rec. trav. chim.* 44, 1064-70(1925). (In English).—van A. (*C. A.* 19, 1235) obtained various phenylhydrazides of acids by the action of ketenes on PhNHNH_2 and has now prepd these compds. by the action of anhydrous PhNHNH_2 on the esters of fatty acids and especially the glycerol esters or fats. The expts. of Falcicola (*C. A.* 9, 866; 14, 3066), who split fats with NH_2NH_2 in aq. soln., and so obtained the hydrazides of the fatty acids while unsatd. fatty acids (among others oleic acid) were converted by the reducing action of the hydrazine into satd. fatty acids (stearic acid), were repeated with abs. MeOH solns. of NH_2NH_2 . By this means also fats are easily ruptured with the formation of the hydrazides of fatty acids. As in aq. soln. (cf. F.) the unsatd. acids are hydrogenated by the NH_2NH_2 and oleic, elaidic and the unsatd. acids of linseed oil are hydrogenated to stearic acid and give stearic acid hydrazide. The fatty acids can be recovered by sapon. the hydrazides with dil. H_2SO_4 and BzH , which fixes the NH_2NH_2 . Fatty acids and fats give the corresponding phenylhydrazides of the fatty acids by heating to 130-50° with PhNHNH_2 . Unsatd. acids such as oleic acid and hydroxy acids such as ricinoleic acid are not reduced in this way to satd. acids by PhNHNH_2 but give the phenylhydrazides of the above mentioned acids. The previously unknown *phenylhydrazides of palmitic and ricinoleic acids* (m. 110.5° and 63°, resp.) were prepd. by this method. E. J. W.

Autoclave fat splitting and apparatus for it. H. RIEMER. *Z. deut. Oel-Fett-Ind.* 45, 653-5, 701-3, 720-2, 737-9(1925), illus.—The essential conditions of intimate emulsion, high temp. and pressure are discussed and the various processes of fat splitting are considered under the following captions, giving full details of operation: (1) Splitting under pressure (autoclaves). (2) In open vessels (Kreibitz process). (3) By H_2SO_4 . (4) By contact substances (Twitchell process). (5) By fermentation. Autoclaving by means of bases. Splitting with H_2O alone at high pressure. Riemer's process (Austrian patent 101,041). P. ESCHER

Qualitative test for unsaponifiable matter in fish oil. D. HOLDE AND A. GORGAS. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 314-6(1925).—Some fish oils with a high content of unsapon. matter show no turbidity when tested qual. by sapon. and diln. with H_2O . An investigation of this abnormal behavior revealed the fact that the turbidity appears only when the H_2O is added dropwise to the soap soln. instead of at once, in which latter case the unsapon. matter coalesces into transparent oil globules which may escape detection. It appears that unsatd. hydrocarbons, characteristic of fish oils, present this absence of turbidity more easily than the satd. hydrocarbons, characteristic of many mineral oils. P. ESCHER

The manufacture and properties of sulfonated fish oil and sulfonated neatsfoot oil. E. STIASNY AND C. RIESS. *J. Am. Leather Chem. Assoc.* 21, 76-108(1926).—See *C. A.* 20, 302. J. A. WILSON

The deodorization of oils and fish oils. J. H. MILLER. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 283-4(1925).—A brief survey of the present practice in deodorizing edible and industrial oils. P. ESCHER

Methods used in the refining of linseed oil. SCHWARCMAN. *Bull. mat. grasses*

inst. colonial Marseille 1925, 193-7; *Can. Chem. Met.* 9, 93-4.—A description of well-known processes. E. SCHERUBEL

Raisin-seed industry. J. BONNET. *Bull. mat. grasses. inst. colonial Marseille* 1925, 198-210. E. SCHERUBEL

Modern extraction and refining of edible oils from oil seeds and fruits. ANON. *Chem.-Ztg.* 49, 979-80(1925).—Remarks on the advantages of extn. over pressing. E. SCHERUBEL

Some experiments on applying physicochemical method to the investigation of Manchurian bean oil. N. I. MOROSOV. *J. Trans. Russian Chinese Polytech. Inst. Harbin*, No. 4, 121-33(1925).—The methods for the detection of Manchurian bean oil added as an adulterant to other vegetable oils is discussed. The properties of the bean oil approximate closely those of maize oil and sunflower oil. Detection of the presence of bean oil in adulteration of these oils is difficult especially when present in small quantities. Color reactions, such as those of Settimi and Newhall, have been proposed but are not always of value. The property of several vegetable oils to produce emulsions under described conditions was investigated. Five cc. of an oil is mixed with 2 cc. of CHCl_3 and then 3 cc. of a 5% soln. of Cu sulfate or Co nitrate is added. When the mixt. is shaken well for 1 min., an emulsion is produced the stability of which depends upon the kind of oil. Bean, sunflower, crude hempseed, peanut and cedar oils have been thus investigated. Bean oil gives a very stable emulsion, while the others very soon divide into 2 immiscible layers. With some specimens of bean oil a flocculent ppt. is formed. Mixts. of crude hempseed oil with 10, 20, 30, 40 and 50% of crude bean oil have been prepd. and treated as above. The presence of the bean oil may be detected by the flocculent ppt. formed on the interface between 2 layers while pure hempseed oil produces either a very slight or no ppt. By this method 10% of bean oil added to hempseed oil is easily detected. NATHAN VAN PATTEN

The Idrapid reagent. SCHRAUTH. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 271(1925).—Polemical. Cf. *C. A.* 19, 1786, 3608. P. ESCHER

The modern soap industry. W. C. PRESTON. *J. Chem. Education* 2, 1035-44, 1130-9(1925). E. H.

Rancidity and yellowing of soap. C. DE BELSUNCE. *Bull. mat. grasses inst. colonial Marseille* 1925, 191-2.—Pressing of soap in dies accelerates rancidity. The use of very pure fats in soap is a cause of rancidity. At the time when the Leblanc soda was used, rancidity of soap was rare. Soaps contg. resin do not become rancid. Resinous perfumes prevent or mask rancidity and prevent yellowing. Filled soaps grow rancid less easily than the unfilled. Dry and powdered soaps easily become rancid. The following lab. expts. were made. Soap boiled with the addition of 1% of $\text{Na}_2\text{S}_2\text{O}_3$ and pressed in a die remained white and odorless for 6 mos. and soap made without this addition became rancid and yellow in 1 mo. Unpressed soap contg. 1% NH_4HCO_3 did not discolor nor become rancid in 4 mos., nor did soap contg. 1% NaHCO_3 . Unpressed soap contg. 1% Na_2CO_3 , $(\text{NH}_4)_2\text{CO}_3$, and 1% $\text{Na}_2\text{S}_2\text{O}_3$ remained white and odorless 4 mos. The use of 1% $\text{Na}_2\text{S}_2\text{O}_3$ and resin is recommended. E. SCHERUBEL

The utilization of dirty fats and oils for curd soaps. A. LARSEN. *Chem. Umschau Fette, Oele, Wachse u. Harze* 32, 319-20(1925).—Detailed directions are given for sapon. dirty oils separately from coconut or palm-kernel oil and removing the dirt by a strong lye change followed by a salt change and bleaching operation and finally sapon. with coconut or palm-kernel oil. P. ESCHER

Soap bleaching with persulfates. E. SCHOTTE. *Soap* 1, 19-20(1926).—Remarks on methods and results as described in foreign journals. E. SCHERUBEL

Soap powder without milling. R. SIEBEL. *Z. deut. Oel-Fett-Ind.* 45, 739-41(1925).—S. describes several types of app. for making soap powder in which the hot saponified soap is mixed in an agitator kettle with the desired ingredients (soda ash and silicate) and by blowing cold air through the solidifying mass a light, fluffy powder is obtained which is floor-cooled and then packed; a simple grinding machine may be introduced prior to packing. P. ESCHER

Hydrogen for hydrogenation of oils (KNOWLES) 18. Resolving emulsions (U. S. pat. 1,570,987) 13. Fractionating tower for distillation of oil (U. S. pat. 1,571,805) 1.

GRÜN, ADOLF: *Analyse der Fette und Wachse, sowie der Erzeugnisse der Fett-industrie*. Berlin: J. Springer.

STIEPEL, C.: *Grundzüge der allgemeinen Chemie und die Technik der Untersuchung der Rohmaterialien und der Betriebskontrolle in der Seifenindustrie*. 2nd Ed. revised. Augsburg: H. Ziolkowsky, G. m. b. H. 260 pp.

Purifying oil. A. W. LIMPSON. Brit. 234,886, Feb. 29, 1924. Oil is subjected to intimate contact with hot H_2O and then to centrifuging. An app. is described.

Column still for purifying oils and fats. H. BOLLMANN. Brit. 235,514, June 12, 1924. In removing odorous substances from oils and fats, as described in Brit. 218,910 (C. A. 19, 583), the oil passes downwards through a column contg. chambers filled with Raschig rings or similar packing against a current of steam.

Extracting oil from cold whale blubber, etc. F. KRUPP GRUSONWERK AKT.-GES. Brit. 235,550, June 10, 1924. Mech. features.

Detergents. H. C. WILSON. Brit. 235,265, March 3, 1924. An alk. soln. such as an aq. Na_2CO_3 soln. is mixed with a soln. of oleic acid or other fatty acid in trichloroethylene or other chlorohydrocarbon deriv., with or without addn. of alc., phenols or other substances.

Detergent. G. ZIMMERLI CHEMISCH-TECHNISCHE FABRIK. Brit. 236,209, June 27, 1924. A cleansing and degreasing compn. is prepd. by mixing sulfonated castor oil or similar material with a hydrogenated phenol, e. g., methylcyclohexanol prepd. from crude cresol, with or without addn. of K-olein soap or the like.

Detergent. C. T. WIESE. U. S. 1,571,829, Feb. 2. A mixt. adapted for cleaning dyed fabrics is formed from a dehydrated soap base obtained from 19 lbs. sapond. cottonseed oil mixed with $2\frac{1}{2}$ gals. H_2O , a soln. formed from 1 lb. sassafras and 8 oz. soap with $2\frac{1}{2}$ gals. H_2O , fuller's earth, Na hyposulfite, Na salicylate, borax and additional H_2O .

Flaked soap. G. F. DAWES. U. S. 1,571,625, Feb. 2. Soap contg. a large proportion of H_2O is subjected to a "dry heat" at a temp. of 120–205° and at atm. pressure to expel the H_2O and form a porous mass.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Returning condensate from one body to another. F. STAUDINGLER. *Sucre. belge* 44, 505–10(1925).—The suggestion was repeatedly made that part of the heat contained in the water condensed in the heating space of an evaporator might be recovered by allowing the water to flow from one body to another. S. gives 2 calcs. One is of a quadruple effect in which the water condensed in a pre-evaporator is used as boiler-feed and the surplus is passed to the first body; the water from the first body goes to the second body. The other calcn. relates to a quadruple effect in which the system of return is not used. The calcs. prove that the radiation losses are such as to make any appearance of economy illusory. The saving does not compensate the cost of installation, and the complications introduced into the system. T. MARKOVITS

The Elliot filtration apparatus. A. A. BLOWSKY. *Facts about Sugar* 20, 758–9 (1925).—An invention for detg. the relative filterability of raw sugars for plant control and its method of use. T. MARKOVITS

Non-condensing electric generators. J. H. GRAINER. *Facts about Sugar* 20, 976–8(1925).—The relative advantages are given for sugar mill service of the different types of prime movers. T. MARKOVITS

The cane sugar industry in Peru. G. KLINGE. *Facts about Sugar* 20, 1096–7 (1925).—The operations are carried on all year under unique climatic conditions. K. gives the organization and methods of cultivation. T. MARKOVITS

Invertase process in cane sirup manufacture. H. S. PAINE AND C. F. WALTON. *Facts about Sugar* 20, 1024–6(1925).—The treatment of cane sugar sirup with invertase is the most satisfactory method for preventing crystn. The use of invertase in sirup manuf. and the method of employment are described. T. MARKOVITS

Clarification in the cane sugar factory. W. E. SMITH. *Facts about Sugar* 20, 1138–47(1925).—Clarification of cane juice is seen on analysis to consist of 4 main phys. or chem. reactions: (1) flocculation of colloids by change of H-ion concn.; (2) flocculation of those colloids which are coagulated by heat; (3) formation of insol. lime salts; (4) formation of sol. lime salts and chem. reaction products. The paper goes very much in detail in regard to the theory of clarification and the importance of liming control and the disposal of the filterpress juice. T. MARKOVITS

Composition and food value of cane sirup. H. S. PAINE. *Facts about Sugar* 20, 998–9(1925).—P. considers the color of a sirup more or less as an index of quality and distinguishes between the Georgia and Louisiana types of sirup. It is pointed out that the sugar content of sirup is the basis of its food value and that the ash and the org. non-sugars have some incidental food value. T. MARKOVITS

Sugar cane breeding at Coimbatore. T. S. VENKATRAMAN. *Facts about Sugar* 20, 826-34(1925).—Methods employed and results obtained in important tests of cane growing from seed in India. * T. MARKOVITS

The root rot problem of sugar cane. W. T. MCGEORGE. *Facts about Sugar* 20, 730-2(1925).—Studies in toxic conditions and causes. The relation of potash to disease resistance is described. T. MARKOVITS

Progress of beet-sugar manufacture in 1925. F. O. VON LIPPIMANN. *Chem.-Ztg.* 50, 61-4(1926); cf. *C. A.* 19, 1063. E. H

Possibility of cultivating sugar beet in Morocco. ANON. *Bull. soc. encour.* 137, 745-89(1925).—A discussion of the problem from the biological, technical, economic and com. standpoints. A. PAPINEAU-COUTURE

The beet sugar industry in Western Canada. J. W. EVANS. *Facts about Sugar* 20, 725(1925).—Establishment of beet culture in southern Canada promises to be the nucleus of great development. T. MARKOVITS

Subjecting of molasses treated with zeolites to the Steffens process. F. R. BACHLER. *Ind. Eng. Chem.* 18, 180-2(1926).—Previous literature is reviewed. Lab. expts. point to the conclusion that zeolite-treated beet molasses subjected to the Steffens process may be expected to yield a higher recovery of sugar and saccharate of superior quality, than molasses not treated with zeolite. F. W. ZERBAN

Studies upon starch. C. L. ALSBERG. *Ind. Eng. Chem.* 18, 190-3(1926).—"Evidence is presented in support of the view of Harrison (*C. A.* 6, 298) and others that starch heated in H₂O suspension does not, for most species, disintegrate to form a colloidal soln. The starch granules merely swell. The process is a gradual one; the 'gelatinization point' cannot be regarded as a characteristic const. of a starch variety. Most boiled starches are suspensions. Their viscosity is that of a suspension rather than that of a true colloid soln. Anything which disintegrates the granules greatly lowers the viscosity of boiled starch. If natural, untreated starch is ground in a pebble mill until most of the granules, while still recognizable under the microscope as starch, are injured, the starch becomes incapable of yielding paste in ordinary concn. A large part of the starch granule substance becomes colloidal sol. in cold H₂O. From such ground starch, without heat or the use of any reagent, clear solns. can be obtained in cold H₂O contg. material which gives the characteristic I reaction, does not reduce Fehling soln., and dialyzes through thin collodion membrane. This material is still under investigation. From the observations upon ground starch, it follows that the phys. properties of boiled starch cannot depend solely upon the colloidal properties of any of its constituents, such as amylopectin." F. W. ZERBAN

A H electrode for flowing liquids (ATEN, VAN GINNEKEN) 1. Use of fertilizer in Java (QUAR) 15. The water-soluble phosphatide from the root of the sugar beet (GRAFE, HORVAT) 11D. Recovery and use of waste products. III. In the sugar industries (KERSHAW) 13.

"Carboraffin" in the Sugar Industry. London, E. C. 3, 24, Monument Street: Bush, Beach & Gent, Ltd. Reviewed in *Intern. Sugar J.* 28, 47(1926).

Grape sugar from starch conversion products. W. B. NEWKIRK. U. S. 1,571,212, Feb. 2. An aq. dextrose soln. produced by conversion of starch is concd to supersatn by heating and cooling and is maintained at a temp. favorable for the production of anhyd. crystals. The mother liquor is sepd. from dextrose crystals, held at a lower temp. to induce the growth of hydrate crystals, and the latter are sepd. from the remaining mother liquor. Cf. *C. A.* 19, 746.

Apparatus for evaporating sugar juices. NAAMLooZE VENNOOTSCHAP DE NEDERLANDSCH-INDISCHE INDUSTRIE. Brit. 235,206, June 7, 1924.

29—LEATHER AND GLUE

ALLEN ROGERS

Review of the year 1925 (in leather chemistry). OSKAR RIETHOF. *Gerber* 52, 4-7(1926). H. B. MERRILL

U. S. Government master specification for sole leather. U. S. Bureau of Standards, Circ. 198 (1925).—The leather should be made from brined, green-salted, or dry-salted hides (not bull or buffalo hides) tanned with oak bark or a combination of vegetable

tanning materials. The water absorption should not exceed 25% and the chem. analysis of the moisture-free leather should show a mix. of water-sol. matter 30%, acidity (modified Procter-Searle method) 1%, total ash 2%, portion of water-sol. matter as glucose and salts 30%, portion of glucose and salts as lipson salt 50%. The hide substance must be between the limits 35 and 45%, grease 3 and 8%, and degree of tannage (combined tannin: hide substance) 60 and 80%. The moisture in the original leather must not be greater than 14%. Detailed directions for sampling are given.

B. C. A.

Some recent advances in the science of tanning. J. A. WILSON. *Gerber* 52, 3-4 *et seq.* (1926).—A review of the work of Wilson, A. W. Thomas and their collaborators since 1922.

H. B. MERRILL

Colloid chemistry in tanning - a reply. K. H. GUSTAVSON. *J. Am. Leather Chem. Assoc.* 21, 53-7 (1926).—Reply to Bancroft (*C. A.* 20, 517). Contrary to B.'s suggestion, chrome tanning cannot be explained as adsorption, which here is a meaningless term. The adsorption conception cannot explain why the combination of hide substance and Cr in a 50% basic liquor exhibits a sharp max. at 17.5 g. Cr_2O_3 per l., why this max. shifts to lower concn. with increasing basicity, why 2 further points of max. occur under certain conditions, and why sulfates and chlorides behave very differently.

J. A. WILSON

Aldehyde tannage. A. W. THOMAS, MARGARET W. KELLY AND S. B. FOSTER. *J. Am. Leather Chem. Assoc.* 21, 57-76 (1926).—Combination of CH_2O with protein is not limited to a simple 1:1 ratio, giving methylenamino linkage with amino N of the mol., but a triformal linkage with amino groups is also possible. Fixation may also take place with imino groups, so that the protein may combine with relatively large amts. of CH_2O . Combination of either CH_2O or furfural is greatest in the p_{H} range of 7 to 9.

J. A. WILSON

Sulfur tannage. A. W. THOMAS. *Ind. Eng. Chem.* 18, 259-61 (1926).—When collagen is brought into contact with Oden's S hydrosol, it combines with the anion $x\text{S}_y\text{S}_6\text{O}_6\text{H}^-$ in a manner analogous to tanning, but does not yield a true leather. The product is more resistant to cold water than raw collagen, but readily decomposes in hot water. The combined S can be extd. from the dry material by CS_2 .

J. A. W.

Tanning skins of marine animals. CHAS. ZIEGLER. *Cuir tech.* 15, 2-4, 23-5 (1926).—A description.

H. B. MERRILL

The application of syntans. LEOPOLD POLLAK. *Gerber* 52, 1-3 (1926).—A description

H. B. MERRILL

The application of ozone in the glue and gelatin industry. II. A. KRAUS. *Chem.-Ztg.* 49, 880-1 (1925).—A method for the treatment of glue stock with O_3 to prevent decomposition.

ERWIN J. KERN

The differentiation of hide glue and bone glue. E. SAUER. *Farben-Ztg.* 31, 721-2, 773-4 (1925).—The ash of hide glue consists chiefly of CaO and CaCl_2 ; that of bone glue is usually greater in amt. and consists chiefly of phosphates. Hide glues are mostly neutral in reaction; bone glues, more or less acid. Tannin soln. may be used as a pptg. agent instead of sulfite waste liquor as prescribed by Stein (*C. A.* 17, 2521) to differentiate the 2 varieties of glues. A concd. soln. of tannin and a small quantity of MgCl_2 and AcOH are added to a 1% soln. of glue at 50° ; hide glue produces only a turbidity; bone glue, a brown, sticky ppt. This test really indicates the different glutin content of the glues. The action of alum on glue solns. (*C. A.* 16, 3230) serves as a differentiation test when 10 cc. of a glue soln. at 30° is thoroughly shaken with 2 cc. of 5% alum soln.; with hide glue gelatinization occurs in 1 to 2 min.; with bone glue no change occurs. With glue mixts. the time required for gelatinization is an indication of the relative amt. of hide glue present. Iron alum has a stronger gelatinizing action than Al alum and the yellow gel produced with hide glue is streaked with red and white which serves as a further differentiation from bone glue. Hide glue, after sufficiently long heating, shows similar phys. properties and the same reactions with alum as bone glue. The difference between these 2 glues consists not only of different glutin content but also of other attendant components.

F. A. WERTZ

The chemistry of adhesive substances. G. M. DYSON. *Chem. Age* (London) 13, 488-90, 512-4 (1925).—I. An account of the manuf. of glue from hides, bones and fish waste is followed by a description of the properties of glues, and finally the more important tests for quality in glues are briefly outlined. II. The following methods of testing glue are described: fusion point by the Cambon fusimeter by which the "glue index" is worked out, the "gold number" test, thionine blue test for glue and agar in foods, the "gelometer" test for strength, the dynamometer test on glued joints. The following coagulation processes for the prepn. of casein are briefly de-

scribed: (1) mineral acids, (2) vegetable acids, (3) rennin. The nature and properties of casein and processes for the prepn. of glues from casein, the uses of dextrin and the nature of and uses for the vegetable gums are all briefly dealt with. E. G. R. A.

The manufacture and properties of sulfonated fish oil and sulfonated neatsfoot oil (STIASNY, RIESS) 27.

ARNOLD, JOHN RANDALL: **Hides and Skins.** Chicago and New York: A. W. Shaw Co. 606 pp.

Treating waste chrome leather, etc. J. MAYER & SOHN. Brit. 235,518, June 16, 1924. Waste chrome leather is subjected to oxidation, preferably by heating in an autoclave with BaO_2 , to convert the Cr to hexavalent form. Ba chromate and BaSO_4 are sepd. from the glue liquor and treated with NaHSO_4 or Na_2SO_4 and H_2SO_4 or HCl to produce Na chromate. Waste chrome tanning liquor is treated with BaCl_2 or Ba(OH)_2 or with a Pb or Sr salt to produce an insol. chromate which is sepd. and converted into Na chromate.

Fibers from skins. A. EHRENREICH and K. BENDIXON. Brit. 235,050, Aug. 25, 1924. In obtaining long fibers of great strength, silk-like appearance and high H_2O -resisting properties, prickles or horn plates are first removed from the skins of chondropterygians and plagiostomes. The skins are then swelled with Na sulfide soln. and reduced to fibers by a tool faced with needles. Waste of tanned skins may be used. The fibers may be rendered more durable by treating either them or the skins from which they are produced with an ext. from the gastric juice or urine (or both) of the fish from which the skin was obtained. By grinding the fibers and mixing them with an agglutinant such as glue obtained from the same fishes, a material adapted for elec. insulation or for resisting heat or moisture is obtained and, with addn. of formaldehyde and use of pressure, a hard material for making gramophone disks and the like is produced.

Tanning. T. BLACKADDER. U. S. 1,571,873, Feb. 2. In prepg. a tanning material from waste sulfite liquor, digester liquor is treated with slightly more lime than required to neutralize it, the ppt. formed is sepd., the liquor concd. and H_2SO_4 added to ppt. the lime.

Tanning hides. O. RÖHM. Brit. 236,483, Feb. 12, 1925. Before tanning, hides are treated with a mixt. of NaCl and NH_4Cl (or other suitable salts of alkalies or alk. earths) in the presence of acid and then treated with NH_3 (which in part may be replaced by other alkali). The skin may be treated with enzymic substances from pancreas either before or after the treatment with NH_3 and the NH_3 may be formed *in situ*. This treatment removes the hair and may be followed by plumping and bating treatments.

Depilating hides. M. BERGMANN. Brit. 236,543, July 2, 1924. $(\text{NH}_4)_2\text{S}$ is used as a depilating agent together with a sol. silicate.

Casein waterproof glue. A. A. DUNHAM. U. S. 1,571,662, Feb. 2. A casein waterproof glue is mixed with 5–20% of wood flour, which serves to avoid discoloration of wood on which the glue is used.

Subdividing glue, etc. AKT.-GES. FÜR CHEMISCHE PRODUKTE VORM. H. SCHEIDEMANDEL, D. SAKOM and P. ASKENASY. Brit. 235,263, Feb. 28, 1924. Glue, gelatin or the like is obtained in small beads or grains by passing its soln. in the form of drops through a cooling liquid comprising an aq. or other miscible liquid, gases or gaseous mixts. or immiscible liquids such as C_6H_6 , Cl derivs. of hydrocarbons, CS_2 or benzyl alc., which may be followed by treatment with cleansing liquid.

Glue, gelatin and fish meal. J. C. KERNOT. Brit. 235,635, March 18, 1924. Fish offal or the like is washed successively with running H_2O , dil. alk. solns., H_2O and dil. acid solns. to prep. the material for glue or gelatin extn. The residue is formed into meal.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The rubber industry during 1925. S. A. BRAZIER. *Ind. Chemist* 2, 18–20(1926). E. H.

The viscosity of rubber solutions. RUDOLF DITMAR. *Rubber Age* 18, 317(1926).—English version of a previous article (cf. C. A. 19, 3193). C. C. DAVIS

Has the serum of Hevea latex any value? W. SPOON. *Arch. Rubbercultuur* 9,

937-47(1925).—Latex probably contains about 1.5% quebrachitol. The proportion of it passing into the serum, detd. by a method already given (*C. A.* 17, 650), is increased by diln. of the latex before coagulation (cf. Contardi, *C. A.* 19, 1135). F. H. Y.

Vulcanization in hot air. B. BUIZOV. *India Rubber J.* 71, 99-100(1926).—See *C. A.* 20, 312. C. C. DAVIS

Effect of accelerators on cure and quality of various rubbers. R. P. DINSMORE AND A. O. ZIMMERMAN. *Ind. Eng. Chem.* 18, 144-57(1926).—Systematic tests of rubber vulcanized with and without accelerators indicate that the rate of cure is not in itself sufficient for judging the quality of a rubber. Adequate judgment can best be obtained with the aid of 3 criteria, viz, the rate of cure, the rigidity (the "stiffness index") and the resistance to tearing at the best cure. This best cure, necessarily empirical, is that at which the rigidity and resistance to tearing are most properly balanced and when aging is at the same time satisfactory. The influence on these properties of various individual accelerators could not be correlated so that any general conclusions could be drawn. C. C. DAVIS

Dyes [for rubber] (*Brit. pat.* 235,169) 25.

Rubber latex. AMERICAN RUBBER CO. *Brit.* 235,888, June 18, 1924. Thickened and stabilized latex for spreading, dipping, molding, etc. is prepd. by treating latex with Na or K silicates or other thickening agent having also a coagulating action and also with a coagulation preventive such as NH_3 soln. or an NH_4 compd. Fillers, vulcanizing ingredients, accelerators, etc., also may be added.

Treating rubber latex. AMERICAN RUBBER CO. *Brit.* 235,232, June 9, 1924. Thickened and stabilized rubber latex compns. for extruding, spreading and dipping purposes are prepd. by adding to latex a non-protein substance which will thicken the aq. phase and stabilize the latex without substantially modifying the colloidal condition of the rubber hydrocarbon. Or, a substance may be used which reacts chemically with the H_2O -sol. constituents of the latex (especially with the latex sugar) but preferably does not attack the proteins. Pb thiosulfate, basic Pb acetate, Pb acetate with a protective agent, PbO, Pb hydroxide, Pb_3O_4 , reaction products of Pb oxides or salts and mono-, di- and polysaccharoses, Pb chloride, Bi hydroxide, Fe_2O_3 , ferrous lactate, basic ferric acetate, ferrous oxalate, stannous oxalate and CdS may be used; or, thickening agents such as NH_4 soaps may be used as may also saponin, glue, oils, fillers, etc. *Brit.* 235,233 specifies compns. contg. rubber and ingredients which impart "tackiness," prepd. by mixing latex or similar aq. rubber suspension with an easily decomposable H_2O -sol. compd. of the other ingredient and afterward decomposing this compd. and removing the portion rendering it sol. Pine tar, coal tar, hardwood pitch or rosin may be used and rendered sol. by combination with NH_3 or an amine. A shoe cement may be formed of latex, NH_4 resinate, H_2O , PbO and S.

Distilling rubber. M. K. BAMBER. *Brit.* 235,380, June 5, 1924. Waste crude scrap or vulcanized rubber is heated in a still to not over 350° under a pressure not exceeding 2 atm. until $1/2$ - $2/3$ of the charge is vaporized. The distillate is condensed at about atm. pressure; it is a liquid consisting mainly of crude dipentene. Gas produced is led to a furnace for heating the still and the liquid residue is used as a substitute for drying oils. Increase of pressure in the still reduces the yield of dipentene. *Brit.* 235,381 relates to paints, varnishes, etc., made with the liquid rubber still residue after it has been given a preliminary treatment with air. This material also may be used in compns. for treating roads.

Tubing from latex. E. HOPKINSON and W. A. GIBBONS. U. S. 1,570,895, Jan. 26. Rubber latex is formed into a tube by extrusion through a die and the walls of the tube are supported by a core of liquid such as HOAc or alc. during coagulation. Cf. *C. A.* 19, 2760.

Rubber vulcanization accelerator. W. SCOTT. U. S. 1,571,739, Feb. 2. An accelerator is formed by the action of formaldehyde on the condensation product obtained from acetaldehyde 3 and aniline 2 mol. proportions.

Rubber vulcanization. V. LEFEBURE and A. J. HAILWOOD. U. S. 1,570,752, Jan. 26. A vulcanization accelerator comprises a stable compd. of a *p*-nitrosoalkylarylamine such as *p*-nitrosodimethylaniline and 2 mol. proportions of β -naphthol.

CHEMICAL ABSTRACTS

Vol. 20.

APRIL 10, 1926

No. 7

1 - APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Sedimentation analysis. I. SVEN ODÉN *Tekn. Tids.* **55** (Bergsvetenskap afd.), 65-8(1925), cf. *C. A.* **14**, 2116. Suggesting a practical application of an automatic electric recording device for measuring particles 10 μ and less by the rate of sedimentation.

A. R. ROSE

The accuracy of graduated measuring vessels. II. H. V. RENN *Ind. Chemist* **2**, 30-1(1926), cf. *C. A.* **20**, 847. — (1) The "Bull" or one mark pipet. R. discusses the methods of delivery generally practiced and the magnitude of the errors resulting from each method, the influence of delivery time and drainage time (graphs), the dimensions recommended by the Comm. of Standardization of Lab. Glassware and the method of testing at the National Physical Lab. (2) The buret. The best methods of graduation, the effect of unevenness of bore, time of delivery and of draining (graph), method of testing at the National Physical Lab. and tolerances are discussed. (3) The graduated pipet. Time of delivery, method of testing and tolerances are treated briefly.

E. G. R. ARDAGH

A circulation apparatus for gases. NITYA GOPAL CHATTERJI AND GEORGE INGLE FINCH *J. Chem. Soc.* **127**, 2461-6(1925). The app. is an improvement of that of Bone *J. Chem. Soc.* **81**, 1903(1902) and may be used to circulate gases or liquids. Two non return Hg valves are joined by a capillary tube which, leading from above the Hg of the 1st valve, dips into the Hg of the 2nd valve. The gas or liquid passes down a capillary through the 1st valve, thence through the capillary into the 2nd valve and out of the top of the latter. Between the valves the capillary connects with a U-tube, in the more remote end of which is a plunger piston. The U-tube is partially filled with Hg, so that downward motion of the piston raises the Hg in the other end of the U-tube and the pressure drives gas into the 2nd valve, the Hg seal in the 1st valve preventing passage backward. On return of the piston, the Hg descends, and gas is sucked in through the 1st valve, the Hg seal of the 2nd valve preventing suction from the 2nd valve. With a U-tube of 1.5 cm. bore, 162 l. per hr. can be circulated. Various precautions and refinements are described and the app. is illustrated.

C. C. DAVIS

Automatic apparatus for determining the melting point of organic compounds. E. B. MACMULLIN *J. Am. Chem. Soc.* **48**, 139-42(1926). An adaptation of Dubose's app. (*C. A.* **19**, 1514) which automatically and accurately records the m. p.

C. J. WEST

The evolution of colloid mills. S. P. SCHOTZ *Chem. Age* (London) **14**, 99-101(1926), cf. *C. A.* **16**, 2745; **17**, 344.

E. J. C.

Determination of the viscosity coefficient of water in absolute value. PIERRE LEROUX *Ann. phys.* **4**, 163-218(1926). — See *C. A.* **19**, 1645.

J. T. S.

Tests with molybdenum steel balls at Matahambre, Cuba. E. C. CLAPP AND F. C. DEVEREAUX *Eng. Mining J. Press* **120**, 891(1925). — Ball-mill tests gave a ball consumption about $\frac{1}{4}$ smaller with Mo treated Cr-steel balls than with ordinary Cr-steel balls.

A. BUTTS

Electrochemical actinometers. GEORGES ATHANASIU *Ann. phys.* **4**, 319-424(1925); cf. *C. A.* **19**, 1356, 2761. — A thorough study of the influence of light and heat on voltaic cells is made. Polarized electrodes show irregular changes. Reversible cells (Ni, Cu, Hg) show uniformly 2 superimposed effects if 1 electrode is exposed to light. One is a chem. change, disappearing immediately with the end of the illumination period. The other effect is caloric and increases with time. Illumination of the electrolyte produces only the second effect while the first one is generally connected with a tarnished electrode surface. The method of measurement permits detecting currents of the order 10^{-10} , which excludes photoelectric currents on account of their low range. A special study is made of electrodes covered with coatings sensitive to

light (Ag, Hg, CuO). A radiation separator is constructed for the wave lengths $3\ \mu$ to 2000 A. U. and the sensitivity curves of these actinometers are detd. J. T. S.

TRINKS, W.: **Industrial Furnaces**. Vol. II. New York: John Wiley & Sons, Inc. 405 pp. \$5.50.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

William H. Nichols. J. F. NORRIS. *Ind. Eng. Chem.* **18**, 317-9(1926); portrait.—A biographical address. E. J. C.

John Townsend Baker. EDWARD HART. *Ind. Eng. Chem.* **18**, 322(1926).—A brief biography, with portrait. E. J. C.

David Talbot Day. M. R. CAMPBELL. *Trans. Am. Inst. Mining Met. Eng.* **71**, 1371-3(1925)—An obituary, with portrait. E. J. C.

Tribute to Senator E. F. Ladd (1859-1925). H. W. WILEY. *J. Assoc. Official Agr. Chemists* **9**, iii-iv(Feb. 15, 1926).—Obituary with portrait. A. P.-C.

Dr. H. A. Lorentz. BALTH. VAN DER POL. *Physica* **5**, 321-4(1925)—Editorial with portrait. B. J. C. VAN DER HOEVEN

Systematic outline of chemical literature. M. G. MELLON. *Chem. Met. Eng.* **33**, 97-8(1926). E. J. C.

A tested method of teaching the history of chemistry. L. C. NEWELL. *J. Chem. Education* **3**, 166-9(1926). E. J. C.

The use of good nomenclature in teaching chemistry. F. J. CRANE. *J. Chem. Education* **3**, 191-2(1926). E. H.

The town and the chemist. C. C. KIPPLINGER. *J. Chem. Education* **3**, 197-200(1926). E. J. C.

An alchemist manuscript book from the library of Joseph Priestley. LEROY S. WEATHERBY. *J. Chem. Education* **3**, 129-33(1926). E. J. C.

Chemical laboratory of the old Nürnberg University at Altdorf. F. HENRICH. *Z. angew. Chem.* **39**, 92-8(1926).—Of historical interest. E. J. C.

Benzene during 100 years. P. WALDEN. *Z. angew. Chem.* **39**, 125-32(1926). E. J. C.

The discovery of the chemical elements masurium and rhenium. ERNST RÜST. *Tech.-Ind. Schweiz. Chem.-Ztg.* **1925**, 234-9.—A brief description of the methods of X-ray spectroscopy and of their application to the discovery of elements 43 and 75 (masurium and rhenium). W. B. PLUMMER

Thirty-second annual report of the Committee on Atomic Weights. **Determinations published during 1925**. G. P. BAXTER. *J. Am. Chem. Soc.* **48**, 541-52(1926); cf. *C. A.* **19**, 1070.—The elements particularly discussed are He, B, C, O, Al, Si, Cl, Cu, Ge, Se, Br, Sb, Ho, Hf, Au and Pb. E. J. C.

The density and atomic weight of helium. II. G. P. BAXTER AND H. W. STARK-WEATHER. *Proc. Nat. Acad. Sci.* **12**, 20-2(1925).—Improved measurements over those in *C. A.* **19**, 1643, involving the use of 2-l. flasks and a corrected value for the force of gravity, give for the d. of He 0.17846 instead of 0.17845 at atm. pressure and 0.08923 at $1/2$ atm. Since the av. d. of He at $1/2$ atm. pressure is exactly half that found for 1 atm. He obeys Boyle's law over this range. The at. wt. of He is remarkably near the value 4.000 with some uncertainty in the 4th decimal place. GEORGE L. CLARK

The determination of the formula of carbon dioxide. W. L. EVANS, J. B. PETERSON, H. B. HASS, G. P. HOFF AND J. E. DAY. *J. Chem. Education* **2**, 932-5(1925).—A lab. expt. for students in general chemistry is described. E. H.

Increase of tensile strength and recovery of zinc crystals. F. SCHMID. *Z. Physik* **32**, 918-21(1925).—The tensile strength increases with plastic deformation, but this action is partly reversed if the crystal is allowed time to recover. B. C. A.

Structure of stearic and stearolic acids. A. MÜLLER. *Nature* **116**, 45 (1925).—Stearic acid crystals, obtained from a satd. soln. in CS_2 , are monoclinic. The dimensions of the unit cell are: a 5.60, b 7.38, c 50.9 A. U., β 59.7°; d slightly above 1.05, indicating 4 mols. to the unit cell. A crystal of stearolic acid appeared to be triclinic. B. C. A.

Measurement of the amount of ozone in the earth's atmosphere. G. M. B. DOBSON AND D. N. HARRISON. *Proc. Phys. Soc. London* **38**, 74-6(1925).—With O_3 having a strong ultra-violet absorption band at wave lengths below 3300 A. U. with a max. at 2850 A. U., it has been detd. in the atm. by the variation of the intensity of a

no. of the Fraunhofer lines in this vicinity, a Br + Cl filter being used to remove wave lengths of over 3300 Å. U. The amt. of O₃ in the atm. (necessarily in arbitrary and undefined units) varies 50% between its max. and min., the change following that of the inverse barometric pressure with considerable accuracy. W. B. PLUMMER

Determination of the viscosity of sulfur dioxide and its mixtures with hydrogen. MAX TRAUTZ AND WALTER WEIZEL. *Ann. Physik* 78, 305-69(1925).—The viscosities of SO₂, H₂, air and 16 mixts. of SO₂-H₂ (varying in concn. from 82.15% to 15.12% SO₂) were detd. from the rate of flow through very short glass capillaries. T. and W. found that the Hagenbach correction for kinetic energy is applicable to gases. A further correction was necessary to take account of the variation from the ideal gas. The coeffs of viscosity of air were detd. between 14 and 199° and found to conform generally with Sutherland's formula. The Sutherland const. was found to be a function of the temp. and pass through a max. in the middle temps. The temp. coeffs of SO₂ between 14 and 199° are fairly const. This gas deviated from the Sutherland formula in direct proportion to its deviations from the ideal gas. In the mixts SO₂-H₂ the viscosity passes through a max. which tends to become less pronounced with the increase in temp. while shifting toward the mixts. richer in SO₂. The increase is approx proportional to the mole fraction of H₂ until the max. value is reached. The viscosity is very similar to that of SO₂ until this point is reached. T. and W. could not det. from their data that the viscosity of gas and gas mixts could be classified as a "corresponding property." They formulate the thesis for further investigation of this problem as follows: Is it the relation of the crit temps of the components of gas mixts which det. the shape of the mole fraction diagram or the corresponding temps of the less ideal gas? The error in measuring the viscosities did not exceed 0.15% (air), 0.2% (SO₂, H₂) and 0.4% (SO₂-H₂). The values for H₂ are larger than those of Klemm and Volker, agree with those of Breitenbach and are smaller than those of Thomsen, Puli, and Graham. Diagrams of app. for measuring flow, mixing the gases and gas generator (SO₂) are given.

E. R. SCHIERZ

The derivation of the equation of state from the specific heat. LÉON SCHAMES *Physik. Z.* 26, 731-2(1925); cf. *Ann. Physik* 57, 321(1918).—In an attempt to derive an equation of state from Clausius' equation: $(\partial C_p / \partial p)_T = -A \cdot T (\partial_2 V / \partial \partial_2)_p$, with the exptl. data of C_p (as a function of the temp. and pressure), the difficulty lies in the detn. of the integration const. The lower temp. limits are functions of the pressure. In the Avogadro state (pressure = 0), the lower temp. limits are those of the Joule or

Boyle points. L. has obtained the equations. $V = (RT/P) - (1/A) \int_{II}^T dT \int_{IIIa}^T (1/T)$ $(\partial C_p / \partial P)_T dT$, where II is the Boyle point, and IIIa is given by the equation $(\partial V / \partial T)_p = R/P$. J. H. PERRY

The validity of equations of state. II. W. HERZ. *Z. Elektrochem.* 32, 31-3 (1926); cf. *C. A.* 19, 1073.—The equation of Berthelot: $PV = RT\{1 + 0.0703 \cdot (T_K P_K / TP)[1 - (6T_K^2 / T^2)]\}$, and that of Wohl: $PV = RT\{1 + 0.0667(T_K P / TP_K) \cdot [1 - 6.40(T_K^2 / T^2)]\}$, have been shown to reproduce exptl. data with very good precision, when not too high pressures are used. Both equations are of about the same validity, although H. slightly favors the equation of W. With increasing temps., the PV -product goes through a min. The ratio of the temp. corresponding to this min., to the crit. temp. is a nearly const. quantity for the 13 substances investigated. J. H. P.

Kinetic activation as a factor in gas reactions. WILFRID TAYLOR. *Trans. Faraday Soc.* (advanced proof), Jan. 18, 1926.—The velocity of activation by different types of collisions, s , is $K = sII_2\{\epsilon/kT + 1\}e^{-\epsilon/kT}\sqrt{T}$, where ϵ is the activation energy and

$II_2 = 2p_1v_1\sigma^2 \sqrt{2k\pi(m_1 + m_2)/m_1m_2}$, where v_1, v_2 are the concns. of the 2 particles colliding, σ is the sum of the radii, and m_1 and m_2 are the resp. masses. D. S. V.

The measurement of the vapor pressure of carbon. F. BORN. *Z. tech. Physik* 7, 24-31(1926).—A crit. review with bibliography. E. H.

Determination of vapor pressure of carbon. H. ALTERTHUM AND F. KOREF. *Z. Elektrochem.* 31, 658-62(1925).—The difference in results in the detn. of the vapor pressure curve of C by the arc method and that involving the measurement of velocity of vaporization is to be ascribed partly to the different velocities of break down of different crystal faces but more particularly to the presence of an adsorption layer of higher concn. than corresponds to the vapor pressure. By consideration of the compn. of this layer it is possible to calc. the accommodation coeff., the vapor pressure curve of the adsorption layer, and the heat of adsorption of C. The latter is 51,900 cal./mol. or

about $\frac{2}{3}$ of the mol. heat of vaporization. No new expts. are reported but the results are obtained by analogy to the exptl. results on metals and C of Langmuir, Knudsen, Lummer, Fajans, Gross, Koref and Moers and others.

GEORGE L. CLARK

The vapor pressures of solid and liquid hydrogen cyanide. J. H. PERRY AND FRANK PORTER. *J. Am. Chem. Soc.* **48**, 229-302(1926).—The HCN, prepd. from KCN and H_2SO_4 , was purified by fractional distn. at low temps. The vapor pressures of the solid were detd. from -30.4° to the triple point; and for the liquid from the triple point to $+27.32^\circ$. The data for the solid and liquid, resp., are represented by the equations: $\log_{10} P_{(\text{mm})} = 9.33902 - (1861.8/\tau)$ and $\log_{10} P_{(\text{mm})} = 7.711603 - (1453.063/\tau)$. The triple point is calcd. to be -14.86° at a vapor pressure of 131.16 mm. The normal b. p. is $+25.65^\circ$. The latent heats of sublimation, fusion and evapn are 316.13, 69.29 and 216.84 cal. per g., resp.

J. H. PERRY

A simple formula for calculating the critical temperature from the expansion coefficient in the liquid phase, and the reason for its non-applicability for many molten salts. J. J. VAN LAAR. *Z. anorg. allgem. Chem.* **146**, 263-80(1925).—A formula is derived with which it is possible to calc. from the slopes of the rectilinear diams. and the ds. at zero abs. the crit. temps. of liquids. The formula has the form $T_k = 1/r\alpha$, where T_k = the abs. crit. temp., α = the expansion coeff. referred to the d. at zero abs. ($D = D_0(1 - T)$), and r = a function of γ the slope of the rectilinear diam. ($r = (1 + \gamma)/\gamma$). This formula holds exactly only for substances the rectilinear diams. of which are straight lines. This is not the case with salts like the alkali halides whose vol. in the liquid phase is considerably less than the sum of the at. vols. of the constituent elements. Their crit. temps. must be detd. by other methods. Van L. has calcd. for the alkali halides the ratio D_0/D_c , where D_0 is the extrapolated liquid d. at zero abs. and D_c is the liquid d. at the l. p. Except for Li halides this ratio is roughly a const., 1.37. The mol. vol. at zero abs. is calcd. by the formula $\tau_0 = M/D_0 - 22416$, where M is the mol. wt. The values of τ_0 calcd. for the alkali halides were considerably less than the sums of the τ_0 values of the individual elements in the compd.

R. L. DODGE

The additivity of the molecular volumes of liquid inorganic compounds. EUGEN RABINOWITSCH. *Ber.* **58B**, 2790-8(1925).—By examn. of the data from org. compds. R. concludes that the at. vol. for all elements of the first period is 5.5; for the second period 11; for the third 23, for the fourth 28 and for the fifth 37.5. These vols. are about 5 less than the at. vols. of the inert gases of the corresponding periods, except for the first period, in which He forms an exception. R. applies this rule to 50 inorg. compds., finding only a few exceptions, these are discussed at length. Unsatur. increases the mol. vol. to the extent of 1.5 for each missing H atom, strong association decreases the vol.

B. H. CARROLL

Surface tension of water, benzene, methanol and ethyl alcohol. B. ALI. *Proc. Indian Assoc. Cult. Sci.* **9**, 155-78(1925).—The capillary-tube method of measuring surface tension is modified by detg. instead of the rise of liquid in the capillary, the pressure which must be applied to the surface of the meniscus in order to depress it to the level of the horizontal surface of the liquid outside the tube, or to an arbitrary mark at a known distance below the free surface of the liquid. The pressure was measured by a sensitive differential manometer. The values of the surface tension of the above 4 liquids at 29.5° were, resp., 71.32, 28.10, 23.30, 21.32 dynes/cm. The advantages of the method are discussed, and the av. error in measurement is estd. as 1 part in 9000.

B. C. A.

Some phenomena of capillary chemistry. RENÉ DUBRISAY. *Compt. rend.* **181**, 1142-3(1925); cf. **18**, 490, 1074, 3131. D. had proposed the hypothesis that a fatty acid is the more active in depressing the interfacial tension between C_6H_6 and an alk. soln. the less sol. is its alkali salt. Supporting this, the vol. of the drops from a buret contg. the C_6H_6 solns. of palmitic, stearic and oleic acids, resp., discharging in 0.001 N NaOH, increased with temp., though in H_2O they decreased with temp.

A. W. FRANCIS

Surface tension of aqueous solutions of the alkali halides. F. DE BLOCK. *Bull. sci. acad. roy. Belg.* [5], **11**, 333-52(1925). Surface tensions have been detd. for solns. of NaCl, NaI, KCl, KBr, KI, LiCl, LiBr, LiI, and NH_4Cl for various concns. up to near the satn. point by the drop-wt. method. The rule of Quincke, that solns. of alkali halides contg. the same amt. of the given halogen have the same surface tension, is verified by the data. Conclusion: none of the proposed methods for relating surface tension to concn. can be used by extrapolation to det. that of the pure salt. The Li halides are shown to be somewhat abnormal from the present standpoint.

W. B. PLUMMER

Influence of temperature on the surface tension of liquids. F. DE BLOCK. *Bull.*

sci. acad. roy. Belg. [5], **11**, 292-300, 353-60(1925).—The equation for the surface tension α and the temp. t ($^{\circ}\text{C}.$) may be written $\alpha = K(t_k - t)^n$, where t_k is the crit. temp. and $K = \alpha_o/(t_k)^n$, and where n is approx. 1.20. Certain available data for C compds between -79° and 176° , and for liquefied gases in the range -258.5° to 50° have been applied to the further testing of this equation for low temps. The relation is verified by data representing the liquid in contact with its vapor, but not by the surface tension of liquids in contact with inert gases.

W. B. PLUMMER

A theory of the adsorption of gases. ÉMANUEL JAQUET *Fortschritte Chem.* **18**, 437-90(1925). This is a theoretical and mathematical paper having for its object the development of a general theory for the adsorption of gases leading to an equation for the "adsorption isotherm" based on probability considerations and independent of any assumptions concerning the nature of the forces involved in adsorption. In addn., a method is shown for computing the energy of adsorption from the tangent to the isotherm at the beginning of the adsorption. The energy of adsorption is explained as an electrostatic energy, and with the aid of elec. concepts a relation is found between the elec. const. of the mols. and the energy of adsorption. The significance of the adsorbent is discussed. Finally the new theory is applied to numerous sp. cases taken from the literature and it is shown that the principle set forth appears to be correct.

F. L. BROWNE

Adsorption power and electrical behavior of different preparations of charcoal. I. OGAWA *Biochem. Z.* **161**, 275-91(1925). A comparison of the adsorption properties of charcoal from blood, sugar, gelatin, naphthalene and paraffin is made, with moisture, phenol, I, HCl, NaOH, org. dyes such as methylene blue and eosin, and Congo red, picric acid, and octyl alc., as the adsorbed substances. Then the relative elec. charge upon the charcoal particles is detd. by the method of elec. endosmosis. The adsorption power has no relation to the ash content, is raised by preliminary heating, and varies probably because of the chem. and phys. constitution of the C. W. D. L.

Adhesive forces in solutions. VI. Experimental data on adsorption from mixed solvents. NIKOLAI SHILOV AND SOPHIE PEYSNER *Z. physik. Chem.* **118**, 361-8(1925), cf. *C. A.* **14**, 1775, **20**, 531. The adsorption of salts and morg. and org. acids by activated charcoal in mixed solvents has been studied. The curves which show the relation between the amt. adsorbed and the compn. of the mixed solvent are similar to curves which show the changes in properties (d., vapor pressure, cond. of dissolved electrolyte, surface tension, etc.) of the mixed solvent with change of compn. For alc.-water mixts., the adsorption curves of most salts and inorg. acids drop from the adsorption values in the pure components to a min., while the curves for org. acids vary without inflection between the values for the pure solvents. In mixts. of solvents which contain no water (alc.-ether, toluene-alc., toluene-ether) the adsorption curves for all substances, with a few exceptions, show minima. The amt. of adsorption is much less in mixed solvents than in either pure solvent, in many cases. Although there seems to be a definite relation between adsorbability and soly. of substances in a certain solvent, other factors interfere to make the process of adsorption very complicated.

R. J. HAVIGHURST

Some rhythmic phenomena in the precipitation of suspensions of red mercuric sulfide. N. I. MOROSOV, *J. Trans. Russian Chinese Polytech. Inst. Harbin*, No. **4**, 135-9(1925); cf. *C. A.* **19**, 1647. Suspensions of red HgS were prepd. by von Veimarn's method. A portion of the sulfide was rubbed in a mortar with milk sugar (1 part of HgS and 10 parts milk sugar) for 10 hrs. The powder produced was mixed with water and shaken for the dissolution of the sugar. After some time peculiar strata in the suspension were formed, similar to those of Ag_2CrO_4 in a gel of gelatin (Liesegang's strata). These were unchanged by gentle but disappeared with vigorous shaking. N. v. P.

Fractional precipitation. II. Topochemical influences in the separation of manganese and zinc by sodium sulfide. OTTO RUFF AND BRUNO HIRSCH, *Z. anorg. allgem. Chem.* **150**, 81-98(1925). The soly. product of MnS being 10^8 times that of ZnS , the fractional pptn. of Zn by Na_2S in the presence of Mn should present no difficulty, according to the previous work (cf. *C. A.* **19**, 3195). Mn salts do not dissolve any Zn out of pptd. ZnS ; however, MnS is never totally transformed into ZnS by Zn salts; the ratio decreases with the age of the MnS , increases with higher dispersion and lower temp., and is independent above a certain level of the Zn concn. This is explained by an impermeable coat of ZnS around the MnS crystals, lowering the reaction speed toward 0. The Mn content of the ppt. from a neutral sulfate soln. can be lowered to 0.2% if a high Zn/Mn ratio is pptd. by dil. Na_2S soln. under efficient stirring and at low temp. Presence of alkali salt or washing after pptn. changes the result little; subsequent boiling improves it somewhat.

JOHN T. STERN

Growth of structures formed by reactions on the boundary between solutions of electrolytes in water and those in gel. VLADIMÍR MORÁVEK. *Spisy Přírodovědeckou Fakultou Masarykovy Univ.* 1925, No. 59, 3-40.—If 0.1 N $\text{Pb}(\text{NO}_3)_2$ is placed over a solidified 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ in 5% gelatin, fibrous structures 0.1-0.3 mm. wide grow out into the former. The fiber wall is formed of gelatin on which is pptd. PbCrO_4 . Through the fiber flows a stream from the gelatin layer that meets the $\text{Pb}(\text{NO}_3)_2$ soln. at the end of the fiber structure. There is always pptd. first a gelatin layer in the form of a membrane on which PbCrO_4 is deposited discontinuously and which grows with a max. velocity of 0.16 mm. per min. The chief growth directions are vertical and horizontal: if neither prevails, the fiber grows ladder- or stair-like, and exceptionally it is spiral-shaped. The vertical growth velocity is always greater than the horizontal. The growth velocity, dimensions and shape of the fibers are influenced by all the factors which can affect the properties of lyocolloids, e. g., concn. of gelatin, substitution of chromate for dichromate, addn. of K^+ or Ca^{++} , increasing the rate of reaction, raising the temp. above 32° . Neither change in intensity of an incandescent lamp nor light of definite wave lengths of the visible spectrum exerts any influence. The cause of the growth of the fiber is the diffusion stream towards the place of the reaction between Pb^{++} and CrO_4^{--} and simultaneous soln. of gelatin into a sol accompanying the reaction. This diffusion stream forms a small channel the walls of which are filled up by pptd. gelatin and PbCrO_4 deposited on it. Above the gelatin layer the channel is prolonged into a fiber. M. draws attention to the similarity of the structure and changes in shape of the fiber and the anatomical and morphological characteristics of vital processes. A. P.-C.

Application of X-ray methods to the problem of imbibition. J. R. KATZ. *Physik Z.* 25, 659-66(1924).—A general review of the possibilities of X-ray technique as a means of elucidating the problems associated with the phenomena of imbibition. B. C. A.

Colloidal silica. B. WASSER. *Metallforsch.* Nov. 11, 1925, *Ind. Chemist* 1, 518 (1925).—W. discusses some of the general properties of silica gel and a few points to be remembered in its manuf., and cites a no. of fields of usefulness. E. G. R. ARDAGH

Influence of the hydrogen-ion concentration upon the velocity of flocculation of a few negative colloids. A. BOUTARIC AND MME. Y. MANIÈRE. *Compt. rend.* 181, 913-5(1925).—The influence of HCl , HBr , HI , HNO_3 , HPO_3 , CH_3COOH , CCl_3COOH , H_2CO_3 , H_2SO_4 , $(\text{COOH})_2$, lactic, tartaric and succinic acids on the flocculation of 3 sols at equal p_{H} is studied. With a gamboge suspension HI , HPO_3 , H_2CO_3 , CH_3COOH and CCl_3COOH show curves deviating from the common curve of the other acids. With mastic rosin only HCl , HBr , and HNO_3 coincide, but all unite at high dilns. With As_2S_3 sol $(\text{COOH})_2$ and H_2SO_4 are close together and HNO_3 , HPO_3 and CCl_3COOH are apart. These variations may be explained either by changes in the velocity of the H ions in these solns. or by an influence of the anions. This influence would also explain the effects related in earlier papers (cf. C. A. 19, 2767). JOHN T. STERN

General colloid chemistry. XVII. The analysis and constitution of colloidal gold (3). LEOPOLD FUCHS AND WOLFGANG PAULI. *Kolloidchem. Beihefte* 21, 195-240(1925); cf. C. A. 19, 3401.—Au hydrosols prepd. by reduction of Au salts in slightly alk. soln. with HCHO or H_2 , when thoroughly dialyzed, become slightly acid in reaction. The c_{H} detd. by electrometric titration of the sol with $\text{Ba}(\text{OH})_2$ reached a const. value at about 1×10^{-6} N. Examn. of the ultrafiltrate or of the supernatant liquid after coagulation revealed no Cl^- . The c_{H} value was not due to CO_2 dissolved from the air, to SiO_2 from the glass vessels, or to colloidal org. acids dissolved from the parchment paper dialyzer. The H ions are regarded as the "contra-ions" for the negative Au particles. The Au particles are conceived to be coated with a layer of an auric acid whose disson. provides the H^+ ions and leaves the particles negatively charged. Zsigmondy's theory that the "contra-ions" are Au^{+++} is disproved by the inability to find Au in the ultrafiltrate or the supernatant liquid after coagulation. Since the H ions are the "contra-ions" for the charged particles it is possible by counting the no. of particles per unit vol. to arrive at the av. no. of charges per particle from the detn. of c_{H} . For HCHO sols this was found to be 46,630 and for H_2 sols 35,000. However, if only a very small quantity of the Au is present as amicros, these nos. will be very greatly reduced. The concns. of AlCl_3 and BaCl_2 required to coagulate the HCHO sol were 1.28×10^{-4} N and 1.4×10^{-3} N, resp., and for the H_2 sol 1×10^{-4} N and 1.16×10^{-3} N.

F. L. BROWNE

The colloid chemistry of bismuth and its compounds. A. KUHN AND H. PIRSCH. *Kolloidchem. Beihefte* 21, 78-96(1925).—By changing the dispersity of a therapeutically active substance it is often possible to suppress an undesirable property, such as cauterizing action or painfulness due to protein coagulation, without losing the therapeutic value. Aq. solns. of Bi compds. have not been useful in therapy because of their pain-

fulness. Methods of making colloidal Bi and Bi compds. were studied with a view to their possible use in medicine. *Prepn. of Bi sols.*: Stable sols contg. as much as 3.5 mg. Bi per cc. were made by reduction of solns. of Bi salts with NaHSO_3 in weakly alk. soln. *Prepn. of Bi_2S_3 sols.*: Protective colloids were required to produce stable sols of sufficiently high concn. With 1% gum arabic, sols contg. 10 mg. Bi per cc. were made. *Prepn. of BiSI sols.*: Protective colloids were required to obtain sols contg. 0.3 to 1.6 mg. Bi per cc. 0.5% gum arabic, 0.5% hemoglobin, and 0.25% gelatin were found suitable. *Prepn. of sols in oil of sesame.*: Quite highly dispersed sols were made by incorporation of Bi compds. in wool fat, cooling in liquid air, and vigorous trituration of the mixt. On dissolving in oil of sesame, stable sols resulted. Sols of Bi_2S_3 , BiSI and Bi(OH)_3 were prepd. contg. 12–16 mg. Bi per cc. and 20% wool fat. *Prepn. of sols by elec. dispersion.*: By the Bredig method, stable sols contg. 8 mg. Bi per cc. and 5% wool fat, and sols with 0.6 mg. Bi per cc. and 1% soln. of rubber in ether as protective colloid were made. By using Svedberg's protected arc method stable sols contg. 6 mg. Bi per cc. and 5% wool fat were prepd. F. L. BROWNE

Emulsions, their theory and practice. E. G. BRYANT. *Pharm. J.* **115**, 755–7 (1925); *Chemist & Druggist*, **104**, 6–7 (1926).—An address, with special reference to pharmacy. S. WALDBOTT

Colloidal properties of nitrocellulose sols in mixed solvents. A. HIGHFIELD. *Trans. Faraday Soc.* **1926** (advance proof).—Detns. of the soly. of trinitrophenol in ether-alc.-water mixts. support Hildebrand's amplification of Langmuir's theory, i. e., the polar alc. and water as well as the non-polar ether, are inferior in solvent power to mixts. Addn. of a precipitant, e. g., CCl_4 , to fix the solvent power of nitrocellulose solvents, led to sepn. into phases for which no phase rule diagrams exist. Therefore, recourse was had to falling-ball viscosity detns. With 4% solns. of 12.2% nitrocellulose in ether-alc.-water, viscosity max. occurred between 7 and 11% of water, the point varying with ether/alc. ratio. Similar U curves were found with acetone-alc.-water; nitrobenzene-alc.; aniline-alc.-nitrobenzene; nitroaniline-alc.; ether-MeOH-water; PrOH-ether; BuOH-ether, acetone-benzene; acetone-ether-water. Progressively decreasing N content increases the range of solvent mixts., down to 10.5%, below which soly. diminishes, as is also the case with very highly nitrated cottons. As with other colloid sols, viscosity varies with concn. "None of the general simple equations which have been proposed from time to time holds even approx. over large ranges, a result only to be expected from the complexity of the physicochem. attractions involved." Viscosity also shows an isoelectric point and aging phenomena. The best solvent mixt. contains polar and non-polar groups balanced in optimum proportions. This holds even when the constituents are not separately solvents. JEROME ALEXANDER

Certain physicochemical properties of mixtures of water and acetone. C. SANDONNI. *Atti accad. Lincei* [vi] **1**, 448–53 (1925).—The results of measurements for water-acetone mixts. of the sp. heats at 14–20°, the heats of mixing at 15°, and the sp. gravities, viscosities and surface tensions at 25° render probable the existence of mol. complexes of water and acetone, although the maxima of viscosity and heat of mixing do not correspond with any stoichiometric relation between the constituents. B. C. A.

Solid solutions of water and oxygen. N. S. KURNAKOV. *Ann. Inst. Physico-Chem. Anal. Leningrad* **2**, 482 (1924).—Striking examples of series of compds. of continuously changing compn. are the Fe compds. such as micas, tourmalines, phosphates and borates. With such compds., the gradual absorption of O and the conversion of FeO into Fe_2O_3 do not affect the homogeneity of the crystals but result in continuous variation in the color and optical properties. The mineral vivianite, consisting of a hydrated ferrous phosphate, may also be produced synthetically, and in the first stages of its formation is composed of almost colorless crystals, which retain their form and uniformity, but gradually become blue as absorption of O proceeds. The proportion of water in vivianite crystals may also change continuously, because of the formation of solid solns. of the mineral with water. B. C. A.

The partial pressures of aqueous ethyl alcohol. H. J. E. DOBSON. *J. Chem. Soc.* **127**, 2866–73 (1925).—The partial pressures of H_2O vapor and EtOH from its aq. soln. at 25° have been detd. by the dynamic method. The vapors were condensed by intense refrigeration, and their compn. was detd. by a special pycnometer. The partial pressure curves and the total-pressure curve are plotted as functions of the compn. of the liquid. The data obtained differ considerably from those of Foote and Scholes (cf. C. A. **5**, 3189) and it is suggested that there may be errors in the latter work due to the analysis of the vapors. The partial pressures of H_2O and EtOH, resp., are: for 20.51 wt. % EtOH in soln. 21.78 and 16.66 mm.; for 39.32%, 20.36 and 26.85 mm.; for 56.50%, 19.01 and 32.16 mm.; for 90.12%, 10.68 and 47.40 mm. A. W. K.

The partial formaldehyde vapor pressures of aqueous solutions of formaldehyde.

II. WILFRID LEDBURY AND E. W. BLAIR. *J. Chem. Soc.* **127**, 2832 9(1925); cf. *C. A.* **19**, 1214. The partial pressures of CH_2O from its aq. solns. free from MeOH have been detd. by the dynamic method at 35° and 45°. At the higher temps. there is a more rapid adjustment of equil. conditions in the soln., presumably between the different polymerized and hydrated forms of CH_2O . The vapor pressure curves take the form $\log_{10} p$ (mm.) = $\alpha - B/T$, where $\alpha = 9.17$, $B = 970$, $\alpha_{40} = 9.81$, $\alpha_{45} = 9.87$ and B for all cases up to 40°C. = 2905. The vapor pressures of CH_2O from MeOH soln. and from aq. MeOH soln. have been detd. at 20° and at 0° also for the latter case. It is very much higher than for aq. solns. The MeOH is presumed to bring about an alteration in the equil. between the simple and complex CH_2O mols. in soln.

A. W. KENNEY

The partial pressures of water vapor and of sulfuric acid vapor over concentrated solutions of sulfuric acid at high temperatures. J. S. THOMAS AND W. E. BARKER. *J. Chem. Soc.* **127**, 2820 31(1925). This work is an extension of the measurements of Thomas and Ramsay (cf. *C. A.* **18**, 924) whose data were found to be uniformly low, probably because of adsorption of H_2SO_4 on the glass wool filter, and lack of thermal equil. The vapor pressures were detd. by the dynamical method with air, the partial pressure being calcd. by the formula $p = 760(r_1 + r_2)$, in which r is the vol. of the H_2O vapor or of the H_2SO_4 vapor, r_1 the vol. of air, and r_2 the combined vols. of the H_2O and H_2SO_4 vapors. The perfect gas law is assumed to hold. The satg. vessels were half filled with short pieces of small-bore tubing. The air was run through slowly to avoid mist, and the vapors were absorbed in NaOH followed by CaCl_2 . Solns. contg. 89.2% to 99.2% H_2SO_4 were studied at temps. ranging from 180 to 295°. The partial pressures can be represented by an equation of the form $\log p = \alpha - B/T - \gamma \log T$ for any given concn. The h. ps. obtained from the total pressure curves by extrapolation are considerably too high, but if it is assumed that complete dissociation of the H_2SO_4 vapor occurs, values are obtained agreeing within about 5%. The partial and total pressure isotherms have been constructed for 260°, 230° and 200°. The total pressures exhibit a sharp min. at 98.2% acid. The partial-pressure curves are in qual. agreement with the Duhem-Margules equation, but the quant. agreement is not close, probably because of the dissociation of the acid vapor.

A. W. KENNEY

Vapor pressure and heat of dilution of aqueous solutions. E. P. PERMAN AND TREVOR LOVETT. *Trans. Faraday Soc.* (advance proof), Jan. 10, 1926. —Vapor pressure of aq. urea solns. were measured by the method of Perman and Saunders (cf. *C. A.* **17**, 2528) and are tabulated for concns. up to satn. and temps. of 40°, 50°, 60°, 70° and 80°. The densities of these solns. are given for these conditions. $(\Delta H, \pi_0, \pi)/\alpha(n/N)$ holds pretty well where π_0 is the vapor pressure of H_2O and π is the no. of mols. of urea and N , no. of H_2O . There is evidently no hydration of the urea. Van Babo's law does not hold. The heats of diln. are given for the above conditions. P. and L. used a new *calorimeter* consisting of a Dewar flask, an elec. heating coil to compensate for radiation, and a second heating coil to bring back the original temp. of the flask. The heat of soln. = $E/RT/R$, where E is the p. d. across the coil and R its resistance. At lower temps. the affinity, A , is roughly proportional to the heat of diln., H , but at higher temps., A increases much more rapidly with increasing concn. than H and finally exceeds it. The values of H calcd. from Kirchhoff's equation agree well with the observed values. The soly. of urea at 50° was found to be 68.5 g. per 100 g. soln. as detd. from the intersection of the heat-of-soln. curve with the heat of diln. curve.

D. S. VILLARS

The relation of viscosity and vapor pressure of binary mixtures. N. A. YAINIK, M. D. BHALLA, R. C. TALWAR AND M. A. SOOFI. *Z. physik. Chem.* **118**, 305 17(1925). If the vapor pressure or the viscosities of 2 mixts. be detd. over an extended temp. range a series of temps. will be found at which the vapor pressure or (viscosity) will coincide. If these abs. temps. are represented by T and T_0 , then T/T_0 plotted against T_0 will give a straight line. Accepting the data of Zawidski for the vapor pressure of various mixts. of toluene and bromobenzene, toluene and iodobenzene, benzene and bromobenzene, benzene and ethylene dichloride, propylene dibromide and PrOH , MeOH and EtOH , pyridine and BuOH , pyridine and AcOH , chloroform and acetone, acetone and CCl_4 , CCl_4 and AcOH , CCl_4 and acetone, CCl_4 and EtH , EtH and AcOH , the authors have detd. the viscosities of these same solns. at different temps. between 15° and 80°. From these 2 sets of data discovered the following relationships between vapor pressure and viscosity of mixts. (1) When the vapor-pressure curve is a straight line the viscosity curve is also a straight line; (2) if the vapor-pressure curve passes through a min. the viscosity curve exhibits a max.; (3) if the vapor-pressure curve passes through a max. the viscosity curve shows a min. All formulas for detg. the viscosities of mixts. from the

viscosities of the components are of limited application, probably because they do not take cognizance of association, dissociation or change in vol. on mixing. E. R. S.

Molecular compounds of the phenols. V. Vapor-pressure curves. G. WEISSENBERGER AND F. SCHUSTER. *Monatsh.* **45**, 437-48 (1925); cf. *C. A.* **19**, 1702. —Where an equimol. complex has been inferred from the position of max. deviation of the vapor pressure-composition curve of mixts. of 2 substances, it is shown that the vapor pressure at a concn. c of 1 component should be given by $Pc/(c+1) + Pkc/(c+1)^2$, where k is a const. If the complex formed is of the type 1 mol. 2 mols. the second term of the expression becomes $Pkc/(c+1)^2$. These formulas are in satisfactory agreement with the observed figures for mixts. of cyclohexanol, *o*-, *m*- and *p*-cresols, 2-, 3- and 4-methylcyclohexanol with benzene, of cyclohexanol with EtOAc, and of *o*-, *m*- and *p*-cresols with EtO. But with mixts. of *o*-, *m*- and *p*-cresols with acetone or Et₂O, resp., second-order differences are found, which are represented with satisfactory accuracy by the addition of a further term $k'Pc^2/(c+1)^3$ to the above expression, and are interpreted as due to the formation of the 2 complexes 2 mol. 1 mol. and 1 mol. 1 mol. A similar second-order deviation occurring with mixts. of cyclohexanol with acetone and MeOH, resp., is attributed to association in one of the components. The values obtained for the system cyclohexanol-chloroform are too complex for interpretation. **VI. Behavior of the naphthols, the α -tetrahydronaphthols, and related substances.** G. WEISSENBERGER, F. SCHUSTER AND N. MAYER. *Ibid.* **49**, 55. —Measurements are recorded of the vapor pressure at 18° of solns. of various concns. of α -naphthol in MeOH, β -naphthol in acetone, α -tetrahydro- β -naphthol in EtOH and in acetone, tetrahydronaphthalene in EtOH, acetone, ether, benzene, and hexane, and CHCl₃, cyclohexanone in EtOH, acetone, benzene and CHCl₃, and of anethole in EtOH and CHCl₃, resp., the figures being compared in each case with those calcd. from the van't Hoff relation. The depression of vapor pressure caused by β -naphthol is less than that found with phenol, but the tetrahydro deriv. gives depressions of the same order as phenol. In the solns. of tetrahydronaphthalene, the observed vapor pressures are higher than the calcd. values in all cases with the exception of the solns. in CHCl₃, where expt. gives a lower value. Cyclohexanone causes a depression of vapor pressure only in the solns. in CHCl₃ where complex formation occurs, probably through the O atom of the keto group just as it occurs through the O atom of the phenols. Anethole, again, gives a depression of vapor pressure with CHCl₃ only. Surface tension and viscosity measurements are also recorded for these mixts. B. C. A.

Diffusion experiments in solutions. REINHOLD FURTH. *Physik. Z.* **26**, 719-22 (1925). —F. describes 2 microscopical methods for the study of diffusion phenomena. In the first method (for colored solns.) a square space of 1.2×1.2 cm., 1 mm. high, on a microscope slide with cover glass is bounded and divided into 2 halves (1.2×0.5 cm.) by vertical walls of hard rubber. In the left half through a slit in the long wall a thin sliding partition can be moved, which at first seps. H₂O from soln., in the right half a more dil. soln. of the same substance is placed. By comparing at different moments the color of the left and right fields through a slit diaphragm, perpendicular to the direction of diffusion, and movable parallel to this direction with an ocular micrometer, the progress of diffusion can be followed and measured. In the second method (for uncolored solns.), only one half of the instrument is used with a strongly magnifying objective. The measurements consist in focusing some fixed point on the bottom slide at different moments, reading the tube displacement and calcd. the concns. from the previously detd. n -concn. relationship. A series of detns. and curves on picric acid ($D = 6.5 \times 10^{-6}$), on Congo red ($D = 1.7 \times 10^{-6}$) and on sucrose are given, (where D is the coeff. of Fick's law, $dx/dt = D \cdot d^2c/dx^2$). The values, calcd. from $x^2 = tD(2\psi(1-2\psi))^2$, are valid when x is small relative to the total length of the vessel. Here t is time, x the velocity of diffusion, c the distance at which the const. concn. c is found at a time t , $v = c_0/c$

is diln., and the function ψ is the inverse of a function $\varphi(u) = 2\sqrt{\pi} \int_0^u e^{-y^2} dy$. The condition of this equation that x is proportional to \sqrt{t} for every v agrees well with the exptl. data at low x values. For the detn. of D only a few measurements are necessary. For sucrose (second method) the equation with const. D does not hold. It appears that D is a function of c ; for increasing c , D first falls to a min., then rises. The expts. are being continued. B. J. C. VAN DER HOEVEN

The kinetic theory of compressibility of solutions and binary fluid mixtures. II. K. C. KAR. *Physik. Z.* **26**, 737-9 (1925); cf. *C. A.* **19**, 3197. —The formulas derived for variation of compressibility with concn. agree with Gilbault's empirical formula (*Z. physik. Chem.* **24**, 385 (1897)). Observed and calcd. values for cane sugar, MgSO₄,

Na_2SO_4 , Li_2SO_4 , NH_4NO_3 , SrCl_2 and NaI are in close agreement. Compressibilities for any concn. k were obtained from the relation $\beta_k = I/(I + 2k)\beta_0$, where β_0 is the cubic compressibility of the soln. medium. The theoretical and exptl. curves of the immiscible mixt. CHCl_3 - CS_2 and the miscible mixt. H_2O - CH_3COOH are given, and their divergences discussed in light of the theory. H. R. MOORE

Assemblies of imperfect gases by the method of partition functions. R. H. FOWLER. *Proc. Cambridge Phil. Soc.* **22**, 861-85 (1925).—A discussion by use of partition coeffs. of the general theory of imperfect gases which has been developed with a view to a proper discussion of the equil. state of assemblies of ionized atoms at high temps. The subjects discussed are (1) gaseous assemblies surrounded by fields of forces of short range; (2) partition functions for the potential energy of the whole assembly; (3) further applications of $B(\vartheta)$; (4) dissociative equil. for mols. of finite extension; (5) effects of long-range forces; (6) a direct calcn. of the contributions of intermol. forces to the free energy. Under (5) the validity of the combined use of the equations of Boltzmann and Poisson are carefully examd., with particular reference to the theory of strong electrolytes advanced by Debye and Huckel. This theory can be regarded as established only for "small" values of the ionic concns. E. R. SCHIEFELZ

A property of van't Hoff's plane diagram. K. F. BELOGLAZOV. *Ann. Inst. Physico-Chem. Anal. Leningrad* **2**, 502-4 (1924).—It is shown that van't Hoff's diagram (*Vorlesungen über theor. u. phys. Chemie* **1**, 161) representing the isothermal crystn. of solns. of 2 salts may be adapted to crystn. at variable temp., the satn. isotherms for different temps. being brought into relation to 1 set of axes. Crystn. and the inverse process of dissolution correspond in the diagram with curves combining the isotherms for the initial and final temps. of the process. For such curves, in conformity with Kurnakov's terminology, the name "crystallization paths" is suggested. B. C. A.

The salting-out effect. The influence of electrolytes on the solubility of iodine in water. J. S. CARTER. *J. Chem. Soc.* **127**, 2861-6 (1925).—The effects of NaNO_3 and Na_2SO_4 at 25° and 35° and of NaH_2PO_4 and NaCl at 25° on the soly. of I_2 in H_2O have been detd. The solns. were made slightly acid to prevent the hydrolysis of I_2 . The soly. of I_2 in H_2O ($p_{\text{H}} = 5$) at 0° is 0.836 millimol./l.; at 25°, 1.321; at 35°, 1.808. The effect of salts may be expressed by the equation $\log S = \log S_0 - Kc$, where S is the soly. of I_2 in a salt soln. of concn. c , S_0 the soly. in H_2O . It is to be noted that the range of validity of this formula is much greater when the concns. are referred to a fixed wt. of H_2O rather than to a fixed vol. of soln.; hence they are expressed as mols. per 1000 mols. H_2O . The values of K are as follows: NaNO_3 at 25°, 0.00296, at 35° 0.00243, Na_2SO_4 at 25°, 0.0090, at 35° 0.0087; NaH_2PO_4 at 25°, 0.0062; NaCl at 25° 0.00575. The effect of HNO_3 and H_2SO_4 on the soly. of I_2 is of a wholly different character and follows no simple relation. With HNO_3 the soly. is considerably increased; it is slightly depressed by H_2SO_4 . A. W. KENNEY

The reaction of neutral water and of distilled water. I. M. KOLTHOFF. *Chem. Weekblad* **22**, 590-4 (1925).—The use of Me red as such leads to errors of 2 p_{H} units because of the effects of the acid character of the indicator in the unbuffered soln. Better results are obtained with neutralized Me red (NaOH) or of chlorophenol red (p_{H} of aerated water 5.9-6.0). A weakly alk. indicator like 2,4,6,2',4',2'',4''-heptamethoxytriphenylcarbinol is, however, the best. The Na salt of bromothymol blue may be used for neutral water; it gives a p_{H} of 6.7-6.6 for boiled water if CO_2 is excluded. The possible errors are discussed. B. J. C. VAN DER HOEVEN

The interpretation of the neutralization curves of mixtures of boric acid and polyhydric alcohols. I. M. KOLTHOFF. *Rec. trav. chim.* **44**, 975-82 (1925).—(In English.) Through the work of Magnanini and especially of Böeseken it has long been known that polyhydric alcs., through the formation of a complex, strongly increase the real acidity of a H_3BO_3 soln., but nothing is known quantitatively of the stability of these complexes. It is usually assumed that the stability of the complex formed is proportional to the increase of the real acidity of the H_3BO_3 soln., but results of Verkade (*C. A.* **19**, 1277) with meconic acid suggest caution in drawing this conclusion. From the neutralization curve of a mixt. of H_3BO_3 and a polyhydric alc. some idea of the stability and the dissociation const. of the complex can be obtained. In solns. which contain not more than 20% glycerol the complex const. K_{complex} is as follows: $K_{\text{complex}} = [\text{H}_3\text{BO}_3][\text{glycerol}]/[\text{H}_3\text{BO}_3 \text{ glycerol}] = \text{about } 0.9$, while the dissoc. const. of the complex acid is about 3×10^{-7} . Mannitol, fructose and probably also other polyhydric alcs. form multibasic complex acids in which 1 mol. of polyhydric alc. combines with more than 1 mol. of H_3BO_3 . The compn. of the complexes is dependent apparently on the ratio of H_3BO_3 to polyhydric alc. in the soln. F. J. WITZEMANN

Chemico-physical researches on acid phthalates of terpenic alcohols. V. PAOLINI.

Ann. chim. applicata **15**, 411-3(1925).—The dissocn. const. of acid phthalates of terpenic ales., which are useful compds. in the purification of terpenic ales. (cf. *C. A.* **5**, 3404; **14**, 2173), cannot be detd. by means of the elec. cond. of their solns. [Ostwald]. Neither can the const. be detd. indirectly from the hydrolysis of the Na salts, for the latter cannot be prepd. free of NaOH. Furthermore by mixing dil. aq. NaOH with excess of acid phthalate and filtering, the sol. Na salt cannot be sepd. from the insol. acid phthalate, because despite the insoly. of the latter in H_2O , it was found to be sol. in the corresponding Na salt soln. This latter property was, however, utilized to det. the const. of the acid phthalates by means of the relation: $\log 1/[H^+] = \log 1/K_a + \log S/A$, where $[H^+]$ is the H-ion concn. of the soln., K_a is the dissocn. const., S is the salt concn. and A is the concn. of free acid. A mixt. of dil. NaOH and excess acid phthalate when filtered gave a soln. contg. the Na phthalate of a concn. equal to that of the original NaOH, i. e., S . Titration of this soln. with N NaOH (phenolphthalein) and correction for the error due to the indicator (data obtained from Betti and Bonino to be published forthwith) gave A . $[H^+]$ was then detd. electrochemically, a quinhydrone electrode being used because of reduction of the compds. with a H electrode. K_a can then be calcd. by the equation above. Detns. at different concns. gave the following dissocn. const. (K_a) for 3 compds: 1- β -carbomenthol H phthalate 3.02×10^{-6} ; β -thujyl H phthalate 7.5×10^{-6} ; 1- α -terpineol H phthalate 1.42×10^{-5} .

C. C. DAVIS

The effect of iodine on the conductivity of aqueous solutions of cadmium iodide and potassium iodide. HEINRICH BRUNS. *Z. Physik* **34**, 751-65(1925).—The soly. of CdI_2 was measured over the temp. range from 0° to 85° . The conds. of CdI_2 and of KI were measured over the ranges 5–10% from 20° to 40° , and with added I_2 0–0.5%. The increase of cond. of CdI_2 solns. is due to the formation of complex ions. F. R. B.

The influence of hydrogen-ion concentration on the velocity of dialysis. HELMUT MOMMSEN. *Z. Physik. Chem.* **118**, 347-56(1925).—The change in velocity of dialysis through a parchment membrane brought about by changes of p_H of the liquid cannot be explained solely on the change of permeability of the membrane. The rate is the same for pure H_2O , 0.002 N NaOH and 0.002 N HCl. With urea and grape sugar only a slight increase was observed in acid soln. With electrolytes an increase of p_H increases the rate of dialysis of anions, a decrease in p_H accelerates the rate of cations. This phenomenon can best be explained by assuming that it is due to changes of the elec. charge of the membrane. The membranes used were S & S. 579 thinbles. An extended bibliography is given.

J. R. SCHIERZ

Investigation of the electrical behavior and the ion permeability of membranes. III. Potential of parchment membranes. A. FUJITA. *Biochem. Z.* **159**, 370-8 (1925); cf. *C. A.* **19**, 3274.—In a study of the diffusion of ions through parchment the change of p. d. across the membrane as diffusion occurs is followed. Then the diffusion potential of the same electrolytes is detd., and from these values the membrane potential is calcd. Salts, acids and bases are used. It seems that the mobility of the anions is lowered by the presence of the membrane. The membrane effect decreases with the valence of the cations, with the exception of the H ion. However, the effect of the multivalent anions upon the membrane potential is greater than that of the univalent anions. IV. Potential differences and permeability of collodion membranes. L. MICHAELIS AND A. FUJITA. *Ibid* **161**, 47-60.—The properties of an air-dried collodion membrane differ from an undried membrane in the following ways: it is only slightly permeable to H_2O and dissolved substances, as shown by its membrane potential, as well as by analysis of the solns. of salts used. It is especially impermeable to the OH ion. However, cations form a diffusion series in the same order as their mobilities in H_2O . In this behavior, collodion resembles apple peel, and also parchment, through which diffusion is much more rapid. Capillarity probably plays an important part in the diffusion process.

W. D. L.

Studies of electrical phenomena and ionic permeability of membranes. VII. Permeability of collodion membranes to multivalent cations. L. MICHAELIS AND AKIHI FUJITA. *Biochem. Z.* **164**, 23-30(1925).—The H ion is by far the most readily permeable ion; it is followed in order by Rb, K, Na and Li. With Li the limit is nearly reached where the permeability is still measurable. The collodion membrane is practically impermeable to all other ions: bi-, ter- and quadrivalent cations as well as all anions, even univalent. OH ions must also be included in this group though they are not perhaps as impermeable as other anions, but have a much smaller permeability than Li.

S. MORGULIS

The theory of chemical reaction velocity. II. NIELS BJERRUM. *Z. physik. Chem.* **118**, 251-4(1925); cf. *C. A.* **18**, 1418.—Mainly polemical against the second ar-

ticle of Brönsted (C A 19, 2901). The essential difference between their opinions is that B₁ defines chem reaction velocity as the no. of mols passing through a crit state X in the direction $A \rightarrow B$. This no. is according to B₁ larger for a reversible reaction near or in dynamic equil. than it is for an irreversible reaction, if both have the same initial velocity. Brönsted assumes an unchanging velocity.

B. J. C. VAN DER HOEFEN

Relation between rapidity of stirring and velocity of reaction in heterogeneous systems. (MILLER) A. KLEIN. *Roczniki Chem* 5 [1 3], 138-47(1925); cf. preceding abstr. — For reactions in heterogeneous systems the following equation is shown to hold. $(K-a)^n = \text{const}$, where K is the velocity of reaction with stirring, a the velocity without stirring, and n the no. of revolutions of the stirrer per min. The value of K also depends on the shape and exact position of the stirrer, and is not const. for the same app., but only for each expt. B C A

Reactions of benzoic acid at the boundary of two liquid phases. (MILLER) A. KLEIN. *Roczniki Chem* 5 [1 3], 101-9(1925). The mechanism of the reaction between benzoic acid dissolved in CCl_4 and aq. NaOH is shown to be in agreement with the diffusion theory. The velocity of the reaction is greatly accelerated by stirring and by rise in temp., 10° increasing the velocity by 32%. Benzoic acid in CCl_4 solns. of more than 0.01 N exists in the form of double mols. The partition coeff. of benzoic acid between the two solvents used is 0.00126. B C A

Relation between the temperature and velocity of transformation of metastable non-variant systems. N. I. STEPANOV. *Ann. Inst. Physico-Chem. Anal., Leningrad* 2, 500-2(1924). — Cases are considered in which the velocity of a transformation diminishes when the temp. is raised, use being made of the following equation for the abs. velocity of the transformation of metastable non-variant systems $V = Ka^n(T_0 - T)^n$, where T_0 is the abs. temp. of the equilibrated system, T the temp. at which the transformation occurs, n a positive no., a a no. greater than 1, and K a positive coeff. depending on the units in which V is measured. The significance of each term in this equation is discussed and also the different types possible for the curves representing the velocity. The considerations advanced are in agreement with the results of Cohen's work on the mutual transformations of gray and white Sn. B C A

Time rates of vaporization and chemical changes on surface of contact of two fluids. S. SANO. *Japan J. Phys.* 3, 117-31(1924). On the basis of several thermodynamical assumptions, S. obtains expressions for the rates of vaporization and the chem. reactions on the surface of sepn. of 2 fluids. B C A

Reactivity in the solid state between acidic and basic metal oxides. F. DE CARLI. *Atti accad. Lincei* [vi], 1, 533-7(1925); cf. Mazzetti and de Carli, C A 19, 1106. Heating curves were detd. for equimol. mixts. of basic and acidic oxides. For the mixt. $\text{MoO}_3\text{-BaO}$ reaction began at 290°, the temp. rising to 1200° in 25 sec., and a white friable mass resulting. The thermal effects in the following cases were much weaker and occurred at the temps. indicated: $\text{MoO}_3\text{-CaO}$ 650°, $\text{MoO}_3\text{-PbO}$ 650°, $\text{MoO}_3\text{-SnO}$ 400°, $\text{MoO}_3\text{-CdO}$ about 500°; $\text{MoO}_3\text{-NiO}$ about 495°, $\text{MoO}_3\text{-CoO}$ 410°; $\text{MoO}_3\text{-ZnO}$ 270° and a weaker effect at 720°; $\text{MoO}_3\text{-MgO}$ no reaction. $\text{WO}_3\text{-BaO}$ 190°; $\text{WO}_3\text{-CaO}$ 245°; $\text{WO}_3\text{-PbO}$ 210°; $\text{WO}_3\text{-SnO}$ 265°; $\text{WO}_3\text{-CdO}$ 250°; $\text{WO}_3\text{-NiO}$ 260°; $\text{WO}_3\text{-CoO}$ 255°; $\text{V}_2\text{O}_5\text{-BaO}$ 270°; $\text{V}_2\text{O}_5\text{-CaO}$ 630°; $\text{V}_2\text{O}_5\text{-PbO}$ about 560°; $\text{V}_2\text{O}_5\text{-CdO}$ 480°; $\text{V}_2\text{O}_5\text{-SnO}$ 250°; $\text{V}_2\text{O}_5\text{-ZnO}$ 260°; $\text{V}_2\text{O}_5\text{-MgO}$ 455°; $\text{Cr}_2\text{O}_3\text{-BaO}$ 220°; $\text{Cr}_2\text{O}_3\text{-CaO}$ about 550°. Sn dioxide, Bi_2O_3 , PbO and Al_2O_3 react only with BaO. B C A

The mechanism of reduction. V. H. J. PRINS. *Rec. trav. chim.* 44, 1050-5 (1925)(in English); cf. C A 20, 744. — The dissolution of Pb in a soln. of CH_3NO_2 in AcOH is much slower than in the presence of PhNO_2 . The reaction velocity measured is that of a true reaction velocity contrary to what was observed with PhNO_2 in which case a diffusion velocity was measured. The crit. concn. can be calcd. because the crit. velocity is a characteristic const. for Pb giving the max. amt. of Pb dissolved per min. in AcOH of a given concn. in the presence of a reducible compd. when the surface remains free from adsorbed Pb(OAc)_2 . The activity of the NO_2 group in PhNO_2 is about 65 times that of the NO_2 group in CH_3NO_2 . This difference must be attributed to the positively charged C atom of the C_6H_5 nucleus in accordance with the view of P. on the mechanism of substitution in the C_6H_5 nucleus. The reduction of the NO_2 group starts between the activated H atom of absorbed AcOH and probably the N atom of the NO_2 group. The activity of the latter depends on the magnitude of the positive charge of the N atom. In good agreement with this view is the fact that pos. groups show an increased reducibility if these are linked together in a mol. VI. *Ibid.* 1093-1100. — The influence of the surface conditions upon the velocity of reduction is discussed. Some methods of reduction are compared and the difference between these is expressed in terms

of the condition of the H used for the reduction. Three kinds of active H can be distinguished: (1) An activated H atom in an adsorbed mol. of acid; (2) activated H atoms formed from an adsorbed H^+ ion; (3) activated H in the form of negative H ions. The influence of the surface conditions of the metal is discussed in relation to the course of a reduction. A series of results on the reduction of Ph_2CO with various reducing agents under a variety of conditions is described and the mechanism of the formation of benzopinacol and benzohydrol is discussed in some detail.

E. J. WITZEMANN

Effect of diffusion on time rate of chemical change. S. SANO. *Japan. J. Phys.* **3**, 133-7(1924).—A theoretical discussion.

B. C. A.

Reactions between liquid amalgams and aqueous solutions. (MLLE). A. KLEIN. *Roczniki Chem.* **5** [1-3], 110-37(1925). The velocity of reaction of amalgams of Na and Zn with water, acids, alkalis and salts is investigated. The results obtained are not const. if with Na amalgam water, alk., or NaCl solns. are used; for other solns., the velocity falls with increase in the Na-ion concn. With neutral or alk. solns. a temp. rise of 10° increases the velocity by 46%, while the rate of stirring has no effect on the speed of reaction. The latter, for acid solns., consists of the sum of 2 components, one of which is the velocity of reaction in neutral soln., the other being at any moment proportional to the concn. of acid, to the rate of stirring, and to the temp. (a 10° rise increasing the coeff. of proportionality by 7%). but not to the concn. of amalgam. With Zn amalgam, the velocity of reaction with HCl appears to be proportional to the 4/6th power of the concn. of the latter, and is doubled by a 10° rise in temp. The presence of Zn ions in the supernatant liquid diminishes the velocity of reaction.

B. C. A.

Studies on atmospheric oxidation. II. The kinetics of the oxidation with sodium ferripyrophosphate. J. H. C. SMITH AND H. A. SPOEHR. *J. Am. Chem. Soc.* **48**, 107-12 (1925); cf. *C. A.* **18**, 2131. By studying the order of reaction and the amts. of O_2 absorbed in the oxidation of $KAsO_2$ and Na_2SO_3 by atm. O_2 with Na ferripyrophosphate as catalyst, the authors conclude that in both cases the active oxidizing agent is an intermediate "mol. oxide" (of the type $FeO \cdot O_2$) which is formed. In the case of Na_2SO_3 , however, the assumption that the Fe salt oscillates between its 2 valences is not impossible.

R. E. GIBSON

Contribution to knowledge of reduction-oxidation and autoxidation processes. WILHELM TRAUBE AND WILLI LANGE. *Ber.* **58B**, 2773-90(1925). Chromous salts in alk. aq. soln. are oxidized with liberation of H_2 on addn. of metals of Pt group, either in colloidal form or as salts. If org. materials are mixed with the chromous soln. and the Pt metal, and the soln. is then made alk., they are powerfully reduced, e. g., H_2CN to $MeNH_2$, CH_2ClCO_2H to $AcOH$. Ferrous hydroxide and carbonate slowly reduce water at 100° in alk. soln. with addn. of Pd salts, although manganous and stannous salts give negative results under the same conditions. The reaction is so slow that its velocity may be limited to the rate at which the Pd loses H_2 with the steam and takes it up again from the water. CO reacts with water in the presence of H_2 satd. Pd to form CO_2 , the H_2 content of the Pd increasing. Formic acid is stable in the presence of colloidal Pd, so cannot be the intermediate product. Alkali accelerates the reaction, but it may occur in the vapor phase at the surface of Pd. The mechanism in the presence of free O_2 is probably different in all these cases. The autoxidation of mixts. of glycerol or mannitol with solns. of CuO in aliphatic amines or amino acids gives principally formates.

B. H. CARROLL

The relation of homogeneous to catalyzed reactions. The catalytic decomposition of hydrogen iodide on the surface of platinum. C. N. HINSHELWOOD AND R. E. BURK. *J. Chem. Soc.* **127**, 2896-2900(1925); cf. *C. A.* **19**, 1805, 3198. — The rate of decompn. of HI was followed by the decrease in pressure. Catalysis was effected by a heated Pt wire in a reaction vessel kept in ice. That the action was truly catalytic was shown by the fact that the theoretical change in pressure was observed after complete decompn., and by the fact that the resistance of the wire remained unchanged. The effects of temp. and pressure on the reaction rate were studied and in all cases it appears that the reaction is a simple monomol. one, corresponding to the reaction $HI = H + I$.

A. W. K.

The catalytic hydrogenation of organic substances. OTTO SCHMIDT. *Z. physik. Chem.* **118**, 193-239(1925). Hydrogenation catalysts are generally metals, situated in the minima of atom or ion vol. curves. The absorption of H_2 by them follows a $\sqrt{p_{H_2}}$ relation, i. e., absorption as atoms or as ions. From calorific data the first possibility can be practically discarded. Ionization of H_2 in the metal is the more probable because the work necessary for it is negligible by virtue of the extremely high "dielec. const." of the metal. The smaller the metal ion is, the easier ionization will take place. The primary reaction is $H_2 \rightarrow H_2^+ + e^-$; the second step is uncertain. Using Bohr's original H_2 model, S. calculates roughly at what distance r from the metal ion nucleus an

electron must come to be attracted sufficiently so that ionization of the H_2 mol. can follow. He finds a limiting r for univalent metals of 0.49×10^{-8} cm., for bivalent 0.70×10^{-8} cm., etc. From estns. by Grimm (*C. A.* 15, 3921) of ion diams. the radii of $Ni^{++} < Co^{++} < Fe^{++}$ and $Zn^{++} < Cu^{++}$ fall below these limits. Ag^+ , Au^+ and Pb^{++} are too large, and no data are available for Pt metals. These theoretical predictions are well borne out by the facts; e. g., pure O-free Zn is a more powerful catalyst than Cu. Expts. on powdered Fe, Co, Ni, Cu, Ag, Au, Zn and Pb as catalyzers for the $C_2H_4 + H_2 \rightarrow C_2H_6$ reaction are given in detail. At higher temps. the activity increases as is generally to be expected from the $e^{-\theta/RT}$ proportionality of the degree of ionization; also the H_2 mol. probably then can approach the metal nucleus more closely. The actual hydrogenation process takes place in the metal between dissolved ionized H_2 and dissolved C_2H_4 . Presence of metal oxides is unessential; it sometimes even prevents hydrogenation; presence of small amts. of a second metal (V, Cr, Mo, W, U, Mn) may promote the reaction considerably by preventing the sintering of the metal surface. In the second part of his paper S. gives the results of expts. on the surface and hydrogen absorption of Ni powders. The surface was estd. by dissolving the powder in dil. (2.5%) HCl and weighing before and after a short interval (11 sec.). The decrease in wt. can be taken as proportional to the surface. From expts. of homogeneous Ni powders (Schoop process) and Ni plates the velocity of attack was found to be 1.6×10^{-7} g. Ni/sq. cm. per sec. The surface of a Ni powder depends on the temp. of reduction of $NiCO_3$. At 300° a much more active powder can be obtained than at 500° , while at 800° it is entirely inactive. The mean surface per g. Ni was detd. as 10^6 sq. cm. No difference in lattice structure between the 350° and 600° catalysts was found. In the absorption expts. only part of the H_2 could be pumped off; this part followed a $\sqrt{p_{H_2}}$ law; at higher temps. more H_2 can be recovered. For strongly sintered powders the H absorption diminishes when the temp. rises; this agrees with the exothermic character of the process (+ 11.4 cal. according to Foresti). If P represents mg. H taken up per g. of Ni and O the surface per g. of the powder the quotient P/O at 20° and 760 mm. pressure is of the order 10^{-5} . This means that at low temps., when the H cannot be pumped off, the gas is held near to the Ni surface by loose bonds, probably as negative ions.

B. J. C. VAN DER HOEVEN

Actions in the presence of carbon. C. SANDONNINI. *Atti accad. Lincei* [6], 2, 427-32 (1925).—The use of substances to render reactions sensitive to light that are not so otherwise has led to many interesting results. Recently Rosenmund, *et al.* (*C. A.* 17, 3837) and Piccard (*Helv. Chim. Acta* 5, 117 (1922)) developed some addnl. data. S. has studied the catalytic action of powdered C and since it is a good absorber of many kinds of radiation wished to det. its influence on processes sensitive to light. The C used was especially prepd. as described and contained only traces of SiO_2 . The $(CO_2H)_2$ soln. of known titer was boiled under a reflux condenser in transparent quartz. The illumination came from an arc lamp 15 cm. from the flask. After illuminating 3 hrs. the $(CO_2H)_2$ solns. were unchanged. The addn. of C was without effect. When 0.01 g. uranyl sulfate (I) was added to 100 cc. $(CO_2H)_2$ soln. 10-12% was decompd. in 3 hrs. I + C gave a decompn. of only 6-7%. 25 cc. of 1% p - $BrC_6H_4SO_3K$ (II) + 25 cc. 20% KOH + 5 drops 5% $CuSO_4$ illuminated while boiling gave results different from those obtained by R. *et al.* (*l. c.*). A series of expts. in the dark and the light was carried out. Without any catalyst a trace of KBr was formed in the dark and 1.5-2.0% II was decompd. in the light. With 0.20-0.05 g. C 0.85-0.65% II was decompd. to give KBr in the dark and 2.75-2.3% in the light. With 0.0012-0.0003 g. Cu 3.8-4.2% II was decompd. in the dark and 7.8-6.5% in the light. With both Cu and C 23.7-10.7% II was decompd. in the dark and 26.3-14.3% in the light. The results show that the action of C alone is quite weak, that Cu acts as R. *et al.* observed and that C + Cu are strikingly active even in the dark. The action of C is thought to be due to its dispersive action on the Cu by which its active surface is increased. Expts. with other more active samples of Cu prepd. according to P. (*l. c.*) and R. *et al.* (*l. c.*) support this suggestion.

E. J. WITZEMANN

Varieties of thorium oxide and their catalytic action in the dehydration of alcohol. G. R. LEVI. *Atti accad. Lincei* [6], 2, 419-22 (1925).—The oxide acts as an energetic catalyst in the formation of C_2H_4 from EtOH (Sabatier and Mailhe, *C. A.* 4, 2633). L. wished to examine the varieties of Th oxide in relation to their structure and their catalytic power. Seven varieties of Th oxide were prepd. For *a*, *b* and *c*, $Th(SO_4)_2$ was pptd. with NH_4OH and after prolonged washing dried at room temp., at 80° and at 120° , resp.; *d* was the oxide prepd. from *a* dried at 340° ; *e* was the oxide obtained from *a* at 1050° ; *f* was the meta-oxide obtained from oxalate by heating at 750° ; *g* was the meta-oxide obtained from the nitrate by heating at 750° . *a*, *b*, *c* and *d* were all amor-

phous while e , f and g were cryst. as shown by their photograms. In the tests on the formation of C_2H_4 by the use of these preps. no appreciable differences could be detected in their catalytic action. The amorphous preps. showed no tendency to become cryst. by heating at 340° with EtOH vapor. I. J. WITZEMANN

The catalytic phenomena which accompany the solution of zinc in acids. M. TZENTNERSHVER and M. STRAUMANIS. *Z. physik. Chem.* **118**, 415-37(1925).—T. and S. detd. the velocity of soln. of Zn in 0.5 N HCl and 0.5 N H_2SO_4 to which had been added varying amts. of salts as catalysts. The plate of Zn (av. diam. 1.2 cm) was immersed in the acid, while the soln. was being stirred (117 r. p. m) the H_2 escaping was collected and measured. The velocity const. was calcd from the formula $K = [(11206 \times 2.303V)/F(t_n - t_0)] \times \log_{10} [(11206 C_0 V - v_0)/(11206 C_0 V - v_n)]$ in which F = area of Zn, t_n = elapsed time, t_0 = length of induction period (time elapsed before all catalyst has been pptd.), C_0 = concn. of acid at beginning in ϵ . equiv./cc., V_n vol. of gas evolved to t_n , v_0 = vol. evolved during induction period. K is dependent upon the character of the ppt., the area of the Zn, the amt. of catalyst, the speed of stirring. Even in parallel detns. it may vary as much as 20%. In 0.001 M concns. the salts of Fe, Ag, Sb, Bi, Cu, As, Co, Au, Ni, Pt increase the velocity of soln. of Zn in the order given. Cd forms a cryst. ppt. but prevents soln., Tl reacts similarly, Pb forms a smooth coating which prevents action of the acid, Sn and Hg are also without positive action. Certain oxidizing salts ($KMnO_4$, $Na_2Cr_2O_7$, $(NH_4)_2MoO_4$, $(NH_4)_2WO_4$) have an accelerating effect in proportion to their oxidizing power. The oxides of the metals of the acid radical act as the catalysts. The effect of overvoltage is discussed in another paper (cf. following abstr.). E. R. SCHIERZ

The overvoltage of hydrogen on finely divided metals and its relation to the catalytic action of metals on the solution of zinc. M. TZENTNERSHVER and M. STRAUMANIS. *Z. physik. Chem.* **118**, 438-46(1925).—The overvoltages of finely divided Zn, Tl, Sn, Pb, Bi, Cd, As, Cr, Cu, Au, Sb, Ni, Ag, Co, Fe, Pt, which varied from 0.78 to 0.005 v. (Pt), in the presence of a vigorous evolution of H_2 were measured but showed no relation to the velocity consts for H_2 evolution (cf. preceding abstr.). The smoother the deposit of the metal the higher the overvoltage. H_2 possesses a definite min. overvoltage for each c. d. characteristic for each metal. With Zn and Bi the overvoltage decreases with decrease in concn. of electrolyte. From this investigation C. and M. conclude that the theory of Ericson-Aurén and Palmar does not explain the phenomena accompanying the soln. of Zn. E. R. SCHIERZ

Autocatalyses with variant catalysts. Febrile biperiodic reactions. A. QUARTAROLI. *Gazz. chim. ital.* **55**, 619-38(1925).—In speaking of autocatalyses with variant catalysts Q means variant not only as to quantity but also quality and thus efficiency. In the previous paper (C. A. **19**, 1524) the case of the formation, in the course of the reaction, of a catalyst that varies not only in quantity (it accumulates for a time) as in the case of ordinary autocatalysts, but undergoes changes with the diminution of the concn. of the reacting substance (H_2O_2), was described. Most of the reactions of metallic oxides with H_2O_2 represent ordinary autocatalytic processes. The behavior of Cu was strange. $Cu(OH)_2$ decomps. an alk. soln. of 3-1% H_2O_2 slowly and then 1% solns. tumultuously, giving in the first case a black ppt. and in the second case a green one. These expts. have been extended and the detailed results are given in tables and graphs. In the case of Cu and Tl there are evidently 2 febrile periods with a period of min. intensity between. This effect appears to be due to the successive formation of different catalysts depending on varying conditions of concn. of H_2O_2 in the course of the reaction. This is made evident in the case of Cu by the changes in the color of the ppt. (brown-black, dark green, apple-green, blue-green). It is thought that a black peroxide is 1st formed and that later when the diln. of H_2O_2 has become sufficient a green suboxide of great activity is formed to which the 2nd most intense period is due. In fact Cr, Mn, Fe, Co and Ni form peroxides with H_2O_2 in alk. soln. but there is doubt about the formulas for these peroxides because they are difficult to isolate from the system in which they are formed without alteration. Ag, Au and Hg oxides are reduced in alk. soln. but it is undecided whether the metals or the suboxides are the intermediate products. Cu occupies an intermediate position between these 2 groups. The weakly active Cu peroxide formed at a concn. of 1.5% H_2O_2 has an activity that agrees well with the succession $Co < Ni < Cu$. The time necessary for 1 mg. of these oxides to decompose $1/2$ of the H_2O_2 in a 3% soln. is a few mins. with Co, 100 mins. with Ni and 200 mins. with Cu at 45° . On the contrary the action of the active green suboxide of Cu corresponds to that of the suboxides of Ag and Au. All the above relates only to solns. contg. 1.66% NaOH. The 3 phases of action of Cu are summarized thus: (1) The little intense febrile period of slow formation and accumulation of the peroxide to a max. of concn. and then the

beginning of the reduction of this to normal oxide, (2) the period of stagnation with max. accumulation of normal oxide; (3) the intense febrile period with reduction of normal oxide to suboxide and accumulation of this nearly to the end. In this way the zone of concn. of H_2O_2 in which it passes from an oxidizing action to a reducing action is quite restricted in solns. which are already quite dil. The position of this zone is changed by changes in the alky. On diminishing the alkalinity this zone is moved toward lower concns. of H_2O_2 . In the case of Ag and especially with Au and Hg nothing occurs in alk. H_2O_2 soln. except reduction, which increases with the alkalinity. With Pb, which is more oxidizable than Ag, Au and Hg, if the alky. and, consequently, the reducing action are weak a very active peroxide is formed, if the alky. is stronger there is a period of intense febrile action after which when the ratio between H_2O and NaOH falls, a lower less active oxide (PbO or $Pb(ONa)_2$) is formed. With Tl the catalytic action is due to peroxides above Tl_2O and to special labile oxides between Tl_2O and Tl_2O_3 and the transformation of the 1st into the 2nd through the inactive Tl_2O_3 explains the 2 periods for Tl. Small changes in concn. affect these processes greatly. Thus with 1 mg. CuO in 1.66% NaOH the velocity of decompn. of H_2O_2 on passing from 1.25% H_2O_2 to 0.75% becomes 20-30 times greater. The effect of uniting 2 catalysts ($Cu + Pb$) is considered in detail.

E. J. WITZEMANN

Graphic methods of representing equilibria in systems of three components. G. G. URAZOV. *Ann. Inst. Physico-Chem. Anal. Leningrad* **2**, 482-3 (1924). U. develops methods for the graphic analysis of the equil. in systems of 3 components characterized by the existence either of a stable chem. compd. or of a compd. melting with decompn., the formation of solid solns. between the components being excluded in both cases. Application of the method of "crystallization paths" permits of the detn. of the compn. of any point within the projected triangular system, and of the order in which solid phases are deposited; it is also possible to foretell the no. of breaks in the cooling curve for a mixt. of any compn.

B. C. A.

Equilibrium diagram of ferrous oxide and silica. O. VON KELL AND A. DAMMANN. *Stahl u. Eisen* **45**, 890 (1925). The equil. diagram for $FeO-SiO_2$ mixts. shows 2 eutectic points (1115° and 1075° at about 40% and 1% SiO_2 , resp.), and a max. at 1503° with 30% SiO_2 in the mixt. corresponding to the compd. $2FeO \cdot SiO_2$. With more than 45% SiO_2 present, the m. p. is too high to be detd. accurately.

B. C. A.

The fusion curves of the systems, benzene *m*-xylene, toluene *m*-xylene and *m*-xylene-*p*-xylene. AKIRA NAKATSUCHI. *J. Soc. Chem. Ind. Japan* **29**, 31 (1926).—The f. ps. of the solns. of various components of the systems, C_6H_6 -*m*- C_6H_4Me , C_6H_5Me -*m*- $C_6H_4Me_2$ and *m*- C_6H_4Me -*p*- C_6H_4Me were measured and the fusion curves of the systems were drawn. The f. ps. of these components are 5.6° for C_6H_6 , 95.7° for C_6H_5Me , 50.5° for *m*- C_6H_4Me and 13.15° for *p*- $C_6H_4Me_2$. The heats of fusion of the components calcd. from the data obtained were 1150 cal. for C_6H_6 and 2400 cal. for *m*- $C_6H_4Me_2$.

K. K.

The fusion curves and some physical properties of the system, benzene toluene. SHINROKU MITSUKURI AND AKIRA NAKATSUCHI. *J. Soc. Chem. Ind. Japan* **29**, 25.9 (1926).—The f. ps. of the solns. of various compn. of C_6H_6 and C_7H_8 have been measured and the fusion curves of the system were obtained. The f. ps. of both components are 5.56° for C_6H_6 and 95.7° for C_7H_8 , and the eutectic point is at -103° and 85% of C_7H_8 . The heats of fusion of the components are calcd. from these data by the thermodynamical formula: 2490 cal. for C_6H_6 and 1100 cal. for C_7H_8 at their m. p. The sp. gr. and the refractive indexes of the system have been detd. at 20° . As an application, the compns. of fractions of the distillate from a light oil were detd. by the measurement of their f. ps.

K. K.

Equilibrium in the system methyl acetate-water-methanol-acetic acid. G. J. BURROWS. *J. Chem. Soc.* **127**, 2723-8 (1925). The equil. const. (K) of the above reaction is studied in solns. contg. relatively small amts. of H_2O and definite quantities of HCl. The effects of dilg. the system with H_2O , MeOH and an indifferent solvent like acetone are also recorded. K depends not only on $[H_2O]/[HCl]$ but also on the amts. of MeOH and acetone in the reaction mixt., being diminished if any one of these factors is increased. HCl displaces the equil. in virtue of its effect on the activity of the H_2O present. By taking this into account B. obtains a const. value of 7.0 for K in reaction mixts. in which $[HCl]$ varies considerably. Copious numerical data are given.

R. E. GIBSON

Equilibria in systems with phases separated by a semipermeable membrane. XI. Systems in which a substance other than water diffuses through the membrane. F. A. H. SCHREINEMAKERS. *Verslag Akad. Wetenschappen Amsterdam* **34**, 675-84 (1925).—

A continuation along the same lines of previous papers (cf. *C. A.* **20**, 137). Also in *Proc. Acad. Sci. Amsterdam* **28**, 812 (1925). B. J. C. VAN DER HOEVEN

The influence of pressure on the equilibrium of binary systems. I. N. A. PUSHIN AND J. V. GREBENSHCHIKOV. *Z. physik. Chem.* **118**, 276-94 (1925). The eutectic point of a binary mixt. ($A + B$) under high pressure tends to shift in the direction of the component B which has the smaller dt/dp deriv. It is thus possible to come from the soly. curve of B by an increase of the pressure via the eutectic to the soly. curve of A . The soly. curves of 1 substance at higher pressures will become less and less parallel. Exptly., these predictions were verified by detns. of t , p and c for a eutectic mixt. and soly. curves (pyrometric method, cf. *C. A.* **19**, 2158). Diphenylamine, urethan and nitroanisole, resp., have the following values of dt/dp , 0.0277, 0.0215, 0.0103; 0.0051, 0.0234-0.0195 for 1 and 2000 atm. The equil. of the system, 85 mol. % urethan-15 mol. % diphenylamine was examd. at the eutectic point. The eutectic point 32.2°, 1 atm., 39 mol. % diphenylamine shifts continuously to about 51.6°, 17.5 mol. % for 1550 atm. For urethan- p -nitroanisole mixts. the eutectic goes from 31.2°, 36.5 mol. % p -nitroanisole at 1 atm. to about 53.29 mol. % at 2550 atm. Some expts. are given on the Na-Hg system; no evidence for the above given rules is, however, obtained because the dt/dp values of the components differ only slightly. B. J. C. VAN DER HOEVEN

Reduction equilibria of zinc oxide and carbon monoxide. C. G. MAIER AND O. C. RALSTON. *J. Am. Chem. Soc.* **48**, 361-71 (1926). The equil. data for the reaction $\text{ZnO}(s) + \text{CO} = \text{Zn}(g) + \text{CO}_2$ are detd. in the range 500-580°, by passing the equil. gases through molten Pb, or better Sn, at the same temp. to dissolve out the Zn, the gases being subsequently analyzed for CO and CO_2 . The standard free energy equation for the reaction is $\Delta F^\circ_T = 17,290 + 4.46 T \ln T - 1.56 \times 10^{-4} T^2 - 3.715 \times 10^7 T^{-3} - 59,7037$. $\Delta F^\circ_{298} = +36,920$. The present data give 85,830 as the heat of formation of zinc oxide, which is in accord with 83,097 found by recalcn. of older detns. The entropy, S°_{298} for ZnO is 10.20 entropy units. Carbon forms during detns., $2\text{CO} = \text{C} + \text{CO}_2$, as a result of the catalytic effect of the zinc surface. A. T. F.

Thermal behavior of hydrated barium aluminate. G. MALQUORI. *Atti accad. Lincei* [vi], **1**, 115-8 (1925). $\text{BaAl}_2\text{O}_4 \cdot 5\text{H}_2\text{O}$, prepd. by boiling pptd. alumina with satd. $\text{Ba}(\text{OH})_2$ soln. in absence of CO_2 , loses 3 mols. of water at 190°, becomes anhyd. at 310°, and exhibits 2 arrests in the heating curve, at 725° and 1010°, resp., corresponding with 2 stages in the decompn. of the compd. B. C. A.

Nature of aluminium-magnesium alloys. G. G. URAZOV. *Ann. Inst. Physico-Chem. Acad. Leningrad* **2**, 180-1 (1924). Investigation of the m-p diagram and microstructure of alloys of Mg with Al shows that these 2 metals form 3 series of solid solns. In the first Al dissolves up to 11 at. % Mg, in the second Mg dissolved up to 7 at. % Al, while the third contains between 37 and 59 at. % Mg. The m-p diagram consists of 3 branches, corresponding with the temps. at which the first crystals of the 3 series of solid solns. appear. B. C. A.

The proposition of establishing a second thermochemical standard. (Reply to M. W. Swientoslawski.) P. E. VERKADE AND J. COOPS, JR. *Bull. soc. chim.* **37**, 1536-10 (1925); cf. *C. A.* **20**, 326. Polymethyl Salicylic acid is recommended as a suitable thermochem. substance. F. C. KRACEK

Thermal conductivity of wires and rods. T. BARRATT AND R. M. WINTER. *Ann. Physik* [iv], **77**, 1-15 (1925). The expression $K = H^2 / pqhV^2 \cot^2 \alpha l$ gives the cond. of a wire or thin rod, and is simplified to $K = H^2 / pqhV^2$ when the length l is great (K is the thermal cond. of the wire, p the circumference of the rod, q the cross-sectional area, h the emissivity of the surface, V the temp. of the hot end, and $\alpha = \sqrt{hp/qk}$. Of these quantities, h is the most difficult to measure. Accordingly, the exptl. methods are designed to secure accurate values for H (the heat supplied in calories per sec. to the hot end of the wire) and V , and the theoretical treatment is designed so that h may be eliminated entirely from the calcs. The technic is based on earlier work (*C. A.* **9**, 2345). Values of K are given for Pt, Ir, Rh, Au, Ta, Mo, various alloys, and for glass, ebonite, graphite and various woods. The mathematical treatment includes a solution of the equation for the fall of temp. along a rod enabling K to be evaluated from H , V , q , and the temp. at any point along the rod. Various cases are discussed and simple formulas deduced so that the result of the work is to place on a sound theoretical basis the exptl. methods developed by the authors for the measurement of K , using very small samples of material. B. C. A.

Black body for optical pyrometer calibration. H. S. ROBERTS. *J. Optical Soc. Am.* **10**, 723-4 (1925).—Details are given for the construction of a black body for use in the calibration of optical pyrometers from the fusion point of a metal. A small piece

of the metal is heated to fusion at the bottom of a graphite or porcelain tube of suitable shape, and the "matching" is done as the metal is observed to melt. The advantages of the procedure are that it gives a direct detn. of the temp. of the black body and that very little of the standard metal is required.

B. C. A.

Latent heat determinations. A. W. SMITH. *J. Optical Soc. Am.* **10**, 711-22 (1925).—A summary of the methods proposed for detns. of the latent heats of fusion and evapn.

B. C. A.

Heats of solution and heats of incomplete reactions. (MLE.) BÉRINGER AND A. TIAN. *Compt. rend.* **180**, 1907-10 (1925).—If a chem. reaction occurs in the presence of a solvent the heat effect is given by $X = Q + Q_1 - Q_2$, where Q is the heat released in the thermochem. expt. Q_1 is the heat of soln. of reactants (1), and Q_2 the heat of soln. of resultants (2), and X is the required heat of reaction. For completed reactions Q_1 and Q_2 are easily measured. They are also measurable for incomplete reactions which can be studied calorimetrically in dil. solns., for Q_1 and Q_2 are given by the algebraic sum of the heats of soln. of all the components of (1) and (2) in a large vol. of solvent S . The problem is quite different if the reaction has to be carried out in concd. solns. Many org. reactions, e. g., esterification, can only be carried out slowly in concd. solutions, and are incomplete. While the equation is still theoretically valid, practically the measurement of Q_1 and Q_2 is possible only when the reaction is either (a) purely catalytic and the catalyst is not in concd. soln., or (b) the reaction is very slow. Methods are indicated whereby approx. values for Q_1 and Q_2 can be obtained under these conditions.

B. C. A.

The heat of combustion of salicylic acid. LÉNDRE BERNER. *J. Chem. Soc.* **127**, 2747-50 (1925).—The heat of combustion of carefully purified salicylic acid is $5233.8 \pm 0.515^\circ$ cal. per g. at const. vol. Wts. are referred to vacuum and the instrument is calibrated with benzoic acid (6324 cal. per g.). Modern procedure is used. Salicylic acid is suitable as a secondary standard for calorimetry.

F. R. B.

Nature of chemical combination—structure of silicon tetrachloride. GEORG JOOS. *Physik. Z.* **26**, 734-7 (1925).—Theoretical deductions of the energy liberated in the binding of Cl^- by Si^{++} . By assuming a mol. of tetrahedral symmetry with each Cl sepd. 2.59 Å U., the energy set free is 2847 and 2301 cal./mol. from electrostatic and thermochem. calcs., resp. The electrostatic value was calcd. by taking into account the magnitude of orbital deformation, as developed by Fajans and J. (*C. A.* **18**, 2103) Fowler's spectroscopic measurements (*C. A.* **19**, 1818) are used to calc. the J values (ionization work). For Si , Si^+ , Si^{++} , Si^{+++} , Si^{++++} the values obtained are in good agreement with F.'s data.

H. R. MOORE

Heats of adsorption and surface tension at the boundary. H. CASSEL. *Physik. Z.* **26**, 862-4 (1925).—A thermodynamical criticism of the work of Iliin (cf. *C. A.* **20**, 135) on the relationship between heats of adsorption and surface tension lowering by adsorption.

F. C. KRACEK

Analogy and difference in the behavior of various forms of energy in reversible and irreversible transformations. E. DENINA. *Gazz. chim. ital.* **55**, 638-45 (1925).—A thermodynamical paper.

E. J. WITZEMANN

Evaluation of the grating energy of crystals. W. WESSEL. *Z. Physik* **30**, 217-24 (1924).—Analysis after the classical fashion of the thermal equil. between the vapors of a salt and its ionized radicals shows that the grating energy of the salt can be detd. from known data and partial pressures of the ions present. The chem. const. involved are calcd. by the method of Born and Heisenberg (*C. A.* **18**, 2837). Direct measurements of the partial pressures of ions are wanting; they are projected by W.

B. C. A.

Electrochemistry of non-aqueous solutions. VI. Electrodeposition of some metals from anhydrous solutions in amyl alcohol, acetonitrile, aniline and quinoline. R. MÜLLER, E. PINTER AND K. PRETT. *Monatsh.* **45**, 525-34 (1925); cf. *C. A.* **18**, 1229. Electrolysis of solns. of Li nitrate or MgBr_2 in acetonitrile and of $\text{Ca}(\text{NO}_3)_2$ in Am alc. with Hg or Pt cathode did not yield the resp. metals, decompn. occurring at voltages below those found for the metal against such solns. On the other hand, cryst. Ag was deposited when solns. of AgNO_3 in Am alc., acetonitrile, quinoline, or aniline were electrolyzed, the potential differences being const. and easily reproducible, so that the reversibility of the Ag electrode is proved with these solvents. Values of the potential differences for various c. ds. in each case are tabulated and represented graphically. The decompn. potential of AgNO_3 is 1.0 v. in Am alc., 1.15 v. in acetonitrile, 2.15 v. in quinoline and 0.5 v. in aniline soln.

B. C. A.

The influence of an electrostatic charge on the surface-conductivity of a rock-salt crystal. P. VAILLANT. *Compt. rend.* **181**, 915-7 (1925).—A salt crystal is embedded

in a mica and in touch with Sn electrodes in such a way that it can be charged up to 92 v. on one side. The other pole of the battery is earth-connected. The current produced on the other side by a 74-v. battery across a 1-mm. slit between the electrodes is measured by a galvanometer in microamp. The current through the body of the crystal is negligible. At 25° over dil. H_2SO_4 the current is increased 1.08 times by a pos. charge and decreased 0.91 times by a neg. charge.

JOHN T. STERN

The electrical conductivity of some silver-zinc alloys in quenched condition. G. J. PETRENKO. *Z. anorg. allgem. Chem.* **149**, 395–400(1925).—Careful cond. detns. at 25° and 100° confirm the existence of a compd. ZnAg , stable up to the m. p., 694°, which was assumed previously on thermochem. evidence.

JOHN T. STERN

Electromotive behavior of cupric oxide. R. E. W. MADDISON. *Trans. Faraday Soc.* **1926** (advance proof).—In the cell $\text{Pt} | \text{CuO}, \text{Cu}_2\text{O}, N \text{ NaOH} | N \text{ NaOH HgO} | \text{Hg}$, the CuO , Cu_2O electrodes initially have a relatively high potential; this drops some 40 milliv. to different values after several weeks. A bibliography is given. The temp. of prepn. of CuO influences the initial and final p. ds. of the electrodes. O_2 occluded on the electrode does not seem to be the cause of variation in the results. It has not been possible to conclude definitely for or against the polymerization hypothesis of Allmand (cf. *C. A.* **4**, 1947).

D. S. VILLARS

Electrode capacity and resistance of electrolytes for a wide range of frequencies. B. B. BANERJI. *Trans. Faraday Soc.* **1926** (advance proof).—Polarization capacity at an electrode varies with the frequency according to the formula, $y = (\alpha + \beta x)/(x + \gamma)$, where x is $(\text{frequency})^2 - 10^6$ and y is capacity in microfarads. The consts. α , β and γ are, resp., 12.8, 0.71, 0.63 for Ag electrodes in AgNO_3 (10 g./100 cc. at 18°); 35.9, 0.716, 0.541 for Cd in CdSO_4 (15 g./100 cc. at 19°); and 13.7, 2.85, 2.2 for Ni in 2 N NiSO_4 . These results can be explained mathematically as being due to 2 condensers in series, one of them leaky; the latter is due to the double layer and the other that caused by concn. changes brought about by the transport phenomena. From the above consts. are calcd. the capacities and resistances of the leaky condensers and the true cond. of the above solns. are found to be 0.0436, 0.036, 0.042 mhos, resp.

D. S. VILLARS

Contact rectification by metallic germanium. ERNEST MERRITT. *Proc. Nat. Acad. Sci.* **11**, 743–8(1925).—A systematic investigation of the current-voltage sensitivity of Ge with contacts made by pressing various metal surfaces against the Ge specimens. Fe and Al give almost identical curves when “Ge to contact e. m. f.” and “e. m. f. contact to Ge” as abscissas are plotted against currents as ordinates. The results indicate a close connection between the direction of the rectified current and the thermoelec. effect. Finally, a study of the behavior of Ge contacts at temps greater than the reversal point has shown that the resistance of the contact on cooling is always greater. This is ascribed to the presence of a high-resistance oxide film.

H. R. MOORE

Data on the flow of electric current in quartz. V. E. WHITMAN. *J. Optical Soc. Am.* **12**, 31–43(1926).—The current is of the order of 10^{-16} amp. for a p. d. of 360 v. maintained between the 2 opposite sides of the specimen. The dielec. const. of fused quartz is 3.88 ± 0.02 ; *cryst. quartz*, 4.04 ± 0.04 .

H. R. MOORE

The use of the mercury cathode in anodic oxidation processes. I. SHCHERBAKOV. *Z. Elektrochem.* **31**, 617(1925).—Additional exptl. precautions to those in (*C. A.* **20**, 551), with particular reference to the use of a diaphragm for the sepn. of the supplementary hard metal (Fe) electrode.

GEORGE L. CLARK

Thermodynamic potential differences at the boundary of two liquid phases. III. SERG. VOZNESENSKII AND K. ASTACHOV. *Z. physik. Chem.* **118**, 295–300(1925); cf. *C. A.* **19**, 3204.—The distribution of HCl and H_2SO_4 between H_2O and phenol, and the e. m. f. of cells contg. HCl , H_2SO_4 or H_3PO_4 in distribution equil. between the aq. and phenol phases are measured. No new phenomena are described, and the measurements are of low precision.

F. C. KRACEK

The determination of p_{H} in fluids and suspensions. Practical application of Einar Billmann's quinhydrone electrode. C. W. G. HETTERSCHIJ AND J. HUDIG. *Chem. Weekblad* **23**, 2–3(1926).—For routine detn. of soil acidity the quinhydrone electrode is superior to any other method, because the potential is rapidly established and is const. Around p_{H} 7 the results are somewhat low, but soil p_{H} is usually below this value. One operator can make 240 detns. in 1 hr. A set of 8 cells (centrifuge tubes with a Pt electrode in each) is connected with a comparison quinhydrone electrode by means of an agar-KCl bridge and a 9-point contact. The 9th point affords connection with a normal cell for the standardization of the storage batteries. The potentiometer described in the following abstract and a Leeds-Northrup galvanometer are used for

the measurements. Nine cc. of the fluid is shaken with 50 mg. of quinhedrone and allowed to stand 2 min. before the measurement.

MARY JACOBSEN

A new method for determination of dielectric constants of electrolytes of high conductivity. H. HELLMANN AND H. ZAHN. *Physik. Z.* 26, 680-2(1925).—The "second Drude method" (a system of parallel wires, bounded on one side by a liquid condenser) is modified in that the damping of (Barkhausen) high-frequency oscillations at resonance in a circuit contg. the condenser is used as a measure for D instead of the place of the resonance point itself. The amplitude measured is compared with that obtained on replacing the condenser by a resistance wire of known inductivity. From curves of the resonance amplitudes as functions of the cond. σ of the soln. it is shown that between very low and very high σ values a sensitive range exists in which the amplitude varies considerably with D ; for a damping decrement of zero for the rest of the app. a ratio of 6:1 for $D = 50$ and 81 is possible. Low decrement of the instruments is absolutely essential. The sensitivity range can be varied by varying D or frequency; for D about 80 and using the shortest waves obtainable it lies around $\sigma = 0.05-0.1$ (5% NaCl).

B. J. C. VAN DER HOEVEN

The quantum theory of the dielectric constant of hydrogen chloride and similar gases. I. PAULING. *Proc. Nat. Acad. Sci.* 12, 32-5(1925).—Calcs. on the quantum theory. The exptl. points lie much nearer to a type of curve required by the classical theory.

GEORGE L. CLARK

Diamagnetism of nematic substances. G. FOEX AND L. ROYER. *Compt. rend.* 180, 1912-3(1925).—The magnetization coeff. of *p*-azoxyanisole in the solid state is independent of temp. At 116° , the nematic phase appears and the magnetization diminishes abruptly by about 17%, because of orientation of mols. by the magnetic field. The nematic phase ($116-134^\circ$) shows great variations of the magnetization coeff. with temp.; the value approaches the original value as the temp. increases and remains const. when the liquid phase is attained. The curve, magnetization coeff.-temp. may be produced to 95° for the nematic phase and the max. difference observed between 2 magnetizations in the liquid and nematic phases is greater than 18%. Whenever the substance solidifies, a different value is observed for the coeff. because of imperfect distribution of the tiny crystals making up the solid. Anisaldazine gave similar results.

B. C. A.

Magnetization of ferro-nickel (alloys) (thermomagnetic properties). M. PESCHARD. *Compt. rend.* 180, 1475-8(1925); cf. *C. A.* 19, 2773, 2907.—Alloys contg. more than 34.4% of Ni (Fe_2Ni) are reversible in the sense that their magnetic properties disappear and reappear at the Curie point, while alloys contg. less than this amt. of Ni are irreversible. If sufficiently cooled the latter acquire a strong magnetization which is connected with the change of the Fe from the γ to the β modifications. Under certain conditions, alloys in the " β " state exhibit reversibility. The various cases possible are discussed and the exptl. results expressed diagrammatically.

B. C. A.

Electrical birefringence of limonene. R. DE MALLEMAN. *Compt. rend.* 180, 1483-5(1925); cf. *C. A.* 18, 1078, 3527.—The Kerr const. for limonene has been detd. M.'s method measuring elec. birefringence (*Ibid* 176, 380(1923)) being used. The rotatory power remains const. within the limits of exptl. error in the elec. fields employed. The birefringence is small and positive in sign. The value of the Kerr const. in abn. units, 6.5×10^{-8} (15° , 0.546μ), is intermediate between the values of benzene and of toluene and about 4 times that of pinene. The significance of this no. from the point of view of structural formulas is discussed.

B. C. A.

Measurement of the light-scattering coefficients of some saturated vapors. SCOTT EWING. *J. Optical Soc. Am.* 12, 15-26(1926).—The intensity of the scattered light was detd. over the temp. range $0-100^\circ$ for Et_2O , C_6H_6 , CHCl_3 , EtOH and MeOH , and was compared with the intensity of the incident light by a photographic method. The effective wave length of scattering was found to be 4446 \AA . U. with a probable error of 7 \AA . U. Coeffs. of scattering deduced exptly. are in good agreement with the measurements of Ramanathan and with theoretical values calcd. from the Einstein-Smoluchowski equation. In using the E.-S. equation, the compressibilities β were estd. from the velocity of sound in the vapors, their ds. and sp. heats. The values of ρ (ratio of intensity of vertically and horizontally polarized components of scattered light) were taken from the literature.

H. R. MOORE

Colors shown by Nobili's rings. B. N. CHUCKURTI. *Proc. Indian Assoc. Cult. Sci.* 9, 82-91(1924).—Nobili's rings may be obtained with a variety of cathodes and electrolytes, but the finest display results when a brass plate is used in PbSO_4 or MnSO_4 soln. The rings consist of granular particles of metal or oxide and are largest ($d = 500 \mu$) near the center and smallest ($d = 275 \mu$) at the periphery. It is suggested

that the colors are due to diffraction by these granules, and the similarity to metal colors produced by heat is pointed out.

Very thin, transparent metal foils. CARL MÜLLER. *Z. Physik* 34, 43-6(1926).—A review (cf. *C. A.* 20, 525) and Brit. pat. 230,456 (*C. A.* 19, 3225).

B. J. C. VAN DER HOEVEN

Determination of the viscosity coefficient of water in absolute value (LEROUX) 1.

HENDRICKS, BERNARD CLIFFORD AND HAMILTON, CLIFF S.: **Student's Laboratory and Study Guide for General Chemistry.** Lincoln, Neb.: University of Nebraska. 194 pp.

HOPKINS, B. SMITH AND NEVILLE, HARVEY A.: **Laboratory Exercises and Problems for Chemistry.** Champaign, Ill. 55 pp.

KLYCE, SCUDDER: **Sins of Science.** Boston: Marshall Jones Co. 432 pp. \$3.00. Reviewed in *Ind. Eng. Chem.* 18, 324(1926).

NERNST, WALTHER: **Theoretische Chemie.** Revised ed. 1926. Stuttgart: Verlag von Ferdinand Enke. 926 pp. Paper M. 46, bound M. 50.

LEGENDRE, R.: **La concentration en ions hydrogène de l'eau de mer.** Paris: Les Presses Universitaires de France. 287 pp. Fr. 30.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The absorption coefficient for slow electrons in mercury vapor. R. B. BRODE. *Proc. Phys. Soc. London* 38, 77-9(1925); cf. *C. A.* 19, 2778; 20, 332. M. F.

Atom theory and mechanics. NIELS BOHR. *Naturwissenschaften* 14, 1-10 (1926).—A lecture.

B. C. J. VAN DER HOEVEN

Atoms and X-rays. F. W. ASTON. *Brit. J. Radiology*, Roentgen Society Section, 22, 3-13(1926).—This presidential address for the Roentgen Society is a semi-popular account of the advances made in the study of atomic structure by the use of X-rays.

EDITH H. QUIMBY

The diamagnetic and paramagnetic rotation of the polarization plane. R. LADENBURG. *Z. Physik* 34, 898-906; *Physik. Z.* 26, 685-6(1925).

H. C. UREY

A registering apparatus for photographing directly the transmission curves of absorbing substances and spectral effects. CARL MÜLLER. *Z. Physik* 34, 824-32 (1925).

H. C. UREY

The quadratic stark effect in the alkalis. W. THOMAS. *Z. Physik* 34, 586-601 (1925).—Theoretical.

H. C. UREY

The perturbation mechanics of molecule models. LUCY MENSING. *Z. Physik* 34, 602-10(1925).—M. concludes that, if the electrons of 1 atom of a diatomic mol. do not simultaneously revolve about the other atom, then the resultant moment of momentum will be in general along the line of nuclei. Special cases where it is perpendicular to the line of nuclei are given. It would never be oriented at an acute angle to the line of nuclei.

H. C. UREY

The dependence of atomic vibration frequencies of elements in the solid state on pressure. H. ZIRK. *Z. Physik* 34, 894-900(1925).—Mathematical.

H. C. UREY

The normal cathode fall in krypton and xenon. A. GÜNTHER-SCHULZE. *Z. Physik* 34, 549-52(1925).

H. C. UREY

Remarks on the theory of atomic structure. P. JORDAN. *Z. Physik* 33, 563-70 (1925).—A discussion of the normalization of quantum numbers following Pauli's (*C. A.* 19, 2450) and Heisenberg's (*C. A.* 19, 3064) theories on the multiplicities of spectral lines.

H. C. UREY

World-geometrical properties indicated by quantized world-lines of the electron in the hydrogen atom. E. REICHENBÄCHER. *Z. Physik* 32, 505-17(1925).—From a consideration of the relativity geometry of the quantized electron orbits in the H atom, it is deduced that the electron is characterized by a fundamental "proper time," h/m_0c^2 (h = Planck's const., m_0 = mass of electron at rest, c = velocity of light); at the end of this time, or some multiple of it, the electron must return to its original condition, or emit radiation.

B. C. A.

Equilibrium of the calcium chromosphere. E. A. MILNE. *Month. Not. Roy. Astr. Soc.* 85, 111-41(1924).—A full soln. is obtained of the problem of the equil. under radiation pressure of an atm. consisting of atoms supposed to possess only 2 stationary

states--the normal and 1 excited state. This special case of the general problem of equil. corresponds fairly with an atm. absorbing spectral lines derived from the normal state of the atom, such as the principal series of Na, Ca, Ca^+ , etc. The law of d. deduced for an atm. fully supported by radiation pressure is that the d. at any point is inversely proportional to the square of the height of the point above a certain fixed level. For an atm. only partly so supported, the law is quite different, and the d. decreases exponentially with height. The least departure from exact balance between radiation pressure and gravity at great heights should cause an overwhelming concn. of the atmosphere into the lowest levels. This is in agreement with the great variations observed in the height of the Ca chromosphere. Conclusion: The high-level Ca chromosphere of the sun must be fully supported by radiation pressure. The investigation confirms M.'s previous est. of the life of an excited atom deduced from solar data.

B. C. A.

Diamagnetism and the size of ions. G. JOOS. *Z. Physik* 32, 835-9(1925).--The distance of the outer electrons from the nucleus is calculated from Langevin's theory and agrees remarkably well with the result obtained from the theory of the crystal lattice.

B. C. A.

The relative size of atoms and ions. RITA BRUNETTI. *Atti accad. Lincei* [6], 2, 410-5(1925).--In extending previous work (C. A. 20, 540) B. has investigated the existence of variations in vol. of electronic systems. From the considerations and data developed, it is concluded that while the ions of the alkali metals have a smaller vol. than that of the atoms, the vol. of negative ions of the halogens and of the metalloids is greater than that of the atom.

E. J. WITZEMANN

Polarization of resonance radiation and the duration of excited state. K. R. RAMANATHAN. *Proc. Indian Assoc. Cult. Sci.* 9, 93-102(1925).--The changes of polarization of the resonance radiation of Hg vapor in weak magnetic fields (Wood and Ellett, *Proc. Roy. Soc.* 103A, 396(1923); cf. C. A. 18, 1610) can be explained by taking into account the Larmor precession of the orbit of the electron round the direction of the magnetic field, and the finite duration of the excited condition of the atom. The duration of the excited state required to explain the decrease of polarization in Hg vapor resonance when a magnetic field is applied parallel to the direction of observation, and perpendicular to the incident beam of light, is consistent with Wien's detn. of the same quantity (C. A. 18, 2107). The changes in intensity and polarization of the resonance radiation when the Hg vapor is mixed with H, He, Ar, or air (Wood, C. A. 17, 493) can be explained by assuming a finite time of excitation of the atom, and that the effect of a collision is either to destroy the radiation or to disturb the polarization so as to make its direction random.

F. G. T.

Ray emission in vacuum. HERMANN AUER. *Ann. Physik* 77, 658-84(1925).--Radiation from a heated gray and a black electrode is discussed.

J. T. STERN

Lorentz and the hypothesis of light quanta. P. ZEEMAN. *Physica* 5, 325-30(1925).--Review.

B. J. C. VAN DER HOEVEN

The translation of kinematical and mechanical relations into terms of the quantum theory. W. HEISENBERG. *Z. Physik* 33, 879-93(1925).--An attempt is made to develop a quantum mechanics such that the observed frequencies and amplitudes of the light emitted by atoms shall be those entering into the "motion" of the particles composing the atom. This is done by assuming that the motion can be expanded into a periodic function similar to a Fourier expansion but having the quantum frequencies required by the Bohr frequency condition instead of the usual frequencies of the classical mechanics. The amplitudes are those required to give the intensities of the light emitted. The quantum condition is stated in the form of a difference equation. The energy of the steady states of an inharmonic oscillator and a rotator is derived and it is found that half quantum nos. are to be used for the inharmonic oscillator and that the energy of the rotator is of the form const. $(n^2 + n + 1/2)$, where n is the quantum no. The frequency in the "motion" is shown to be equal to $(W_1 - W_2)/h$ as required by the Bohr frequency condition. The Goudsmit-Kronig-Hönl intensity formula is derived (cf. following abstr.).

H. C. UREY

Quantum mechanics. M. BORN AND P. JORDAN. *Z. Physik* 34, 858-88(1925).--An extension of the work of Heisenberg (cf. preceding abstr.). It is shown that Heisenberg's quantum mechanics can be most easily handled by means of the mathematics of matrices and his method of multiplication, the quantum condition, etc., are expressed in terms of matrices. The original must be consulted for details. The more outstanding features of the system are: the frequency in the "motion" is the quantum frequency; time can be eliminated from the equations so that the terms mechanics, motion, velocity, etc., have no real meaning; the steady states, measured frequency and amplitudes as

detd. by the light emitted remain. The inharmonic oscillator is considered in detail and the entire soln. secured without reference to classical mechanics and the correspondence principle. An electromagnetic theory of light in terms of matrices is suggested. H. C. UREY

Commercial production of radium, mesothorium and helium. R. B. MOORE. *Ind. Eng. Chem.* **18**, 198–211 (1926).—Perkin Medal address in which the work of M. and his collaborators of the Bureau of Mines in the production of Ra, MsTh and He is reviewed and compared with other methods. The history of the use of He in aviation, including the Army and Navy developments, is also related in detail. S. C. L.

Uranium X, its extraction and estimation. RAJENDRALAL DE. *J. Sci. Assoc. Maharajah's Coll.* **2**, 43–52 (1925).—By using a β -ray electroscope and very thin films, the amt. of U X in a sample of $\text{UO}_2(\text{NO}_3)_2$ purified in 1921 was detd. The method of extn. was to dissolve the salt in a satd. soln. of NaF and then carry down the U X with a colloidal sol of $\text{Fe}(\text{OH})_3$. Various explanations of the process are offered

MARIE FARNSWORTH

Observations on space radiation penetrating to sea level. G. HOFFMANN. *Physik. Z.* **26**, 669–72 (1925).—H. previously found (*C. A.* **18**, 3001) that the ionizing radiation present in a brass vessel with 2-mm. walls at Koenigsberg had a power of 4.70 J (one J produces one ion pair per sec. in one cc. of normal air), inside 3-cm. lead armor 1.56 J, 12-cm. lead 1.00 J. In order to test for more strongly penetrative space radiation expts. were made inside 32 cm. lead; 0.96 J was measured. This proves that besides the own radiation of armor and instruments some radiation penetrates from outside but only $1/8$ of that calcd. from the 1.4 J. (Kolhörster) value for open-air radiation at sea level. The latter value is apparently too high. H. even feels inclined to assume that this small amt. of strongly penetrative radiation is solely due to the presence of known Ra elements (γ -rays). He gives evidence that even 32 cm. lead does not entirely hold back short γ -waves (the coeff. of absorption may be as low as 0.18 per cm). In a discussion of the original Hess expts. (*C. A.* **7**, 3568) it is shown that because of the scattering instead of absorption of γ -rays by light elements (water and air) Hess' principal arguments are invalid.

B. J. C. VAN DER HOEVEN

The dispersion constants and critical electron velocities of molecular hydrogen. H. SCHÜLER AND K. L. WOLF. *Z. Physik* **34**, 343–6 (1925).—It is possible to calc. the dispersion of H by means of the formula $n-1 = c_1/(v_1^2-v^2) + c_2/(v_2^2-v^2)$ by substituting for the characteristic frequencies v_1 and v_2 values corresponding to the wave lengths $\lambda_1 = 942.6$ A. U. and $\lambda_2 = 734.5$ A. U. (13.1 and 16.8 v. resp.). These 2 characteristic frequencies are assumed to be centers of gravity for some absorption spectrum of the hydrogen molecule.

H. C. UREY

The excitation of the spectrum of hydrogen by electron collision. P. M. S. BLACKETT AND J. FRANK. *Z. Physik* **34**, 389–401 (1925).—It is shown experimentally that in 1 collision between an electron and a H_2 mol. the H_2 can be decomposed into a normal atom and an excited atom and that the continuous spectrum appears at the same time. When a discharge tube is in the red condition (at. H) the Doppler effect of the H_α line is small but when the tube is white (mol. H_2) this line shows a large Doppler effect even at liquid-air temps. This must be due to the velocity of sepn. of the 2 atoms of the mol. It is suggested that the sepn. of the atoms is due to an electron being removed very suddenly to a higher energy level so that the nuclei are under a large force of repulsion, resulting in their sepn. into a normal atom and an excited atom moving with high velocity.

H. C. UREY

Lead peroxide as a detector (in wireless telegraphy). J. CAYREL. *Compt. rend.* **181**, 1127–8 (1925).—A piece of PbO_2 from a storage-battery plate or a film of PbO_2 deposited electrolytically on a Pb, Pt or C plate possesses, under certain conditions, intense detecting properties, the detecting current passing from the plate to the point. Al, Mg, Ca, Zn, Sn, etc., points can be used without special precautions. Pt, Au, Ag, Ni, Cu, Fe, etc., points do not ordinarily detect, but can detect if the contact is exceedingly light. If sliding contact is used instead of a permanent contact, detection is extremely sensitive, irrespective of the nature of the point. With 2 points of the same nature, better detection is obtained with the lighter contact and the one having the smaller contact area. With 2 points of different nature, the degree of detection depends mainly on the nature of the resp. points. Above a certain current d. detection ceases, so that a fairly large contact point, or a sliding contact, should be used. The favorable action of a sliding contact may be due to the suppression of coherence when the passing of the current through the contact tends to produce.

A. PAPINEAU-COUTURE

Red limit and work of escape of photoelectric electrons. R. SUHRMANN. *Z. Physik* **33**, 63–84 (1925).—The curves of photoelectric sensitivity for Pt, Au and Ag near

the red limit were measured with the most delicate instruments possible. All 3 metals show the influence of surface films, but only Pt and Au show any considerable diminution in emission after continued heating at a high temp. to remove occluded gas—probably H in the case of Au and Pt, O in that of Ag. From the curves characteristic consts. can be deduced by applying the theory of thermionic emission, and the value for the work of escape and the red limit can be calcd. for zero abs. A temp. scale can be constructed and the photoelectric cell may be used as a total-radiation pyrometer.

B. C. A.

The energy required to split hydrochloric acid into atomic ions. E. C. KEMBLE. *J. Optical Soc. Am.* 12, 1-13(1926).—A new analysis of the band system of the HCl mol. is given, taking into account the displacement of the lines due to the isotopic effect. —Preliminary studies showed that the current flowing from a Pt foil to a grid in a tube designed for detection of secondary emission increased when the foil was illuminated with light from a C arc, tungsten-filament lamp, and a Nernst lamp. With an improved app. the velocity distribution of the secondary bundle was detd. for incident electrons of 4-12 v. velocity and with a negative p. d. of 15 v. applied to the foil. The effect of light is attributed to a diminution of electron reflection, since with opposing fields its action is negligible (cf. Farnsworth, *C. A.* 17, 235; 19, 1092). Further, it was impossible to demonstrate a systematic dependence of the effect on the velocity of the primary electrons, possibly because the intensity of the reflected bundle is not influenced by a high velocity of incident electrons. The conclusion is reached that light exerts a purely thermal effect in accentuating secondary emission, since no change was noticed in studying restricted spectral regions from the ultra-violet to the infra-red, and identical results were obtained on illuminating the back side of the foil. This evidence frustrates a possible photoelec. interpretation of the effect.

H. R. MOORE

A characteristic effect produced by bombarding platinum with slow electrons. ERIK RUDBERG. *Medd. Vetenskapsakad. Nobelinst.* 6, No. 12, 9 pp.(1925)(in German). —Preliminary studies showed that the current flowing from a Pt foil to a grid in a tube designed for detection of secondary emission increased when the foil was illuminated with light from a C arc, tungsten-filament lamp, and a Nernst lamp. With an improved app. the velocity distribution of the secondary bundle was detd. for incident electrons of 4-12 v. velocity and with a negative p. d. of 15 v. applied to the foil. The effect of light is attributed to a diminution of electron reflection, since with opposing fields its action is negligible (cf. Farnsworth, *C. A.* 17, 235; 19, 1092). Further, it was impossible to demonstrate a systematic dependence of the effect on the velocity of the primary electrons, possibly because the intensity of the reflected bundle is not influenced by a high velocity of incident electrons. The conclusion is reached that light exerts a purely thermal effect in accentuating secondary emission, since no change was noticed in studying restricted spectral regions from the ultra-violet to the infra-red, and identical results were obtained on illuminating the back side of the foil. This evidence frustrates a possible photoelec. interpretation of the effect.

H. R. MOORE

Molecular refraction of simple compounds. K. F. HERZFELD AND K. L. WOLF. *Ann. Physik* 78, 195-203(1925); cf. *C. A.* 19, 1223.—From dispersion data of NaCl and KCl conclusions are drawn on mol. refraction calcs. of simple salts with ions similar to those of noble gases. The characteristic wave length of the cation is calcd. from the relation $Q = Q_G + Q_E = N_A h \nu = 289/\lambda$, where Q_G is the Coulomb fraction of space energy, and Q_A is the electron affinity of the free Cl atom. The "electron no. per ion" is a fundamental datum, and is estd. from the total no. of electrons of the corresponding noble gas. The dispersion attributed to the main term is produced by 95% of these electrons, and the remaining 5% is ascribed to the resonance line or characteristic frequency secured from the limit of continuous absorption. With this method the mol. refractivities of the anions and cations of the halide alkali salts are calcd., and are found to be in substantial agreement with the data of Fajans and Joos (*C. A.* 18, 2103) and Spangenberg (*C. A.* 18, 488). The following values of the electron affinity of the halide ions in kg. cal. are given: F 105, Cl 88, Br 89, I 81. Finally, data are given for the mol. refraction of the O ion in alk. earth oxides, and similarly the fractions attributable to the cations and anions, resp., for the H halides.

H. R. M.

Diffusion of slow electrons in an electric field. G. HERTZ AND R. K. KLOPPERS. *Physik. Z.* 26, 868-70(1925); cf. *C. A.* 19, 2908.—The mean wandering velocity or diffusion of electrons in an elec. field is a function of the mean free path, velocity and the elec. field. In several detns. a const. accelerating p. d. is maintained between a wire supported in the center of a tube and 2 plates placed equidistantly. When the ratio of the currents for 2 different p. ds. is plotted against $V_2 - V_1$ (difference of the applied voltages), curves are obtained in Ne and A which bear a formal resemblance to the curve developed from theoretical considerations.

H. E. MOORE

Action of visible light on electrodes. RENÉ AUDUBERT. *J. phys. radium* 6, 313-22(1925).—When light from a 20-amp. Hg arc maintained at 110 v. and from a 2500-c. p. W N₂-filled lamp is allowed to fall on electrodes of Hg, Ag, Cu and Au immersed in solns. of their salts and other inorg. salts, e. m. fs. of the order of 10^{-7} to 5.0×10^{-7} v. are produced. Gas occlusion vitiates the reproducibility of the results. Some attempt was made to study the variation of the effect with wave length, and in general

the threshold frequency of the photovoltaic effect was displaced to higher frequencies for the more electropositive metals. The photovoltaic effect thus bears a resemblance to the photoelec. effect, although V in Einstein's fundamental equation $eV = h\nu - h\nu_0$ is a function of the incident luminous intensity. E. m. fs. resulting in the movement and diffusion of ions mask the primary electron emission occurring at the electrodes. Hence $e = \phi(I, C, T)$, denoting intensity concn., and temp., resp. Athanasiu's interpretation, attributing the photovoltaic effect to chem. action and heat effects at the electrodes is criticized in the light of these new results (cf. Athanasiu, *C. A.* 18, 1243, 3008).

Action of light on chlorine dioxide. H. BOOTH AND E. J. BOWEN. *J. Chem. Soc.* 127, 510-3(1925).—In the abstract in *C. A.* 19, 2453 "ClO" should read "Cl₂O."

H. R. MOORE

E. J. C.

Relations involving internal pressure, intensity, mercury transfer, cross-section and electric conditions in mercury-vapor lamps. GEO. S. FORBES AND P. A. LEIGHTON. *J. Optical Soc. Am.* 12, 53-63(1926); cf. *C. A.* 19, 1093, 2915. —Numerous curves establish the dependence of internal pressure on cross-section, voltage gradient and current. Internal pressure, however, is independent of the cathode or anode temps., as measured with thermocouple inlets and also arc length within the range 15-37 cm. With increased potential gradients, the positive-ion current gains on the electron current as expected from kinetic considerations.

H. R. MOORE

An attempt to derive the lattice type from the assumption of isotropic polarizable ions. F. HUND. *Z. Physik* 34, 833-57(1925).—A mathematical study of the crystal lattice types to be expected on the assumption of isotropic ions of given charge and polarization const. and a non-coulomb repulsion of the form b/r^n . Three types of lattices are found to be stable, depending on the magnitude of the polarization of the ions. Ions with slight polarization form the coordination type lattice, those with larger polarization form a mol. lattice or a layer lattice. The crystal structures of many substances are discussed.

H. C. UREY

The K β lines in the X-ray emission spectra of the elements phosphorus and potassium. O. LUNDQUIST. *Z. Physik* 33, 901(1925).—It is shown that the intensities and wave lengths of the group of K β lines in the spectrum of P depend on its chem. combination, and also, with the element, on material of the anticathode of the X-ray tube. Twelve different K compds. were tested for a similar effect of the K β lines, but none could be found.

S. K. ALLISON

Continuous X-ray spectrum and Planck's radiation law. A. MARCH. *Ann. Physik* [iv], 75, 711-42(1924).—Mathematical, with a discussion of exptl. results. The continuous background is regarded as a heat radiation emitted by atoms of the anticathode which have been strongly heated by collision with electrons.

B. C. A.

Crystal for wave-length measurements of soft X-rays. L. PAULING AND A. BJÖRKESSON. *Proc. Nat. Acad. Sci.* 11, 445-7(1925).—Hexagonal β -alumina possesses an unusually large grating-const., rendering it very suitable for measurements of soft X-rays. For the line CuK α , the const. is 11.240 A. U. and for AgL α , 11.225 A. U. The difference is a real effect. The crystal gives strong reflection.

B. C. A.

Barium sulfate as a protective material against Röntgen radiation. F. L. HUNT. *Am. J. Roentgenology* 14, 524-8(1925).—BaSO₄ in the form of bricks or plaster is sometimes used as a substitute for metallic Pb as protection against X-rays. Comparisons of plaster (1 part finely ground and 2 parts coarsely ground BaSO₄ and 1 part of portland cement) with various thicknesses of metallic Pb were made, with X-rays of a large range of penetrating power. A "protective coeff." was obtained by dividing the Pb equiv. thickness by the thickness of the plaster. This coeff. varies with the voltage, passing through a max. at 110 kv. for the thickness of plaster used. For complete protection at 100 kv. 3 mm. of Pb is necessary, and at 200 kv., 6 mm. The plaster equivalents are 25 mm. and 70 mm., resp.

EDITH H. QUILMBY

The line and band absorption spectrum of copper and its fine structure lines. HILDEGARD STRÜCKLEN. *Z. Physik* 34, 562-85(1925).—The absorption spectrum of Cu was investigated, a spark under water being used. The line absorption spectrum consists of doublet and quartet systems. The former is due to the excitation of the 4₁ electron and the latter to excitation of one of the 3₁ electrons. The fine structure of the at. lines varies greatly with the conditions of excitation and it is suggested that these are very short bands due to very unstable mols. It is shown that the moment of inertia calcd. is of the expected order of magnitude. An absorption band (probably CuH) with P and R branches at 2240 A. U. is observed and is degraded toward the red. The moments of inertia in the initial and final states are 12.7×10^{-40} and 14.2×10^{-40} g. sq. cm., resp.

H. C. UREY

The theory of broadening of spectral lines. LUCY MENSING. *Z. Physik* **34**, 611-21(1925).—The broadening of spectral lines due to the perturbing fields of neighboring atoms should be greater when the perturbing effect is due to like atoms, since the perturbations will be greater because the frequencies in the motion are commensurable. H. C. UREY

Influence of different nuclei on absorption spectra of substances. J. E. PURVIS. *J. Chem. Soc.* **127**, 2771-6(1925); cf. *C. A.* **18**, 498, 1242, 1434.—The absorption spectrum bands of Ph, PhCH₃, thymol and camphor salicylates are comparable with those of salicylic acid, the difference from the latter and from one another being chiefly in position and strength. The basic nucleus is the chief agent in the sp. absorption of the benzoate, citrate and hydrochloride of caffeine. In the salicylates of theobromine, caffeine, phenazone and quinine the acid nucleus modifies that of the basic nucleus to a larger extent, but least in the quinine compd. In *o*-acetoxybenzoic acid, and in the *o*-acetoxybenzoates of theobromine and quinine the replacement of the H of the OH group by the acetyl group exerts a very great influence on the final absorption. The sp. and general absorption of these substances, therefore, depends upon 3 factors, the nature of the base, the nature of the acid and the presence of H in the OH group. The expts. indicate that the replacement of the H atom of the OH groups by another radical, not itself possessing sp. absorption, decreases the absorption capacity of the other parts of the mol. E. P. WIGHTMAN

Quantum analysis of new nitrogen bands in the ultra-violet. R. T. BIRGE AND J. J. HOPFIELD. *Nature* **116**, 15(1925).—A group of strong bands in the predicted position (cf. *C. A.* **19**, 600) has been analyzed, but the progressions are unexpectedly not related to those of any other analyzed group of N, or of any other substance. The equation for the new group is $\nu = 68,956.6 + (1681.45n' - 15.25n'^2) - (2345.16n'' - 14.445n''^2)$, where n' varies from 0 to 9 and n'' from 0 to 3 only. B. C. A

Hydrogen spectrum of constant frequency-difference. J. W. NICHOLSON. *Month. Not. Roy. Astr. Soc.* **85**, 656-9(1925).—Among the lines of the secondary spectrum of H showing a normal Zeeman effect, and therefore probably of at. origin, a no may be picked out between 3732.25 and 4966.98 Å. U. which have an approx. const. wave-number difference of 1313. Another large group nearer the red end has a wave-number difference which is nearly the same, namely, 1300. The lines of these 2 groups which have certain members in common, are also most characteristically unaffected by the presence of He. They appear to belong to a series spectrum nearer to the Ne than to the He type, and they show a certain resemblance to the nebular and to the Wold Rayet spectra. Another class of lines previously described (*C. A.* **19**, 3220), which show no Zeeman effect, form widely sepd. bands of mol. origin. B. C. A

Infra-red emission and absorption of potassium vapor. A. L. NARAYAN AND D. GUNNAYA. *Proc. Indian Assoc. Cult. Sci.* **9**, 1-14(1924); cf. *C. A.* **18**, 1086.—In K vapor at 500-700°, the existence of Moll's line at 3.65 μ and Paschen's line at 2.72 μ has been confirmed, and a new line at 1.2 μ found. Below about 600°, the vapor exhibits no selective absorption. B. C. A

Absorption spectra of benzophenone derivatives. T. TASAKI. *Acta Phytochim.* **2**, 49-73(1925).—Benzophenone in 0.0001 *M* alc. soln. shows an absorption band at frequency 4000 Å. U., uninfluenced by methylation of the benzene nucleus. *o*- and *p*-hydroxy substitution have a much greater effect than *m*-hydroxy substitution. The *o*-hydroxy deriv. shows 2 bands, while *p*-hydroxy substitution has a bathochromic influence which is much stronger in the dihydroxy derivs. The 2,3,4-substituted compds. show in general a broad band at frequency 3200. Substitution in both nuclei shows in general a greater effect than substitution in one nucleus. The structural formulas of the naturally occurring cotoin, phlorhizin and phloretin are confirmed spectrographically. B. C. A

Opalescence of binary liquid mixtures. J. C. K. RAO. *Proc. Indian Assoc. Cult. Sci.* **9**, 19-60(1924).—The intensity and polarization of light scattered by dust-free mixts. of toluene and AcOH at the ordinary temp. and of MeOH and CS₂ over a range of temps. has been measured. Intensities show max. values at definite concns. and temps.; these maxima are steepest at the crit. temp. and very steep indeed at the crit. concn. The degree of polarization follows a similar course, and at the crit. temp. and concn. the scattered light is almost completely polarized. A formula based on Lorentz's electromagnetic theory is developed to express the amt. of scattering at right angles to the primary beam. B. C. A

The Zeeman effect in spectra of high order. S. GOUDSMIT. *Physica* **5**, 419-23(1925); cf. following abstr. B. J. C. VAN DER HOEVEN

The "g" values of terms in spectra of high order. S. GOUDSMIT. *Naturwissenschaften*

schaften 13, 1090-1(1925).—Preliminary report. When an electron is added to the electronic structure of an ion, the values of the resultant vectorial quanta \bar{R} and \bar{K} (Pauli) may or may not change independently of each other. In the first case the Landé "g" (spectral splitting) factor for weak magnetic fields can be calcd. according to Landé as for normal multiplets of high order. In the second case the J values (J is resultant of R and K) of atom (1) and electron (2) can be compounded immediately to \bar{J} of the complex, only limited by the condition: $\bar{J}_1 - J_2 + \frac{1}{2} \leq \bar{J} \leq \bar{J}_1 + J_2 - \frac{1}{2}$. Calcg. according to the Landé method, G. now finds for g from the g_1 and g_2 values of atom and electron: $\bar{g} = g_1(\bar{J}^2 - \frac{1}{4}) + (\bar{J}_1^2 - J_2^2)/2(\bar{J}^2 - \frac{1}{4}) + g(\bar{J}^2 - \frac{1}{4} + J_2^2 - \bar{J}_1^2)/2(\bar{J}^2 - \frac{1}{4})$. Other cases are briefly discussed. B. J. C. VAN DER HOEVEN

The spectra of hydrogen and helium. S. GOUDSMIT AND G. H. UHLENBECK. *Physica* 5, 266-70(1925).—A discussion of the theory of Wentzel (C. A. 19, 2913). According to W.'s theory the hydrogen and alkali spectra are similar; the electron energy $W(n,k) = RZ^2/n^2$ for both. The spectrum of neutral He can on the same principle be considered as similar to the alk. earth spectrum, the narrow doublets of ortho-He being undissolved triplets (cf. Pauli, C. A. 19, 2450). However, Wentzel's scheme is far from sufficient for explanation of the magnetic properties of the spectrum, particularly the normal Zeeman effect of the H fine structure and the He doublet. B. J. C. VAN DER HOEVEN

Chemiluminescence and heteropolar combination. A. PETRIKALN. *Z. Physik* 32, 569-74(1925).—The decompn. of the iodide of Millon's base is shown to be an endothermic reaction; above 350°, the decompn. is accompanied by the emission of light, the spectrum exhibiting the bands of HgI_2 and the Hg lines 4017, 4359, 5461 Å U; with a specially made spectrograph the line 2537 was obtained. Conclusion: The electron holding the Hg and N atoms together belongs to the 2s orbit. B. C. A.

Theory of diminution of fluorescence. A. PREDVODITELEV. *Z. Physik* 32, 861 71(1925).—The energy absorbed by a fluorescent substance is partly transformed into heat and partly radiated as fluorescence. A relationship is exhibited between the amt. of fluorescence and the sp. heat at const. vol. of the active mols. A method of calcg. the mean energy of the resonators is given and its relation to the amt. of fluorescence is deduced. B. C. A.

The chemical effects in ionized organic gases. S. C. LIND AND D. C. BARDWELL. *Science* 62, 422-4(1925).—This study initiated with C_2H_6 (C. A. 19, 440) has been extended to detns. of the M/N ratios and chem. behavior of the following substances when mixed with Rn: CH_4 , C_3H_8 , C_4H_{10} , C_2H_4 , C_2H_2 , $(CN)_2$, HCN and NH_3 . The satd. hydrocarbons CH_4 , C_3H_8 , C_4H_{10} show the same behavior as pure C_2H_6 ; i. e., they condense with elimination of H_2 instead of decomposing. CH_4 as well as H was found to be a product of condensation of C_2H_6 , C_3H_8 and C_4H_{10} ; for higher polymers small quantities of C_3H_8 and C_4H_{10} were formed. Nothing is known of the exact compn. of the yellowish brown liquid and solid condensates resulting from the action of the α -rays, but it is inferred that they possess some degree of unsatn. or consist of ring compds. since the H/C ratio is 1.8/1. The value of the M/N ratio (no. of mols. reacting per ion pair produced) increases with the degree of unsatn.; thus for satd. hydrocarbons $M/N = 1.4-2$, for double-bonded compds. approx. 5 as in C_2H_4 , and for triple-bonded compds. still higher (e. g., $(CN)_2$, 7; HCN, 10; C_2H_2 , 20). The oxidation of all the above compds is studied except C_3H_8 and HCN. Reaction kinetics of the oxidations of CH_4 and C_2H_6 are in conformity with the principle of the exclusivity of oxidation (C. A. 20, 145). Hydrogenation of C_2H_2 , of C_2H_4 (?) and of $(CN)_2$ and polymerization of C_2H_2 , $(CN)_2$ and HCN have been accomplished. It was found that Na ions are as effective in causing the polymerization of C_2H_2 , $(CN)_2$ and HCN as their own ions. Since the N_2 did not enter permanently into combination, it seems clear that this phenomenon is an instance of a new type of catalysis in the gaseous phase, namely *ionic catalysis*. H. R. MOORE

The absorption spectrum and the photochemical decomposition of acetone. C. W. PORTER AND C. IDINGS. *J. Am. Chem. Soc.* 48, 10-4(1926). A detn. was made of the molal extinction coeffs. for ultra-violet light of gaseous Me_2CO . All the light absorbed is effective in bringing about decompn. By means of Me_2CO filters it was found that radiation corresponding to the peak of the absorption curve does not possess any special significance with regard to the light which brings about the reaction. By means of crotonic acid filters it was shown that decompn. is not dependent upon the presence of the shorter wave lengths within the absorption region. E. P. WIGHTMAN

Visible decomposition of silver halide grains by light. A. P. H. TRIVELLI AND

S. E. SHEPPARD. *J. Phys. Chem.* **29**, 1568-82(1925).—The photochem. darkening of specially prepd. AgBr crystals has been studied microscopically. It is shown that the decompn. occurs in definitely oriented patterns depending upon the growth and structure of the crystals. The visible darkening of the AgBr grains of emulsions was studied statistically. In contrast to the specially prepd. crystals, the decompn. is largely irregular. The visible sensitivity increases with the size of grain in the same emulsion. The lack of parallelism between the developable sensitivity and the visible sensitivity of different emulsions is due to the fact that the visible sensitivity is relatively independent of sensitivity nuclei. A tentative hypothesis is proposed. It is suggested that the photochem. decompn. is oriented in the crystal according to the gradients of ionic deformation, or perturbation of electron orbits following certain directions of growth. Since sensitivity nuclei, as also reduced Ag, will induce marked deformation in contiguous AgBr, the decompn. becomes autocatalytically oriented. This explains the contrast in behavior between the special AgBr crystals and emulsion grains as well as the effect of size.

E. P. WIGHTMAN

Photochemical kinetics (reply to J. Plotnikov). RUDOLPH WEGSCHEIDER. *Rec. trav. chim.* **44**, 1118-20(1925). (In German.)—Reply to P.'s criticisms (*C. A.* **19**, 3427) of the work of W. (*C. A.* **17**, 1747) and of Langedijk (*C. A.* **19**, 2301). W. and L. are in agreement against P.

E. J. WITZEMANN

Production of ozone by silent discharge at low pressures. E. WARBURG AND W. RUMP. *Z. Physik* **32**, 245-51(1925).—Siemens tubes were used in which the passages for the gas varied from 1 to 3.5 mm. in width. The O contained 3.5% of N, and the potential varied from 5000 to 9000 v. As the pressure was reduced the current across the tube increased, but the yield of O₃ diminished, at first slowly, then more rapidly, and for pressures below 200 mm. it was proportional to the pressure. With air the yield of O₃ is greater than the value corresponding with the partial pressure of the O

B. C. A.

Polymerization and hydrogenation of ethylene by means of excited mercury atoms. A. R. OLSON AND C. H. MEYERS. *J. Am. Chem. Soc.* **48**, 389-96(1926).—C₂H₄ in presence of Hg vapor was exposed alone and with H₂ in a quartz vessel at low pressures and moderate temps. to radiation from a Hg lamp. Pressure readings showed that C₂H₄ first decompd. slightly, and then the remainder polymerized. With H₂, C₂H₆ was formed, the rate being proportional to the sq. root of the H₂ concn. A mechanism is proposed

A. W. FRANCIS

Measurements of the energy absorption attending certain photochemical reactions with iodine. B. K. MUKERJI AND N. R. DHAR. *Z. Elektrochem.* **31**, 621-5(1925).—The kinetics of the reactions of I₂ with KCHO₃, K₂C₂O₄, FeSO₄, NaNO₂ were investigated and the true energy absorptions calcd. by subtracting the measured value for pure H₂O in the same reaction cells. (For previous studies of the kinetics of the I₂-NaCHO₂ and I₂-K₂C₂O₄ reactions, see Dhar, *C. A.* **12**, 111; **17**, 3837. For the I₂-FeSO₄ reaction, Banerji and Dhar, *C. A.* **18**, 2634.) A 100-c. p. Pointolite lamp was used as source, and the energies were detd. with a radiomicrometer. Photographs taken with a quartz spectrograph revealed absorption for all solns. of wave lengths in the range 4600-3160 Å. U. The mean wave length 3880 Å. U. was taken for the quantum efficiency calcs., on the assumption that the reactions are due entirely to activation of the I₂ mol. The yields of the K₂C₂O₄, FeSO₄, and NaNO₂ reactions indicate the transformation of only 1 mol. of I₂ for every 28, 15 and 49 hν absorbed, a substantial departure from Einstein's law of photochem. equivalence. For the KCHO₃ reaction, on the other hand, 10 I₂ mols. are transformed per hν absorbed. A possible interpretation is suggested, taking into account the exothermal and endothermal character of the various reactions.

H. R. MOORE

Ozone formation by electron impact. F. KRÜGER AND O. UTESCH. *Ann. Physik* **78**, 113-56(1925).—A repetition of Moeller's work (*Dissertation*, Danzig, 1912) on the action of cathode rays admitted through a Lenard window on flowing O₂. In these expts. a glow rectifier was used in the secondary circuit imparting electrons with an av. velocity of 24-26 kv. O₃ was estd. by liberation of I₂ from neutral KI soln. The ratio of the no. of O₃ mols. formed to the no. of ions produced (*M/N* ratio) was secured by measuring the satn. current in a condenser filled with O₂ of d. sufficient to absorb all the electrons. The no. of O₃ mols. was always in large excess of the no. of ions formed, usually of the order of 20-40 according to the speed of flow of O₂. The distribution of the total energy of the cathode rays was detd., and found to be 5-11% for O₃ formation, 2-4% for secondary rays produced in the gas and 80-90% as heat. The following reaction mechanism is recommended: O₂ + e → O₂* (1), O₂* → O + O (2), O + O₂ → O₃ (3), where O₂* is an energy-rich mol. according to the

Stern-Volmer conception. The formation of O_2^* should, therefore, add to the transformation produced by O_2 ions alone. K. and U. point out that the action of light and electrons in O_2 synthesis should be comparable according to the quantum relation $eV = h\nu$, but a dense stream of electrons of velocity less than the ionization potential of O_2 should be employed for testing the efficacy of the relation. H. R. MOORE

Characteristic reactions induced by light-excited bromine. J. EGGERT, F. WACHNOLTZ AND R. SCHMIDT. *Physik. Z.* 26, 865-8(1925).—A continuation of work previously reported by E., and by E. and Borinski (*C. A.* 18, 3548; 19, 1224) on the photochem. sensitization of Br in the conversion of *diethyl maleate* into *diethyl fumarate*. The reaction is carried out in CCl_4 soln. with the blue light 436 $m\mu$ of the Hg arc. The exptl. characteristics of the isomeric change are given in a table recording the dependence of ϕ , the no. of mols. transformed per quantum absorbed, and α , the no. of Br_2 mols. added, on various conditions. The postulate of the existence of the intermediate compd. diethyl dibromosuccinate in the direct as well as the reverse change is borne out by the facts, although no attempt was made to isolate this substance. At 21° and with 0.1 N Br_2 the values of ϕ and α are 295 and 8.2, resp. These quantities, moreover, are independent of the following factors: (1) light intensity with the limits 1.5-0.25 Hefner candles, (2) ester concn. within the limits pure ester to 70 mols. CCl_4 , (3) reaction temp. The exptl. independence of ϕ of the concn. of Br_2 within the limits 0.03-0.3 N is taken as the essential datum in formulating theories of reaction mechanism. Time of transformation of the maleic ester mol. must be of the order of 3×10^{-11} sec., since this is the approx. duration of the excited Br_2 mol. H. R. MOORE

Dangers in the use and handling of radioactive substances (MARTLAND, *et al.*) 11H.

BUCKY, GUSTAV: *Die Röntgenstrahlen und ihre Anwendung*. 2nd ed., enlarged and revised. Leipzig and Berlin: B. G. Teubner. 120 pp.

CLARK, C. H. DOUGLAS: *Basis of Modern Atomic Theory*. London: Methuen & Co. 292 pp. 8s. 6d.

HOUSTOUN, ROBERT ALEXANDER: *Intermediate Light*. London, New York: Longmans Green & Co. 228 pp.

4—ELECTROCHEMISTRY

COLIN G. FINK

New electric furnace. ANON. *Iron Age* 116, 1453(1925).—The Kay furnace has 2 spouts, 1 at each end. The lining converges toward the spouts and makes possible the pouring of metal from considerable depth below the slag. The position of the electrodes can be altered with respect to the furnace wall so as to prevent the concn. of heat at any particular part of the furnace. A. D. SPILLMAN

New high frequency induction furnaces. DUDLEY WILLCOX. *Metal Industry* (N. Y.) 23, 401-2(1925); cf. *C. A.* 19, 1170.—In the brass melting furnace described the crucible is surrounded by a coil, an in. of insulation sepg. the two. The furnace housing can be lowered away from the crucible so that the latter may be readily poured and any no. of different alloys may be produced. Among the advantages and features of this furnace are: that the crucible is never hotter than the metal and therefore the crucible life is longer; violent stirring results from the induced currents set up in the bath. The crucible is practically the only thing that needs replacing, the efficiency, if operation is just a few hrs. a day, drops off very little. On red brass 303 kw.-hrs. are required per ton on 8 hr. operation, and 286 kw.-hrs., on continuous operation, as against 351 and 273 kw.-hrs., resp., for other types of elec. furnace. High frequency furnaces are also in successful operation in melting precious metals and ferrous alloys and in heat treating steel. A. D. SPILLMAN

Ajax-Wyatt induction furnace for brass melting. ANON. *J. four élec.* 34, 233-5 (1925).—The standard capacity of the European type is 300 to 500 kg. of brass. The furnace requires for a 300-kg. charge 74 kw., 50 cycle, monophasic current at about 440 v. in the primary circuit. The av. for 1 heat is 4.69 kg. per kw.-hr. or about 200 kw.-hrs. per ton with 78.5% efficiency for a 70-kw. furnace. Loss by volatilization is about 1.5%. Production costs are tabulated in francs for a 65:35 brass. Sketches of the furnace are given. C. J. BROCKMAN

Electric furnace linings. G. F. HUGHES. *Metal Ind.* (N. Y.) 23, 487-90(1925).—H. discusses refractory problems in non-ferrous induction and rocking arc elec. furnace

melting, emphasizing furnaces in which the refractory acts as an insulator for the generated heat. In the rocking arc type of furnace for brass melting, asbestos paper is placed next the shell followed by a course of fire-brick. Trouble is encountered in failure of the refractory bushing by which the C electrode is held in the shell wall, it generally being necessary to replace the bushing twice before completely relining. Several days of preheating with a charcoal fire before starting the arc is important. In the *Ajax-Wyatt* type of induction furnace, asbestos paper is placed next the shell followed by a layer of *sil-o-cel* or *non-pareil* brick. In melting yellow brass alloys, $\text{Al}_2\text{O}_3\text{-SiO}_2$ refractory linings have also been used successfully. The desired refractory is one which will permit melting of alloys contg. 80% Cu and over, combined with Zn and alloys of Sn and Cu contg. 1-8% Sn. *Chrome base cements* have given consistently good results.

H. STOERTZ

Power factor problems. E. V. CLARK, E. W. DOREY, *et al.* *Electrician* **96**, 167, 172(1926).

C. G. F.

Electrical manufacture of carbon black. J. J. JAKOSKY. U. S. Bur. of Mines, *Tech. Paper* **351**, 42 pp.(1924)—The ordinary types of app. for the fixation of N by elec. methods proved unsuitable for the production of C black from natural gas. By passing natural gas through an arc formed by direct or alternating current in an exptl. app. it is possible to sep. a considerable proportion of C. It is also possible to produce C black by means of an elec. arc from various oils or org. liquids, e. g., kerosene, gasoline, benzene, creosote, or alc.; O compds., such as creosote, appear to need less expenditure of power than paraffin hydrocarbons. C black produced by such elec. processes compares favorably with the better grades of ordinary C black both in tinting strength and particle size. When dispersed in oil, unlike ordinary C black, it does not tend to agglomerate. The elec. process is considered to have good industrial possibilities, particularly in view of the present uneconomical method of producing C black by burning natural gas.

B. C. A.

The formation of ozone from air under increased pressure. H. V. WARTENBERG AND M. TREPPENHAUER. *Z. Elektrochem.* **31**, 633-6(1925). It has been observed by Warburg (*C. A.* **18**, 1946) that in mixts. of O and N there was a proportionality between the amt. of O_3 formed by elec. discharge and the partial pressure of O, the total pressure of the gas mixt. having been kept const. This fact suggested the study of formation of O_3 at pressures higher than normal. Theoretically an increase in the amt. of O_2 should be expected; on the other hand an increased pressure might affect the discharge. Actually it was found that the amt. of O_3 first increases with increased pressure, but quickly decreases when the pressure exceeds 2 atm. There is no prospect of a technical application of this method, since the necessity of building of gas-tight and more resistant ozonizers renders the production of O_3 too expensive.

EMIL KLARMANN

The production of ozone by high frequency alternating currents. H. V. WARTENBERG AND M. TREPPENHAUER. *Z. Elektrochem.* **31**, 636-41(1925). The influence of the frequency of elec. discharges on the yield of O_3 has been previously investigated (cf. *C. A.* **18**, 24), alternating currents having been applied with a number of cycles up to 10,000. Recently it has been shown by Warburg (cf. *C. A.* **18**, 1946) that the O₂ producing low frequency a. c. induces the formation of a superposed a. c. with a cycle number of about 10^6 ; the latter current, however, produces no O_3 . In order to verify this statement W. and T. studied the formation of O_3 with a c. the cycle number of which was between 10^4 and 10^6 . In pure O the energy yield, expressed in g. O_3 per kw. hr., decreases with the increase of the number of cycles when currents with 500 and 23,000 cycles are compared, the velocity of the O current being the same. An increased velocity of O, however, furnishes an increased energy yield (although a lower concentration) so that currents of 10,000 cycles may give the same energy yields as those of 500 cycles. Currents of 300,000 cycles give practically no yields in a stream of gas of normal velocity. In air higher frequencies do not increase the energy yields, but decrease the formation of NO. The expts. permit the conclusion that there is no pronounced difference between the chem. action of low- and of high-frequency currents. To account for the lower yields of O_3 when high-frequency currents are used, the assumption is made that the acceleration of the impacting electrons must reach a min. value before being able to split O_2 into O atoms; this is prevented by a too quick change of the direction of the elec. field. Similar conditions seem to prevail in the system $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$.

EMIL KLARMANN

The electrodeposition of nickel. C. H. PROCTOR AND O. J. SIZELOVE. *Metal Ind.* (N. Y.) **23**, 415-6(1925).—The value of inert salts in Ni plating solns. and their max. of efficiency is a question which should be detd. Solns. high in Na_2SO_4 are probably beneficial in Ni plating any type of die casting. The following formula for the

castings resulting in a high luster without polishing is. H_2O 1 gal., single Ni salts 12 oz., boric acid 1.5 oz., anhyd. Na_2SO_4 12 oz., NH_4Cl 2 oz.; *brightening agent*, Cd sticks or 5 grains CdCl_2 per gal. of soln. The p_{H} of this soln. should be 5.4, acidulating with HF, temp. 27° , voltage 4–5, anodes 99% Ni, current 10–25 amp./sq. ft. of surface. MgSO_4 can be used in place of Na_2SO_4 , giving a whiter plate. The following formula was used successfully: H_2O 1 gal., MgSO_4 12 oz., single Ni salts 12 oz., boric acid 2 oz., NH_4Cl 2 oz., acidulating with HCl , p_{H} 5.4, brightening agent CdCl_2 . The following formula for electrolytes is also suggested: H_2O 1 gal., single Ni salts 32 oz., CoCl_2 4 oz., MgSO_4 16 oz., boric acid 2 oz., AcOH 0.5 oz.

(Central) Station batteries charged with vacuum tube rectifiers. C. F. BEN-HAM. *Elec. World* 87, 357 (1926).

Artificial (electric) light. ANON. *J. Elec.* 56, 127–31 (1926).—A review.

C. G. F.

The production of metal coatings on Fe (KRÖHNKE) 9. Use of the Hg cathode in anodic oxidation processes (SCHERBAKOV) 2.

WOODRUFF, L. F.: *Principles of Electric Power Transmission and Distribution*. New York: John Wiley & Sons, Inc. 340 pp. \$4.00.

5—PHOTOGRAPHY

C. E. K. MEES

Photochemistry of silver iodide. LÜPPO-CRAMER. *Phot. Ind.* 1925, 1116–7, cf. C. I. 19, 1382.—AgI in gelatin, when sensitized with metol and sulfite, as in the Johnson process, prints out more strongly than when treated with sulfite alone, yet it is more sensitive for development when treated with sulfite alone than with metol plus sulfite. C. is unable, by any means of sensitizing or ripening, to obtain a AgI emulsion of speed even equal to that of a bromide lantern plate. In the case of some iodide emulsions prep'd, he observed an apparent increase in sensitivity by the action of CrO_3 soln. This was found to be due to the action of the H_2O alone, followed by drying; and is attributed to an effect of the swelling and drying of the gelatin on the AgI grain. C. E. K. M.

Photographic sensitometry. A. ODENCRANTS. *Phot. J.* 65, 191–3 (1925).—O. used a 10-volt, 0.5-watt lamp, with filter, and controlled voltage to 0.2%. If 2 curves are plotted, one with the time scale, and the other with the intensity scale, the time scale will fall above the intensity scale. The difference is the Schwarzschild const., which varies with time, temp., developer and probably, gamma. In plate testing, the intensity curve is the most important, the variations being obtained by use of a Sanger-Shepherd step-wedge, which does not require great intensity. O. used 2 different solns. for developing, first soaking the plate in a reducer, and then in the alk. soln., finally stopping development by a rinse in $\text{HC}_2\text{H}_3\text{O}_2$. He recommends that a density curve be given for (1) a standard developer, (2) for process plates with a constant developer, and (3) with the manufacturer's formula, and advises the use of the intensity scale in plate testing.

M. A. YERGER

Enhancing the sensitivity of papers by optical sensitizing. K. JACOBSON. *Phot. Ind.* 1925, 1127–8.—By bathing fast papers, as used for enlarging, in a 1 in 1,000,000 erythrosin soln. to which 2 drops of NH_3 per 100 cc. has been added, for 2 min., washing for 3 min. in change of H_2O , and drying, J. obtains an increase in speed to 2–4 times. The paper may be developed by bright red light, or alternatively by a yellow safelight if a little pinakryptol green be added to the developer. Pinachrome instead of erythrosin increases the speed up to 15 times, but renders the paper red-sensitive and also increases the rate of development, so that it is not easy to avoid fog. C. E. K. M.

Optical sensitizing. II. G. KÖGEL AND A. STEIGMANN. *Phot. Ind.* 1925, 1169–70.—These facts support the generalized photochem. hydrogenation-dehydrogenation theory: Methylene blue is hydrogenated by neoarsphenamine even in the dark; eosin is not hydrogenated in the dark, even on warming, but almost instantly in sunlight or in the light of a quartz lamp, the color returning almost as quickly in the dark unless the insolation has been unnecessarily prolonged; in this case the eosin is irreversibly changed into a strongly fluorescing substance. Instead of neoarsphenamine, hyposulfite, alk. arspenamine, arsenophenylglycine, or Na_3AsO_3 may be used as bleach-out sensitizer.

C. E. K. M.

What do we mean by light-sensitivity? A. STEIGMANN. *Camera (Luzern)* 4,

97-100(1925).—The light-sensitivity of substances has been largely measured by the visible effects produced in photographic processes. These effects, however, are dependent upon both light and dark reactions, the nature of the developer, the complex nature of the sensitive surface, etc. This point is illustrated by the discovery by Shepard of the influence of substances like allylthiourea on the sensitivity of AgBr. What is needed is a true criterion of the inherent light-sensitivity of substances, and an understanding of the conditions on which it depends. Investigation in the field of org. photochemistry will help solve the problems of the photochemistry of the Ag salts. For example, allylthiourea has been found by Kögel and Steigmann to be one of the best sensitizers for bleach-out dyes. The optical sensitizing and desensitizing of Ag salts has also been explained on the basis of org. photochemistry. Under the influence of light certain dyes are assumed to be capable of activating labile H atoms (e. g., in allylthiourea). If this H is taken up partly by the dye, and partly by the Ag halides, with reduction of the Ag salt, optical sensitizing takes place; if the H (which may also be activated by AgBr, or finely divided Ag) is taken up exclusively by the dye, desensitization takes place. M. W. SEYMOUR

Remarks on measurement of densities in parallel light. W. SCHEFFER. *Phot. Ind.* 1925, 1093-4.—Using a Martens photometer under suitable divergent conditions, S. has made comparative measurements of photographic densities in parallel light and in light approaching a numerical aperture of unity. He finds that the steeper gradation in parallel light becomes less marked the finer the grain of the deposit. C. E. K. M.

Measurement of photographic densities. F. C. TOY. *Phot. J.* 65, 164-77(1925).—A sketch is given of work on photographic densities, beginning with the attempts of Hurter and Driffield and Abney (1890). Because of the complexities of the problem it is unlikely that an accepted standard visual method for measuring printing value of photographic densities will be reached. Printing density is defined and a statement made of the variables: (a) printing light; (b) printing medium. Details are given for carrying out the actual measurements. Variation in printing intensity and time of exposure has no effect on printing densities (D_ϕ). The value of a printing density is independent of the kind of plate or paper used in its detn. The effect of quality of light was detd. by varying the voltage on the printing lamp and using a green filter. Little variation was found in printing density. An expression is developed giving the relation between projection densities (D_H) and printing densities (D_ϕ), $D_H/D_\phi = 1 - (1/D_\phi) \log(1-f)$, where f is the fraction of light scattered by the negative being measured. The equation $D_H = kD_\phi$ satisfactorily expresses the relation between printing density and density measured with diffused light for higher values. It is in error in measuring low densities. M. A. YERGER

Photographic development. Measurement of densities and the interpretation of results. F. F. RENWICK. *Phot. J.* 65, 188-9(1925).—R. recommends that a manufacturer should designate the details of development suitable for a given material and that all plates for portraiture should be compared at a gamma of 0.6-0.8 and 0.9-1.1 for plates for general work. Density measurements should be made with diffused light, the diffusing medium being an accepted standard material. The objection is made that the H. & D. system devotes attention only to the straight portion of the characteristic curve, consideration of threshold exposure values being omitted. M. A. Y.

Development in bright light. A. HÜBL. *Phot. Rund.* 62, 461-4(1925); cf. *C. A.* 20, 153, 555.—Desensitizers behave differently with different developers. Pinakryptol green and phenosafranine are insol. in hydroquinol developers and sol. in glycine, metoquinone or elon-hydroquinol when the ratio of elon to hydroquinol is 2:1, or more. Used as a preliminary bath the desensitizer sometimes accelerates development and sometimes retards it. An energetic amidol developer loses its rapidity while a slow hydroquinol developer is accelerated. V. MOVES

Divided development. P. VON JOANNOVICH. *Phot. Ind.* 1925, 1176-8.—After bathing for 1 min. in a soln. of metol 5, hydroquinol, 5, Na₂SO₃ 100, H₂O 1000, plates are transferred to 10% K₂CO₃ soln., in which in 30 sec. (or a few sec. less or more) development is complete. The first soln. may be used to the last drop, but the second must be renewed after about 30 plates have passed through it. C. E. K. M.

P. P. v. Veimarn's opinions on the states of matter in their application to the photographic ripening and development processes. A. SREIGMANN. *Camera (Luzern)* 4, 66-9(1925); cf. *C. A.* 19, 1668.—Fine, highly dispersed crystals may be obtained by mixing either an extremely dil. soln. of NH₃-free, KBr gelatin and AgNO₃ gelatin, or a very concd. soln. of these salts. Large crystals cannot form from the dil. soln. because of the lack of dissolved material; nor from the concd. soln. because of the very slight solv. of AgBr in H₂O and the spontaneous formation of an immense no. of nuclei. Only the

second method is of practical value in the prepn. of emulsions. The use of NH_3 favors the formation of larger crystals by increasing the soly. of AgBr , and thereby reducing the no. of nuclei. Slow mixing and the use of KBr favor the formation of large crystals. The addition of KI favors the formation of smaller crystals and more light-sensitive emulsions. The mechanism of the action of the iodide is explained in detail. S. has developed a means of detecting the presence of $1/40$ mg. of colloidal Au and 1 cu. m. of H_2O , based upon the ability of colloidal Au to catalyze the reduction of certain soln. of Ag salts. The Ag nuclei of exposed plates may be analogously detected by the use of Lumière's intensifier. The difference in the dispersity and color of the Ag deposits on chemically and physically developed plates is explained on the basis of the degree of supersatn. with respect to Ag occurring in the 2 kinds of developing soln.

M. W. SEYMOUR

Interpretation of results of photographic plate tests. O. BLOCH. *Phot. J.* 65, 186-7(1925).—B. notes the important factors that must be considered in making various kinds of photographic plates and points out the characteristics which may be analyzed with the small data.

M. A. YERGER

The prevention of graininess in small negatives. A. STEIGMANN. *Camera (Luzern)* 4, 91-2(1925).—Care must be exercised in the choice of the negative material. The best materials are to be found among plates and films of medium sensitiveness. The use of a pyro developer is recommended, since the oxidation products of the pyro tend to surround the Ag grains, and to prevent development spreading to proximal grains.

M. W. SEYMOUR

New experiments on the effect of color filters. F. FORMSTECHE. *Phot. Rund.* 62, 467-8(1925).—In the printing-out process the use of a yellow filter made from auramine increases the contrast of the image, especially in the middle tones, while the finished picture shows a bluer tone, which is more permanent than the usual red one. A red filter of Ponceau 2R gives soft pictures with a greater tone scale. A green filter produces less than normal contrast but more contrast than the red filter. A blue filter increases contrast and gives a bluish image.

V. MOYES

Effect of a yellow filter on the printing of printing-out paper. M. MÜNZINGER. *Phot. Ind.* 1925, 1094-6.—While AgCl in presence of AgNO_3 has a single sensitivity max. in the near ultra-violet (at about $375 \mu\mu$), the same material after printing out to a rose to violet colored "photo-chloride" has in addition another max. in the yellow-green, thus explaining the steeper gradation obtained by printing under a yellow or green filter.

C. E. K. M.

Palladium toning. F. FORMSTECHE. *Camera (Luzern)* 4, 70-2(1925).—Pd toning is used mostly in combination with Au toning. The chief difficulty with Pd toning is a yellow stain over the whites, consisting of PdS . This is caused by the fact that the AgNO_3 cannot be completely washed out of the print before toning. AgNO_3 and PdCl_2 give $\text{Pd}(\text{NO}_3)_2$, which is hydrolyzed to insol. $\text{Pd}(\text{OH})_2$. $\text{Pd}(\text{OH})_2$ is converted into PdS by "hypo." One remedy is to use NH_4Cl instead of "hypo" for fixing. Another remedy is to ppt. the Ag in the paper by inserting a NaCl bath before toning. This method makes toning slow, and gives yellowish brown tones. These may be avoided by using a Au bath for a short time before the Pd bath. Pure Pd toning is recommended for buff papers only.

M. W. SEYMOUR

Oxidation fog. PATHÉ-CINÉMA. *Bull. soc. franç. phot.* 67, 28-9(1925); cf. C. A. 19, 1384.—Observations of Dundon and Crabtree on the effect of desensitizers, particularly pinakryptol green, in preventing oxidation fog with developers have been confirmed. The desensitizer, basic scarlet N, when added to an elon-hydroquinol developer in the proportion of 1 g. of dye to 1000 l. of developer, is effective in preventing aerial fog.

J. I. CRABTREE

Action of photographic fixing baths and their components on various metals. I and II. M. EULE. *Phot. Ind.* 1925, 1244-5, 1273-4.—The metals tested for their action on fixing baths were Pb , Cu , Sn , Al , Zn , brass and nickel-plated brass. These, in the form of rectangular strips, were immersed, at room temp. for about 40 days, in each of the following solns.: (1) "hypo" 20%; (2) Na_2SO_3 50 g., H_2SO_4 6 cc., H_2O 1 l.; (3) soln. 2 in which 200 g. of hypo per l. had been dissolved; (4) a used fixing bath contg. 20% of hypo, a little H_2SO_4 , and 3.19 g. of Ag per l. The amt. of metal depositing as oxide or sulfide, or passing into soln., and the Ag displaced from the used bath, were compared, and the results summarized in 2 tables. Al , Sn and Pb are, in the order named, the metals least attacked by the fresh acid fixing bath.

C. E. K. M.

Fixing baths and fixing times. E. KARGE. *Phot. Ind.* 1925, 1319-22.—The rate of fixing of Agfa cine positive film is greater in an $(\text{NH}_4)_2\text{S}_2\text{O}_8$ than in a $\text{Na}_2\text{S}_2\text{O}_4$ soln. of corresponding S_2O_4 content, and the optimum concn. in each case corresponds to

about 16% S_2O_3 . In an iodide-contg. emulsion this optimum concn. is higher, fixing is slower, and the superiority of the $(\text{NH}_4)_2\text{S}_2\text{O}_3$ is relatively more marked.

C. E. K. M.

Improvements and simplification pertaining to the dichromated gum process. C. DUVIVIER. *Camera (Luzern)* **4**, 59-63, 88-90, 117-20(1925).—The 2 principal modifications which D. has introduced into the dichromated gum process for making prints are: (1) That the gum and the coloring matter are added, in powdered form, to the soln of $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$; (2) the prints are allowed to "ripen" for 24 hrs. after exposure and before development, whereby the action produced by the light is increased. Full directions are given for carrying out the process according to the method of D.

M. W. SEYMOUR

Interpretation of the H. and D. curve. T. T. BAKER. *Phot. J.* **65**, 181-5(1925).—General summary of the views of various leading workers.

M. A. YERGER

Red filter in the printing-out process. F. FORMSTECHE. *Phot. Ind.* **1925**, 1119.—The use of a red filter of Ponceau 2K in gelatin diminishes the contrast obtained with printing-out paper considerably. In consequence of the color adaptation, the color of the print is a striking crimson. This disappears for the most part in toning and fixing, the loss of density being greater than when no filter is used, so that considerable overprinting is required.

C. E. K. M.

Washing motion picture film. K. C. D. HICKMAN. *Trans. Soc. Mot. Picture Eng.* No. **23**, 62-73.—Motion picture film loses "hypo" exponentially in a rapid stream of H_2O . The actual rate of washing under practical conditions depends on 3 factors: nature and degree of swelling of the emulsion; the rate of stirring of the H_2O ; and the rate of renewal of H_2O in the washing vessel. Washing takes place most efficiently when the rate of diffusion from the film is equal to the rate of diln. in the vessel. As this requires that the H_2O be changed every 0.5 min. such a condition is impracticable. Washing by "changes" or in "cascade" can be made to give rapid washing, especially if vigorous stirring is employed. The nature of town water supplies, the effects of high temps. and partial washing in sea water are examd. The theoretical advice is reinforced in the practical recommendations.

K. C. D. HICKMAN

Visible decomposition of Ag halide grains by light (TRIVELLI, SHEPPARD) **3**.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Proposals of the German Nomenclature Committee for Inorganic Chemistry. R. J. MEYER AND A. ROSENHEIM. *Z. angew. Chem.* **38**, 713-5(1925).—A preliminary report.

AUSTIN M. PATTERSON

Antimony sulfides. L. M. CURRIE. *J. Phys. Chem.* **30**, 205-38(1926).—Pptd Sb sulfides, Sb_2S_3 and Sb_2S_5 , are amorphous solids. All the amorphous products are converted into black cryst. Sb_2S_3 by long heating at approx. 200° . Amorphous Sb_2S_3 in a very fine state of subdivision is yellow while larger particles are crimson; intermediate shades contain particles of intermediate size or are mixts. of yellow and crimson. Maroon shades are mixts. of crimson and black sulfides. A cryst. yellow Sb_2S_3 can be found by elec. disintegration of stibnite under H_2O . Pigments pptd. in the presence of S'' or HS' will not darken through crimson and maroon shades but instead darker through varying shades of golden to brown and then to the black modification. The difference between the brown and maroon pigments is due to an adsorbed film of H_2S by the former which prevents growth of the particles. Cryst. crimson pigment has not been prepd.

HARRY B. WEISER

An investigation of the green color of tungstic oxide. NICOL H. SMITH AND HIRAM S. LUKENS. *Chem. News* **132**, 33-5(1925).—Samples of WO_3 , varying in color from light to dark green did not change in wt. or in color when heated in a current of O . All green samples contained Na salts, whereas yellow oxides contained only traces. Furthermore addn. of Mn or Fe compds. in the prepn. of the yellow oxide did not give a green product on ignition. Ignited green WO_3 on being dissolved in NH_4OH and reprecipd. with acid gave a yellow oxide free of Na salts. On the other hand the depth of green could be controlled in the prepn. of the WO_3 by the concn. of the Na_2WO_4 treated with acid and therefore by the amt. of Na compds. in the final product. It was thus proved that the green color of WO_3 is due to Na compds. and that the depth of color varies with the amt. Light does not turn yellow WO_3 to green WO_3 , and in fact it has,

contrary to the view of v. Liempt (*C. A.* **16**, 880), no part in the phenomena described. During the evapn. of a soln. of $(\text{NH}_4)_2\text{WO}_4$, NH_4Cl , NH_4OH and NaCl , a white cryst. Na-NiI_4 complex of the compn. $10\text{WO}_3 \cdot 4\text{Na}_2\text{O} + 4(10\text{WO}_3 \cdot 4(\text{NH}_4)_2\text{O}) + 50\text{H}_2\text{O}$ was obtained (cf. Gibbs, *Am. Chem. J.* **1**, 229(1879)). On ignition it first became yellow and then intense green, the latter color arising from the presence of Na compds. which could not be extd.

C. C. DAVIS

Some double fluorides of zirconium. M. M. WINDSOR. *J. Am. Chem. Soc.* **48**, 310-2(1926).—The following 6 new double fluorides of Zr were prepd. by dissolving ZrO_2 in HF, adding an equiv. amt. of the base in EtOH and either crystg. or pptg. with Me_3CO : *aniline (A) deriv.*, $\text{A}_2\text{H}_2\text{ZrF}_6 \cdot \text{H}_2\text{O}$; *brucine (B) deriv.*, $\text{B}_2\text{H}_2\text{ZrF}_6 \cdot 7\text{H}_2\text{O}$; *cinchonine (C) deriv.*, $\text{CH}_2\text{ZrF}_6 \cdot 2\text{H}_2\text{O}$; *quinine (D) deriv.*, $\text{D}(\text{ZrF}_6)_2$; *quinidine (E) deriv.*, $\text{E}(\text{HIZrF}_6) \cdot \text{ZrF}_6 \cdot 4\text{H}_2\text{O}$; *strychnine (F) deriv.*, $\text{F}_3(\text{HIZrF}_6)_2 \cdot 2\text{H}_2\text{O}$. All were white and transparent when dry and were sol. in EtOH and in hot and cold H_2O . A double fluoride with cinchonidine could not be crystd. from the impure jelly first obtained. In the prepn. of the aniline deriv., a red cryst. compd. was obtained which was probably a double fluoride of some oxidation product of aniline, contg. 29.87% F and 32.68% Zr. Solns. of the quinidine deriv. were bluish and opalescent. These compds. should be of value in the development of a method for the sepn. of Zr and Ti similar to that of Schaeffer (*C. A.* **3**, 519) for the sepn. of Ti from Co and Ta.

C. C. DAVIS

Tellurium nitride. WILHELM STRECKER AND WERNER LEBERT. *Ber.* **58B**, 2527-34(1925).—Tellurium nitride, Te_3N_4 , was prepared in the form of deep yellow amorphous fragments by the action of liquid NH_3 on TeCl_4 or TeBr_4 , at -15° to -70° , in the complete absence of H_2O . The complete reaction would be, $3\text{TeBr}_4 + 16\text{NH}_3 = \text{Te}_3\text{N}_4 + 12\text{NH}_4\text{Br}$. This reaction is an ammonolysis and in practice does not go to completion, so that the Te_3N_4 is mixed with small amts. of ammonobasic salts, e. g., $\text{Te}_3\text{Br}_5\text{N}_2$. The NH_4Br was removed from the reaction products by repeated extn. with liquid NH_3 . Te_3N_4 explodes violently upon slight mechanical shock and when touched by Br or H_2SO_4 , or when dropped into Cl_2 gas. When moist with liquid NH_3 it is only slightly explosive. It is decompd. by H_2O . The compn. suggested for Te_3N_4 is, $\text{N} \equiv \text{Te} - \text{N} = \text{Te} = \text{N} - \text{Te} \equiv \text{N}$. The compd., TeN , described by Metzner (*Ann. chim.* **15**, 257-63 (1898)) as the product of the above reaction, is not formed.

R. H. LOMBARD

Correction to a paper on aluminum sulfide. WILHELM BILTZ. *Z. anorg. allgem. Chem.* **146**, 289-90(1925); cf. *C. A.* **5**, 3019, 3661.—The colorless, needle-like crystals that appeared during the sublimation of Al_2S_3 have been identified as SiS_2 .

R. L. DODGE

Metal-carbon monoxide salts. XII. The behavior of carbon monoxide toward palladium salts and platinum salts; and a separation of palladium and platinum based thereon. W. MANCHOT. *Ber.* **58B**, 2518-21(1925); cf. *C. A.* **19**, 942.—Dry or moist PdCl_2 does not form compds. with CO at 260° . The compds., $\text{PdCl}_2 \cdot \text{CO}$, $\text{PdCl}_2 \cdot 2\text{CO}$ and $2\text{PdCl}_2 \cdot 3\text{CO}$, reported by Fink (*Compt. rend.* **126**, 646(1898)) in sublimates obtained by the action of CO on PdCl_2 at 260° , were the analogous compds. of Pt which were present in the PdCl_2 as impurity. Small amts. of Pt in Pd can be detected or detd. and Pd can be freed from Pt as follows: Pass dry CO over the dry mixt. of PdCl_2 and PtCl_2 at about 250° so long as a sublimate of the CO compd. of Pt continues to form. Wash the sublimate from the tube with H_2O and aqua regia, evap., ignite and weigh as Pt, Ru, Rh and Os, if present, will also be in the sublimate in the form of their CO compds. CO reduces PdCl_2 rapidly in aq. soln., but in H_2SO_4 or fuming HCl soln. there is no reduction until 20 and 10% H_2O , resp., are added; and there are no compds. formed. The relative stabilities of the CO compds. of the metals of the Pt group are discussed.

R. H. LOMBARD

Researches on stannous chloriodide, bromiodide, and chlorobromide. T. KARANTASSIS. *Compt. rend.* **182**, 134-6(1926).—I dissolved in a HCl acid soln. of SnCl_2 gives a red soln. which becomes pale yellow upon reduction by tin plate in excess. On cooling needles of SnClI are obtained. The crystals are colorless and unstable in moist air. Their compn., checked by thermal analysis, corresponds to that calcd. for SnClI . SnBrI is obtained in soln. by reducing a soln. of SnBr_2 , HBr and I with tin plate. Analysis of the crystals indicated a solid soln. of SnI_2 in SnBrI . SnBrCl cannot be obtained in a wet way because of its great soly. In a dry way, SnBr_2 and SnCl_2 give a mixt. that swells greatly during crystn. but no stable mixed salt results. These results differ from those of Young and Maxwell (*J. A. C. S.* **9**, 515(1897)).

P. B. PLACE

SCOTT, ALFRED WITHERSPOON: **A Laboratory Course in General Inorganic Chemistry.** Athens, Ga. 6 pp.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

The purposes and aims of agricultural chemical analysis. C. A. BROWNE. *J. Assoc. Official Agr. Chemists* 9, 15-23(1926).—An address. A. P. C.

The reliability of qualitative analytical procedures in the hands of beginning students. G. B. HEISIG. *J. Chem. Education* 3, 177-88(1926). E. J. C.

Critical remarks about iodometric methods. M. BÖTTGER. *Chem. Umschau Fette, Öle, Wachse u. Harze* 32, 275(1925).—Possible titration errors in the reaction between As_2O_3 , HCl and iodides were investigated. Atm. O_2 may cause greater pptn. of I than light, especially when the titration is made after fixed time intervals, but even immediate titration may cause high results and the end point may become indefinite by re appearance of the blue color. Standardization of the oxidizing agents must be made with I ions to obtain correct results; a direct oxidation of the $Na_2S_2O_3$ soln. as in the back titration of its excess may cause partial conversion into sulfate. $K_2Cr_2O_7$ gives correct values only when air is excluded. P. ESCHER

The use of uranous sulfate in volumetric analysis. G. VORTMANN AND F. BINDER. *Z. anal. Chem.* 67, 269-76(1925).— $U(SO_4)_2$ is fairly stable in aq. soln. toward atm. oxidation and is not oxidized readily by H_2O_2 and I_2 . Ferric salts are reduced quickly but molybdates are not. $U(SO_4)_2$ is, therefore, a moderately strong reducing agent which can be used for the titration of trivalent Fe in the presence of molybdic acid and for the indirect titration of substances which are capable of oxidizing ferrous Fe. To prep. the standard soln. dissolve 50 g. UO_2SO_4 in 200 cc. of water, make strongly acid with H_2SO_4 and reduce on the hot water bath with granulated Zn. Dil. the soln. to make it approx. 0.1 N and standardize against $KMnO_4$. Kept in the dark, the titer of a soln. changed to about 0.75 of its original value after standing 26 days. Procedures are given for the titration of ferric salt, evaluation of pyrolusite, detn. of HNO_3 , $HClO_3$ and H_2CrO_4 . The results given are accurate to about 0.5%. W. T. H.

Critical studies on the fusion of rare metal ores. II. The separation of tantalum and columbium. GEO. W. SEARS. *J. Am. Chem. Soc.* 48, 343-8(1926); cf. C. A. 19, 2000.—The sepn. of Cb and Ta is based on the difference in decompn. temps. of Na tantalate and columbate, and on the difference in soly. of the compds. formed. The ore is fused with $Na_2S_2O_7$ at 835-875°, leached, filtered and the residue washed with 3 N HCl. Conc'd. H_2SO_4 dissolves out the Cb compd., leaving the insol. Ta oxide.

ALBERT THOMAS FELLOWS

A new method of separation of iridium from rhodium and platinum and the separation of platinum and rhodium. ISABURO WADA AND TAMAKI NAKAZONO. *Sci. Papers Inst. Phys. Chem. Research* 1, 139-54(1925).—Rh and Pt are reduced to metal by $Ti_2(SO_4)_3$, but Ir is not. The Ir can be pptd. as sulfide in the remaining soln. and sepd. from the Ti. To the soln. contg. chlorides of Ir, Rh and Pt add $Ti_2(SO_4)_3$ soln. and after 5 minutes filter off the reduced Rh and Pt, washing first with 2 N H_2SO_4 and then with water. To the filtrate add an equal vol. of glycerol or 30 g. of tartaric acid for each 100 cc. of soln. (to prevent hydrolysis of Ti^{++}) and sat. with H_2S in the cold. Stopper and heat an hour in the water bath. Filter, dissolve the sulfide in aqua regia, evaporate to dryness, dissolve in conc'd. HCl and again evaporate to dryness. Repeat the evaporation with conc'd. HCl and finally dissolve the last residue in a few drops of 6 N HCl. Sat. with powdered NH_4Cl and with Cl_2 and allow to stand 30 minutes. A black crystalline ppt. shows that Ir is present. The presence of Ir can be confirmed by heating the HCl soln. contg. Ir with 1 cc. of conc'd. H_2SO_4 , evaporate to fumes and adding powdered NH_4NO_3 in small portions. A blue color should develop. For the Rh and Pt tests, treat the ppt. produced by the $Ti_2(SO_4)_3$ reduction with aqua regia and if a black residue remains, Rh is present. For the Pt test, evaporate the aqua regia soln. to dryness, dissolve the residue in a few drops of 6 N HCl and rinse the soln. into a test tube. Add a strip of Al and allow to stand 20 minutes. A black residue indicates Pt, Ir or both. Fuse the residue with $K_2S_2O_7$, cool and extract with water. A black residue indicates Pt. To detect traces of Pt and Ir, treat the aq. soln. of the pyrosulfate melt with H_2S and sat. with H_2S in the cold. Stopper and heat on the water bath. Cool, filter, dissolve in aqua regia and evaporate to dryness twice with HCl to remove all HNO_3 . Dissolve the residue in a very little HCl, add 1 cc. of alc. and nearly sat. with NH_4Cl . A small yellow ppt. of K_2PtCl_6 indicates Pt and a red soln. Rh. W. T. H.

Standardization of hydrochloric acid against potassium iodate compared with results obtained against soda and borax. I. M. KOLTHOFF. *Pharm. Weekblad* 63, 37-48(1926).—For standardization of 0.1 N HCl, dissolve 0.3566 g. KIO_3 in 100 cc.

H₂O, add 0.5 g. KI and 3 g. Na₂S₂O₃ and titrate with acid, using methyl red as indicator. No color change is obtained until all the KIO₃ is reduced. Titrations by this method check closely with those performed with Na₂CO₃ or borax. Anhyd. Na₂CO₃ is not recommended as a standard since it is hygroscopic and the end point to dimethyl yellow is not sharp when the CO₂ is boiled off. Borax is preferable to Na₂CO₃ on account of its high equiv. wt. and its sharp end point to methyl red and dimethyl yellow. The titration confirms the at. wt. of 10.82 for B. A. W. DOX

Determination of bismuth and its separation from lead and other metals by hydrolysis. LUDWIG MOSER AND WLADIMIR MAXYMOWICZ. *Z. anal. Chem.* 67, 248-56 (1925).—The hydrolysis of Bi salt takes place quantitatively with about 2 g. of KBrO₃ in dil., nearly neutral soln. by slowly adding about the same wt. of KBr in a concd. aq. soln. On boiling off the liberated Br₂, all of the Bi is pptd. The reaction is of the same order to sensitiveness as the test for Bi by means of the sulfide ion. W. T. H.

Determination of thallium. W. STRECKER AND P. DE LA PEÑA. *Z. anal. Chem.* 67, 256-69 (1925).—Five methods were found satisfactory for the detn. of Tl. (1) Ppt. the Tl as NaTl₂Co(NO₂)₆ by means of freshly prepd. Na₃Co(NO₂)₆ and weigh the ppt. after drying at 110°. (2) Ppt. Tl by means of Mg in a flask provided with a Bunsen valve. After all the Tl is pptd., add NH₄Cl soln. and heat till all the excess Mg has dissolved. Dissolve the pptd. metal in HCl and measure the vol. of liberated H₂. (3) Same as (2) but heat the Tl sponge to 200° in H₂ and weigh as Tl. (4) Same as (2) but add some Woods' metal, which in the hot soln. will alloy with the Tl in a form convenient for weighing. (5) Ppt. the Tl as TlI by adding a known vol. of KI soln. and titrate the excess iodide with thiosulfate after oxidation to I₂ by means of HNO₃. W. T. H.

Micro-iodometric determination of copper. N. SCHOORL AND H. BEGEMANN. *Rec. trav. chim.* 44, 1077-86 (1925).—Details are given of a method suitable for the detn. of Cu in the blood of invertebrates, such as snails. The method is based on that given in Pregl's book and depends on (a) destruction of org. matter and conversion of Cu to CuSO₄ by treatment with HNO₃ and H₂SO₄, (b) deposition of Cu electrolytically, (c) soln. of the deposit in HNO₃ and (d) titration with Na₂S₂O₃ of the I₂ liberated when Cu⁺⁺ reacts with KI. E. J. WITZEMANN

The method of Feigl for the determination of copper. F. AZZALIN. *Ann. chim. applicata* 15, 373-7 (1925).—Though the method of Feigl (*C. A.* 18, 30) is claimed to be accurate even with other metals present, tests show it to be very unreliable. Excess benzoin monoxime cannot be completely washed from the ppt., and because of this the method is quicker and much more accurate if the ppt. is incinerated and weighed as CuO. Under these conditions, however, there is a great tendency to form graphite and this cause of high results is avoided only by heating very slowly. With this precaution the method is practically as accurate as standard ones, provided that Cu alone is present. But when Fe, Zn, Al, Pb or Sn is also present, systematic expts. show that even with the most careful technic the error increases progressively with the amt., because of occlusion in the Cu benzoin oxime ppt. The method is in general inaccurate if small amts. of a second metal are present, and is useless with larger amts. C. C. DAVIS

The nephelometric determination of calcium and magnesium. L. KRISS. *Biochem. Z.* 158, 203-4 (1925).—In the presence of NH₄ salts, Mg gives no cloud with Na sulfocinoleate (*C. A.* 17, 3351). Ca, therefore, can be detd. nephelometrically with this reagent. F. A. CAJORI

Two methods for the separation of lead and silver. G. VORTMANN AND O. HECHT. *Z. anal. Chem.* 67, 276-9 (1925).—If (NH₄)₂HPO₄ is added to a slightly ammoniacal tartrate soln. contg. Ag and Pb ions, the latter are pptd. as Pb₃(PO₄)₂. The ppt. can be filtered off and weighed after gentle ignition. If KI is added to a slightly ammoniacal soln. contg. Ag and Pb in the presence of an excess of tartrate ions, the Ag ions are pptd. as AgI which can be weighed. For 0.5 g. of the metals, 2.5 g. of tartaric acid should be used before adding NH₃ in the latter sepn. W. T. H.

Estimation of iron by reduction with hydriodic acid. F. J. WATSON. *Chem. Eng. Mining Rev.* 18, 80-1 (1925).—Directions are given for carrying out the well-known iodometric method of C. Mohr (*Ann.* 105, 53). L. W. RIGGS

A method for the determination of arsenic. I. BANG. *Biochem. Z.* 161, 195-209 (1925).—Org. material contg. As is oxidized with a HNO₃-H₂SO₄ mixt. The As is then reduced to As₂O₃ by use of FeSO₄, and is converted to AsCl₃ by the addn. of KCl and KBr. If the KBr is omitted, reduction is not complete. The AsCl₃ is then distd. directly into a flask contg. H₂O, is neutralized with NaHCO₃, and titrated with I, with starch as an indicator. W. D. L.

A sensitive differential reaction of cerium. L. FERNANDES. *Gazz. chim. ital.* 55,

616 8(1925) —In the study of the various complexes formed by the rare earth hydroxides and pyrocatechol, pyrogallol and hydroxylated org. compds. (to be described in a later paper) a new sensitive reaction for Ce, even in the presence of the other rare earth elements, was discovered. One part Ce per million can be detected, but in the presence of the other rare earths the reaction is somewhat less sensitive. One part Ce in 400,000 of H_2O is easily detected. A soln. of a Ce salt treated with pyrocatechol and then NH_4OH gives a violet ppt. due to $[Ce(C_6H_4O)_3](OH)_3$ which darkens in the air and which is completely sol. in acids and in strong bases. With NH_4OH the violet salt $[Ce(C_6H_4O)_3](ONH_4)_3$ is formed. By reason of the browning of alk. solns. of pyrocatechol in air the violet color may be obscured unless $Na_2S_2O_3$ is added which delays this browning. The other rare earths give colorless compds. with this reagent. Other elements that give colored compds. with the reagent must be removed before a test is made for Ce.

H. J. WITZEMANN

Sensitive color reactions of zirconium, hafnium and fluorine with hydroxyanthraquinones. J. H. DE BOER. *Rec. trav. chim.* **44**, 1071-6(1925) —Atack (C. A. **9**, 3186) described a color reaction for Al with alizarinsulfonic acid. Lately de B. reported (C. A. **19**, 793) that nearly all rare metals give red to violet color reactions with alizarinsulfonic acid but these all disappear on adding HCl except the red-violet color with Zr, which persists even in the presence of concd. HCl. In 1 cc. contg. enough HCl so that no other metal reacts, 0.02 mg. Zr gives a distinct color. Since they readily form complexes with Zr, F ions disturb the color reaction. Alizarinsulfonic acid is a sensitive reagent for F. 0.02 g. Zr as $ZrOCl_2 + 0.015$ g. alizarinsulfonic acid in 10 cc. H_2O with 60 cc. concd. HCl is a good reagent for F and the red reagent gives a yellow color with 10^{-6} g. F in 1 cc. H_2O . A fairly accurate volumetric method for Zr is described. To the unknown soln. contg. 0.050-0.200 g. ZrO_2 add 15 cc. concd. HCl and 1 cc. of alizarinsulfonic acid soln. Add 1% NaF soln. from a buret until the soln. becomes yellow. Titrate a known soln. in exactly the same way. Repeat the titration with different quantities of the unknown until the blank and the unknown are not more than 0.5 cc. apart on the NaF used. This is done because the NaF required also depends on the HCl present. Most other metals, including Ti, Ce, Er, Yt, Mn, Al, etc., do not interfere. Fe^{+++} must first be reduced with $SnCl_2$; the method fails in the presence of Th. Of the compds. purpurin, rufigallic acid, alizarin blue-S, quinizarin, purpuroxanthin and hystazarin, all those having OH groups in the 1,2-positions (at least) give characteristic colors for Zr as with alizarinsulfonic acid. The results with the other 3 dyes are not similar. The behavior of Hf with these dyes resembles that of Zr. In concd. HCl solns. the color faded somewhat sooner with Hf especially with rufigallic acid. Hf stands between Zr and Th but closer to Zr in this respect since Th gives stronger colorations in almost neutral solns. that fade in even dil. HCl.

E. J. WITZEMANN

Platinum and palladium dimethylglyoximes. R. A. COOPER. *J. Chem. Met. Min. Soc. S. Africa* **25**, 296-7(1925).—Pt dimethylglyoxime forms a fine blue, cryst. ppt. having a characteristic metallic bronze luster when Na formate is added to a slightly acid soln. of H_2PtCl_6 contg. an alc. soln. of dimethylglyoxime. Pptn. is quant. but the compd. cannot be ignited to metal without loss, although it can be dried at 100° to $C_8H_{14}O_4N_4Pt$ for weighing. When NaOH is added to water in which Pt dimethylglyoxime is suspended, it dissolves completely, but an excess causes pptn. of a purple unstable compd.; Pd dimethylglyoxime dissolves in NaOH and is not further affected by excess.

B. C. A.

Methods for the determination of sodium sulfide. P. BUDNIKOV. *Z. anal. Chem.* **67**, 241-8(1925).—Seven well-known methods were studied and satisfactory results obtained except in 1 case in which some H_2S was lost upon neutralizing with AcOH prior to titration with $ZnSO_4$. The method of Podreshetnikov (*Z. Farben. Ind.* **6**, 388) gives good results after a little practice and provides for the detn. of Na_2S and NaSH in 1 operation.

W. T. H.

The reduction of chloric acid and chlorates by ferrous sulfate. CECIL O. HARVEY. *Analyst* **50**, 538-43(1925).—In neutral soln. the reduction is incomplete, better results are obtained in acid soln. but it is advisable to provide a little KI in the analysis of chlorates. The following method gave over 99% of the theoretical value of the oxidizing power. Place 10 cc. of chlorate soln. (0.2 N or less), 25 cc. of acid $FeSO_4$ soln. and 5 g. KI into a glass-stoppered bottle. Tightly stopper and keep in hot water ($45-50^\circ$) for 20 min. Cool, add 50 cc. of recently boiled water and titrate with $Na_2S_2O_3$. Run a blank using 10 cc. of water in place of the chlorate soln.

W. T. H.

Determination of the extract. A new micro method. A. C. RÖTTERING. *Oesterr. Chem.-Ztg.* **29**, 1-4(1926).—The extract, or total solids, of wine, spirits, vinegar, honey solns., etc., is sometimes detd. directly by merely evapg. to dryness and weighing the resi-

due or *indirectly* by detg. the original sp. gr. and that of the soln. after distg. off alc. The direct method as usually accomplished gives reliable results only when the extract is low. By using 0.05–0.2 g. of sample, on a roll of dried filter and heating in an evacuated tube immersed in hot CaCl_2 soln. it is possible to get a very accurate direct detn. of the *extract* or portion non-volatile at 100° .

A method of analysis of colored gas, based on the use of a photoelectric cell and application to the case of nitrous gases. H. COPAUX AND A. COPAUX. *Compt. rend.* **181**, 1058–60 (1925).—The photoelec. cell mentioned in the title is used as a photometer, a column of the gas to be analyzed being interposed between it and a steady light source.

W. T. H.
F. C. KRACEK

Examination of cream of tartar and raw materials containing tartaric acid. FRITZ GLASER. *Z. anal. Chem.* **67**, 279–81 (1925).—The method of Goldenberg (*Z. anal. Chem.* **47**, 57) gives satisfactory results only when all the conditions are kept uniform. The more sensitive the litmus paper used is to acids, the higher the results and the more sensitive to bases, the lower the results. If this method is to be used in cases of dispute, all labs. should use the same litmus paper and keep all conditions as uniform as possible.

W. T. H.

A simple method for determination of nitrobenzene. I. M. KOLTHOFF. *Chem. Weekblad* **22**, 558–9 (1925).—Nitro compds. are reduced to amines by TiCl_3 . Qual test for PhNO_2 : To 10 cc. soln. add 3 to 4 drops 15% TiCl_3 soln. and 1 cc. 4 N NaOH; after 1 or 2 min. make the soln. acid with HCl, add phenol and try the indophenol reaction. The intensity is maximal 3 to 5 min. after addn. of Cl_2 (1:200,000 sensitive). Quant. detn. (a 0.1% soln. nitrobenzene was used): Add to 25 cc. soln. in a glass-stoppered Erlenmeyer flask, 5 cc. 4 N NaOH and 15% TiCl_3 soln. dropwise, until the black remains for 2 min. (flask closed). After 5 min. more, open the flask and shake until all Ti^{++} is oxidized by the air to Ti^{+++} (about 5 min.). Then add 0.5 to 1 g. alkali bromide, 10 cc. 4 N HCl, 25 cc. 0.1 N KBrO_3 , close the flask, after 5 min. add 1 g. KI and titrate back after another 2 min. with thiosulfate. One cc. 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$ corresponds to 2.05 mg. PhNO_2 .

B. J. C. VAN DER HOEVEN

Application of capillary measurements to the study of mixtures of fatty acids. R. DUBRISAY. *Compt. rend.* **181**, 1060–2 (1925).—The author attempts to identify fatty acids by the surface tension of their aq. solns.

F. C. KRACEK

Microchemical identification of metaldehyde. GEORGES DENIGÈS. *Bull. soc. pharm. Bordeaux* **63**, 207–12 (1925).—Place a small quantity of the material (less than 1 mg. is sufficient) on a glass slide, suspend another slide above it and sublime with the aid of a very low flame. The sublimate, when examd. under the microscope, will be found to consist of long, brilliant prismatic needles emerging from the face of the slide and pointing in diverse directions. Below these larger crystals will be found other smaller ones which also are prisms, but which appear to be branched because of their juxtaposition with respect to other similar crystals. If a small quantity of the material is dissolved in CHCl_3 and the latter allowed to evap. spontaneously, the metaldehyde will be deposited in the form of rhombic needles. These are frequently grouped or interlaced in a characteristic manner. To confirm the microcryst. tests, the following color reaction may be applied: Dissolve a little of the material in a droplet of concd. H_2SO_4 and add a small crystal of guaiacol. If the material is metaldehyde, a blood-red color will develop. Other phenols will also give the test.

A. D. DUMÉZ

Detection of small quantities of arsenic in cocoa. H. LÜHRIG. *Pharm. Zentral-halle* **67**, 1–3 (1926).—Mix intimately in a porcelain dish 15 g. of the sample with 0.5 g. MgO and 5 cc. concd. As-free HNO_3 , evap. to dryness on the H_2O bath and carefully incinerate. Treat the ash with As-free HCl, filter, add H_2SO_4 and heat to appearance of SO_3 fumes, cool, add H_2O and test in a Marsh app. The As test may be more expeditiously made *via* Reinsch by treating 15 g. of the sample with 75 cc. As-free HCl (about 16%), immersing a narrow bright Cu foil (1×4 cm.) and boiling gently 20–25 min., cooling and dilg. with H_2O , rejecting the liquid and examg. the Cu strip which in the presence of As (as little as 0.15 mg.) is colored gray. The As may be sublimed by repeated dipping of the foil in fresh H_2O , rolling and gently heating over a micro-flame and under a cooled cover glass.

W. O. F.

Metal-carbon monoxide salts. XII. The behavior of CO toward Pd and Pt salts; and a separation of Pd and Pt based thereon (MANCHOT) 6. Determination of the gases dissolved in beer and other liquids (MURRAY) 16.

GOOCH, F. A. and BROWNING, P. E.: **Outlines of Qualitative Chemical Analysis** New York. John Wiley & Sons, Inc. 206 pp. \$1.75.

- JAMIESON, GEORGE S.: **Volumetric Iodate Methods.** New York: The Chemical Catalog Co., Inc. 96 pp. \$2.00. Reviewed in *Ind. Eng. Chem.* 18, 326(1926).
- STAUDINGER, HERMAN AND BRAUNHOLTZ, W. T. K.: **Introduction to Qualitative Organic Analysis.** New York: D. Van Nostrand Co. 128 pp. \$2.50.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

The use of the Skita apparatus in experimental mineralogy. N. NIKOLOFF. *Centr. Mineral. Geol.*, A 1925, 183-91.—Exptl. results on the action of CO_2 solns. on orthoclase, olivine, augite, serpentine, bronzite and diopside are given. The app., briefly described, provides a continuous supply of fresh CO_2 throughout the expt.

J. E. GILL

Dilute coloring of minerals. R. KLEMM AND G. O. WILD. *Centr. Mineral. Geol.* A 1925, 291-5.—The coloring of idiochromatic minerals is probably due to complex structures. Many others are believed to be colored by subsequently sepd. colloidal particles.

J. E. GILL

Coloration of quartz. R. KLEMM AND G. O. WILD. *Centr. Mineral. Geol.*, A 1925, 270-3.—Chem. and spectral analyses show no marked differences between quartzes of different colors. Li and Na are the only foreign elements showing lines in the spectra not present in the spectrum of the electrodes. It is planned to det. whether the coloring is due to Na and Li, or to splitting off of Si from the mol. No reference is made to the work of Holden (*C. A.* 19, 3447) in solving this problem.

J. E. GILL

Spectroscopic investigation of minerals. I. Sapphire. G. O. WILD AND R. KLEMM. *Centr. Mineral. Geol.*, A 1925, 273-4.—Comparison of blue-green sapphire from Anakie, Australia with an artificial stone of the same color showed that both contained Fe and Ti. Colorless sapphire from Ceylon contained no Fe, but CN bands and lines of B, Ge, Ag were present. Blue sapphire from Australia showed Fe, CN and B. II. Beryl containing cesium. *Ibid* 295-6.—A Cs content is typical of rose beryl and is regarded as the coloring agent.

J. E. GILL

Lead sulfobismuthite of volcanic origin. F. ZAMBONINI, O. DE FIORE AND G. CAROBBI. *Rend. accad. sci. Napoli* [iii], 31, 24-9(1925).—A cryst. mineral, for which the name *cannizarite* is proposed, has formed since 1921 in the lower parts of fumaroles on Vulcano (Eolie, Lipari Islands), where the emission of acid volcanic gases is greatest and access of air is prevented. The temp. of the region is 550-615°. The crystallographic const. were not detd. accurately, but the mineral appears to be rhombic, and isogonal with bismuthinite and stibnite in the 001 zone. $d_{100} 6.54$. The analysis corresponds with the formula $\text{PbS}_2\text{Bi}_2\text{S}_3$. It is probably formed by the action at high temps. of H_2S on the chlorides of Bi and Pb.

B. C. A.

Heating curves of Tichvinski bauxites. N. S. KURNAKOV AND G. G. URAZOV. *Ann. Inst. Phys.-Chem. Anal. Leningrad* 2, 495-6(1924).—The heating curve of Ural diasporite exhibits an arrest at 509-555°, but no exothermic effect at a higher temp. Artificial hydrargillite shows 2 arrests, at 200-295° and 509°, resp. After expulsion of the bulk of its water at 100°, colloidal hydrated alumina shows both the diasporite and the hydrargillite arrests. Tichvinski bauxites with high silica contents also show the diasporite and hydrargillite arrests, and, in addn., an arrest at about 567°, corresponding with kaolinite. An exothermic effect at a higher temp. is observed sometimes, but not always.

B. C. A.

Thermal analysis of clays and bauxites. N. S. KURNAKOV AND G. G. URAZOV. *Ann. Inst. Phys.-Chem. Anal. Leningrad* 2, 496-8(1924).—When a pure kaolin $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot n\text{H}_2\text{O}$ (n = about 2), is heated, an endothermic arrest occurs at 558-605° because of the elimination of H_2O and an exothermic effect (recalcination) at 950-1000°. Under identical conditions the cryst. monohydrated alumina, diasporite, shows a temp. arrest at 509-555°, but, like other hydrated forms of alumina investigated, no exothermic effect. The natural trihydrate (gibbsite) or artificial trihydrate is characterized by 2 endothermic arrests on its heating curve, at 202-296° and about 500°, the latter coinciding with that observed with diasporite. With the richly aluminiferous Tichvinski bauxites contg. up to 15% of water and not more than 12-15% of SiO_2 , only endothermic arrest is found corresponding with that of diasporite (509-555°); if the silica exceeds 12-15% the kaolinite arrest (558-605°) also is encountered. The latter bauxites evidently consist of a mixt. of diasporite and kaolinite; further, bauxites contg. more than 14-15% of H_2O exhibit also a lower arrest at 200-296°, indicating the presence of hydrargillite.

B. C. A.

Determination of the plagioclases. ALADÁR AND MIKLÓS VENDL. *Centr. Mineral. Geol.*, A 1925, 177-82.—Useful microscopic data are given. J. E. GILL

Chemical composition of the sanidine from Vegardo. VICTOR ZSIVNY. *Centr. Mineral. Geol.*, A 1925, 279-84.—A discussion. J. E. GILL

The system CaSiO_3 - MgSiO_3 - FeSiO_3 , especially in diallage, augite and hornblende of the gabbro-basaltic magmas. PETER CHIRVINSKII. *Centr. Mineral. Geol.*, A 1925, 199-202.—Av. analyses of diallage, augite and basaltic hornblende suggest 2CaSiO_3 - $3(\text{Mg, Fe})\text{SiO}_3$ as a basic formula for these minerals. MgSiO_3 : FeSiO_3 averages 3:1. This empirical av. formula can be variously interpreted, e. g., as representing diopside, $\text{CaMgSi}_2\text{O}_6$ (77.14 mol. %), with isomorphous mixt. of $(\text{Fe, Mg, Mn})\text{SiO}_3$ (22.8 mol. %) or as an unstable double salt involving the actinolite and wollastonite mols., $\text{Ca}(\text{Fe, Mg})_2\text{Si}_4\text{O}_{12}$. J. E. GILL

The relationship between davynite and hauynite. B. GOSSNER. *Centr. Mineral. Geol.*, A 1925, 169-77.—The minerals have analogous chem. structure plans, are similar in d., n, crystal form, in spite of the fact that they belong to different crystal systems. It is suggested that this similarity be expressed by writing the formulas hauynite $3[\text{Na}_2\text{SiO}_3 \cdot \text{SiO}_2 \cdot \text{Al}_2\text{O}_3] \cdot 2\text{CaSO}_4$; and davynite $3[\text{Na}_2\text{SiO}_3 \cdot \text{SiO}_2 \cdot \text{Al}_2\text{O}_3] \cdot \text{CaSO}_4 \cdot \text{CaCl}_2$. Variations in davynite are small and probably result from partial replacement of Na_2SiO_3 by CaSiO_3 or slight variations in the ratio CaSO_4 : $\text{CaCl}_2 = 1$; some CaCO_3 may also enter. J. E. GILL

Chemical constitution of the gehlenite-melilite group. B. GOSSNER. *Chemie der Erde* 2, 103-13(1925).—The isomorphous mixing of such complex mols. as suggested by Buddington (*C. A.* 16, 1058) is regarded as improbable; and G. traces a connection between the minerals of the gehlenite-melilite group and the monoclinic ("pseudo-tetragonal") pyroxenes. They are regarded as double compds. $\text{CaO} + \text{pyroxene}$, of the form $\text{CaO} \cdot [\text{SiO}_3\text{Ca} \cdot \text{SiO}_3\text{Mg}]$, where SiO_3Mg is replaceable by Al_2O_3 , and $\text{Si}_2\text{O}_6\text{MgCa}$ by $\text{Si}_2\text{O}_6\text{AlNa}$. Gehlenite is written $\text{CaO} \cdot [\text{SiO}_3\text{Ca} \cdot \text{Al}_2\text{O}_3]$ and melilite as $2\text{CaO} \cdot [\text{Si}_2\text{O}_6\text{MgCa} \cdot \text{Si}_2\text{O}_6\text{AlNa}]$. Åkermanite approaches $\text{CaO} \cdot [\text{SiO}_3\text{Ca} \cdot \text{SiO}_3\text{Mg}]$. B. C. A.

Simple stoichiometric relations of the average biotite of granite and the connection between the anorthite and the biotite content of granite. PETER CHIRVINSKII. *Centr. Mineral. Geol.*, A 1925, 304-13.—Av. analyses of biotite in granites suggest that the equl. center for this mineral is an equimolar mixt. of the muscovite and olivine mols. Granites and closely related rock types contain anorthite and biotite in about equal proportions. The anorthite-biotite system in idealized form may accordingly be represented thus: $[\text{CaAl}_2\text{Si}_2\text{O}_8 + \text{CaAl}_2\text{Si}_2\text{O}_8] + [(\text{K, Na, H})\text{Al}_2\text{Si}_2\text{O}_8 + (\text{Fe, Mg})\text{Si}_2\text{O}_6]$. J. E. GILL

Druse minerals in a granite of southern Schwarzwald. ECKART SCHRÖDER. *Centr. Mineral. Geol.*, A 1925, 260-70.—The occurrence and characteristics of biotite, K-feldspar, albite, quartz, molybdenite, pyrrhotite, chalcopyrite, pyrite, tourmaline, zinnwaldite, fluorite, epidote, hematite, prehnite, apophyllite, zeolites, calcite, kaolin and bitumen are described. An analysis of epidote is given. J. E. GILL

Hydrolysis of mica. P. A. ZEMYATCHENSKII. *Ann. Inst. Anal. Physico-Chem. Leningrad* 2, 484-5(1925).—When heated with water, muscovite undergoes energetic hydrolysis and gradually approaches kaolinite in compn. The extent to which this change takes place depends on the duration of the action and on the fineness of the mica; the change may be accelerated and rendered complete by raising the temp. Muscovite is decomposed more readily than kaolinite when treated with 10% HCl soln. Slight hydrolytic decompn. of muscovite doubtless plays a large part in the process of the decay of mica. B. C. A.

Notes on swedenborgite. B. GOSSNER. *Centr. Mineral. Geol.*, A 1925, 289-91.—Similarities in phys. properties and crystal form suggest that swedenborgite consists of an intergrowth of 2 similar corundum-like networks of Al_2O_3 and NaSbO_4 . J. E. GILL

Graphite in Ukraine. V. N. CHIRVINSKII. *Ann. inst. polyt. agr. Kiev* 1924, 61-94; *Mineralog. Abstracts* 2, 557.—Chem. analyses and a bibliography of the Ukraine graphites are given. J. F. SCHAIRER

Barite in Ireland. T. HALLISSY. *Mem. Geol. Survey Ireland, Mineral Resources* 1923, 81 pp.; *Mineralog. Abstracts* 2, 556.—Ba reached the fissures from a deep-seated source and the deposition of BaSO_4 resulted from a reaction between an ascending soln. of BaCl_2 and a descending soln. of sulfate formed by oxidation of sulfides. J. F. S.

The small iodine occurrences in the north German salt deposits. HANS STÖBBE AND K. F. STEINBERGER. *Centr. Mineral. Geol.*, B 1925, 337-40.—Several explanations for the low I content are reviewed. Recent data suggest another theory. Metallic iodides in sea water and in the sap of marine plants become decomposed by atm. CO_2

and photo-oxidation. The I forms tri-iodides or polyhalogen compds., which easily dissociate and give up free I, which volatilizes. J. E. GILL

Coal formation as a tectonic phenomenon. HANS STILLE. *Braunkohle* 24, 913-8 (1926).—A discussion of various European coal deposits from the above standpoint. W. B. PLUMMER

The Secondary [Mesozoic] era and petroleum. A. MONTIBELLI. *Rass. min. met. chim.* 63, 130-2(1925).—The fact that petroleum in Mexico, Roumania and Galicia may be traced to the Mesozoic era led to a study of the westerly basin of Resegone (from Lecco to Maggianico) which is of Lio-triassic formation. The presence of petroleum was further indicated by the presence of feldspar metamorphosed from gabbro in eruptive rock, bituminous shales, rock-salt, waters contg. CaSO_4 and MgSO_4 , sulfurous fluorescent waters, S (perhaps deposited from the action of hydrocarbons on CaSO_4) and emanations of CH_4 . These theoretical considerations were substantiated by the discovery of horizons of petroleum C. C. DAVIS

Quantitative mineral composition of two German gabbros. PETER CHIRVINSKIT. *Centr. Mineral. Geol.*, A 1925, 275-9 —Detns were made by the Rosiwal method, on olivine-gabbro from Volpersdorf, Silesia and amphibole-gabbro from Frankenstein, Odenwald. J. E. GILL

The so-called picrites in Banat. ALADAR VENDL. *Centr. Mineral. Geol.*, A 1925, 297-304.—Petrographic and chem. analyses show that 3 rocks formerly called picrites are actually limburgite, plagioclase-basanite and nepheline-basalt. J. E. GILL

The calcite-rich bombs from the upper Devonian limestone of Oberscheld. ERNA FRERICHS. *Centr. Mineral. Geol.*, A 1925, 161-8 —Petrographic and chem. analyses lead to the conclusion that the calcite-rich volcanic bombs are limestone fragments ejected after metamorphism by a basic magma J. E. GILL

The primary formation of crystalline magnesite. M. ROZSA. *Centr. Mineral. Geol.*, A 1925, 195-7.—Investigations of Paleozoic carbonate rocks have yielded geologic, mineralogic and physico-chem facts which indicate that cryst. MgCO_3 formed as a primary marine sediment. J. E. GILL

The clays of the Lake Agassiz basin. J. E. MAYNARD. *Trans. Roy. Soc. Can., Sec. IV* (3) 18, 103-14(1925).—The paper contains mech., chem. and colloidal analyses of the layers of clay deposited by fresh water in glacial lake Agassiz near Winnipeg. M. claims to have established a relation between hygroscopicity and fineness of grain in the clay particles. Temps from 200° upwards gradually destroy the colloids in the clay until at 1000° they are completely destroyed. J. W. SHIPLEY

Chalk and flint. G. LINCK AND W. BECKER. *Chemie der Erde* 2, 1-14(1925).—An outline is given of the various views on the formation of flint in chalk. Expts were made with solns. of colloidal silica (contg. 0.5-0.8% SiO_2) in the presence of pptd. CaCO_3 (vaterite and calcite). The amt. of silica adsorbed is greater with smaller sizes of grain of the Ca carbonate. Ppts. obtained from solns. of $\text{CaH}_2(\text{CO}_3)_2$ in the presence of sol. silica contain up to 17% SiO_2 , the amt. depending on the concn. of the solns. Treatment of these ppts. after heating at 50 - 200° , with dil. solns. of NaCl , NaOH , NH_3 , etc., causes a portion of the adsorbed silica to pass into soln. again. It can be again coagulated by the action of MgCO_3 or of CaCO_3 soln. in the presence of NaCl . Conclusion: In the formation of chalk the silica was originally distributed throughout the material, as a pellicle around the min. grains of Ca carbonate. There re-soln. of the silica in the presence of alkali and NH_3 from org. remains would leave the CaCO_3 with a loose open texture. Migration and coagulation in cavities and crevices would give rise to nodules, bands, and veins of flint. Analyses of chalk from Rügen show 0.81-1.54% SiO_2 , the amt. varying with the distance from the bands of flint. B. C. A.

Chemical alteration of granite beneath peat. P. BLANCK AND A. RIESSER. *Chemie der Erde* 2, 15-48(1925).—A detailed review and discussion is given of the literature on the formation of clay or kaolin by weathering processes, more particularly in association with peat and lignite deposits. Analyses are compared of fresh granite, from the Harz Mts., and of the weathered rock taken from below a layer of peat and from the surface. There is no evidence of the formation of kaolin under these conditions. SO_2 was found in the weathered products, in peat, sphagnum-moss and moor-waters, and it is concluded that this has some action in the weathering processes. B. C. A.

Weathering of sandstone by circulating solutions. F. KLÄNDER. *Chemie der Erde* 2, 49-82(1925).—The peculiar forms of weathering shown by the sandstones of Saxon Switzerland and the Palatinate are attributed to the action of circulating solns. contg. humus compds. and sulfates derived from the surface vegetation. Analyses are given of the portions extd. by water from the rocks and from the soils derived from them. B. C. A.

Bleached rings and zones containing vanadium in the clay shale of the red beds from the Heinrich shaft, Olsnitz, Erzgebirge. R. SCHREITER. *Centr. Mineral. Geol.*, A 1925, 214-22, 242-50.—Bleached rings, zones and interbeds contain appreciable quantities of V oxides, nuclei of bleached rings having an especially high content. Bleaching results from chem. reactions involving reduction of Fe and oxidation of V.

J. E. GILL

Sources of carbon in the Pre-Cambrian formations. E. S. MOORE. *Trans. Roy. Soc. Can.*, Sec. IV (3) 18, 21-8(1925).—M. reviews the recent discoveries of evidence of plant life in the Pre-Cambrian and describes oölites and concretions of algal origin in the Animiki Fe-bearing rock near Port Arthur, Ontario. Graphitic carbon to the extent of 0.21% was found in the concretions. The occurrence of anthraxolite at Sudbury, Ontario, is attributed to the formation of solid bitumen from oil-producing algae which flourished in the Animiki period.

J. W. SHIPLEY

Origin of terrestrial helium and its association with other gases. S. C. LIND. *Proc. Nat. Acad. Sci.* 11, 772-9(1925).—Review of theories regarding He supports radioactive origin as most probable. The He accumulation of the richest pools requires vertical migration from a depth of only 1 or 2 miles, over a period of 1-2 hundred million years, leaving out of account lateral migration and deep vents. The rarity of these rich He pools is probably dependent on a combination of circumstances favorable to migration and local storage. It is suggested that removal from the radioactive mineral and migration are both aided by the gases generated by certain chem. decomps. produced in the earth's crust by the original high-velocity He atoms (α -rays), such as the decompn. of H_2O , of nitrogenous material, or of carbonates to give CO_2 . Analyses are presented of the gases from 2 samples of uraninite (Katanga and South Dakota) and from 2 secondary minerals (carnotite of Colorado and a mixt. of curite and becquerelite from Katanga). The universal presence of N_2 in uraninite is discussed, as well as the occurrence of O_2 and the low He content of the secondary minerals. The latter is attributed to porosity and the "seeping" effect of the generated gases. The great scarcity of H_2 in natural gases is attributed to catalytic reduction of metallic oxides.

S. C. L.

The Lancashire Coalfield—Smith Seam (ANON) 21.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

Chemistry in the metallurgical division of the Bureau of Standards. H. W. GILLET. *J. Chem. Education* 3, 148-56(1926); illus.

E. J. C.

Brief history of metallurgical practice in cannon-making with particular reference to the cast-iron gun. JOB GOOSTRAY, R. F. HARRINGTON AND M. A. HOSMER. *Trans. Am. Inst. Mining Met. Eng.* 71, 404-35(1925).

E. J. C.

Milling practice of American Zinc Co. of Tennessee at Mascot. ROBT. AMMON. *Trans. Am. Inst. Mining Met. Eng.* 71, 1029-60(1925).

E. J. C.

The Cape Copper Company's works, Briton Ferry, South Wales. A. S. GILL. *Mining Mag.* 33, 137-45(1925).

A. BUTTS

Evolution of copper-ore concentration at Morenci, Ariz. ARTHUR CROWFOOT. *Eng. Mining J.-Press* 120, 884-90(1925).—Improvements made during 19 years' operations are described.

A. BUTTS

Study of flotation oils applied to the blendes of Ingurtosu. PAUL AUDIBERT. *Rev. ind. minérale* 1926, No. 122, 21-40.—It has already been found that the flotation of Ingurtosu blende is a difficult process, for which pine oil has been used in the past. Lab. expts. with various other oils, including mixts. in different proportions, showed that especially good results can be obtained with the following mixts.: pine oil 50, cresylin 60; crude petroleum 75, pine oil 25; crude petroleum 50, pine oil 50; cresylin 50, Puertollano oil 50; pine oil 50, Diesel oil 50; and pine oil 25, Diesel oil 75. The mixt. pine oil 50, Diesel oil 50 gave the best results of all. This comparison is based on the max. yield of Zn. Calcns., however, of the relative economy showed the mixt. crude petroleum 50, pine oil 50 to be the most economical, followed closely by the mixt. pine oil 50, Diesel oil 50. On an industrial scale, however, a mixt. of pine oil 40, Diesel oil 60 gave the best results. By using excess $CuSO_4$ there was a great economy of oil effected, the amt. being reduced to about $\frac{1}{4}$, and the use of H_2SO_4 eliminated.

C. C. DAVIS

Producing gold and arsenic at Jardine, Mont. EDWARD H. ROBIE. *Eng. Mining*

J.-Press 120, 765-72(1925).—An account of the production and treatment of concentrates carrying 38% As and 2 oz. Au per ton. These are roasted to produce As_2O_3 and then shipped to a smelter. A. BUTTS

Manganese and manganiferous ores in 1924. HELENA M. MEYER. *U. S. Geol. Survey, Mineral Resources of U. S., 1924*, Pt. I, 89-103(preprint No. 9, publ. Feb. 3, 1926). E. J. C.

Manganese, its alloys and uses. G. M. DYSON. *Chem. Age (London)* 14, No. 347, Metallurgical Sect. 10-11, 15(1926). E. J. C.

Manganese poisoning and its effect on the central nervous system. R. F. GAYLE. *J. Am. Med. Assoc.* 85, 2008-11(1925).—Mn, more often than is recognized, causes symptoms in workmen handling this ore. Certain persons are not susceptible to the poisoning effects of Mn as encountered in handling the ores. Others are susceptible to the invasion of the central nervous system by this poison and show a gradual progression of the symptoms as long as they absorb Mn ore dust. There appears to be a destruction of cerebral tissue, which, except in the mildest cases, will cause permanent disability. Mental changes were found in each of the 6 cases of this series. Daily baths with change of clothing and the wearing of suitable masks while at work, are suggested as prophylactic measures. L. W. RIGGS

The determination of certain curves and their application to the desilverization of lead by the Parkes process. G. K. WILLIAMS. *Proc. Australasian Inst. Mining & Metallurgy* 1925, No. 58, 47-97.—A study was made of the interdependence of variables in the Parkes process, and also of the possibility of decreasing the quantity of Zn required and raising the Ag content of the crusts for retorting. Various mixts. of Pb, Zn and Ag were melted and crystd., by means of a kettle of 25 lb. capacity wound with resistance wire to permit close temp. control; bullion and crusts were sampled accurately with bullet molds. Curves were detd. showing the Ag and Zn content of the various molten mixt. at successive temp. as they cooled. The bullion which solidified, being the residu after the sepn. of the Zn crusts, was in each case a eutectic mixt. of Pb, Zn and Ag. The interpretation and use of the curves are explained, and different methods of zincking based on the curves are discussed. By liquefaction of the crusts and again cooling, an enriched crust is obtained which results in raising the Ag content of the retort bullion from 2000 to 16,000 oz. per ton. Formation of Ag_2Zn_3 does not play an essential part in desilverization and this compd. does not always exist in the crusts. It is not true that a fixed amt. of Zn (usually stated as 0.7%) must be added to the kettle before Pb will give up any of its Ag; this amt. varies with other factors and is lower the higher the Ag content of the bullion. A. BUTTS

Cyanide plant details. F. C. NINNIS. *Eng. Mining J.-Press* 120, 856-8(1925).—Describes a new device for adding CaO to cyanide solns., a crushing unit, an automatic sampler, an agitating tank, a pulp sampler, a furnace-charging hopper and a furnace gas-washing method. A. BUTTS

Complete heat balance of a standard blast furnace for the manufacture of Thomas iron, including that of the Cowpers and of the engines burning the furnace gases. MAURICE DERCLAYE. *Rev. métal.* 23, 1-7(1926).—The heat balance given in detail shows an efficiency of 46.5% from a metallurgical standpoint and of 8.9% from a power-generating standpoint, so that the overall efficiency is 55.4%. A. P.-C.

Evaluation of the characteristics of a blast furnace as a function of the quantity of slag. MAURICE DERCLAYE. *Rev. universelle mines* 8, 270-85(1925).—A mathematical paper, based on calcs. of the heat necessary for reducing the metallic oxides, fusing the crude metal and slag, decomp. the carbonates and evapg. and decomp. the H_2O . Equations are derived by which it may be detd. whether the furnace operation is normal, the influence of an increase in temp. of the blast, a change in the ash of the coke, an increased yield from the charge and a change in the coeff. of utilization of coke, either by a modification of the tuyères or by a change in the method of charging. C. C. DAVIS

Tests of the Halberg-Beth dry gas purifiers at the Audun-le-Tiche (blast furnace) plant of the Société Manière des Terres-Rouges. MARCEL STEFFES. *Rev. métal.* 23, 8-26(1926).—Detailed account of tests carried out on 3 units guaranteed to reduce the dust content to 0.02 g. per m.³ when purifying up to 36,000 m.³ per hr., at 0° and 760 mm. The results showed the app. met the guarantee, but with greater amts. of gas the dust content rose rapidly (0.05 g. per m.³ with 39,000 m.³ per hr.). A. P.-C.

Cutting down wastes on castings. A. A. WOOD. *Iron Age* 117, 487-8(1926) E. J. C.

The production of metal coatings on iron. KRÖHNKE. *Gas u. Wasserfach* 69,

21-4, 48-52(1926).—A description with *extensive bibliogra*; vapor condensation, and molten bath processes for produ Ni, Co, Cu, Cr, etc., on Fe.

Influence on the welding properties of mild steel of the form mixed crystals with the iron. ANON. *Apparatebau* 19, 3466.

Welding cast iron pipes with bronze. F. MUHLERT. *Apparatebau* 38, 20(1926).—Cf. Starke, C. A. 19, 2630.

W. B. PLUMMER
of elements which
(1926).—Cf. C. A.
J. H. MOORE
J. H. MOORE

Refractories for blast furnaces (BOOZE) 19. Nature of Al-Mg alloys (URAZOV) 2.

LAATSCH, WILHELM: **Die Edelmetalle; eine Übersicht ihre Gewinnung, Rückgewinnung und Scheidung.** Berlin: J. Springer. 91 pp.

ROUELLE, JEAN BAPTISTE CÉLESTIN: **Steele.** Translated by Alfred Chapple. London: G. Bles. 168 pp.

Formation of metal layers or fillings on any base by the Schoop process. NAAMLÖÖZE VENNOOTSCHAAP ALGEMEENE NEDERLANDSCHE OCTROOIMAATSCHAPPIJ A.N.O.M. Dutch 13,905, Dec. 15, 1925. An initial layer of metal, squirted on a surface is more firmly attached to it by heating it with a second layer of Al and thus reducing (thermite process) the oxides present. The process is particularly suited for giving a protective coating to grate bars; some metal, like W, may be mixed with the Al.

10—ORGANIC CHEMISTRY

CHAS. A. ROULLER AND CLARENCE J. WEST

Optical rotation and atomic arrangement. R. A. BAXTER, G. L. SHUE AND G. W. THOMAS. *Colorado School of Mines Mag.* 15, no. 8, 6-9(1925).—A general discussion in which it is stated that not the masses of the radicals surrounding the C atom but the nature and arrangement of atoms det. the rotation. C. J. WEST

Dissymmetry and asymmetry of molecular configuration. F. G. MANN AND Wm. J. POPE. *Chemistry & Industry* 44, 1225-6(1925), cf. C. A. 19, 3480.—Polemical with Main Smith (C. A. 20, 359). C. J. WEST

Do free alkyl radicals occur in the Kolbe electrochemical hydrocarbon synthesis? H. ERLÉNMEYER. *Helvetica Chim. Acta* 8, 792-7(1925).—An attempt to decide between the free-radical theory of Crum Brown and Walker (*Ann.* 261, 107(1891)) and that based on Schall's assumption that peroxides are the intermediate products (*Z. Elektrochem.* 3, 83(1896)). Repetition of Kaufler and Herzog's expts. (C. A. 4, 212, 1049) on a quant. basis showed the yield of C_2H_6 on electrolysis of 40% KOAc soln. to remain as high (ca. 33%) after addn. of I_2 or Br_2 as in their absence, and that the amt. of MeI or MeBr formed did not exceed 0.6%, indicating its formation as a result of a side reaction. As Fichter (C. A. 18, 1438) has postulated the intermediate formation of AcO_2H (I) this might react in part according to $AcO_2H + HBr \rightarrow MeBr + CO_2 + H_2O$. I was prepd. in 80% yield according to d'Ans and Frey (C. A. 6, 2737) except that it was found better to add the H_2O_2 to a cooled H_2SO_4 - Ac_2O mixt. I reacted with NaBr in HOAc at 60°, giving a small amt. of MeBr, isolated as $PhNM_2Br$ (0.62 g. from 20 g. I). K. and H.'s work, therefore, does not support the theory of intermediate free radicals, as claimed. M. HEIDELBERGER

Electronic interpretation of the ethylenic linkage. HENRY GILMAN AND J. M. PETERSON. *J. Am. Chem. Soc.* 48, 423-9(1926).— $RMgX$ do not add in Et_2O soln. to substituted ethylenic compds. Under the conditions of the expts., there appear to be no active or polar forms of the ethylenic linkage, or the concn. of active forms is extremely small, or the active forms are not sufficiently active to add $RMgX$. $EtMgBr$ reacts 100% with di-*p*-tolylidysulfonylethylene but the nature of the reaction is as yet unknown. C. J. WEST

Nitrosate formation in olefins. F. W. KLINGSTEDT. *Ber.* 58B, 2363-70(1925); cf. Schaarschmidt and Hofmeier, C. A. 19, 2634.—Expts. on the action of N_2O_4 (partly with pure N_2O_4 , partly with the N oxides evolved from AmONO and HNO_3) on $Me_2C=CHMe$ (I) and $Me_2C=CH_2$ (II) showed that the yield of bisnitrosates (III and IV) depends greatly not only on the temp. and length of the reaction and on the qual. and quant. compn. of the reaction mixt. but also on the abs. amt. of the latter. With pure N_2O_4 in Et_2O or petroleum ether the yield of III is about 0.1 that obtained with AmONO

and HNO_3 at about -10° . II with free N_2O_4 in Et_2O at $3-10^\circ$ gave materially higher yields of IV. To obtain the max. yield of solid product some time must be allowed for the polymerization process and the temp. must not be allowed to rise much above 0° . On longer standing there set in, sooner or later, secondary reactions, depending on the temp., which may result finally in a complete disappearance of the bisnitrosates. This decompn., proceeding slowly with gas evolution at room temp., has its seat in the liquid, blue-green portion of the reaction product. The liquid undergoes, depending on the temp. of addn. and on that at which it is kept after the addn., a more or less rapid auto-decompn., often accompanied with a quite marked evolution of heat. Even during the addn. oxidation reactions may set in. In working up large amts. the temp. within the mixt. may easily rise too high, in spite of vigorous external cooling, with a consequent diminution in yield. Too great an excess of HNO_3 and the use of acid more dil. than 65% also result in a diminished yield. From 7.5–25 g. I with AmONO and H_2SO_4 was obtained 28–40% III, with N_2O_4 3.7–4.3%; from 3.8–10 g. II, 27.0–35.8 and 40%, resp., of IV. The quant estn. of the olefins on the basis of the yield of bisnitrosates is therefore very uncertain. Schmidt maintains (*Ber.* 35, 2336(1902)) that the blue-green liquid formed on the addn. of nitrous gases consists chiefly of the monomol. form of the dimeric nitrosate and gradually polymerizes to the latter in a cool dark place, but K. found that in all his expts. the polymerization was rapid (2–4 hrs., working with 4–25-g. portions of material), if the solid was removed at the end of this time, the liquid part showed no further tendency to polymerize and, unlike the solid nitrosate, which, when entirely pure, is stable, it was characterized by a marked lability. According to Wallach (*Ann.* 306, 281(1899)) the nitrolamines obtained from the bisnitrosates are monomol. compds. and it seemed possible that if the primary product of the addn. of N_2O_4 contained a nitrosate which for some reason did not polymerize or a dinitrosate which did not cryst. out it might, by the use of a suitable org. base, be isolated as the nitrolamine, especially as the well-washed but not recrystd. solid dinitrosates gave, with PhNH_2 , *c. g.*, const. (70–80%) yields of nitrolamine. The products obtained from the blue-green liquids with PhNH_2 or *p*- $\text{MeC}_6\text{H}_4\text{Me}$, however, were brown oils from which no solid nitrolamine could be isolated nor a solid chloride be pptd. with HCl in Et_2O ; owing to their instability, the oils could not be purified by distn.; that obtained from I gave, to be sure, in poor yield a N-contg. dark red chloroplatinate whose complete compn. has not been established but which is of a different type from the orange to yellow salts obtained in the same way from the solid nitrolamines. K. concludes that the liquid addn. products formed by the action of N_2O_4 consist chiefly of substances which in constitution or configuration are different from the monomol., easily polymerized nitrosates. Pure IV m. 116° (cor.) Hexenenitrolamine m. 86° . C. A. R.

The stereoisomers of chloriodoethylene. H. VAN DE WALLE AND A. HENNE. *Bull. sci. acad. roy. Belg.* [5], 11, 360–74(1925).—By absorbing $\text{CH}_2=\text{CHI}$ in a soln of ICl in 4 vols. aq. HCl crude $\text{CHCl}:\text{CHI}$ is obtained and is sepd. into its isomers by fractional distn. of its mixt. with an equal wt. of PrOH , the azeotropic mixt. of the *trans*-form with PrOH b_{760} $87.5-85^\circ$ and contg. 4% of alc., while the azeotropic mixt. of the *cis*-form b_{760} $93.6-4.0^\circ$ contg. 44.4% alc. After sepn. of the alc. from the azeotropic mixts. the yields from 2.475 kg. of crude $\text{CHCl}:\text{CHI}$ were 0.2 kg. of the *trans*- and 0.98 kg. of the *cis*-isomer. The const. of the *trans*- and *cis*-isomers arc, resp., b_{760} $113-4^\circ$, $116-7^\circ$. m. -41.0° , -36.4° ; d_4^{15} 2.1048, 2.2080; d_4^{20} 2.1355, 2.2399; n for various lines, n_D 1.56562, 1.57684, D 1.57146, 1.58288, H_B 1.58598, 1.59808, H_γ 1.59858, 1.61131; sp. inductive capacity (dielec. const.) 2.95, 2.72; relative rapidity of action with KOH 0.55, 1.00. If either isomer is exposed to sunlight for 1 hr. the same equil. mixt. is obtained, whose const. (n and d .) show it to contain 17.5% of the *trans*-isomer, the actual decompn. being slight although some reddish color is developed. W. B. P.

A new method for the separation of ethyl alcohol from acetaldehyde and acetone. G. GORR AND J. WAGNER. *Biochem. Z.* 161, 488–91(1925).—The mixt. is treated with HgCl_2 and NaOH (1 mol. aldehyde to 3–4 mols. HgO) and refluxed 4 or 5 hrs. The AcH ppts. as a Hg salt of unknown compn. The residue is then distd. and the alc. content of the distillate detd. by use of a pycnometer. Acetone ppts. much as does AcH , and the same method may be used for its removal. This sepn. is useful in a study of alc. fermentation. W. D. L.

Electropyrogenic decomposition of ethyl alcohol. F. G. MÜLLER. *Helvetica Chim. Acta* 8, 821–5(1925).—An arc was used at 30–35 v. and 25–30 amp. burning between a fixed Fe electrode and a movable C electrode insulated from the glass or Cu reaction vessel by asbestos packing. A 50-cm. Cu reflux condenser was used, provided with a U tube with arms 15–20 cm. long, through which 100 cc. alc. could be added every 40–5 min. in order to keep the arc under alc. (originally 300 cc.). In 5 hrs. *ca.* 1 l. alc.

was decompd., yielding *ca.* 1200 l. gas which gave *ca.* 48 cc. condensate at 12–15° (I) and 60 cc. at –40–80° (II). C was liberated, part of which may have come from the C electrode. 30% aq.-alc. was left in the flask, depositing very little tar on distg. off the alc. I yielded 4 cc. AcH and 44 cc. alc., while II gave 2.5 cc. acetylenes (III), 8 cc. AcH, and alc. The gases consisted of C₂H₂, 7–9.9%; C₂H₄, 6–9.6%; satd. hydrocarbons, 6.8–20.4%; CO, 20.4–23.8%; and H₂ 46.2–49.9%. PHH was absent. The isolation of HC:CC:CH in small amt. from III (cf. following abstr.) is new, and this is considered a possible intermediate in the formation of C₁₀H₈ and C₁₄H₁₀ in other pyrogenic decompns.

M. HEIDELBERGER

Diacetylene (butadiene). F. G. MÜLLER. *Helvetica Chim. Acta* **8**, 826–32(1925); cf. preceding abstr.—0.5–1.0 g. HC:CC:H (I) was isolated from each l. of alc. decompd. I could not be sepd. entirely from AcH by fractionation, but with cold Ag⁺-NH₃ soln. it gave the yellow explosive Ag salt, stable under H₂O. Decompd. with HCl this yielded I still contg. C₂H₂ and homologs. The final purification was accomplished at 10 mm. and low temps. in a somewhat modified Stock app. (*C. A.* **8**, 1248, 12, 547; **15**, 3256). The vapor pressure of I at –40° is 66.2 mm.; at 0°, 466.7 mm., and is calcd. to be 760 mm. at 13.6°. Values between –40° and 0° are given, also the difficult analyses and mol. wt. detn. Polymerization begins above 0°, the color becoming yellow within 5 min. in the light, longer in the dark with formation of a brown-black mass (II) in several days to 4 weeks. I m. –36–7°, and was once obtained as a blue, instead of colorless, liquid. It reacts violently with Br₂; the hexabromide, m. 181° (cor.) (cf. Noyes and Tucker, *J. Am. Chem. Soc.* **19**, 123(1897); Lespieau and Prévost, *C. A.* **19**, 1693, 2472, 2635), probably has the open-chain structure and a double bond, as it reacts with KMnO₄. I gives a brown-red, explosive Cu salt with Illosvay's reagent (*Ber.* **32**, 2698(1899)); with I₂ the Ag salt gives C₂H₂I₂, m. 93°, explodes 95°. II does not m. 350°, explodes at higher temps., is insol.

M. HEIDELBERGER

Some derivatives of ethyl selenomercaptan. E. H. SHAW, JR., and E. E. REID. *J. Am. Chem. Soc.* **48**, 520 8(1926).—EtSeH was prepd. by a modification of Siemens' method (*Ann.* **61**, 360(1847)), the av. yield being 40%. EtSeH condenses with ketones (HCl gas) giving about 97% of mercaptols: Me₂CO gives 2,2-bis[selenoethyl]propane, b₁ 81°, d₄⁰ 1.4577, d₂₅²⁵ 1.4329, the butane deriv., b_{3.5} 91.5°, d₄⁰ 1.4294, d₂₅²⁵ 1.4064; the pentane deriv., b₃ 104.5°, d₄⁰ 1.3825, d₂₅²⁵ 1.3608; oxidation of either of these gave a nearly quant. yield of EtSeO₂H. The HNO₃ compd., EtSeO₂H·HNO₃, m. 80° (cor.), gradually decompd. at 100°; the HCl compd., m. 107° (decompn.), when the heating is 14° per mm. With HBr there results, instead of the expected HBr compds., 89% of ethyl-selenium tribromide, darkens 50°, decompd. 73°. Oxidation of the mercaptols with 3% H₂O₂ yields a soln. of EtSeO₂H which can be concd. to a thick sirup without crystg. Free halogens break the bonds between the Se and the C in the mercaptols; SeCl₄ and SeBr₄ result, together with viscous evil-smelling oils. (ClCH₂CH₂)₂S and EtSeH in NaOH give 63% of bis-[β-ethylselenomercaptoethyl] sulfide, b₄ 171°, m. 15°, d₂₅²⁵ 1.4724. The sulfide decompd. on heating. The sulfone, m. 72.5°; yield, 84%. Anthraquinone 1-butylsulfone 5-ethyl selenide, deep red, does not m. at 300°. Other Na salts are reduced to the non-reactive hydrol form before the reaction takes place.

C. J. WEST

Esterification of aliphatic acids in glycerol. A. KAILAN and H. RAUPENSTRAUCH. *Monatsh.* **45**, 485–518(1925).—The rates of esterification of heptico acid in abs. glycerol, of iso- and n-valeric and hexoic acids in abs. and aq. glycerol, in presence of HCl, at 25°, have been measured. Contrary to esterification in mixts. rich in water, the unimol. reaction consts. are proportional to the total concn. of HCl. With valeric acid, a measurement was also made of the rate of esterification in presence of H₂SO₄ in aq. glycerol. Expressions are derived for the variation of the velocity consts. with the water content of the system with the valeric acids. The velocity consts. for the esterification of the above normal aliphatic acids have the same value, with the same catalyst, as that for butyric acid, while the const. for isovaleric acid is much smaller. The retarding influence of water is also the same as that with butyric acid, and similarly much less with glycerol than with EtOH. Thus, in presence of N/6 HCl, the above aliphatic acids are esterified, with EtOH, in mixts. contg. 0.03 mol. of water per l., about 4 times as rapidly as with glycerol, while when the water concn. is 4/3 mols. per l. the rates are about the same. The rate of esterification at 35° is 2.7 times that at 25°. The rate of esterification of H₂SO₄ with glycerol in presence of water is proportional to the 2/2 power of its concn. Valeric acid is esterified with glycerol about 1.7 times as fast in presence of HCl as in presence of H₂SO₄. Measurements of the rates of esterification of iso- and n-valeric, hexoic and heptico acids, in absence of catalyst, were made at 183.5°,

both with abs. and aq. glycerol, and showed that the rate of esterification under these conditions is proportional to the 3/2 power of the concn. of the acid present, indicating a catalysis by H ions. Water acts as an accelerator up to a concn. of 7 mols./l., thereafter exerting a retarding influence.

B. C. A.

Aliphatic nitro alcohols. ERICH SCHMIDT, ALFONS ASCHERL, AND LUDWIG MAYER. *Ber.* 58B, 2430-4 (1925); cf. C. A. 16, 2475.—In the present paper are reported the conditions under which hydroxylamino alcs. may be obtained in pure form by the catalytic reduction of the NO₂ alcs. 1-Nitro-2-pentanol (71% from PrCHO and MeNO₂ in cold H₂O with KOH), b₃ 87-8°, n_D²⁰ 1.4421, d₄²⁰ 1.0847. Me₂CHCH(OH)CH₂NO₂ (67.5% from iso-PrCHO), b₄ 83-4°. Me₂CHCH₂CH(OH)CH₂NO₂ (64.5% from iso-BuCHO), b₂ 90-1°, b₆ 99-100°, n_D²⁰ 1.4433, d₄²⁰ 1.0519. The catalyst was palladinized BaSO₄ (5% Pd). (McNHOH)₂ (CO₂H)₂ (9 g. from 6.1 g. MeNO₂, 6.3 g. crystd. (CO₂H)₂ and 1 g. catalyst in 77 cc. H₂O), m. 158° (decompn.). 1-Hydroxylamino-2-propanol oxalate (81% from MeCH(OH)CH₂NO₂), m. 111°. 1-Hydroxylamino-2-butanol oxalate (79%), m. 100-1° (decompn.). 4-Hydroxylamino-2-methyl-3-butanol oxalate (76%), m. 106-8° (decompn.). 1-Hydroxylamino-2-pentanol oxalate, (prepd. in 96% alc.; yield, 81%), m. 99° (decompn.). 5-Hydroxylamino-2-methyl-4-pentanol oxalate (prepd. in AcOH-EtOH; yield, 69%), decomp. 144-5°. 1-Hydroxylamino-2-octanol oxalate (prepd. in AcOH-EtOH-H₂O; yield, 69.5%), decomp. 142-3°.

C. A. R.

Preparation of neutral phosphites from the hydrogen esters. (MLLE.) M. JANCZAK. *Roczniki Chem.* 4, 180-1 (1924).—The action of dialkyl phosphites on their Na salts leads to trialkyl phosphites; the Na salts have, therefore, the same structure as the latter and contain trivalent P, e. g., (RO)₂P^{III} ONa, while the H esters themselves have the formula (RO)₂PV(O)H; the formation of the Na salts thus involves tautomeric change. The formation of neutral esters can also be brought about by the action of AcOH on the above Na salts; the change is accompanied by partial conversion of the neutral esters into alkylphosphonates, (RO)₂PV(O)R. The Na salts are immediately decomposed by water, but not by alc.

B. C. A.

Tautomerism of dialkyl phosphites. III. T. MILOBEDZKI. *Roczniki Chem.* 4, 183-4 (1924); —It has been suggested by Nylén (C. A. 18, 3167) that Na di-Et phosphite is a deriv. of quinquevalent P from its behavior towards ClCH₂-CO₂Et. This view is contradicted by the results obtained by Janczak (preceding abstr.), which point to the existence of tautomerisms between pseudo-acids of the type (RO)₂PV(O)H and true acids, (RO)₂P^{III}(OH), in the process of salt formation. The fact that Nylén could not oxidize the salt by means of I in aq. soln. is due to the fact that it is immediately decomposed by water. The corresponding Ag salt, which is stable, may be a deriv. of quinquevalent P as suggested by Stelling (C. A. 18, 1239).

B. C. A.

Boroacetic anhydride as a reagent. II. OTTO DIMROTH, R. RUCHTI, K. SAGS, TETTER, J. HETZER, H. BERNZOTT, C. BAMBERGER, O. REBMANN AND R. SCHWEIZER. *Ann.* 446, 97-122 (1925); cf. C. A. 16, 1766.—The boroacetic anhydride of Pictet and Geleznoff (*Ber.* 36, 2219 (1903)) is obtained only as a pyroboroacetate (I), B₂OAc₄, m. 150-2°; slowly heated at 150-60°, it splits off Ac₂O, giving metaboroacetate, BO₂Ac; crystn. from Ac₂O regenerates I. The use of this reagent in detg. the structure of certain classes of compds is illustrated. I and hystazarin give only the di-Ac deriv. Anthragallol and I in Ac₂O give the boroacetate of 2,3-diacetylanthragallol, orange, easily decompd. into H₂BO₃, AcOH and 2,3-diacetylanthragallol, m. 214°. 1-Aminoanthraquinone gives an orange soln. in Ac₂O, changed to red-violet by I, from which crystals the boroacetate, deep violet tablets heating *in vacuo* in a C₆H₄Me₂ bath for 38 hrs. gives the red-violet melaborate, C₁₄H₇O₂NHBO. Heating 0.5 hr. with Ac₂O gives the Ac deriv., m. 203°. The 2-NH₂ deriv. shows no color change with I but yields the Ac deriv. The 1,4-(NH₂)₂ deriv. gives a diboroacetate, deep violet prisms. The 1,5-(NH₂)₂ deriv. gives a brown-violet diboroacetate, brown, glistening prisms. The 1,8-(NH₂)₂ deriv. gives only the di-Ac deriv. 1,5-Dihydroxy-4,8-diaminoanthraquinone gives a violet-blue color in Ac₂O, with I a green-blue color, from which crystals. the diboroacetate, brown prisms; hydrolysis yields diacetylanthranthrafin, m. over 270°. 1-Hydroxyxanthone yields a deep yellow boroacetate, while the 2- and 4-HO derivs. are not colored by I. 1,8-Dihydroxyxanthone yields a mono-Ac boroacetate, citron-yellow prisms, slowly hydrolyzed by H₂O. 1-Hydroxy-4-aminophenanthraquinone gives a dark boroacetate, hydrolyzed to a N-Ac deriv. I and 2,3,4-trihydroxybenzophenone in Ac₂O give in the cold a labile ester, which upon standing or warming yields the 3,4-di-Ac deriv., m. 119°. 2-Aceto-1-naphthol boroacetate, honey-yellow, with green fluorescence. 1-Aceto-2-naphthol boroacetate, orange-yellow 3-Aceto deriv., orange. 2-Benzo-1-naphthol boroacetate, light orange glistening prisms. 2,4-Diaceto-1-naphthol boroacetate, dirty yellow. 2-Aceto-1,8-dihydroxynaphthalene-1-

boroacetate, brick-red. If the soln. stands, the color changes from red-brown to a deep greenish brown and on diln. with Ac_2O shows a very strong green fluorescence. Hydrolysis gives *8-acetoxy-2-aceto-1-hydroxynaphthalene*, pale green, m. 168–9°, which gives a *boroacetate*, glistening yellow leaflets. The *di-Ac deriv.*, m. 146°, likewise gives the same *boroacetate*. 8-Acetoxyquinoline, m. 55.5–6.5°; from 50% AcOH it crystals with 1 AcOH , m. 59–60°; from H_2O as a hydrate. $o\text{-HOC}_6\text{H}_4\text{CO}_2\text{H}$ and **I** in Ac_2O give *salicyl boroacetate*, whose formula is not definitely established; on warming with Ac_2O complicated decompn. follows. AcOH gives borodisalicylic acid, which also results from $o\text{-HOC}_6\text{H}_4\text{CO}_2\text{H}$ and **I** in Et_2O or C_6H_6 . *m*- and *p*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ give only the *Ac* derivs. of the acids.

C. J. WEST

The reaction of organomagnesium compounds on nitriles. P. BRUYLANTS. *Bull. sci. acad. roy. Belg.* [5], 11, 261–80 (1925).—Previous studies (cf. *C. A.* 18, 529, 815, 816; 19, 37, 288, 822) have shown that nitriles of the type $\text{R}_2\text{NCHR}'\text{CN}$ generally react with $\text{R}''\text{MgX}$ to substitute R'' for the CN group, although in some cases the product is $(\text{R}_2\text{NCHR}')_2$ by doubling up the original mol. with elimination of CN. The present work shows this also to be general for nitriles of the type $\text{R}_2\text{NCR}_2'\text{CN}$. $\text{Me}_2\text{NCMeEtCN}$ (**I**) with PhMgBr gives $\text{Me}_2\text{NCMeEtPh}$, b_{776} 234–5°, d_{20} 0.9275, n_D^{20} 1.5097; picrate, m. 178°. With PhCH_2MgBr **I** gives $\text{Me}_2\text{NCMeEtCH}_2\text{Ph}$, b_{771} 258°, d_{20} 0.9265, n_D^{20} 1.5152; chloroplatinate, m. 194°. With EtMgBr **I** gives $\text{Me}_2\text{NCMeEt}_2$, b_{769} 146°, d_{20} 0.7830, n_D^{20} 1.4306. α -Methyl- α -piperidobutyronitrile (**II**) with PhCH_2MgBr gives $\text{MeEt}(\text{C}_6\text{H}_{10}\text{N})\text{CCH}_2\text{Ph}$, b_{760} 310°, d_{20} 0.9614, n_D^{20} 1.5277; chloroplatinate, m. 192°. With PhMgBr **II** gives $\text{MeEt}(\text{C}_6\text{H}_{10}\text{N})\text{CPh}$, b_{760} 288–90°, d_{20} 0.9611, n_D^{20} 1.5253; chloroplatinate, m. approx. 205°. With EtMgBr **II** gives $\text{Me}(\text{C}_6\text{H}_{10}\text{N})\text{CEt}_2$, b_{768} 214°, d_{20} 0.8614, n_D^{20} 1.4637. By the reaction of $\text{CH}_2\text{:CHCHO}$ with KCN and $\text{Me}_2\text{NH}\cdot\text{HCl}$ is obtained 30% of $\text{Me}_2\text{NCH}_2\text{CH}_2\text{CH}(\text{NMe}_2)\text{CN}$ (**III**), b_{110} 90°, d_{20} 0.8876, n_D^{20} 1.4416. With PhMgBr **III** gives $\text{Me}_2\text{NCH}_2\text{CH}_2\text{CH}(\text{NMe}_2)\text{Ph}$, $b_{110.5}$ 128.5°, b_{768} 259°; HCl salt, m. 245°. The strong influence of the $\alpha\text{-NR}_2$ group in causing exchange of CN for the radical of the RMgX is very evident here, since $\gamma\text{-NR}_2$ substituted nitriles are ordinarily polymerized by RMgX . By reacting the HCl salt of piperidine with $\text{CH}_2\text{:CHCHO}$ and KCN is obtained 30% of $\text{CH}_2\text{:CHCH}(\text{NC}_5\text{H}_{10})\text{CN}$, b_{110} 94°, d_{20} 0.9813, n_D^{20} 1.4746, which with PhMgBr gives 40% of $\text{CH}_2\text{:CHCHPhNC}_5\text{H}_{10}$, b_{702} 271°, d_{20} 0.9704. n_D^{20} 1.5305; chloroplatinate, m. 176°. From MeCH:CHCHO with $\text{Me}_2\text{NH}\cdot\text{HCl}$ and KCN (g. mol. quantities) is obtained 17 g. of $\text{MeCH:CHCH}(\text{NMe}_2)\text{CN}$, $b_{110.5}$ 64–5°, d_{20} 0.8761, which with PhMgBr gives 60% of $\text{MeCH:CHCH}(\text{NMe}_2)\text{Ph}$, b_{768} 237°, d_{20} 0.9135.

W. B. PLUMMER

The reaction of organomagnesium compounds on nitriles. VELGHE. *Bull. sci. acad. roy. Belg.* [5], 11, 301–8 (1925).—Continuation of the preceding work (cf. preceding abstr.) with various α -aminoisobutyronitriles gives the same general result, viz., the CN group is exchanged for the radical of the RMgX . α -Piperidobutyronitrile (**I**) with EtMgBr gives $\text{Me}_2\text{EtCNC}_5\text{H}_{10}$, b. 188°, d_{20} 0.8608, n_D^{20} 1.4593. With MeMgBr **I** gives $\text{Me}_2\text{CNC}_5\text{H}_{10}$, b_{768} 166°, d_{20} 0.8465, n_D^{20} 1.4532; chloroplatinate, m. 235°. With PrMgBr **I** gives $\text{Me}_2\text{PrCNC}_5\text{H}_{10}$, b_{769} 205–7°, d_{20} 0.8517, n_D^{20} 1.4592. $\text{Me}_2\text{NCMe}_2\text{CN}$ (**II**) with MeMgBr gives doubling, with the formation of 67% of $\text{Me}_2\text{C}(\text{NMe}_2)\text{C}(\text{NMe}_2)\text{Me}_2$, b_{767} 149°. With EtMgBr **II** reacts mainly in the sense of the last reaction above to give 69% of diamine, but 15% of $\text{Me}_2\text{NCMe}_2\text{Et}$, b. 115°, also is formed by the normal reaction. With PrMgBr **II** forms a small amt. of the same diamine together with 20% of $\text{Me}_2\text{NCMe}_2\text{Pr}$, b. 138–9°, d_{20} 0.7950; chloroplatinate, m. 230°.

W. B. P.

Basis for the physiological activity of certain -onium compounds. IV. The sulfur analog of choline. R. R. RENSHAW, N. BACON AND J. H. ROBLER. *J. Am. Chem. Soc.* 48, 517–20 (1926); cf. *C. A.* 20, 364.— Me_2S and $\text{ICH}_2\text{CH}_2\text{OH}$ give *hydroxyethyl-dimethylsulfonium iodide*, hygroscopic needles, which soon decomp. on standing. Similarly Me_2S and BrCH_2OAc give *acetoxymethyl-dimethylsulfonium bromide*, m. 104° (cor.); in the presence of moisture or any foreign material, they decomp. on standing. Heated in EtOH it dissociates, giving Me_2S and HCHO . The pharmacol. examn. of the latter substance indicates that the -onium element is significant in detg. the stimulating nicotine effect.

C. J. WEST

The decomposition of diazo compounds under the influence of copper. J. S. P. BLUMBERGER. *Chem. Weekblad* 22, 599–604 (1925).—A review of the literature. Only Cu^+ halides form intermediate compds. with the diazo compds. Cu and all other Cu salts act merely by surface catalysis. In discussing the Sandmeyer and related reactions and the nature of the cupro-diazo compds., it is pointed out that the theory of induced alter-

nate polarity ought to prove valuable for the understanding of the influence of substituents on these reactions.

MARY JACOBSEN

Identification of monosubstituted acetylenes. Derivatives of diethynyl mercury. J. R. JOHNSON AND W. L. McEWEN. *J. Am. Chem. Soc.* **48**, 469-76 (1926).—Simple Hg salts of the formula $(RC \equiv C)_2Hg$ are formed by treating monosubstituted acetylenes with an alk. soln. of HgI_2 or $Hg(CN)_2$. *Dipropynyl Hg*, m. 203-4° (16% yield on the 1,2- $C_3H_5Br_2$ used). *Dibutynyl Hg*, m. 162-3° (34% yield on the 1,2- $C_4H_9Br_2$ used). *Di-[3,3-dimethylbutynyl] Hg*, m. 91-2° (94%). *Diheptynyl Hg*, m. 61° (80%). *[2-Bromo-1-decene, b₂₂ 115-6°, b₃ 76-7°, d₂₀⁰ 1.1044, d₂₀²⁰ 1.0844, n_D²⁰ 1.46015, 1.46290, 1.47011 for C, D and F, MR_D 55.630 (calcd., 55.628), in 60% yield from $C_7H_{15}MgBr$ and $BrCH_2-CBr:CH_2$; $NaNH_2$ gives 68% of 1-decine; *didecynyl Hg*, m. 83-4° (70%). *Diphenylpropynyl Hg*, m. 106.5-7.5°. $PhC \equiv CMe$ did not give a Hg salt. *4-Phenyl-2-bromo-1-butene*, b₆ 77-8°, b₂₁ 117-8°, d₂₀⁰ 1.3102, d₂₀²⁰ 1.2924, d₄²⁰ 1.2901, n_D²⁰ 1.5450, MR_D 51.73 (calcd. 52.03); 44% yield; $NaNH_2$ gives 63% 4-phenyl-1-butene. *Diphenylbutynyl Hg*, m. 83.5-4.5° (95% yield). *Di-p-tolyethynyl Hg*, m. 199-202° (75%), di-p-anisylethynyl Hg, m. 207-9° (95%). *Dicyclohexylpropynyl Hg*, m. 104° (78%). *Diphenoxypropynyl Hg*, m. 120.5-1° (84%).*

C. J. WEST

The action of halogens on acrolein in dilute aqueous solution and the preparation and properties of certain trihalogenated propionic acids. A. BERLANDE. *Bull. soc. chim.* **37**, 1385-94 (1925).— α, α, β -Trihalogenated propionic aldehydes are readily prepd in good yield by the action of halogens on α -monohalogenated acrolein in an inert solvent. Cautious oxidation with HNO_3 gives the corresponding acid. B. sets out to improve the methods of prep. α -monobromo- and α -monochloroacrolein and to prep. α -moniodoacrolein. He does so by acting on acrolein with halogens in dil. aq. soln. The mechanism of the reaction is discussed and shown to be as follows: $CH_2:CHCHO + X_2 \rightleftharpoons CH_2XCHXCHO \rightleftharpoons HX + CH_2:CXCHO$. Details of the prep. and properties of $CH_2:ClCHO$ and of the aldehydes, acids and *Et* esters corresponding to the following acids are given: $CH_2BrCBr_2CO_2H$, $CH_2ClCIClBrCO_2H$, $CH_2ClCCl_2CO_2H$ and $CH_2BrCClBrCO_2H$.

R. E. GIBSON

Platinum oxide as a catalyst in the reduction of organic compounds. XII. Selective reduction of citral by means of platinum oxide-platinum black and a promoter. ROGER ADAMS AND B. S. GARVEY. *J. Am. Chem. Soc.* **48**, 477-82 (1926); cf. *C. A.* **20**, 376.—Citral may be reduced quant. to geraniol by means of PtO - Pt black and H in the presence of small amts. of promoters such as $FeSO_4$ or $Zn(OAc)_2$. When 2 mol equivs of H instead of 1 are used, pure citronellol results, while with 3 equivs. tetrahydrogeraniol is obtained. Geraniol is reduced to citronellol and then to tetrahydrogeraniol. Promoters for the citral reduction act as poisons in this reduction.

C. J. WEST

Polarimetric study of mixtures of optically active organic acids with aldehydes and ketones. MARIO PASSERINI. *Gazz. chim. ital.* **55**, 726-9 (1925).—In some previous papers (*C. A.* **16**, 555, 556; **18**, 245) P. suggested that in mixts. of org. acids with ketones or aldehydes addn. products, $RR'C(OH)OCOR''$, are formed. This having been confirmed for aldehydes (and ketones) and organic acids (*C. A.* **19**, 822), P. has now investigated optically active acids. The data on the rotation of optically active org. acids mixed with various ketones and aldehydes conform with the previous results and it is suggested that the formation of the same addn. product accounts for the large changes observed in the optical rotation for the optically active acids used.

E. J. W.

Separation of the liquid linolic acids by fractional solution of their zinc salts in alcohol. GG. AGDE. *J. prakt. Chem.* **112**, 37-56 (1926).—A careful re-exam. of the work of Erdmann (*C. A.* **6**, 862) shows that his results cannot be reproduced and that it is impossible to sep. the liquid linolic acids by the fractionation of their Zn salts in $EtOH$.

C. J. WEST

X-ray crystal analysis as an auxiliary in organic chemical research. R. ROBINSON. *Nature* **116**, 45 (1925).—A brief account of the successful application, by Shearer, of X-ray analysis to the detn. of the length of C chains and the position of a C:O group. Similar investigations indicate that the acetylenic linking of stearolic acid is hydrated in each of the theoretically possible directions, i. e., $Me[CH_2]_7CO[CH_2]_nCO_2H$ and $Me[CH_2]_nCO[CH_2]_7CO_2H$, when the substance is treated successively with H_2SO_4 and water.

B. C. A.

The catalytic decomposition of amides. ALPHONSE MAILHE. *Bull. soc. chim.* **37**, 1394-7 (1925).—When the vapors of acid amides are passed over a freshly reduced Ni catalyst heated to ca. 400°, CO is split off and an amine contg. one C atom less than the amine is unaltered and appears in the end products, but with the alkyl amides, of which $Me_2CHCH_2CONH_2$, $EtCONH_2$ and $AcNH_2$ are described in full, the amine is

further decompd. to a nitrile, $\text{AcNH}_2 \rightarrow \text{MeNH}_2 \rightarrow \text{HCN}$. This is important as a ready method of degradation in an homologous series. R. E. GIBSON

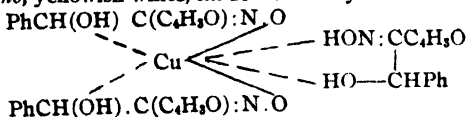
The imine residue. K. F. SCHMIDT. *Ber.* 58B, 2413-5(1925).—Reply to Oliveri-Mandalà (*C. A.* 19, 2791). C. A. R.

Butyl esters of the simpler amino acids. W. T. J. MORGAN. *J. Chem. Soc.* 1926, 79-84.—These esters were prepd. as a possible means of sepg. the hydrolysis products of proteins. They were first isolated as the HCl salt and liberated by $\text{Ba}(\text{OH})_2$ in Et_2O followed by a little 70% KOH . *Bu glycine*, b_{18} 81-1.5°, d_{18} 0.9703; in a sealed tube it changed in 24 hrs. to a cryst. solid, charring at 240° (triglycylglycine *Bu ester*?); *HCl salt*, m. 69-71°; *picrate*, pale yellow, m. 113°; *benzoquinone deriv.*, scarlet, m. 179-80°. *Bu carbamidoacetate*, m. 119°. *Isobutyl glycine*, b_{18} 79.5-80.5°, d_{17} 0.9618, d_{20} 0.9609; *HCl salt*, m. 84-8°, very hygroscopic and quickly liquefies in the air; *picrate*, m. 82-7°, *benzoquinone deriv.*, scarlet, m. 171-2°. *Bu dl-alanine*, b_{18} 81.5-2°, d_{19} 0.9342; *HCl salt*, m. 58-61°, rapidly deliquesces in moist air; *picrate*, m. 124°. *Isobutyl dl-alanine*, b_{19} 77-8°, d_{18} 0.9330; *HCl salt*, m. 60-3°, changes to a sirup on exposure to the air for a few min.; *picrate*, m. 132-3°. *Bu dl-valine*, b_{17} 98-8.5°, d_{14} 0.9266; *HCl salt*, m. 59-60°, *picrate*, yellow, m. 91-2°. *Bu dl-leucine*, b_{18} 113.5°, $d_{18.5}$ 0.8733; *HCl salt*, m. 110-1°, very hygroscopic; *picrate*, yellow, m. 139°. *Isobutyl dl-leucine*, b_{19} 110°, $d_{18.4}$ 0.9066; *HCl salt*, m. 97-9°; *picrate*, m. 135-6°. C. J. WEST

Relations between atomic grouping and specific affinity. The copper-affinity effectiveness of the atomic grouping $>\text{C}(\text{OH})\cdot\text{C}(\text{:N}\cdot\text{OH})\cdot$. F. FEIGL, G. SICHER and O. SINGER. *Ber.* 58B, 2294-303(1925); cf. *C. A.* 18, 30.— $\text{PhCH}(\text{OH})\text{C}(\text{:NOH})\text{Ph}$ (I), as shown in the earlier paper, may be used for the quant. detn. of Cu ; as in the ppt. formed with Cu^{++} in NH_4OH the Cu atom is unable to add NH_3 as a neutral component with the formation of ammine salts the ppt. was formulated as an inner complex salt,

$\text{Ph} \overline{\text{CH} \text{ O} \cdot \text{Cu} \cdot \text{O} \cdot \text{N} \cdot \text{C}} \cdot \text{Ph}$, in which the affinity field of the C double bonds of each

Ph group occupies a coordination position on the Cu atom and therefore sats. a secondary valence just as an added NH_3 mol. would. This assumption had to be proved by a study of the homologs of I and it was found that all acyloin oximes, $\text{RCH}(\text{OH})\text{C}(\text{:NOH})\text{R}'$, yield green, H_2O -insol. Cu salts of the same compn., which are decompd. by acids. Varying R and R' produces no change in this respect; their influence is shown only in the behavior towards NH_3 ; it is the grouping $=\text{C}(\text{OH})\text{C}(\text{:NOH})\cdot$, therefore, to which a Cu affinity must be ascribed. Insol. in NH_4OH or inability to add NH_3 results when R and R' are able to sat. Cu coordinatively; aromatic radicals are always able to do this, and there is no difference between sym. and asym. acyloin oximes. Substituents in the Ph group have no influence. In the aliphatic acyloin oximes only those radicals in which the C chain has more than 3 members have such a power to sat. Cu coordinatively. Cu salts of the oximes of the following compds. have been prepd., those marked s being sol. in NH_3 : fructose, s; acetol, s; acetoin, s; propioin, s; butyroin, s; valeroïn; capronin; enanthoin; diphenylacetoin; benzoin; furoin; anisoïn; cuminoïn; piperonyloïn; phenyloxyethenylamide, difficultly sol.; benzofuroin; benzanisoin; cumin-anisoin; p-dimethylaminobenzoin; p-chloro-p'-dimethylaminobenzoin; phenylbenzoin, s. benzylbenzoin, s. Valeroïn, from BuCO_2Et by the method of Bouveault and Locquin (*Bull. soc. chim.* [3], 35, 629(1906)), b_{12} 100-2°. Enanthoin, from Et enanthate in abs. Et_2O with Na on the H_2O bath, b_{10} 165-8°. Diphenylacetoin, from $\text{PhCH}_2\text{CO}_2\text{Et}$, b_{12} 160°. Benzoin oxime with $\text{Ni}(\text{OAc})_2$ also forms a flesh-colored amorphous compd. $[\text{PhCH}(\text{OH})\text{CPh}\cdot\text{NO}]_2\text{Ni}$, whose sepn. is hindered in tartaric acid and it is therefore probably a normal salt. Cuminoin oxime, yellowish white, m. 137°. Benzofuroin oxime, m. 158°; this also gives a brown Cu salt, $\text{PhCH}(\text{OH})\text{C}(\text{C}_6\text{H}_5\text{O})\cdot\text{N}\cdot\text{O}$



prepd. by treating the normal salt in H_2O suspension with concd. H_2SO_4 ; with NH_3 it gives the normal salt. C. A. R.

Keto-enol isomerism of ethylenebisacetylacetone. G. T. MORGAN and C. J. A. TAYLOR. *J. Chem. Soc.* 1926, 43-9.— $\text{C}_2\text{H}_5\text{Br}_2$ and Ac_2CHNa give ethylenebisacetylacetone, sepd. by fractional distn. into the keto form (I), b_{20} 97-9°, sol. in dil. NaOH to a yellow soln., and gives a Na salt with metallic Na in Et_2O ; the EtOH slowly develops a color with FeCl_3 ; a possible dehydration product, $\text{C}_{10}\text{H}_{10}\text{O}_4$, which does not give a color with FeCl_3 ; the mono-enol form (II), m. 99°, which gives an instantaneous deep violet

color with FeCl_3 and a Cu salt with $\text{NH}_4\text{OH}\cdot\text{Cu}(\text{OAc})_2$; after several months the m. p. was $146\text{--}52^\circ$; and the *dienol form* (III), m. $140\text{--}3^\circ$. Titration with Br in EtOH indicates that I contains about 0.8% of II, that II is pure and that III contains about 25% of the dienol and 75% of the monoenol. I yields an α -tetraoxime, m. 165° ; II, the β -tetraoxime, m. $220\text{--}2^\circ$. I and TeCl_4 give a small yield of β -chloroethylacetylacetone, m. 79° . II gives a yellow soln. in NaOH and yields no ppt. on addn. of H_2SO_4 , but Et_2O exts. I. II is partly changed into III under the influence of $\text{NH}_4\text{OH}\cdot\text{Cu}(\text{OAc})_2$. C. J. WEST

Influence of carbon rings on the velocity of reactions involving their side chains. I. Hydrolysis of cyclic and open-chain malonic esters. RICHARD GANE AND C. K. INGOLD. *J. Chem. Soc.* 1926, 10-7.—The results of the hydrolysis of $\text{CH}_3(\text{CO}_2\text{Et})_2$, $\text{CHMe}(\text{CO}_2\text{Et})_2$, $\text{CMe}_2(\text{CO}_2\text{Et})_2$, $\text{CHEt}(\text{CO}_2\text{Et})_2$, $\text{CEt}_2(\text{CO}_2\text{Et})_2$, $\text{CHPr}(\text{CO}_2\text{Et})_2$, iso $\text{PrCH}(\text{CO}_2\text{Et})_2$, Et cyclopropane-, -butane-, and -hexane-1,1-dicarboxylate by NaOH are reported and discussed. The points connecting the log of the initial velocities and the calcd. angles between the valencies carrying the CO_2H groups lie on a smooth curve both for the cyclic esters and the *gem*-di-Me ester. The curve indicates a value of 105.3° for the angle appropriate to the *gem*-di-Et ester. The curves of the tautomeric malonic esters show that the various alkyl groups exert an influence appropriate to their relative size, although it is difficult to express this effect quantitatively. C. J. WEST

Action of ammonia on the esters of citraconic, mesaconic and itaconic acids. K. STOSIUS AND E. PHILIPPI. *Monatsh.* 45, 457-70 (1925).—The action of anhyd. liquid NH_3 on Et citraconate at the ordinary temp. affords first the di-Et ester of homoaspartic acid, b₁₂ $118\text{--}9^\circ$ (cf. Philippi and Spenner, *C. A.* 9, 1302; the b. p. there recorded should read $125^\circ/18\text{ mm.}$), together with a trace of a substance, m. 185° . Continued action yields the diamide of homoaspartic acid, m. 175° (oxalate, m. 237°), which is hydrolyzed by boiling with water to the monoamide (homoasparagine), $\text{HO}_2\text{CCMe}(\text{NH}_2)\text{CH}_2\text{CO}_2\text{NH}_2$, m. 242° (cf. Piutti, *Ber.* 31, 2039-53 (1898)) which was also obtained together with α -mesaconamic acid (cf. Anschütz, *C. A.* 1, 2080), by the action of NH_3 on α -Et mesaconate, $\text{HO}_2\text{CCMe}\cdot\text{CHCO}_2\text{Et}$. Citraconic diamide was not among the products, but the action of NH_3 on Me citraconate yielded homoaspartimide, m. 185° , together with the above diamide. Homoaspartic acid, prepd. from homoasparagine (cf. Piutti, *loc. cit.*), crystallizes anhyd. from water and does not lose wt. at 180° , above which temp. it sublimes. The action of liquid NH_3 on Et mesaconate afforded mesacondiamide, while alc. NH_3 at 100° yielded Et homoaspartate and the above homoaspartimide. Et itaconate yielded similarly with liquid NH_3 2-ketopyrrolidine-4-carbamide, $\text{CH}_2\cdot\text{NH}\cdot\text{CO}\cdot\text{CH}_2\cdot\text{CHCONH}_2$, m. 217° , hot alc. NH_3 yielding again homoaspartimide. B. C. A.

Steric series. VII. The configuration of aspartic acid. KARL FREUDENBERG AND ALFONS NOË. *Ber.* 58B, 2399-408 (1925), cf. *C. A.* 20, 377.—It has been shown that sarcosolactic acid and natural alanine have the same configuration, and as natural malic (I) and natural aspartic (II) acids correspond, sterically, to the above 2 compds. they must also have the same configuration. A direct comparison of I and II has been made, both to confirm the above conclusion and to develop the technic, which is necessary in order that the α -haloaliphatic acids may also be included in the investigation. For the comparison were used analogous derivs. of the di-Et esters of the 2 acids: those of I are all liquid, while of the derivs. of II only the HCHO compd. is liquid, the others were used in the superfused state. Below are given, resp.: solvent (if any was used) and concn. in parentheses, temp., and $[\text{M}]_{578}^{25}$. *Di-Et L-malates*: Cinnamoyl (III), 20° , 6.7; 100° , -13.4. Benzoyl (IV), 20° , -12.4; 100° , -27.7. Formyl (V), 17° , -56.0; 100° , -58.1. *Hydrocinnamoyl* (VI), 20° , -55.8; 100° , -68.3. Acetyl (VII), 20° , -53.3; 100° , -67.5. Heptoyl (VIII), 20° , -59.8; 100° , -70.1. *Ethanesulfonyl* (IX), 20° , 105.2; 100° , -101.4. (*Ethanesulfonyl di-Me ester* (X), 18° , -98.3.) *p-Toluenesulfonyl* (XI), 20° , -104.1; 100° , -101.2. (*Acetyl dimethylalanilide* (XII), (alc. 20.6), 20° , 62.7. *Dianilide* (XIII), (alc., 4.3), 20° , 166.6.) *Di-Et L-aspartates*: Cinnamoyl (XIV), 20° (superfused), 25.4; 100° , 19.7; (HCO_2H , 17.9), 22° , 63.5; (HCO_2H , 27.3), 18° , 79.4; (HCO_2H , 45.2), 18° , 94.8. Benzoyl, 100° , 11.8; (alc., 3.9), 14° , -67.6. ($\text{C}_6\text{H}_5\text{N}$, 3.0), 20° , -74.3; ($\text{C}_6\text{H}_5\text{N}$, 17.2), 20° , -73.3; ($\text{C}_6\text{H}_5\text{N}$, 30.3), 20° , -69.7. ((CHCl_2), 4.8), 20° , 142.9. Formyl (XV), 20° , -0.3; 100° , -12.9. *Hydrocinnamoyl* (XVI), 20° (superfused), -17.8; 100° , -9.1. Acetyl (XVII), 19° (superfused), -21.0. 100° , -9.1. (*Acetyl di-Me ester* (XVIII), 20° (superfused), -30.7; 100° , -25.0.) Heptoyl (XIX), 20° (superfused), -46.0; 100° , -19.9. *Ethanesulfonyl* (XX), 20° (superfused), -28.7; 100° , -31.2; ($\text{C}_6\text{H}_5\text{N}$, 8.12), 17° , -59.1; ($\text{C}_6\text{H}_5\text{N}$, 44.0), 17° , -62.9; ($\text{C}_6\text{H}_5\text{N}$, 74.4), 17° , -57.3; (HCO_2H , 27.7), 18° , -49.1; (HCO_2H , 47.9), 18° , -48.3; (HCO_2H , 76.5), 18° , -39.7. *p-Toluenesulfonyl* (XXI), 20° (superfused), 37.5;

100°, —36.0; (C_6H_5N , 10.9), 22°, —59.3; (C_6H_5N , 25.6), 22°, —60.7; (C_6H_5N , 36.3), 18°, —61.7; (C_6H_5N , 46.8), 22°, —58.5; (HCO_2H , 25.9), 18°, 9.6; (HCO_2H , 50.6), 18°, 14.5; (HCO_2H , 57.9), 18°, 17.8; (HCO_2H , 65.8), 18°, 19.3; ($(CHCl_2)_2$, 9.8), 18°, 109.2; ($(CHCl_2)_2$, 24.2), 18°, 96.6; ($(CHCl_2)_2$, 44.4), 18°, 85.61. $[\alpha]_D^{20}$ for λ 637, 578, 546 and 436 also is given. At 20° the agreement between I and II is poor but at 100° it is excellent, the only (insignificant) discrepancy being in the case of XVI. The Bz and $PhCH_2-CH_2CO$ derivs. have the highest d -rotation, the aliphatic derivs. occupy a middle position and the sulfonyl derivs. have the highest l -rotation. With increase in temp. in the derivs. of I (except the sulfonyl compds) the rotation is shifted towards the left, while in the derivs. of II the influence of temp. is entirely irregular and often extraordinarily great; evidently in the superfused state there exist associations which influence the form of the mols. and change the rotation; the true values for solids are more likely to be obtained at the higher temps. at which the liquid phase is stable. For the same reason, extrapolation of the values for solvent-free substances from values obtained in solvents is unreliable unless the concn. of the soln. is very high. The rule that Et esters of the d -series rotate far more to the right than the Me esters must for the present be limited to the α -HO acids and their derivs. In the action of HNO_2 on asparagine or aspartic acid there is no Walden inversion. III, light yellow, b_p 195°. IV, b_0 5.152°. V, b_2 120–1°. VI, b_3 185–6°. VII, b_{10} 139°. VIII, b_2 140°. IX, $b_{0.5}$ 154–5°. X, b_1 167–8°. $MeSO_2Cl$, b_{13} 60–4°. XI, b_1 197–8°, is not stable on standing; this and the di-Me ester give with alc. NH_3 , even at —50°, only formamide and $MeC_6H_4-SO_2NH_2$. Benzoyl- l -malic acid, m. 162°, $[\alpha]_{578}^{14}$ —1.2° (± 0.5) in Me_2CO . Acetyl- l -methyl dichloride, b_{14} 118°. XII, m. 116°. XIII, m. 177°. XIV, m. 72°, shows no detectable rotation in C_6H_5N in concns. up to 54%. XV, b_1 145–6°. XVI, b_2 203°, m. 34°. XVII, b_{20} 183°, m. 31°. XVIII, $b_{1.5}$ 154–5°, m. 63°. XIX, m. 29°. XX, m. 50°. XXI, m. 79°; free acid, crystals with H_2O , m. (anhyd.) 139–40°, has a weak d -rotation; dichloride, m. 96–7°. Addendum.—The work of Sonn and Rosinsky (*C. A.* 20, 360) confirms that of Freudenberg and Brauns upon which Kuhn and Ebel (*C. A.* 20, 742) throw some doubt.

C. A. R.

Guanidine. G. PELLIZZARI *Mem. accad. naz. Lincei* (v), 14, 707–76 (1924).—A summary of P's investigations on guanidine, published since 1891 in 34 papers.

B. C. A.

Synthesis of galegine. ERNST SPATH AND WOLFGANG SPITZY. *Ber.* 58B, 2273–9 (1925).—Barger and White suggest (*C. A.* 18, 968) that in addn. to the structure $Me_2C:CHCH_2N:C(NH_2)_2$ (I) proposed by S. and Prokopp (*C. A.* 18, 2499) for galegine (II), it might have the structure $MeC:(CH_2)CH_2CH_2N:C(NH_2)_2$. Since $Me_2C:CHCH_2N_2H_2$ (III), which is obtained by the cleavage of II, gives II quite smoothly with $NCNNa_2$, it became incumbent to synthesize III in order to complete the artificial prepn. of II. This was finally effected after a no. of unsuccessful attempts. Dimethyl- β -iodoethyl-carbinol (27 g. from 54.4 g. $ICH_2CH_2CO_2Et$ with $MeMgI$), b_{12} 81–3°; attempts to split off H_2O from this compd. with $ZnCl_2$, ZnI_2 or P_2O_5 , or to replace the HO group by I with P and I and then split off HI led to no practical results; either there was resinification or sepn. of large amts. of free I. Direct distn. of the carbinol under atm. pressure gave I, III and a brown oil yielding a fraction, b_{10} 40–55°, which consisted in part of the expected β -isoamylenyl iodide, for with satd. alc. NH_3 at 100° it yielded a product giving the picrate, m. 138–9°, of III. Bromination of iso-Am NH_2 and subsequent splitting off of HBr, the action of $MeMgI$ on $H_2NCH_2CH_2CO_2Et$ or $HOCH_2CH_2CO_2Et$ and the Hoffmann degradation of $Me_2C:CHCH_2CONH_2$ likewise did not yield satisfactory results. Finally, $ClCH_2CH_2CO_2Me$, b_{10} 40–2°, obtained in 80.6 g. yield from 94 g. of the acid in MeOH satd. with HCl, was treated with 2.5 mols. $MeMgBr$ (from 190 g. MeBr), yielding 60 g. dimethyl- β -chloroethylcarbinol, b_{14} 62–3°, 19 g. of which (in 3 portions), heated in sealed tubes with $C_6H_5(CO)_2NK$ in xylene at 169° and finally at 218°, yielded 4.77 g. β -isoamylenylphthalimide, m. 100°; 3 g. of this, distd. with aq. $Ba(OH)_2$, the distillate then being neutralized with HCl, gave 1.65 g. III. HCl, identified with the product obtained from natural II through the picrate, m. 139–40°, m -nitrobenzoyl deriv., $C_{12}H_{14}O_3N_2$, m. 100°, and the chloroplatinate, m. 191–2° (decompn.) in an evacuated tube. The synthetic III. HCl (0.6 g.) with $NCNNa_2$ yielded 0.6 g. II picrate, m. 180–1°, further identified as the sulfate, m. 225–6° (in an evacuated tube), the 2,4,6-trinitro- m -cresolate, yellow, m. 160–1.5°, and the di- m -nitrobenzoyl deriv., m. 163–4°.

C. A. R.

New (observations) in sugar chemistry. VI. H. KILIANI. *Ber.* 58B, 2344–62 (1925); cf. *C. A.* 18, 665.—I. The lactone Na salt, $C_6H_7O_7Na$, of d -saccharic acid dissolves in 28 parts H_2O but the proposal to use it for the prepn. of d -saccharic acid

proved to be impracticable, for while the salt crystals so well when pure, its separation is hindered extraordinarily by the presence of a certain amount of other organic substances, a condition which is unavoidable in the oxidation of *d*-glucose or starch with HNO_3 . If into the pure lactone in 4 parts cold H_2O is stirred the necessary amount of solid crystalline NaOAc to form the Na salt the latter quickly begins to separate on vigorous stirring (even more readily after seeding), but if the same lactone is dissolved in 1 mol. cold *N* NaOH , the solution, in spite of its relatively greater concentration, cannot be made to yield crystals, even on seeding, and addition of several volumes of 95% alcoholic precipitates a sirup which, after again seeding, solidifies only very slowly in the course of several days, to a crystalline cake of the salt. The hoped-for transformation of the salt into glucuronic acid also ended in disappointment; the salt is not attacked at all in H_2O solution (1:30) by Al-Hg nor in 1:50 solution by Na-Hg when CO_2 is constantly passed in to combine with the Na; the yield of glucuronic acid on reduction in H_2SO_4 (Fischer and Piloty, *Ber.* 24, 521 (1891)) can be increased to 30%, starting from the free lactone, by turbinizing instead of "continuous stirring," and by adding dil. H_2SO_4 continuously at a measured rate from a dropping funnel instead of adding it "frequently." II. *Preparation of d-saccharic acid.* To eliminate the difficulties previously pointed out, all the factors have been studied individually and it has been found that (1) as raw materials must be used starch and 20% HCl (1 g. starch to 3.4 cc. acid), the mixture being allowed to stand 12 hours before the heating which (2) must be at 75° if 50 g. starch at most is oxidized in 1 flask and at first at $50-5^\circ$ if 50-250 g. starch is oxidized in 1 portion; (3) in any case, the mixture must be heated some hours at 100° at the end; (4) the $(\text{CO}_2\text{H})_2$ must be removed with CaCO_3 ; (5) the acid solution must be wholly neutralized with 1:2 KOH and, after evaporation at 50° , treated with AcOH (80 cc. for 250 g. starch), the acid K salt (yield, 23-5%) converted into the neutral salt and then, with 1:1 CaCl_2 into the Ca salt, which with $(\text{CO}_2\text{H})_2$ yields the free saccharic acid whose solution, concentrated to a sirup, readily solidifies to a cake of the monolactone, m. 130° ; the condensation of 0.5641 g. of the lactone in 10 cc. H_2O at $20.7-0.8^\circ$ changes only from 0.005357 to 0.005284 in 65 min. so that its conversion into the dibasic acid is slow. III. *Preparation of l-arabonic acid.* The method of Neuberg and Hirschberg (*C. A.* 5, 313) can be much simplified; 1 kg. cherry gum is heated 10 hours at 100° with 3 l. of 2% HCl , then 8 hours in a dish with occasional renewal of the evaporated H_2O , filtered, treated with 75 cc. Br , neutralized after 24 hours with freshly slaked lime, evaporated until a pellicle forms and allowed to stand several weeks; the crude salt can be recrystallized with the greatest ease from hot H_2O . The brucine salt contains $4\text{H}_2\text{O}$. IV. *Preparation of l-mannonic acid and l-gluconic acid.* The earlier method (*C. A.* 16, 2120) has been improved; after standing 5-6 days (the first 3 in a bath of cold H_2O) the *l*-arabinose- HCN mixture is stirred into 1.2 times the calculated amount of $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ in 4 parts H_2O on the H_2O bath, evaporated to a thick sirup and stirred until no more NH_3 is evolved, diluted with hot H_2O , treated with 0.8 times the calculated amount of H_2SO_4 (1 part concentrated acid to 4 parts H_2O), completely freed from the rest of the Ba with more dil. H_2SO_4 , evaporated to a sirup and worked up as previously described. The crude brucine *l*-gluconate is recrystallized from 0.5 part hot H_2O . The purified salt (m. 155°) is not, as previously supposed, homogeneous but contains a not inconsiderable amount of *l*-mannonate; the 2 acids can be separated by taking advantage of the fact that, contrary to the statement of Fischer, Ba *l*-gluconate (stout tables with $3\text{H}_2\text{O}$) crystals well and, therefore, *l*-gluconic lactone can readily be obtained in crystalline form. Pure brucine *l*-gluconate, m. $167-8^\circ$. V. *Salts of mucic acid.* Khotinsky and Epifanova (*C. A.* 19, 2640) obtained the anhydrous Na_2 salt from mucic acid and the calculated amount of *N* NaOH only because they boiled the mixture; 5 g. acid dissolved at first in the calculated amount of *N* NaOH but soon formed crusts and, on stirring, a crystalline powder of the Na_2 salt which, filtered after 1.5 hours, weighed 3.8 g.; this, heated 0.5 hr. at 100° with 25 cc. H_2O , at first almost wholly dissolved and then formed crusts and a finely pulverulent precipitate of the anhydrous salt (0.68 g.), while the mother liquor, concentrated to $\frac{1}{3}$ its volume and allowed to stand 12 hours, yielded a crust and a massive deposit of the hydrated salt (4.5 or possibly $5\text{H}_2\text{O}$). The Ca salt, precipitated from 1:40 and 1:60 solutions of the K salt by CaCl_2 in amorphous form, changes rapidly into characteristic stout granules; in a 1:80 solution there is at first only a slight turbidity but a granular crust is gradually formed; in concentrated solution (1:30) the change of the amorphous precipitate is much slower, being still very incomplete after 5 days. VI. Höning and Tempus (*C. A.* 18, 2872) consider it not improbable that K.'s "hydroxygluconic acid" is identical with their 2-ketogluconic acid, which yields arabinose on fermentation, but K. has been unable to obtain any arabinose by the action of yeast on his acid. Under the conditions under which H. and T. obtain their "osazone," K. obtained from the Ca salt of his acid only the very difficultly soluble phenylhydrazone of the salt, and from the free acid chiefly resinous products. VII. *Preparation of β -glucoheptone lactone.* Fischer's method (*Ann.* 270, 78 (1892)) can be materially simplified

and improved; the sirup drained from the α -lactone is dild. with 2-2.5 parts H_2O , treated at 35° with the calcd. amt. of brucine (detd. by titration of an aliquot) and allowed to stand 2 days. The soln. of the glucoheptonic acid obtained from the brucine salt (through the Ba salt) is so pure that on concn. (not above 50°) it begins to cryst. on the H_2O bath and the thin sirup, soon after cooling, solidifies almost completely, forming only the long needles of the β -lactone. VIII. A monoacetyl-*d*-galactonic acid, m. 160° , is obtained from galactonic acid, AcOH and concd. HNO_3 or HCl allowed to stand a long time at room temp. IX. The supposed *l*-galacturonic lactone semicarbazone, $C_7H_{11}O_6N_3 \cdot H_2O$, m. 189° , obtained by treating with $H_2NCONHNH_2 \cdot HCl$ the product of the oxidation of *d*-galactonic acid (I) with HNO_3 proved to be the semicarbazone, $C_7H_{10}O_7N_3$, of I, formed from the I which had escaped oxidation; refluxed in *N* HCl it gives I, and it is also obtained from I with $H_2NCONHNH_2 \cdot HCl$ and NaOAc in H_2O . *l*-Mannonic acid under the same conditions yields no difficultly sol. product, but the corresponding oxidation product, the double lactone of *l*-mannosaccharic acid, in concd. AcOH with NaOAc and $H_2NCONHNH_2 \cdot HCl$ yields the monosemicarbazide, $C_7H_{11}O_7N_3$, m. 193° , identical with the product previously supposed to be the uronic acid deriv. The true nature of the products formerly obtained from hediosite and isosaccharin after oxidation with HNO_3 was not cleared up so satisfactorily; the 2 substances, to be sure, give cryst., difficultly sol. products, as in the oxidation expts., when treated with $H_2NCONHNH_2 \cdot HCl$ and NaOAc but only in vanishingly small amts.; on the other hand, *i*-pentahydroxypimelic acid (the oxidation product of hediosite) forms no trace of a difficultly sol. $H_2NCONHNH_2$ deriv. X. The observations recorded under IX above of course materially diminished the hope of making the uronic acids more readily available by the $Br-Na_2CO_3$ method; below are some expts. which had already been made along these lines. Crystd. I (30 g.) + 3 parts H_2O + 25 g anhyd. Na_2CO_3 with 66 cc Br gave in 2 hrs. an abundant crop of the difficultly sol. Na salt, $C_6H_{11}O_7Na \cdot 2H_2O$, of unchanged I; soly. (anhyd.) in H_2O , 1:8.49. If in the oxidation 6 parts H_2O is used originally instead of 3, no salt of I seps. but the soln. contains large amts. of it, together with considerable mucic acid; Fehling detns. showed that only about 12% of the I has been converted into a reducing substance (perhaps *l*-galacturonic acid). XI. The following observations may prove of value in future work looking to the isolation of the uronic acids. (1) Glucuronic lactone with *p*- $O_2NC_6H_4NHNH_2$ in 50% AcOH gives the yellow hydrazone, $C_{12}H_{15}O_7N_3$, m. 224° , so difficultly sol. in boiling H_2O (contrary to the statement of Ekenstein and Blanksma, *Rec. trav. chim.* 24, 33(1905)), that it can hardly be recrystd. from this solvent but easily sol. in C_6H_6N . (2). With *p*- $BrC_6H_4NHNH_2$ in aq. AcOH *l*-mannohepturonic lactone (II) yields a cryst. product (probably the hydrazone), becomes discolored 145° , m. 165° (foaming). (3). II in aq. AcOH forms no difficultly sol. product with $BzNHNH_2$. (4). With *o*- $MeC_6H_4NHNH_2$ it forms yellow leaves difficultly sol. in H_2O but soon darkening. (5). *l*-Mannolactone with aq. $NH_2OH \cdot H_2O$ (0.126 g. per cc.) at room temp. gives the *hydrazide*, m. 161° , soly. in H_2O about 1.15; with *d*-gluconic acid nothing seps. and evapn. of the soln. yields a sirup which does not cryst.; I forms a thick cryst. mass; *l*-arabonic lactone forms no deposit in 5 hrs. but the sirup remaining on evapn. slowly solidifies; α - and β -glucoheptone, glucuronic and ketorhamnone lactones and *d*-saccharic and *i*-pentahydroxypimelic acids yield no crystals directly; the double lactone of *l*-mannosaccharic acid forms a cauliflower-like mass sepg. from H_2O in crusts of small needles, m. 182° (foaming); *l*-mannohepturonic lactone yields a cryst. magma which, however, slowly disappears completely in the course of 6 hrs. and after moderate spontaneous evapn. a 2nd sepn. (structureless spherules) and finally complete solidification occur. XII. The Fehling reducing action of the double lactone of "meta-" or *l*-mannosaccharic acid is about 25% that of glucose; with I and NaOH, it uses up 4 atoms I; in 2 mols. dil. NaOH with NaHg it slowly absorbs H and gradually loses its power to reduce Fehling soln.; in 2 mols. dil. KOH with KCN and in excess of hot dil. alkali it undoubtedly forms new substances.

C. A. R.

Structure of the normal monosaccharides. III. Rhamnose. E. I. HIRST AND A. K. MACBETH. *J. Chem. Soc.* 1926, 22-6; cf. C. A. 19, 1409.--Trimethyl- α -methyl-rhamnoside, b_D 101° , n_D^{15} 1.4415, results from a mixt. of α - and β -Me rhamnosides or from rhamnose, Me_3SO_4 and NaOH, followed by Ag_2O and MeI. Hydrolysis with 8% HCl at 90° gives trimethylrhamnose, b_D 141° , n_D^{15} 1.4565, which is oxidized by HNO_3 at 85° to *l*-arabotrimethoxyglutaric acid, isolated as the *di*-Me ester, b_D 135° , b_D 143° , n_D^{20} 1.4350, $[\alpha]_D$ 47.6° (MeOH, *c* 1.706). The Na salt showed $[\alpha]_D$ 25° . These facts indicate the amylene-oxidic structure for trimethylrhamnose, α - and β -Me rhamnosides and probably for rhamnose itself.

C. J. WEST

is unstable. II boiled 1 hr. in EtOH with concd. HCl gave 2,4,6-trinitrophenylurea (picrylurea), yellow, m. 201–3° (decompn.). E. J. WITZEMANN

Action of thiosemicarbazide on some aromatic nitro compounds. MICHELE GIUA AND RODOLFO PETRONIO. *Gazz. chim. ital.* 55, 665–74 (1925).—In extending the study of the labile NO₂ group (G. and Ruggeri, C. A. 17, 3865, 235; 18, 1479) the action of H₂NCSNHNH₂ (I) on aromatic NO₂ compds. was studied. 5 g. 2,4-(O₂N)₂C₆H₃Cl (II) in 80 cc. 95% EtOH warmed 3 hrs. on the H₂O bath with 4.5 g. I sepd. 2,4-dinitrophenyl-β-thiosemicarbazide, (O₂N)₂C₆H₃NHNHCSNH₂ (III) or (O₂N)₂C₆H₃NHNHCSNH₂ (SH):NH (IV), yellow, m. 210° (decompn.). 10 g. II in 50 cc. EtOH + 4.5 g. I + 6.7 g. NaOAc heated on the H₂O bath gave yellow [2,4-(O₂N)₂C₆H₃]₂S, m. 192–3°. 5 g. picryl chloride in 30 cc. EtOH with 3.7 g. I for 0.5 hr. on the H₂O bath gave 2,4,6-trinitrophenyl-β-thiosemicarbazide (or picryl-β-thiosemicarbazide) (V), m. 183–4° (decompn.). 2.4 g. V in 30 cc. EtOH with an excess of 20% FeCl₃ gave a ppt. of what is probably picrylazothiocarbamide 2,4,6-(O₂N)₃C₆H₂N:NCSNH₂ (VII), m. 166° (decompn.). β-Trinitrotoluene (VIII) with I gave 2,4-dinitro-*m*-tolyl-β-thiosemicarbazide (IX) (1 of 2 formulas like III and IV), yellow, m. 203–4°. When I and VIII are heated in H₂O in the ratio of 1:1 2,6,2',6'-tetranitro-5,5'-dimethyldiphenyl sulfide (X) mixed with IX is pptd. On crystg. from AcOH X seps. as yellow needles, m. 222°. X is not attacked even by fuming HNO₃, while the sulfide obtained from γ-MeC₆H₄(NO₂)₃ is transformed into the sulfoxide (C. A. 17, 3865). γ-MeC₆H₄(NO₂)₃ in EtOH with I gives 4,6-dinitro-*m*-tolyl-β-thiosemicarbazide (XI) (1 of 2 formulas like III and IV), yellow, m. 188° (decompn.). XI reacts easily in the cold with FeCl₃, giving a mixt. of XI, its oxidation product (XII) and 4,6,4',6'-dimethyldiphenyl disulfide (XIII), red, m. 265°. XIII is the main product when I and γ-MeC₆H₄(NO₂)₃ react in equimol. amts. in the presence of EtOH. E. J. WITZEMANN

Organic molecular compounds. VII. Azoxybenzene and aromatic nitro derivatives. MICHELE GIUA AND GUIDA GUASTALLA. *Gazz. chim. ital.* 55, 646–52 (1925).—Recently Meisenheimer (C. A. 14, 2793) described addn. compds. of aromatic poly nitro derivs. with Ph₂N₂O. The f. p. diagrams of 5 such systems are described in the paper. In the system α-(O₂N)₂C₆H₃Me–Ph₂N₂O an addn. compd., m. 64°, of 3 mols. of the 1st and 2 of the latter is formed. The equil. curve shows 2 max., of which 1 due to an anomalous reaction caused by the slowness with which the above compd. is formed. The eutectic between the compd. and Ph₂N₂O solidifies at 26.7°; that between the compd. and α-(O₂N)₂C₆H₃Me solidifies at 53.7°. The system β-(O₂N)₂C₆H₃Me–Ph₂N₂O shows a simple eutectic at 25% of the 1st compd. that solidifies at 25°. The system γ-(O₂N)₂C₆H₃Me–Ph₂N₂O shows a simple eutectic at 35% of the 1st compd. that solidifies at 22°. The system 2,4-(O₂N)₂C₆H₃Me–Ph₂N₂O shows a eutectic at 31.3% of the 1st compd. that solidifies at 16°. The system 2,4-(O₂N)₂C₆H₃Me–Ph₂N₂O shows a simple eutectic at 42% of the 1st compd. that solidifies at 16°. VIII. Azo compounds and aromatic nitro derivatives. M. GIUA AND GIULIO REGGIANI. *Ibid* 652–61; cf. Hofmann and Kirmreuther, C. A. 4, 2801.—One mol. Ph₂N₂ forms a mol. addn. compd. with 2 mols. α-(O₂N)₂C₆H₃Me that m. about 65°. The system Ph₂N₂–2,4-(O₂N)₂C₆H₃Me shows a eutectic at 49.15% of the former compd. that solidifies at 39.6°. The system Ph₂N₂–*p*-O₂NC₆H₄Me shows a single eutectic at 46% of the former compd. that solidifies at 28.6°. The system Ph₂N₂–*m*-C₆H₄(NO₂)₂ shows a eutectic at 56.2% of the 1st compd. that solidifies at 46.5°. The system *p*-H₂NC₆H₄:N:NPh–*p*-O₂NC₆H₄Me shows a eutectic at about 30% of the 1st compd. that solidifies at 34.4°. Equimol. amts. of *p*-H₂NC₆H₄:N:NPh and *m*-C₆H₄(NO₂)₂ give an addn. compd. that m. about 86°. The system *p*-H₂NC₆H₄:N:NPh–*p*-O₂NC₆H₄Cl shows a eutectic at 41.5% of the 1st compd. that solidifies at 53.8°. 1 mol *p*-Me₂NC₆H₄:N:NPh combines with 2 mols. of α-(O₂N)₂C₆H₃Me giving an addn. compd. that m. 82°. The eutectic between the compd. and the 1st component lies at 77.2°; that with the 2nd component at 73°. The system *p*-Me₂NC₆H₄:N:NPh–2,4-(O₂N)₂C₆H₃Me shows a eutectic at 34% of the 1st compd. that solidifies at 52.7°. The system *p*-Me₂NC₆H₄:N:NPh–*p*-O₂NC₆H₄Me shows a eutectic at 30% of the 1st compd. that solidifies at 40.8°. The system *p*-Me₂NC₆H₄:N:NPh–*m*-C₆H₄(NO₂)₂ shows a eutectic at 45.3% of the 1st compd. that solidifies at 63°. E. J. WITZEMANN

Influence of sulfur on the color of azo dyes. Further investigation. G. D. PALMER AND E. E. REID. *J. Am. Chem. Soc.* 48, 528–32 (1925); cf. C. A. 18, 2877.—The influence of S and of the SO₂ group on the color of azo dyes has been further studied by prep. the *meta* series of dyes. The –S– is strongly bathochromic and the –SO₂– hypsochromic, both effects being most pronounced when the alkyl is Me. The groups arrange themselves in the order SO₂Me < Me < OMe < SMe in the *m*- as in the *p*-series, but the bathochromic effect of S is not as distinct or as intense in the *m*- as in the *p*-position.

Alkyl ethers of m-acetylaminothiophenyl: Me, m. 75°; Et, oil, d_{25}^{25} 1.0360; Bu, oil, d_{25}^{25} 1.0101; benzyl, m. 74.1°; the yields were 49, 50, 64 and 50%, resp. Refluxed with concd. HCl in EtOH, there results the HCl salts of the *m*-aminothiophenol alkyl ethers: Me, 69% yield; Et, 82%; Bu, 87%; benzyl, 95%. *m*-Acetylaminophenylalkyl sulfones: Me, m. 137°, 85% yield; Et, m. 96°, 86%; Bu, oil, d_{25}^{25} 1.3727, 83%; benzyl, m. 134.2°, 94%. Hydrolysis with HCl-EtOH gave the corresponding HCl salts of the *m*-aminophenyl alkyl sulfones: Me, 59%; Bu, 57%; benzyl, 96%. The colors of the dyes prepd. from R-salt are given.

C. J. WEST

p-Chloromercuribenzoic acid and related compounds. F. C. WHITMORE AND GLADYS E. WOODWARD. *J. Am. Chem. Soc.* **48**, 533-6 (1926).—Oxidation of 100 g. crude p -ClHgC₆H₄Me with KMnO₄ in dil. NaOH gives 90% of *p*-chloromercuribenzoic acid (I), amorphous, which could not be purified; with I in EtOH it gives 95% *p*-IC₆H₄CO₂H. Refluxed in dil. EtOH-NaOH until soln. is practically complete, there results 73% of Na *p*-hydroxymercuribenzoate (II), lustrous plates. Boiling I with Na₂CO₃ gives the Na salt, hard, granular crystals. II and NaI in H₂O give Na *p*-iodomercuribenzoate, large plates; the IHg linkage is very stable; the *p*-bromo compd. was prepd. in a similar manner. I and SnCl₂ in excess of NaOH give 60% of *p*-mercuribisbenzoic acid, readily sol. in NaHCO₃; Na salt very sol. in cold H₂O. PCl₅ in CHCl₃ or SOCl₂ gives the chloride, from which the Bu ester, m. 170°, is obtained in 56% yield. C. J. W.

Organic bismuth compounds. I. Preparation of tricarboxytriphenylbismuth dichlorides and certain nitrotriaryl bismuth compounds. J. V. SUPNIEWSKI AND ROGER ADAMS. *J. Am. Chem. Soc.* **48**, 507-17 (1926).—By extg. the black ppt. from the reaction of BiCl₃ and RMgX with CCl₄ or CHCl₃, R₃Bi are obtained in 30-65% yields. *Tri-o-anisyl bismuth*, m. 169-70°. The dihalides were prepd. by passing Cl into a CCl₄ soln. or with 10% Br-CCl₄. *Tri-m-tolyl bismuth dichloride*, m. 132-3°; *dibromide*, m. 52°, could not be recrystd. and decomps. quickly in the air. The tri-*o*- and *p*-anisyl compds. appear to be very unstable towards halogens. Heating the dihalides with glacial AcOH gives the diacetates. *Triphenylbismuth diacetate*, m. 152-3°; by boiling HCl this gives the corresponding dichloride. Oxidation of (*o*-MeC₆H₄)₃-BiCl₂ in AcOH with CrO₃ gives 15% of *tri-o-carboxytriphenylbismuth dichloride*, m. 157-9°. The *p*-deriv., m. 130°, results by the use of KMnO₄ or CrO₃; the alk. soln., pptd. by EtOH or Me₂CO, gives the corresponding salt; on standing decompn. occurs. *Tri-p-carbomethoxytriphenylbismuth dichloride*, m. 103°; the yield is poor as Bi ppts. on warming with MeOH. The dihalides in Me₂CO, treated with AgNO₃ in 50% EtOH, give the corresponding dinitrates. *Trinitrotriphenylbismuth dinitrate*, pale yellow, explodes at about 147°. Crystn. from AcOH gradually replaces the NO₂ radical by the Ac radical. HCl in Me₂CO gives the *dichloride* (I), m. 132-4°. *Trinitrotri-p-tolylbismuth dinitrate*, explodes about 160°; the *dichloride*, m. 156°. *Trinitrotri-o-tolylbismuth dichloride*, m. 149-50°, decomp. on standing. *Trinitrotri-p-carbomethoxytriphenylbismuth dinitrate*, explodes about 150-60°; boiling with HCl gives *trinitrotri-p-carboxytriphenylbismuth dichloride*, m. 250-60° (decompn.). Reduction of I at 0° with Na₂S₂O₄ gives *trinitrotriphenylbismuth*, m. 121°, decomp. on standing. *Trinitrotri-p-tolylbismuth*, m. 126°. Sulfonation of tri-*o*-tolylbismuth dichloride gave a product which is apparently hydrolyzed most readily by H₂O and alkali so that the final product is [Me-(OH)C₆H₃]₃Bi(OH)Cl, m. 154°. PhN₂Cl and BiCl₃ give an addn. product, explodes about 120°. *o*-Bromobenzyl methyl ether, b_{748} 225°; the *p*-deriv., b_{730} 127°, b_{730} 201°. No Grignard reagent could be formed from them.

C. J. WEST

Cyclic organometallic compounds. I. Compounds of tellurium. H. D. K. DREW. *J. Chem. Soc.* 1926, 223-32.—TeCl₄ (23.8 g.), 18.7 g. Ph₂O and 15 cc. dry CHCl₃, heated 26 hrs., give 90% of *p*-phenoxyphenyltelluriumtrichloride, PhOC₆H₄TeCl₃ (I), pale yellow, softens about 154°, m. 156-7°. There also results about 0.5 g. of *p,p'*-diphenoxydiphenyltelluriumdichloride, m. 157-8°, best obtained by heating 3.9 g. I and 1.7 g. Ph₂O at 140-65° for 6 hrs. in an atm. of N; this is unchanged at 210° after 1 hr., is unchanged by cold aq. KOH but decompd. by boiling, giving Ph₂O. Reduction of I in ice-cold H₂O with K metabisulfite gives a quant. yield of *p,p'*-diphenoxydiphenyl ditelluride, bronzed brownish violet or purplish red, softens 85°, m. 87-8°, mol. wt. in freezing C₆H₆, normal. Solns. exposed to the air slowly deposit an amorphous oxide; Br gives a yellow bromide, m. about 180°; warm HNO₃ ultimately gives (*p*-O₂NC₆H₄)₂O. Heating I at 150-200° for 4.75 hrs. or heating TeCl₄ and Ph₂O at 100-240° during 13 hrs., gives 10,10-dichlorophenoxitellurine, m. 265°; at 100° the cryst. form is yellow but becomes colorless on cooling. It is slowly hydrolyzed by boiling H₂O to an oxide. Reduction gives phenoxitellurine, lemon-yellow to orange, m. 78-9°, with a delicate floral odor; it can be vaporized unchanged; the cold concd. H₂SO₄ soln. is deep purplish red. It is

stable towards hot concd. HCl or dil. aq. NaOH. Warm concd. HNO_3 gives the 10,10-dinitrate, decomp. about 258° . The dibromide, bright yellow, decomp. 290° ; the diiodide, red, decomp. about 270° . The action of heat upon mixts. of TeCl_4 and Ph_2O in various proportions is discussed. C. J. WEST

Constitution of tribromophenol bromide and its congeners. W. M. LAUER. *J. Am. Chem. Soc.* **48**, 442-51(1926).—The tetrabromocyclohexadienone formula of Thiele and Eichwede (*Ber.* **33**, 673(1900)) for the compd. resulting by the action of Br on $\text{Br}_3\text{C}_6\text{H}_2\text{OH}$, is improbable. The "hypobromite" formula of Benedikt (*Ann.* **199**, 127(1879)) accounts for the facts introduced if there is postulated a partial rearrangement of trihalogenated phenol chlorides which contain Br in the *p*-position to the isomeric trihalogenated phenol bromides. 4,2,6- $\text{BrCl}_2\text{C}_6\text{H}_2\text{OH}$ and Cl give a compd. $\text{C}_6\text{H}_2\text{BrCl}_3\text{O}$, decomp. about 114° (depending upon the rate of heating); Br and $\text{ClBr}_2\text{C}_6\text{H}_2\text{OH}$ give the compd. $\text{C}_6\text{H}_2\text{ClBr}_3\text{O}$, decomp. about 115° ; Cl and $\text{Br}_3\text{C}_6\text{H}_2\text{OH}$ give an isomeric compd., decomp. about 131° . The action of EtOH upon these compds. is described. The original should be consulted for the theoretical discussion. C. J. WEST

Nitration of *m*-bromophenol. H. H. HODGSON AND F. H. MOORE. *J. Chem. Soc.* **1926**, 155-61; cf. *C. A.* **19**, 2937.—Mononitration of *m*- $\text{BrC}_6\text{H}_4\text{OH}$ with NaNO_2 and H_2SO_4 gives a mixt. of the 6- NO_2 deriv., m. 42° (volatile with steam) (Me ether, m. 85.5° ; benzoate, cream-colored, m. 104° ; Na salt, scarlet needles) and the 4- NO_2 deriv., yellowish white, m. 131° (Me ether, m. 45° ; benzoate, cream-colored, m. 102° ; Na salt, amber needles). HNO_3 in oleum gives the 2-nitro deriv., bright yellow, m. $65-7^\circ$; Na salt, red needles; Me ether, m. 73° ; benzoate, m. 133° ; it forms a very labile, colorless hydrate, m. 35° ; the yellow form reverts to the hydrate in moist air; the sensitiveness of the compd. is such as to make it an approx. indicator of atm. humidity. The anhyd. yellow variety of 3-chloro-2-nitrophenol, m. $45-7^\circ$; the hydrate, with 1 H_2O , m. $37.5-8^\circ$, this hydrate is much more stable in air than that of the Br deriv. *m*- $\text{BrC}_6\text{H}_4\text{OH}$ and 90.5% HNO_3 in an equal vol. of AcOH give the 4,6-(NO_2)₂ deriv., m. 92° ; this also results from the 6- or 4- NO_2 deriv. and mixed acid (15 vols. 98% H_2SO_4 , 12 vols. 70% HNO_3 and 9 vols. H_2O) and by boiling 1,3,4,6- $\text{Br}_2\text{C}_6\text{H}_2(\text{NO}_2)_2$ with aq. Na_2CO_3 6 hrs. Ag salt, yellow gelatinous ppt gradually changing to a red cryst. form; in aq. NH_3 a yellow cryst. form results. The 2- NO_2 deriv. in the mixed acid gives the 2,6-dinitro deriv., m. 131° ; a small amt. is obtained from the 6- NO_2 deriv. in oleum (27% SO_3) after 3 hrs. at 10° by nitrating with 90.5% HNO_3 in oleum. Ag salt, red. The 2,4-dinitro deriv. forms a yellow Ag salt. The 2,6- and 2,4-(NO_2)₂ derivs. may be sep'd by conversion into the Ag salts and digestion with NH_4OH , the 2,6-(NO_2)₂ salt being soluble in cold NH_4OH . Concd. NH_4OH converts both derivs. into 2,4,1,3-(O_2N)₂- $\text{C}_6\text{H}_2(\text{NH}_2)_2$. NaOH gives 2,4,1,3-(O_2N)₂- $\text{C}_6\text{H}_2(\text{OH})_2$. 3,2,4,6- $\text{Br}(\text{NO}_2)_3\text{C}_6\text{H}_2\text{OH}$, m. 149° . 3-Bromo-2,5,6-trinitrophenol, m. 146° ; the yellow Ag salt is sol. in H_2O but insol. in NH_4OH . K 3-bromo-2,5,6-trinitrophenol-4-sulfonate, yellow, explodes on heating. C. J. WEST

Reduction with active charcoal of organic substances containing oxygen. G. STADNIKOV, N. GAVRILOV AND A. VINOGRADOV. *Ber.* **58B**, 2428-9(1925).—C deposited on finely divided Fe is extraordinarily active and at a relatively low temp. (430°) is burned to CO and CO_2 at the expense of the O of cresols, which are thereby reduced to PhMe. Asbestos is soaked with Cl-free $\text{Fe}(\text{NO}_3)_3$, pressed out, treated with 10% NH_4OH , washed, dried and filled into a tube which is heated 3-4 hrs. at $460-70^\circ$ in a current of H; the temp. is raised to $480-90^\circ$ and *p*-cresol is added at the rate of 3-5 drops per min. while a slow current of H is passed through the tube; the cresol decomp. into H, CO and C which is deposited on the Fe; when CO_2 appears in the issuing gas, the temp. is gradually dropped to 430° when the cresol can be added more rapidly (12-5 drops per min.); the issuing gas contains 10-14% CO_2 and 5-8% CO and as high as 84% PhMe can be obtained. In CO_2 instead of H a good yield of PhMe (up to 75%) can also be obtained; the issuing gas contains considerable CO, formed by reduction of the CO_2 by the C. In N, 85% PhMe can be obtained. C. A. R.

Benzoquinone dichloride. OTTO DIMROTH, EBER HANS AND KARL WEHR. *Ann.* **446**, 132-47(1925).—Benzophenone dichloride (I) (5 g.) in 25 cc. Ac_2O and 0.5 cc. concd. H_2SO_4 at 65° for 3 days yields 2,3-dichlorohydroquinol diacetate, m. 121° ; no intermediate product could be isolated. A slow acetylating agent, such as Ac_2O contg. *p*- $\text{MeC}_6\text{H}_4\text{SO}_3\text{H}$, acting for 4 weeks at 50° , gives the 2,5-dichlorohydroquinol diacetate, m. 141° . The dibromide, under all conditions, always gives the 2,5-diacetate. β -Naphthoquinone dichloride or dibromide with Ac_2O - H_2SO_4 gives the 2-Cl- or 2-Br- α -deriv. *p*-Diketocyclohexane, Ac_2O and H_2SO_4 give cyclohexane-1,1,4,4-tetraacetate (II), m. 107° , sublimes $200-20^\circ$ (partial decompn.); warming on the H_2O bath gives hydroquinol diacetate, m. 122° . II and Ac_2O contg. *p*- $\text{MeC}_6\text{H}_4\text{SO}_3\text{H}$ give cyclohexadiene-1,4-diacetate.

m. 94–5°. Reduction of I with CrCl_2 gives hydroquinol; SnCl_2 and HCl at 0° give monochlorohydroquinol, m. 104°, as does SO_2 . HI at 0° appears to give a dihydrodichlorohydroquinol, m. about 92°. Oxidation of I with KMnO_4 at 0° gives isodichlorosuccinic acid (III), m. 175°, as does toluquinone dichloride. *Acetaminoquinone dichloride*, pale yellow, m. 91°; oxidation gives III. Methoxyquinone dichloride, yellow prisms and needles, m. 144–5°; oxidation gives III. The Cl probably adds to O:C₆H₄:O in the *trans*-position. C. J. WEST

Organo-metallic compounds of aluminium. IV. Action of acid chlorides. P. LEONE. *Atti accad. Lincei* [vi], 1, 443–5 (1925), cf. *C. A.* 19, 2929. The action of BzCl on Al Et iodide in ether yields MeCHBz_2 , benzoyl ethane, a small proportion of PhCOPr , and ethane, the last probably resulting from decompn. of some of the Al Et iodide by the HCl formed during the condensation. B. C. A.

Chloro derivatives of m-hydroxybenzaldehyde. II H. HODGSON AND H. G. BEYARD. *J. Chem. Soc. 1926*, 147–55, cf. *C. A.* 19, 2040. Direct chlorination of 3- $\text{HOCH}_2\text{CH}_2\text{CHO}$ in glacial AcOH gives a little 6-Cl deriv., but principally the 2-chloro deriv. (I), m. 139.5°; catalysts have little or no effect on the reaction. The same deriv. was prepd. from 2,3- $\text{O}_2\text{N}(\text{HO})\text{C}_6\text{H}_3\text{CHO}$ through the diazo compd. Oxidation gives 2-chloro-3-methoxybenzoic acid, m. 160°. I gives an *Ac* deriv., m. 62°, a *Bz* deriv., m. 88°, an *oxime*, m. 149°, a *p*-nitrophenylhydrazone, orange-red, m. 244–5°, a semicarbazone, pale yellow, m. 236–7°. The 4-chloro deriv. (II), m. 121°, yields an *oxime*, m. 126° (hydrate decomps. 106–10°), *p*-nitrophenylhydrazone, violet-red, m. 226–7°, and semicarbazone, pale yellow, m. 238–9°. The 6-chloro deriv. (III), m. 111°, was obtained in very poor yield through the 6- NO_2 deriv. and also by nitration of 2- $\text{ClC}_6\text{H}_4\text{CHO}$, reduction and diazotization; 2-chloro-5-aminobenzaldoxime, m. 159–60°. III yields an *oxime*, m. 146–7°, also crystg. with 1 H_2O from dil. EtOH ; *p*-nitrophenylhydrazone, red, m. 250–1°; semicarbazone, pale yellow, m. 236°. Chlorination of I, m- $\text{HOCH}_2\text{CH}_2\text{CHO}$ or III gives the 2,6-dichloro deriv., m. 140°; *oxime*, m. 174–5°; *p*-nitrophenylhydrazone, deep orange-red, m. 205–6°. II gives the 2,4-dichloro deriv., m. 141°; *oxime*, m. 188°; *p*-nitrophenylhydrazone, orange-red, m. 277–8°. The 2,4,6- Cl_3 deriv., m. 114°; Na salt, pure yellow; *oxime*, m. 174°; *p*-nitrophenylhydrazone, yellow-orange, m. 272–3° (decompn.). 6-Nitro-3-methoxybenzoic acid, m. 255° (Rieche, *Ber.* 22, 2347 (1889), gives 132–3°); *Ag salt*. 2-Chloro-3-methoxybenzaldehyde, m. 56°; *oxime*, m. 130.5°; *p*-nitrophenylhydrazone, old gold, m. 226–7°; *p*-bromophenylhydrazone, pale yellow, m. 155–6°; *t*-chloro deriv., m. 52°, *oxime*, m. 98–9°, *p*-nitrophenylhydrazone, old gold, m. 251°; *p*-bromophenylhydrazone, pale pink, m. 134°. 6-Chloro deriv., m. 62°; *oxime*, m. 101.5°; *p*-nitrophenylhydrazone, old gold, m. 229°; *p*-bromophenylhydrazone, pale yellow, m. 100°. 2,6-Dichloro deriv., m. 102°; *p*-nitrophenylhydrazone, old gold, m. 214–5°; oxidation gives the corresponding acid, m. 149.5°. 2,4-Dichloro deriv., m. 82°; *p*-nitrophenylhydrazone, old gold, m. 258–60°. 2,4,6-Trichloro deriv., m. 76°; the corresponding acid, m. 109° (Zincke, *Ann.* 261, 239 (1891)) gives 90°. The chloro-3-hydroxybenzaldehydes all have very pronounced stannatory properties, which are most marked in the 2,6- and but slightly less so in the 2,4,6-compd. For the mono-Cl derivs. the order is 6-, 2- and 4-. The property is comparatively feeble in the last compd. and thus is indicated its dependence on *o*-substitution. The property vanishes on methylation but the MeO compds. have a hawthorn-like odor which in turn vanishes when these are oxidized to the acids. All these compds. attack the moistened skin, producing painful blisters. C. J. WEST

New synthesis of o-acetoveratrole. F. MAUTHNER. *J. prakt. Chem.* 112, 57–60 (1926).—2,3- $\text{HO}(\text{MeO})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ (50 g.) and 134 cc. Me_2SO_4 give 45 g. 2,3-(MeO)₂- $\text{C}_6\text{H}_3\text{CO}_2\text{H}$, which yields 34.7 g. Me ester; with 19 g. AcOH and 4.2 g. Na there results 17 g. *Et* 2,3-dimethoxybenzoylacetate, pale yellow oil, which yields a pyrazolone deriv., m. 125–6°. Boiled 12 hrs. with 25% H_2SO_4 , 17 g. ester gives 4 g. 2,3-(MeO)₂- $\text{C}_6\text{H}_3\text{Ac}$, whose *p*-nitrophenylhydrazone, red, m. 155–6°. C. J. WEST

New synthesis of o-vanillin and o-veratraldehyde. F. MAUTHNER. *J. prakt. Chem.* 112, 60–4 (1926).—2,3- $\text{HO}(\text{MeO})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ (25 g.) and 11.2 g. ClCO_2Me in 36 g. PhNMe_2 and 125 g. C_6H_6 in a cooling mixt. give 16.5 g. carbomethoxyguaicol-*o*-carboxylic acid, m. 145–6° (decompn.); FeCl_3 gives a very pale color. The acid (12 g.) and 13.8 g. PCl_5 in 25 cc. CHCl_3 give 11 g. of the chloride, m. 43–4°. Reduction of 5 g. of the chloride in 15 cc. PhMe with 2 g. Pd-BaSO_4 catalyst at 110° for 6 hrs., followed by sapon., gives 2 g. *o*-vanillin, whose *p*-nitrophenylhydrazone, red, m. 217–8°. 2,3-Dimethoxy-1-benzoyl chloride, b_p 142–3°, m. 54–5°, results in 18 g. yield from 20 g. of acid; the amide, m. 93–4°. Reduction of 5 g. of the chloride as above gives 2.1 g. *o*-veratraldehyde, whose *p*-nitrophenylhydrazone, m. 205–6°. C. J. WEST

Preparation, hydrolysis and reduction of the fluoro-, chloro- and bromo-benzyl

bromides. J. B. SHOESMITH AND R. H. SLATER. *J. Chem. Soc.* 1926, 214-23; cf. *C. A.* 19, 474.—The $\text{ClC}_6\text{H}_4\text{CH}_2\text{Br}$ were prepd. from the corresponding $\text{ClC}_6\text{H}_4\text{Me}$ through the $\text{ClC}_6\text{H}_4\text{CHCl}_2$, $\text{ClC}_6\text{H}_4\text{CHO}$ and $\text{ClC}_6\text{H}_4\text{CH}_2\text{OH}$. *o*-Chlorobenzyl bromide, b_p 102°. *m*-Deriv., b_{10} 109°. The $\text{BrC}_6\text{H}_4\text{CH}_2\text{Br}$ were prepd. by passing a stream of air through Br into boiling $\text{BrC}_6\text{H}_4\text{Me}$; the *o*-deriv., m. 31°; *m*-deriv., m. 40°; *p*-deriv., m. 63°. With KI they yield the *bromobenzyl iodides*: *o*-deriv., m. 47°; *m*-deriv., m. 42°; *p*-deriv., m. 73°. *o*-Fluorobenzyl bromide, b_{15} 84-5°; *m*-deriv., b_{12} 77°; *p*-deriv., b_{15} 85°. Results are given for hydrolysis and reduction of the bromides. The order in which the atoms or groups affect the reactivity of the Br towards hydrolyzing agents in a general way is OMe, Me, F, Cl, Br, CO_2H , NO_2 , ranging from the strongly enhancing MeO group to the strongly retarding NO_2 group and towards HI is OMe and Me, Cl, Br, CO_2H and F. In the latter case only the MeO and the Me group have an appreciable general influence on the reduction velocity. The alternating and steric effects also are discussed. C. J. WEST

Organic peroxides. VIII. Some additional reactions which apparently proceed according to the R.H. scheme. H. GELISSEN AND P. H. HERMANS. *Ber.* 58B, 2396-9 (1925); cf. *C. A.* 19, 2484.—Attention is drawn to some reactions described in the literature which seem to support the validity of G. and H.'s R.H. scheme. v. Lippmann with $\text{MeCH}:\text{CHEt}$ (I) and BzO_2H (*Monatsh.* 5, 559(1884)) obtained CO_2 , BzOH , "Amylwasserstoff" (II) and an oil (III) (C 75.4, H 8.0%) which on hydrolysis with alc. KOH yielded BzOK and a liquid which he called "diamylene oxide" (IV). G. and H. believe his II was C_6H_6 and the IV was $\text{Et}_2\text{C}:\text{CMcCOEt}$ (V) and that the reaction proceeds chiefly according to the scheme $\text{I} + \text{Bz}_2\text{O}_2 \rightarrow \text{BzOCet}:\text{CHMe}$ (VI) + $\text{PhH} + \text{CO}_2$. The VI (C 75.1, H 7.4%) on hydrolysis yields BzOH and the enol, which at once rearranges into Et_2CO , and this, under the influence of the alc. KOH, gives V, whose compn. and vapor d. agree well with the values found by v. L. for his IV. The decompn. of $(\text{PhSO}_2)_2\text{O}_2$ by H_2O at 61° observed by Fichter and Stocker (*C. A.* 19, 980) can be explained fully as well as proceeding according to the scheme $\text{PhSO}_2\text{O.O.SO}_2\text{Ph} + \text{H.OH} \rightarrow \text{PhSO}_2\text{OH} + \text{PhOH} + \text{SO}_3$. C. A. R.

Ring systems with *p*-linkages. GUSTAV HELLER AND SIEGFRIED GOTTFRIED. *J. prakt. Chem.* 111, 368-72(1925).—*p*-Aminobenzoic acid hydrazide (I) and BzCl in $\text{C}_6\text{H}_5\text{N}$ give *p*-benzoylamino benzoic acid benzoylhydrazide, m. 262°; it is unchanged by heating at 260°. Heating with Ac_2O does not cause ring formation but the introduction of an Ac group, giving the compd. $\text{C}_{22}\text{H}_{19}\text{O}_4\text{N}_3$, m. 226°. Heating I at 220-80° causes the loss of NH_3 and the formation of *p*-benzoylpyrazolone, $(\text{C}_7\text{H}_5\text{ON}_2)_x$, crystg. with 0.5 H_2O , pale brown, m. 312°; *Ac* deriv., m. 340°. The HCl soln., treated with NaNO_2 , gives with Na_2CO_3 a red ppt., sol. in excess. *Et p*-hydrazinobenzoate, yellow, m. 118°; *Ac* deriv., m. 148-9°. C. J. WEST

Action of ammonia on ethyl cinnamate. K. STOSIUS AND E. PHILIPPI. *Monatsh.* 45, 569-72(1925).—By keeping a mixt. of Et cinnamate (14 g.) and liquid NH_3 (5 cc.) in a sealed tube at the ordinary temp. for 4 months, the following products were obtained: cinnamamide, m. 142°; $\text{PhCH}(\text{NH}_2)\text{CH}_2\text{CO}_2\text{H}$, m. 221-2° (slow heating) or 231° (rapid heating); and β -amino- β -phenylpropionamide, m. 88-110° [oxalate (+2 H_2O)], m. 193° (anhyd.)], which loses NH_3 when boiled with water, yielding cinnamamide. B. C. A.

Polymerization and depolymerization by light of different wave lengths. II. α - and β -trans-Cinnamic acids, *allo*-cinnamic acid and their dimers. HANS STOBBE AND ALICE LEHFELDT. *Ber.* 58B, 2415-27(1925); cf. *C. A.* 18, 2503.—I. *Photoisomerizations and photopolymerizations of the rhombic α -trans-cinnamic acid and the *allo*-acid 68°*. The α -trans-acid, m. 133° (I), exposed 6 months to sunlight in H_2O gave 90.5% I and 9.5% of the *allo*-acid (II); in $\text{H}_2\text{O} + \text{HCl}$, 75.0 and 25.0%; II in H_2O gave 14.0% I and 86.0% II; in $\text{H}_2\text{O} + \text{HCl}$, 29.0 and 71.0%. In suspensions instead of solns., the isomerization is accompanied by polymerizations; below are the % yields of I, II, α -truxillic acid (III), β -truxinic acid (IV) and resin, resp., obtained after 6 months' exposure to sunlight. I in H_2O , 76.0, 5.0, 10.0, 9.0, —; in $\text{H}_2\text{O} + \text{HCl}$ (10:1), 35.0, 1.0, 49.0, 15.0, —. II in H_2O , 61.0, 6.5, 6.0, 20.0, 6.5; in $\text{H}_2\text{O} + \text{HCl}$, 47.0, 1.0, 5.0, 42.0, 5.0. The relative yields of I (+ resin), and III from 1 g. I exposed 4 weeks to sunlight in suspension in various mediums were as follows: 150 cc. H_2O , 85.3, 14.6; 150 cc. $\text{H}_2\text{O} + 15$ cc. HCl , 23.4, 75.0; 150 cc. $\text{H}_2\text{O} + 15$ cc. $\text{HCl} + 0.5$ g. NaCl , 25.0, 73.0; 150 cc. $\text{H}_2\text{O} + 0.5$ g. NaCl , 46.5, 53.5; in all cases, traces of II and IV also were formed. From I exposed 95 hrs. to a quartz Hg lamp (4.4 amp., 6 cm.) in H_2O suspension were obtained 88.9% I, 8.9% II and 2.2% III + IV; in $\text{H}_2\text{O} + \text{HCl}$ (10:1), 81.8, 13.6 and 4.5%, resp. II. *Photodepolymerizations of α -truxillic and β -truxinic acids*. Yields of

I, II, III, IV and resin after 500 hrs.' exposure to a quartz Hg lamp; from quartz (transparent to all rays down to 180μ), 18.2, —, 77.8, —, 4.6; in uviolet (transparent to all rays down to 270μ), 15.2, —, 82.2, —, 2.6. From IV in quartz, —, 26.8, —, 69.4, 3.8; in uviolet, —, 15.4, —, 80.2, 4.4. From III in C_6H_6 suspension in quartz, 12.0, 7.0, 63.0, 13.4, 4.6; in uviolet, 5.8, 1.8, 79.6, 9.0, 3.8; in glass (transparent to 320μ), 3.0, 0.1, 93.5, 3.4, —. From V in C_6H_6 suspension in quartz, 3.4, 9.8, 28.0, 56.6, 2.2; in uviolet, 1.4, 8.0, 18.8, 69.8, 2.0; in glass, 0.1, 2.7, 11.5, 85.7, —. From the Na salt of III in aq. soln. in quartz, 21.4, 7.1, 70.8, 0.7, —; in uviolet, 20.1, 6.7, 72.8, 0.4, —; in glass, 9.0, 0.1, 90.9, —. From the Na salt of IV in quartz, 15.1, 47.2, 0.4, 37.3, —; in uviolet, 12.1, 25.7, 0.3, 61.9, —; in glass, 3.3, 6.9, —, 89.9, —. The same results are obtained in 100 instead of 500 hrs. III. Photoisomerization and photopolymerization of β -trans-cinnamic acid. In aq. acid suspension (prepd. by adding a slight excess of HCl to a soln. of the Na salt), the β -trans-acid (V) after 5 months in winter sunshine gave 5.0% I, 37.5% IV and 57.5% resin, after 4 weeks in summer sunshine 23.5, 57.6 and 18.6%, resp. Repetition of de Jong's expts. (C. A. 16, 2683) gave the following yields of I, II, III and IV (exposure to direct sunlight, 35 hrs. in 7 days): V dissolved and repptd. only at the beginning and not covered, 50.6, 3.2, 29.2, 17.0; repptd. each day and uncovered, 26.8, 11.1, 22.7, 39.3; repptd. only at the beginning, scraped off and powd., and covered with glass, 54.6, 3.5, 28.4, 13.6; same, but not covered, 51.0, 2.9, 30.0, 16.1; powd., not repptd. (hence I) and not covered, 57.1, traces, 42.9, —. Yields of I, II, III, IV and resin from V exposed to sunlight 14 days but allowed to stand varying lengths of time in the dark after the pptn. before being illuminated: 0 hr., 29.0, 1.2, 17.1, 32.3, 20.4; 1 hr., 37.5, 1.6, 19.8, 28.1, 13.0; 2 hrs., 39.2, 1.7, 37.0, 21.7, 1.7; 24 hrs., 70.9, 1.4, 23.8, 4.2, —. Yields after 35 hrs.' exposure to a quartz Hg lamp: uncovered, repptd. 7 times, 19.7, 67.5, traces, 0.4, 12.0; repptd. once, 60.1, 28.2, 1.4, 1.4, 8.9; not repptd., 96.4, 0.4, 1.2, —, 2.0; covered with glass, repptd. once, 57.3, 2.5, 26.7, 13.3, —. Yields from freshly repptd. V exposed 175 hrs. in aq. acid suspension to the Hg lamp, 18.9, 70.40, 1.4, traces, 9.3. These results show that the metastable V is isomerized to I much more rapidly than the stable I and the II on further illumination, when the shorter ultra-violet rays are excluded, is directly polymerized to IV, which is, therefore obtained in good yield from V, while the difficultly isomerized I gives only little IV but much III (formed directly from the I). The views of de Jong as to the formation of III and IV are thus definitely disproved. Addendum. Reply to de Jong (C. A. 17, 3173).

C. A. R.

Reactions of the nitroso derivatives on unsaturated compounds. III. Dinitrones corresponding to α -diketonic acids. L. ALESSANDRI. *Gazz. chim. ital.* 55, 729-44 (1925).—The work in a previous paper (C. A. 19, 45) on the addn. of aromatic NO derivs. to C_2H_2 derivs. (tolan) is extended in this. 2.92 g. $PhC:CCO_2H$ (I) + 4.5 g. $PhNO$ in Et_2O were kept in the dark at room temp. for 10 months. $PhNO$ was still present (A., C. A. 5, 276). The Et_2O soln. was treated to sep. the products and Ph_2N_2O and unchanged I were recovered. 3.5 g. of $PhC:CCO_2Et$ + 4.5 g. $PhNO$ in enough $CHCl_3$ to dissolve them were kept in the dark at room temp. 22 days. The solvent was evapd. and the residue crystd. from $EtOH$ gave the dinitrone of an α -diketonic acid (II) $PhN(O):CPhC(CO_2Et):N(O)Ph$, m. $143-4^\circ$. II crystals in 2 forms, having different m. ps., which are mutually transformable. The structure assigned to II depends on the data of analysis, on the Au-yellow color, the development of $PhNO$ by the action of $KMnO_4$, its decompn. in sunlight (C. A. 16, 2504) and the fact that in $EtOH$ with $NH_2OH \cdot HCl$ it gives oximidophenylisoxazolone, which is a normal reaction for 2 nitronic groups (C. A. 4, 2457; 5, 276). $PhC:CCO_2Et$ with $EtO_2CC_6H_4NO$ (III) in glacial $AcOH$ gave the corresponding dinitrone, $EtO_2CC_6H_4N(O):CPhC(CO_2Et):N(O)C_6H_4CO_2Et$, m. about 185° (decompn.), the structure of which is similar to that of II, as indicated by similarity of properties. In $CHCl_3$ this result is not obtained. $PhC:CCO_2Et$ is oxidized and probably $BzCOCO_2Et$ is formed. Reduction products of III, especially considerable (p - $EtO_2CC_6H_4$) $_2N_2O$, were isolated. Similar expts. were made with p - $ONC_6H_4NMe_3$ (V), which does not react with tolan or C_2H_2 . $PhC:CCO_2Et$ with V gives what is probably $Me_2NC_6H_4N(O):CPhC(CO_2Et):N(O)C_6H_4NMe_3$, m. 164° (decompn.). This compd. was also obtained as an addn. product with 1 mol. $EtOH$. Heller, *et al.* (C. A. 16, 2686; 17, 3024) obtained such addn. products with nitrones. A. expects to continue the study of these compds. E. J. W.

Phenylalanine series. VI. Decarboxylation of tyrosine and leucine. E. WASGR. *Helvetica Chim. Acta* 8, 758-73 (1925).—An electrically heated app. is described and illustrated in which 30 g. of tyrosine (I), heated 0.5 hr. *in vacuo* at $300-10^\circ$, yielded 60-75% of the theory of tyramine (II). An inert heat-carrier proved better (cf. also Graziani, C. A. 9, 3065; 11, 792; Johnson and Daschavsky, C. A. 19, 1135; Zemlén,

Ger. pat. 389,881) A table is given of the substances tested and the yields of **II** obtained with their aid, fluorene (**III**) finally being chosen because of the high yield of **II** (96%) and the short reaction time. The closed Al-plated Fe app. used contained a stirrer operating in a Hg seal and a reflux condenser heated with superheated steam to return vaporized **III** as a liquid. 400–500 g. **I** was added in 10-g. portions every min. to 1200–1500 g. **III** at 280–90°. After 5–10 min further stirring the mixt. was cooled close to the f. p. of **III**, poured out, pulverized, boiled 2–3 times with several vols. H₂O or dil. HCl, dried and returned to the app. for the next fusion. The HCl salt (**IV**) of **II** is best purified by recrystn. from 3.75 parts of boiling NaCl-H₂O (1:3.5), followed by pressing out, washing with a little H₂O and recrystn. from alc. with addn. of Et₂O. **II** is best isolated directly from the melt by extrn. with boiling H₂O until the Millon test is indistinct, concn. *in vacuo* with the capillary connected to a supply of H₂, and distn. *in vacuo* or recrystn. from alc. or both. **IV** is best converted into **II** through the sulfite, m. 297–8° (cor.), which is decompd. with the calcd. amt. of Na₂CO₃. PhOMe is the best solvent for recrystg. **II**, but it is best purified by distn. in a high vacuum in a flask designed to avoid clogging by the sublimation or freezing of the **II**; it b₁₃ 195°, b₂ 165–7° (cor.), m. 164–4.5° (cor.). When heated by itself or with Fe filings, or as the Ba salt, leucine (**V**) yields, besides iso-AmNH₂ (**VI**), varying amts. of iso-BuCH(CO)NHCH(CH₂CHMe)₂CO)NH and iso-BuCN. Description of a typical

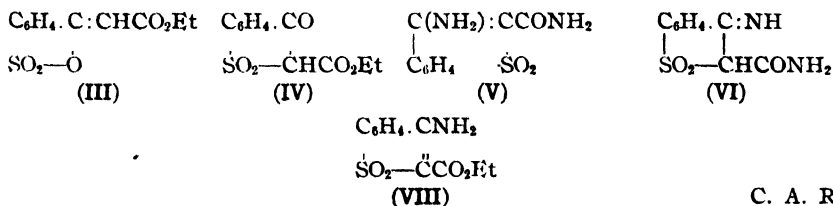
run is given. 15 g. **V**, added to 45 g. **III** at 120°, heated to 180°, and finally to 200–35° until gas evolution ceased (10 min. in all), yielded **VI** almost quant., partly as the carbonate; purified through the HCl salt. **VII. Synthesis of l-3,4,5-trihydroxyphenyl-alanine.** E. WASER, A. LABOUCHÈRE AND H. SOMMER. *Ibid* 773–9.—Schaaf and L. (C. A. 18, 1825) having published a synthesis of the *dl*-(HO)₃C₆H₂CH₂CH(NH₂)CO₂H (**I**), W. has completed his work on the extension to *l*-I (*Verh. Schweiz. Naturf. Ges.* 1921, II, 117) of W. and Lewandowski's synthesis of *l*-3,4-(HO)₂C₆H₃CH₂CH(NH₂)COOH (**II**) (C. A. 16, 81). In Johnson and Kohlmann's method (C. A. 9, 2657) for the prepn. of 3,5-dinitrotyrosine (**III**) slight modifications permitted the use of 10-g. batches; or better, 7 g. powd. tyrosine (**IV**) was stirred into 55 g. H₂SO₄ and 8 g. 65% HNO₃ at –10° during 15 min., keeping the temp. <0°, then 15 min. <10°, and chilled 20–30% NaOH was then added until a red ppt. formed, sol. in excess. After 12 hrs the ppt., stirred with 150 cc. H₂O at 35° to remove Na₂SO₄ and recrystd. from H₂O, was converted into free **III** with the calcd. amt. *N* HCl and recrystd. from H₂O; yield 4.2 g.; explodes 230° when rapidly heated. Reduction of **III** with Sn and HCl was unsatisfactory, but with Pt and H₂ in dil. HCl or H₂SO₄ for 1–2 days, concg the soln. *in vacuo* with a capillary connected to H₂, the *HCl* salt, or sulfate (**V**), hygroscopic needles, of *l*-3,5-diaminotyrosine was obtained. With BaCO₃ **V** yields a soln. of the free acid, easily oxidizable, turns red with FeCl₃, changing to violet, gives a yellow ppt. with Millon's reagent, turning brown on boiling; for [α]_D see W., C. A. 17, 1798. All subsequent manipulations were in an atm. of H₂. **V** from 6.53 g. **III** was tetrazotized in 11 g. H₂SO₄ and 11 g. H₂O with a soln. of 5.49 g. Ba(NO₃)₂, cooling with ice; added to a boiling soln. of 50 g. CuSO₄ in 50 cc. H₂O, cooled, treated with H₂S, then 100 g. BaCO₃, let stand 12 hrs., filtered, washed with boiled H₂O, freed from Ba⁺⁺, filtered in the presence of a little SO₂, and concd. dry, it yielded 1 g. *l*-3,4,5-trihydroxyphenylalanine, very hygroscopic, and sol. in H₂O contrary to S. and L. (*loc. cit.*), the aq. soln. rapidly darkening; when rapidly heated, decomp. ca. 225–30°. A table is given showing the similarity in its color reactions to those of 1,2,3-C₆H₃(OH)₃. M. HEIDELBERGER

Derivatives of *p*-carboxyphenoxylacetic acid. W. G. CHRISTIANSEN. *J. Am. Chem. Soc.* 48, 460–8 (1926).—Me *p*-carbomethoxyphenoxylacetate (**I**), m. 92–2.7°, in 49.7 g. yield from 59.5 g. of acid in MeOH-HCl. Treating **I** with concd. NH₄OH or *p*-HO₂CC₆H₄OCH₂CONH₂ with Me₂SO₄ gives *p*-carbomethoxyphenoxylacetamide (**II**), m. 164°. *p*-HOC₆H₄CO₂H and ClCH₂CONH₂ give a mixt. of *p*-carboxyphenoxylacetamide, m. 282–2.5° and a very little of *O*-*p*-hydroxybenzoylglucosylamide, m. 257–8°. **II**, heated with concd. NH₄OH under pressure, gives *p*-carbamidophenoxylacetamide, m. 261–4.5°. Nitration of 40 g. **I** with 1 mol. equiv. of HNO₃ in H₂SO₄ gives *Me* 2-nitro-4-carbomethoxyphenoxylacetate, slightly yellow, m. 125.5–7°, as the main product (16.5 g.). 0.62 g. of the 2,6-dinitro deriv., yellow, m. 118.5–9°; 3.3 g. of 2,4-(O₂N)₂C₆H₃OCH₂CO₂Me; and 1.97 g. of a *Me* ester of 2-nitro-4-carboxyphenoxylacetic acid (**IV**), m. 204–5°. Reduction of 2,4-O₂N(HO₂C)C₆H₃OCH₂CO₂H with FeSO₄ in NH₄OH gives 70% of 6-carboxy-3-keto-3,4-dihydro-1,4-benzoxazine (**III**), softens 306–7°, m. 310–4°; the *Me* ester, m. 192.5–3°, results by esterification of **III** or by the reduction of the 2,4-O₂N-(MeO₂C)C₆H₃OCH₂CO₂Me with Fe in MeOH-HCl. **III** and Me₂SO₄ give the *Me* ester, m. 165–6°, of 6-carboxy-3-keto-4-methyl-3,4-dihydro-1,4-benzoxazine, m. 287–90°.

In the reduction with Fe there is obtained an isomeric *Me ester* of IV, m. 151–4°, whose *Na salt*, m. 149–52° and effervesces 153–4°.

C. J. WEST

Transformation of benzoylacetic ester by concentrated and fuming sulfuric acid. FRANZ FEIST (with H. PAUSCHARDT AND H. DIBBERN). *Ber.* 58B, 2311–7(1925); cf. *C. A.* 18, 1818.—BzCH₂CO₂Et (I) allowed to stand a long time at room temp. with an equal wt. of concd. H₂SO₄ gives a cryst. compd. which was supposed to be α,α' -diphenylpyrone but which has been shown by Arndt (see following abstr.) to be the isomeric 4,6-diphenylcumalin (II). On the other hand, with fuming H₂SO₄ I gives chiefly an *Et anhydrobenzoylacetic acid* (III or IV). II, yellowish white, m. 138.5–9.0°, insol. in Na₂CO₃, sol. in alkalis only slowly on boiling, dissolves in H₂SO₄ without color and with faint blue fluorescence, gives no color with FeCl₃, reduces KMnO₄. Together with II are formed some BzOEt and PhCOMe. III or IV, from I added dropwise with stirring to 2.5 parts ice-cold fuming H₂SO₄ (70% SO₃) and stirred 30–60 min. longer (yield of crude product, 10% of the I), m. 140°, mol. wt. in camphor 230, forms an acid aq. soln., gives a red color with FeCl₃ in alc., dissolves in alkalis, reduces KMnO₄; its neutral Na salt gives ppts. with Pb(OAc)₂, SnCl₂, HgNO₃, HgCl₂, Cu(OAc)₂ (greenish white), FeCl₃ (red), FeSO₄ (orange-red), Co(NO₃)₂ (pink); no ppts. with Ba, Mg, Ag and Cr salts; in CHCl₃ suspension with Br it forms a *Br deriv.*, C₁₁H₈O₂BrS, m. 98.5°, sol. in Na₂CO₃ and alkalis, gives no color with FeCl₃. With O₃ in CHCl₃ III (or IV) gives (CO₂H)₂ and *o*-HO₃SC₆H₄CO₂H, while with 10 mols. boiling 20% NaOH it gives *benzoylacetic sulfonic acid*, m. 158–60°, whose *Me Et ester*, m. 104°, can be obtained directly from III (or IV) in MeOH and concd. H₂SO₄ on the H₂O bath. The chloride of III (or IV), prepd. by gently warming the acid with 1 mol. PCl₅, gives with excess of NH₄OH a yellowish white compd., m. 246–50°, free from N, and what is probably the *amide* (V or VI), m. 315°, sol. in Na₂CO₃ only on boiling (evolution of CO₂). On the other hand, with only a little more than 1 mol. NH₄OH the chloride gives, together with a N-free S compd., m. 136–7° (identical with a by-product (VII) obtained in the prepn. of III or IV), a *compd.* (probably VIII), faintly pink, m. 233–4°, mol. wt. in camphor 259.7, forms no Bz deriv. in faintly alk. soln. with BzCl, evolves an intense carbonylamine odor on heating in CHCl₃ with KOH and a violent isonitrile odor when heated in alc. with CS₂, and, after removal of the CS₂, with HgCl₂; with HNO₂ it regenerates III (or IV) and with KMnO₄ it uses up 3 atoms O and yields HO₃SC₆H₄CO₂H, (CO₂H)₂ and NH₃. VII is formed especially if the sulfonation of the I is too intense; it gives no color with FeCl₃ and is very probably an *acetophenone-o-sulfonic anhydride*, C₆H₄.CO.CH₂.SO₂.



C. A. R.

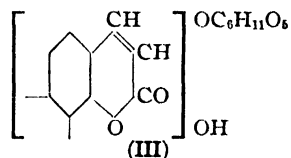
4,6-Diphenylcumalin. F. ARNDT AND B. FEISTERT. *Ber.* 58B, 2318–20(1925); cf. preceding abstr.—4,6-Diphenylcumalin (I) (4–5 g. from 20 g. BzCH₂CO₂Et allowed to stand 2–4 weeks in 20 g. concd. H₂SO₄), faintly yellowish, m. 138–8.5°, sol. in concd. H₂SO₄ with yellow color and blue fluorescence. 2-Thio *deriv.*, prepd. like 4-thiodiphenylpyrone (*C. A.* 19, 519), orange-red, m. 121–2°, unchanged by heating at 180° or by treatment with NH₄OH. I in CHCl₃ with 4 or more atoms Br or the 3-Br *deriv.* (II) below in C₆H₅ with Br give stout orange crystals (probably a 5,6-Br₂ addn. product of II) which at once lose Br in the air, becoming dark red and then orange again; they turn dark red at 40–50°, yellow at 80–90° and m. around 126°. II, from the above product in contact with alc. or allowed to stand *in vacuo* over alkalis, faintly greenish yellow, m. 130°, converted by hot aq. alc. NaOH into 2,4-diphenylfuran, m. 110°.

C. A. R.

β -Amyrin from Manila elemi resin. III. A. ROLLETT AND A. SCHMIDT. *Monatsh.* 45, 519–23(1925); cf. *C. A.* 17, 2117.—Oxidation of mixed amyryns with persulfate yields oxy- α - and - β -amyrin acetates as mixed crystals, m. 215–6°, from which neither isomeride can be sepd. When the mixed benzoates are oxidized with CrO₃ in AcOH, oxy- α -amyrin benzoate, m. 263°, can be isolated from the product first pptd. by the addn. of water, but the β -isomeride could not be isolated from subsequent ppts. Treatment of the mixed amyryns with Br in AcOH afforded bromoamyrin acetates as mixed

crystals, m. 215–6°. When a larger proportion of Br was applied, bromo- α -amyrin acetate, m. 263°, could be isolated, but the more sol. β -isomeride could not be crystd. Bromination of the mixed acetates gave similar results. B. C. A.

Constitution and synthesis of daphnin. P. LEONE. *Gazz. chim. ital.* 55, 673–8 (1925).—A glucoside, daphnin (I), is extd. from *Daphne alpina* and *Daphne mezereum*. Stunkel (*Ber.* 12, 110) found that I, m. 200° (decompn.), gives glucose and dihydroxycoumarin, called daphnetin (II). The constitution assigned to (I) was (III) in which the



substituents in positions 3 and 4 remain undetd. Several glucosides have been prepd. from hydroxycoumarin, e. g., Glaser and Kraus (*C. A.* 18, 76) prepd. esculin and Mauthner (*C. A.* 9, 1908) prepd. skimmmin. L. prepd. II from pyrogallaldehyde (IV) and Ac_2O (+NaOAc) by the method of Gattermann and Köbner (*Ber.* 32, 487). IV was prepd. by the modified method of Adams and Levine (*C. A.* 17, 3867). β -Acetobromoglucose (V) was prepd.

from anhyd. glucose and AcBr . 1.5 g. II in 3.5 cc. 10% NaOH was treated slowly with cooling with 3.5 g. V in 20 cc. Me_2CO . After standing 12 hrs. the Me_2CO was evapd. *in vacuo*. The sirup was beaten up with H_2O and crystd. from MeOH. The tetra-cetylglucodaphnetin (VI) obtained, m. 220°, $[\alpha]_D^{17}$ –52.52°. 1.5 g. in 150 cc. MeOH was cooled with ice and satd. with NH_3 . The liquid was evapd. *in vacuo* over H_2SO_4 until all NH_3 was lost. A few drops of AcOH was then added and most of the EtOH was allowed to evap. I sepd. as a powder, m. 215–6°, $[\alpha]_D^{17}$ 29.4°, identical with I from natural sources. It was not detd. which of the 2 possible formulas (cf. III) is correct.

E. J. WITZEMANN

Action of phosphoric acid on certain terpenes and related compounds. P. G. CARTER, H. G. SMITH AND JOHN READ. *J. Soc. Chem. Ind.* 44, 543–7T (1925).—The action of H_3PO_4 on certain terpenes (and cineole) results, through isomerization, polymerization, etc., in the formation of a mixt. of other terpenes (chiefly α -terpinene) and a diterpene (I), $\text{C}_{20}\text{H}_{32}$, both of which resist strongly the further action of H_3PO_4 at ordinary temp. The diterpenes from various sources show close agreement in phys. properties (except optical activity); the values of $[\text{R}_L]_D$ point to a dicyclic diterpene with 3 ethylene linkings. The purest prepn. b_{24} 193–5°, b_{788} 315–9°, d_4^{20} 0.9240, n_D^{20} 1.5175; from 13° to 30°, $\delta n_D/\delta t$ = –0.00042; $\delta d/\delta t$ = –0.00081; the highest optical activity was observed in a fraction from the phellandrene fraction of the oil of *Eucalyptus dives*, α_D^{20} 21.2°. I decolorizes Br- H_2O or Br in CHCl_3 , HBr being evolved in the latter instance; no cryst. deriv. could be obtained from this, or from HCl, HNO_3 , NOCl, etc. I appears to be very susceptible to oxidation (KMnO_4). *l*- α -Phellandrene gave approx. 40% of crude I, α_D^{20} 14.96°; that from *E. dives* oil, 50% with α_D^{20} 13.20°; from *E. phellandria* oil, 40%, 3.28°; from *Melaleuca acuminata* oil, 45%, 1.00°; *d*-limonene, 75%, 0.16°; *d*-pinene, 75%, –0.10°; *l*-pinene, 75%, 0.07°; cineole, 60%, 0.00°. Other phys. properties of these products are reported. C. J. WEST

The terpene and sesquiterpene of Mitsuba-zeri. Preliminary report. NENOKICHI HIRANO. *J. Soc. Chem. Ind. Japan*, 29, 48–52 (1926).—By steam distn. of Mitsuba-zeri (*Cryptolaenia japonica* Hassk. (*Umbellifer*), a terpene cryptotenene, $\text{C}_{10}\text{H}_{16}$, and a sesquiterpene mitsubene, $\text{C}_{15}\text{H}_{24}$, have been isolated. Cryptotenene: b_{18} 67–8°, $[\alpha]_D^{19.8}$ 2.66°, d_4^{25} 0.8128, n_D^{25} 1.47476, forms a triozonide but only 4 atoms of Br are added, which shows the presence of a conjugated double bond. By the decompn. of the triozonide, CO_2 , HCO_2H , Me_2CO , acetone superoxide, succinic acid and a C:O compd. were isolated and as an α -ketonic acid is generally oxidized into a mono- CO_2H acid, the formula of cryptotenene will therefore be: $\text{Me}_2\text{C}:\text{CHCH}_2\text{CH}_2\text{CH}:\text{CH}:\text{CH}:\text{CH}_2$ or $\text{Me}_2\text{C}:\text{CHCH}:\text{CHCH}_2\text{CH}_2\text{CH}:\text{CH}_2$. Mitsubene, b_{18} 142–3°, $[\alpha]_D^{21.9}$ 8.31°, d_4^{25} 0.9175, n_D^{25} 1.50381, and its Br addn. compd. contains 4 atoms of Br. On heating mitsubene with S and treating the product with picric acid, a picrate is obtained, whose m. p. (90°) is identical with that of eudalene picrate (Ruzicka, *C. A.* 15, 3476; 16, 2501). Mitsubene is therefore a sesquiterpene of the eudesmol type. CO_2 and HCO_2H were isolated from the ozonide by decompn. The study is going on. K. K.

• **The isonitriles.** XIII. Reaction of phenyl isonitrile with pernitrosomenthone. MARIO PASSERINI. *Gazz. chim. ital.* 55, 721–6 (1925); cf. *C. A.* 20, 593.—In a previous paper (*C. A.* 19, 264) the action of PhNC on pernitrosocamphor was described. In this paper the action of PhNC on pernitrosomenthone (I) is given. To 5 g. I in a little Et_2O were added 2.7 g. PhNC . After 8–10 days the cryst. mass of α -mentholcarboxylic

δ-anilide (II), $\text{Me}_2\text{CHCH}(\text{CH}_2\text{CH}_2\text{CHMeCH}_2\text{C}(\text{OH})\text{CONHPh})$, colorless, m.

166–8°, $[\alpha]_D^{10}$ 62.62, was filtered off. A compd. isomeric with II, m. 134–6°, was obtained in small quantity. II is quite resistant to hydrolyzing agents. Only by heating 80 hrs. at 120–30° in a sealed tube with concd. EtOH-KOH is it saponified, in part, giving PhNH_2 and α -mentholcarboxylic acid, m. 112–3°. 3 g. II with 12 cc. concd. $\text{H}_2\text{SO}_4 + 9$ g. $\text{K}_2\text{Cr}_2\text{O}_7$ was heated on the H_2O bath for 0.5 hr. and then steam-distd. The oily portion of the distillate was taken up in Et_2O and identified as *l*-menthone by converting it into the oxime, m. 58°, and the semicarbazone, m. 184°. E. J. WITZEMANN

The blue oil of peat tar. J. HERZENBERG AND S. RUHEMANN. *Ber.* 58B, 2249–62 (1925); cf. R. and Benthin, *C. A.* 19, 1190.—The opinion was expressed in the earlier paper that the blue color and fluorescence of the neutral oil from peat retort tar was due to a substance related to that present in the high boiling dark blue oil obtained from camomile and many other ethereal oils, which can also be prepd. from certain sesquiterpenes (e. g., α -gurjunene) and from which Sherndal isolated a dark blue hydrocarbon, azulene, $\text{C}_{18}\text{H}_{18}$ (I) (*C. A.* 9, 2089). The present work was undertaken to study the nature of the blue oil from peat and to clear up its formation from the bitumen of the peat in the retort carbonization. The fractions described in the earlier paper were shaken with aq. $\text{H}_4\text{Fe}(\text{CN})_6$ and the ferrocyanides again decompd. with dil. NaOH . In this way from the neutral oil fractions b_{14} 130–75° were isolated small amts. of deep blue, strongly fluorescent oils. The limits of the b. ps. of these “blue oils” were further apart than those of the original fractions, however, indicating that they were mixts. contg. varying amts. of the pure blue oil. Moreover, the parts of the neutral oil volatile with steam at 100° contained the blue oil in about the same amts. as the parts not volatile with steam at 100°, investigated by Benthin. The yield of ferrocyanides and of blue oils increases with increase in the b. p. of the various fractions up to that b_{14} 175°; in the fractions boiling above this temp. the oils isolated by means of $\text{H}_4\text{Fe}(\text{CN})_6$ are no longer blue. The yield in blue oils also varies considerably with tars taken at different times from the same retort. Among their properties are to be noted the intense blue color of their vapors and their sensitiveness to oxidizing and reducing agents; on long standing in the air the blue color changes to brown and it is also destroyed by weak oxidizing agents ($\text{Hg}(\text{OAc})_2$) and by reducing substances (SO_2). On the other hand, the blue oils are not affected by rise in temp. and can be distd. under atm. pressure almost without decompn. The compn. of the various blue fractions and especially the wide range within which they boil indicates that they are complex mixts. and in view of the small amts. available chem. sepn. seemed hopeless and attempts at identification by an exact spectrophotometric study of them seemed to offer the greatest chance of success. A blue oil was accordingly prepd. from gurjunene by Sherndal's method, and the visible spectra of alc. solns. of it and of the blue oil from peat were photographed and the intensity of the absorption at the different wave lengths was measured with a registering microphotometer. The results leave no doubt that the blue color of the oils from both sources is due to the same constituent. Moreover, by catalytic dehydrogenation of gurjunene at 400°, using as catalyst finely divided Ni deposited on Al_2O_3 (prepd. by pptg. an equimol. soln. of Ni and Al nitrates (about 1%) with NH_4OH), it is possible to obtain up to 4–5% pure I (as compared with 0.4% by the Sherndal method), which can be isolated either by converting the crude product into the colorless ferrocyanide and thence into the blue-black picrate or by fractionating it and sepg. it directly as the picrate, m. 116–7° (the slightly higher m. p. (122°) reported by S. is probably due to the fact that the picrate is so unstable that it can hardly be said to have a sharp m. p.). H. and R. believe that the formation of I from gurjunene involves not only a dehydrogenation but also probably a condensation with formation of a new ring; at any rate, as will be shown in later papers, I is not a pentamethylbenzofulvene, as suggested by Kremers (*C. A.* 17, 1459). It is likely that the I does not exist preformed in peat (the characteristic blue color and fluorescence has never been observed in exts. of peat) but is probably formed during the process of carbonization from the resin constituents of the bitumen, which by pyrogenic decompn. are partially broken down into sesquiterpenes from which the I is formed during the carbonization. The neutral oil of peat tar should therefore contain such sesquiterpenes, for it is not probable that they would be completely converted into I during the carbonization. A fraction of peat neutral oil, b_{16} 120–50°, was accordingly distd. repeatedly *in vacuo* over Na, yielding light yellow, almost colorless oils; of these, the fraction b_{12} 126–33°, when dehydrogenated over Ni at 340–50°, yielded a product with the pure blue color of I; the fractions b_{12} above 133° gave products with only a green mixed color. In the carbonization process the only dehydrogenating catalysts which can come into play are the coke or

finely divided C and the ashes contg. Fe oxide; that C can play such a role is shown by the fact that gurgunene passed over active "T-Kohle" at 410–20° splits off H vigorously and yields a product with the characteristic blue color of I. There are numerous reports in the literature of the formation of blue oils from bicyclic sesquiterpenes, such as cadinene, and even from terpenes by the action of concd. H_2SO_4 and Ac_2O , but H. and R. have shown that such results are in every case due to the presence of I-forming sesquiterpenes. Thus, a well-fractionated *d*-sylvestrene, d_{14} 0.8577, n_D^{21} 1.4789, after repeated distn. over Na *in vacuo* gave on catalytic dehydrogenation a colorless product almost completely sol. in H_2SO_4 contg. 7% SO_3 , whose const. (d_{14} 0.861, n_D^{23} 1.4918) agree with those of *m*-cymene; similar results were obtained with cadinene and caryophyllene. C. A. R.

The pseudo acids. G. B. SEMERT AND A. PICHIETTO. *Gazz. chim. ital.* **55**, 679–87 (1925).—In spite of the large literature on the pseudo acids no one has compared the properties of 2 structurally isomeric pseudo acids. S. and P. have now compared 2 pseudo acids, $\text{C}_{10}\text{H}_{16}\text{O}_3\text{N}$: nitrocamphor (I) and camphoryl oxime (II) and their resp. Na salts. I and its Na salt were prepd. according to Lowry (*J. Chem. Soc.* **73**, 995 (1898)). II and its Na salt were prepd. by a modification of L.'s method. The variations of the cond. with the temp. of solns. of I and II and their Na salts demonstrate the pseudo acid character of I and II. For the temps. 25°, 30° and 35° the cond. of the Na salt of II increases more rapidly with diln. than does the Na salt of I; for the temps. 40°, 45° and 50° the reverse is true. It follows that the degree of ionization of the salt of I is greater than that of the salt of II for the 1st temp. and less for the last. Likewise the slow neutralization confirms the pseudo acid character of the 2 compds.; on that account in the case of I equil. is reached in a shorter time, which agrees with the fact that below 35° the Na salt of I has a greater degree of ionization than that of the salt of II. The refractometric data on the Na salts of I and II lead to values very near those of the mol. refraction; the small differences are attributed to the different structure. The rule of Muller was verified for II: in fact the difference between M_{salt} and M_{acid} is 1.7, *i. e.*, greater than the difference found for the weak acids. When this difference is subtracted from the mol. refraction of the Na salt of I the value 61.28 is obtained for the mol. refraction of I, which is considered to be nearly correct. Also *Atti accad. sci. Torino* **60**, 599 (1925). E. J. WITZEMANN

Isomeric thujones (tanacetones). *d*- α -Thujone. V. PAOLINI. *Ann. chim. applicata* **15**, 414–6 (1925).—The existence of an α -thujone with $[\alpha]_D$ 10.23° has already been shown by P. (C. A. **6**, 2233). Furthermore since the *l*- α -thujone prepd. by Wallach (cf. *Ann.* **336**, 263 (1904)) is very unstable in respect to its rotatory power without any accompanying change in its other const., it was considered probable that this latter thujone changed to the former by stereoisomerization. Expts. now confirm this assumption. Steam distn. of a mixt. of the semicarbazone and $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ yields only *l*- α -thujone with $[\alpha]_D$ –10.23°, but if the mixt. is heated with H_2O at 100° as in ordinary hydrolyses, a *d*- α -thujone with $[\alpha]_D$ 10.23° is obtained. The *l*- and *d*- α -thujones gave an optically inactive mixt. The prolonged action of H-ions therefore causes inversion of the stereoisomeric form of α -thujone, the ionic concn influencing both the velocity of this inversion and the final equil. between the 2 forms. The latter explains why Wallach obtained a product with $[\alpha]_D$ –5°13' and why P. by working under the limiting conditions obtained 2 pure stereoisomeric forms. C. C. DAVIS

Chemistry of the caryophyllene series. I. G. G. HENDERSON, J. M. ROBERTSON AND C. A. KERR. *J. Chem. Soc.* **1926**, 62–70.—Caryophyllene (I) (150 g.), heated with 1 l. AcOH contg. 12 cc. H_2SO_4 and 40 cc. H_2O at 80–100° for 30 hrs., gives about 30% of caryophyllene alc. (II) and an unsatd. compd., $\text{C}_{15}\text{H}_{24}$, b_D 110–4°, n_D^{10} 1.5010, d_4^{10} 0.9263, α_{5790}^{16} –19.56°; this may be the same as the tricyclic caryophyllene obtained from the di-HCl salt by the quinoline method, and possibly with clovene. II is unchanged after heating with H_2O_2 in glacial AcOH at 50–5° for 52 hrs.; it is not attacked by cold 1% KMnO_4 or by Br in CHCl_3 at room temp. This would indicate that II cannot be regarded as a direct hydrate of I but that some ring closure has taken place with the formation of a new tricyclic structure. II formate, d_4^{17} 1.024, n_D^{17} 1.4998, $[R_L]_D$ 71.02; II acetate, d_4^{17} 1.003, n_D^{17} 1.4919, $[R_L]_D$ 75.64; these values clearly indicate the tricyclic nature of the I radical. I in Et_2O and dry HCl give the di-HCl salt, m. 69°, $[\alpha]_D^{67}$ 67° (EtOH, 2.5%); in glacial AcOH with AcOAg, there results some regenerated I; about 20% of an unsatd. alc., caryophyllol, $\text{C}_{15}\text{H}_{24}\text{O}$, b_{10} 142–50°, d_4^{17} 1.5015, $[R_L]_D$ 68.03 (calcd. for dicyclic alc., 68.12), unsatd. towards Br and alk. KMnO_4 and gives an oily dibromide, slowly decomp. in the light; and about 3% of a glycol, $\text{C}_{11}\text{H}_{22}\text{O}_2$,

m. 173°, satd. towards Br and alk. KMnO_4 . II and PCl_5 give *chlorodihydrocaryophyllene*, m. 63°; it is recovered unchanged after boiling with concd. EtONa for 12 hrs., with quinoline at 210° for 3 hrs. but with AcONa in AcOH it yields the acetate, b_{10} 149–52° m. 40°. HOCl and I give a yellow oil *dichlorohydrin* (?), $\text{C}_{15}\text{H}_{24}(\text{OH})_2\text{Cl}_2$, is not volatile with steam and does not distil without decompn.; Ac_2O gives a *monoacetate*, b. 190–200°; distn. at 1 mm. gives an *anhydride*, $\text{C}_{15}\text{H}_{24}\text{OCl}_2$, b. 125–40°, satd. towards Br and KMnO_4 . Attempts to remove the Cl failed, Na-Hg giving a product with 1 Cl, b_1 120–30°. Oxidation with H_2O_2 gave only succinic acid. C. J. WEST

Oxidation of certain sesquiterpenes with chromyl chloride and chromic acid. D. T. GIBSON, J. M. ROBERTSON AND JAMES SWORD. *J. Chem. Soc.* 1926, 161–7.— β -Caryophyllene, b_9 119°, n_D^{18} 1.5030, $[\alpha]_D^{15}$ —5.2°, gives with CrO_2Cl_2 the *addn. product* $\text{C}_{15}\text{H}_{24} \cdot 2.5\text{CrO}_2\text{Cl}_2$, even when different proportions of the CrO_2Cl_2 are used. Decompn. with H_2O yields a *ketone*, $\text{C}_{15}\text{H}_{24}\text{O}$, b_1 100–10°, and giving a *semicarbazone*, m. 234°; an unsatd. *ketone*, $\text{C}_{15}\text{H}_{20}\text{O}$, b_1 118°, caryophyllene alc., and some chlorinated oxidation products, but no aldehyde. Cedrene, b_8 123–5°, d_4^{20} 0.9361, n_D^{17} 1.5017, $[\alpha]_D^{17}$ —55.4°, gave a similar *addn. product*, which, on decompn. with H_2O , yields a *ketone*, $\text{C}_{15}\text{H}_{24}\text{O}$, $b_{0.15}$ 93°, n_D^{18} 1.5462, mol. wt. in freezing C_6H_6 , normal; *semicarbazone*; and chlorinated oxidation products. Cadinene, b_{10} 130–4°, d_4^{20} 0.9189, n_D^{20} 1.5097, $[\alpha]_{5461}^{18}$ —125°, gives a similar *addn. product*, which, on decompn., yields a small amt. of a non-cryst. acid and about 10% of a neutral product which does not give a cryst. semicarbazide. Oxidation of cadiene with CrO_3 in glacial AcOH gives the *compd.* $\text{C}_{15}\text{H}_{24}\text{O}_2$, b_{12} 180–96°, n_D^{20} 1.5095, which is unsatd. towards Br and alk. KMnO_4 , appears not to contain a CO or OH group and is polymerized by Na. The acid portion contd. 59.2% C and 8.4% H; its Ag salt contd. 35.4% Ag. C. J. WEST

Behavior of mixed *O*-acyl-*N*-acyl derivatives in which the reacting groups are not on adjacent carbon atoms. L. C. RAIFORD AND E. P. CLARK. *J. Am. Chem. Soc.* 48, 183–9(1926).—2-Benzoyloxy-3,5-dibromobenzylacetanilide, m. 150°, shows no tendency to rearrange and on hydrolysis gives the original material. *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$ gives an *Ac acetate*, m. 95°; hydrolysis yields the *alcohol*, m. 116°, whose *benzoate* m. 110°. The *Bz benzoate*, m. 131–2°, the free *alcohol* 95° and the *acetate* 115°; mixed m. p. of the *Ac benzoate* and *Bz acetate*, 80–105°. 4'-Benzoylamino-4-benzoyloxydiphenyl, m. 273–4°; the 4-hydroxy *compd.* m. 284° and the 4-acetyloxy *compd.* m. 227°. 4'-Acetylamino-4-acetyloxydiphenyl, m. 219–20°; the 4-hydroxy *compd.*, m. 224–5° and the 4-benzoyloxy *compd.*, m. 254–5°. This behavior opposes the theory that positions 4 and 4' of Ph_2 derivs. are fixed relatively as suggested by the Kauler-Cain formula. 8-Benzoylamino-1-benzoyloxynaphthalene, m. 207–8°; hydrolysis gives the 1-hydroxy *deriv.*, m. 216°, whose *acetate* m. 180°. 8-Acetylamino-1-acetoxynaphthalene m. 118° and the 1-hydroxy *deriv.* m. 181°; its *benzoate* is identical with the above *acetate*, m. 180°, indicating that a mol. rearrangement occurred in 1 case and that positions 1 and 8 have a relationship approaching that of an *o*-compd. C. J. WEST

"Fluorenone hydrate." RICHARD KUHN AND ALBERT WASSERMANN. *Ber.* 58B, 2230–1(1925).—Schmidt and Mezger by boiling α -9-acetoxyluorene (I) with concd. HCl obtained a *compd.* (II), m. 94°, which they believed to be 9,9'-dihydroxyfluorene (*Ber.* 39, 3895(1906)). Repetition of their work yielded a substance (III), m. 91.5°, similar to II in soly., color reaction with H_2SO_4 and volatility with steam, unchanged by $\text{NH}_4\text{OH.HCl}$ in the presence of BaCO_3 and giving fluorene, m. 114°, with Na-Hg in alc. That boiling Ac_2O converts it into fluorenone, as stated by S. and M., is incorrect; only unchanged III can be isolated from the product. 9-Chlorofluorene, identical with III (and II) can be obtained by boiling fluorene alc. 15 min. in concd. HCl . The I, m. 69.5°, is best prepd. by heating *ms*-fluorene alc. in $\text{C}_6\text{H}_5\text{N-AcOH}$ 0.5 hr. on the H_2O bath. C. A. R.

Stereochemistry of aromatic compounds; the isomerism of the 9-aminofluorenes (addendum). RICHARD KUHN AND PAUL JACOB. *Ber.* 58B, 2232(1925).—Since the publication of the original paper (*C. A.* 20, 48) the *compd.* m. 161° first described by Kerp has become readily available by a method of prepn. devised by Bader and has been found to be not a H_2CO_3 deriv. but an *acetate* of γ -9-aminofluorene; the unstable free *base* m. 46–6.5°, the m. p. rising rapidly when the *base* is kept in a desiccator. Cf. also Wieland and Krause, *C. A.* 19, 2334. C. A. R.

Nickel carbonyl carbon monoxide and Grignard reagents. WM. L. GILLILAND AND A. A. BLANCHARD. *J. Am. Chem. Soc.* 48, 410–20(1926).—CO has been made reactive with Grignard reagents but only as a constituent of $\text{Ni}(\text{CO})_4$, the $\text{Ni}(\text{CO})_4$ is, however, continuously regenerated from the liberated Ni and fresh CO. With PhMgBr the identified products are Ph_3CH , $\text{Ph}_2\text{C:CPhOH}$, $\text{Ph}_3\text{CCHPh}_2$ and $\text{Ph}_3\text{C:}$ —

CPh_2 . Reactions for the formation of these compds. are formulated on the assumption of a structure $\text{Ni}(\text{:C:O})_4$, the double bond Ni:C being the first point of attack, both the MgBr and Ph groups adding to the C atom. The C:O double bond may still be attacked in the normal way and the new C-MgBr grouping is capable of reacting as a new Grignard reagent, thus giving a great no. of possible substances, a mixt. of which is probably contained in the non-cryst. oil that comprises rather more than 0.5 of the entire product. C. J. WEST

Conception of the "polymethine dyes" and a general dye formula derived therefrom as the basis of a new system of dye chemistry. W. KÖNIG. *J. prakt. Chem.* 112, 1-36 (1926).—General theoretical discussion of the formulation of dyestuffs. C. J. WEST

Action of pyridine solutions of benzoin and of aromatic aldehydes on metallic copper. H. MOHLER. *Helvetica Chim. Acta* 8, 740-57 (1925).—The soln. of Cu by BzCH(OH)Ph (I) in $\text{C}_6\text{H}_5\text{N}$ (Bernoulli, private communication) is caused by BzOH resulting from the oxidation of I, the resulting blue compd. being Cu(OBz)_2 with $\text{C}_6\text{H}_5\text{N}$ of crystn. (II). The reaction rate (r. r.), detd. by the amt. of Cu in soln., was const. in the beginning, and then increased. O_2 increases the r. r., is necessary for the soln. of the Cu , and is used up in the reaction. Old solns. of I react more rapidly than fresh ones, but this is due not only to the formation of Bz_2 , but to free O_2 as well, which, in the presence of Cu , can carry the oxidation still further. If BzOH or $\text{Ph}_2\text{C(OH)CO}_2\text{H}$ is substituted for I the r. r. is greater and if the reaction is run in the absence of air, reduction of the acid takes place. $\text{Cu-C}_6\text{H}_5\text{N-O}_2$ is a system of strong oxidizing power, in which other solvents, such as C_7H_8 , $\text{C}_6\text{H}_7\text{N}$ and $\text{C}_6\text{H}_{11}\text{NH}$, are less effective. Oxidation of the I to BzOH by O_2 depends on the Cu , while the resulting acid can only react with Cu in the presence of O_2 or reducible substances. The r. r. depends on the Cu surface exposed, and is accelerated by the addn. of II. The phenomena are best explained on the basis of a heterogeneous coupled reaction with at least two induction periods I. $\text{BzCH(OH)Ph} + \text{O}_2 + (\text{Cu}) \rightarrow \text{BzOH}$. II. $\text{BzOH} + \text{Cu} + (\text{O}_2) \rightarrow \text{Cu(OBz)}_2$. Substitution of BzH , PhCH:CHCHO , $p\text{-MeC}_6\text{H}_4\text{CHO}$, $p\text{-MeOC}_6\text{H}_4\text{CHO}$, $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CHO}$ and $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ for I showed the r. r. in these cases to depend both on the ease of oxidation of the aldehyde and on the reactivity of the resulting acid with Cu . Numerous tables of exptl. detd. values of dissolved Cu are given to substantiate the statements made, and the results are expressed in a series of curves. M. HEIDELBERGER

Preparation of 1-halogeno-2-nitronaphthalenes and 2-nitronaphthalene. H. H. HODGSON AND ERNEST KILNER. *J. Chem. Soc.* 129, 7-10 (1926).— $2\text{-O}_2\text{NC}_{10}\text{H}_6\text{NH}_2$ (I) is readily obtained from $2\text{-O}_2\text{NC}_{10}\text{H}_6\text{OH}$ by heating with concd. NH_4OH and $(\text{NH}_4)_2\text{CO}_3$ at $120\text{-}30^\circ$ for 6 hrs. The 4- NO_2 deriv. is best prepd. at $140\text{-}60^\circ$. Hydrolysis of aceto-1-nitro-2-naphthalide is best effected by acid, giving $1,2\text{-O}_2\text{NC}_{10}\text{H}_6\text{NH}_2$. Very slow decompn. of diazotized I by CuCl in HCl gives 1-chloro-2-nitronaphthalene, pale yellow, m. 76° (2.5 g. from 5 g. I); the 1-bromo deriv., bright yellow, m. 97° , results in 0.95 g. yield; the 1-iodo deriv., pale yellow, m. 111° , in 1.9 g. yield. I (4.2 g.) gives 1.24 g. 2-nitronaphthalene, yellow, m. 79° ; cinnamon-like odor. C. J. WEST

Action of sulfurous acid upon aromatic amino and hydroxyl compounds. XII. Products of the action of sulfites on 1,8-dinitronaphthalene. H. TH. BUCHERER AND HANS BARSCH. *J. prakt. Chem.* 111, 313-39 (1925); cf. C. A. 20, 195.—A study of the reaction of NaHSO_3 on $1,8\text{-C}_{10}\text{H}_6(\text{NO}_2)_2$ according to D. R. P. 79,577 (A. Fischesser and Co.) shows that the formation of the 1,8,2,4,5-naphthylenediaminetrisulfonic acid does not proceed as smoothly as the patent would indicate; during the reaction there are formed H_2SO_3 esters of the 1,8-aminonaphtholtrisulfonic acid, which decreases the yield. The yellow-brown reaction product, on making alk. in the cold, becomes green; addn. of acid changes the color to violet. According to the Höch patent (D. R. P. 215,338), in which NaHSO_3 reacts in the presence of NH_3 , the yield of 1,4,7-naphthylaminedisulfonic acid (I) (13.2%) is also decreased by the formation of SO_2 esters of 1,8-aminonaphtholdisulfonic acid (II). It is possible by coupling reactions under suitable conditions to prove the presence of I, II and 1,8-naphthylenediaminedisulfonic acid. The sulfonation of $1,8\text{-C}_{10}\text{H}_6(\text{NH}_2)_2$ gives 1,8,4-naphthylenediaminesulfonic acid and a di- SO_3H acid; these resemble closely the Fischesser acid in their color reactions but differ considerably in their capacity to form disazo dyestuffs. C. J. WEST

Fluorescent derivatives of β -naphthol. A. SAKOSCHANASKY. *Chem. News* 131, 39 (1925).—The compd., $\text{NMe}_2\text{C}_6\text{H}_4\text{CH(OH)CCl}_3$, formed by the action of chloral hydrate on PhNMe_2 , reacts with β -naphthol at 200° , giving a substance which shows strong reddish green fluorescence in concd. H_2SO_4 . Chloral hydrate reacts with β -naphthol at high temps., giving a non-fluorescent substance. B. C. A.

Nitration of β -naphthoic acid and some new amino- and nitronaphthoic acids.

H. A. HARRISON AND F. A. ROYLE. *J. Chem. Soc.* 1926, 84–9.—Repetition of Ekstrand's expts. on the nitration of β - $C_{10}H_7CO_2H$ in the absence of solvent shows that approx. equal amts. of the 5- and 8- NO_2 derivs. are formed in at least 95% combined yield, together with a trace of the 1- NO_2 deriv. $HOC_{10}H_6CO_2Na$, heated with NH_4OH and a satd. soln. of SO_2 at 15° in an autoclave at 200 – 10° for 10 hrs., gives an almost quant. yield of the amino acid. 6-Amino-1-naphthoic acid, light brown, m. 203° ; HCl salt, needles; Ac deriv., m. 170 – 2° . The 7-amino deriv., light brown, m. 223 – 4° 1; HCl salt, needles; Ac deriv., m. 229 – 30° . 6-Amino-2-naphthoic acid, pale yellow, m. 225° ; HCl salt, small flakes; Ac deriv., m. 230 – 2° . The 7-amino deriv., pale yellow, m. 245° ; Ac deriv., m. 200 – 1° (decompn.); the fluorescence exhibited in various solvents is tabulated. The NH_2 acid is converted into the NO_2 acid by treating the diazo soln. with Cu powder and excess of $NaNO_2$. 6-Nitro-2-naphthoic acid, pale yellow, m. 310° ; Et ester, m. 177° , brownish yellow. 7- NO_2 acid, yellow, m. 262° ; Et ester, m. 131° , pale salmon. C. J. WEST

Action of diamines on naphthalic anhydride. A. BISTRZYCKI AND J. RISI. *Helvetica Chim. Acta* 8, 810–20(1925).—On 2 successive occasions 1,8- $C_{10}H_6(CO)_2O$ (I) suspended in boiling alc. and alc. $N_2H_4 \cdot H_2O$ gave 1,8-naphthalhydrazide, $C_{10}H_6(CONH)_2$ (II), leaflets or pale yellow needles, m. 25 – 5° (darkening), does not yield a benzal deriv. or combine with more I as $C_{10}H_6(CO)_2NNH_2$ (III) (Ostrogovich and Mihailescu, *C. A.* 6, 995) does; it m. 242° when mixed with III; di-Ac deriv., m. 214 – 5° . After several months further attempts to prep. II resulted only in the formation of III. I and $(CH_3NH_2)_2$, heated in boiling alc. only until crystals sep., give *N*-[8-carboxy-1-naphthoyl]-ethylenediamine (IV), $HO_2CC_{10}H_6CONHC_2H_4NH_2$, decomps. 196 – 7° , splits into its components in the higher boiling solvents, is partly sol. in dil. aq. $NaHCO_3$ or HCl, fluoresces more strongly in H_2SO_4 than does I; Pb salt, amorphous. At 230 – 40° for 10–15 min.

IV yields 1,2-[1',8'-naphthoylene]-imidazole 4,5-dihydrate $C_{10}H_6.CO.N.C_2H_4.CH_2.N.C$,

greenish yellow, m. 179 – 80° (decompn.), fluoresces in H_2SO_4 , stable to boiling alc. KOH. 8-Carboxy-1-naphthoyl-*o*-phenylenediamine (V), $HO_2CC_{10}H_6CONHC_6H_4NH_2$, yellow, gradually loses H_2O when heated, m. 236 – 8° (decompn.), partly sol. in dil. aq. $NaHCO_3$ or HCl, sol. in H_2SO_4 with an orange color; Ag salt, amorphous. Heated 10 min at 150° , then gradually to 230 – 40° , V forms 1,2-[1',8'-naphthoylene]benzimidazole,

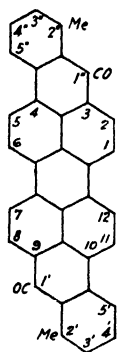
$C_{10}H_6.CO.N.C_6H_4.N.C$, greenish yellow, m. 189° sol. in H_2SO_4 with a greenish yellow

color. Unlike the corresponding benzoylene compd. (B. and Cybulski, *Ber.* 25, 1990 (1892)) it is not reduced by Zn dust in boiling HOAc. *N*-[1'-Amino-2'-naphthyl]-1,8-naphthalimide acid (VI), almost colorless, m. 143 – 4° when rapidly heated, sol. in H_2SO_4 with a brownish orange-red color; Ag salt, flocks; 1,2-[1',8'-naphthoylene]- α -naphthimidazole, from VI, heated 15 min. at 230 – 40° , brownish orange, m. 238 – 9° (decompn.). To decide whether condensation in VI had actually occurred on the 2- NH_2 group of 1,2- $C_{10}H_6(NH_2)_2$, (VII) $C_6H_4(CO)_2O$ and VII were heated in boiling alc. or PhH, giving *N*-[1'-amino-2'-naphthyl]phthalimide acid (VIII), decomps. ca. 205° (Ag salt, amorphous), converted by treatment with 12% HCl, drying on clay, and boiling under a reflux with $AmONO$ and a few drops of 12% HCl into *o*- $HO_2CC_6H_4CONHC_{10}H_7(\beta)$, dimorphic. At 270 – 80° for 15 min. VIII yields 1,2-[1',2'-benzoylene]- α -naphthimidazole, orange, m. 208° , sol. in H_2SO_4 with an orange color. M. HEIDELBERGER

Phenyl α -acenaphthyl ketone (5-benzoylacenaphthene) and phenyl- α -acenaphthylmethane (5-benzylacenaphthene). KAROL DZIEWONSKI AND MIECZYSLAW RYCHLIK. *Ber.* 58B, 2239–49(1925).—Ph α -acenaphthyl ketone (I), m. 100 – 1° , was obtained in 60–70% yield essentially by the method of Graebe and Haas (*Ann.* 327, 96(1903)); it is reduced in alc. at 50° with Zn dust and concd. aq. KOH or in boiling alc. with Na-Hg to the carbinol, m. 113 – 4° , easily sol. in concd. H_2SO_4 with violet-blue color changing to olive-green (sulfonation) on long standing. With Na in abs. alc. on the H_2O bath I gives α -benzoylacenaphthene (phenyl- α -acenaphthylmethane) (II), b₁₈ 210 – 5° , m. 110 – 1° , identical with the product obtained from $PhCH_2Cl$ and acenaphthene in the presence of $ZnCl_2$ and erroneously designated as a β - $PhCH_2$ deriv. (*Bull. acad. sci. Cracovie*, 1904, 36). 4-Benzoylnaphthalic anhydride (III), obtained from I or best from II in $AcOH$ with $Na_2Cr_2O_7$, is completely converted at 140 – 50° into its anhydride, m. 200 – 1° . Two different oximes of benzoylnaphthalic anhydride are described in the literature and the opinion had been expressed that they are derivs. of the structurally isomeric α - and β -Bz anhydrides but D. and R. now believe that they are *cis-trans* isomeric derivs. of III. The oxime m. 254 – 5° (decompn.), light yellow, strongly refracting rhombohedrons,

easily sol. in alkalis with light yellow color, is obtained by heating **III** in 1-2% NaOH with $\text{NH}_4\text{OH} \cdot \text{HCl}$ for several hrs. on the H_2O bath and when heated a few min. in AcOH contg. some Ac_2O it changes into the isomer m. 199-200°, snow-white needles easily sol. in alkalis and converted back by long heating in 60% soln. (solvent not stated.—ABSTR.) into the form m. 254-5°. 4-Benzyl-naphthalic anhydride, m. 170-1°, previously obtained by gentle oxidation of **II** and supposed to be a β - PhCH_2 deriv., has now been prepd. by reducing **III** in NaOH with Zn dust and $\text{NH}_3 \cdot \text{CuSO}_4$. Di-K 4-benzoylnaphthalate fused with KOH at 210-20° and then acidified yields naphthalic anhydride, m. 269-70°, and BzOH. Treated rapidly in AcOH at 100-10° with $\text{Na}_2\text{Cr}_2\text{O}_7$, **I** gives, together with much **III**, a small amt. of α -benzoylacenaphthenequinone, golden yellow columns (from C_6H_6) or rhombic tables (from AcOH), m. 199-200°, very slightly sol. in alkalis, very easily in cold concd. H_2SO_4 with golden yellow color; trioxime, yellow amorphous powder, decomp. 94-6°. From **I** heated 1-2 hrs. at 200-10° with S is obtained a small amt. of dibenzoyldinaphthylene, Bordeaux-red, m. 213-5°; the chief product is tribenzoyltrinaphthylenebenzene (tribenzoyldecacylene) (best prepd. by raising the temp. during the heating with S to 250-60°), orange-red, m. 335-6°, sol. in concd. H_2SO_4 with blood-red color, mol. wt. in boiling PhNO_2 726-53 (the corresponding PhCH_2 derivs. were previously described erroneously as β -derivs. (*Bull. acad. sci. Cracovie* 1904, 201)). α' -Nitro- α -benzoylacenaphthene, from **I** in AcOH at 10-5° treated dropwise with HNO_3 (d. 1.48), lemon-yellow, m. 169-71°, sol. in concd. H_2SO_4 with intense red color, yields on fusion with KOH BzOH and a resinous mass insol. in alkalis; in AcOH with $\text{Na}_2\text{Cr}_2\text{O}_7$ on the H_2O bath it gives 5-nitro-4-benzoylnaphthalic anhydride, light yellow, m. 273°, converted by long heating with concd. NH_4OH on the H_2O bath into the imide, light yellow, m. 302-4° (decompn.) C. A. R.

Perylene and its derivatives. X. A. ZINKE AND K. FUNK (WITH J. MATSCHER, O. WOLFRAUER AND N. LÖRRER). *Ber.* 58B, 2222-7 (1925), cf. C. i. 19, 2335.—It was shown in earlier papers that isoviolanthrone (**I**) can be synthesized in various ways from perylene (**II**). In the method involving the baking of 3,9-dibenzoylperylen (**III**)



with AlCl_3 the yield of **I** is much diminished by simultaneous reduction processes effected by the **II** catalytically split off and it can be materially increased by adding to the reaction mixt. a suitable H acceptor. MnO_2 proved to be especially effective and with its aid the yield of **I** can be increased to 45%. As freshly pptd. MnO_2 reacts too vigorously, it is best to use the natural, finely powd. oxide. Its use, however, may often bring about secondary processes; e. g., the HCl liberated in the decompn. of the fusion mixt. may simultaneously chlorinate the final product. Thus, the 3,8-di-*p*-methoxybenzoylperylen (**IV**) formed from **II** and *p*- $\text{MeOC}_6\text{H}_4\text{COCl}$ by the Friedel-Crafts method gives on baking with AlCl_3 an alkali-insol. dimethoxyisoviolanthrone and a product difficultly sol. in alkalis, which is probably the di-HO compd. resulting from the hydrolysis of the MeO groups by the HCl liberated during the baking; if, however, MnO_2 is added, not only is the alkali-insol. product increased in yield but it now also contains halogen and its compn. corresponds to that of a chlorodimethoxyisoviolanthrone (**V**). The reaction whereby **I** is prepd. from dihalogen derivs. of **III** with alkalis in boiling PhNH_2 or quinoline has been applied

to the 3,9-di-*o*-, *m*- and *p*-toluyl-4,10-dichloroperlylenes (**VI**). **IV**, golden yellow, m. 319.5°, dissolves in concd. H_2SO_4 with pure corn flower-blue color. **V**, dark powder sol. in H_2SO_4 with blue-green color. *o*-**VI** (1.5 g. from 4 g. dichloroperlylene (**VII**), AlCl_3 and *o*- $\text{MeC}_6\text{H}_4\text{COCl}$ in CS_2), yellow, m. 351°, sol. in cold H_2SO_4 with red color changing to blue on heating; *m*-isomer (2.8 g. from 4 g. **VII**), brown-red, m. 334°, sol. in cold H_2SO_4 with violet-red color (blue in thin layers), changing to violet-blue on heating; *p*-compd. (2.5 g. from 4 g. **VII**), light yellow, m. 345°, sol. in cold H_2SO_4 with red color changing to violet-blue on warming. 2',2''-Dimethyl-3(CO),4,9(CO)-10-dibenzoyleneperlylene (dimethylisoviolanthrone) (**VIII**), (appended formula) from *o*-**VI** and powd. KOH in boiling quinoline and purified by treating with $\text{Na}_2\text{S}_2\text{O}_4$ in boiling 2', NaOH and pptg. hot with air, dark needles difficultly sol. in boiling PhNH_2 , PhNO_2 and quinoline with violet color, dissolves in concd. H_2SO_4 with a soft green color, 3',3''- or 5',5''- Me_2 isomer (0.8 g. from 2.2 g. *m*-**VI**), dark needles rather difficultly sol. in boiling PhNH_2 , PhNO_2 and quinoline with deep violet-blue color, sol. in H_2SO_4 with soft green color; 4',4''- Me_2 compd. (1.2 g. crude or 0.7 g. crystd. product from 2 g. *p*-**VI**), dark needles, sol. in boiling PhNH_2 , PhNO_2 and quinoline with violet-blue color, in H_2SO_4 with soft green color; the vat is intensely blue with red fluorescence and, like its isomers, dyes cotton bluish violet. **VII** with 1- $\text{C}_{10}\text{H}_7\text{COCl}$ and AlCl_3 in CS_2 gives only 3- α -naphthoyl-4,10-dichloroperlylene (**IX**), golden yellow, m. 275°, sol. in cold concd

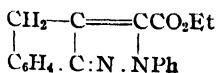
H_2SO_4 with blue-green color changing on heating to blue and then violet; with powd. KOH in boiling quinoline it gives a dark product, almost insol. in all solvents, rather difficultly sol. in concd. H_2SO_4 with green-blue color, which still contains halogen and forms an only very faintly dark blue vat dyeing cotton blue with a violet tinge. *3-β-Naphthoyl isomer of IX*, Cr-yellow, m. 293° , sol. in H_2SO_4 with green color, gives with KOH in boiling quinoline a substance sol. in moderately hot H_2SO_4 with blue-green color, which cannot be converted into a vat dye. **XI**. A. ZINKE, R. SPRINGER AND A. SCHMID. *Ibid* 2386–91.—It has been shown that dihaloperylenes with hot concd. H_2SO_4 are hydrolyzed, with elimination of HX, and oxidized and that in the case of the 3,10-Br₂ deriv. the product is 3,10-perylenequinone. The results of the present work indicate that the product obtained from 4,10-dichloroperylene is likewise 4,10-perylenequinone which, however, seps. as a very stable mol. compd. $(\text{C}_{20}\text{H}_{10}\text{O}_2)_2 \cdot \text{H}_2\text{O}$ (I), black-violet needles almost insol. in the lower boiling solvents, relatively sol. in boiling PhNH_2 with green color and formation of a compd. which has not yet been obtained in cryst. form, does not lose H_2O at $160\text{--}70^\circ$ *in vacuo*. The red soln. of I in concd. H_2SO_4 is changed by a little H_2O to green, much H_2O reprecip. the I. $\text{Na}_2\text{S}_2\text{O}_4$ converts I in dil. alkali into an orange-red to red (depending on the concn.) vat with intense yellow-green fluorescence, from which CO_2 pptts. the orange-yellow *hydroquinol*, very sensitive to air. The vat dyes cotton a faint orange-red changing in the air through brownish and olive-green to dull violet tones. Repeated recrystn. of I from PhNO_2 gives long graphite-like needles with 82.23–83.02% C, 3.34–4.08% H (av., 82.53, 3.70); distn. with Zn dust and ZnCl_2 gives perylene. The vat with BzCl gives 4,10-dibenzoylperylene-hydroquinol, brown-yellow m. 324° , mol. wt. in perylene (mol. depression 25.7°) by Rast's method 491–536; 4,10-di-*p*-bromobenzoyl analog, brown-yellow, m. $359\text{--}61^\circ$, mol. wt. in perylene 684–751, hydrolyzed by concd. H_2SO_4 on the H_2O bath to I.

C. A. R.

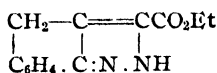
Constitution of naphthazarin. OTTO DIMROTH AND FRITZ RUCK. *Ann.* **446**, 123–31 (1925).—Naphthazarin (I) and pyroborooacetate in Ac_2O give a brick-red *di-borooacetate*, with a greenish metallic luster, which indicates that I must be 1,4-dihydroxy- and not 1,2-dihydroxy-5,8-naphthoquinone. The previous structure of I depends largely upon Will's synthesis (*Ber.* **28**, 2234 (1895)) in which he started from $\delta\text{-C}_{10}\text{H}_4(\text{NO}_2)_4$, assumed to be the 1,2,5,8-deriv. because it was obtained by further nitration of 1,2,5- and 1,5,8- $\text{C}_{10}\text{H}_5(\text{NO}_2)_3$. The 1,2,3-deriv., however, is shown to be a difficultly separable mixt. of several substances and is therefore to be stricken from the literature. The $\delta\text{-C}_{10}\text{H}_4(\text{NO}_2)_4$ is therefore the 1,4,5,8-deriv. 1,3,5- $\text{C}_{10}\text{H}_5(\text{NO}_2)_3$ and $\beta\text{-C}_{10}\text{H}_7\text{OH}$ form an equimol. compd., orange-red, m. $146\text{--}8^\circ$, not decompd. by 90% HCO_2H or AcOH but is decompd. by crystn. from MeOH . A mixt. of about equal parts of 1,3,5-(α)- and 1,4,5-(γ)- $\text{C}_{10}\text{H}_5(\text{NO}_2)_3$, crystd. twice from HCO_2H , m. $110\text{--}2^\circ$, while Will gave $112\text{--}3^\circ$ as the m. p. of the 1,2,5-deriv.

C. J. WEST

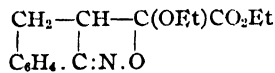
α -Hydrindone- β -oxalic ester. HERMANN LEUCHS AND GEORG KOWALSKI. *Ber.* **58B**, 2288–93 (1925).—From 13.2 g. α -hydrindone and 1 mol. $(\text{CO}_2\text{Et})_2$ at -15° slowly treated with Na in cold abs. alc. is obtained 18–20 g. *Et 1-hydrindone-2-oxalate* (I), faintly yellow, m. $71\text{--}2^\circ$, b_{10} 203° , sol. in H_2SO_4 with yellow color, dissolves only slowly in dil. alkalis, gives a brown-violet color with alc. FeCl_3 ; 1.16 g. with 2 mols. PhNH_2 at 100° gives 0.8 g. of the *unilide*, yellowish, m. $229\text{--}31^\circ$. Heated several hrs. *in vacuo* at 200° , I gives no or only very little gas and on distn. it is recovered unchanged; addn. of a little AlCl_3 or H_2SO_4 or heating to $260\text{--}90^\circ$ yields, together with some hydrindone,



(II)



(V)



(VI)

only resinous products. Free acid (1.9 g. from 2.32 g. I with 2 mols. N NaOH at $30\text{--}40^\circ$), yellowish, sinters 205° , m. about 215° (gas evolution), sublimes mostly undecompd. *in vacuo*, dissolves in hot NaOAc , NaHCO_3 and KHCO_3 , sepg. on cooling as the salt; at $220\text{--}30^\circ$ it loses CO and CO_2 . In 8 cc. abs. alc. with 0.36 g. PhNHNH_2 0.9 g. I yields 1.05 g. of an addn. compd., $\text{C}_{15}\text{H}_{20}\text{O}_4\text{N}_2$, sinters 90° , m. $95\text{--}6^\circ$, gives a brown color with alc. FeCl_3 , is insol. in but is altered by 5 N HCl , as well as by drying at 78° ; 1 g. allowed to stand 40 hrs. under 5 N HCl yields 0.3–0.4 g. of a pyrazole-like *anhydride* (probably II), m. $125\text{--}7^\circ$, and 0.4 g. of a *phenylhydrazone* (III) of I, greenish, sinters 150° , m. $156\text{--}8^\circ$. II seps. in long prismatic needles and in stout 4- and 6-sided tables into which the needles change but both forms can exist side by side for a long time. I (1.3 g.) refluxed 45 min. with 0.54 g. PhNHNH_2 in alc. yields 0.45 g. III and 0.37 g. of an isomer (IV), yellowish, m. $173\text{--}4^\circ$ (changing into III). III is unchanged by aq. 5 N HCl at

15° but with alc. HCl gives **II**, while **IV** is rapidly converted into **II** by the aq. acid. The semicarbazone of **I** occurs in only 1 form, m. 161–3°, gives no color with alc. FeCl₃ and with alc. HCl yields a *compd.* (probably **V**), m. 173–4°. Oxime of **I**, sinters 145°, m. 155–7°, gives no color with FeCl₃, yields with alc. HCl a *compd.* (probably **VI**), m. 61°. Attempts to alkylate **I** by boiling its Na salt in alc. with EtBr gave only hydrindone, which was also obtained by boiling the salt in alc. alone. C. A. R.

Reactions of the *meso*-hydroxyanthrones. M. A. MATTHEWS. *J. Chem. Soc.* 129, 236–45(1926).—OC(C₆H₅)₂CHOH (20 g.) in glacial AcOH is reduced by simultaneous addn. of Zn and concd. HCl to *dihydrodianthranyl* (**I**) (6 g.), m. 298–300°, exhibits an intense violet-blue fluorescence in org. solvents. Excess Br gives the *di-Br deriv.*, yellow, does not m. 320°, darkens on exposure to light and exhibits a blue fluorescence in soln. Excess HNO₃ gives a *NO₂ deriv.*, Au-yellow, m. 305° (decompn.), darkens on exposure to light. Dichlorodihydrodianthranyl (m. 268°, not 288° as reported in C. A. 18, 256), slowly heated with HNO₃ in glacial AcOH, gives *dichlorodinitrodianthranyl*, orange-red, does not m. 330°. OC(C₆H₅)₂CPhOH is reduced by Zn and HCl to diphenyldianthranyl. Dianthrol (**II**) is largely unchanged after boiling with Zn and HCl in AcOH for 3 hrs.; 3 g. **II** with Zn and NH₄OH gives 0.6 g. anthracene; 1 g. **II** and HI in AcOH give 0.9 g. anthrone; 5 g. **II**, boiled with Sn and HCl in AcOH, gives 0.8 g. **I**. Reduction of dianthraquinone with Zn and HCl gives dianthranol. 1-Chloro-9-anthrone and Ac₂O in C₆H₅N give *1-chloro-9-anthranyl acetate*, yellow, m. 110–2°; the EtOH solns. exhibit blue fluorescence. The *4-Cl deriv.* m. 124–6° and also shows a blue fluorescence in EtOH. *1-Chloro-10-bromoanthrone*, pale yellow, m. 165° (decompn.). Boiling with dil. Me₂CO gives *1-chloro-10-hydroxyanthranone* (**III**), m. 144–5°, whose alk. soln. is deep red; the *4-Cl deriv.* (**IV**), pale yellow, m. 144–5°. OC(C₆H₅)₂CHOH and HCl or OC(C₆H₅)₂CH₂ and Cl give *10-chloroanthrone*, m. 225° (gas evolution); it is stable towards boiling dil. alkali, is very slowly hydrolyzed by dil. Me₂CO and may be recrystd. from boiling C₆H₅Me₂. C₆H₅N gives *anthronylpyridinium chloride* (*10-hydroxyanthranyl-9-pyridinium chloride*), orange-red, m. 204° (decompn.). **IV** and HCl gas in C₆H₆ give *4,10-dichloroanthrone* (**V**), pale yellow, m. 125–8°, while **III** gives a mixt. of 1-chloroanthraquinone and 1-chloro-9-anthrone. Cl and 4-chloro-9-anthrone in CCl₄ contg. a crystal of **I** likewise give **V**, while 1-chloro-9-anthrone gives *4,4'-dichloro-9,9'-dianthrone*. OC(C₆H₅)₂CHOH, heated with H₂O for 20 min., gives anthraquinol. The products of the reaction of OC(C₆H₅)₂CHOH and the 2 *α*-chlorohydroxyanthrones with HBr, HCl, HI, Sn + HCl, H₂SO₄, and Al + H₂SO₄ are tabulated. C. J. WEST

Preparation of quinizarin. HARRY H. REYNOLDS AND LUCIUS A. BIGELOW. *J. Am. Chem. Soc.* 48, 420–2(1926).—The influence of time, amt. of H₃BO₃ and temp. on the yield of quinizarin has been studied. The recommended procedure consists in heating 115 g. *p*-ClC₆H₄OH, 300 g. C₆H₄(CO)₂O, 50 g. crystd. H₃BO₃ and 2000 g. 96% H₂SO₄ 3.5 hrs. at 200°; the yield is 74% of a product m. 199–200° (cor.). C. J. W.

The constitution of the phenylpyrrole of O. Fischer and E. Hepp. G. PLANCHER AND E. GHIGI. *Gazz. chim. ital.* 55, 757–9(1925).—In a recent paper P. and G. (C. A. 19, 2203) noted that benzene azo-*N*-phenylpyrrole (**I**) prepd. from *N*-phenylpyrrole, obtained by distg. aniline mucate m. 49–50°; and that the same deriv. (**II**) prepd. from *α*-phenylpyrrole m. 116° (and not at 112°; Khotinsky, Soloweitschik, C. A. 3, 2565). Fischer and Hepp (*Ber.* 19, 2251) reported that **I** m. 117°, but P. and G. thought that this product is identical with **II**. They have now repeated the work of F. and H. and the product obtained is indeed **II** and not derived from *N*-phenylpyrrole as stated by F. and H. The prepn. of *benzeneazo-α-phenylpyrrole* and *p-anisylazo-α-phenylpyrrole*, 140–1°, is described. E. J. WITZEMANN

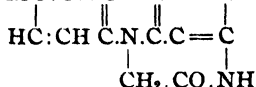
The thiophenes and intermediate products for their synthesis. (MISS) A. CHRZASZCZEWSKA. *Roczniki Chem.* 5, (1–3), 33–76(1925).—Various thiophene derivs. have been synthesized by Paal's method from salts of homologs of succinic acid. The yield is greatly increased by the addn. of sand to the reaction mixt. in quantity equal to that of the P₂S₅ used, the violence of the reaction being thereby considerably diminished. Better yields of 2-substituted thiophenes are obtained when the latter are more volatile, this being explained by the greater tendency to charring of the higher *γ*-keto acids. An excess of P₂S₅ has a deleterious effect on the reaction. The nitration of thiophenes has been investigated, and it is shown that the yield is quadrupled if AcCl is added to the nitrating mixt. of Ac₂O and HNO₃. 3-Phenylthiophene, m. 91–2°, was synthesized in the above way from Na phenylsuccinate, and from it *nitro-3-phenylthiophene*, pale yellow, m. 141°, was prepd., the nitro group being shown to be in the thiophene ring, and this on reduction gave *amino-3-phenylthiophene-HCl*. Pt black and H have practically no reducing action on 3-phenylthiophene. *3-p-Anisylthiophene*, m. 129°, was prepd. from *p-anisylsuccinic acid*, pale yellow, m. 189–90°, prepd. from *ethyl p-methoxy-*

benzylidenemalonate, m. 38–40°, obtained from the condensation of anisaldehyde with Et malonate. In the same way, *Et p-tolylidenemalonate*, m. 46–7°, is prepd., which gives on hydrolysis the *acid*, m. 184°, and from which *p-tolylsuccinic acid*, m. 192°, is prepd. From this, *3-p-tolylthiophene*, m. 111–2°, is obtained by the modified Paal method. 2-Methylthiophene is obtained in 62% yield in this way from Na levulate, as compared with 15% yield from the unmodified method; its *nitro deriv.*, yellow oil, $b_{88.5}$ 147.7°, is described. Similarly, 2-phenylthiophene is prepd. from Na benzoylpropionate in 30% yield, giving on nitration *nitro-2-phenylthiophene*, yellow, m. 74°, and on treatment with 1 *iodo-2-phenylthiophene*, pale yellow, m. 76–7°. 2-*p-Tolylthiophene*, m. 63–4°, obtained from *p-tolylpropionic acid*, and *p-hydroxyphenylsuccinic acid* (+1H₂O), m. 159°, from *Et p-hydroxybenzylidenemalonate*, m. 93°. B. C. A.

Influence of acetyl chloride on the nitration of acetanilide and dimethylaniline. A. CHRZASZCZEWSKA AND (Mlle.) M. BIATA. *Roczniki Chem.* 5, 77–95(1925); cf. preceding abstr. and Menk. *Ibid* 1, 386.—The nitration of AcNHPh and of PhNMe₂ has been studied, under various conditions and in various solvents. In particular, the effect of the addn. of AcCl as a dehydrating agent to the reaction mixt. has been investigated. In general, this increases the yield of nitro derivs., and, with PhNMe₂, increases the yield of *o*- at the expense of the *p*-nitro deriv. B. C. A.

Synthesis of substitution derivatives of indigo. I. *o*-Nitrobenzoylactic acid and related compounds. C. J. OVERMYER. *J. Am. Chem. Soc.* 48, 454–60(1926).—Several improvements are reported in the synthesis of indigo from *o*-O₂NC₆H₄COCl. Little or no hydrolysis occurs in the formation of O₂NC₆H₄COCH₂CO₂Et from O₂N-C₆H₄COCH(Ac)CO₂Et, since the reaction product gives with PhNHNH₂ a pyrazole instead of the expected pyrazolone. The constitution of the series of quinoline oxide derivs. obtained in the reduction of O₂NC₆H₄COCHAcCO₂Et is further established by the reduction of 2-methyl-4-hydroxyquinoline-3-carboxylic acid oxide (I), m. 214°, by Zn and HCl to the acid, m. 245° (decompn.), which loses CO₂ on heating, giving 2-methyl-4-hydroxyquinoline. I and Me₂SO₄ give the *4-methoxy deriv.*, m. 190°, does not reduce Fehling soln., gives an emerald-green soln. with KMnO₄ and a red color with FeCl₃. C. J. WEST

Derivatives of 1-aminocarbazole. HANS LINDEMANN AND FRANZ MÜHLHAUS. *Ber.* 58B, 2371–7(1925); cf. C. A. 19, 2824.—The prepn. of condensed systems in which the nucleus N atom of carbazole (I) is a member of the ring has finally been effected by starting with 1-derivs. of I. 3,6-Dibromocarbazole (II), m. 213°, from 50 g. I with 31 cc. Br in boiling CS₂. *N-Ac deriv.*, m. 189°; *N-NO deriv.*, light yellow, begins to turn brown 180°, m. 192° (decompn.), loses its NO group on mere warming with alc. HCl or boiling in aq. alc.; *N-Me deriv.*, m. 158–60°, forms, when fused with I, a deep blue melt. 1-*NO₂ deriv.* (II) (40 g. from 50 g. I and HNO₃ (d. 1.4) in boiling AcOH), yellow-red, m. 260°, sol. in alc. alkali with formation of a deep blue-red salt hydrolyzed by H₂O; II is also obtained from 1-nitrocarbazole with Br in CS₂. *N-Me deriv.* of II, yellow, m. 221°, gives no color with alc. alkali. II is reduced by Na₂S₂ in boiling alc. or by SnCl₂ in boiling AcOH to the 1-NH₂ compd. (III), m. 192°, which with HNO₃ forms amorphous, brown-red, non-homogeneous products, does not couple with phenanthrenequinone in either alc. or AcOH; *Bz deriv.*, m. 273° (blackening), becomes electrified when rubbed on glass; *Ac deriv.*, forms no benzimidazole derivative on heating with AcOH-HCl, POCl₃ or P₂O₅; *ω-chloroacetyl deriv.* (8 g. from 74 g. III with ClCH₂COCl in hot C₆H₆), m. 265–7°, this, refluxed in aq. alc. KOH, gives 3,6-dibromocarbazole-1,9-[3'-ketopiperazine], BrC:CH.C—C.CH:CB_r, darkens above 300°, m. 333°, converted by



NaNO₂ in boiling AcOH into the 2',3'-diketo compd., m. 435°, which with 50% KOH on the H₂O bath regenerates III. 3,6,8-Tribromocarbazole (IV), from I and somewhat more than 3 mols. Br in boiling CS₂, m. 184°, forms with 1 mol. Br in hot AcOH the tetra-Br compd., m. 220°. 1-*NO₂ deriv.* of IV (11 g. from 10 g. IV), intensely yellow, m. 264°, dissolves in alc. alkali with deep blue-red color. 1-NH₂ compd., m. 239°; *Ac deriv.*, m. 305°; *ω-chloroacetyl deriv.*, m. 285°, gives with alc. KOH 3,6,8-tribromocarbazole-1,9-[3'-ketopiperazine], m. 375°. C. A. R.

Quarternary salts of benzoxazoles. I. M. CLARK. *J. Chem. Soc.* 1926, 232–6.—Benzoxazole methiodide, yellow, m. 202° (decompn.); Fischer (*J. prakt. Chem.* 70, 435 (1906)) gives 182°; the aq. soln. is acid to litmus, from which, after addn. of 1 equiv. of KOH, there seps. *o*-formylmethylaminophenol, m. 103–4°; hydrolysis gives *o*-Me-NHC₆H₄OH, whose *NO deriv.* m. 125–6°. 1-Methylbenzoxazole methiodide, m. 196°

(decompn.); NaClO_4 gives the *methoperchlorate*, m. 173° ; aq. KOH or Ag_2O in Me_2CO transforms the methiodide into $\text{HOC}_6\text{H}_4\text{NMeAc}$, m. 151° ; at room temp. the methiodide was completely hydrolyzed by H_2O in 66 hrs. 1-Phenylbenzoxazole methiodide, m. 196° (decompn.); hydrolysis gives *o*- $\text{HOC}_6\text{H}_4\text{NMeBz}$, whose *urethan* m. 144° . With Me_2SO_4 the methiodide gives *o*-benzoylmethylaminoanisole, m. 115° , also prepd. from BzCl and *o*-methylaminoanisole. Attempts to reverse the hydrolysis by passing dry HI through *o*- $\text{HOC}_6\text{H}_4\text{NMeBz}$ in Et_2O or by dissolving *o*- $\text{HOC}_6\text{H}_4\text{NMeAc}$ in concd. HClO_4 failed.

C. J. WEST

Thiazoles. X. Synthesis of some 2-phenylbenzothiazolearsonic acids. M. T. BOBERT AND H. B. CORBITT. *Proc. Nat. Acad. Sci.* **11**, 768-72(1925); *Ch. C. A.* **20**, 600.—Diazotized 6-amino-2-phenylthiazole in H_2SO_4 , treated with AcONa and then poured into a suspension of KAsO_2 and Cu bronze in KOH , gave 5.4% of 2-phenylbenzothiazole-6-*arsonic acid*, yellow needles, does not m. 310° . 2-[*p*-Aminophenyl]benzothiazole, treated in like manner, gave 25.9% of 2-phenylbenzothiazole-*p*-*arsonic acid*, pale yellow, does not m. 302° . Nitration gives 91% of a *mono-NO_2* deriv., dull yellow powder, which is reduced by FeSO_4 and alkali to the *NH_2* deriv., grayish green powder (24.3% yield); its H_2O and EtOH solns exhibit green fluorescence; the diazotized product gives a cherry-red dye with $\beta\text{-C}_{10}\text{H}_7\text{OH}$. Preliminary expts. indicate that the compd. has a somewhat greater, though slower, action upon *Tr. equiperdum* than the corresponding C_6H_6 deriv., and also a greater toxicity for the white rats used in the expts. No evidence of any effect upon the nervous system was noted. 2-[*p*-Hydroxyphenyl]benzothiazole-*arsonic acid*, dark chocolate color, 46.7% yield.

C. J. WEST

2-Thio-3-[2-*p*-xylydyl]-4-ketothiazolidone and some of its derivatives. R. M. HANN. *J. Wash. Acad. Sci.* **16**, 31-5(1926).—*NH_4* 2-*p*-xylyldithiocarbamate, yellow, with a marked disagreeable odor, decomps. in the air to a yellow oil, with $\text{BrCH}_2\text{CO}_2\text{Et}$ gives 70% of 2-thio-3-[2-*p*-xylydyl]-4-ketothiazolidine, yellow, m. $119-20^\circ$ (cor.). *Benzal deriv.*, brilliant yellow, m. $188-9^\circ$ (cor.); the concd. H_2SO_4 soln. is brilliant red. *Cinnamal deriv.*, orange-yellow, m. $194-5^\circ$ (cor.); with Br this gives the α,β -*dibromo- β -phenylpropional deriv.*, yellow-brown, m. $119-20^\circ$ (cor.). *Vanillal deriv.*, bright yellow, m. $155-6^\circ$ (cor.); the concd. H_2SO_4 soln. has a brilliant red color. *Bromovanillal deriv.*, golden brown, m. $192-3^\circ$ (cor.); concd. H_2SO_4 soln., bright red.

C. J. WEST

Pyrogenic processes in the transformation of the *o*-aminoazo compounds into triazoles. G. B. CRIPPA. *Gazz. chim. ital.* **55**, 706-11(1925).—The 2-*N*-aryltriazoles (I) are obtained from the corresponding *o*-aminoazo compds. (II) by closing the ring

thus: $\text{H}_2\text{NArN:NAr}' \longrightarrow \text{Ar} \begin{array}{c} \diagup \text{N} \diagdown \\ | \\ \diagdown \text{N} \diagup \end{array} \text{NAr}'$. Among the various methods suggested

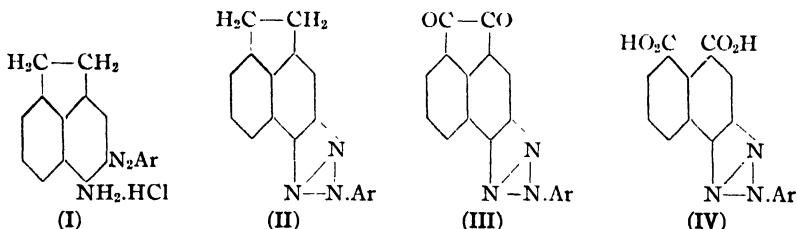
the Chem. Fab. Griesheim-Elektron (D. R. pat. 273,443(1913)) has boiled II in PhNO_2 in the presence of Cu and Fe powder and C. has now tried other media for this purpose. The results showed that the velocity of the transformation depends on the b. p. of the solvent used and not on an oxidizing action of the PhNO_2 . Charrier (*C. A.* **5**, 1744)

found that II decomps. thus: $3\text{H}_2\text{NArN:NAr}' \longrightarrow 2\text{Ar} \begin{array}{c} \diagup \text{N} \diagdown \\ | \\ \diagdown \text{N} \diagup \end{array} \text{NAr}' + \text{Ar}'\text{NH}_2 +$

o- $\text{Ar}(\text{NH}_2)_2$ and C. found that when vaseline oil was used the *o*-diamine could be isolated readily if the reaction is completed quickly but not in other cases. The free H formed in closing the ring reacts with unchanged mols. of II, reducing them to the amines given. Heating for 10 min. with oil of vaseline (b. 280°) gives about the same result as heating 10 hrs. with PhNO_2 or 50 hrs. with turpentine (b. 155°) except that less tar is formed. *p*-Chlorophenylazo- β -naphthylamine gave negative results with some solvents including PhNO_2 but 2,*N*-*p*-chlorophenyl-1,2-naphthotriazole was readily obtained from it when vaseline oil was used. 5 g. pseudocumylazo- β -naphthylamine in 40 cc. vaseline oil and 0.7 g. powd. Cu were boiled 15 min. The liquid was filtered and on standing sepd. a brown mass from which *o*- $\text{C}_{10}\text{H}_6(\text{NH}_2)_2$ was extd. with boiling H_2O . Traces of basic compds. were removed by boiling with dil. HCl . The residual mass was 2-*N*-2',4',5'-trimethylphenyl-1-2-naphthotriazole (2,*N*-pseudocumyl-1,2-naphthotriazole). The vaseline oil was steam-distd. and yielded pseudocumidine, which was identified by diazotization and copulation with $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$ as pseudocumylazo- β -naphthylamine. E. J. W.

***o*-Aminoazo compounds and 1,2,3-acenaphthenic triazoles.** G. CHARRIER AND A. BERETTA. *Gazz. chim. ital.* **55**, 745-54(1925).—Previous experience permitted C. and B. to predict that diazonium salts would react with 5-aminoacenaphthene (*periethylene- α -naphthylamine*), giving 4-arylazo-5-aminoacenaphthenes (I) which sep. as HCl salts. I are oxidized and transformed into the corresponding 2-*N*-aryl-1,2,3-triazoles (II) and on reduction give 4,5-diaminoacenaphthene. I are quite stable and

give several reactions of acenaphthene such as the oxidation to 2-*N*-aryl-4,5-triazolacenaphthenequinone (III) and 2-*N*-aryl-3,4-triazonaphthalic acid (IV). I are garnet-red, very stable, sol. in org. solvents, sep. in cryst. form, and are easily oxidized to II. II are quite similar to the naphthalenic 1,2,3-triazoles; they are colorless and less sol. in org. solvents than I. A soln. of PhN₂Cl (treated with urea to remove HNO₂) with an equimol. amt. of 5-aminoacenaphthene in EtOH sepd. a HCl salt which, decompd. with dil. NH₄OH, gave 4-phenylkuzo-5-aminoacenaphthene (V) m. 140°. V with alc. Na₂S₂O₄



gave PhNH₂ and 4,5-C₁₂H₈(NH₂)₂, m. 140–2°. V oxidized with ammoniacal Cu soln. (Schmidt, Hagenböcker, *C. A.* 16, 1092) gave 2-*N*-phenyl-4,5-acenaphtho-1,2,3-triazole (VI). 10 g. VI in glacial AcOH with 40 g. Na₂Cr₂O₇ heated a few min. sepd. 2-*N*-phenyl-4,5-triazolacenaphthenequinone (VII), m. 268°, which was converted into the corresponding phenylhydrazone, m. 254°; with *o*-C₆H₄(NH₂)₂ it gives the corresponding phenazine, m. 300°. VII with alk. KMnO₄ gives 2-*N*-phenyl-3,4-triazolacenaphthalic acid, m. 218°. The following compds. were obtained by similar methods: 4-*o*-tolylazo-5-aminoacenaphthene, m. 175°; 2-*N*-*o*-tolyl-4,5-acenaphthotriazole, m. 100°; 4-*m*-tolylazo-5-aminoacenaphthene, m. 171°; 2-*N*-*m*-tolyl-4,5-acenaphthotriazole, m. 181°; 4-*p*-tolylazo-5-aminoacenaphthene, m. 154°; 2-*p*-tolyl-4,5-acenaphthotriazole, m. 198°; 4-*s*-pseudocumylazo-5-amino-acenaphthene, m. 170°; 2-*N*-*s*-pseudocumyl-4,5-acenaphthotriazole, m. 150°; 4-*p*-nitrophenylazo-5-aminoacenaphthene, m. 195°; 4-*p*-chlorophenylazo-5-amino-acenaphthene, m. 184°; 2-*N*-*p*-chlorophenyl-4,5-acenaphthotriazole, m. 223°; 4-*p*-bromophenylazo-5-aminoacenaphthene, m. 185°; 2-*N*-*p*-bromophenyl-4,5-acenaphthotriazole, m. 231°.

E. J. WITZEMANN

Mechanism of the formation of triphenylguanidine and phenylthiocarbimide from thiocarbanilide. S. J. C. SNEDEKER. *J. Soc. Chem. Ind.* 44, 547–8T(1925).—From a consideration of the various methods of prepg. (PhNH)₂C:NPh from (PhNH)₂CS, it is concluded that the tautomeric form, HSC(Ph)NPh, reacts to form an unstable reaction product, PhNHCSNPhC(NPh)NPh and H₂S; this then decomps. into PhN:CS and (PhNH)₂C:NPh. Me₂SO₄ and (PhNH)₂CS give the *S*-Me deriv., m. 109°. (PhNH)₂CS and AcNNAph in CS₂ give the *Na* salt of thiocarbanilide, pale yellow, m. 70°; in contact with the skin, it causes a severe form of eczema. C. J. WEST

Action of sulfuryl azide on benzene. K. F. SCHMIDT. *Ber.* 58B, 2409–12(1925); cf. Curtius and S., *C. A.* 17, 1000.—In order to obtain larger amts. of material the glass app. used in the earlier work was replaced by a spacious Cu autoclave and a total of 250 g. N₂SO₂N₂ in 50 parts dry C₆H₆ was heated, in 12 portions, 1 hr. at 140°; the av. resultant pressure was 14 atm. Half of the product was worked up for the free base (I) (designated in the earlier paper as “pseudoaniline”) (yield, 3 g. b. 114–5°), the other half for the picrate (6 g. crude product, m. 160°). It was established with certainty, by analysis, mol. wt. detns. and prepn. of derivs. (methiodide and its chloroplatinate) that I is C₆H₅N. This is confirmed by the work of Curtius and Bertho (*Sitz. Heidelberger Akad. Wiss., Abt. A*, 1924–5), who obtained small amts. of C₆H₅N and α,α' -lutidine, resp., from C₆H₆ and *p*-xylene with N₂CON₃. C. A. R.

Condensation of 3-bromo- and 3-nitro-4-dimethylaminobenzaldehyde with ethyl acetoacetate and ammonia. L. E. HINKEL AND WM. R. MADELL. *J. Chem. Soc.* 1926, 161–3.—3,4-Br(Me₂N)C₆H₃CHO (1 mol.), 2 mols. AcCH₂CO₂Et and 1 mol. EtOH-NH₃ give 82% of Et 4-[*m*-bromo-*p*-dimethylaminophenyl]-2,6-dimethyl-1,4-dihydropyridine-3,5-dicarboxylate, yellowish white, m. 133°; nitrous fumes oxidize it to the corresponding pyridine deriv., pale yellow, m. 91°. The corresponding *m*-nitro derivs. deep yellow, m. 127° (70% yield) and yellow, m. 109°, resp. C. J. WEST

Action of isobutyl- and phenylmagnesium halides on quinoline methiodide. JAKOB MEISENHHEIMER, ERWIN STOTZ AND KARL BAUER. *Ber.* 58B, 2320–30(1925); cf. *C. A.* 17, 3341.—As already shown for 1-methyl-2-propyltetrahydroquinoline, so also Freund and Kessler's supposed stereoisomeric forms of the 2-iso-Bu analog are really homologs. Quinoline-MeI and iso-BuMgBr give 1-methyl-2-isobutyl-1,2-dihydroquinoline (I)

which dists. undecompd. *in vacuo* but under atm. pressure splits off CH_4 and changes into 2-isobutylquinoline (II). Reduction converts I and II into the corresponding tetrahydro derivs. and it is these 2 compds. which are F. and K.'s supposed stereoisomers. I, obtained in about 40% yield, b_{12} 143–4° (in H), is a red-yellow oil of unpleasant odor, decomp. on standing, dissolves in acids without color and not with a red color, as stated by F. and K.; the orange-yellow picrate, m. 92–4°, soon becomes brown to black in daylight, cannot be recovered unchanged from any solvent, always giving, together with resinous products, a dark red picrate (the picrate, m. 154–5°, described by F. and K. was somewhat impure II picrate). II, faintly yellowish oil of not unpleasant odor, b_{23} 157°, sol. in acids without color, is obtained as the lemon-yellow picrate, m. 161° (yield of crude product, 20 g.), from 17 g. I refluxed 5 hrs., distd. under 12 mm. and treated with hot alc. picric acid; methiodide, yellow, m. 186°, sol. in org. solvents with yellow, in H_2O with no color 2-Isobutyl-1,2,3,4-tetrahydroquinoline (III) (8.6 g. from 10 g. II with Sn and HCl), b_{16} 157–8°; b_{20} 159–60°; HCl salt, m. 217° (F. and K. give 223–4°), sublimes without decompn.; methiodide, m. 158–9° (F. and K., 168°), hydrolyzed by H_2O , the resulting oil giving with picric acid the picrate, m. 150°, of 1-methyl-2-isobutyl-1,2,3,4-tetrahydroisquinoline (IV); picrate of III, from the components in alc., m. 130–1° (if the reaction is carried out in H_2O the picrate seps. with $1\text{H}_2\text{O}$ and m. around 68–72°). IV (6–7 g. from 11 g. I with Na and alc.), light yellow oil, b_{18} 157°, purified through the golden yellow picrate, m. 150°; methiodide, m. 146° (151° on rapid heating; F. and K. give 174°). 1-Methyl-2-phenyl-1,2-dihydroquinoline (V), m. 88–9°, is obtained in 80% yield from quinoline-MeI with 1.5 mols. PhMgBr ; it is quite unstable, resinifying on long warming with solvents, and on standing its m. p. gradually falls. With an equal wt. of picric acid in alc. or Et_2O at room temp. it gives 80% of a bright red substance (VI), m. about 130°, which has the compn. of the expected 1,2-dihydroquinoline picrate but which is insol. in Et_2O and can be sepd. by fractionation from hot alc. or AcOH into 1-methyl-2-phenylquinolinium picrate (VII), m. 136–9°, and a deep red picrate (VIII), m. 140°, having the same compn. as VI and corresponding in every respect to that described in the earlier paper, where it was assumed to be an indole picrate; M., S. and B. now believe, however, that it is a 1,4-dihydroquinoline picrate. VIII is obtained in considerably better yield (80%) from VI when the VI is cautiously dissolved in cold Me_2CO and pptd. with ligroin; it is perfectly stable towards boiling alc., from which it can be recrystd. unchanged. VI, therefore, cannot consist exclusively of VIII but must contain an admixt. which on soln. in cold Me_2CO changes into VIII and with boiling alc., on the other hand, gives VII. This admixt. can hardly be anything else but the 1,2-dihydroquinoline picrate, which must be assumed to be of itself easily sol. in Et_2O and alc. but, in the presence of VIII, to sep. with the latter as a double compd. The above view is supported by the fact that the transformation of the original yellow picrates, which with alkalis regenerate the 1,2-dihydroquinolines, into the red picrates, which do not, can no longer be effected when the free 2-H atom necessary for the change of the 1,2- into the 1,4-dihydro bases is substituted, as in 1,2,2-trimethyl-1,2-dihydroquinoline, which gives in good yield a pure yellow picrate undergoing no change of any kind on recrystn. That the 1,4-dihydroquinoline picrates are red is probably due to the fact that the 1,4-dihydroquinolines are such weak bases that they cannot form normal picrates but form addn. compds. in Pfeiffer's sense. NaOH resinifies VIII while HCl converts it into VII. Treated in a little H_2O with Na_2CO_3 , VIII yields a 1-methyl-2-phenyl-1,4-dihydroquinoline-Na picrate double compd., $\text{C}_{16}\text{H}_{15}\text{N} \cdot \text{C}_6\text{H}_5\text{O}_2\text{Na} \cdot \text{Na}$, m. 170°, also formed, but very slowly and in impure state, when Me_2CO or alc. solns. of V and Na picrate are mixed; with HCl it regenerates VIII. Heated 8 hrs. on the H_2O bath in 20% HCl, cooled and treated with H_2O , 1 g. V gives 0.6 g. of a light red ppt., about 0.5 of which dissolves in Et_2O , leaving a substance, m. 160–2°, which is apparently a polymer of V. Heated in CO_2 at 250°, 2 g. V evolves CH_4 and gives about 1 g. of a resinous substance (probably a polymerization product) and 0.6 g. 2-phenylquinoline (IX), m. 82°, whose picrate m. 187° and methiodide m. 197°; the latter does not decomp. on recrystn. and with picric acid in alc. gives VII. Reduction of IX with Sn and HCl for 8–10 hrs. gives 65% of the 1,2,3,4-tetrahydro deriv. (X), b_{24} 218–20°, whose picrate, m. 129–30°, regenerates pure X with NaOH . 1-Bz deriv. of X, m. 124–5°. As found by Freund (Ber. 37, 4670(1904)), bromination of V gives bromo-2-phenylquinolinium methobromide, $\text{C}_{16}\text{H}_{15}\text{NBr}_2$, m. 248–50°, whose yellow picrate, m. 168–9°, is perfectly stable and can be recrystd. from alc. and 50% AcOH . C. A. R.

Dihydroquinolines. JAKOB MEISENHEIMER AND ERWIN STOTZ. Ber. 58B, 2330–3 (1925).—Brief discussion of the structures and properties of the 3 classes of dihydroquinolines described in the literature—those of Freund, of Heller and of R  th. R. supports the structure he assigns his compds. on the supposed identity of the product

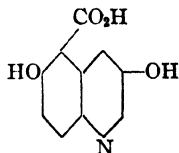
he obtained from *o*-MeC₆H₄NHMe and MeCHBrCH(OEt)₂ (C. A. 18, 2898) with the 1,2-dimethyl-1,2-dihydroquinoline obtained by Freund from quinoline-MeI and MeMgI. The work of both was repeated; F.'s method gave more than 80% of a light yellow oil, b₁₄ 128.5°, which undoubtedly has the structure assigned to it by F.; like all such 1,2-dihydro bases it gives in cold alc. and Et₂O a well-crystd. yellow picrate, m. 130°, showing the characteristic property of these picrates of gradually changing in the solid state through orange to brown, of at once becoming red in solvents and of not being recrystallizable without change. R.'s method, on the other hand, gave a fraction b_{14.5} 125–35°, forming no cryst. picrate in alc.; in Et₂O it gave a light yellow picrate, m. 175–8°, which could be recrystd. from alc. and showed no tendency to change. The fore- and after-fractions, b_{14.5} 103–20° and 137–60°, resp., gave yellow picrates, m. 185–200° and 140–60°; the whole product is evidently a very complex mixt. and certainly different from F.'s compd., so that for the present it is quite uncertain whether R.'s compds. have the structures he assigned to them.

C. A. R.

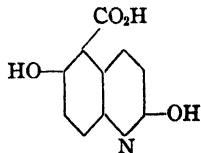
Quinaldine oxide. JAKOB MEISENHEIMER and ERWIN STOTZ. *Ber.* 58, 2334–5 (1925).—The supposed γ -ketohydroquinaldine (I) obtained by Heller and Sourlis by gentle reduction of *o*-nitrophenyllactic acid Me ketone (C. A. 2, 3352) seps. from H₂O with 2 mols. solvent, 1.5 of which it loses *in vacuo* over H₂SO₄; at 63° *in vacuo* it again loses in wt. but at the same time sublimes; after 2 hrs. it is practically anhyd. The last 0.5 mol. of H₂O is held very firmly and is not dissociated away by soln. in anhyd. solvents ((CH₂Br)₂, C₆H₆), as shown by mol. wt. detns. I is also obtained in good yield from quinaldine with BzO₂H in C₆H₆ and M. and S. believe that it really is *quinaldine N-oxide*; the acid obtained by energetic oxidation of I would then be a *quinoline N-oxide-2-carboxylic acid*.

C. A. R.

The occurrence of dihydroxyquinolinecarboxylic acid (the β -acid of Suzuki) in rice bran. Y. SAHASHI. *Biochem. Z.* 159, 221–34 (1925).—The β -acid of Suzuki (I) (C. A. 6, 2774) has been obtained in large amts. (300 g.), and its properties and chem. structure have been detd. On heating I at 100°, an indefinite amt. of H₂O is lost, but at 150°, 1 mol. is driven off, giving the anhyd. acid, C₁₀H₇NO₄ (II) which changes at 150° to orange-yellow and at 300° to brown, but does not change again up to 315°. It burns with partial sublimation. The following salts are prepd.: (C₁₀H₆NO₄)₂.Cu.2H₂O, (C₁₀H₆NO₄)₂.Ba.2H₂O, C₁₀H₆NO₄Na, C₁₀H₆NO₄K, besides basic salts of Ag, Na, NH₄ and Ca. It gives a mono-Bz or Me ester, a diacetate, and a tri-Bz deriv. One of the Bz groups is present as an anhydride, so that the acid is monobasic and contains 2 groups which are phenolic. Bromination of the Cd salt gives a salt (C₁₀H₆NO₄.Br.HBr)₂.CdBr₂. By the action of HNO₃ on II, is obtained dinitro-3-hydroxybenzene-1,2-dicarboxylic acid (juglone acid), and (CO₂H)₂, while distn. with Zn dust gives quinoline. Therefore, I is either



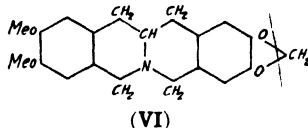
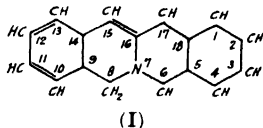
or



W. D. L.

Synthetical experiments in the isoquinoline group. VI. Synthesis of derivatives of parabarine. RAY CAMPBELL, R. D. HAWORTH and WM. H. PERKIN, JR. *J. Chem. Soc.* 129, 32–43 (1926); cf. C. A. 19, 2958.—The substance I is termed *parabarine*. An alkaloid of this type has been synthesized with this skeleton in order to compare the ease of formation and general properties with those of the alkaloids met with in nature. 3,4-Dimethoxyphenyl 3,4-methylenedioxy- β -phenylethyl ketone, m. 102–3°, gives an *oxime*, m. 119–21°, and an *isomeroso deriv.* (II), m. 137°. It is not reduced by Zn and AcOH at 60° but SnCl₂ and HCl in EtOH give 3,4-dimethoxyphenyl 3,4-methylenedioxy- β -phenyl- α -aminoethyl ketone, isolated as the SnCl₄ salt and analyzed as the HCl salt (III), m. 218–9°, and the yellow *picrate*; attempts to isolate the free base gave the *pyrazine*, pale yellow, m. 205°; this is best prepd. from II in NaOH with Zn dust. III in MeOH and 40% HCHO, decompd. with NaHCO₃, boiled 20 min., washed free from HCHO and digested with 20% HCl, gives 6,7-methylenedioxy-3-[3',4'-dimethoxybenzoyl]-1,2,3,4-tetrahydroisoquinoline, m. 137°; HCl salt, m. 232–4° (decompn.), *crystg.* with 2 mols. H₂O, m. 115–20°; *Bz deriv.*, m. 187–8°; *picrate*, yellow, with 1H₂O, m. 167–8°; *oxime*, m. 205–9° (decompn.). Oxidation with I in EtOH contg. KOAc gives, 6,7-methylenedioxy-3-[3',4'-dimethoxybenzoyl]isoquinoline (IV), m. 222°; *sulfate*, pale yellow

plates dissociated by H_2O ; *oxime*, m. $234-6^\circ$ (decompn.); fusion with KOH gives veratric acid. Reduction with Zn dust in AcOH gives the 3-[α -hydroxy-3',4'-dimethoxybenzyl] deriv., m. 153° ; *picrate*, yellow, darkens 183° , m. 195° (decompn.). HBr and Zn dust probably give 6,7-methylenedioxy-3-[3',4'-dimethoxybenzyl]isoquinoline, whose *picrate*, yellow, m. $206-7^\circ$. Electrolytic reduction of IV in 10% H_2SO_4 gives 6,7-methylenedioxy-3-[3',4'-dimethoxybenzyl]-1,2,3,4-tetrahydroisoquinoline, whose HI salt (V) m



226° (decompn.); HI salt, m. $220-2^\circ$ (decompn.); *nitrosamine*, m. 128° . V in MeOH, decompd. with $NaHCO_3$ and treated with $HClO$ and HCl, gives a very small yield of 2,3-methylenedioxy-11,12-dimethoxy-6,15,16,17-tetrahydroparaberine (VI), m. $221-2^\circ$; HI salt, m. $236-8^\circ$; *picrate*, yellow, m. $199-201^\circ$; *methiodide*, m. 268° ; *methochloride*, m. 260° (decompn.). Oxidation with I in EtOH gives 2,3-methylenedioxy-11,12-dimethoxy-6,17 (or 6,15)-dihydroberberine, pale yellow, amorphous powder, m. $180-90^\circ$, III-salt, pale yellow, m. $225-6^\circ$; HI salt, bright yellow, with $0.5H_2O$ of crystn., m. 120° .

C. J. WEST

Transformation of 2,4-dinitro-4'-phenylazodiphenylamine into derivatives of phenazine. A. BERETTA. *Gazz. chim. ital.* **55**, 711-3 (1925).—Sixty g. Sn and 160 g. HCl in a porcelain dish were treated with 36.2 g. powd. 2,4-dinitro-4'-phenylazodiphenylamine (I) (cf. Beretta, C. A. **18**, 1477). The mixt. was kept on the H_2O bath at not over 70° . When the soln. has become limpid H_2O is added, the temp. is made 40° and Zn is added to ppt. the Sn. The filtrate is satd. with $CaCO_3$. The liquid obtained is cooled and treated with 35 g. $K_2Cr_2O_7$ in H_2O . The colored soln. is filtered, treated with NaCl which ppts. aminophenosafuranine (I), m. 360° after repeated crystn. from boiling H_2O , identical with that obtained by Ris (*Chem.-Ztg.* 305 (1893)). I on reduction gives equimol amts. of $PhNH_2$ HCl and 2,4,4'-triaminodiphenylamine, which with CrO_3 react to give I. 6 g. 2-amino-4-nitro-4'-phenylazodiphenylamine (for prepn., cf. B. I. c.) were dissolved in hot EtOH and acidified with 0.5 cc. HCl. This soln. was poured into 3.75 g. phenanthrenequinone in glacial AcOH at 100° . After heating on the H_2O bath for some time the soln. was allowed to stand and evap. for some days. The concd. liquid was dild. with H_2O + AcOH. Nitrophenylazoflavinduline chloride, m. $146-8^\circ$, is pptd.

E. J. WITZEMANN

The dioximes. XXVII. G. PONZIO AND G. PEROLIO. *Gazz. chim. ital.* **55**, 688-98 (1925); cf. C. A. **20**, 746.—Since $PhC(:NOH)C(:NOH)Cl$ (I) (C. A. **17**, 2268) reacts with NH_3 and $PhNH_2$ with the substitution of Cl it was thought that $PhNHNH_2$ would react giving phenylphenylhydrazinoglyoxime (II) but the reaction was more complex and the compd. formed had the compn. of II less $1H_2O$, but was not the corresponding furazan, azoxime or the oxadiazole that might have been formed. It was concluded that 2,6-diphenyl-3-keto-2,3,4,5-tetrahydrotetrazine (III) was formed. 5 g. I suspended in 30 cc. EtOH was treated with 6 g. $PhNHNH_2$. The product was filtered off and washed with H_2O to eliminate $PhNHNH_2$. The residue of III, m. $174-5^\circ$ (decompn.), is stable in hot 20% NaOH but is decompd. in dil. HCl. III with Ac_2O in the cold gives the *mono-Ac* deriv., $C_{14}H_{11}ON_4Ac$, m. 161° ; heated with Ac_2O and NaOAc it gives the *di-Ac* deriv., m. 174° . III in hot 50% AcOH treated with CrO_3 , pptd. *sym.-2,6-diphenyl-3-keto-2,3-dihydrotetrazine* (IV), m. $264-5^\circ$. IV in boiling AcOH was treated with Zn dust and poured into H_2O . The ppt. was dissolved in Et_2O-HCl On adding H_2O *sym.-2,6-diphenyl-2,3,4,5-tetrahydrotetrazine* (V), m. 86° , was pptd. V in AcOH with CrO_3 pptd. *sym.-2,6-diphenyl-2,3-dihydrotetrazine*, m. $238-9^\circ$. I treated as in the prepn. of III with *p*- $BrC_6H_4NHNH_2$ gave *sym.-6-phenyl-2-p-bromophenyl-3-keto-2,3,4,5-tetrahydrotetrazine*, m. $189-90^\circ$; heated with Ac_2O it gives the *di-Ac* deriv., $C_{14}H_9ON_4BrAc_2$, m. $169-70^\circ$. Finely powd. β -*p*-tolylglyoxime (Avogadro, C. A. **18**, 661) suspended in $CHCl_3$ and treated with dry Cl_2 to satn. gave *p*-tolylchloroglyoxime (VI), $MeC_6H_4C(:NOH)C(:NOH)Cl$, m. 201° (decompn.); the Ni salt, $(C_6H_5O_2N_2Cl)_2Ni$, seps. as orange crystals that blacken at 180° but do not melt; in the cold with Ac_2O it gives the *di-Ac* deriv., m. 95° . VI treated with $PhNHNH_2$ as with III gave *sym.-2-phenyl-6-p-tolyl-3-keto-2,3,4,5-tetrahydrotetrazine* (VII), m. $190-1^\circ$; heated with Ac_2O it gives the *di-Ac* deriv., m. 170° . VII in AcOH with a suspension of H_2O-CrO_3 gave *sym.-2-phenyl-6-p-tolyl-3-keto-2,3-dihydrotetrazine* (VIII), m. 265° . VIII in boiling AcOH with Zn dust gave *sym.-2-phenyl-6-p-tolyl-2,3,4,5-tetrahydrotetrazine*, m. 104° , and this

in AcOH soln. with CrO_3 gave *sym*-2-phenyl-6-*p*-tolyl-2,3-dihydrotetrazine, m. 259° . **XXVIII.** G. PONZIO. *Ibid* 698–705.—In previous papers P. has given data on the prepn. and properties of a no. of so-called peroxides of glyoxime. A paper by Meisenheimer *et al.* (C. A. 19, 2819) leads P. to published some results on β -phenylglyoxime peroxide (I). 5 g. β -phenylglyoxime (II), m. 180° , was treated with 50 cc. 4 N HNO_3 . After 24 hrs. H_2O was added and I was volatilized with steam to remove it from $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ and a little tar. 2.5 g. I, m. 108° , were obtained. It does not react with Ac_2O , PhNH_2 , PhNHNH_2 or concd. H_2SO_4 (in the latter it is dissolved and reprecipitated unchanged on adding H_2O). With hot HNO_3 it gives $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$. In the sealed tube with HCl at 160° it decomps. giving $\text{BzOH} + \text{NH}_3$. With Zn dust + AcOH it gives II. With N_2O_4 in Et_2O it remains unchanged. The results of M. *et al.* and the constitution of I are discussed in some detail E. J. WITZEMANN

Substituted dihydropentazines a new series of cyclic nitrogen compounds. FREDERICK DANIEL CHATTAWAY AND GEORGE DAVID PARKES. *J. Chem. Soc.* 1926, 113–7.— $\text{PhC}(\text{NH}_2)\text{NNHC}_6\text{H}_3\text{Br}_2$ and $\text{HN}(\text{O}_2)$ in cooled soln. or $\text{PhCH.NNHC}_6\text{H}_3\text{Br}_2$, PhNH_2 and EtONa heated at 100° for 15 hrs. give 1-[2,4-dibromophenyl]-4-phenyl-1,2,3,5-tetrazole, m. 127° . The 4-*m*-nitrophenyl compd., m. 215° . $\text{PhCBr.NNHC}_6\text{H}_3\text{Br}_2$ and N_2H_4 in EtOH give ω -hydrazinobenzaldehyde 2,4-dibromophenyldiazone (I), m. 123° , darkens on exposure to light and slowly decomps. in the air; it yields salts with mineral acids, the HCl salt, m. 188° (decomps.), BzH gives the ω -benzylidene deriv., yellow, m. 126° , sol in concd. H_2SO_4 with a brown, changing to a red color; EtOH-KOH gives a yellow color; p -nitrobenzylidene deriv., dark violet by transmitted, dark green by reflected light, m. 194° ; EtOH-KOH gives a deep blue color, fading quickly; concd. H_2SO_4 gives a brown color changing to violet. Hydrazobenzaldehyde 2,4-dibromophenyldiazone, m. 237° , from I and $\text{PhCBr.NNHC}_6\text{H}_3\text{Br}_2$ I and HNO_2 (NaNO_2 and HCl in a freezing mixt.) give 1-[2,4-dibromophenyl]-5-phenyl-1,4-dihydropentazine, $\text{PhC.N.N}(\text{C}_6\text{H}_3\text{Br}_2).\text{N.N.NH}$, m. 172° ; rapidly heated, it decomps. with a puff of black

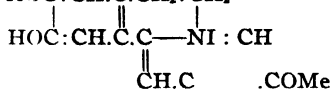
smoke and formation of PhCN ; it exhibits slightly basic properties C. J. WEST

Resolution of *dl*-dicentrine. R. D. HAWORTH, W. M. H. PERKIN, JR. AND JOHN RANKIN. *J. Chem. Soc.* 1926, 29–32; cf. C. A. 20, 206.—*dl*-Dicentrine may be resolved by means of tartaric acid, both the *d* and *l*-forms in 169° and show $[\alpha]_D^{20}$ 61.1° and -63.5° ; direct comparison of the *d*-base with a sample of the natural product establishes the identity of the synthetic product C. J. WEST

Hydroxyacanthine. ERNST SPATH AND ALFRED KOLBE. *Ber.* 58B, 2280–5 (1925).—The results of this work indicate that hydroxyacanthine (I) has the compn. $\text{C}_{40}\text{H}_{40}\text{O}_6\text{N}_2$ and contains 3MeO and 1 phenolic HO group and 2 isoquinoline rings, the other two O atoms are not present as a CH_2O_2 group but probably in ether groupings. The root bark of *Berberis vulgaris* was extd. with EtOH the ext. evapd. to dryness *in vacuo*, treated with hot dil. HCl and filtered, the filtrate pptd. with Na_2CO_3 , the ppt. completely dried *in vacuo* and extd. in a Soxhlet with Et_2O , in which the I slowly dissolves, and the crude I pptd. from hot dil. HCl with NaBr as the HBr salt (yield, 18 g. from 1130 g. fresh dry bark), which was converted through the free I into the sulfate; this was recrystd. several times from hot H_2O and when treated in H_2O with NH_4OH gave an amorphous ppt. of I which could not be recrystd. from alc. but when dissolved in much Et_2O and concd. sepd. on scratching repeatedly or on seeding, in compact crystals, m. $216\text{--}7^\circ$ (all m. ps. in evacuated tubes), mol. wt. in camphor 594–643; di-HCl salt, m. $270\text{--}1^\circ$, $[\alpha]_D^{20}$ 188.5° (H_2O); di-HBr salt, m. $273\text{--}5^\circ$ (gas evolution). If the HCl salt is dissolved in moderately dil. KOH and concd. KOH is then added the amorphous resinous *K* salt seps.; it is easily sol. in pure H_2O and regenerates I with CO_2 . With $\text{MeN}(\text{NO})\text{CO}_2\text{Et}$ and NaOMe in MeOH 4 g. I yields 2 g. of a *Me ether*, resinous mass forming a well-crystd. HCl salt. With MeI and NaOMe in MeOH , 1.2HCl gives a *Me ether dimethiodide*, $\text{C}_{40}\text{H}_{40}\text{O}_6\text{N}_2\text{I}_2$ (II), m. $255\text{--}60^\circ$, 2 g. of which, boiled in dil. NaOH , yields 1.54 g. of an amorphous base which on renewed methylation and boiling with NaOH gives NMe_3 and a hydrocarbon to be studied later. II (11.6 g.) shaken in hot H_2O with excess of AgCl , filtered, heated on the H_2O bath with Na-Hg and extd. with Et_2O , the yellowish viscous mass remaining when the Et_2O is evapd. being then treated in MeOH with an excess of MeI , gives 7.5 g. of a compd. $\text{C}_{40}\text{H}_{40}\text{O}_6\text{N}_2\text{I}_2$, m. $230\text{--}1^\circ$, which on treatment with AgCl and then with Na-Hg yields a compd. $\text{C}_{36}\text{H}_{40}\text{O}_6$, m. $124\text{--}15^\circ$, mol. wt. in camphor 560. C. A. R.

Syntheses of hydroxyberberine, palmatine and tetrahydrojatrorrhizine. ERNST SPATH AND HERBERT QUIETENSKY. *Ber.* 58B, 2267–72 (1925).—Since the supposed synthesis of berberine (I) by Pictet has been shown by Haworth, Perkin and Rankin

(*C. A.* 18, 3385) to have been based on error, the prepn. of palmatine (II) starting from tetrahydroberberine (*C. A.* 16, 1778) can no longer be considered a "synthesis" of II. S. and Q., however, have now really synthesized I through hydroxyberberine (III), which was prepd. about the same time by Perkin, Rây and Robinson (*C. A.* 19, 1710), from whose results those of S. and Q. differ only in minor respects and are, therefore, not reported in detail. A new method for the conversion of I into II has been devised and tetrahydrojatrorrhizine (IV), identical with the product obtained from the natural alkaloid (*C. A.* 20, 603), has been synthesized. When 8 g. I sulfate is heated with H_2SO_4 in the presence of phloroglucinol (V), the CH_2O_2 group is split off as HCHO , which condenses with the V to difficultly sol. products; the filtrate from these is treated with NaI and the pptd. iodides are treated with dil. KOH , which leaves the I iodide undissolved, while acidification of the intensely brown KOH ext. yields 8.1 g. of the yellowish brown iodide $\text{HOC}:\text{CH}:\text{C}:\text{CH}_2:\text{CH}_2$



$\text{CH}:\text{CH}:\text{C}:\text{OME}$, 1 g. of which in 3 cc. MeOH with 0.1 g. Na in 2 cc. MeOH and 0.42 cc. Me_2SO_4 , the same amts. of NaOMe and Me_2SO_4 being added twice more at 3-hr. intervals, gives 0.7 g. II iodide, while 3 g. of the iodide in 20 cc. MeOH with 0.307 g. Na in 6.15 cc. MeOH and 1.28 cc. Me_2SO_4 , the same amt. of NaOMe and Me_2SO_4 being added once more after 4 hrs., gives 1.06 g. of a product which with Zn dust and dil. H_2SO_4 on the H_2O bath gives IV, m. 216–7°. C. A. R.

Action of acetylene tetrabromide on organic bases. J. D. FULTON. *J. Chem. Soc.* 1926, 197–9. $\text{C}_2\text{H}_2\text{Br}_4$ and tert. bases give additive compds. of the HBr with the $\text{C}_2\text{H}_2\text{Br}_4$. H_2O decomp. these compds., liberating the $\text{C}_2\text{H}_2\text{Br}_4$. *Nicotine*, $\text{C}_{10}\text{H}_{14}\text{N}_2 \cdot 2\text{HBr} \cdot 2\text{C}_2\text{H}_2\text{Br}_4$, softens 140°, m. 178–80° (decompn.); $[\alpha]_{\text{D}}^{17} \text{green}$, 3.21° (EtOH , c 5.6025); repeated crystn. gives the compd. $(\text{C}_{10}\text{H}_{14}\text{N}_2 \cdot 2\text{HBr})_2 \cdot \text{C}_2\text{H}_2\text{Br}_4$, m. 182–3° (decompn.); $[\alpha]_{\text{D}}^{17} \text{green}$ 6.96° (EtOH , c 5.6025); both give the same bromoaurate, $\text{C}_{10}\text{H}_{14}\text{N}_2 \cdot 2\text{HBr} \cdot \text{AuBr}_3$, dark red, m. 183°. *Pyridine*, $\text{C}_5\text{H}_5\text{N} \cdot \text{HBr} \cdot \text{C}_2\text{H}_2\text{Br}_4$, m. 108–9°; bromoaurate, brownish red, m. 318–9°. *Quinoline*, $(\text{C}_8\text{H}_7\text{N} \cdot \text{HBr})_2 \cdot \text{C}_2\text{H}_2\text{Br}_4$, softens 115°, m. 136°; bromoaurate, dark red, m. 171–2°. *Isoquinoline* gave mostly its HBr salt, m. 207°; the additive compd., $(\text{C}_8\text{H}_7\text{N} \cdot \text{HBr})_2 \cdot \text{C}_2\text{H}_2\text{Br}_4$, m. 155–6°, was not quite pure. Bromoaurate, dark red, m. 223°. *Lutidine*, $(\text{C}_7\text{H}_9\text{N} \cdot \text{HBr})_2 \cdot \text{C}_2\text{H}_2\text{Br}_4$, m. 135–40°. α -*Picoline*, $\text{C}_8\text{H}_7\text{N} \cdot \text{HBr} \cdot \text{C}_2\text{H}_2\text{Br}_4$, m. 104–5°. *Piperidine*, *coniine*, *homopiperonylamine*, *menthylamine*, *hexamethylenetetramine* and PhNHNH_2 gave rise to the HBr salts only. Antipyrine and pyrrole do not react with $\text{C}_2\text{H}_2\text{Br}_4$. C. J. WEST

The influence of chemical constitution on the odor of mustard oils (DYSON) 11A. The catalytic hydrogenation of organic substances (SCHMIDT) 2. Characteristic reactions induced by light-excited Br (isomerization of diethyl maleate) (EGGERT, *et al.*) 3. Absorption spectra of benzophenone derivatives (TASAKI) 3.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Liver and blood catalase. II. P. RONA, A. FIEGAL and Y. NAKAHARA. *Biochem. Z.* 160, 272–84 (1925); cf. *C. A.* 17, 1034.—Blood or liver catalase, rendered inactive by KCN , was restored to activity by destruction of the KCN with H_2O_2 ; the recovery of catalase action followed at a definite time interval the oxidation of the KCN . SO_4^{--} , Cl^- and NO_3^- ions diminished catalase action in acid soln., p_{H} 3–5, but showed little or no effect on catalase action at a p_{H} 7–8. F. A. CAJORI

The behavior of saponin during dialysis. I. KOFLER and A. WOLKENBERG. *Biochem. Z.* 160, 398–406 (1925).—The time of dialysis of 1% solns. of various saponins through parchment paper was recorded. A certain relationship was found between the speed of dialysis of different saponins and the ease of their absorption from the intestinal tract. Saponins were purified by electrodialysis; this process removed inorg. impurities but did not lessen the hemolyzing power of the saponin. F. A. C.

The action of hydrochloric acid and of pepsin and hydrochloric acid on dissolved proteins. H. W. VAN URK. *Biochem. Z.* **160**, 448-50(1925).—HCl changes egg albumin to acid albumin, which is *l*-rotatory ($[\alpha]_D = -83^\circ$). Pepsin with HCl forms proteoses and peptones which also are *l*-rotatory. The fact that the products of both these agents are *l*-rotatory explains the apparent similarity of the action of gastric juice and acid on proteins. F. A. CAJORI

More on phosphorylation of sugars. C. NEUBERG AND M. KOBEL. *Biochem. Z.* **160**, 464-6(1925); cf. *C. A.* **19**, 3278.—The H_2PO_4 esterification of fructose during fermentation was uninfluenced by the presence of $Na_2Fe_2(P_2O_7)_3$ and it seems unlikely that complex Fe salts play any role in this type of sugar change as it occurs biologically (cf. Spoehr, *C. A.* **18**, 2131). F. A. CAJORI

The preparation and chemistry of insulin. H. A. SHONLE. *J. Chem. Education* **3**, 134-47(1926).—A review with bibliography. E. J. C.

Action of the secretion of the peptic-hydrochloric acid glands on monobutyryl. CARLO COSTANZI AND ANTONUCCI SEVERINI. *Arch. farm. sper.* **40**, 220-34(1925).—Gastric juice collected from a small stomach in the fundus by the Pavlov operation on a dog and tested by the stalagmometric method with monobutyryl showed lipase to be present in some samples and absent from others. When the secretion is obtained entirely free from blood and from cells of the mucosa it contains no lipase even after ingestion of foods rich in fats. The presence of lipase indicates contamination with blood or tissue cells. The enzyme is not secreted by the peptic-HCl glands

A. W. DOX

Further studies on the structure of the proteins. Studies on the physical and chemical properties of the 2,5-diketopiperazines. Comparative studies on the cleavage of 2,5-diketopiperazines at definite p_H without affecting the dipeptide linkage and studies on the behavior of proteins and peptones under the same conditions. Fumaric acid among the cleavage products of gelatin. EMIL ABDERHALDEN AND RICHARD HAAS. *Z. physiol. Chem.* **151**, 114-25(1926).—The presence of diketopiperazines in proteins has already been established beyond doubt. It is possible, however, that in some proteins this grouping occurs in its more labile tautomeric form, and perhaps this difference accounts for the ease with which many proteins are hydrolyzed by enzymes in contrast to the great resistance of proteinoids such as keratin and fibroin. In isolated diketopiperazines the opening of the ring occurs more readily than the further cleavage of the resulting depeptide into its component amino acids. It occurs even at a p_H which is of biol. significance. At p_H 11.40 glycine anhydride, alanyl-glycine anhydride and alanine anhydride undergo partial hydrolysis at room temp. until after 160 hrs. an equil. is reached and the p_H has dropped to 8.50. Silk peptone and casein behave in the same manner, the drop in p_H being accompanied by a rise in CH_2O titer and a diminution in intensity of the picric acid and 3,5-(O_2N) $_2$ C $_6$ H $_3$ CO $_2$ H color reactions. The adsorption by charcoal is about 5 times as great with the anhydrides as with the corresponding dipeptides. Another difference is the fact that the anhydrides are pptd. from alk. soln. by K_2HgI_4 , whereas the dipeptides and amino acids, with the exception of tryptophan and histidine, are not pptd. In this pptn. the Hg^{++} is reduced to Hg^+ . In distg. the amino acid esters obtained by acid hydrolysis of gelatin and esterification with MeOH, 5 g. of methyl fumarate was obtained from 1 kg. of gelatin.

A. W. DOX

Further studies on the structure of the proteins. Comparative oxidation experiments. EMIL ABDERHALDEN AND HANS QUAST. *Z. physiol. Chem.* **151**, 145-50(1926); cf. preceding abstr.—Oxidation of silk peptone by $Zn(MnO_4)_2$ gives both oxamide and (CO $_2$ H) $_2$. The diketopiperazine ring probably is first oxidized to tetraketopiperazine (I) which then undergoes hydrolysis. Attempts to isolate I were, however, unsuccessful. A parallelism was demonstrated between the intensity of the picric acid reaction, the NH_2N present and the yield of oxamide, after preliminary treatment with *N* NaOH followed by oxidation. With prolongation of the alkali treatment the oxamide yield and the picric acid reaction decreased and finally disappeared while the NH_2N increased.

A. W. DOX

Chemistry of the blood pigment. IV. Sulfhemoglobin. Addenda to previous papers. FELIX HAUROWITZ. *Z. physiol. Chem.* **151**, 130-44(1926); cf. *C. A.* **18**, 3065.—Sulfhemoglobin was obtained in cryst. form by alternate treatment of a 20% soln. of Hb with H_2S and O_2 until the absorption bands of Hb had disappeared, and adding 20% of EtOH to the ice-cold soln. The product shows an intense band in the red at $\lambda 617$. When the aq. soln. stands in the air S gradually seps. It was not detd. whether S-Hb contains chemically bound or merely adsorbed S. The Fe is in org. linkage since it cannot be removed by dil. HCl after heat coagulation. The Fe content

(0.34%) is identical with that of pure Hb. The supposed SO-Hb and CO-S-Hb are mixts. which show merely a S-Hb spectrum superimposed on the spectra of Hb, O-Hb, Met-Hb and CO-Hb. Likewise Se-Hb and CO-Se-Hb are impure S-Hb. Other Hb derivs. described in the literature, Cat-Hb, N_2O_5 -Hb, NO-Met-Hb and AsH_3 -Hb, are merely mixts. The various methemoglobins, however, are equilibria of 2 forms of Met-Hb. CO-Hb, NO-Hb, CN-Hb, F-Met-Hb and S-Hb are individual cryst. substances. A. W. Dox

Hydrolysis of polypeptides by enzymes. EMIL ABDERHALDEN. *Z. physiol. Chem.* **151**, 151-4 (1926).—The recent work of Waldschmidt-Leitz on the sepn. and sharp differentiation between trypsin and erepsin throws new light upon the older expts. of Fischer and Abderhalden whereby the acid amide linkage in proteins was established by "tryptic" digestion. A. W. Dox

The oxido-reductase (dehydrogenase) of yeasts. II. HANS V. EULER AND RAGNAR NILSSON. *Z. physiol. Chem.* **151**, 155-64 (1926); cf. *C. A.* **20**, 57.—The time required for decolorization of methylene blue by washed yeast is greatly diminished by addn. of biocatalyst Z, although the latter alone is without action. The Z-prepn. can, therefore, replace the co-reductase removed by washing. Muscle juice activates yeast reductase in the same manner. The ash from the Z-prepn., on the other hand, is inactive. CH_3O is inhibitory and AcH without action. The activity of yeast reductase is increased also by warming to 40° . Reduction of $NaNO_2$ could not be demonstrated. A. W. D.

Supplement to the paper "Biocatalysts of carbohydrate metabolism. III," by Hans v. Euler and Karl Myrback. EMIL ABDERHALDEN. *Z. physiol. Chem.* **151**, 165-6 (1926); cf. *C. A.* **20**, 425.—The slight acceleration of yeast fermentation by insulin was not claimed by A. to be due to the component responsible for hypoglycemia. Certain amines are known to have a similar effect. Moreover, the activity of insulin preps. from various sources, as detd. by animal expts., does not run parallel to the effect on fermentation. A. W. Dox

Influence of chemical constitution on the odor of mustard oils. G. M. DYSON. *Perfumery Essent. Oil Record* **17**, 20-2 (1926).—Several important generalizations have been drawn from a consideration of the effects observed in lengthening and branching of carbon chains, and of the nature and orientation of substituent groups on the odor of alkyl- and substituted arylthiocarbamides. As far as these mustard oils are concerned the odor characteristics are divisible into 3 classes, viz., strength, nature and quality. The strength of odor is due in large measure to volatility. Hence any chem. process which tends to decrease the volatility, such as lengthening of C chains, introduction of NO_2 , SO_3H , CO_2H or OH groups, multiplication of substituent groups, tends at the same time to decrease, and in some cases completely to inhibit, the odor. By nature of odor is meant the class to which the odor of the compd. belongs. Thus, by taking the odor of phenyl mustard oil as the true aromatic mustard oil odor, all substances with a similar, or slightly modified, odor are said to have odors of the same nature. The presence of a single *o*- or *m*-group causes little or no modification in the nature of the odor, while the presence of a single *p*-substituent causes an aniseed-like odor which is almost independent of the chem. nature of the substituent group. Where *o*- and *p*-groups are present together the effect of the *p*-substituent usually predominates, while if 2 *o*- or *m*-, and 1 *p*-group are present the nature of the odor is often entirely different from that of either compd. produced by *o*- or *p*-substitution alone. The quality of the odor is a more subtle distinction than the 2 foregoing properties; it is another term for the delicacy or harshness of the odor. An increase in no. and wt. of the substituent groups usually softens and sweetens the odor, which effect is also obtained in the aliphatic series by lengthening the C chain. Branching the C chain has the opposite effect. The constitutional use of these principles in rational synthesis is obvious. W. O. E

Has air a vital property? F. E. HARTMAN. *J. Am. Soc. Heating Ventilating Eng.* **32**, 67-72 (1926).—The vital property of air is ozone or activated air which contains ozone rather than a negative property attributed to lack of poison. Ozone has been used successfully in treating tuberculosis pertussis and anemia by daily inhalation. It increased the oxyhemoglobin of the blood 1-4%. This ionized oxygen seems to act as a catalyst. It is suggested as the "air-soluble vitamin." H. C. HAMILTON

Normal variations of the inorganic phosphate of blood. R. E. HAVARD AND G. A. REAY. *Biochem. J.* **19**, 882-7 (1925).—The authors used a micro-adaptation of Brigg's modification of the Bell-Doisy technic (*C. A.* **16**, 3493). They noticed a seasonal variation in the av. normal blood phosphate of from 2.9 mg. P per 100 cc. in January to 4.0 mg. P per 100 cc. in August. Rises in the inorg. phosphate of 20-50% during sleep were observed. BENJAMIN HARROW

Binding of iodine. I. Binding of iodine by aromatic substances. A. JEZLER. *Z. ges. expl. Med.* **46**, 486-99(1925).—The power of phenol and of serum to bind I is a function of the p_H . In acid medium the binding of I is adsorptive or physical in character; in alk. medium it is chem. The adsorptive binding of I is dependent on the degree of dispersion of the proteins. When p_H and degree of dispersion remain uniform the power of binding I is influenced by the ions present. HARRIET F. HOLMES

The radiophysiological equilibrium is shifted by *l*-adrenaline to the α side, by *d*-adrenaline to the β side. H. ZWAARDEMAKER. *Verslag Akad. Wetenschappen Amsterdam* **34**, 872-3(1925); cf. *C. A.* **14**, 2497; **15**, 2448. —While *l*-adrenaline shifts the radiophysiol. equil. to the α side, *d*-adrenaline of Meister, Lucius & Brüning was found to have the reverse effect, so that in a certain K-U mixt. and with an adrenaline concn. of 10^{-6} , 25% of the original U-salt content had to be added in order to restore the equil. A considerable error may be involved owing to the possible *l*-adrenaline content of the prepn. MARY JACOBSEN

Further communication on the alleged influence of fructose on blood clotting. E. SLUITER. *Verslag Akad. Wetenschappen Amsterdam* **34**, 949-50(1925); cf. *C. A.* **19**, 3318. —C. p. fructose prep'd. by Kahlbaum from inulin produced no clotting in laked blood. The previously reported effect was due to the presence of 0.64% $MgCl_2$ in com. fructose. While Mg is unable to coagulate oxalated blood, Sr coagulates oxalated, citrated and phosphated blood. The effect is due to the liberation of Ca ions. MARY JACOBSEN

Determinations of permeability in *Saccharomyces cerevisiae* (pressed yeast of the Ned. Gist- en Spiritusfabriek). N. I. SÖHNGEN AND K. T. WIERINGA. *Verslag Akad. Wetenschappen Amsterdam* **34**, 999-1003(1925). —In diffusion expts. the water diffusion and imbibition can be accounted for by adding gelatin to the soln. and detg. the decrease of concn. of both gelatin and the substance exam'd. The method was proved to be reliable by expts. with lactose and NaCl in a 0.5% gelatin soln. The rates of diffusion thus found were: 0.25 mg. NaCl and 3.2 mg. (2.2 mg. in the first, 1.0 in the last 24 hrs.) urea per 48 hrs. and per 1 g. yeast with about 1 sq. m. surface. The water withdrawn from the cell protoplasm in a 1% NaCl soln. is 8%, the imbibition water 12% of the yeast. The latter is 17% for a lactose soln. MARY JACOBSEN

Gas formation in the heart of the cadaver. DVYRENFURTH. *Deut. Z. ges. ger. Med.* **6**, 650-1(1926); cf. Ladislaus Jankovich (*C. A.* **20**, 427). —D. was able to demonstrate gas within 12 hrs. after death. FRANCES KRASNOW

Sulfatase. VII. The splitting of ethereal sulfuric acids of different series by sulfatase and the mechanism of the action of sulfatase. C. NEUBERG AND J. WAGNER. *Biochem. Z.* **161**, 492-505(1925); cf. *C. A.* **19**, 2674. —Sulfatase from fungi is not specific in its action, but hydrolyzes sulfuric acid esters of simple phenols, naphthols, dihydroxybenzenes, substituted phenols, as well as phenolic aldehydes and acids, and quinoline and indole derivs. However, some of the aliphatic or terpene esters such as the ethyl, amyl, mandelic or borneol esters are not hydrolyzed. Either $CaCO_3$ or $BaCO_3$ may be used to control the neutrality of the soln. A water ext. of the enzyme may be filtered clear with practically no loss in activity. W. D. L.

The hormone of the estrual cycle II. E. LAQUEUR, P. C. HART, S. E. DE JONGH AND J. A. WIJSENBECK. *Deut. med. Wochschr.* **52**, 52-5(1926). —A water-clear, protein-free, partly dialyzable aq. soln. has been obtained from ovarian follicle fluid which has the properties of inducing the estrual cycle in mice and is named "menformon." Potent solns. yield residues, upon drying, that are too slight to weigh (0.01-0.1 mg. per "mouse unit"). All protein reactions were negative. No N_2 could be demonstrated by the micro-Kjeldahl method in the purer prepns. NH_3 , OH, P and cholesterol were also absent. Apart from its sp. effect menformon has no toxic action upon the mouse, rabbit or man. There is no depressor action and no effect upon the frog heart nor upon respiration. A definite contraction of the isolated uterus of the virgin guinea pig can be produced by 15 mouse-units. The metabolism of castrated rats is increased. A striking increase in the growth of the female sexual organs can be produced by 8 mouse-units of menformon in mice. LOUIS LEITER

The physical chemistry of the proteins. E. J. COHN. *Physiol. Rev.* **5**, 349-437 (1925). —Review with extensive bibliography. E. R. LONG

The destructive action of acids, alkalis, and enzymes on insulin. H. A. SHONLE AND J. H. WALDO. *J. Biol. Chem.* **66**, 467-74(1925). —"Insulin may be of a true protein structure possessing sp. physiol. activity or it may consist of a chem. complex attached to a protein structure. However, when the protein is broken down into slightly smaller units, either by acid, alkali, or enzyme, the physiol. functioning is lost. In every instance it is observed that the loss of physiol. activity was gradual and occurred simul-

taneously with the gradual hydrolysis of the protein material. In no instance was it possible to recover any of the activity; the change was irreversible." A. P. L.

The histidine and tyrosine content of a number of proteins. M. T. HANKE. *J. Biol. Chem.* **66**, 489-93 (1925).—The histidine and tyrosine content of a number of proteins have been detd. by the method recently described by H. (C. A. **20**, 1093). The mean values obtained for histidine and tyrosine, resp., are as follows: gelatin 0.53, 0.25; casein 2.61, 4.5; cryst. egg albumin 2.3, 2.35; squash-seed globulin 2.26, 3.05; gliadin 2.1, 2.35; hordein 0.98, 2.43; zein 1.25, 3.66; secalin 1.23, 1.37; sativin 0.74, 1.56; sorghumin 0.51, 2.3; sheep fibrin 2.18, 3.3; swine fibrin 2.27, 3.45; cattle fibrin 2.05, 3.5%. The quant. Millon procedure of Fürth and Fisdher for tyrosine (C. A. **19**, 89, 1721) is not reliable, as it is sensitive to slight and uncontrollable variations in the compn. of the final reaction liquid. The values obtained are invariably much lower than those obtained by that method and by the Folin and Denis procedure.

A. P. LOTHROP

An alcohol-soluble protein isolated from polished rice. W. F. HOFFMAN. *J. Biol. Chem.* **66**, 501-4 (1925).—Extn. of 6.5 kg. of com. polished rice meal with hot 70% alc. yielded 7.5 g. (0.12%) of rice prolamine having a % compn., C 55.92, H 6.49, N 16.22, S 1.14 and resembling those of kafir and sorghum in compn. and soly. The N distribution in % of total N detd. by the Van Slyke method is as follows: NH_3 12.45, sol humin 1.68, insol. humin 1.65, arginine 13.21, histidine 6.24, cystine 1.33, lysine 1.73, amino N in filtrate 53.59, nonamino N in filtrate 7.32, total 99.20. It thus does not contain the high % of $\text{NH}_3\text{-N}$, which is typical of prolamines but contains more basic N than any heretofore isolated, only a small amt. of which, however, is lysine, the arginine content is also much higher than that of any known prolamine.

A. P. LOTHROP

Ultra-violet absorption spectra of blood serum and certain amino acids. WILHELM STENSTRÖM and MELVIN REINHARD. *J. Biol. Chem.* **66**, 819-27 (1925).—The absorption band around 2800 Å. U. of blood serum is due to the proteins present and it is mainly the tyrosine and tryptophan constituents of the proteins which are responsible for this band. The absorption band of tyrosine shifts towards longer wave length and its intensity is increased when the soln. is made alk. The absorption of blood serum changes in a similar manner when the p_{H} is reduced below $10^{-12.7}$. A mixt. of tyrosine, tryptophan, phenylalanine, cystine, glycine, leucine and glutamic acid in the proportion indicated by analysis of blood serum (albumin and globulin) gives a curve which agrees qual. with the blood-serum curve taken at the same p_{H} ; there is quant. agreement between the two curves if the concn. of the mixed amino acids is reduced 25%.

A. P. LOTHROP

The apparent dissociation constants of creatine and creatinine. G. S. FADL and ANDREW HUNTER. *J. Biol. Chem.* **67**, 237-44 (1926).—Creatine and creatinine were titrated electrometrically with HCl at 20°. From the results the apparent basic dissociation const. (K'_b) of creatine is calcd. to be 9.6×10^{-12} , that of creatinine 6.3×10^{-10} ; or pK'_b for creatine is 11.02 and for creatinine 9.20.

A. P. LOTHROP

Zymophosphate formation and biochemical sugar conversion. HANS V. RULF and EDWARD BRUNIUS. *Svensk Kem. Tids.* **37**, 301-7 (1925).—Sugar was fermented by yeast and the CO_2 vol. plotted against time. The experimental variable was 0.0-0.06 M $\text{C}_6\text{H}_5\text{OH}$. A single table gives the decrease in inorg. P with the increase in $\text{C}_6\text{H}_5\text{OH}$. Synthesis of org. P is more rapid for cane sugar than for glucose. A. R. ROSE

Colloid chemistry and pharmacology of the keratin substances of the human skin. HELLMUT MENSCHL. *Arch. expul. Path. Pharm.* **110**, 1-45 (1925).—An increase in vol. of some 25 to 30% occurs when nails imbibe water and in this process of swelling the tissue conforms to the rule of acid resistance and alkali susceptibility. Within the p_{H} zone 1 to 11.5 the swelling does not exceed that which takes place in distd. water, but when the p_{H} reaches 12.3 to 13 or above there is a marked increase in swelling. Neither inorg. nor org. acids increase swelling beyond that induced by distd. water. Alkalies (NaOH , KOH in N and $2 N$ concns.) induce a max. swelling and this is followed by a prompt peptization. In $2 N$ alkali the action is more rapid than in N . In the same concns. NH_4OH is not active. $\text{Ca}(\text{OH})_2$ in a satd. soln. has but a slight swelling effect and even after 3 months no peptization has taken place. Hydrosulfide solns. have a very strong swelling effect and after the max. effect has been attained a slow peptization occurs. Aq. suspensions of As_2S_3 and hepar cause no material change within 48 hrs. Detns. on hair involved extension, elasticity and tensile strength. Distd. water causes no evident swelling during a period of 3 weeks. The effect of alkali is very marked ($2 N$ NaOH , KOH); it can be largely removed by washing and causes but little permanent damage. Hyposulfite solns. have quite an opposite effect, causing

no increased extension and leading to a complete loss in tensile strength within about 5 min. NH_3 in a concn. of 2 *N* is less active. For acid (2 *N*) to have any effect it requires exposure for a period of 3 weeks. The effects of acids of the chloroacetic series is related to their chem. constitution, while inorg. acids in a concn. of 2 *N* cause changes after exposure for 3 weeks comparable to those of trichloroacetic acid. HNO_3 is most active. Salicylic acid in a satd. soln. has no effect on the mech. properties of hair. Tanning agents, especially CH_2O (40%), and, to a less degree, pyrogalllic acid make hair brittle, as does a 20% resorcinol soln. A disintegrative effect occurs when hair is placed in an atm. of pure H_2S . In 2 *N* AcOH pieces of epidermis undergo a typical change, a retectolysis, *i. e.*, a swelling and peptization of the rete malpighii. Peptization of the rete malpighii proceeds very quickly in 2 *N* AcOH (complete within 48 hrs.). AcOH swells the albumoses of the horny layer very actively, but does not modify the keratin substances. The occurrence of retectolysis is in part dependent on the mech. properties of the skin. Inorg. acids penetrate the rete malpighii and cause more or less localized areas of swelling in the stratum corneum, while formic, acetic, butyric and lactic acids induce a diffuse swelling. The changes in the albumoses of the cornified material result in alterations in the elastic structure of the skin. With other acids more or less distinctive changes occur. Retectolysis of pieces of skin occurs on both the acid and alk. sides, the behavior of different acids manifesting certain sp. effects. Alkalies in 2 *N* concn. penetrate the rete malpighii quickly, causing swelling and a prompt peptization which is complete. The characteristic feature of the action of alkali is an actual keratolysis. Alkali also causes a marked swelling of the albumoses of the horny layer and the elastic structure of the epidermis is destroyed. NH_4OH in 2 *N* concn. does not cause such a pronounced effect. The effects of alkali are reversible. NaOH and KOH cause perceptible differences in the stretching capacity of the skin; NH_4OH is without effect. Distd. water does not cause the albumoses of the cornified layer to swell. Deprivation of water, as by abs. alc. or formalin, increases the double refraction of the skin. G. H. S.

Ion antagonism in invertase-protein and invertase-lecithin systems. II. A. SCHÜRMEYER. *Arch. ges. Physiol.* (Pflüger's) 210, 755-8(1925); cf. *C. A.* 19, 3303.—Although NaCl and CaCl_2 are antagonistic as regards the inhibitory influence on invertase + globulin and invertase + lecithin on the alk. side of the isoelec. point of globulin and lecithin, on the acid side of the isoelec. point there is neither an ion antagonism nor a pronounced salt inhibition. In its inhibitory activity in an invertase system NaCl is antagonized by Ca, Mg, Ba and La, but not by Co or Ni. G. H. S.

Time relationships between contraction and lactic acid formation in muscle. OTTO MEYERHOF AND L. LOHMANN. *Arch. ges. Physiol.* (Pflüger's) 210, 790-6(1925); cf. *C. A.* 19, 1295.—Additional data, involving the time relationships of lactic acid formation under different conditions of muscular activity, supporting the authors' concept. G. H. S.

Irreciprocal permeability of surviving membranes. ERNST WERTHEIMER. *Arch. ges. Physiol.* (Pflüger's) 211, 255-9(1926); cf. *C. A.* 20, 443.—Evidence is presented showing that contrary to the idea of Bauer the one-directional permeability of membranes is not due to injury to one side of the membrane but is rather a true irreciprocal permeability. G. H. S.

Absorption of potassium iodide by the skin. E. CANALS AND M. GIDON. *J. pharm. chim.* (8) 2, 102-7(1925).—Soln. of KI by itself or mixed with soap soln. does not penetrate the human skin, but if applied in the form of pomade regardless of the excipient used (fats, hydrocarbons or mineral gel, except lanolin), it is absorbed by the skin and appears in the urine. To guard against liberation of I, $\text{Na}_2\text{S}_2\text{O}_3$ was added to all KI mixts. With lanolin, the absorption of KI is feeble; thus the passage of KI into the organism seems to depend on a state of semi-solid emulsion which it forms with the other excipients. S. WALDBOTT

The electrical behavior and the ion permeability of membranes (III) potential of parchment membranes (FUJITA) 2. Application of X-ray methods to the problem of imbibition (KATZ) 2.

TRUMPER, MAX.: *Memoranda of Toxicology*. Philadelphia: P. Blakiston's Son & Co. 230 pp. \$1.50.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A kinetic method for the investigation of gastric chemistry. II. G. KATSCH AND HEINZ KALK. *Klin. Wochschr.* 4, 2190-3(1925).—A test meal consisting of 0.2

g. caffeine in 300 cc. H_2O is recommended as a gastric stimulant. It has all of the advantages and none of the disadvantages of the alc. test meal of Ehrmann. M. H.

Apparatus for the graphic registration of oxygen consumption and carbon dioxide production. HANS DETHLOFF. *Klin. Wochschr.* 4, 2440-1(1925).—A detailed description.

MILTON HANKE

Spirometer method of studying continuously the gaseous metabolism of man during and after exercise. K. FURUSAWA. *Proc. Roy. Soc. (London)* 99B, 148-54(1926).—The rapidly altering gaseous metabolism of man during and after muscular exercise may be studied continuously by use of a spirometer of large capacity. The gases within the spirometer are kept continuously stirred; the total ventilation is measured every 10 l.; and samples are taken at intervals for analysis. The results are similar to those yielded by other methods, but are obtained with the expenditure of less labor

JOSEPH S. HEPBURN

Contribution to the technic of the study of gaseous metabolism. H. W. KNIPPING. *Z. ges. expil. Med.* 47, 1-3(1925).—Some improvements have been made on the method of studying gaseous metabolism previously described (*C. A.* 19, 2681). The CO_2 is detd. by a pycnometric method with a sensitive aerometer, and both O and CO values can be read quickly.

HARRIET F. HOLMES

The time limit for the chemical detection of elementary phosphorus. C. IPSEN. *Deut. Z. ges. ger. Med.* 6, 481-7(1925).—Diagnosis must be made from the findings in the blood instead of the usual sources: stomach, intestine, liver, kidney, etc. Even after 12 months P has been demonstrated in blood which had been mixed with P from the head of a phosphorus match.

FRANCES KRASNOW

Ultrafiltration of serum. BRUNOLF BRUKNER AND PAUL UHLENBUCK. *Z. Biol.* 83, 586-92(1925).—The speed of ultrafiltration with the Zsigmondy suction filtration app. may be increased by the application of a stirring device. There is such a device, electromagnetically controlled, for pressure ultrafiltration. Application of high pressures the filter greatly. The optimum speed for the ultrafiltration of serum by the suction method is 12 cc. per hr. and for the pressure method 18 cc. per hr. The fractionation of serum proteins by the removal of electrolytes is successful only in very limited amounts

FRANCES KRASNOW

Microchemical method for the determination of brain lipoids. HENRIETTE GORDISSKA. *Biochem. Z.* 159, 379-94(1925).—Brain material (40-60 mg.) is ground, placed on filters and extd. with alc. to remove fat. The paper is then dried according to the method of Bang. The lipid material is extd. with $(CH_3)_2CO$, the extd. mixt. hydrolyzed with NaOH and treated with $K_2Cr_2O_7$ and H_2SO_4 . The whole is then dild. and treated with KI, and the excess I titrated with $Na_2S_2O_3$. From the difference between the amts. of $K_2Cr_2O_7$ and $Na_2S_2O_3$ used, the amt. of lipid is estd. The details for extn. with petroleum ether, EtOH and $(CH_3)_2CO$ are worked out. The cholesterol in the $(CH_3)_2CO$ ext. is detd. by use of the Liebermann reaction. P is detd. colorimetrically.

W. D. L.

Determination of total iodine in organs, blood and urine. R. v. BODÓ. *Biochem. Z.* 161, 401-3(1925); cf. following abstr.—The org. material in which the I is to be detd. is treated with NaOH or KOH and dried. The carbonaceous material is then oxidized by heating with dry KNO_3 , the residue dissolved, neutralized with 50% H_2SO_4 and chlorine water is added to convert the I to IO_3 . The excess Cl is removed by heat and to the cooled soln. are added KI and acid. The I formed is then titrated with $Na_2S_2O_3$.

W. D. L.

The determination of iodides in urine. RICHARD v. BODÓ. *Biochem. Z.* 160, 386-9(1925).—Fifty to sixty cc. 0.1 N $AgNO_3$ are added to 25 cc. of filtered urine after acidifying with N HNO_3 . After 12-24 hrs. standing in the dark, the pptd. $AgCl$ and AgI are filtered off, suspended in 100 cc. H_2O and 1 cc. N HCl and 15 cc. of freshly prepd. Cl H_2O added. The excess Cl is removed by boiling. After cooling, the $AgCl$ is removed by filtering. The filtrate is acidified with 20% H_3PO_4 and 20 drops of 10% KI added. After 10 min., the liberated I is titrated with 0.1 N or 0.01 N $Na_2S_2O_3$.

F. A. CAJORI

A colorimetric method for the determination of the p_H of cerebrospinal fluid. IRVINE MCQUARRIE AND A. T. SHOHL. *J. Biol. Chem.* 66, 367-74(1925); cf. *C. A.* 19, 3503.—An app. is described which permits the collection of the cerebrospinal fluid over Hg without loss of CO_2 and the detn. of the p_H colorimetrically at body temp., 38°. When detd. by this method the fluid has the same p_H , 7.35 to 7.40 \pm 0.02, as blood. Earlier work gave p_H values much too alk., because of loss of CO_2 ; values of p_H 9 to 10 have been reported.

A. P. LOTHROP

The colorimetric determination of phosphorus. C. H. FISKE AND YELLAPRAGADA

SUBBAROW. *J. Biol. Chem.* **66**, 375–400(1925).—In the methods described phosphomolybdic acid is reduced to a blue substance by 1,2,4-aminonaphtholsulfonic acid rather than by hydroquinol as in the Bell and Doisy and Briggs methods. Reduction is complete in 5–10 min., the color is permanent, and most of the substances likely to be present in the analysis of biol. material do not interfere with the reduction unless present in excessive amts. Methods are described in detail for the detn. of inorg. phosphate in urine and blood and of total P and acid-sol. P in blood. The method may be applied with safety to the analysis of any sort of biol. material with proper attention to detail.

A. P. LOTHROP

The determination of gases in blood and other solutions by vacuum extraction and manometric measurement. III. Gasometric determination of methemoglobin. D

1) **VAN SLYKE.** *J. Biol. Chem.* **66**, 409–14(1925).—Nicolux's method (*C. A.* **19**, 1287) for the detn. of methemoglobin has been adapted for use with the manometric blood gas app. The methemoglobin is reduced by an ammoniacal soln. of $\text{Na}_2\text{S}_2\text{O}_4$ to reduced hemoglobin, which is then satd with CO. The methemoglobin is accordingly estd. from the difference in CO-combining capacity before and after treatment with $\text{Na}_2\text{S}_2\text{O}_4$. The CO is detd. by the method of Van Slyke and Neill (*C. A.* **18**, 3615). The possibility of regeneration of methemoglobin is entirely avoided by the use of CO.

A. P. LOTHROP

The quantitative estimation of tyrosine and histidine in protein and a method for estimating tyramine in protein-containing mixtures. M. T. HANKE. *J. Biol. Chem.* **66**, 475–88(1925).—"The complete analytical process is, briefly, as follows: The protein is hydrolyzed with H_2SO_4 . Histidine is pptd. as Ag complex and its amt. estd. colorimetrically (Koessler and Hanke, *C. A.* **13**, 3200). The filtrate from the histidine Ag is boiled with $(\text{AcO})_2\text{Hg}$ and treated with NaCl, which ppts. tyrosino-mercuric chloride, a white solid very insol. in H_2O and in a mixt. of amino acids. This ppt is dissolved in 20% HCl, freed from Hg by H_2S and the tyrosine is estd. in the Hg-free filtrate by the method of Hanke and Koessler (*C. A.* **16**, 1104). A method for estg. tyramine and histamine in protein-contg. matter in a similar manner is also described.

A. P. LOTHROP

A continuous dialysis or extraction apparatus which operates at reduced pressure with a constant volume of liquid. M. T. HANKE AND K. K. KOESSLER. *J. Biol. Chem.* **66**, 495–9(1925).—The liquid vol. is solely dependent upon the size of the app. and so can be controlled at will which is highly desirable when the diffusate is to be analyzed. The dialysis or extrn. can be carried out at any desired temp. The dialyzate is always surrounded by freshly distd. solvent and is agitated constantly, greatly increasing the speed of dialysis. Phenol, toluene or other antiseptics may be used to keep the contents fairly sterile depending upon the nature of the expt. The app. functions automatically and can be operated for days with practically no attention.

A. P. LOTHROP

The relation between colorimetric reading and the true p_{H} of serum or plasma. J. H. AUSTIN, W. C. STADIE AND H. W. ROBINSON. *J. Biol. Chem.* **66**, 505–19(1925).—Under pathol. conditions in man and under normal and exptl. conditions in the dog there is considerable variation in the difference between the colorimetric reading of the $[p_{\text{H}}]$ of dild. serum or plasma at either 20° or 38° and the true p_{H} of the undild. serum or plasma at 38°. A method is outlined of detg. ($[p_{\text{H}}] - p_{\text{H}}$) for making the correction which has checked with ± 0.03 p_{H} the electrometric detns. of the p_{H} 38° of the undild. serum or plasma as drawn in every instance where such a comparison has been made.

A. P. LOTHROP

The determination of calcium in tissues, feces and milk. R. C. CORLEY AND W. DENNIS. *J. Biol. Chem.* **66**, 601–8(1925).—Autoclave digestion of the material in the presence of dil. NaOH soln. is substituted for ashing and the Ca is detd. as usual by pptn. as CaC_2O_4 and titration of $\text{H}_2\text{C}_2\text{O}_4$ with KMnO_4 . Much time and labor are saved and the results are within the limits of reasonable accuracy when compared with those obtained by the ashing process.

A. P. LOTHROP

A method for the determination of the energy values of foods and excreta. F. G. BENEDICT AND E. L. FOX. *J. Biol. Chem.* **66**, 783–99(1925).—"A method has been developed for the indirect detn. of the energy values of foods, feeding stuffs, and excreta. The fundamental principle involves the direct measurement of the O_2 consumed during the combustion of a known wt. of a substance and the computation therefrom of the potential energy of the substance by means of a series of factors for the calorific value of a l. of O_2 previously established with a bomb calorimeter. The app. embodying this principle has been styled the 'oxy-calorimeter.' A brief description is given of the combustion chamber and the device for ignition of the substance, and the adaption of

simple respiration app. as oxy-calorimeters is discussed in detail. Illustrations of the calcn. of results are given, together with tables listing the calorific values of O_2 for some commonly metabolized compds. and for a number of various foods and excreta. This simple form of oxy-calorimeter is recommended especially for hospitals, dietetic labs., and those institutions already possessing one of the numerous simple forms of closed-circuit respiration app. Av. calorific values of O_2 for use in connection with detns. with the oxy-calorimeter are suggested as follows: for N-rich substances 4.68, for fats 4.7, for carbohydrate-rich foods 5.0, for a mixed diet of carbohydrates and fats 4.825, for feces 5.0 cal. per l. of O_2 ." A. P. LOTHROP

The use of the quinhydrone electrode for the determination of the hydron concentration of feces. C. S. ROBINSON. *J. Biol. Chem.* **66**, 811-2(1925).—The quinhydrone electrode of Biilmann may be used for the detn. of fecal reactions and is quite as reliable and much more convenient than the H_2 electrode. The feces are macerated to a thin, homogeneous paste with H_2O and poured into the cell, a little quinhydrone is then added and the cell is shaken to insure uniformity of distribution. The reading is taken at once and the p_H calcd. from Cullen's equation, $p_H = e. m. f. + e_0/0.0001984 T$, e_0 being the e. m. f. of the quinhydrone electrode found by standardizing the system against a soln. of known p_H . A. P. LOTHROP

Standardization of hemoglobinometers by the refractometer. H. C. GRAM. *Acta med. Scand.* **63**, 1-6(1925).—The hemoglobin percentage (Haldane) of a given blood can be detd. by the refractometer by using (1) a 0.8% NaCl soln. (R_1); (2) an 0.8% NaCl soln. contg. 0.14% Merck's purest saponin (R_2); (3) the supernatant fluid from a diln. of 1 cc. blood with 5 cc. of the first soln. (R_3); and (4) the supernatant fluid from a diln. of 1 cc. blood with 5 cc. of the second soln. (R_4). The % of hemoglobin is calcd. from the 4 values of n by the equation $(R_4 - R_3 - k_2)k_1 = \% \text{ hemoglobin}$, where k_2 means $(R_2 - R_1) 5.6/5$ and is a const. for each series in which the same solns. are used. k_1 has been empirically detd. to be 21,500. S. MORGULIS

Method for the determination of bicarbonate in small quantities of serum. J. P. BOUCKAERT. *Compt. rend. soc. biol.* **93**, 841-3(1925).—The titration is carried out on 0.5-1.0 cc. serum to which 0.01 N HCl has been added and the excess titrated back with 0.01 N NaOH to a p_H of 7.4. This is done electrometrically in the Bovie vessel. Better results are obtained on the dialyzate obtained from serum dialyzed against 4 cc. 0.9% NaCl. The titration is carried out in an atm. of H_2 . Another procedure is to titrate against phenol red as indicator, also in the absence of CO_2 , to p_H 7.2 (to correct for the protein error) using a series of standard tubes for comparison. In this case the titration can be made with 0.01 N $Ba(OH)_2$. The $NaHCO_3$ content per cc. serum is 2.20-2.32 cc. 0.01 N. S. MORGULIS

Importance of the protein error in p_H determination with bromothymol blue. D. JAUMAIN. *Compt. rend. soc. biol.* **93**, 860-2(1925).—An error of as much as 0.8 of a p_H may result from a $1/50$ concn. of serum. It is recommended, therefore, to avoid bromothymol blue when the detns. are made with protein-contg. material. S. MORGULIS

Determination of fibrinogen and of fibrin in plasma. EDGARD ZUNZ. *Compt. rend. soc. biol.* **93**, 865-6(1925).—The blood during anaphylactic shock becomes incoagulable and plasma obtained from this blood by long and rapid centrifuging may remain liquid for several days. The plasma is placed in a glass and a current of CO_2 is bubbled gently through it for 20 min. Care must be exercised to avoid as far as possible the formation of foam. This is then left for 4-6 hrs. in an ice box when a fiber clot is formed. Another procedure is to start with citrated plasma, add to it an equal vol. of 1% $CaCl_2$ and then pass CO_2 gas. The clot is gently sepd. from the walls of the glass, pressed into a thin membrane between filter papers until dry, it is then washed 15 min. with H_2O , 5 min. with alc., and 5 min. with ether, and finally dried at 60° first, then at 105° , and weighed. Results are thus obtained agreeing within about 5%. S. MORGULIS

New methods for the determination of cystine. YUZURU OKUDA. *J. Biochem. (Japan)* **5**, 201-15(1925).—Titration of cystine with a bromate soln. in the presence of acid and Br requires only a few min. but cannot be used in the presence of cystine, tyrosine or tryptophan. Titration in a HCl soln. in the presence of I^- with a standard iodate soln. is not as simple as the Br method, but can be used in the presence of all protein cleavage products. It is, therefore, available both as a qual. and a quant. method for detg. cystine in amino acid mixts. Solns. required: 5% aqueous KI; an exact 4% HCl; an exact 2% HCl; a $M/300 KIO_3$ made by dissolving 2.14 g. of pure KIO_3 in 3 l. of exact 2% HCl. The soln. should be standardized against a standard cystine soln. Procedure: To 20 cc. of colorless, exactly 2% HCl soln. contg. 0.005 to 0.05 g. of cystine add 5 cc. of the KI and 4% HCl solns. and titrate with KIO_3 until a faintly

yellow color appears which remains for a min. and read the temp. of the liquid. If this is 17.5° the calcn. is $0.01 \times \text{cc. KIO}_3/4.65 = \text{g. cystine}$, in 20 cc. The amt. of KIO_3 required differs somewhat with the temp. A curve or table showing the relation between temp. and cc. KIO_3 required by the standard cystine soln. can be worked out and used throughout an expt. It was also proved that 6 atoms of Br are required for complete oxidation of a mol. cystine to cystic acid. S. MORGULIS

Subcutaneous injection of gaseous substances such as oxygen. AGASSE-LAFONT AND ROGER DOURIS. *Compt. rend.* 181, 534-5(1925).—A description is given of the technic for the subcutaneous administration of O (cf. following abstract). L. W. R.

Oxygen therapy. The oxygen generator of Agasse-Lafont and Douris for use in oxygen therapy. ROGER DOURIS. *Bull. sci. pharmacol.* 32, 577-85(1925).—Cf. preceding abstract. L. W. RIGGS

Micro-iodometric determination of Cu (SCHOORL, BEGEMANN) 7.

D—BOTANY

B. M. DUGGAR

Chemistry of heterotrophic phanerogams. V. J. ZEILNER. *Monatsh.* 45, 535-8(1925).—The light petroleum ext. (0.89% of the dried material) of *Prosopanche Burmeisteri* de Bary (*Hydnora americana*, R. Br.) contains ceryl alc., phytosterol and palmitic acid. The ethereal ext. (0.31%) contains a resin alc., obtained as a white powder, together with aliphatic acids. The alc. ext. (15.81%) contains a tannin of the protocathechuic acid series, which yields a "tannin red" on hydrolysis with mineral acids, and is converted, when boiled in alc. soln., into phlobaphenes. These form, together with the tannin, more than half of the dried plant material. The tannin is accompanied by sugars and a base which is pptd. by K mercuric iodide. The aq. ext. (26.40%) contains traces of polysaccharides, KCl and probably KH tartrate, the total dissolved mineral matter being 2.42% of the dried material. The latter contained further: free acid 1.69 (as KOH), reducing sugars 1.42, total N 1.49, raw fiber 8.86 and total ash 10.45%. B. C. A.

The proof that acetaldehyde is an intermediary product in the anaerobic respiration of higher plants. C. NEUBERG AND A. GOTTSCHALK. *Biochem. Z.* 160, 256-60(1925).—During fermentation, established under sterile conditions, with the germinating seeds of the sugar pea and bean, CH_3CHO was formed. CH_3CHO is then an intermediary product of anaerobic respiration in higher plants. F. A. CAJORI

The components of the integument of the seeds of *Anagyris foetida*. PIETRO CONDORELLI. *Ann. chim. applicata* 15, 426-31(1925).—The integument, sep'd. by crushing dry, mature seeds, was treated repeatedly with boiling H_2O , filtered, evap'd. to a sirup, pptd. with twice the vol. of 95% EtOH, filtered again and washed with EtOH. The alc. filtrate contained a reducing sugar, which was identified by the method of Fischer (*Ber.* 20, 821; 41, 75) as galactose. No other reducing sugar was present, even in the cotyledons, showing that Reale was in error in reporting the presence of glucose (cf. *Gazz. chim. ital.* 17, 325). The mucilaginous mass was purified by repeated soln. in hot H_2O and pptn. with EtOH until it was white. The term *podalirin* (from the botanical groups) is proposed for this mucilage. It is very sol. in H_2O , not optically active, not pptd. by $(\text{NH}_4)_2\text{SO}_4$ or MgSO_4 and does not give a blue color with I. Oxidation with HNO_3 yields mucic acid. With HCl and phloroglucinol it gives the reaction of a pentose. Hydrolyzed with boiling 4% H_2SO_4 it gives both galactose and arabinose, and heated with HCl it gives furfural. Its properties and reactions suggest para-galactoaraban $(\text{C}_{11}\text{H}_{22}\text{O}_{11}) \cdot \text{C}_6\text{H}_8\text{O}_4$ (cf. Schulze, *Landw. Vers.-Sta.* 41, 207). C. C. DAVIS

The presence of methyl mercaptan in fresh roots of *Raphanus sativus*. L. NOBUZO NAKAMURA. *Biochem. Z.* 164, 31-3(1925).—From 40 kg. of fresh roots 1 g. of pure Hg methylmercaptan, corresponding to 0.31 g. mercaptan, was isolated. It is believed that a large portion of this, if not the entire amt., is present in free condition, though the possibility that the mercaptan is formed from some labile substance during the distn. is not excluded. S. MORGULIS

Influence of light on the alkaloid content of *Lupinus luteus* L. TH. SABALITSCHKA AND C. JUNGERMANN. *Biochem. Z.* 164, 279-87(1925); cf. C. A. 19, 3286.—Elimination of light invariably lowers the abs. alkaloid content of the plant as compared with that of normal plants kept in daylight. Plants germinated in the dark showed later when exposed to daylight a greater production of alkaloid, as well as of total plant substance, than those which have been continuously under the influence of light. The production

of alkaloid took place in the absence of N so that the N necessary for alkaloid synthesis must have been derived from other nitrogenous substances in the plant. S. M.

Effect of anesthesia on the growth of the onion; observations on the anesthesia shock. EDMOND GAIN. *Compt. rend. soc. biol.* **93**, 763-4 (1925).—Anesthesia stimulates growth, which is increased about 168%. But a depression supervenes, which reduces growth to zero with the prolongation of the anesthesia (CHCl_3). When the effect of the CHCl_3 is removed, the plant rapidly awakens and its growth likewise attains a max. in about 15 min.

S. MORGULIS

Sunflower (*Helianthus annuus* L.). J. PIÉRAERTS. *Mat. grasses* **17**, 7191-2, 7280-4, 7340-3 (1925); **18**, 7391-3 (1926); *Bull. mat. grasses inst. colonial Marseille* No. **7**, 170-81; No. **9-10**, 263-8 (1925).—A description of the plant and its cultivation, and of the compn., properties and uses of the seed, oil and press cake. A. P.-C.

ARRER, AGNES: **Monocotyledons.** Cambridge: University Press. 258 pp. 21s.

K—NUTRITION

PHILIP B. HAWK

Feeding experiments on goats with ammonium acetate, urea and horn meal as protein substitutes. K. PAASCH. *Biochem. Z.* **160**, 333-85 (1925).—Detailed data are presented showing the N balance, milk yield and compn. of the milk from goats the protein of whose feed was in part replaced by urea, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ and horn meal for periods of 2 to 3 weeks in contrast to like periods where no protein substitution was made. Up to 50% of the fodder protein may be replaced by $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ without detriment to milk yield, somewhat less urea, during which feeding, the butter fat yield was lower. Horn meal is a more valuable substitute than either of the others.

F. A. CAJORI

The effect of changes in the sodium chloride and water content of food on the blood and the liquid and salt exchange between tissues and blood. K. ONOHARA. *Biochem. Z.* **160**, 426-32 (1925).—A slight rise in blood NaCl and a fall in total blood solids was found during 3 hrs. after feeding a salt, H_2O and protein-rich diet to dogs. The results indicated that the blood and tissues exchanged H_2O and salts, depending on the quantities of these being eaten.

F. A. CAJORI

A plea for the retention of the term "bios." MARGARET B. MACDONALD. *Science* **63**, 187 (1926).—The suggestion of Funk (*C. A.* **20**, 62) that vitamin D be used is opposed

E. J. C.

A study of some biochemical color tests. III. Color reactions associated with vitamin A. W. R. FEARON. *Biochem. J.* **19**, 888-95 (1925).—About a g. of P_2O_5 is added to 5 cc. of the oil, either undiluted or dissolved in light petroleum, and the tube gently shaken. A deep violet color is obtained if the oil is positive to the Drummond test (dissolve a drop or two of the liver oil in 5 cc. of an anhyd. fat solvent, add a drop of concd. H_2SO_4 , and agitate gently; a violet color, which soon fades, is obtained). The color slowly changes to a muddy brown. The P_2O_5 may be added directly to the oil. The pigment produced with P_2O_5 may be isolated as follows: 50 g. P_2O_5 are rapidly ground up with 50 cc. of an active liver oil. The deep violet color which develops reaches a max. in about 7 min. The mixt. is centrifuged, the supernatant layer poured off, the residue washed with light petroleum and again centrifuged. This is continued until the washings fail to give the Lieberman-Burchard test for sterols. The ppts are suspended in light petroleum, poured into a l. flask $\frac{3}{4}$ full of water, which hydrolyzes the pigment P_2O_5 combination. The pigment is extd. with light petroleum, and the latter evapd. The residue, a pale yellow oil, gives the sterol color tests, but not the Drummond nor the P_2O_5 tests. Pyrogallol may also be employed as a test for vitamin A. One or two drops of the oil, or dry ethereal soln., are placed in a flask, a few crystals of pyrogallol added and then 5 cc. of a 12% trichloroacetic acid in dry light petroleum. The contents are shaken. A blue color slowly develops. This changes to deep rose. Other polyphenols, though not good, or pyrogallol, also give colorations. B. H.

Diet and reproduction. G. GRIJNS. *Verslag Acad. Wetenschappen Amsterdam* **34**, 874-85 (1925); cf. *C. A.* **16**, 3685; **18**, 2189; **19**, 845, 1293.—Of the 2nd generation of rats fed on a diet of corn meal, peanut or coconut meal, meat, hardened fat and salts all females produced young when mated with normal males, while the males were sterile. There was no relation between growth and sterility. Females fed on a diet of corn and peanut meal with 1% cod-liver oil produced larger litters. M. J.

Experiments regarding the dietetics for stomach ailments. A. L. MOLNER AND O. PORGES. *Arch. Verdauungs-krankh.* **36**, 1-28 (1926).—The digestion of fat is facilitated by intimate mixing with amyloses. The latter promote the emulsification of fat and

raise the acidity of the gastric contents. Conversely, the digestion of "Schwartzbrot" is facilitated by the simultaneous digestion of fat. Digestion of cheese is promoted in the presence of "Schwartzbrot," since the optimum acidity is reached earlier. After the ingestion of freshly baked "Schwartzbrot," the stomach contents are coarse and more viscous, the acidity is greater, and the stay in the stomach longer than after the ingestion of stale "Schwartzbrot."

FRANCES KRASNOW

Studies of fat, cholesterol and "steroid" metabolism in the organisms of rats growing in the presence or absence of vitamin A. BACKIANG LIANG AND LEONHARD WACKER. *Biochem. Z.* 164, 371-93(1925).—In the absence of vitamin A growing rats are unable to deposit fat in their bodies even on a carbohydrate-rich diet. The fattening process on a carbohydrate diet is associated with the formation of considerable quantities of endogenous O. It has not been definitely ascertained to what extent vitamin A and lipochrome act as carriers of the O from carbohydrate to other body substances. Pure triglycerides in the absence of vitamin A cannot support life. Likewise, the synthesis of fat from glycerol and fatty acids depends on the presence of vitamin A. Cholesterol is synthesized in the growing organism. This is much more extensive when the diet is poor in fat, cholesterol and vitamin A than in the presence of these substances, and more cholesterol is found in the organism of rats after 5 weeks on the poorer diet than when their diet is rich in fat. The steroid is a substance which the authors have invariably found in conjunction with cholesterol or phytosterol and represents the entire residue of the unsaponifiable portion with the exception of cholesterol. This substance prevents the crystn. of cholesterol and keeps it in colloidal suspension and gives to it a certain plasticity which enables it to form membranes. Under all dietary conditions an excess of steroid substance appears which does not come from the food. Especially much steroid material leaves the body with feces on a fat-rich diet. Whether the steroid is synthesized in the organism could not be detd. The steroid substance increases only slightly in the organism of rats which have been on the exptl. diet for 5 weeks, but when the diet is poor in fat there is no increase at all.

S. MORGULIS

Changes in the tissues and in the organs occurring during hunger. KÄTHE WIRSCH. *Arch. ges. Physiol.* (Pflüger's) 211, 185-212(1926).—In considering the changes occurring in the blood, in wt. and in the tissues during a protracted period of deprivation of food the stage of starvation must be kept in mind as well as individual peculiarities referable to nutritional condition. During a hunger period lasting up to 82 days, involving a loss of wt. equiv. to 59%, dogs showed no distinctive irritation manifestations. Not until late in the hunger period did permanent changes in the compn. of the blood appear. The earlier transient changes in both the water and total N content of the blood were referable to a disturbance in the excretory mechanism. The later permanent blood changes included an increased water content with a reduction in solids, an increase in the total N in proportion to the solids and an increased residual N in proportion to both total N and to solids. Blood sugar remained normal or showed but a slight fall. Acetone and acetoacetic acid never appeared. Quite naturally the abs. wt. of all organs showed a loss during the hunger period, but the relative changes in wt. varied very considerably. Some organs, such as heart, kidney and adrenals, showed an increased relative wt., while in all other organs the change represented a loss of greater or smaller degree, the liver presenting the greatest loss. The chem. compn. of the different organs became modified. With the exception of the spleen the water content of all organs increased; the % of increase was small in some (heart and liver) and considerable in others (pancreas and adrenals). Even after protracted hunger glycogen could still be found in liver and muscle, although the quantities were small (0.02%). The glycogen content of the heart was higher than normal up to the period of exhaustion. During the early stages of hunger the fat content of the liver was extremely high; later this became utilized. Conditions of the kidney approx. those of the liver. The total N content of the liver was increased. In general, during hunger the organs remain functionally normal.

G. H. S.

Vitamin problems. I. Is rickets a combined (B + C) avitaminosis (Reyher)? WALTHER SCHMITT. *Z. Kinderheilk.* 40, 601-19(1925).—There is no clinical evidence that rickets is, in the sense of Reyher, a double avitaminosis (B+C).

G. H. S.

CARPENTER, THORNE MARTIN: Human Metabolism with Enemata of Alcohol, Dextrose and Levulose. Washington: The Carnegie Institution of Washington. 197 pp.

Lectures on Nutrition. Series of lectures given at the Mayo Foundation and the Universities of Wisconsin, Minnesota, Nebraska, Iowa and Washington (St. Louis). The Measurement and Significance of Basal Metabolism. By F. G. Benedict. Prob-

Ilems of Metabolism. By G. Lusk. **The Proportions in Which Protein, Fat and Carbohydrate Are Metabolized in Disease.** By E. F. DuBois. **Muscular Activity and Carbohydrate Metabolism.** By A. V. Hill; cf. C. A. 19, 675. **Our Present Knowledge of the Vitamins.** By E. V. McCollum. **The Relations between Fertility and Nutrition.** By H. M. Evans. Philadelphia and London: W. B. Saunders Co. 243 pp.

F—PHYSIOLOGY

ANDREW HUNTER

Oxyproteic acid fraction of urine. E. FREUND AND A. SITTENBERGER-KRAFT. *Biochem. Z.* 157, 261-2(1925).—Reply to Brings (C. A. 19, 1446). B. C. A.

Chemical changes in lipodieresis in the lungs. E. SCHMITZ AND F. PEISER. *Biochem. Z.* 160, 20-7(1925).—No formation of acetoacetic acid (I) or hydroxybutyric acid (II) was found to take place in the surviving cat lungs. During autolysis of lung tissue an increase of II but not of I was found. F. A. CAJORI

The viscosity of human synovia. J. SCHNEIDER. *Biochem. Z.* 160, 325-32(1925).—The viscosity of the synovial fluid obtained at autopsy from 30 hospital cases showed enormous variations, 3.9 to 1490. The viscosity of fluid obtained from 1 case at intervals during an operation varied from 18.2 to 22.2. F. A. CAJORI

Some relations between the reaction and the total ion equilibrium in blood. K. L. GOLLWITZER-MEIER. *Biochem. Z.* 160, 433-41(1925).—Changes in the HCO_3 , Cl, P, Na, K and Ca-ion content of the blood of men, following administration of NaHCO_3 , NH_4Cl and CaCl_2 , overbreathing and CO_2 breathing were studied. The results are discussed from the point of view of exchange of ions between blood and tissues and the effect of such exchanges on the H-ion concn. of the blood. F. A. CAJORI

The question of the existence of combined sugar in the blood. MICHELE BUFANO. *Arch. farm. sper.* 40, 235-50(1925).—The increase in reducing power of blood albumin after the hydrolytic treatment employed for detn. of total sugar in blood is negligible, hence the so-called combined sugar is not due to reducing substances resulting from hydrolysis of protein. Likewise detns. of NH_2N in the plasma from insulinized rabbits before and after the hydrolysis show that no protein hydrolysis has occurred. Furthermore, glycogen subjected to this treatment shows no increase in reducing power. The combined sugar must, therefore, exist in a very unstable combination with the protein without entering into the mol. structure of the latter. A. W. DOX

The chlorine content of the blood (the dependence of the sodium chloride concentration of the blood on the secretion of gastric juice). A. SINDLER. *Z. ges. exptl. Med.* 47, 156-66(1925).—Frequent detns. were made of the NaCl content of the blood of an individual during a period of 9 days, during which the diet was varied. Secretion of gastric juice caused a lowering of NaCl concn. in the blood of 7%. The lowering was most rapid with a meat diet rich in extractives. The addition of 6 g NaCl did not alter markedly the NaCl content of the blood. Hunger is accompanied by a rapid lowering of the NaCl content. HARRIET F. HOLMES

The physiology of synovial fluid. F. A. CAJORI, C. Y. CROUTER AND RALPH PEMBERTON. *Arch. Int. Med.* 37, 92-101(1926).—The concn. of the diffusible constituents of synovial fluid, when uninfluenced by exptl. feeding, closely approaches that of blood plasma. The prompt rise of sugar in the synovial fluid after glucose feeding to the blood sugar level or even higher suggests very easy passage of blood constituents into the fluid and a close connection with the gastro-intestinal tract. Alkalization of the blood by NaHCO_3 feeding and exposure to heat involved no corresponding change in the synovial fluid. MARY JACOBSEN

Carbohydrate metabolism in the animal organism and the presumable origin of glucosurias. CESARE SERONO. *Rass. clin. terap. sci. affini* 24, 253-62; 25, 315-26(1925); cf. C. A. 19, 1902.—Starch is converted by salivary and pancreatic diastase to isomaltose only. This process is most likely completed in the stomach and the isomaltose diffuses directly into the blood. Only a small part of the starch reaches the intestine where it is hydrolyzed by the pancreatic secretion. Intestinal ext. alone produces only a negligible amt. of glucose from isomaltose unless it is activated by salivary or pancreatic diastase. Activation by pancreatic ext. is indispensable for the hydrolysis of glycogen to isomaltose and glucose by liver ext., as well as for the synthesis of glycogen from glucose and isomaltose by spleen ext. Blood from the portal vein contains mainly isomaltose and only traces of glucose, while blood from the hypot-brachial artery contains chiefly glucose. The glucose is oxidized by the cell enzymes mainly to alc. and to a small part to lactic acid. The alc. is easily oxidized by the lungs to CO_2 . This hypothesis could be confirmed in the principle by expts. *in vitro*. Eml-

den's hypothesis regarding the intermediate products of glucose oxidation lacks exptl. support.

MARY JACOBSEN

The influence of hypophysis extract on the stomach. W. SCHOENDUBE AND HEINZ KALK. *Arch. Verdauungs-krankh.* 36, 227-44(1926).—After the injection of the ext. there is, in many cases, a decrease in the gastric secretion lasting about 20 min.

FRANCES KRASNOW

The carbohydrate content of brain. K. TAKAHASHI. *Biochem. Z.* 159, 484-8 (1925); cf. C. A. 19, 1883.—Brain tissue was frozen, ground with quartz sand, treated with 3% NaF soln. (about 6 cc. per 10 g. tissue) and then with 3% $\text{CCl}_3\text{CO}_2\text{H}$ (10 cc. per 10 g. tissue). The mixt. was extd. with H_2O , the filtrate concd., made alk. with KOH and treated with 95% alc. The ppt. was washed with alc. and ether and for quant. detn. inverted by Pflüger's method. The product was identified as glycogen by its reaction with I and KI and by its optical rotation.

W. D. L.

The basal metabolism of children. F. B. TALBOT. *Physiol. Rev.* 5, 477-517 (1925).—Review, with extensive bibliography, on normal metabolism and metabolism in malnutrition and a number of other pathol. conditions.

E. R. LONG

The significance of hemoglobin in submammalian forms of life. JOSEPH BARCROFT. *Physiol. Rev.* 5, 596-617(1925).—Review. Hemoglobin acts as an O carrier and, where not transported, as an O store.

E. R. LONG

Red and white muscle. DOROTHY M. NEEDHAM. *Physiol. Rev.* 6, 1-26(1926).—Review. Myoglobin is a pigment closely related to but not identical with hemoglobin. In the white muscle the fibrillary structure may be regarded as a machine adapted to produce rapid motion. A change in H-ion concn. sets this machine in motion, and the breakdown of glycogen through hexaphosphate to lactic acid with combustion of a part of the lactic acid supplies the energy. In the red muscle the same mechanism appears to be present, although not elaborated or used to the same extent.

E. R. L.

The state of the serum calcium in experimental hypo- and hypercalcemia. A. R. MORITZ. *J. Biol. Chem.* 66, 343-51(1925).—In hypocalcemia following thyroparathyroidectomy the decrease in serum Ca shows a disproportionately great decrease of the diffusible fraction. In hypercalcemia produced by injection of parathyroid ext. the ratio of the diffusible to non-diffusible Ca shows no consistent changes. In the former case the original ratio tended to become reestablished with the beginning of the rise of serum Ca in those animals which recovered; the ratio was not restored in the animals which died in tetany.

A. P. LOTHROP

Blood changes during digestion with special reference to urea formation. SERGIUS MORGULIS. *J. Biol. Chem.* 66, 353-65(1925).—During the absorption of protein digestion products there is frequently an increase in the urea N of the systemic blood before there is any increase in amino-acid N; this is shown particularly well in animals tested a short time after breaking a preliminary protracted fast. Not infrequently there has also been observed a fall in the amino-acid N of the blood in the early stages of the digestive process. In 2 dogs with true Eck fistulas the urea concn. of the blood was exceptionally low, 2.9-6.4 mg. per 100 cc., whereas the non-protein N was only a little lower than is generally found in normal animals and the amino-acid N was entirely normal. These findings seem to furnish proof of the urea-forming function of the liver in the intact animal. However "what is generally designated as 'urea formation' may in reality not represent a single process at all. It is not improbable that deamination of the amino acids and the synthesis of urea may be independent processes. The predominant role of the liver may be limited to the process of urea synthesis proper. It is possible that a closer approach towards a soln. of this problem will be attained from this angle."

A. P. LOTHROP

Studies of methemoglobin formation. D. D. VAN SLYKE AND ERIK VOLLMUND. *J. Biol. Chem.* 66, 415-24(1925).—The new method of Van Slyke for the gasometric detn. of methemoglobin (C. A. 20, 1093) has been used in a study of the effect on hemoglobin of certain chem. substances which have been considered to transform it into methemoglobin. When PhNH_2 is absorbed by rabbits it causes anemia without methemoglobinemia and when it acts on blood *in vitro* it does not yield a product which can be detd. as methemoglobin by the $\text{Na}_2\text{S}_2\text{O}_4$ -CO method. PhNH_2 , $\text{K}_3\text{Fe}(\text{CN})_6$ and NaNO_2 in the presence of air convert hemoglobin into methemoglobin. The action of PhNH_2 shows a latent period for some hrs. and after methemoglobin formation has begun it proceeds slowly and several mols. of PhNH_2 are required per mol. of hemoglobin to complete the reaction; this seems to indicate that the product of PhNH_2 rather than PhNH_2 itself causes the methemoglobin formation. Methemoglobin is formed in the cells of unlaked blood by the action of PhNH_2 so that this substance or its product penetrates the cells. NaNO_2 and $\text{K}_3\text{Fe}(\text{CN})_6$ react almost in-

stantly and 1 mol. of each forms approx. 1 mol. of methemoglobin. These substances differ in that NaNO_2 penetrates the cell instantly; methemoglobin formation by $\text{K}_3\text{Fe}(\text{CN})_6$ *in vitro* occurs only after blood is laked as the cells appear entirely impermeable to $[\text{Fe}(\text{CN})_6]$ anions.

A. P. LOTHROP

The chemical investigation of the corpus luteum. IV. The acetone-soluble fat. G. F. CARTLAND AND M. C. HART. *J. Biol. Chem.* **66**, 619-37(1925); cf. *C. A.* **18**, 1178.—Of the acetone-sol. fatty acids in the corpus luteum 52% are present as glycerides and the other 48% as free fatty acids. 35% of the total fatty acids are satd. and 65% unsatd. The fatty acid mixt. has the following % compn.: palmitic 25, stearic 11.2, $\text{C}_{18}\text{H}_{36}\text{O}_2$ 1.6, oleic 32.8, linolic 16.6, arachidonic 8, and 4.8% of a new hexa unsatd. acid which has the formula $\text{C}_{20}\text{H}_{34}\text{O}_2$. 700 g. of the fat, freed from acetone- and alc.-insol. and CdCl_2 -precipitable phosphatides, yielded 524 g. of fatty acids and 105 g. of unsaponifiable material. About 58 g. of cholesterol were crystd. from the unsaponifiable material. **V. The lipoids of the acetone extract.** M. C. HART AND F. W. HEYL. *Ibid* 639-51.—The lipoids present in the acetone ext. of the corpus luteum are cholesterol, cholesteryl palmitate, K stearate, leucine, isoleucine, valine, possibly sphingomyelin, tristearin, a lecithin which was prepd. pure with a N and P ratio of 1:1 and free from contaminating cephalin impurities, and fat, the chemistry of which is given above.

A. P. LOTHROP

The formation of lactic acid by depancreatized dogs. C. J. WEBER, A. P. BRIGGS AND E. A. DOISY. *J. Biol. Chem.* **66**, 653-69(1925).—Depancreatized dogs retain the capacity of forming lactic acid during strychnine convulsions (cf. Sass, *C. A.* **9**, 657) or running. Diabetics thus are able to form lactic acid. These dogs exhibit a remarkable tenacity for the lactic acid precursor substances in muscle; treatment with adrenaline reduces these precursors rapidly to low values.

A. P. LOTHROP

Benzoylated amino acids in the animal organism. I. The behavior of hippuric acid following its oral administration. W. H. GRIFFITH. *J. Biol. Chem.* **66**, 671-81(1925); cf. *C. A.* **18**, 3635. **II. The hydrolysis of hippuric acid in the alimentary canal of the rabbit.** W. H. GRIFFITH AND P. B. CAPEL. *Ibid* 683-90.—"Hippuric acid and benzoylalanine were hydrolyzed in the large intestine of the rabbit, probably by an intracellular histozyme (an amidase which hydrolyzes acyl derivs. of amino acids) present in certain intestinal microorganisms. Benzoyl- α -aminoisobutyric acid, which is not acted upon by histozyme, was not hydrolyzed in the large intestine. Hippuric acid was isolated from the urine of rabbits after the oral administration of benzoylalanine but not after the administration of benzoyl- α -aminoisobutyric acid."

A. P. LOTHROP

The fate of sugar in the animal body. I. The rate of absorption of hexoses and pentoses from the intestinal tract. C. F. CORLI. *J. Biol. Chem.* **66**, 691-715(1925).—Rats were used as the exptl. animal and a known amt. of the substance under investigation was fed by stomach tube. After a given time the rats were killed and the amt. of substance remaining in the whole intestinal tract (stomach, small intestine and the whole large intestine) was quant. detd. after the tract was washed out with successive portions of hot distd. H_2O . For actively growing male and females rats between 100 and 180 g. in wt., the quotient, intestinal surface/body wt., or amt. absorbed/body wt., is a const. "50% solns. of glucose, galactose, fructose and mannose are absorbed from the intestine at a rate which is const. for each sugar. Even after the absorption of 70% of the sugar originally introduced the rate of absorption is not diminished. Hence the rate of absorption of hexoses is independent of the abs. amt. and also of the concn. of sugar present in the intestine. 25, 50 and 80% glucose solns. are absorbed at the same rate, which is considered as additional evidence that the rate of absorption is independent of the sugar concn. present in the intestine. The following order in the rate of absorption has been found: galactose > glucose > fructose > mannose > xylose > arabinose. The selective permeability of the intestinal membrane for stereoisomeric sugars is thus emphasized. Hypertonic sugar soln. is dild. in the stomach by the excretion of H_2O . The H_2O content of the blood, liver and muscle is not changed during the absorption of a hypertonic sugar soln., showing that the vital organs are protected against dehydration, whereas the skin shows a marked diminution in the H_2O content. Glucose, when fed to rats in as large amts. as 15 g. per kg., does not lead to sugar excretion in the urine. With galactose close to 50% of the total amt. absorbed is eliminated in the urine."

A. P. LOTHROP

The excretion of normal sugar urine. N. R. BLATHERWICK, MARION BELL, ELSIE HILL AND M. LOUISA LONG. *J. Biol. Chem.* **66**, 801-10(1925).—Addn. of glucose to a standard diet causes a very small increase in the excretion of fermentable sugar in the urine. There appears to be a significant relationship between the protein of

the food and the nonfermentable sugar as there is an increased % of it as the protein intake is augmented. As daily variations in sugar excretion occur even when the diet is const., it is not possible to conclude from the results obtained without qualification that the nonfermentable sugar is derived from protein metabolism but the expts. strongly point to that as the chief source of this fraction of the normal urine sugar. The chief source of the fermentable sugar is the main carbohydrate metabolism. A. P. L.

The fate of creatine when administered to man. ALFRED CHANUTIN. *J. Biol. Chem.* **67**, 29–41(1926).—There is no evidence of the bacterial destruction of creatine in the alimentary tract and its absorption seems to be complete. There is an increase in creatinine excretion after ingestion of large amts. of creatine and the extra creatinine is derived directly from the ingested creatine. It is suggested that after small doses creatine may possibly be stored and slowly metabolized just as fat or glycogen which has been deposited in their resp. depots. It is possible that stored creatine may act as an anabolite in protein metabolism. A. P. LOTHROP

The question of the interaction of insulin, muscle tissue and glucose. A. D. BARBOUR. *J. Biol. Chem.* **67**, 53–8(1926).—The expts. of Lundsgaard and Holbøll (*C. A.* **19**, 834, 1886, 3520) have been repeated and their results have not been confirmed. "In a series of expts. on mixts. of glucose and insulin in contact with rat, rabbit, dog and guinea-pig muscle, it has been impossible to detect any change in the rotatory or reducing power of the sugar after 2 hrs.' incubation at 37°, or any discrepancy between the concns of sugar obtained by detns. of the rotatory and reducing power. In a mixt. of glucose and insulin alone, it was found to be impossible to detect any change in the rotatory or reducing power of the sugar after 24 hrs.' incubation at 37°." A. P. LOTHROP

Total acid-base equilibrium of plasma in health and disease. I. The concentration of acids and bases in normal plasma. J. P. PETERS, H. A. BULGER, ANNA J. EISENMAN and CARTER LEE. *J. Biol. Chem.* **67**, 141–58(1926).—The total electrolyte equil. of the plasma of healthy individuals under normal conditions has been studied by detg. at the same time the total base, inorg. acids, bicarbonate, chloride, phosphate and protein of the plasma. "The difference between total base and the sum of the base-combining power of the acids enumerated gives a measure of the org. acid and sulfate. The latter is present in negligible amts. only, so the 'undetd.' acid must be practically equiv. to org. acid. Normal serum contains 147 to 161 mM of monovalent base. 138 to 148 millimols (mM) of this base are combined with the 4 acids, protein, bicarbonate, chloride and phosphate. These limits should probably be extended somewhat for hospital patients to 145 to 167 for total base and 135 to 155 for total acid. The org. acid never exceeded 20 mM in normal persons or patients with pathol. conditions in which there was no especial reason to expect a disturbance of electrolyte equil. There is a general tendency for protein, bicarbonate and chloride to reciprocate in their changes and to aid one another in maintaining the total acid and total base at a const. level." II. The effect of carbon dioxide tension on the concentration of the acids of the plasma of oxygenated blood. ANNA J. EISENMAN, H. A. BULGER and J. P. PETERS. *Ibid* 159–64.—

"The sum of the base-combining powers of the acids, $\text{HCO}_3^- + \text{Cl}^- + \text{protein}$ of the plasma of oxygenated blood increases on the av. about 2 mM when the CO_2 tension of the blood is increased from 30 to 60 mm. at 38°. In this change HCO_3^- increases 5 mM. The extent of the increase is detd. chiefly by the concn. of hemoglobin or the vol. of the cells of the blood. The cells swell slightly, diminishing the vol. of the plasma and consequently augmenting the concn. and base-combining power of protein and, to a lesser extent, of phosphate. This is a little more than offset by the diminution of the acid value of protein brought about by reduction of pH . The av. change of plasma vol. amounts to -0.6 vols. %, while the base-combining power of the proteins diminishes about 0.8 mM. Cl^- decreases by about 2 mM, compensating for a little less than $\frac{1}{2}$ of the HCO_3^- change. Because base does not traverse the cell membrane the loss of H_2O from plasma to cells results in a concn. of base that neutralizes the excess acid." III. The differences between arterial and venous blood. J. P. PETERS, H. A. BULGER and ANNA J. EISENMAN. *Ibid* 165–73.—"The general conception that arterial and venous blood differ as regards electrolyte equil. only in so far as they contain more or less CO_2 and O_2 is erroneous. Detns. of O_2 capacity, cell vol., plasma proteins, and the whole blood chlorides show that arterial and venous blood may contain also different amts. of H_2O and chloride. In keeping with this is the fact that CO_2 absorption curves of the 2 bloods may also differ. This explains the fact that attempts to obtain proper respiratory quotients by simple comparison of the differences in O_2 and CO_2 contents of arterial and venous blood have usually failed. The changes that occur while the blood is traversing the tissues affect the sep. components to different

degrees and in different directions; the reasons for these apparent inconsistencies have not, as yet, been detd. The end-result on the plasma acids, $\text{HCO}_3^- + \text{Cl}^-$, of the transformation from arterial to venous blood is an av. alteration of 2.5 mM, usually an increase. The max. changes encountered in 14 examns. of 9 patients, selected because it seemed likely that they would present large venous-arterial differences, were +5 to -2.5 mM." A. P. LOTHROP

Studies on the chemical composition of beef blood. I. The concentration of certain constituents in normal beef plasma. C. S. ROBINSON AND C. F. HUFFMAN. *J. Biol. Chem.* **67**, 245-55(1926).—Analyses of more than 100 samples of blood from normal mature cattle show the following range and av. values, resp., in mg. per 100 cc of plasma: inorg. P 3.0-8.88, 5.87; Cl 294-357, 329; Ca 7.7-14.7, 11.0; CO_2 41.4-75.8, 59.2; K 16.4-41.3, 27.3; Mg 0.31-3.08, 2.16. The max. 24 hr. variations for the first 4 constituents were as follows: 1.87, 24, 2.0, 14.0. Increased intake of Ca phosphate produced a slight increase in the inorg. P and Ca in the blood but the values were still within the normal range. Other factors produced greater changes in these 2 constituents. **II. The composition of the blood of dams and calves immediately after calving.** *Ibid* 257-66.—Certain characteristic changes in the compn. of the blood of cows and calves during the week following calving have been found but in very few cases were values found outside the range for normal cattle. The inorg. phosphate of the blood of cows was approx. 0.64 mM lower than that in calf blood at birth. The values rose slightly during the first few hrs. and at the end of the week were generally higher than those at calving time. The same was true of the calf blood. The Cl content was high at calving and dropped steadily. The calf blood contained less Cl than that of its dam at birth; the amt. increased slightly during the first few hrs. after birth and then dropped though not so consistently as that of the cows. A reduced NaHCO_3 content in both bloods was apparent at birth, the value of the mother being lower than that of her calf and that relationship not being reversed during the 1st week although there was a tendency for both to rise. The Ca was lower in cow blood but tended to increase during the 1st week while the Ca content of the calf's blood decreased. A. P. L.

Studies of intermediary carbohydrate metabolism. XV. Muscle dehydrases. TH. BRUGSCH, H. HORSTERS AND Y. HARADA. *Biochem. Z.* **164**, 271-8(1925); cf. *C. A.* **20**, 941.—On fresh muscle the lactic acid dehydrase has an optimum within 0.1-0.5 M lactate. Muscle deprived of its coenzyme through washing is activated by greater lactic acid concn. (1-2 M). The succinic acid dehydrase has an optimum in low concn. (0.1-1.0 M), is little changed by washing or by high succinic acid concn. Malic acid inhibits the lactic acid dehydrase. It seems probable that the muscle does not produce lactic acid from malic acid by decarboxylation. S. MORGULIS

Systemic and sex determinants of bone growth (*Mus norvegicus albinus*). F. S. HAMMETT. *Biol. Bull. Marine Biol. Lab.* **50**, 61-70(1926).—The systemic and sex factors as determinants of the type and rate of growth of the humerus and femur of the albino rat were studied. The influence of the systemic factors is largely expressed as differences in degree, while that of the sex factors is exhibited as differences in the course as well as in the rate of growth. From the point of view of differential development systemic correlation is closer than sex correlation, both in rate and direction of change, particularly during the period of active differentiation (23 to 65 days of age). From this it is concluded that the sex factors of influence, which apparently are gonadal in immediate origin, are superimposed upon the systemic determinants and direct the sex-sp. course of development. L. W. RIGGS

Influences of constituents of thymus gland cells on growth of young organisms. Y. MIYAGAWA AND K. WADA. *Japan Med. World* **5**, 275(1926); *J. Am. Med. Assoc.* **86**, 231.—When the cell constituents of a calf thymus gland are introduced into the peritoneal cavity of young rats or dogs, the growth, development and differentiation of the animal are influenced. It is believed that there is a direct action of these cell constituents, which are absorbed in the blood circulation, on the cells of living thymus or thyroid, facilitating or retarding functioning, and influencing growth and development. This direct action is only relatively sp., but the stimulus is very adequate and effective. L. W. RIGGS

Methemoglobin formation. VII. Nitrite. ROLF MEIER. *Arch. expil. Path. Pharm.* **110**, 241-64(1926); cf. *C. A.* **20**, 453.—Just as the reaction capacity of nitrate in inorg. reactions is dependent upon the p_{H} , so also is its action on oxyhemoglobin influenced by the p_{H} . In an alk. reaction it causes but very little change, even if present in great excess. In a neutral or in a weakly acid reaction only methemoglobin is formed if there is a definite mol. relationship between nitrite and blood pigment. Below this concn. relationship oxyhemoglobin is present along with the methemoglobin, and above

it both methemoglobin and NO-hemoglobin are present. In a mol. relationship where only methemoglobin is produced about $\frac{1}{4}$ of the O bound to the oxyhemoglobin is liberated, with a corresponding change in nitrite. The reaction may be expressed: $4\text{HbO}_2 + 4\text{HNO}_2 + 2\text{H}_2\text{O} = 4\text{HbOH} + 4\text{HNO}_3 + \text{O}_2$. The NO-hemoglobin appearing in the presence of an excess of nitrite is due to a further breaking down of HNO_2 into nitrite and NO (with a relative deficiency of O) in which the methemoglobin is reduced. In the absence of O methemoglobin and NO-hemoglobin are formed from reduced hemoglobin independently of the reaction. During the acute intoxication of cats with nitrite or nitrous gases a pronounced methemoglobin formation occurs. On standing the blood contains, after some time, only NO-hemoglobin which is due to the fact that the reducing substances of the blood or bacterial O become operative, reacting in the same way as a chem. reducing agent. G. H. S.

Effect of hypophysin and thyreoidin on diuresis. ERNST FREY. *Arch. expil. Path. Pharm.* 110, 329-34(1926).—There is no basis for the concept that hypophysin exerts a colloid chem. effect, it being much more probable that the action is confined to an effect on the vasomotor mechanism. On the contrary thyreoidin has an effect on the colloids: since it causes an infused soln. to pass more quickly from the blood into the tissues with a simultaneous inhibition of the amt. of urine. It also acts in an antagonistic manner as regards the development of edema in the perfusion expt. and at the same time it renders the blood cells more susceptible to hypotonic solns. G. H. S.

Behavior of the constant current in modified nerves. III. Nerves treated with solutions of alkali, acid and the chlorides of zinc, iron and aluminium. D. S. WORONZOW. *Arch. ges. Physiol.* (Pflüger's) 210, 672-88(1925).—Study of the effect of NaOH, HCl, FeCl_3 , AlCl_3 and ZnCl_2 , and of combinations of the salts with acid and alkali upon the cond. of nerves with a const. current showed that NaOH is neutralized by the anode, while the effect of HCl is not completely neutralized by either an- or catelectrotonus. The action of ZnCl_2 is neutralized by catelectrotonus. FeCl_3 induces irreversible changes, as does AlCl_3 , although the latter acts more slowly. When a mixt. of a salt and acid acts upon the nerve the effect induced is that of the more active component of the mixt. Alkali exerts a very potent influence upon the action of salts, favoring the effect of univalent cations, inhibiting the bivalent ones. G. H. S.

Chemical actions of heart-nerve stimulation. LEON ASHER. *Arch. ges. Physiol.* (Pflüger's) 210, 689-96(1925).—Repeated tests in the same expt. with fluids from a period of vagal stimulation and with fluids from a rest period fail to show a const. effect referable to the vagal stimulation. G. H. S.

Physiology of the processes of restoration. I. The submaxillary gland of the dog. N. A. PODKOPAJEW. *Arch. ges. Physiol.* (Pflüger's) 210, 727-35(1925).—By feeding dogs for 1.5 hrs. with zwieback the secretion of the submaxillary gland is exhausted insofar as the sp. components are concerned by about 47 to 48%, but the period of activity of the gland is without influence on the secretion of water and the inorg. components. The process of restoration of the sp. org. substances in the exhausted gland takes place slowly, the normal condition being attained only after 36-40 hrs. G. H. S.

Formation of urine in the frog kidney. VIII. Elimination of sodium chloride and glucose by the undisturbed kidney. A. SCHÜRMEYER. *Arch. ges. Physiol.* (Pflüger's) 210, 759-62(1925).—The question as to whether the kidney allowed to remain *in situ* and perfused behaves like the isolated artificially perfused kidney as regards the concn. of NaCl and glucose is answered, by injection expts. and expts. on pancreatic diabetes animals, in the affirmative. G. H. S.

Nature of the effects on the growth and development of frog larvae due to feeding thymus tissue. E. ABDERHALDEN. *Arch. ges. Physiol.* (Pflüger's) 211, 324-32(1926).—The tadpole expt. is not suited to settle the question whether or not the thymus gland has an internal secretion. G. H. S.

Relation of the thyroid gland to the surface tension of the blood plasma. I. The effect of thyroidectomy. C. M. WILHELMJ AND MOYER S. FLEISHER. *J. Exptl. Med.* 43, 179-93(1926).—Following thyroidectomy in guinea pigs, there is a gradual elevation of the surface tension of the blood plasma which reaches its height in 19-22 days after operation. This elevation is probably permanent, since it has persisted for as long as 120 days. A few animals were found in which the surface tension of the plasma was still within normal limits 24 and 120 days after operation. These exceptions may be due to incomplete thyroidectomy, presence of accessory thyroid tissue or compensatory activity on the part of other organs. The surface tension of the plasma from operated animals is higher than that from controls in both the initial and 20 min. detns., but the difference is greater at the 20 min. period. The time-drop (dif-

ference between the initial and 20 min. detns.) is somewhat greater in the plasma from normal than in that from operated animals. The changes may be due to a decrease in the amt. of certain normally occurring surface-active substances, the production of which is directly or indirectly dependent upon the thyroid gland. **II. The effect of the administration of thyroid extract and thyroxin.** *Ibid* 195-205.—Detns. of the surface tension of blood plasma from guinea pigs, before and after feeding thyroxin, showed in most cases a definite decrease. Out of 27 exptl. animals, 20 showed a depression in the surface tension which ranged from 1.9 to 13.9 dynes (avi, 5 dynes). Six animals showed variations hardly exceeding the limits of exptl. error, while 1 showed an elevation of 1.1 dynes. Six normal control animals bled on the same days, and kept under identical conditions, showed differences in the 2 detns. which ranged from a decrease of 0.5 to an increase of 0.6 of a dyne. One other control showed a drop of 1 dyne. Two animals which had been fed large quantities of thyroid ext. over a period of 10 days gave values considerably below normal. One of these animals survived, and after 11 days during which no thyroxin was given, the surface tension was found again to be within normal limits. C. J. WEST

G—PATHOLOGY

II. GIDEON WELLS

Contribution to the question of intestinal putrefaction with special reference to chronic constipation. JOSEF VON DESCHWANDEN. *Arch. Verdauungs-krankh.* 36, 34-75 (1926)—Intestinal putrefaction after an ordinary meal and after a Schmidt test meal was studied with the aid of a Rodella putrimeter. The investigation indicates that the putrimeter is adapted for measuring the degree of putrefaction—the putrefaction index = mm. Hg \times cc albumin soln. \div hrs. during which putrefaction takes place. In the normal subjects the putrefaction index varies between 120 and 200 with an occasional higher value. In chronic constipation the index is over 300 (Schmidt test meal)

FRANCES KRASNOW

The surface tension of plasma in shock. ZUNZ. *Bull. acad. roy. med. Belg* [5], 5, 334-66(1925).—The surface tension of citrated blood plasma, drawn during anaphylactic shock, is lowered by 5-10 dynes. The same is observed if the shock is produced by electrargol, Witte's peptone, or homologous serum, treated with agar. Atropine, choline-HCl, and hirudin prevent the lowering of the surface tension, the more efficiently the more they prevent anaphylactic shock. The alk. reaction of the plasma is diminished, the more severe the shock; it may even turn acid as far as $pH = 6.9$. The diminution of the alk. is also observed if homologous serum, treated with agar, is injected into rabbits for the first time. R. BEUTNER

Nephrosis and nephritis through cystine. G. O. E. LIGNAC. *Nederland. Tijdschr. Geneeskunde* 69, II, 2203-11(1925).—White mice were injected with a sterile suspension of L-cystine, daily, during 3 weeks (concn. of suspension not given). Retroperitoneal cystine deposits were found, after the animals were killed, also deposits around the capsules of the kidney and spleen. R. BEUTNER

Complement-binding experiments with rabbit serum against bacteriophages and bacterial extracts. P. C. FLU. *Nederland. Tijdschr. Geneeskunde* 69, II, 2285-300 (1925).—The serum of normal rabbits sometimes contains substances which, combined with bacteriophages or with bacterial exts., bind complement. The serum of rabbits, immunized intravenously with bacteriophages, contains antibodies which give complement-binding reactions with all bacteriophages, not only with the special bacteriophage used for immunization. It is impossible to prove by means of complement-binding reactions that all bacteriophages are derived from one original kind. R. BEUTNER

Hypophyseal fat dystrophy with hyperglucemia and glucosuria. Report of a case. S. SHAPIRO AND M. G. KLIATSHCO. *Arch. Neurol. Psychiatry* 15, 85-91(1926).—In a woman aged 32, the basal metabolic rate was -20%, the respiratory quotient 0.86, the glucose tolerance curve resembled that in moderately severe diabetes mellitus, as did the inorg. phosphate. There was no acetonuria, and blood pressure and urine secretion were normal. A. T. CAMERON

Basal metabolism in mental disease. K. M. BOWMAN AND C. C. FRY. *Arch. Neurol. Psychiatry* 14, 819-23(1925).—The literature, and a number of new cases showed tendency towards a low basal metabolism in dementia precox (52 normal, 52 low and 11 high). A. T. CAMERON

Cerebrospinal fluid from different loci. J. B. AYER AND H. C. SOLOMAN. *Arch. Neurol. Psychiatry* 14, 303-14(1925).—This may vary in compn. even in absence of

block. In pathol. cases protein showed marked variation, sugar slight, in samples from different levels.

A. T. CAMERON

The relation between gastric acidity and the hydrogen-ion concentration of the urine with a study of the effect of histamine. F. D. ACKMAN. *Can. Med. Assoc. J.* **15**, 1099-1106(1925).—The degree of urinary acidity in patients with relatively normal gastric acidity appears to vary inversely with the amt. of the latter. In hyperchlorhydria the p_H of the urine throughout the day slowly tends to the alk. side. In achlorhydria the "alkaline tide" is usually wanting. Different diets, as they exert different degrees of stimulus on the gastric secretion, consistently produce corresponding changes in urine p_H . High-carbohydrate and low-protein diets produce little effect. Rich protein diets produce a marked "tide." Starvation tends completely to eliminate the tide, though water be given. Histamine given subcutaneously to an individual having a normal or high gastric acidity increases this secretion and produces a well-marked "tide," and in hypochlorhydria, and in cases of achlorhydria in which histamine stimulates HCl secretion, a "tide" is developed. Where there is no gastric response to histamine no "tide" develops. These results strongly support the theory of the gastric origin of the "alkaline tide," and suggest that where it is impossible to examine the gastric contents directly some conception of the secretory activity of the stomach may be obtained by means of the urine p_H curve based on hourly specimens.

A. T. CAMERON

Serum calcium mirror in pulmonary tuberculosis. G. ROSENSTEIN AND H. SCHMIDTKE. *Beitr. klin. Tuberk.* **59**, 199-203(1924).—The serums of 65 cases of pulmonary tuberculosis were examd. according to deWaard. The Ca values were found reduced, more so as the disease progressed (productive form 10.1 mg.%; productive exudative forms 9.7 mg.%; exudative form 9.1 mg. %). Especially low values were found in cases of combined pulmonary and intestinal tuberculosis. During hemoptysis the serum Ca figures were increased from 0.5 to 1 mg. % . Lime feeding did not increase the figures in pulmonary tuberculosis. On the basis of the examn. of the serum Ca in vagotomy, it is believed that the vagotonic symptoms of tuberculous individuals are attributable to demineralization, especially a diminution of Ca.

H. J. CORPER

Method of preparation of artificial antibodies (antitoxins) for the treatment of diphtheria and tuberculosis. G. A. SMIRNOW. *Beitr. klin. Tuberk.* **59**, 278-99(1924).—Old diphtheria bouillon cultures treated by electrolysis and oxidation proved of therapeutic value in animal expts. It is reasoned that the derivs. produced by the activity of living bacteria on the protein media are responsible for the formation of antitoxin, and not toxins nor other bacterial products. In the animal body the oxidation probably results from the action of cells and their enzymes. Glycerol broth cultures from $\frac{1}{2}$ to 1 yr. old were hydrolyzed 1 to 2 weeks in the incubator with 5% KOH, the tuberculoxins combined with nucleins being pptd. out by concd. H_3PO_4 and filtered. The filtrate is dialyzed through gelatin to remove H_3PO_4 , neutralized and again dialyzed, then electrolyzed 48 hrs., filtered, neutralized and again dialyzed and finally sterilized by filtration. Animal expts. were encouraging and favorable results are reported in lupus and bone and gland tuberculosis as well as first stage pulmonary tuberculosis.

H. J. CORPER

The serodiagnosis of tuberculosis. FRANZ MÜNDEL. *Beitr. klin. Tuberk.* **59**, 622-6(1924).—The Bonacorsi flocculation reaction was positive in 91% of tuberculous individuals, 11.3% non-tuberculous, and 66% lues. Exclusion of the Sachs-Georgi pos. serums increased the specificity of the reaction. Better results were obtained with an antigen consisting of an ext. in alc. of 1% beeswax plus 1% cholesterol in a diln. of 1-10. With this antigen lues serums gave a flocculation in only 10%. Without the addition of the cholesterol to the wax ext. no flocculation occurred, leading to the assumption that the active substance in the Bonacorsi reaction was cholesterol. Pure cholesterol solns. also gave reactions. This clarifies the outcome of the Sachs-Georgi reaction in a large percentage of cases of tuberculosis.

H. J. CORPER

The diagnosis of tuberculosis by means of the flocculation reaction. F. v. KOVATS. *Beitr. klin. Tuberk.* **59**, 645-50(1924).—The serum of children with tuberculosis, lues and in some cases chronic pneumonia give a positive flocculation reaction with $(NH_4)_2SO_4$ (concn. 18-19%). The two latter conditions are easily excluded, thus emphasizing the diagnostic value in tuberculosis. The more intense the tuberculous process the more marked the flocculation with a definite concn. In varying concns. the flocculation parallels the intensity of the disease. A diminution or disappearance indicates a favorable prognosis.

H. J. CORPER

Changes in the surface tension of the plasma and serum. EDGARD ZUNZ. *Ergebnisse Physiol.* **24**, 445-73(1925).—A method for the measurement of the surface

tension of plasma and serum is given, its value in the plasma of guinea pigs, rabbits and man, its lowering in anaphylactic shock, the effect of the intravenous injection of electrargol thereon, and the influence of X-rays. The surface tension of both the plasma and serum in syphilis and other diseases is discussed as well as the advantage of its detn. in plasma over that of serum.

H. J. DEUEL, JR.

Some outstanding physical considerations in radium and Röntgen therapy. D. C. A. BURTS. *Radiology* 6, 47-54(1926).—Cancer is a biophysical and physicochem. alteration in cell metabolism. Malignant cell change is atomic or physical, mol. or chem., and histological. In Ra and X-ray therapy, beneficial results are due to radiations of a negative nature, which reduce the increased potential of neoplastic tissues. The caustic effect of such rays is due to an excess of original or induced electrons in the tissues. By equilibrating quantities of electrons, neoplastic cells may be restored to a normal condition. A résumé is given of the clinical application of these principles in several hundred cases of cancer.

JOSEPH S. HEPBURN

Constitutional serology and its application in biology and medicine. L. HIRSZFELD. *Naturwissenschaften* 13, 17-25(1926).—A review, no bibliography.

B. J. C. VAN DER HOEVEN

The effects of progressive anoxemia on the heart and circulation. JANE SANDS AND A. C. DEGRAFF. *Am. J. Physiol.* 74, 416-35(1925).—Up to the crisis, anoxemia has 2 opposing effects on the heart, the balance of which detn. the systolic discharge: (1) reduction of venous pressure and abbreviation of the phase and the time interval of systolic ejection; (2) rise of pressure in the left ventricle and resulting increase of the rate of ventricular ejection. The result is an increase of the minute flow of blood in the body. With progressing anoxemia (2) always dominates. These effects can be attributed to stimulation of the vagus or of the accelerator mechanism. The crisis which occurs at 9% O is characterized by a reduction of systolic discharge with following reduction of minute output, slowing of the heart and decline of arterial pressure. This effect is undoubtedly due to a direct influence of O deficiency on the heart.

M. J.

The cause of death from anoxemia. A. E. KOEHLER, H. M. F. BEHNEMANN, O. E. BENELL AND A. S. LOEVENHART. *Am. J. Physiol.* 74, 590-615(1925).—In the first stage hyperpnea induces an excessive loss of CO₂ and alkalosis. With the increase of fixed acids because of reduced oxidation in the tissues a normal p_H is established and gives place to extreme acidosis. During recovery the blood p_H returns to normal after a passing alk. as soon as the CO₂ becomes normal. Total CO₂ is reduced to very low limits during anoxemia but does not influence the symptoms. Acidosis plays a role in death since administration of alkali markedly prolongs life. Acidosis interferes with tissue oxidation, and death finally ensues because of failure of the supply of energy required to maintain the physicochemical relationships and the structure of the cell.

MARY JACOBSEN

Flocculation of colloidal gold by proteins. H. A. KREBS. *Biochem. Z.* 159, 311-24(1925).—Only acid Au sols are pptd. by blood serum. Pptn. may occur at 2 ranges of acidity (p_H ranges not given) but with solns. of casein and gelatin only 1 range is noted. The 1st range of pptn. with serum coincides with the isoelec. point of the serum globulin. The albumin is not pptd. with the Au.

W. D. L.

Acid binding by the blood of healthy and sick children. J. CSAPÓ AND GÉZA MIHALOVICS. *Biochem. Z.* 161, 459-64(1925).—See C. A. 20, 69.

W. D. L.

The serological differentiation between lecithin and cholesterol. H. SACHS AND A. KLOPSTOCK. *Biochem. Z.* 159, 491-501(1925).—By preliminary treatment of rabbits with lecithin or cholesterol in swine serum, anti-sera may be obtained which react in a characteristic manner with the corresponding lipid material so that a serological differentiation is possible.

W. D. L.

Metabolism in pregnancy. V. J. HARDING. *Physiol. Rev.* 5, 279-302(1925).—Review with bibliography.

E. R. LONG

Insulin and phlorhizin diabetes. II. With some further observations on the mechanism of phlorhizin diabetes. T. P. NASH, JR. *J. Biol. Chem.* 66, 889-900(1925); cf. C. A. 18, 708.—"The following results have been observed after giving glucose alone, or with insulin, to fasting phlorhizinized dogs: a diminution in N output in the urine of from 30 to 65% associated with a lowered non-protein N of the blood; little if any effect upon the rate of creatinine excretion; a large decrease in, or complete abolition of, the excretion of inorg. phosphate attended usually by a lowered concn. of blood inorg. phosphates; a large decrease in, or complete abolition of, the ketosis and ketonuria; a pronounced, temporary improvement in the phys. condition of the animals followed by periods of abnormal weakness and prostration; extensive synthesis and storage of glycogen in muscles and liver. No consistent quant. differences in these

results have been noted when equiv. amts. of glucose are given. The av. recovery of glucose when given alone, in 11 expts., was 72.5%. The av. recovery of glucose given with insulin was 72.5%. The effect of glucose retained under the influence of insulin has not been determined. However, glycogen storage has been demonstrated to an extent which supports the possibility of fat synthesis." The elevation of the p_H observed in phlorhizinized dogs following administration of glucose and insulin together may be due to other factors than increased oxidation of glucose, such as the formation of fat or some other reduction product of carbohydrate or the production of lactic acid or some other acid causing hyperpnea and blowing out of "extra" CO_2 . Until these possibilities are eliminated it does not seem justifiable to interpret increases in the respiratory quotient as proof of the oxidation of glucose by the phlorhizinized dog.

A. P. LOTHROP

Total acid-base equilibrium of plasma in health and disease. IV. The effect of stasis, exercise, hyperpnea, and anoxemia; and the causes of tetany. J. P. PETERS, H. A. BULGER, ANNA J. EISENMAN AND CARTER LEE. *J. Biol. Chem.* 67, 175-218 (1926); cf. *C. A.* 20, 1101.—"Prolonged venous obstruction leads to the transfer of H_2O from the blood to the tissues and a concn. of the proteins. Base combined with HCO_3 is unavailable for the neutralization of this excess acid because the usual escape of CO_2 through the lungs is prevented by the presence of the tourniquet. Under these circumstances plasma chloride diminishes, yielding its base to protein and H_2CO_3 . In brief, vigorous exercise considerable lactic acid and an excess of H_2CO_3 are formed, and the p_H of the serum falls. Chloride remains unchanged. Bicarbonate cedes some base to the org. acid but the major portion of the latter is neutralized by base yielded from the tissues. If overventilation is produced as rapidly as possible, symptoms of tetany appear when the p_H has risen by not more than 0.2. Although the total CO_2 of the serum falls, the CO_2 capacity remains unchanged. Org. acid, probably partly ketone acids, but mostly lactic acid, is considerably increased. The total base remains unchanged and the base required for the neutralization of the foreign acids is largely derived from the chlorides, which are diminished. The reaction of the electrolytes to O_2 -want varies according to the respiratory response. If moderate overventilation develops and continues for a long time, bicarbonate falls. The HCO_3 is replaced partly by an increase in the concn. of serum protein, but chiefly by Cl withdrawn from the tissues. If extreme anoxemia is produced org. acid rises and is neutralized by base derived from the tissues. A postencephalitic case presenting overventilation without tetanic symptoms compensated for an extreme reduction of CO_2 by an equiv. increase of Cl. On 3 occasions Cl and HCO_3 were found to have changed, always in reciprocal directions. A malignant hypertension case and one with typhoid fever by vomiting depleted the chlorides of the serum. Under these circumstances tetany followed mild overventilation. The loss of Cl appears to diminish the ability of the organism to prevent tetany by readjusting the acid-base balance after loss of H_2CO_3 . It is suggested that all these reactions are conservative in nature. Any given disturbance of electrolyte equil. will evoke a train of reactions and changes in all the other electrolytes. These reactions always tend to restore equil. The response is not directed towards the maintenance of the concn. of any single constituent or group of constituents, but will be manifested to a greater or less degree in one or the other according as it may best serve to restore the equil. and maintain the functional automatism of the whole organism." **V. Miscellaneous pathological conditions.** *Ibid* 219-27.—"The effects of vomiting on the electrolytes of the serum are highly variable and probably depend on the nature of the vomitus, the severity and duration of emesis, and the degree of inanition produced. The most frequent result is a reduction of Cl, with or without a diminution of base. The level of HCO_3 is capricious. Vomiting of HCl is not essential for the production of this picture, as it has been encountered in a patient with esophageal obstruction who had not vomited. In a series of infections HCO_3 was generally at or a little below the usual level. This may represent the reaction to temp. which reduces the CO_2 capacity of the blood. In lobar pneumonia, on the other hand, HCO_3 is usually normal while Cl is almost invariably low. In some cases diminution of base and in others the presence of an unusual amt. of org. acid are factors in detg. the low serum Cl. These changes are, however, inconst. and therefore cannot be the essential causes of the characteristic hypochloremia. It is tentatively suggested that the reduction of HCO_3 which usually occurs with elevation in temp. may be prevented in pneumonia by the impairment of the respiratory mechanism. CO_2 is, therefore, maintained at a relatively high tension to facilitate escape of CO_2 in the lungs and HCO_3 assumes a larger share of the blood base at the expense of Cl to minimize the re-

duction of p_H that would otherwise occur. Anemia and polycythemia have no characteristic influence on the base or acids of serum." A. P. LOTHROP

Study of renal function in pregnancy. KO YAMADA. *J. Biochem. (Japan)* **5**, 245-85(1925).—Expts. were made with normal, pregnant and puerperal rabbits of about 2.5 kg. in wt. They were given regularly 100 g. "Tofukara," a bean meal, and 50 g. fresh cabbage daily. The urine was taken with a catheter. The creatinine excretion for each individual being very const. the various urinary factors were expressed as ratios over creatinine excretion. Thus, the excretion of NaCl, I, phenol-sulfonaphthalein, lactose, urea, amino acids and NH_3 N was examd. The results of this study indicate that the kidney during pregnancy, when there is a delay in NaCl excretion but not of N substances, cannot be regarded as presenting a condition of tubular lesion, because these symptoms promptly disappear after delivery. Furthermore, although in the pregnant animal on administering NaCl the increased rate of Cl excretion does not begin as promptly nor does it become as high as in normal non-gravid animals, the duration of the increased excretion is not altered. It seems probable that a considerable amt. of the NaCl becomes incorporated in the animal's tissues. The fetus retains more NaCl and H_2O than does the adult organism. The pregnant animal shows the same tendency but to a less degree. The sp. gr. of the urine under a uniform diet shows normal fluctuations, and falls and rises upon the administration of water just as it does in the normal animal. The retention of NaCl and water in the pregnant animal must, therefore, be ascribed to extrarenal factors. Histologically also the kidney during pregnancy reveals nothing exceptional. Further expts. were made with the administration of either Na_2SO_4 or $(NH_4)_2SO_4$ to gravid and non-gravid rabbits for periods of 3-12 weeks. These were given subcutaneously, intramuscularly, intraperitoneally or orally (in several small doses throughout the day). The expts. with the $(NH_4)_2SO_4$ show clearly that an increase in the ammonia content of the blood or tissues causes anomalies in renal excretion which disappear soon when the administration of the salt stops. The amt. of the NH_3 in the blood and tissues always increases during pregnancy and when this exceeds a certain limit cramps occur. This is taken to mean that the cause of anomalies in pregnancy must be looked for in the toxicity of the NH_3 . The increase in NH_3 is ascribed to the overproduction of acids in the pregnant organism, and when Na_2CO_3 is given to counteract the acid the ammon. accumulation is prevented. The abnormal acid formation is attributed to the presence of toxic substances in some pregnant organisms. The anomalies of pregnancy are thus to be ascribed not to a kidney lesion but to a condition of tissue intoxication resulting in overproduction of acids with the secondary effect of bringing about a high NH_3 level. S. MORGULIS

Pentosuria. Report of five cases in one family. H. W. JONES AND C. W. NISSELEK. *Ann. Clin. Med.* **4**, 505-9(1925).—There are 3 types of pentosuria, alimentary, essential and complicating. The cause is not known but it may be due to oxidation of inactive galactose. Pentosuria does not become dextrosuria. JOHN T. MYERS

The Wassermann reaction in serum filtered through collodion sacs. E. TRENTI. *Centr. Bakt. Parasitenk. I Abt., Orig.* **97**, 57-64(1925).—The ability of a serum to fix complement depends on the globulin content. Ultrafiltration of a luetic serum yields a Wassermann-negative filtrate. The residue remains strongly positive and it is more sensitive than whole serum. This has practical value in the control of treatment. JOHN T. MYERS

New colloidal chemical considerations concerning diuresis and some investigations of serum viscosity. ROSINA ISSAKOVA. *Folia Haematol.* **31**, 226-52(1925).—In cases of hypertension, the serum proteins have a high swelling power, which is changed by the addn. of water or electrolytes. This affinity for water may explain high blood pressure. JOHN T. MYERS

No immunity produced by inoculating irradiated tumor tissue. F. C. WOOD AND ROSA E. PRIGOLEN. *J. Cancer Res.* **9**, 287-97(1925).—Expts. with the inoculation of 6000 mice, compared with 30,000 control stock inoculations, furnished considerable evidence against the assumption either that immunity to inoculation, or resistance to a growing mouse or rat tumor, can be induced by the inoculation of radiated tumor material. Initial injection of irradiated tumors did not materially affect the state of resistance to, or susceptibility to subsequent inoculations with the Flexner-Jobling carcinoma, sarcoma No. 10, carcinoma No. 11 or sarcoma No. 180. F. B. SEIBERT

The insulin content of tumor tissue. G. T. CORI. *J. Cancer Research* **9**, 408-10(1925).—Exts. prepd. from malignant and benign tumors, according to the method of Doisy, Somogyi and Shaffer, contain only traces of insulin. F. B. SEIBERT

The relation of certain endocrines to the salt content of rat blood. G. L. ROH-

DENBURG AND O. F. KREHBIEL. *J. Cancer Research* 9, 422-4(1925).—An increased hypermineralization (K, Ca, Na) of the blood to the extent of about 35% is caused by an incised wound, 45% by splenectomy, and 67% by thymectomy, with about the same changes in the relative amts. of K, Ca and Na. Thyroidectomy caused a hypermineralization of 110% with the Na 13% greater and K 13% less than that in normals. Castration caused an increase of 177% with the Na 18% above that in control rats. Adrenalectomy caused an increase of 203% with the relative amt. of K decreased to 9.5%. F. B. SEIBERT

Two cases of cystinuria in children. J. F. H. STALLMAN. *Lancet* 1925, II, 375-8.—Cystine calculi were present. F. B. S.

The experimental treatment of implanted malignant tumors of the rat. T. LUMSDEN. *Lancet* 1925, II, 539-43.—An antiserum to the mouse carcinoma (M. 63) or Jensen's rat sarcoma produced by numerous peritoneal injections of the respective finely divided tumor kills cancer or sarcoma cells *in vitro* rapidly and invariably. It is much less toxic to the normal tissues than to the malignant cells. Pieces of cancer tissue kept in antiserum for 3-6 days at 37° do not thereafter produce a progressive tumor when inoculated into the living animal. Jensen's rat sarcoma of the foot can be caused to disappear by repeated injections of antiserum into and around the tumors, along with temporary stoppage of circulation in the foot. After such a removal of a tumor the rat becomes immune and very often a tumor on the other foot is simultaneously absorbed. F. B. SEIBERT

A case of renal glucosuria with ketonuria. J. PATTERSON. *Lancet* 1925, II, 596-97. F. B. SEIBERT

A clinical study of diabetic coma. W. W. PAYNE AND E. P. POULTON. *Lancet* 1925, II, 638-42.—A report of 11 cases with blood and urine analyses. F. B. S.

Nature of urinary protein. A. HYND. *Lancet* 1925, II, 910-5.—The protein excreted in the urine in various conditions is not always identical. In the 12 cases investigated of "albuminuria of pregnancy" without convulsions the specific rotation of the urinary albumin averaged -55.81° , and thus agreed with that found for human serum albumin under similar treatment, -54.47° . A similar close agreement in specific rotation, -54.27° , was found in five cases of proteinuria not associated with pregnancy. On the other hand, the 14 cases of eclampsia investigated were sharply divided into two groups, one group of six having an av. $[\alpha]_D$ of -56.37° , and the other group of eight having an av. $[\alpha]_D$ of -38.5° . The optical activity of the albumin in the former group agrees well with that of serum albumin (-54.47°), while that in the latter approximates closely to that of cow lactalbumin (-41.17°). Accordingly, it is suggested (a) that in certain types of eclampsia the urinary albumin may be mainly lactalbumin; (b) that eclampsia may be an anaphylactic reaction due to the circulation in the blood of this foreign protein; and (c) that the mammary gland may be an important factor in the causation of eclampsia. F. B. SEIBERT

The behavior of the diabetic toward circulating glucose. H. S. PEMBERTON AND I. CUNNINGHAM. *Lancet* 1925, II, 1222.—The diabetic differs from the non-diabetic in his behavior towards circulating glucose, as follows: (1) during fasting and without insulin, the arterial value differs widely from the venous, sometimes lower and sometimes higher; (2) with glucose and ether and without insulin, there is a greater increase in both arterial and venous values in the diabetic and in the fasting state the venous value may rise higher than the arterial; (3) with insulin, either fasting or with food, the relationship between arterial and venous tends to approach those of the non-diabetic. F. B. S.

The oxygen deficiency theory and experimental tetany. J. A. CAMPBELL. *Lancet* 1926, I, 72-4.—The expts. support the O_2 deficiency theory of Morris in the etiology of tetany. In many different exptl. conditions in which tetany eventually occurs, the tissue O_2 -tension is markedly decreased before the onset of the tremors. Muscular contraction causes a marked increase of O_2 -tension in the tissues and it is suggested that the purpose of the muscular contraction in tremors and convulsions is to supply O_2 at increased tension in the tissues. F. B. SEIBERT

New knowledge of the metabolism of carcinoma cells. A. LASNITZKI. *Z. Krebsforschung* 22, 531-5(1925).—Strips of Flexner-Jobling rat carcinoma put into Ringer soln. contg. dextrose have a glycolytic power 120 times greater than that of blood, 200 times greater than resting and 8 times greater than the maximal working fresh muscle. The glycolytic power lasts for days if the Ringer soln. containing sugar is aerated with O_2 . Glucolysis is checked by narcotics just as is fermentation in the yeast cell. It is only slightly sensitive to HCN. Under aerobic conditions the amt. of glucolysis falls to about 23% of the amt. under anaerobic conditions. Similar results were

obtained with the Jensen rat sarcoma and the Rous hen sarcoma. The anaerobic glucolysis of tumors is nothing more than the anaerobic metabolic phase of embryo tissue. Glucolysis in germinal epithelium, thymus and lymph glands is less than for embryonal tissue. The glucolysis of thymus completely disappears in the presence of O but that of germinal epithelium and lymph adenoid tissue only diminish. There is a question as to whether results *in vivo* are the same as these results where glucolysis was followed *in vitro*. When dextrose was injected intraperitoneally, the glucose as well as lactic acid content of the tumor rose but the lactic acid content of the liver remained the same. In a series of expts. there was an unmistakable antagonism between glucolytic and lipolytic power of the tissues. This is especially true if carcinoma tissue, spleen and skeletal muscle are contrasted with liver and kidney tissue.

F. B. SEIBERT

Isolation of methylated guanidines from the urine in two cases of parathyreoprival tetany. JOACHIM KÜHNAU. *Arch. expil. Path. Pharm.* 110, 76-88(1925).—The amts. found were 51 to 184 mg., as contrasted with normal values of between 2 and 15 mg.

G. H. S.

Metabolism of the liver in chloroform and phosphorus poisoning. RUDOLF HÜTHLE. *Arch. expil. Path. Pharm.* 110, 153-73(1925).—Comparison of the behavior of the liver of the normal rat with the liver tissues of rats subjected to CHCl_3 or P poisoning showed that while the livers of the normal animal would break down from 39 to 42% of the introduced acetoacetic acid within a period of 90 min., in P intoxication the ability to accomplish a breaking down of acetoacetic acid is impaired to such an extent that there may even be more acetoacetic acid present than was artificially introduced. In CHCl_3 poisoning the ability to break down acetoacetic acid is not completely suppressed, as indicated by the fact that in but 1 of 4 cases the damage to the liver was so severe that an increase in acetoacetic acid occurred. Marked changes in the hydroxybutyric-acetoacetic acid reaction occur in CHCl_3 and in P poisoning. The normal rat liver transformed hydroxybutyric acid into acetoacetic acid with such rapidity that under the conditions imposed by the expt. the acetoacetic acid formation represented 30-38% of the hydroxybutyric acid decrease, while in animals poisoned with CHCl_3 and P the abs. amt. of hydroxybutyric acid transformed was within the normal limits of the normal liver.

G. H. S.

Metabolism in lead poisoning. Nitrogen metabolism. A. TSCHERKESS. *Arch. expil. Path. Pharm.* 110, 174-97(1925).—The N, or rather, the protein metabolism in exptl. Pb poisoning presents abnormalities of both a quant. and qual. nature. The intensity and character of these changes depend primarily on the amt. of Pb introduced and circulating in the body. Poisoning with large doses causes a toxic (not specific) increase in protein transformation. The slow effect of small doses, as in chronic poisoning, causes a change that may be divided into 2 stages. First there is an increase in N metabolism associated with the intake of Pb and the reaction of the cell substance to the foreign poison. At this time the amt. of protein decompn. products in the urine is augmented, a N deficit occurs in the body, the appetite fails and the food intake is diminished. When the second stage intervenes the progressive loss in wt. ceases and all life processes become retarded. The amts. of N found in the urine and in the blood indicate that protein decompn. is reduced as is also N utilization. Disturbances in the processes of protein metabolism are revealed by derangements in the coeffs. of the relations of N of the urine; the creatinine-creatinine ratio to total-N is disturbed; the amt. of ammonia N is increased; the p_H of the urine tends to the acid side; and at times a creatinuria manifests itself. This second stage may persist for a month or more in rabbits, and end shortly before death in a renewed transitory increase of metabolism. From the point of view of the pathology of the chronic condition the reduction in metabolic processes in the second stage is most important. A formation within the body of decompn. products of increased acidity is associated with the retarded metabolism and the reduction in processes of oxidation. It is also probable that in a gradual and continued Pb poisoning, with the establishment of a Pb balance in the body, the functional stimulation due to minimal amts. of the poison leads to a diminished fermentative activity and a reduction in the oxidation processes, inducing thereby a retardation of N metabolism. During this period the body stabilizes itself to a new level of physiol. equil. Chronic intoxication in man apparently represents a sp. dynamic action of Pb on the biochem. processes of the body.

G. H. S.

Trypan blue anemia in rabbits and frogs. M. A. PIWOWAROFF. *Arch. expil. Path. Pharm.* 110, 281-94(1926).—Frogs which receive several subcutaneous injections of trypan blue usually present an oligocythemia which may become very marked. Other substances such as *Bact. ranicida*, Congo red, indulin, and neutral red fail to show

a comparable effect. Ink causes only a slight reduction in the erythrocyte count. Trypan blue also causes an oligocythemia in rabbits; apparently the reticulo-endothelial app. plays a role in the anemia.

G. H. S.

Biological action of Röntgen rays. III. Analysis of sensitization to Röntgen rays by thorium salts. PH. ELLINGER AND OSKAR GANS. *Arch. expl. Path. Pharm.* 110, 295-9(1926).—The changes of chem. or colloid-chem. nature taking place in tissues through the action of active protein-pptg. agents are not of sufficient magnitude to explain the increased susceptibility to irradiation; thus it must be assumed that the changed susceptibility following Th is a result of an increased electron emission.

G. H. S.

Protein therapy and its effect on the body in children and experimental animals. A. F. TUR. *Z. Kinderheilk.* 40, 322-30(1925).—In children beneficial results from protein therapy are the exception. The best results are obtained in the treatment of hypertrophic conditions. The clinical effects, the temp. and leucocyte reactions, as well as the changes in the activity of the enzymes of the cells, vary. The increase in temp. sometimes observed after an injection of milk cannot be explained as an effect of bacterial toxins, but is more probably a reaction of the body to the introduced protein. In cases in which protein therapy is beneficial, the effect appears after 1-2 injections. The general condition of the child improves, the wt. increases, food is tolerated better, and the digestive disturbances disappear. In certain cases there is a definite blood rejuvenation due to an increased activity of the blood-forming organs. Neither during treatment nor subsequently does non-sp. protein therapy modify the hemoglobin content of the red cells or the color index of the blood. Arneith's formula usually shifts to the left. Young forms of both red and white cells appear. In cases which are improved by protein therapy the catalase, lipase, esterase, the autolytic serum enzymes, the pepsin of the urine and the autolysis of organs (in exptl. animals) are increased. Amylase and antitrypsin show no consistent changes. In cases which show no improvement the catalase, lipase, esterase and the peptic activity of the urine are diminished. The autolysis of the serum is increased. In clinically indifferent cases the enzyme changes are irregular.

G. H. S.

Periodic fluctuations in fermentative energy in the urine in year old, healthy children and in those suffering from different nutritional disturbances, and the relation of these fluctuations to different digestive phases. A. F. TUR. *Z. Kinderheilk.* 40, 331-42(1925).—Amylase and propepsin are present in the urine of infants. In children during the first year of life the fermentative activity is weaker than in older children, since with age the amt. of enzyme in the urine increases, and at 10-12 years it is essentially that of adults. Only by a repeated, systematic study of fresh urine can a true picture of the state of the intracellular fermentative energy be obtained.

G. H. S.

Goiter in childhood. III. Gas and iodine metabolism in goiter at puberty. A. ECKSTEIN AND E. MOMMER. *Z. Kinderheilk.* 40, 475-87(1925).—Children with goiter show a perfectly normal gas metabolism, indicating that goiter at puberty is not a hyperthyroid condition. It further appears that the administration of I in either large or small amts. fails to modify the gas metabolism in the characteristic way. There is no considerable retention of I. **IV. Iodine resorption in the thyroid.** A. ECKSTEIN AND MARIA NUELLE. *Ibid* 488-92.—The administration of I *per os* to dogs results in a slight deposition of I in the thyroid. Under normal conditions the I content of the thyroid is independent of the wt. of the gland and to a certain degree unrelated to its anatomical structure. Incidentally, in the normal animal the I content of the two halves of the thyroid may not be the same, the result being that factors other than simply an increased I value must be considered in interpreting data observed. In dogs, as in man, the amt. of I retained in the body after the administration of I is extremely small. The effect of I on the thyroid can only be that of a catalytic agent.

G. H. S.

Allergic irritability. III. The influence of chronic infections and of trypan blue on the formation of specific antibodies. P. A. LEWIS AND DOROTHY LOOMIS. *J. Exptl. Med.* 43, 263-73(1926).—The allergic irritability of the guinea pig (capacity of the animal to react to antigenic substances) is increased by infection with *Bacillus abortus* and a streptococcus, by the dead tubercle bacillus and by intensive treatment with trypan blue, resp.

C. J. WEST

H—PHARMACOLOGY

ALFRED N. RICHARDS

The effect of ephedrine on experimental shock and hemorrhage. K. K. CHEN. *Proc. Soc. Exptl. Biol. Med.* 22, 203-6(1924).—In dogs, the low blood pressure of hist-

amine or Witte peptone injections, of surgical, of traumatic and of anaphylactic shock was quickly restored by the intravenous injection of ephedrine, an alkaloid obtained from *ma huang*. An efficient dose was 2.3 mg. per kg. of body wt. The rise and maintenance of blood pressure is attributed to cardiac stimulation. Excessive bleeding or prolonged low blood pressure required transfusion to restore the blood pressure. The use of ephedrine is advocated in surgical shock and hemorrhage and as a prophylactic remedy in long operations. C. V. B.

Histological investigations on organs of rabbits after prolonged treatment with subcutaneous injections of small doses of glycerol. ANTONIO PIRAS. *Arch. farm. sper.* **40**, 251-6(1925).—Prolonged treatment of rabbits by small subcutaneous injections of glycerol produces serious lesions of the liver, kidney and intestine.

A. W. DOX

Animal poisons. HANS DIETMANN. *Pharm. Presse* **31**, 4-7, 22-3(1926).—An enumeration and brief discussion of the more important poisons of animal origin, notably those of certain snakes, toads, salamanders, lizards, scorpions, fish, spiders, myriapods, caterpillars, ants, bees, wasps, flies, etc., with some references to antidotal treatment.

W. O. E.

Tolerance to coramine. KONRAD SCHUBEL. *Klin. Wochschr.* **4**, 2245-6(1925).—Frogs, rats, mice, guinea pigs, rabbits, dogs, cats and apes do not acquire a tolerance to coramine (*N,N*-diethylnicotinamide). The same dose is equally effective regardless of the number of times it has been administered.

MILTON HANKE

The action of theophylline on the tissue. A. FROHLICH AND E. ZAK. *Klin. Wochschr.* **4**, 2305(1925).—The subcutaneous absorption of easily diffusible substances such as NaCl, KI and $K_4Fe(CN)_6$ is enhanced, in frogs and mice, by treatment with theophylline. The absorption of difficultly diffusible substances such as indigo carmine and trypan blue is retarded. The intraperitoneal absorption of any of these substances is enhanced by theophylline.

MILTON HANKE

Detoxication of thallium. A. BUSCHKE AND BRUNO PEISER. *Klin. Wochschr.* **4**, 2444-5(1925).—Thallium, administered as acetate, appears to have a specific action upon the endocrine organs because it leads to changes in the stomach and the bones, affects growth and development and leads to cataract formation. It is highly toxic. Tervalent Tl in the form of dimethyl-, diethyl- or dipropylthallium bromide is only 10% as toxic as TlOAc and has none of the characteristic pharmacol. properties of univalent Tl. The pos. radical $TlMe_2$ is probably very stable and is not decomposed in the animal organism, into the toxic Tl^+ .

MILTON HANKE

Oligodynamic action of a silver preparation. A. E. RUETE. *Klin. Wochschr.* **4**, 2499-500(1925).—The silver prepn. is a very fine powder that contains 95% Ag and 1% Au. Suspended in 1000 or less parts of water, it is powerfully bactericidal to staphylococci. The microorganisms remain intact; but they are dead. The silver can, apparently, be recovered unchanged; it is equally effective when used a second time. The method is recommended for the sterilization of vaccines. Water that has stood in contact with the metal for 24-48 hrs. acquires some bactericidal properties. It is not, however, as effective as the H_2O -metal mixt.

MILTON HANKE

The relation between the regulation of warmth and sugar metabolism. The effect on blood sugar of antipyretics of the pyrazolone group. H. CHIARI AND R. RIGLFF. *Z. ges. expil. Med.* **46**, 433-53(1925).—Pyramidone in small doses intravenously or *per os* causes a lowering of the sugar content of the blood in both man and animals, and in larger doses a marked increase in blood sugar content. In mild cases of diabetes small doses produce a lowering and in severe cases of diabetes a rise in blood sugar content. Dogs after pancreatectomy show an increase in blood sugar after small doses, indicating that the mechanism of the action of pyramidone in lowering the blood sugar content is dependent on the pancreas.

HARRIET F. HOLMES

Experimental alteration of the indirect galvanic irritability of muscle. H. BEHRENDT AND R. HOPMANN. *Z. ges. expil. Med.* **46**, 564-72(1925).—In healthy children and adults a change of metabolism in the direction of alky. caused increased indirect elec. irritability of the muscles. This change of metabolism was brought about by oral doses of $NaHCO_3$ or subcutaneous injection of thymoglandol, pituglandol and insulin. Acidosis produced by oral doses of NH_4Cl caused a decrease in muscular irritability. Testiglandol and epiglandol, which have been reported to cause acidosis, were without effect on muscular irritability. A pharmacodynamic influence on the neuromuscular app. through the vegetative nervous system by means of pilocarpine, adrenaline and atropine was seldom shown and then only in slight degree. H. F. H.

The fundamental characteristics of heart muscle and their mutual relations. VI. F. SCHELLONG AND F. TIEMANN. *Z. ges. expil. Med.* **46**, 703-17(1925).—The heart

muscle of the frog shows max. irritability in the Ca:K ratio of Ringer soln. Addition of CaCl_2 reduces slightly the irritability of normal heart muscle and increases the irritability of injured heart muscle.

HARRIET F. HOLMES

The action of the calcium ion on the sensibility of the vegetative nervous system. ISTVAN WEISS AND Z. BENKOVICS. *Z. ges. expil. Med.* **46**, 784-8(1925).— CaCl_2 given intravenously reduces the sensibility of the vegetative nervous system to adrenaline as long as an excess of Ca is present in the blood. This action may be due to the Ca ion itself or to the action of the Ca ion on the p_H of the blood.

HARRIET F. HOLMES

The action of halogen substitution products of barbituric acid. R. HÜRTLE. *Z. ges. expil. Med.* **47**, 129-40(1925).—Various halogen substitution products of barbituric acid were studied for their pharmacol. effect, but only dibromobarbituric acid was found to have an effect. An abrupt fall of temp. was noted in rabbits and a narcotic effect in dogs. Dibromobarbituric acid was found accumulated in the medulla oblongata in rabbits and in the brain in dogs. The instability of dibromobarbituric acid would probably prevent its therapeutic use as an antipyretic.

HARRIET F. HOLMES

A contribution to anabolic therapy. I. Experimentation with Helypin. J. MAGAT. *Z. ges. expil. Med.* **47**, 211-21(1925).—Helypin, an emulsion of lecithin and glycerol, to which has been added a suitably balanced system of electrolytes, CaCl_2 , KCl, NaCl and NaHCO_3 , on intramuscular or intravenous injection increases the physico-chem. activity of the cells, activating the synthetic processes of the cell.

H. F. H.

The influence of insulin, administered orally and subcutaneously, in phlorhizin diabetes. O. H. GAEBLER AND J. R. MURLIN. *J. Biol. Chem.* **66**, 731-81(1925).—See *C. A.* **19**, 3539.

A. P. LOTHROP

Chemistry and pharmacology of a new benzyl compound (Betilon). U. HINTZELMANN, G. JOACHIMOGLU AND H. OHLE. *Biochem. Z.* **164**, 126-34(1925).—Betilon is the name proposed for $\text{PhCH}(\text{SO}_3\text{Na})\text{CO}_2\text{CH}_2\text{Ph}$. This can be crystd. from 95% alc. on adding ether, in glass-like needles contg. 1 mol. H_2O of crystn. This is lost when the substance is kept over CaCl_2 . The crystals melt at 106° and undergo decompn. at about 200° . Boiled with dil. HCl, Betilon hydrolyzes into mandelic acid, benzyl alc. and H_2SO_4 . It gives insol. salts of brucine or strychnine which crystallize so well that they can be used for the identification of Betilon. In a concn. of 1:400 it produces a marked dilatation of the guinea-pig uterus, which is obvious also with a 1:1500, but not with a 1:2000 concn. It causes also loss of tone of the intestine (rabbit), smooth muscle and blood vessels. A soln. of 0.5 g. in 10 cc H_2O injected into a rabbit causes death in about a minute, probably as a result of the great drop in blood pressure.

S. MORGULIS

Sensitivity of thyroidectomized dogs to insulin. B. A. HOUSSEY AND A. CISNEROS. *Compt. rend. soc. biol.* **93**, 877-8(1925); cf. *C. A.* **19**, 1312.—In thyroidectomized dogs under the influence of insulin the blood sugar does not fall much more slowly and reaches a somewhat lower level than in control dogs.

S. MORGULIS

The action of dimethylguanidine on the vascular system of the frog. T. ENGLUND. *Skand. Arch. Physiol.* **47**, 15-47(1925).—Dimethylguanidine-HCl is a vasoconstricting substance, the activity of which depends upon the presence of a sufficient concn. of Ca. In the absence of Ca from the perfusion fluid there is inversion of the guanidine effect, which becomes one of vasodilatation. The effect of the increasing concn. of Ca in strengthening and prolonging the constrictor action is attributed to the influence of the motor element of the sympathetic innervation. However, K is also necessary for the constrictor action which becomes feeble in the absence of K, while an increase in the K content of the perfusion fluid diminishes the constricting effect of guanidine or even alters it to a dilating effect. The latter effect is attributed to the relative diminution of the Ca concn. Under the influence of atropine guanidine exerts a constricting effect even in the absence of Ca which indicates that the guanidine may act directly on the muscles. Ergotamine diminishes or even inverts the constrictor action of the guanidine which indicates that the sympathetic end organs are likewise concerned in the vasoconstrictor effect.

S. MORGULIS

The cardiac effect of lobeline. BO CLAESON. *Skand. Arch. Physiol.* **47**, 48-77(1925).—With concn. of 0.1 cc. 0.0001% lobeline soln. there is a slight diminution in the systole without any effect on the diastole or pulse rate; but with similar quantities of 0.01-0.1% soln. there is an increased cardiac tone together with a small increase in the pulse rate. When 0.1-0.6 cc. of a lobeline decoction is used there is a diminution of the systole without any alteration in the diastole, and after 0.5-1 min. there is a progressively increasing arrhythmia cordis with considerable reduction of the pulse frequency. Expts. with atropine show that the decoction has no definite effect on the parasympathetic end organs, while its inhibitory action on the heart is not noticeably

influenced by the absences of either K or Ca ions from the perfusion fluid. Furthermore, lobeline has no ability to alter the effect produced by acetylcholine, which indicates that it cannot act upon the irritability of the parasympathetic end organs, nor can it alter the response of the sympathetic end organs to adrenaline. Lobeline, even in massive doses, has no influence upon the results of vagus stimulation. But acetylcholine may to a certain extent invert the cardiac effect of the lobeline. This alteration in the lobeline action by acetylcholine can, therefore, not be due to a paralyzing influence of the lobeline on the vagus end organs but to its ability to displace from the parasympathetic end organs substances which stimulate them. S. MORGULIS

Effect of saponins on muscle. C. G. SANTESSON. *Skand. Arch. Physiol.* 47, 78-101(1925).—Saponin added to Ringer soln. in which frog muscles are suspended causes a quick onset of spontaneous contracture which increases still further on being stimulated electrically, the contracture being 2-3 times as great as can be produced by such stimuli ordinarily. The muscle is a very sensitive reagent for testing the strength of a saponin soln. Neither cocaine nor novocaine can stop the contracture, though they can reduce considerably its degree. S. MORGULIS

Bismuth in the therapy of syphilis with case reports. O. L. MULO. *Ann. Clin. Med.* 4, 307-13(1925).—Large doses are of value where other drugs fail. J. T. MYERS

Report of the treatment of erysipelas with mercurochrome-220 soluble. W. B. ELDREDGE. *Ann. Clin. Med.* 4, 333-5(1925). JOHN T. MYERS

The effect of magnesium sulfate on the cerebrospinal fluid pressure and on the brain volume. E. J. MORRISSEY. *Arch. Surg.* 2, 778-89(1925).—In man 45 g. of $MgSO_4$ by mouth does not cause a drop in spinal fluid pressure in 2 hours. A slight fall of intracranial pressure was noted in a few animals. Apparently brain vol. is not changed in 40 min. following the injection of a large amt. of $MgSO_4$ into the small intestine. JOHN T. MYERS

Observations on the action of the convulsant thujone. H. FLOREY. *J. Path. Bact.* 28, 645-50(1925).—A preliminary fall in blood pressure occurs because of direct action on the heart muscle. A subsequent rise is due to action on the vasomotor center. JOHN T. MYERS

Action of the base tropine on the heart. RENÉ HAZARD and L.-J. MERCIER. *Compt. rend.* 181, 526-8(1925).—Expts. with dogs proved that tropine retards the rate and diminishes the systolic amplitude of the auricles and ventricles. This action differs from that of atropine which at first causes acceleration. With the frog, however, atropine causes a slowing of the heart similar to that caused by tropine. Large variations are shown in the susceptibility to tropine by different individuals, thus, an injection of 0.05 g. per kg. caused death in one dog, while another dog showed only a retardation of rate and diminution of systolic amplitude after a dose of 0.3 g. per kg. L. W. RIGGS

Toxicity of certain alkaloids for the dogfish. Chlorine content before and after injection. R. F. LÉGUION. *Compt. rend.* 181, 820-1(1925).—Injections of neutral strychnine sulfate, neutral atropine sulfate, nicotine, pilocarpine-HCl and morphine-HCl were severally made in the dogfish. The drugs were in 1% or 0.1% soln. in sea water. Acids and bases are more toxic to fish than alkaloids, and the latter are less toxic to fish than to man. The Cl content of the blood was increased after injection of atropine, morphine or pilocarpine, but was notably decreased after injections of strychnine and slightly decreased after the injection of nicotine. L. W. RIGGS

Alkaloidal derivatives with attenuated toxicity. MAX POLONOVSKI and MICHEL POLONOVSKI. *Compt. rend.* 181, 887-8(1925); cf. *C. A.* 19, 289, 1426, 1700, 2500, 2957. Geneserine is similar to eserine in its physiol. and therapeutic actions but is less toxic. Perhaps geneserine may be substituted for the bases from which it is derived. In tests with dogs the lethal doses of geneserine and certain derivs. in g. per kg. were as follows: geneserine 0.02, genatropine 0.2, genhyoscyamine 0.15, genoscolamine 0.2, and genostrychnine 0.02. The latter acts like strychnine rather than geneserine. L. W. RIGGS

Some unrecognized dangers in the use of and the handling of radioactive substances, with especial reference to the storage of insoluble products of radium and mesothorium in the reticulo-endothelial system. H. S. MARTLAND, PHILIP CONLON and J. P. KNEF. *J. Am. Med. Assoc.* 85, 1769-76(1925).—The cases described represent a hitherto unrecognized form of occupational poisoning. The anemias encountered are proved to be due to the ingestion of radioactive elements with the deposition of insol. fixed particles in the phagocytic cells of the sinusoids of the reticulo-endothelial system, where they continuously emit irritative rays, which in time produce exhaustion of the adjacent hematopoietic centers. L. W. RIGGS

The use of ether in pertussis by intramuscular and rectal injection. ALTON GOLDBLOOM. *J. Am. Med. Assoc.* **85**, 1791-3(1925).—Histories are given of 18 cases treated by intramuscular injection of ether, and of 21 cases by ether in olive oil by rectum. The latter method of administration appears to have advantages. While ether may not be regarded as a cure for whooping cough, it often may bring a relief, especially to infants, which proves to be life-saving.

Sodium thiosulfate in treatment of metallic intoxication. H. A. KUHN AND H. H. REESE. *J. Am. Med. Assoc.* **85**, 1804-8(1925).— $\text{Na}_2\text{S}_2\text{O}_3$ has been found efficacious in the treatment of arsenamine dermatitis and jaundice, and in acute As and Hg poisoning. The treatment increases the excretion of As and hastens the restoration of the kidneys to normal. Saline soln. is recommended as the solvent when $\text{Na}_2\text{S}_2\text{O}_3$ is given by mouth. **Sodium thiosulfate in mercurial poisoning.** C. C. HASKELL, W. C. HENDERSON AND J. R. HAMILTON. *Ibid* 1808-10.—Expts. with dogs poisoned by HgCl_2 (4 mg. Hg per kg.) proved that $\text{Na}_2\text{S}_2\text{O}_3$ is of no value as an antidote for Hg that has entered the circulation.

Renal function. Results of experimental work with morphine and atropine. W. H. HAINES AND L. F. MILLIKEN. *J. Am. Med. Assoc.* **85**, 1853-5(1925).—Morphine and atropine, in the usual hypodermic dose, do not affect kidney function unfavorably. Ether anesthesia inhibits kidney function in dogs, and morphine and atropine given prior to the anesthetic prevent this inhibition. Clinical observation and expts. indicate that morphine and atropine have the same effect on kidney function in man during ether anesthesia that they have in exptl. animals. The use of morphine and atropine in urologic surgery is recommended.

Carbon dioxide as an aid in general anesthesia. J. S. LUNDY. *J. Am. Med. Assoc.* **85**, 1953-5(1925).— CO_2 in moderate concn. assists in producing anesthesia, rendering the anesthetic apparently safer and easier to administer. It should be used in such concn. as will produce optimal results, and these vary with the individual and the type and stage of the operation. Too much CO_2 is worse than none. Care should be exercised to prevent more than 5% being used. These conclusions follow from observations in 1350 cases at the Mayo Clinic.

Present status of hexylresorcinol as an internal urinary disinfectant. VEADEE LEONARD AND AUSTIN WOOD. *J. Am. Med. Assoc.* **85**, 1855-9(1925); cf. *C. A.* **20**, 451.

Dangers in the use of certain halogenated phthaleins as functional tests. W. H. ROSENAU. *J. Am. Med. Assoc.* **85**, 2017-20(1925).—Following the use of phenol-tetrachlorophthalein, thromboses, local inflammatory reactions at the site of injection, and chills have been observed. Clinical and exptl. work indicates the possibility of strain or damage to the liver, following injection of the dye. Attempts to make the dye nonirritating on injection have failed. Severe toxic reactions have been observed following the use of tetrabromophenolphthalein, and tetraiodophenolphthalein.

Narcotics and the blood serum. E. HISINGER-JÄGERSKIÖLD. *Finska Läkaresällskapets Handlingar* **57**, 880(1925); *J. Am. Med. Assoc.* **86**, 160.—No change in the P content of the blood serum was observed in 15 medical students after test injection of 8 different narcotics. The Ca content rose in some, dropped in others, and was unmodified in another group. It appears that during a tranquil mental state the Ca content declines.

The intravenous administration of resorcinol. I. The direction and mechanism of its action. J. LUKÁCS. *Magyar Orvosi Archivum* **26**, 527-34(1925).—The actions following the intravenous injection of resorcinol are temp. rise, leucocytosis and consecutive leucopenia, changes of the colloidal blood picture by increased labile fractions, transient elevation of blood sugar, increase of agglutinin titers and increased diuresis. The action appears to be composed of 2 phases: unsp. irritation attributed to changes of the serum albumins, and parasympathetic irritation corresponding to phenol action.

The toxic effects of lead administered intravenously. W. B. BELL, W. R. WILLIAMS AND L. CUNNINGHAM. *Lancet* **1925**, II, 793-800.—Blood changes and pathol. lesions in the tissues are cited.

Experimental pathology of the vascular system in lead intoxication. I. Effect of lead salts on the vessels of isolated organs. ALEXANDER TSCHERKESS. *Arch. exptl. Path. Pharm.* **108**, 220-9(1925).—In a concn. of from 1:1000 to 1:10 million the salts of Pb (acetate and nitrate) cause a constriction of the vessels of the isolated organs (ear, kidney, spleen) of the rabbit. The vascular system of the abdominal organs is more susceptible to Pb and reacts more intensely than do the peripheral

vessels. The mode of action of Pb depends upon its effects upon the smooth musculature of the vascular walls. G. H. S.

Experimental pathology of the vascular system in lead intoxication. II. Functional changes in the vessels. ALEXANDER TSCHERKESS AND E. PHILIPPOWÁ. *Arch. exptl. Path. Pharm.* 108, 365-76(1925).—In chronic exptl. Pb intoxication of rabbits functional damage occurs in the vascular system of isolated organs. The vasodilating app. is affected early and intensely. Vasodilating substances, such as caffeine, chloral hydrate, etc., not only fail to dilate the vessels, but indeed diminish the vascular vol. The effect of vasoconstricting substances, as adrenaline and BaCl_2 , is not modified. Qualitatively the character of the effect on the internal organs (kidney and spleen) is the same as that on external tissues (ear), but quant. the functional damage is greater to the internal organ. In subacute Pb intoxication both the constricting and dilating functions of the vessels are paralyzed. G. H. S.

Acute and chronic poisoning by heavy metals. I. Manganese. H. HANDOVSKY, H. SCHULZ AND M. STAEMMLER. *Arch. exptl. Path. Pharm.* 110, 265-80(1926).—Smaller amts. of Mn are required to kill an animal during a chronic than during acute intoxication, the citrate being definitely more toxic than other compds., doubtless because of its more rapid adsorption. Mn is excreted very quickly in the feces (amts. up to 50% of that injected) while even after protracted periods of administration only traces appear in the urine, indicating the impermeability of the kidney for Mn. Very large amts. of Mn are to be found in the bile, in ascitic fluid, and in pus, showing that the body eliminates the metal by these pathways far more readily than by way of the kidney. Changes in capillary permeability due to pathol. processes render the vessels more permeable for heavy metals. Very large amts. of Mn are to be found in the bone, since here large amts. of carbonate and phosphate are available for pptn. Study of bone is of more importance in metal poisoning than has been assumed. The amt. of Mn in the different organs in fatal poisoning is not necessarily related to anatomical changes in the organs. A large amt. of Mn is invariably deposited in some organs, such as the spleen and brain; in others, as the liver, the amt. present varies over very wide limits, while in some organs, such as the lung, very little is deposited. Why there is sometimes much, sometimes little in the liver, cannot be detd., but it must be due to some cause purely local in the organ, and is secondary to the intoxication phenomenon as a whole. The histopathol. findings include fatty changes in the Kupffer cells, in other cells of the liver and at times in the kidney and heart; and a destruction of red blood cells, as indicated by the formation of hemosiderin. The mechanism of the intoxication with Mn differs in the acute and chronic forms, as is true with other heavy metals. In acute intoxication there is a progressive paralysis of the central nervous system and arrest of the heart. Acute intoxication occurs when a fixed but very high concn. of Mn in the blood is attained. If this concn. is not reached the nervous symptoms do not appear, but the liver becomes involved in irreversible changes, as in chronic intoxication, where the liver, and especially the Kupffer cells, are first attacked. It is suggested that the recognized effect of Mn on antibody production may be allied to this action on the liver. G. H. S.

Vasodilating action of adrenaline and stimulation of the sympathetics. W. FELDBERG, HAHN AND SCHILF. *Arch. ges. Physiol.* (Pflüger's) 210, 697-707(1925).—After a preliminary treatment of the frog-vessel prepn. with suitable amts. of adrenaline a further addn. of adrenaline, or stimulation of the sympathetics, causes vasodilatation. Under both circumstances the initial concn. of adrenaline necessary to lead to this reversal of action is the same. G. H. S.

Morphine miosis. V. E. HENDERSON AND R. W. GRAHAM. *J. Pharmacol.* 26, 469-78(1926).—Morphine miosis in dogs is due to a stimulation of subcortical structures, probably in the corpora quadrigemina. It does not appear to be due to changes in CO_2 combining power or p_{H} of the blood. In rabbits the miosis produced by morphine appears to be due to the increased CO_2 combining power of the blood and possibly to the decreased p_{H} . C. J. WEST

I—ZOOLOGY

R. A. GORTNER

The influence of theophylline on tadpoles. A. FRÖHLICH AND E. ZAK. *Klin. Wochschr.* 4, 2303-5(1925).—Theophylline enhances the growth and, therefore, the weight of tadpoles. MILTON HANKE

Hydrogen-ion concentration and oxidation-reduction potential of the cell-interior before and after fertilization and cleavage: a micro-injection study on marine eggs.

JOSEPH NEEDHAM AND DOROTHY M. NEEDHAM. *Proc. Roy. Soc. (London)* 99B, 173-99 (1926); cf. *C. A.* 19, 3493.—Study was made of 3300 injected eggs, including those of 4 species of echinoderms, 1 species of tunicate, and 1 species of polychaete worm. The internal p_H of all the eggs studied was close to 6.6; it was not altered by fertilization, remained const. as far as the 16-cell stage, did not show rhythmical change, and was not influenced by local injury or by morphological degeneration of asphyxia until cytolytic changes had begun. Cytolysis changed the p_H to a value between 5.0 and 4.0. The τ_H of the cells varied more than the p_H , but remained between 19 and 22; it did not change on fertilization, remained const. as far as the 8-cell stage, and apparently was not influenced by cytolysis. Micro-injection is superior to vital staining since (1) substances to which the normal cell-wall is impermeable can be introduced into the cell with little or no injury to the latter; and (2) the method is so rapid and the amt. of dye so minute that far less danger exists of an upset in the original equil. of the cell, and the establishment of an unnatural equil. In vital staining, the cell probably is far removed from its physiol. normal by the time staining is complete. J. S. H.

The permeability of the intestine of holothurians. H. A. P. C. OOMEN. *Verslag Akad. Wetenschappen Amsterdam* 34, 1028-35(1925).—No active absorption of isotonic solns. by the live or surviving wall was found. The phenomena reported by other authors may be caused by the activity of amebocytes. MARY JACOBSEN

Physiologic reactions of *Spirostonum ambiguum* Ehrenberg to stimulation. H. BLÄTTNER. *Arch. Protistenk.* 53, 253-311(1926).—This organism reacts like paramecium to various chemical stimuli: AcOH, H₂SO₄, HCl, HNO₃, H₂CO₃ and chromic and picric acids; KOH and NaOH; NaCl and Na₂CO₃; alcohol and sucrose. *Spirostonum* can bear the cold well but is more active in warm environment. Its rheotaxis is positive. Increase in CO₂ enhances geotaxis. Normally, there is no reaction to light. However, through the aid of certain dyes (fluorescent as well as non-fluorescent) a negative phototaxis may be induced. The resistance to harmful effects of light is then greatly lowered. FRANCES KRASNOW

Modification of development on the basis of differential susceptibility to radiation. II. *Arbacia* and visible light following sensitization. MARIE A. HINRICHS. *Biol. Bull. Marine Biol. Lab.* 50, 1-10(1926).—Expts. with fertilized *Arbacia* eggs proved that the effectiveness of photodynamic sensitization depends upon exposure of the sensitized system to radiation of sufficient intensity and duration, which in order to be absorbed and so become effective, must have a wave-length range including that of the absorption band of the particular sensitizer used. The susceptibility to visible radiation following sensitization with the following sensitizing dyes (eosin, benzoflavine, neutral red and methylene blue) is differential, *i. e.*, regions of high physiol. activity are first to be modified in their development. Differential inhibition, recovery and acclimation have been produced in this way. It is possible to produce these effects (as with *Fundulus* and ultra-violet radiation) by exposure during the first few min. after fertilization, indicating an early difference in susceptibility of various regions of the egg. Differential modification is also obtained by fertilizing normal eggs with photodynamically treated sperm. These expts. confirm the view of the nonsp. and quant. nature of susceptibility relations along the body axis. L. W. RIGGS

The cause and nature of encystment in *Polytomella citri*. J. MCA. KATER AND R. D. BURROUGHS. *Biol. Bull. Marine Biol. Lab.* 50, 38-54(1926).—The culture medium was prepd. by boiling about 10 g. of timothy hay in 1 l. of distd. water. Attempts were made to det. the effect of various temps., H-ion concns., metabolic products and food deficiency on the tendency to encyst. *Polytomella citri* encysts only when the cell body contains considerable starch. Encystment is not due to any perceptibly adverse environmental factors. Optimum conditions for growth and reproduction are concomitant with max. encystment. Prevention of encystment, either by continuous transfer or by low temp., if carried to sufficient extent, will result in morphological degeneracy and loss of the tendency to store starch and to encyst. L. W. R.

Production of light by a nudibranch mollusk of New Caledonia. RISBEC. *Compt. rend.* 181, 472-3(1925).—This nudibranch appears to be the first non-pelagic gastropod in which luminous organs have been found. During the night, at the least disturbance, the animal emits 3 to 5 series of 4 to 5 very brief flashes of white light. After this emission new flashes cannot be obtained within one hr., the new emission being less intense. L. W. RIGGS

The role of the lymphocytes and granulocytes in the reparation of injured tissues in the crawfish. L.-M. BÉTANCÈS AND J. DELUNA. *Compt. rend.* 181, 626-8(1925).—A histologic study. L. W. RIGGS

Does the Bunsen-Roscoe law apply in the luminous excitation of invertebrates?

(Result of studies with *Mya arenaria*.) HENRI PIÉRON. *Compt. rend.* **181**, 688-90 (1925).—Expts. show that the law is not valid. L. W. RIGGS

Hemolytic properties of the pedicellariae of certain sea urchins. ROBERT LÉVY. *Compt. rend.* **181**, 690-2(1925).—Pedicellariae of the 3 species of sea urchin studied contain hemolytic toxins which act only in the presence of lecithin, or the vitellus of the fowl. Tridactyls, which have no glandular pockets as do the pedicellariae, also carry these toxins. The hemolysis by these toxins is by a catalytic process analogous to that of poisonous venoms. L. W. RIGGS

12—FOODS

W. D. BIGELOW

Iron in food products. C. MASSATSCH. *Pharm. Ztg.* **71**, 58(1926).—A reply to the recent criticism of Troponwerke Dinklage & Co. (cf. C. A. **20**, 951). W. O. E.

Determination of unsaponifiable matter in wheat flour, alimentary pastes and eggs. RAYMOND HERTWIG AND L. H. BAILEY. *J. Assoc. Official Agr. Chemists* **9**, 122-1 (1926).—The direct Et_2O ext. of flour and eggs does not contain all the unsapon. matter of these materials. Hertwig's acid hydrolysis extn. method (C. A. **17**, 2621) apparently has some chem. action on the unsapon. matter which causes low results for flour and eggs. The official A.O.A.C. neutral method for lipid extn. of flour, alimentary pastes and eggs gives the highest results, is believed to be the most satisfactory from the standpoint of operation for general purposes, and seems to be the most accurate.

A. PAPINEAU-COUTURE

Raising dough by means of pure yeast cultures. G. SCHLBER AND (MISS) G. BOVSHIK. *Bull. inst. Lesslafs Leningrad* **1924**, 10; *Bull. assoc. inst. sup. fermentation Gand* **27**, *Ann. soc. brasseurs* **35**, 70(1926).—Working with a rye flour dough, S. and B. found that it rose if the yeast added corresponded to 141,000 cells, or over, per g. of dough, the rate of rise increasing with the amt. of yeast added. The use of pure cultures in liquid medium requires less raw material in the prepn. of the yeast needed for a given amt. of dough than the use of pressed yeast.

A. PAPINEAU-COUTURE

Preparation of benzoic acid. A. B. LORGES. *Rev. chim. ind.* **35**, 10-4(1926). Description of the manuf. of technical BzOH and of pure BzOH for food and pharmaceutical use.

A. PAPINEAU-COUTURE

Detection of dyes in caramel. L. V. NOEL. *Pharm. Zentralhalle* **67**, 33-5(1926). Among other exptl. findings it is shown that the unequivocal detection of dyestuffs in caramel is best effected in relatively high diln. A redyeing of the thread used in the test is essential and tartaric acid as fixing agent is preferable to KHSO_4 . Furthermore, natural dyestuffs behave very like caramel, the former being fixed in concd. soln. on wool in such quantity as to render wool thus treated less susceptible to added dyestuffs, while in dil. soln. such added dyes are more readily fixed on the wool than the natural dye. This property becomes more apparent on redyeing, since only a portion of the natural dye is rendered sol. on treatment with dil. NH_3 , so that in the resulting highly dild. soln. the artificial dyestuff greatly exceeds the natural, which subsequently is scarcely pptd. on the wool, thus making detection of the added dye relatively certain.

W. O. E.

Determination of water in honey with the immersion refractometer. WILHELM MÜLLER. *Mitt. Lebens. Hyg.* **16**, 261-5(1925); cf. Behre, C. A. **16**, 2558.—The refraction of 20% honey soln. is detd. with a Zeiss immersion refractometer and the refractive index obtained from the tables. The water content is then found from sugar tables. This agrees within 0.5% with gravimetric and pycnometric detns., a closer check than is found between duplicate gravimetric detns. F. L. SEYMOUR-JONES

Determination of sucrose. HEINRICH FINCKE. *Z. Nahr. Genussm.* **50**, 351-65 (1925).—An extension of the work of Hasse and Bake (C. A. **17**, 3059). Tables of correction factors are given for polarimetric detn. of sucrose in chocolate, cocoa-sucrose mixts. and milk chocolate.

WILLIAM J. HUSA

The refractometric determination of vanillin in vanillin-sugar. E. ARBENZ. *Mitt. Lebens. Hyg.* **16**, 265-8(1925); cf. Utz, C. A. **18**, 3088.—Vanillin-sugar is a new product, being a mixt. of synthetic vanillin with finely powdered sugar. Dissolve 3 g. in 20 cc. anhydrous acetone, filter and det. the refraction with a Zeiss immersion refractometer at 17.5° . A table giving vanillin content against Zeiss scale degrees is given.

F. L. SEYMOUR-JONES

Imitation vanilla essence. J. C. MACLAURIN. *Analyst* **50**, 548-9(1925).—An

interesting law suit is described in which the official chemist found an essence to contain added vanillin and won the case in spite of an ingenious defense. W. T. H.

Pectin and the patents on its manufacture. M. R. DAUGHTERS. *Canning Age* 1926, 110-2.—The development of pectin is traced through the several patents issued to cover its manuf. T. MARKOVITS

The microscopical examination of ground nutmeg. CATH. H. KOPERBERG. *Chem. Weekblad* 23, 62-4(1926).—Admixture of seed coat (testa) can be detected by the presence of a relatively large proportion of oblong, lignified cells which give the phloroglucinol reaction. A small amt. of these cells may be derived from the perisperm, which is not considered an adulterant. MARY JACOBSEN

Determination of cacao shell in cacao. CATH. H. KOPERBERG. *Chem. Weekblad* 23, 64-6(1926).—The stone cells in 2 g. defatted cacao are counted and compared with standards contg. a known percentage of shell. The results are only approx., since com. samples are not sufficiently uniform. MARY JACOBSEN

Formaldehyde in certain marine products. D. B. DILL AND P. B. CLARK. *J. Assoc. Official Agr. Chemists* 9, 117-22(1926).— CH_2O is shown to develop in sterile canned crustacea and so-called red rock cod (*Sebastes sp.*). This development of CH_2O is independent of the nature of the container and of the processes of can corrosion or of the blackening of these products from formation of Fe sulfide. It takes place in the absence of free O. Acidification and steam distn. failed to recover more than one-third of the CH_2O added to CH_2O -free salmon. Up to 1 part CH_2O in 30,000 parts of canned crustacea was found, which would indicate that they may contain up to 1 part in 10,000. A. PAPINEAU-COUTURE

Grading as to size of green peas for canning. ED. LASSAUSE. *Ann. fals.* 19, 28-40(1926).—Owing to changes in the size of peas during and after blanching, screening of the peas a few months after canning will not correspond to the screening of the raw peas. A large no. of analyses before and after canning showed no marked relationship between size and chem. compn. On calcg. the analytical results per 100 peas (instead of % by wt.) a certain gradation of the chem. compn. according to size was noted; but it held only for the product of a given district and for a given harvest. A. P.-C.

"Avgotarachon." CONSTANTIN PYRIKI. *Z. Nahr. Genussm.* 50, 366-71(1925).—Description, photographs and analyses of "Avgotarachon," a fish-egg delicacy prepared in Greece, Turkey and Egypt. WILLIAM J. HUSA

Sultana drying by the cold dip process. FRANCOIS DE CASTELLA. *J. Dept. Agr. Victoria* 23, 716-31(1925).—The cold dip process promises two marked improvements in sultana drying: (1) Improvement in color, which is bright golden instead of brown. (2) Absence of stickiness in the finished fruit, owing to the skin not being broken, hence elimination of the sugary appearance on storage. Its principal defects are (1) slower drying and more rack space. (2) the presence of odd, dark berries, which are rendered more conspicuous by the lighter color of the general sample. The process consists in the substitution of a cold K_2CO_3 soln. for the hot NaOH dip previously used. The concn. of the soln. is usually about 1 lb. K_2CO_3 to 2 gals. H_2O . To this soln. olive oil is added, about 1 pt. to 50 gals. of soln. During drying the fruit is sprayed two or three times with ordinary dip soln. in which the proportion of oil is slightly increased. When nearly dry the fruit is bleached or finished on strips of hessian lying on the ground, to which it is transferred from the racks or trays. Bleaching develops the desired golden tint. This is aided by an additional spray. Final washing is often beneficial and sometimes necessary to remove any excess of K_2CO_3 left by the spraying. This is effected by dipping in a weak K_2CO_3 soln., 1° Baumé, with olive oil at the rate of 1 pt. to 50 gals. RUSSELL M. JONES

Determination of milk fat in foods. J. KUHLMANN AND J. GROSSFELD. *Z. Nahr. Genussm.* 50, 329-46(1925).—The % of milk fat is practically proportional to the Reichert-Meißl no., except in presence of coconut or palm-kernel oils, for which corrections are presented. An accurate description is given of the procedure of Bertram, Bos and Verhagen for the detn. of coconut oil and milk fat in fat mixts., together with a rapid graphical method of calcg. the results. WILLIAM J. HUSA

A study of milk and cream confectionery. J. KUHLMANN AND J. GROSSFELD. *Z. Nahr. Genussm.* 50, 346-51(1925).—The quant. sepn. of the fat of milk and cream confectionery is carried out by dissolving 100 g. of the substance in 400 cc. hot H_2O , coagulating by addn. of 25 cc. Fehling soln. and 25 cc. 0.25 N NaOH, filtering and extg. the dried coagulate with fat solvents. Com. candies frequently contain fats other than milk fat; for detn. of milk fat see preceding abstract. WILLIAM J. HUSA

Sweetened condensed milk. III. In a total solids residue what is the form of lactose? F. E. RICE AND JACK MISCALL. *J. Dairy Sci.* 9, 62-4(1926).—Aq. lactose

solns. were treated by the A.O.A.C. method for detg. total solids in sweetened condensed milk. Lactose was recovered as anhydride. F. L. SEYMOUR-JONES

Humidity equilibria of milk powders. G. C. SUPPLEE. *J. Dairy Sci.* 9, 50-61 (1926).—Drum and spray process powders were held over H_2SO_4 solns. for periods up to 6 months. Above 50% humidity hydration is rapid. It follows a smooth curve irrespective of the process of manuf. except for a break at 50%, which does not occur in dehydration. Excessive heating or previous satn. alters the absorptive properties. There was decreased absorption and retention of moisture with increasing fat content of the milk powder. F. L. SEYMOUR-JONES

Action of rennet extract on the paracasein of skim milk, as affected by different organic acids. C. T. TOWNSEND. *Sci. Agr.* 6, 158-64 (1925).—Skim milk was sterilized with $CHCl_3$ for 24 hrs. Equal vols. of 0.1 and 0.2 N lactic, acetic and propionic acids were added together with rennet and all held one week at room temp. With 0.1 N acids lactic and propionic were equal and gave greater paracasein digestion than acetic or rennet alone. With 0.2 N acids acetic and propionic were equal and more digestive than lactic or controls. "With an increase in concn. of acid in the milk at the time of curdling, a corresponding increase in the amt. of paracasein digested by rennin is obtained." F. L. SEYMOUR-JONES

Physicochemical factors influencing cream rising. I. Viscosity. L. S. PALMER AND E. O. ANDERSON. *J. Dairy Sci.* 9, 1-14 (1926).—Cream vols. from raw and pasteurized milk standardized to 3.5% fat content were measured after 24 hrs. at 0° and 10°. Jersey, Guernsey, Holstein and Ayrshire milks were used. Viscosity was detd. with the MacMichael viscometer and p_H potentiometrically. No relation between p_H and viscosity was found. In raw milk cream vol. was largely detd. by the solids not fat content; viscosity varied with solids not fat and with temp. and was a good index of creaming ability. Fat globule size is of minor importance. For pasteurized milk viscosity is not important; creaming is less exhaustive and fat globules are more closely packed. F. L. SEYMOUR-JONES

Factors influencing the viscosity of cream and ice cream. F. F. SHERWOOD AND H. L. SMALLFIELD. *J. Dairy Sci.* 9, 68-77 (1926).—Cream in aging sometimes increased in viscosity. Where this occurred there was a greater grouping together of fat globules with consequent fixation of part of the free serum. F. L. S.-J.

Detection of annatto in milk. A. D. GARDINER. *Analyst* 50, 549-50 (1925).—The following modification of Leach's method has been found very satisfactory. Coagulate 25 cc. of milk in a 100 cc. conical flask by heating to 50° and adding 0.2 cc. of AcOH. Filter off and press the curd. Return it to the original flask and shake with 75 cc. of ether. Allow to stand overnight. Pour off the ether, ext. into a porcelain evap. dish and evap. to dryness. As soon as the dry stage is reached, add 6 cc. of 0.1 N NaOH, stir and transfer to a wet filter paper. When all the liquid has drained through the filter, and only fat remains, open the paper, spread it on a watch glass, wash it with hot water and dry. An orange tint is imparted to the paper and the presence of annatto can be confirmed by the pink color produced upon adding a drop of $SnCl_4$ in citric acid. W. T. H.

Some factors affecting the growth of certain strains of *P. roqueforti*. I. Blue mold. N. S. GOLDING. *J. Dairy Sci.* 9, 28-36 (1926).—Citric and acetic acids in amts. comparable with those found in starters in Wensleydale cheese have a distinct effect on the growth of different strains of *P. roqueforti*. Low concns. of acetic acid tend to reduce the digestion of casein in milk by the blue mold, while citric acid has the opposite effect. However, in a special medium contg. lactose, peptone, agar and 4 salts, the contrary was true, namely, acetic acid increased the growth of the organism while citric acid tended to inhibit the growth. These facts have a direct bearing on the results to be obtained with different kinds of starter, for a preponderance of acetic or citric acid will directly affect the growth and activity of *P. roqueforti*. G. F. REDDISH

Saltbushes and their allies in the United States. G. L. BIDWELL AND E. O. WOOTEN. U. S. Dept. Agr., *Bull.* 1345, 1-39 (1925).—Proximate analyses are given of 64 varieties of native plants of the arid and semiarid United States with comments on their forage value for range animals. A bibliography of 30 literature references is appended. W. H. ROSS

Detection of As in cacao (LÜHRIG) 7. The purposes and aims of agricultural chemical analysis (BROWNE) 7.

DOWD, MARY T. AND JAMESON, JEAN D.: **Food, its Composition and Preparation.** 2nd ed., revised. New York: J. Wiley & Sons, Inc. 177 pp. \$1.50.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The dependence of industry on chemical science. HERBERT LEVINSTEIN. *Chem. Age* (London) **14**, 104-5(1926).—An address. E. J. C.

The chemical industry in Poland. CURT PORALLA. *Z. ges. Schiess-Sprengstoffw.* **20**, 139-40(1925).—A general discussion, with special reference to *N* fixation.

The man [chemist] in the works. CHAS. S. ROY. *Chem. Age* (London) **14**, 126-7(1926).—An address. C. G. STORM
E. J. C.

Research, the government and the public. L. B. ATKINSON. *Electrician* **96**, 196(1926).—An address. C. G. F.

Our foreign trade in chemicals in 1925. OTTO WILSON. *Ind. Eng. Chem.* **18**, 291-4(1926); cf. *C. A.* **19**, 1170. E. J. C.

Factors in chemical plant location. CHAPLIN TYLER. *Chem. Met. Eng.* **33**, 83-5(1926). E. J. C.

The purchase of materials on specification. DEAN HARVEY. *Proc. Am. Soc. Testing Materials* **25**, II, 425-41(1925). E. J. C.

American Society for Testing Materials tentative standards submitted or revised at the 1925 annual meeting. ANON. *Proc. Am. Soc. Testing Materials* **25**, I, 509-962(1925).—Tentative specifications are given for C-steel car and tender axles, structural Si steel, C-steel castings for valves, flanges and fittings for high-temperature service, alloy-steel bolting material for high-temp. service, W powder, spiegeleisen, ferro-Mn, ferro-Si, ferro-Cr, ferro-V, hollow staybolt Fe, Al base alloy sand castings, bronze trolley wire, Muntz metal condenser tube plates, Al ingots for remelting, non-ferrous insect screen cloth; for quicklime for use in the manuf. of sulfite pulp, quicklime for use in water treatment, hydrated lime for use in water treatment; for preservative coatings including raw tung oil, dry bleached shellac, Fe oxide and Fe hydroxide, lithopone, lampblack, boneblack, chrome yellow, pure chrome green, reduced chrome green; for high-C tar cement for use cold in repair work, high-C tar cement; for waterproofing materials including acid-resisting asphalt mastic, smooth-surfaced asphalt roll-roofing, slate-surfaced asphalt roll-roofing and slate-surfaced asphalt shingles, asphalt-satd. roofing felt for use in waterproofing and in constructing built-up roofs, coal-tar satd. roofing felt for use in waterproofing and in constructing built-up roofs; for textile materials including textile testing machines, tolerances and test methods for cotton yarns, single and plied, tolerances and test methods for cotton sewing threads, tolerances for numbered cotton duck, tolerances and test methods for knit goods; for sieves for testing purposes. *Tentative methods* are given for sampling ferro-alloys, chem. analysis of ferro-alloys, chem. analysis of Al and light Al alloys; chem. analysis of limestone, quicklime and hydrated lime, securing specimens of hardened concrete from the structure; testing shellac varnish, routine analysis of white linseed oil paints; test for distn. of gasoline, naphtha, kerosene and similar petroleum products, for distn. of natural gas gasoline, for penetration of greases, for viscosity of petroleum products and lubricants, for color of petrolatum by means of the Union Colorimeter, for burning quality of long-time burning oil for railway use, for neutralization no. of petroleum products and lubricants, for cloud and pour points of petroleum products, testing gas oils (gravity, distn., S, C residue, pour point, viscosity, water); mech. analysis of subgrade soils, test for the detn. of moisture equiv. of subgrade soils in the field, test for consistency of port.-cement concrete, float test for bituminous material; test for absorption of slate, flexure testing of slate (detn. of modulus of rupture and modulus of elasticity); testing felted and woven fabrics satd. with bituminous substances for use in waterproofing and roofing, testing bituminous mastics, grouts and like mixts.; testing smooth-surfaced asphalt roll-roofing, slate-surfaced asphalt roll-roofing and slate-surfaced asphalt shingles; testing of insulating varnishes, of elec. insulating materials for voltage effects at radio frequencies, of cable splicing and pothead compds., of untreated insulating paper, of laminated sheet insulating materials, of grease wool and allied fibers for scoured content; tension testing of metallic materials, compression testing of metallic materials, Brinell hardness testing of metallic materials. *Tentative recommended practice* is described for carburizing and heat treatment of carburized objects; thermal analysis of steel. *Tentative definitions* are given of terms relating to the gypsum industry, the term sand; terms relating to coal; terms relating to methods of testing, terms relating to sp. gr., the term screen (sieve). Under the heading "Tentative revisions of A. S. T. M. standards" standards specifications are given for C-steel and

alloy-steel forgings, quenched-and-tempered C-steel axles, shafts and other forgings for locomotives and cars, C-steel forgings for locomotives, quenched-and-tempered alloy steel axles, shafts and other forgings for locomotives and cars, C-steel car and tender axles, welded and seamless steel pipe, lap-welded and seamless steel and lap-welded Fe boiler tubes, welded wrought-Fe pipe, staybolt, engine-bolt and extra-refined wrought-Fe bars, malleable castings, Lake Cu wire bars, cakes, slabs, billets, ingots and ingot bars, electrolytic Cu wire bars, cakes, slabs, billets, ingots and ingot bars, light Al casting alloys, high-strength bronze trolley wire, round and grooved, 40 and 65% cond., seamless admiralty condenser tubes and ferrule stock, high sheet brass, naval brass rods for structural purposes; specifications and tests for port. cement, cement-concrete sewer pipe, fire tests of materials and construction, paving brick, hydrated lime for structural purposes; turpentine; broken slag for waterbound base and wearing course; shovel run or crusher-run broken slag for waterbound base. *Recommended practice* is described for heat treatment of case-hardened C-steel objects. *Standard methods* are given for testing gypsum and gypsum products; test for distn. of bituminous materials suitable for road treatment, lab. sampling and analysis of coke, lab. sampling and analysis of coal, sampling and analysis of creosote oil, testing molded insulating materials. *Standard definitions* are given of terms relating to paint specifications. H. G. Compulsory working of patents. H. CAHN. *Z. angew. Chem.* 39, 105-13(1926). E. J. C

Adjustment of inventors' rights in accordance with the new Austrian patent law FERDINAND ARLT. *Österr. Chem.-Ztg.* 29, 18-20(1926). E. J. C

Experiments on cable insulation. E. G. GILSON. *Elec. World* 87, 297-9(1926). Tests on insulating compds. used in high-tension paper insulated cables show the effect of temp. in forming voids. Upon using a liquid filler, such as petrolatum, sufficiently liquid to flow readily at all temps. to which the cable might be subjected, the formation of voids was prevented. C. G. F

Device for making break-down tests on insulating tapes. R. W. CHADBOURN. *Elec. World* 87, 307(1926); 1 illus. C. G. F

Tables for technical gas calculations. R. MICHEL. *Gas u. Wasserfach* 69, 71-9, 89-92(1926).—A detailed and abstruse discussion of tables for the conversion of gas densities, calcn. of gas vols. for different pressures, etc. W. B. PLUMMER

Promotion of knowledge of engineering materials. F. M. FARMER. *Proc. Am. Soc. Testing Materials* 25, 1, 34-45(1925).—An address. E. J. C

Distribution of the industrial power load in the United States as of January 1, 1924, and energy consumed by industrial plants during 1924. ANON. *J. Elec.* 56, 91-5(1926).—Detailed statistics. C. G. F

Recent developments in industrial hygiene. H. F. SMYTH. *Am. J. Pub. Health* 16, 126-9(1926). E. J. C

COSTON, E. P.: *Graduated Course in Strength and Elasticity of Materials*. Vols. I & II. New York: D. Van Nostrand Co. Vol. I, 276 pp., Vol. II, 448 pp. \$4.25 per vol.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Biography of Dr. John C. Thresh. ANON. *Water and Water Eng.* 27, 430(1925). JACK J. HINMAN, JR.

Recent studies relating to the purification of water. J. C. THRESH AND J. F. BEALE. *Surveyor* 68, 579(1925).—With river waters which sometimes vary rapidly the "excess lime" method of water treatment must be carefully controlled. Water exposed to the air in certain places has been shown to absorb sufficient impurities of a phenol-like nature to give a disagreeable taste in subsequent chlorination. *B. coli* has been shown to multiply in water in the presence of "*Enteromorpha intestinalis*" and "*Oscillatoria nigra*." Silicate of soda prevents the oxidation of Pb by O-bearing water. Also in *Water & Water Eng.* 27, 475-8(1925). R. E. GREENFIELD

Stream pollution in Ohio. W. H. DITTOE. Ohio Conference on Water Purification, Fourth Ann. Rept. 1925, 10-3.—Progress in the survey of stream pollution which is being conducted by the State Dept. of Health is reviewed. In discussion it was stated that excess Cl treatment for eliminating taste due to phenol was found ineffective in lab. expts. at Cleveland. R. E. THOMPSON

The Cincinnati water-works system. CLARENCE BAHLMAN. Ohio Conference on Water Purification, *Fourth Ann. Rept. 1925*, 68-74.—The water-purification plant is described and data on operation are given. Coagulation is effected with lump CaO and iron sulfate. The cost of operation during 1923 was equiv. to \$6.76 per million gal. delivered into service, of which \$2.44 was expended on chemicals. R. E. THOMPSON

Water purification at East Liverpool, Ohio. D. H. RUPP. Ohio Conference on Water Purification, *Fourth Ann. Rept. 1925*, 47-59.—Tabulations of bacteriol. data for 1923 are given. Coagulation removes 81-87% of raw water bacteria, filtration 77-84% of bacteria applied, and chlorination 94-97% of bacteria surviving filtration. The raw Ohio River water contains an av. of 4 p.p.m. of sol. Fe and there is probably several times that amt. of sol. Al. This explains the comparatively small amt. of coagulant required, 0.7 to 1.5 grains per gal. Since water purification has been adopted, the typhoid death rate has decreased from 75.8 to 4.4 per 100,000. Considerable difficulty has been experienced with tastes due to pollution of supply with phenol wastes, the taste complained of being that of phenol rather than chlorophenol. A phenol content of 0.1 p.p.m. invariably results in complaints. Results of lab. studies on the effect of various methods of treatment on the phenol content of water are summarized. R. E. THOMPSON

The new water purification plant at Toronto, Ohio, employing double coagulation of Ohio River water. D. H. RUPP. Ohio Conference on Water Purification, *Fourth Ann. Rept. 1925*, 65-7.—The new coagulation and filtration plant at Toronto is described. Double coagulation is employed at all times, it having been found that best results with least application of chemicals can be obtained thereby. The amt. of alum used has averaged 3 grains per gal., in approx. ratio of 2.1 to the first and second basin, resp., and lime employed has averaged 2 grains per gal. R. E. THOMPSON

Pollution and natural purification of the Ohio River. III. Factors concerned in the phenomena of oxidation and re-aeration. H. W. STREETER AND E. B. PHELPS. U. S. Pub. Health Service, *Bull.* 146, 75 pp. (1925); cf. C. A. 19, 3333.—Observations were made during the year 1914-15 at sampling stations along the Ohio of the dissolved O in the river water and the biochem. O demand of the river water. It was found that only $\frac{1}{4}$ of the purification was due to diln. and that $\frac{3}{4}$ was due to re-aeration. The theory of the O demand upon a stream and the O resources of a stream is treated in a mathematical manner, and the results obtained are applied to the same factors in the case of the Ohio. The self-purification of the river as far as concerned its O content was found to be a measurable phenomenon capable of expression by a mathematical formula. On account of this definite expression the same principle can be applied to the examn. of all polluted streams. B. C. A.

Further observations on the biology of Jersey Water Works. W. RUSHTON AND P. A. AUBIN. *Surveyor* 68, 557; *Water & Water Eng.* 27, 487-9 (1925).—The use of CuSO_4 spray as a means of controlling algae is the most effective method. The presence of large nos. of "Asterionella" did not in 1 case produce an odor. A weekly count of microscopic organisms gives a sufficient indication of the condition of growth in the reservoirs studied. R. E. GREENFIELD

Use of pebble quick lime. ANON. Ohio Conference on Water Purification, *Fourth Ann. Rept. 1925*, 41-2.—Substitution of pebble CaO for $\text{Ca}(\text{OH})_2$ at the Columbus and Delaware plants gave satisfactory results and effected considerable economy in operating costs. R. E. THOMPSON

Dry feed of coagulants. P. J. O'CONNOR, W. I. VAN ARNUM AND E. C. LINDSEY. Ohio Conference on Water Purification, *Fourth Ann. Rept. 1925*, 36-41.—Experiences with dry feed of chemicals at Warren, Youngstown and Ravenna indicate that the Gauntt type of machine is not as accurate as Pittsburgh and other types when flow of water varies appreciably. R. E. THOMPSON

Offensive tastes in public water supplies caused by industrial wastes. W. H. DINTON. Ohio Conference on Water Purification, *Fourth Ann. Rept. 1925*, 7-10.—Prevalence of taste and odor due to phenol-contg. wastes and progress in the prevention of the same is reviewed and discussed. Evapn. of liquid wastes from coke plants by employing it for coke quenching appears to be the most satisfactory method of disposal. R. E. THOMPSON

Advantages of lime in water softening. C. P. HOOVER. Nat. Lime Assoc., *Tech. Papers and Addresses 1925*, 70-5.—Lime softening decreases the mineral content of the water. Lime removes CO_2 , which dissolves iron, causing "red water." Lime and alum remove bacteria, color and turbidity by coagulation. K. C. BEESON

Use of sodium aluminate as coagulant. J. P. BROWNSTEAD, E. T. EDWARDS, E. E. SMITH AND C. P. HOOVER. Ohio Conference on Water Purification, *Fourth*

Ann. Rept. 1925, 31-6.—Substitution of Na aluminate for alum ordinarily applied with lime for coagulation during 4- and 2-month exptl. periods, resp., at Ashland, Ky. and Ironton, O., gave good results. Higher bacterial efficiencies with lower cost for coagulant per million gal. treated were obtained with Na aluminate at the former plant. Bottle expts. at Lima, O., indicated that it would not be economical to replace any part of the necessary application of alum with Na aluminate. Lab. studies at Columbus, O. showed that Na aluminate has the same beneficial effect on softening by the lime-soda process as alum. Commercial Na aluminate is also an aid to softening because of its Na_2CO_3 and NaOH content, whereas alum increases the non-carbonate hardness and necessitates the employment of additional Na_2CO_3 . It is estd. that commercial Na aluminate costs from 74 to 135% more than an equiv. mixt. of alum, Na_2CO_3 and lime solns. R. J. THOMPSON

Further investigation into the sterilization of water by chlorine and some of its compounds. C. H. H. HAROLD. *J. Roy. Army Med. Corps* **45**, 190-207, 251-73, 350-63, 429-42; *J. State Med.* **33**, 428-39, 451-77 (1925).—Details of tests showing advantages over Cl of simple chloramines prepd. from Cl and $(\text{NH}_4)_2\text{CO}_3$. A. T. C.

Chloramine treatment of water in the field. C. H. H. HAROLD. *J. Roy. Army Med. Corps* **46**, 115-9 (1926).—In field tests mono- and dichloramine gave satisfactory water with better taste than did Cl. A. T. CAMERON

The Coolgardie pipe line in Australia and measures taken to correct corrosion. F. P. LANGLEY. *J. New England Water Works Assoc.* **39**, 421-44 (1925).—Within five yrs. tuberculation had greatly reduced the carrying capacity of the line and it had perforated in many places. Treatment with lime, while probably preventing further corrosion, deposited an excessive coating which further reduced the carrying capacity of the line. Deaeration by spraying through a partial vacuum results in about a 90% removal of O and while not improving the existing carrying capacity of the line from tests pieces hung in the flowing water it has reduced corrosion especially in those sections of the line farthest removed from deaerator. R. E. GREENFIELD

St. Paul's water consumption and costs in 1924. J. W. KELSEY. *Eng. News Rec.* **95**, 1041 (1925); cf. *C. A.* **20**, 789.—The daily per capita consumption during 1924 was 76.9 gal. As ground water is easily obtained the city supplies only approx. 60% of the total water consumed. The cost of maintenance during the year was equiv. to \$57.37 per million gallons, and total cost, including interest and sinking fund, \$103.35. Services are 100% metered. R. E. THOMPSON

Tampa's new water works. *Public Works* **57**, 1-6 (1926).—The supply, taken from Hillsboro river, has a color variation from 26 to 200 p.p.m. with a hardness of from 30 to 200 p.p.m. The period of max. hardness coincides with the period of min. color. Low lift pumps take the water from the intake wells to the first mixing chamber where it flows by gravity through the entire plant to the filtered water reservoir. It is then pumped through 3 miles of 30 inch force main to the distribution system and to three elevated tanks each of $1\frac{1}{2}$ million gallons capacity. The pumping and purification plants are designed to handle 12 million gallons per day with provisions for a 25% overload. Lime will be added in the first mixing chamber for softening. SO will be added with the alum for decolorizing. C. C. RUCHHOFF

New water works plant for the city of Tallin (Reval) Esthonia. ANON. *Water and Water Eng.* **27**, 437-8 (1925).—A rapid sand filter installation of 5.5 Imp. gallon capacity uses air agitation of the sand bed, and is designed to operate at the rate of 1.5 Imp. gals./sq.ft./min. When heated to 120° F. the water shall have no taste of mud, earth, fishy material, nor of Cl. The org. matter of the filtered water expressed as albuminoid NH_3 shall not exceed 0.5 p.p.m. The filtered water must be neutral to litmus at 175° F. and must not contain more than 20 bacteria per cc. when the applied water contains 3000 per cc. *B. coli* must be absent from 100 cc. J. J. H. JR.

The water supply of Vienna and the possibility of its extension. FRANZ SCHÖN BRUNNER. *Gas u. Wasserfach* **69**, 85-9 (1926).—Discussion of the hydrology of the vicinity. W. B. PLUMMER

The iodoform taste of chlorinated water. B. ADAMS. *Medical Officer, Water and Water Eng.* **27**, 435-6 (1925).—A decided taste which could not be distinguished from that of chlorophenols was given by 1 part per 1000 million of iodoform. Mere trace of alc. or acetone with I in alk. water will give the iodoform reaction. By adding 0.2 p.p.m. I to water contg. 1 p.p.m. alc. or acetone vile tastes of iodoform were produced. Natural waters may have the necessary org. compds. set free from org. matter by bacterial action, and the I might be set free from its compds. by Cl. Chlorophenol tastes are developed instantly, but some time is necessary for the iodoform-like tastes to appear. Superchlorination and KMnO_4 will avoid iodoform tastes, but SO₂ does

not remove the taste. An iodoform taste can be produced in a water contg. 0.005 p.p.m. I. JACK J. HINMAN, JR.

A score system of grading water supplies according to sanitary conditions. E. S. CASE. *J. New England Water Works Assoc.* 39, 229-34 (1925). R. E. G.

Iodine and water supplies. H. W. CLARK. *J. New England Water Works Assoc.* 39, 204-7 (1925).—See C. A. 20, 250. R. E. GREENFIELD

Tastes in the water supply of Marquette, Michigan due to phenol waste. PAUL HANSEN. *J. New England Water Works Assoc.* 39, 320-44 (1925).—See C. A. 20, 249. R. E. GREENFIELD

Chemical and chemico-physical researches on three mineral waters of Agnano (Naples). F. ZAMBONINI, G. CAROBBI AND V. CAGLIOTI. *Ann. chim. applicata* 15, 134-74 (1925).—The source of the waters, designated De Pisis (hyperthermal), Sprudel (hyperthermal) and Marte (subthermal), is in the volcanic region of Agnano. The first two resemble the famous hyperthermal springs of Wiesbaden, Adler and Kochbrunn, the Marte water that of Apollo water. The 3 waters had, resp.: d_4^{25} 1.0055, 1.0075, 1.0014; radioactivity (Maché units per l.) 0.283, 0.132, 0.645, and temp. 75.5°, 70.5°, 27°. Extensive analyses indicate that the compn. is approx. as follows (mg. per l.) for the 3 waters: Li^+ 1.7, 1.5, 0.3; Na^+ 1793.5, 2352.6, 382.2; K^+ 344.7; 650.6, 124.1; NH_4^+ 12.1, 22.6, 6.9; Mg^{++} 41.3, 66.3, 24.3; Ca^{++} 159.4, 220.1, 99.7; Ba^{++} 1.3, 0.6, 0.2; Pb^{++} 0.05, 0.09, —; Mn^{++} 1.2, 3.2, 1.8; Fe^{++} 3.2, 3.0, 8.4; Cl^- 2627.3, 4036.9, 262.9; Br^- 3.6, 5.1, 0.6; I^- 0.2, 0.2, 0.05; SO_4^{--} 245.9, 244.5, 150.8; HPO_4^{--} 0.4, 1.4, 1.0; HAsO_4^{--} 0.17, 0.01, 0.006; HCO_3^- 1214.6, 1100, 1035.2; NaCl 652.1, 1311.2, 17.3; Na_2SO_4 159.9, 206.3, 36; NaHCO_3 389.4, 432.5, 109; KCl 0.4, 93, 2.2; K_2SO_4 9.5, 13.1, 15; KHCO_3 22.6, 28.7, 13.1; NH_4Cl 12.2, 4.8, 0.2; $(\text{NH}_4)_2\text{SO}_4$ 0.5, 0.8, 0.4; NH_4HCO_3 1.4, 1.6, 1.2; MgCl_2 71.2, 161.9, 5.6; MgSO_4 18.2, 26.5, 12.1; $\text{Mg}(\text{HCO}_3)_2$ 45.4, 57.1, 37.6; CaCl_2 168.2, 332.1, 16.7; CaSO_4 41.6, 52.7, 35; $\text{Ca}(\text{HCO}_3)_2$ 102.1, 111.2, 106.8; MnCl_2 —, 2.2, 0.2; MnSO_4 —, 0.3, 0.4; $\text{Mn}(\text{HCO}_3)_2$ —, 0.7, 1.0; FeCl_2 —, 2.1, 1.0; FeSO_4 —, 0.3, 2.2; $\text{Fe}(\text{HCO}_3)_2$ —, 0.7, 6.6; SiO_2 176.8, 151.8, 87.1; TiO_2 0.0025, 0.0015, 0.002; H_2BO_3 1.1, 1.3, 0.7; free CO_2 493.7, 102.8, 1692.4. Various other phys. and chem. const. are given; details of all the methods of analysis followed. C. C. DAVIS

Some recent deep borings in the London basin. H. J. DEWEY, J. PRINGHAND AND C. P. CHATWIN. *Water and Water Eng.* 27, 398-400 (1925). J. J. H., JR.

Period of storage and microorganisms in reservoirs. R. S. WESTON. *J. New England Water Works Assoc.* 39, 225-9 (1925).—In general ample storage decreases rather than increases trouble from microorganisms. R. E. GREENFIELD

Statutory regulation of stream pollution and the common law. E. B. BESSELIEVRE. *Water and Water Eng.* 27, 431-4 (1925).—Largely a review of American practice. JACK J. HINMAN, JR.

Spore-bearing gas-formers in the Ohio River at Cincinnati. HENRY SOHN. *Ohio Conference on Water Purification* 1925, 85-9.—Of 99 samples of Ohio River water examd. for spore-bearing gas-formers, 21 were found to contain such organisms. Only 6 of the 21 positive mixed cultures survived plating and purifying processes and proved capable of fermenting lactose. All 6 were spore-bearers and 4 of them grew aerobically. The remaining 15 positive cultures were apparently due to symbiotic growth of spore-bearing types. The rate of gas formation by the spore-bearing types encountered was too slow to cause serious interference with gas production by colon group organisms. During the same period 85% of routine presumptive positive tests on Ohio River water were confirmed by the usual tests for *B. coli*. R. E. T.

Prevention of deposit in water mains. W. RANSOM. *Munic. & County Eng.* 69, 324-5; *Surveyor* 68, 481-2 (1925).—Deposits of iron formed chemically and by iron bacteria are discussed. Cement lining or coating the pipes with a mixt. of coal tar or pitch oils and rosin is recommended to prevent chem. incrustation. Efficient filtration with the removal of the org. matter will prevent the development of iron bacteria. C. C. RUCHHOFF

The significance of bacteriophage in surface water. LLOYD ARNOLD. *Am. J. Pub. Health* 15, 950 (1925).—Surface waters contg. a high degree of domestic sewage contain bacteriophagic substances in direct proportion to the amt. of pollution. These phages cause lysis of the pathogenic bacteria, thus reducing the probability of epidemics. They also influence bacteriol. examn. for pathogens in these waters. The use of bacteriophages in filtration and sewage treatment is suggested. K. C. BRESON*

The filtration works of the City of Montreal. F. E. FIELD. *J. New England Water Works Assoc.* 39, 208 (1925). R. E. GREENFIELD

Partial purification of sewage by activated sludge. H. C. WHITEHEAD. *Surveyor* 68, 449-50, 473-4 (1925).—The economy of a process involving sedimentation, a

short period of activated sludge, with separate sludge aeration followed by bacteria bed treatment is pointed out. R. E. GREENFIELD

Epsom's new sewage work. ANON. *Surveyor* 68, 347(1925).—The one-half million gallon per day "Simplex" surface aeration plant is put in operation. The plant reduces the O consumed 92.3%, free and albuminoid NH_3 83.3%. R. E. GREENFIELD

Chlorine in sewage and waste disposal. J. C. BAKER. *Can. Eng.* 50, 127-8 (1926).—The development of chlorination and the application of Cl₂ to oyster beds and sewage effluents are discussed. C. C. RUCHHOFF

New sewage-disposal plant at Kitchener. STANLEY SHUPE. *Can. Eng.* 49, 587-9(1925).—An activated-sludge plant having a capacity of 750,000 gal. per day is described. C. C. RUCHHOFF

Activated sludge plant, Melfort, Sask. J. E. UNDERWOOD. *Can. Eng.* 49, 627-9 (1925).—Features and advantages of this small plant are described. C. C. R.

Sewage-disposal plant, York Township. E. M. PROCTOR. *Can. Eng.* 50, 161-1 (1926).—A general description of the new plant. C. C. RUCHHOFF

Recent research in sewage disposal. F. A. DALLYN AND A. V. DELAPORTE. *Can. Eng.* 50, 193-5, 213-5(1926).—The work of the Provincial Expt. Station in Toronto, Canada, on the activated-sludge process is described. C. C. RUCHHOFF

The washing of sewage filtering media. H. MACLEAN WILSON AND J. H. GARNEK. *Surveyor* 68, 383-4(1925).—The cost of washing, sizing and returning old filter bed (contact) material is usually less than the purchase of new material. Washing by machinery except under special conditions is cheaper than hand washing. R. E. GREENFIELD

Recent experiments in dewatering sewage sludge. H. D. BELL. *Surveyor* 69, 79-82(1926).—The use of sand with smooth grains in sludge drying beds causes sludge to dewater more rapidly. Fresh lime-treated sludge dewatered better than unlimed sludge. R. E. GREENFIELD

Anaerobes in sewage. F. E. GREER. *Am. J. Pub. Health* 15, 860(1925).—*Cl. welchii* is the most common anaerobe found in sewage. In order of importance, *Cl. sporogenes*, *Cl. tetani* and *Vibrio septique* were found. Activated-sludge treatment does not materially reduce the number of anaerobes. K. C. BEESON

Sewerage of towns on tidal waters. D. BALFOUR. *J. Royal Sanit. Inst.* 46, 159-60(1925).—The proper placing of the outfall sewers is of importance and varies with local conditions. Proper preliminary treatment should be used to prevent nuisances. R. E. GREENFIELD

Sludge disposal. P. G. LLOYD. *Surveyor* 68, 447, 576-7(1925).—The most economical disposition of sewage sludge depends to a considerable extent on local conditions. R. E. GREENFIELD

Activated sludge experiments at Bradford. J. H. REDDIE. *Surveyor* 68, 451-2, 475(1925).—A loss of 8.3% of the total incoming nitrogen is reported in an activated-sludge plant. The loss is accompanied by a conversion of free NH_3 and nitrate N to org. N. A partial treatment with activated sludge followed by filter-bed treatment is recommended. R. E. GREENFIELD

Water Sterilization by Gaseous Chlorine. London: The Paterson Engineering Co., Ltd.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Soil acidity. E. KURCKMANN. *Z. Pflanzenernähr. Düngung* 5A, 1-92(1925).—The nature and occurrence of soil acidity are discussed, and methods for the determination of acidity and lime requirement are examined practically. In the light of the classification of acidity into 3 forms: "active," "exchange" and hydrolytic (Kappen), variations in soil acidity due to origin, position, moisture and humus content are examined and recorded. B. C. A

Second report on the influence of soil, season and fertilizing on the quality and growth of barley, as indicated by the malts made therefrom. H. M. LANCASTER. *J. Inst. Brewing* 31, 104-11(1925).—The results obtained with barleys of the 1923 season (cf. Russell, C. A. 19, 1748) are as follows: The market value of each barley and the "actual" value deduced from the resulting malt were not influenced by the different kinds of fertilizers employed nor by the soil and the season. The yield per acre was influenced by the fertilizers added. In 1 case especially by the addition of K and NH_4Cl .

in place of the resp. sulfates, there was marked improvement. H. L. HIND. *Ibid* 111-4.—The results of analysis are given. B. C. A.

Action of limestones, marls and certain calcium and magnesium compounds on soil. A. GEHRING AND C. SCHÜLCKE. *Z. Pflanzenernähr. Düngung* 4B, 113-39(1925).—The effects of a no. of limestone samples on the permeability to water, the CO_2 production and bacterial numbers of a soil were much more marked for material passing a 1-mm. sieve than for coarser material, and were in general agreement with the solubilities of the samples in carbonic acid, NH_4Cl and citric acid solns. On a "black" soil the oxide, carbonate and sulfate of Ca had a temporary depressing effect and the corresponding compds. of Mg a more marked and more persistent depressing effect. B. C. A.

Anomalous flocculation in colloidal clays and soils. F. HARDY. *J. Phys. Chem.* 30, 254-65(1926).—Unlike hydroxides of the alkali metals and NH_4 , $\text{Ca}(\text{OH})_2$ flocculates negatively charged colloidal clay quite rapidly. The flocculation phenomena of lateritic clays and soils are discussed from the point of view of Comber's theory, which ascribes the anomalous flocculation of clay by lime to the formation of insol. colloidal complexes. Hydrous Al_2O_3 and Fe_2O_3 which probably occur in laterites are assumed to be colloidal ampholytes possessing isoelec. points not far from neutrality. This assumption serves to explain the mechanism of their anomalous flocculation by lime, silicate ion and phosphate ion. It is also suggested that hydrous SiO_2 , aluminosilicates, and ferrosilicates may be regarded as ampholytes. HARRY B. WEISER

From what depth in the soil can plants usefully obtain nutrients? O. LEMMER-MANN, H. WIESSMANN AND K. ECKL. *Z. Pflanzenernähr. Düngung* 4B, 233-41(1925).—Various crops were grown in deep pots, dicalcium phosphate being added to the soil at various depths down to 75-100 cm. from the surface. In other series different depths of a poor soil were superimposed on different depths of a rich soil and *vice versa*. The crops were weighed and analyzed. The general conclusion is reached that plants can take up nutrients in amts. sufficient to affect the yield from a considerable depth; and that the food supply in the subsoil cannot be ignored in plant nutrition studies. B. C. A.

Hawaii's experience in the use of fertilizer. J. A. VERREY. *Facts about Sugar* 21, 10-3(1926).—The amt. used per acre approx. doubled within 10 years by meeting special soil conditions. Better yield of sugar per acre is due to better understanding of the fertilization problem. T. MARKOVITS

The production of flour of phosphate. E. V. BRITZKE. *Contributions Sci. Inst. Fertilizers (Leningrad)*, *Bull.* 12, 31-40(1924).—This is a description of the tech. milling operations of rock phosphate. J. S. JOFFE

Effect of increased fertilizing on turnips. A. JACOB. *Z. Pflanzenernähr. Düngung* 4B, 156-61(1925).—J. quotes results to show that potash, P_2O_5 or N may be a limiting factor in turnip cultivation. By referring particularly to N and potash it is shown that, up to a limit, a slight excess of the one may overcome a deficiency of the other. Crops treated with a fertilizer contg. potash always show a high yield of dry matter and sugar. This and the cheapness of potash compared with other fertilizers in Germany indicates that a fertilizer with a high potash content is the best for economical cropping of turnips. B. C. A.

Fertilization of cigaret tobacco. A. V. OTRIGANIEV. *Inst. Exptl. Tobacco Culture. Krasnodar (Russia)* 1925, 1-12.—A report of expts. on the effects of fertilizer on yield of tobacco. The fertilizers used were sulfate of potash, acid phosphate and nitrate of soda. In all cases an increase of yield was obtained. J. S. JOFFE

Effectiveness against the San Jose scale of the dry substitutes for liquid lime-sulfur. W. S. ABBOTT, J. J. CULVER AND W. J. MORGAN. U. S. Dept. Agr., *Bull.* 1371, 1-26(1926).—Results obtained in 39 tests with dry calcium-sulfur, 13 with dry sodium-sulfur, and 11 with dry barium-sulfur under practical orchard conditions in 4 states over a period of 3 years showed that the com. samples of dry Ca-, Na- and Ba- sulfur, even when used in strengths much greater than that ordinarily employed, do not furnish a satisfactory control of the San Jose scale. The lack of effectiveness of the dry substitutes is thought to be due to their relatively lower content of the higher polysulfides and to the presence of a higher proportion of CaS_2O_3 , S and other ingredients of no practical value. W. H. ROSS

Methods of stimulating germination of western-pine seed. J. A. LARSEN. *J. Agr. Research* 31, 889-99(1925).—The delayed germination of western white-pine seed is not caused by any inherent physiological characteristic of the seed embryo or endosperm, such as after-ripening or the need for a period of rest, but by the impermeability of the seed coat. Prompt germination may be obtained from unimpaired fresh seed by (1) reduction of the seed coat by chem. corrosion, preferably by immersion

for 45 min. in concd. H_2SO_4 with thorough rinsing; (2) reduction of the seed coat by a mechanical abrasion; and (3) soaking the seed in cold water for 24 hrs. and exposing it to air freezing in winter for at least 40 days.

W. H. ROSS

Arsenic; with special reference to its use in horticulture and agriculture. A. McCUTCHEON. *Pharm. J.* 116, 109-12; *Chemist & Druggist* 104, 161(1926).—After an historical review on As compds., the use of As in horticulture, arsenical weed killers, sheep dips, the use of Paris green as an insecticide, etc., are discussed in order to show the futility and the risks involved in the use of As for these purposes. In sheep dipping, cresol dips have largely replaced As. In discussion, P. F. Kendall refers to the root of *Derris elliptica* as also being used in the prepn. of sheep dip.

S. WALDBOTT

Arsenic in horticulture and agriculture. J. JACK. *Pharm. J.* 116, 112-3; *Chemist & Druggist* 104, 161(1926).—Details are given notably as to the proper time for the successful spraying of fruit trees with Paris green. The harmful effect of As in sheep dips is pointed out. A certain New Zealand sheep dip consists of tar acid (crude PhOH) 29, paraffin oil 36, soft soap 17.5, H_2O 9.5, lanolin 8%.

S. WALDBOTT

Benzene as a larvicide for screw worms. D. C. PARMAN. *J. Agr. Research* 31, 885-8(1925).— C_6H_6 when properly used is an effective larvicide for the screw worm. It has no ill effects on the wounds and acts as a styptic temporarily to make the wound less attractive to the adult flies. When used in wounds as a larvicide for the screw worm it has not been found to be toxic to any animal.

W. H. ROSS

The determination of ρ_{H} [in soil] (HETTERSCHIJ, HUDIG) 2. The purposes and aims of agricultural chemical analysis (BROWNE) 7.

WILEY, HARVEY W.: **Principles and Practice of Agricultural Analysis.** Vol. I—Soils. 3rd ed., revised and enlarged. Easton, Pa.: The Chemical Pub. Co. 685 pp. \$7.50. Reviewed in *Ind. Eng. Chem.* 18, 325; *Chem. News* 132, 44(1926).

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Detection of methanol in alcoholic beverages. F. R. GEORGIA AND RITA MORALES. *Ind. Eng. Chem.* 18, 304-7(1926).—The methods for detg. MeOH in presence of $\text{C}_2\text{H}_5\text{OH}$ were tested and found unsatisfactory. A new method, based on that of Chapin, using KMnO_4 and H_3PO_4 was developed. The excess KMnO_4 is destroyed by the addn. of $\text{C}_2\text{H}_2\text{O}_4$ in H_2SO_4 . A modified Schiff's reagent is then added to the soln. and the characteristic color for HCHO develops after standing 10 min. Methods for the removal of any HCHO existing in the soln. to be tested are described. A list of substances interfering with the test, such as pectin, is given and methods for their removal are discussed.

C. N. FREY

Rapid determination of the gases dissolved in beer and other colloidal liquids. H. D. MURRAY. *J. Inst. Brewing* 31, 137-9(1925).—An app. for detg. gases in beer or other liquids is described and illustrated. The error due to the gas left dissolved in the liquid, such as CO_2 , O and N, in equil. with the evolved gas should be less than 1%.

B. C. A.

Tannins in the wine industry. F. LEVALLOIS. *Ann. fals.* 19, 15-28(1926).—A discussion of the advisability of regulating the nature of such products when used in wine making, with a critical review of the methods of qual. and quant. analysis available for the enforcements of such regulations, if enacted.

A. P.-C

Effect of sunstroke on the ripening of grapes and the composition of the wine made from them. E. HUGUES AND (MISS) PUJO. *Ann. fals.* 19, 40-3(1926).—Comparative analyses of the musts of grapes which had been damaged by excessive solar heat and of neighboring grapes which had been unaffected gave: reducing sugars (as sucrose) 115, 164; total acidity (as tartaric acid) 11.25, 9.00 g. per l., resp., showing that the damaged grapes had not ripened to the same extent as the others. The compn. of the 2 wines is given, the chief characteristics being lower alc. (about 3%), lighter color and higher acidity of the wine from the damaged grapes.

A. P.-C

• **Oxidizability of iron contained in some wines.** JULES WOLFF AND LUCIEN GRAND-CHAMP. *Compt. rend.* 181, 939-41(1925).—The ferrous salts, which wines normally contain, may be transformed rapidly into ferric salts under the influence of an oxidase. This appears to lead to the phenomenon of casse in the wine, a fact hitherto not recognized.

L. W. RIGGS

Addition of hops in the mash tub. J. RAUX. *Brasserie et malterie* 15, 326-30 (1926); cf. *C. A.* 19, 2861.—Two cases taken from brewing practice are described and discussed, confirming previously reported conclusions that addn. of the hops in the mash tub frequently injuriously affects the foaming qualities and mellowness of the beer and that it leads to an increase rather than to a decrease in the amt. of hops required to give character to the beer. A. PAPINEAU-COUTURE

Infection before the boiling stage [in brewing]. R. R. MORITZ. *J. Inst. Brewing* 31, 139-41 (1925).—Various experiences quoted show that decomposed wort-deposits in brewing plant used prior to the boiling stage constitute predigested and highly assimilable food for hostile organisms invading the wort or beer subsequently. Decompn. of such deposits is more rapid than that of post-boiling deposits, as they are unhopped and contain bacteria and yeasts from the exterior of the malt. B. C. A.

Removal of nitrogen from wort by yeast during brewery fermentation. H. F. E. HULTON AND J. L. BAKER. *J. Inst. Brewing* 31, 185-97 (1925).—Data obtained from 14 beers of different original gravities and different types show that neither the protein content of the unfermented wort nor the amt. of residual assimilable protein in the beer can be correlated with the development of acid-forming bacteria or wild yeasts observable either during the subsequent forcing of the beer or under the ordinary trade conditions. In discussion, H. L. HIND pointed out that the authors' figures appeared to indicate that in the case of ales of a given range of original gravity the degree of attenuation and the degree of stability followed the same order. B. C. A.

Application of chemistry to pot still distillation. S. H. HASTIE. *J. Inst. Brewing* 31, 198-215 (1925).—The increased yields of spirit obtained when various salts are added to the water used for mashing result principally from alteration in the p_H value of the mash, this being the predominant factor. The changes in the compn. of the spirit produced by altering the manner of collection of the different fractions are slight but definite. Thus, the effect of early change from foreshot to spirits gives more higher alcs., more acids, more esters, more aldehydes and less furfuraldehyde in the spirit, whereas delayed change to feints from spirit gives less aldehydes, more esters, more acids, more furfuraldehyde and less higher alc. in the spirit. As was shown by Schidrowitz and Kaye (*J. Inst. Brewing* 12, 486-511 (1906)), the simple distn. of low wines, etc., gives rise to changes in the amts. of the constituents in spirit, with elimination of impurities *via* the spent lees and H. finds that the process of distn. of the low wines and feints in the spirit still is accompanied by hydrolysis of the esters, by oxidation of the alc. to aldehyde and also to AcOH by production of esters, etc. As regards the simultaneous formation and hydrolysis of esters, no equil. point is reached in the conditions of practical distn., on account of the continual removal of the interacting substances to the distillate. Many numerical data are given. B. C. A.

Pickle fermentation. F. W. TANNER. *Canning Age* 1926, 121-3.—The process of acid fermentation, the changes in the cucumbers and the microbiology of brine pickles are discussed. T. MARKOVITS

ALLEN, PAUL W.: **Industrial Fermentations.** New York: The Chemical Catalog Co., Inc. 421 pp. \$5.00. Reviewed in *Ind. Eng. Chem.* 18, 326 (1926).

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Review of therapeutic novelties, including specialties and secret remedies, for 1925. S. RABOW. *Chem.-Ztg.* 50, 93-4, 99-100 (1926); cf. *C. A.* 19, 1929. E. J. C.

Opium production in Asia Minor. O. ZEKERT. *Pharm. Monatshefte* 7, 1-5 (1926).—The production areas notably in Persia and Afghanistan are considered and numerous tabulated data given covering the production and export of the commodity for the period 1860 to 1923. W. O. E.

Folia jaborandi. H. ESCHENBRENNER. *Pharm. Ztg.* 70, 1560 (1925); 71, 73 (1926).—Of 3 samples examd. the ash and alkaloidal content were 8.7, 5.8, 5.9 and 0.18, 0.41, 0.35%, resp. Since heat effects partial decompn. in the alk. complex expts. were carried out tending to indicate the most appropriate form of jaborandi prepn. From leaves assaying about 0.76% alkaloid, a decoction, infusion, tea and maceration (all 1:10), a maceration with NH_3 addn., tincture (1 + 5) and fluid ext. (1 = 1) assayed 0.026, 0.036, 0.037, 0.054, 0.056, 0.12 and 0.68%, resp. W. O. E.

Disintegration of pills prepared with "cenomassa" and other constituents. JOHN GRÖNBERG. *Pharm. Ztg.* 71, 55-7 (1926).—A series of expts. is described relative

to the effect of hot H_2O , 2% HCl , 0.4% Na_2CO_3 soln., solns. of pepsin, HCl and H_2O and of trypsin, Na_2CO_3 and H_2O , resp., on the disintegration of various pill mass combinations. The use of orris root, mucilage, lanolin, vaseline, burnt magnesia, wax and collodion is discouraged, while that of "cenomassa" (a mixt. of yeast and yeast ext.) is strongly recommended as a pill or tablet constituent. W. O. E.

Results of investigation of remedies, patent medicines, cosmetics and similar products. C. GRIEBEL. *Z. Nahr. Genussm.* 50, 374-8(1925).—A report of ingredients found in various German proprietaries. WILLIAM J. HUSA

Indigenous and tropical medicinal plants. C. INVERNI. *Boll. chim. farm.* 64, 738-48(1925).—A list of Italian plants having the same pharmacol. action as the pharmacopoeial vegetable drugs. MARY JACOBSEN

Further researches on the preservation of insulin. E. TROCELLO AND A. CRUTO. *J. Trop. Med.* 29, 1-2(1926).—"Insulin should be kept in solid form because, as shown by expts., it does not undergo any alteration at a high temp., and can be preserved for an unlimited length of time. The cause of the difference in preservation of insulin in liquid form lies in the fact that hydrolysis of the product causes a deterioration in its pharmacodynamic properties." FRANCES KRASNOW

Determination of the strength of pituitary extracts by their antidiuretic properties. W. KESTRANEK, H. MOLITOR AND E. P. PICK. *Biochem. Z.* 164, 34-43(1925).—The strength of hypophyseal preps. can be assayed by the antidiuretic effects. Since the antidiuretic activity is parallel to the property of causing contraction of the uterus, results obtained by both these methods yield important quant. information of the therapeutic value of the prepn. The most sensitive method for demonstrating the inhibition of diuresis is on dogs with bladder fistulas. By this procedure, a study of the curve of diuresis reveals also the presence in the prepn. of such impurities as adrenaline or histamine. Another, less sensitive though still quite reliable, method is the detn. of the inhibition of diuresis in rabbits. Vögtlin's acetone dry prepn. is used as the standard with which the activity of other preps. is compared. The uterine method differs from the diuresis method of assaying the strength of pituitary ext. only in the fact that the isolated uterus responds to much smaller concn. of the active material. Commercial preps. tested by the antidiuretic effect reveal as much variability as when tested by the isolated uterus. It is recommended that preps. which have been on the market a year since first put out should be restandardized with preps. contg. coagulable protein or a high albumose concn. should not be permitted for use. Furthermore, the pituitary ext. should be preserved in hard-glass ampules so that the necessary acidity (pH 3-4) would be maintained unaltered over a long time. S. MORGULIS

Spectrographic identification of alkaloids. MAURICE DE LAET. *Ann. nat. légale* 1, 148-58(1921); *Rev. droit pénal criminel. arch. intern. méd. légale* Nos. 3, 4, 5 (March, April, May, 1921).—A series of spectra obtained with light from an arc with Fe electrodes, filtered through solns. of an alkaloid of const. concn. but increasing thickness, shows a gradual widening of the absorption bands, which is absolutely characteristic for each alkaloid, and which is best represented by Hartley's graphical method. The data required are best obtained by detg. the extinction coeffs. by means of a Hilger spectrophotometer; but a considerable personal element is introduced in the appreciation of identity of shade in comparing the lines. The method is extremely sensitive, and can be used on 0.001-0.00006 N solns. A. PAPINEAU-COUTURE

Terpeneless essential oils. M. VIARD. *Parfums de France* No. 35, 10-2(Jan., 1926).—Brief outline of their prepn. and properties. A. PAPINEAU-COUTURE

Oil of cedar from British East Africa. ÉTABLISSEMENTS A. CHIRIS. *Parfums de France* No. 35, 22(Jan., 1926).—A sample of very dark brownish red oil and a sample of light golden-yellow oil, both of which contained enough crystd. cedrol at ordinary temp. to make a semi-solid mass, had the following consts. resp.: d_{20} 0.9712, 0.968; $[\alpha]_D^{20}$ unreadable, $-38^\circ 30'$; acid no. 1.82, 1.54; ester no. 1.75, 1.4; ester no. after cold for mylation 92.75, 87.5; alcs. (as cedrol) 38.55, 36.27%; both are sol. in 5.3 vol. of 90% alc. The crystals sep'd. by draining the oil m 86° and gave cedrol phenylure than m 106-7°. The samples are oil of *Juniperus procera*, Hochst, which differs from oil of *J. virginiana*, L., by a much higher cedrol content, resulting in higher d . and lower $[\alpha]$. A. PAPINEAU-COUTURE

* **Oils of the chaulmoogric group.** EM. ANDRÉ. *Compt. rend.* 181, 1089-91(1925).—Oils from 3 species of *Hydnocarpus* and from 1 species each of *Tarakogenos*, *Asteristigma*, *Oncoba* and *Carpotroche* gave consts. within the following ranges: d . 0.9217-0.9499, n_D 1.4725-1.4780, rotatory power $+44^\circ$ to $+61^\circ 40'$, m . p. 20.5-41°, sapon. index 183.7-201.0, I index 82.8-106.1. L. W. RIGGS

Evaluation of commercial vanilla oleoresins. J. B. WILSON AND J. W. SALE. *Ind. Eng. Chem.* 18, 283-5 (1926).—Authentic vanilla oleoresins for use as standards were prepd. by extg. 3 varieties of vanilla beans with a suitable solvent and recovering the solvent under reduced pressure. These authentic samples, together with com. vanilla oleoresins, were prepd. in different ways for analysis and the resulting products were subjected to analysis. The significance of the analytical data is discussed and those methods of analysis which proved to be useful in evaluating the com. samples are listed.

Thor Emanuel Ekecrantz. 70 years. ANON. *Svensk Farm. Tids.* 30, 18-20 (1896).—A biographic sketch with photograph of one of Sweden's foremost pharmaceutical chemists.

L. W. RIGGS

A. R. ROSE

Hydrogen-ion concentrations of some injection liquids; influence of sterilization. L. ROY. *J. pharm. chim.* [8], 1, 525-32 (1925).—*Cocaine-HCl* (A) is acid in aq. soln., because of partial hydrolysis into base and HCl. Heating increases acidity and recbly but distinctly saponifies the base, splitting off BzOH and MeOH. Alky. of the glass, and higher temp. of sterilizing accentuate this decompn. With *novocaine* (B), *stovaine* and *atropine sulfate* (cf. Hardy, *C. A.* 16, 4299), the effect of temp. sterilization on p_H is similar to that with A. Solns. of B heated to 100-120° in alk. glass yielded by decompn. BzOH and small quantities of NH_3 . (This was set free by MgO and detd. by absorbing the vapor in Nessler's soln.) On mixing unsterilized solns. of 1% A (p_H 5.20) and 5% dextrose-serum (p_H 6.20), p_H of the mixt. became 4.45. Sterilizing it now for 30 min. at 100°, p_H = 4.20; then for 20 min. at 120°, p_H = 3.90. High acidity in injection liquids may account for occasional accidents in surgical operations; it also lessens the anesthetic power; hence the advantage of neutral or slightly alk. solns. (Régner, *C. A.* 19, 134, 352), which allow the use of much smaller doses.

S. WALDBOTT

G. Bruylants (1850-1925). "G. M." *J. pharm. chim.* [8], 1, 552-4 (1925).—An obituary.

S. WALDBOTT

Arsenical emetics of pyridine, quinoline and some alkaloids. L. DEBUQUET. *J. pharm. chim.* [8], 1, 571-4; 2, 5-13 (1925); cf. Yvon, *C. A.* 4, 2094; 5, 1823.—D. prepd. the emetics of *As* and *pyridine* (A), *quinoline* (B), *strychnine* (C), *codeine* (D), *morphine* (E), *cocaine* (F) and *quinine* (G). To prep. A and B, boil equiv. wts. of $H_2C_4H_4O_6$ and base with H_2O , add the equiv. wt. of As_2O_3 , boil, then cool to crystn. To prep. C, D and E, boil $H_2C_4H_4O_6$ and As_2O_3 with H_2O , then add an equiv. wt. of the alkaloid and boil again. In F, add the cocaine to the acid soln. cooled to 60-70°. Evap. the final soln. to dryness *in vacuo* over H_2SO_4 . In G, quinine slowly dissolves in the cold acid soln. finally warmed to 60°; G crystallizes on cooling. The crude yields in prepg. A to G were, resp. 73.8, 86.8, 81.9, 67.9, 62.6, 91.1 and 44.7%. A, $C_4H_3AsO_6 \cdot C_5H_5N$, soly. in H_2O 9.6% at 15°; $[\alpha]_D^{22} + 18.5^\circ$; if calcd on the (active) group $C_4H_3AsO_6$, $[\alpha]_D + 25.03^\circ$. B, $C_4H_3AsO_6 \cdot C_9H_7N$, soly. in H_2O 4.2%; $[\alpha]_D + 15.83^\circ$; calcd. on $C_4H_3AsO_6$, $+25.03^\circ$. C, $C_4H_3AsO_6 \cdot C_{21}H_{21}N_2O_2 \cdot H_2O$; soly. in H_2O 0.48%; in H_2O-Me_2CO soln., $[\alpha]_D - 6.69^\circ$. D, $C_4H_3AsO_6 \cdot C_{18}H_{21}NO_3$; soly. in H_2O 2.1%; insol in Me_2CO ; $[\alpha]_D^{22} - 67.17^\circ$. E, $C_4H_3AsO_6 \cdot C_{17}H_{19}NO_3 \cdot 2H_2O$; sol. in H_2O ; $[\alpha]_D^{15} 62.01^\circ$; for the anhyd. salt, -66.39° . F, $C_4H_3AsO_6 \cdot C_{17}H_{21}NO_4 + 0.37-0.39\% H_2O$. Soly. in H_2O 21.02%; $[\alpha]_D - 38.77$, varying with concn. G, $(C_4H_3AsO_6)_2 \cdot C_{20}H_{24}N_2O_2 \cdot 2H_2O$; soly. in H_2O (15°) 1.23%; $[\alpha]_D - 98.75^\circ$. The aq. solns. of all these compds. are acid to litmus; this may limit their therapeutic uses. A list of 12 references is given.

S. WALDBOTT

Preparation of amorphous iodobismuthate of quinine and its analysis. M. FRANCOIS AND MLE. L. SEGUIN. *J. pharm. chim.* [8], 2, 59-69 (1925).—The prepn. of the crystd. salt by F. (*C. A.* 16, 3663) is restated. The amorphous salt, official in the Codex, is prepd. similarly except that crystn. is avoided by leaving the ppt. in contact with the mother liquor for only a short time. The process is given in detail, as are also the assay methods for Bi, I and quinine. The compn. of the ppt. is approx. $(BiI_3)_2 \cdot C_{20}H_{24}N_2O_2 \cdot 2HI$.

S. WALDBOTT

Presence of lecithin in fats. E. BOEDTKER. *J. pharm. chim.* [8], 2, 107-13 (1925).—By careful oxidation with excess of fuming HNO_3 and detn. of P B. finds lecithin (L) present in 15 samples of vegetable fats (not in castor oil) and in 11 samples of animal fats. Those richest in A are linseed oil (0.53-0.63%), sunflower and almond oils, butter, whale and cod-liver oils. Linseed oil gave 0.15% of ash, chiefly $Ca_3(PO_4)_2$; still, Ca may not be combined in the oil in this form. A Kjeldahl detn. of N in the oil gave 0.077-0.082% N, which would correspond to 4.5% of A. The larger part of this N must be in the form of an albumin-A compd.; in further support of this, the oil gave a pos. test for S.

S. WALDBOTT

The influence of chemical constitution on the odor of mustard oils (DYSON) 11A. The colloid chemistry of Bi and its compounds (KUHN, PIRSCH) 2. Emulsions: their theory and practice (BRYANT) 2. Detection of As in cacao (LÜHRIG) 7. Preparation of benzoic acid (LORGES) 12.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Saltpeter (KNO_3) production in Germany 200 years ago. FRITZ HILDEBRANDT. *Z. angew. Chem.* 39, 90-2(1926). E. J. C.

Salt pans of South Africa. A. J. PELLING. *J. Chem. Met. Soc. S. Africa* 25, 297-308(1925).—A phase rule study of the brines from the Pretoria and Matzap salt pans. The former contains on the av. NaHCO_3 0.8%, Na_2CO_3 8.2, NaCl 15.5, and H_2O 75.5%. For the recovery of the salt and soda the brine must first be concd. to 17.7% Na_2CO_3 and 15% NaCl . This may be effected by agitating the brine with suitable proportions of the dried salts obtained by solar evapn. or by evapn. of the brine to the required d., followed by cooling to 30° , with agitation, so that the $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ deposited at 100° re-dissolves while NaCl is pptd. pure. On further cooling to 15° about 61% of the soda crystallizes out as decahydrate; a recovery of over 90% may be effected by adding $1/17$ of its weight of water and cooling to 0° and an almost complete recovery by cooling to -5° . The monohydrate may be obtained pure from the soln. by evapn. at 100° until the clear liquid contains 9% Na_2CO_3 and 23.5% NaCl , the crystals being removed from the hot liquor as they form. An av. brine from the Matzap pan contains Na and Mg chlorides, sulfates and nitrates; for the recovery of MgCO_3 and NaNO_3 from this soln. slaked lime equiv. to the sulfate content is stirred in and the ppt. of gypsum and $\text{Mg}(\text{OH})_2$ is carbonated to obtain a mixt. of Ca and Mg carbonates. The purified brine is treated with more slaked lime, equiv. to the remaining Mg, and the pure $\text{Mg}(\text{OH})_2$ so formed is carbonated. Na_2SO_4 is added to the filtrate to ppt. the lime as gypsum. The soln. is then evapd. until it is just satd. with respect to NaCl and NaNO_3 ; on cooling nitrate alone crystallizes. B. C. A.

The fixation of atmospheric nitrogen. H. C. HETHERINGTON. *J. Chem. Education* 3, 170-6(1926).—General. E. J. C.

Nitrogen fixation in the state of Washington. H. K. BENSON. *Chem. Met. Eng.* 32, 935(1925).—Statistics are given on the quantity of hydroelec. power available for N fixation in the state of Washington. W. H. ROSS

Some factors affecting the fixation of nitrogen as sodium cyanide. E. W. GUERNSEY, J. Y. YEE, J. M. BRAHAM AND M. S. SHERMAN. *Ind. Eng. Chem.* 18, 243-7(1926).—The effects of the following variables on NaCN formation were studied: silica in the charge, CO in the gas, rate of N_2 supply, proportion of Fe catalyst, source of C. F. C. Z.

Note on the properties of active carbon. P. HONIG. *Chem. Weekblad* 23, 66-8 (1926); cf. Nellensteyn C. A. 20, 774.—N.'s expts. on the selective adsorption of graphite and diamond are inadequate. Carboraffin (I) and norite (II) cannot be considered to be elementary C in view of their high H and O content. The aliphatic nature of I and the aromatic of II follow from their mode of prepn. The nature of the oxidation products is not a proof of the constitution, since ash (Fe) and porosity of the C have a considerable influence on the course of the oxidation. M. J.

Activated charcoal. ED. URBAIN. *Recherches et inventions* 7, 65-90(1926).—Description of the properties and com. applications of activated charcoals. A. P.-C.

The adsorption of poisons on charcoals. II. ELIZABETH DINGEMANSE AND ERNST LAQUER. *Biochem. Z.* 160, 407-16(1925).—The comparative adsorptive powers of a no. of com. charcoals for strychnine sulfate, HgCl_2 , morphine, $\text{H}_2\text{C}_2\text{O}_4$ and methylene blue indicated that the new "supra-norite" (C. A. 19, 2729) in all cases was the strongest. F. A. CAJORI

Occurrence and commercial purification of graphite. W. LANDGRAEBER. *Brennstoff-Chem.* 6, 355-6(1925).—Deposits in Europe and N. America are discussed briefly. The most important deposit commercially is in Ceylon, mainly because of its purity and easy workability. Purification of raw graphite was formerly effected by grinding and sieving, which resulted in considerable loss of fines. This is now recovered by flotation methods. J. D. DAVIS

Natural pearls and cultivated pearls. RYZIGER. *Ann. fals.* 19, 5-15(1926).—Description of the structure of natural and of cultivated pearls, and of the various methods of distinguishing between them. A. PAPINEAU-COUTURE

Hydrating lime for bleach manufacture. D. F. RICHARDSON, W. E. EMLEY AND J. M. PORRER. *Chem. Met. Eng.* **32**, 936-7(1925).—A study was made of the properties and keeping quality of bleach prepd. from samples of CaO that had been slaked with varying proportions of water. The results showed that in order to produce an entirely satisfactory product, the amt. of water used in hydrating the CaO should be carefully controlled, and that the best product is obtained when the CaO is slaked with 45 to 50% of its wt. of water. W. H. ROSS

The scientific study of the chemical technology of artificial horn. O. MEIER. *Caoutchouc & gutta-percha* **22**, 12,908-13(1925); **23**, 12, 995-6(1926).—A review, with numerous references, of the chemistry and the manuf. of artificial horn (galalith), including a diagram of the process used at Harburg and at Reickenau. C. C. DAVIS

Preparation of crystalline alkali ferrocyanides from their solutions. NAAMLIOOZE VENNOOTSCHAP STIKSTOFBINDINGSINDUSTRIE "NEDERLAND." Dutch 13,904, Dec., 1925. The soly. of alkali ferrocyanides in water is diminished one-half (between 10° and 50°) on addition of a mixt. of alkali carbonate and hydroxide, e. g., 15.7 g. NaOH and 12.1 g. Na₂CO₃ per 100 g. soln. lower the soly. of Na₄Fe(CN)₆ to only 1.44 g. A rather high end temp. of the crystn. process (30°) is hereby possible, on account of the low dc/dt below 30°. By using appropriate amts. of material and adding metallic iron to the original reaction mixt., the necessary carbonate and hydroxide can be made to be automatically present in the product.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The glass industry and future development. T. C. MOORSHEAD. *Pottery Gazette (Glass Trade Rev.)* **50**, 1722-6(1925).—A model glass-melting tank which will be built by the research department of the United Glass Bottle Manufacturers, Ltd. The design has many novel features and it is thought that the fuel consumption will be cut in half. P. D. H.

The use of lime in glass. G. O. SMITH. *Glass Ind.* **6**, 271(1925).—Lime is used in making almost all kinds of glass. It imparts smoothness and brilliancy and increases resistance to chem. agents. Increasing the lime increased the fusibility to a certain extent, and tends to prevent cords but also increases the tendency to devitrify. Glass with high lime is hard and brittle and must be annealed more carefully. There is a difference of opinion as to whether limestone or burnt lime should be used. The merits of both are discussed. Also the question of how much lime to use is open. The requirements of different types of machines will det. this. F. G. J.

Glass chipping. WALTER SMITH. *Glass Ind.* **6**, 277(1925).—An ornamental translucent non-transparent glass can be made by chipping. The surface is first sand-blasted and then coated with glue. It is then dried and gradually heated in a gas-fired oven. The glue adheres and shrinks as it dries, finally flaking off and taking a chip of glass with each flake. By repeating the sand blasting and chipping a still more beautiful finish is obtained. F. G. J.

Modern street-lighting glassware. ANON. *Glass Ind.* **6**, 278(1925).—A description of the requirements and the process of manuf. of globes and canopies. F. G. J.

Properties of glass as an industrial material. E. BERGER. *Z. Ver. deut. Ing.* **70**, 37-43, 129-32(1926).—A general consideration of the characteristics and nature of glass is given. With data, mostly previously published, B. compares the phys. properties of glass with those of the common metals at normal temps. and with those of fused salts and amalgams at higher temps. While the variety of glass-forming elements is large, the chem. compn. of a glass must remain within fairly narrow limits to be workable, resistant to the action of water, and slow to crystallize. Röntgen-ray patterns indicate no definite mol. structure of pure glass. The change in complexes in glass during cooling is compared to that taking place in the passage of a colloid sol to a gel. H. F. K.

Continuous batch feeder in successful operation on window glass tank. ANON. *Glass Ind.* **7**, 4(1926).—A device that has been in use for several years at the St. Louis plant of the Mississippi Glass Co. The cullet is mixed with the batch and both are held in a tank or hopper above the dog house. A 6-inch steel pipe leads from it at an

angle of 60°. At the lower end is a sleeve which can be raised or lowered by a chain and counterweight. Raising the sleeve increases the flow of batch to the dog house. A heavy pull is maintained on the tank. Scum formation caused very little trouble. The life of the tank is as long as others where the pull is much less. Distribution of refining is excellent.

Making pyrex glass at Corning Glass Works. S. G. ROBERTS. *The Glass Worker* 45, 15(1925).—A long illustrated descriptive article.

Changes give a tank 75% more glass output on less coal. ANON. *Ceramic Ind.* 5, 520-1(1925).—Changes in design of a glass tank at the Carr-Lowrey Glass Company's plant at Baltimore, Md. increased the capacity from 12 tons of melted glass, with 1½ tons of coal, to 21 tons of melted glass, with 12 tons of coal. The changes were (1) lowering of the crown, 18 inches, (2) lowering of the port, which brought the flame closer to the glass, (3) increasing of port area, which gave a 30% increase of flame area, and (4) increasing of the checker area, about 50%.

Natural gas as fuel in glass furnace stack. J. P. SCHELLHAUS, JR. AND G. J. O'NEILL. *Glass Ind.* 7, 5(1926).—A 44-year-old 12-pot stack has been remodeled to heat with natural gas instead of coal. A single No. 6 Maxon Premix burner is used with 6" gas-air mixt. outlet. At 40 pots of 2200 lbs. each a week, the present rate 8.6 cu. ft. of gas is burned per lb. of glass melted.

Dust counting in the pottery industry with special reference to health consideration. E. L. MIDDLETON. *Trans. Ceram. Soc. (England)* 24, 348-60(1925).—Methods of detg. the amts., sizes and kinds of dust in the air of mines and potteries are given. The Owens app. for dust collection and examn. is described.

The minerals of bentonite and related clays and their physical properties. C. S. ROSS AND E. V. SHANNON. *J. Am. Ceram. Soc.* 9, 77-96(1926).—Bentonite is the result of devitrification and chem. alteration of glassy volcanic ash or tuff. It is commonly composed of montmorillonite but less often of beidellite. It contains no gel colloids and few of the crystal particles are as small as colloid size. It has high adsorptive properties. Such clay minerals resemble micas but are not so variable chemically. Montmorillonite is $(\text{Mg}, \text{Ca})\text{O}, \text{Al}_2\text{O}_3, 5\text{SiO}_2, n\text{H}_2\text{O}$. Beidellite is $\text{Al}_2\text{O}_3.3\text{SiO}_2.n\text{H}_2\text{O}$, where n = about 4 and Al_2O_3 may be partly replaced by Fe_2O_3 . A third micaceous clay mineral is halloysite, $\text{Al}_2\text{O}_3.2\text{SiO}_2.n\text{H}_2\text{O}$. It is all crystalline and has high birefringence.

An ultramicroscopic motion picture study of the relation of colloidal content and plasticity in clays. W. G. FRANCE. *J. Am. Ceram. Soc.* 9, 67-76(1926).—The app. included (1) a Bell and Howell Film Camera, with F 3.5 lens and using 16 mm. Cine Kodak film, (2) a Siedentopf Cardiod Ultramicroscope, (3) arc light with cooling cell etc. The ultramicroscopic motion pictures taken of the colloidal fractions of the suspensions showed marked differences in the four clays studied, the relative order of decreasing plasticity being indicated thus: English china clay, S. Car. kaolin, N. Car. kaolin and semi-flint fire clay. "The results tend to support the idea that a definite relation exists between the colloidal content of a clay and its plasticity."

Elimination of limestone from clay. R. A. HORNING. *J. Am. Ceram. Soc.* 9, 110-3(1926).

Influence of ferric oxide and titanium dioxide on pure clays. A. H. KURCHLER. *J. Am. Ceram. Soc.* 9, 104-13(1926).—On kaolin and fire clays cone fusion tests seem to indicate about 6 or 6½ cones lowering of deformation point with the addn. of 10% Fe_2O_3 , also a lowering of 2-3 cones with the addn. of 5% TiO_2 . On a % basis the fluxing actions of Fe_2O_3 and TiO_2 seem to be about the same. No eutectic was revealed.

Influence of the composition of body and glaze on the physical properties of a true porcelain. P. W. LEE. *J. Am. Ceram. Soc.* 9, 97-103(1926).—Lee aimed to produce a better, true porcelain at cones 10-12. Conclusions: (1) Glaze application is better on jiggered than on cast ware. (2) Warpage is greater in cast ware. (3) For any given body there is a temp. which gives best color. (4) For best working conditions the total of alk. earth fluxes must not be over 1%. Not over 0.4% MgCO_3 must be used to improve color. (5) Vitrification is increased by increasing feldspar or flint or by decreasing clay. (6) Fine grinding of glaze lowers the fusion point but increases tendency to craze. (7) ZnO increases whiteness but decreases translucency and produces rough surface.

Refractories at Mellon Institute. M. C. BOOZE. *Iron Age* 117, 479-81(1926).—A list of publications of the refractories fellowship is included.

Refractories for blast furnaces and coke ovens. M. C. BOOZE. *Blast Furnace & Steel Plant* 14, 86-8(1926).

Use of zirconia as a refractory. R. K. *Rev. chim. ind.* 35, 14-6(1926).—Brief outline of the manuf. of refractory ZrO_2 crucibles. A. PAPINEAU-COUTURE

Electric furnace linings (Hughes) 4.

SEARLE, A. B.: **The Chemistry and Physics of Clays and other Ceramic Materials.** New York: Van Nostrand Co. 695 pp. Reviewed in *Expt. Sta. Record* 52, 811.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Development of portland cement manufacture since the war. PAUL HANSEL. *Z. angew. Chem.* 39, 81-90(1926). E. J. C.

Theory of the setting of hydraulic cements. M. BAYKOFF. *Compt. rend.* 182, 128-9(1926).—B. concludes from expts. that the setting of cement occurs in three successive stages: (1) dissoln. or satn. with sol. matter, (2) colloidalization corresponding to the initial setting, and (3) crystn., during which the gels change to cryst. aggregates and which corresponds to the actual hardening process. P. B. PLACE

Method of testing concrete blocks. H. G. LLOYD. *Engineering* 121, 55(1926).—A new method of detg. the normal consistency of neat cement mixts. is given. A method of prepg. concrete blocks for testing and the results of crushing tests are described. I. B. M.

Bond between concrete and steel. D. A. ABRAMS. Structural Materials Research Lab. *Bull.* 17, 20 pp.; *Proc. Am. Soc. Testing Materials* 25, Pt. II, 256-82(1925).—The investigation deals with the bond between concrete and steel and its relation to reinforced concrete construction. The principal conclusions are: (1) Slipping of a steel bar embedded in concrete begins at a bond stress of 10 to 15% of the compressive strength of the concrete, but considerable additional load is taken before the ultimate bond resistance is reached; (2) bond and compressive strength increase with age from 7 days to 1 year; (3) water-ratio of the concrete affects bond and compressive strength similarly; (4) for very rich mixts. the bond fell off; (5) the use of 4% of the 28-day compressive strength as the working stress in bond for plain bars is satisfactory; (6) crude oil causes a reduction in bond and compressive strength; (7) addn. of hydrated lime decreases compressive strength and bond; (8) the pull-out test is satisfactory for comparative studies of bond. I. B. M.

Manufacture of special tar for road surfacing. CH. AB-DER-HALDEN. *Chimie et industrie* 15, 14-7(1926).—Tar for road surfacing should have the following compn: H_2O 0.1%; distn. test 0-20° < 0.1, 200-70° 10.5, 270-360° 15-25; pitch 60-75%; naphthalene < 0.5%, phenols and cresols < 0.5%. Tar meeting these requirements is best obtained by distn. of crude tar by A.'s process (*C. A.* 16, 1498). It can be applied by charging into sprinkler tanks at 160°, the exhaust from the motor being used to keep the tar hot. A. PAPINEAU-COUTURE

Coal-tar pitches and asphalt as road-building materials. F. MÜLLER. *Gas u. Wasserfach* 69, 52-6(1926).—Discussion of properties of pitches and asphalts and of methods of road construction. W. B. PLUMMER

Nomenclature of roofing papers. RIEHM. *Teer* 24, 40-1(1926).—Criticism of Mallison (*C. A.* 20, 810). W. B. PLUMMER

Testing raw paper and impregnating agents for roofing papers. RIEHM. *Teer* 24, 39-40(1926).—Detn. of the amt. of impregnating agent in papers by repeated extn. with creosote oil and finally with benzene showed about 12% left in the paper. For 5 grades of raw paper the data for a 20 × 20-cm. piece were as follows. Wt. of dry paper 23.8, 18.1, 13.5 g., wt. 2 days after impregnation with pitch-anthracene oil mixt. 162, 134, 114 g., wt. after extn. with creosote and benzene, 26.5, 20.0, 15.0 g., wt. of impregnated paper after 14 days at room temp. exposed to air on all sides, 160.8, 133.0 and 113.2 g. W. B. PLUMMER

Preparing asphalt for roofing-manufacture. R. A. HASTINGS. *Chem. Met. Eng.* 32, 875(1925).—A reducing still 8' × 22' is fired along 1 side with surface-combustion burners. The temp. can be controlled accurately at 400° F. The cost (price and kind of gas not given) of gas is 7% of the total cost of producing a roll of finished roofing. W. F. FARAGHER

Brick and cement containing colloidal silicic acid. NAAMLOOZE VENNOOTSCHAP KUNSTZANDSTEENFABRIEK "ARNOUD." Dutch 13,907, Dec. 15, 1925. Dune or river

sand is treated with steam at 20–25 atm. pressure until the surface of the grains is gel atinized (12–16 hrs.), then pressed in forms or used for the prepn. of mortar. The mass hardens on drying.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Practical results of the newer coal researches. IWAN BOLIN. *Meddel. Sveriges Kem. Ind-kontor.* 8, 95–102(1925).—A brief statement of progress in production of fuel oil from coal by low-temp. distn., direct hydrogenation and treatment with H_2 and CO. A. R. ROSE

Coals in the Union of South Africa. J. KERSTEN. *Rev. universelle mines* 9 [7], 6–26(1926).—A description of the various fields, including the geology, methods of exploitation and analyses of the coals. C. C. DAVIS

The Lancashire Coalfield-Smith Seam. ANON (Dept. Sci. Ind. Research). Fuel Research Bd., *Phys. and Chem. Survey of Natl. Coal Resources* No. 5, 30 pp. (1925).—A description and geological sketch map of the Lancashire Coalfield are given together with diagrammatic cross-section figures of the Smith, Rushy Park and Dandy Seams. These are thin coal seams varying from 19 to $52\frac{1}{2}$ in. in thickness and in some localities are cut into by narrow dirt or by fusain bands. Samples were collected from different sections of each seam and from each seam as a whole. Proximate and ultimate analyses of the samples, analyses of the ash, m. ps. and colors of ash, nature of coke formed by the different samples, and comparative studies of the data are summarized in some 35 tables. Sink and float and coal-washing tests were made with some of the samples. Microscopical examns. were made of the coal from the Smith Seam and 2 pictures of coke formed from this strongly caking coal are given. The volatile matter varied from 36 to 40%, ash usually from 1.4 to 4.3%, though 2 samples gave over 10% ash. The compn. of the ash from different horizons in the seams varied, but the m. ps. were practically const. throughout. N ran about 1.6%, calcd. to dry coal. S content varied from 1.11 to 3.51% except in the Dandy Seam where S was high, 6.37%. As only a small proportion of the S in the Dandy Seam occurs in lenticular form this coal could not be purified to any great extent by ordinary washing. After froth-flotation tests this coal was still too high in S to make metallurgical coke, although the high % ash in fine slack from this seam was greatly reduced by the flotation process. Float-and-sink tests on Atherton District coal showed it could be purified by washing. The calorific values of the samples varied from 13,730 to 14,430 B. t. u. per lb. The practical value of these studies in the future com. development of thin coal seams is emphasized. W. W. HODGE

Influence of moisture on the spontaneous heating of coal. J. D. DAVIS AND J. F. BYRNE. *Ind. Eng. Chem.* 18, 233–6(1925); cf. C. A. 19, 1339.—Bituminous coal dried in an inert atm. or *in vacuo* will invariably heat spontaneously from 70° in O, provided the temp. of drying has not exceeded 140° and the time of drying has not been excessive, since the latter apparently alters the colloidal nature of the coal so as to prevent O adsorption and oxidation. Coals "as received" contg. 2–10% moisture will not heat in dry O, showing instead actual cooling, while in O satd. with H_2O at room temp. the coal at 70° heated with low rates of circulation but cooled slightly at high rates, showing in the above cases the large effect of the latent heat of evapn of the H_2O in the coal. W. B. P.

The oily bitumen and solid bitumen in bituminous coal. H. BROCHE AND T. BAHR. *Brennstoff-Chem.* 6, 349–64(1925).—A critical review of the work of Bone, Pearson and Quarendon (C. A. 18, 2593), in which the solid and not the oily bitumen was found responsible for coke cementing power of coal, contrary to previous findings of Fischer and Broche (C. A. 19, 717, 1767). New exptl. evidence is included to show that the bitumens tested on a coked residue (Bone's method) do not show the same coking tendency (cementation and swelling) as when tested on extd. residues (Fischer's method). It is argued that the logical inert on which to test the extd. bitumens is the extd. coal residue since with this a synthetic substance similar to the original coal is obtained. Furthermore Bone's coking test method differed from that of Fischer and might be expected to yield different results. J. D. DAVIS

Microscopical structure of anthracite. H. G. TURNER. *Trans. Am. Inst. Mining Met. Eng.* 71, 127–48(1925). E. J. C.

Artificial after-drying of peat. G. STADNIKOV, P. MEHL AND W. PUTZLO. *Brennstoff-Chem.* 6, 333–6(1925); cf. C. A. 19, 389.—Artificial drying of peat beyond the air-

dry state (25% H_2O) results in lowering its bitumen content with Fe_2O_3 (Russ. pat. 76,138) loses more rapidly by oxidation uncoagulated peat. This is due to catalytic action of Fe_2O_3 . bath a sample of the former showed 215° and the latter 18 reached 215° . Samples air-dried at room temp. were after-d at room temp. and (b) at temps. up to 150° in air or CO_2 . (a) was 4.1%, the acid no. 32.6 and the iodine no. 49.8. In 3.8% to 1.7% with increasing drying temp., acid no. 43.7 to 62.4 and 1 no. 48.8 to 26.4. Drying in CO_2 gave similar results except that the iodine no. decreased only slightly with increasing temp. of drying. Sapon. nos. of the samples also were detd. Drying in air at elevated temps. both oxidizes and hydrolyzes the peat bitumens; oxidation but not hydrolysis is avoided by drying in CO_2 . J. D. DAVIS

How we utilized the largest output of natural gas on record. H. J. STRUTH. *Natural Gas* 7, No. 1, 4, 5, 62(1926).—The total output of natural gas for the year 1924 was about 1300 billion cu. ft. This natural gas was utilized as follows: industrial consumption 34%; consumption by gas and oil companies for drilling and pumping 27%; domestic consumption 22%; unaccountable loss 12%; converted to gasoline 3%; other uses 2%. The industrial consumption is again subdivided according to the various industries. E. G. MEYER

Measurement of raw gas and its distribution to coolers, washers and purifiers. R. GEIPERT. *Gas u. Wasserfach* 69, 61–3(1926).—Gas is measured and its distribution controlled by the pressure drop across calibrated plate type valves or dampers. W. B. PLUMMER

The corrosion and rusting of wrought iron and steel gas barrel. ALBERT STOKES, et al. Report of the Wrought Iron Tubing Inquiry Committee. *Gas J. (Supplement)* 171, 3–12(1925).—Samples of metal were immersed for definite periods of time in siphon liquor and in distd. water. Results show that the most desirable material is wrought iron of the very best quality without any admixt. of steel. Exposure in a stream of moist coal gas gave the same result. Some samples of material which had given poor service were found to be heterogeneous, a mixt. of wrought iron and steel. Tests carried out in a closed bottle system, with different electrolytes, different gas mixts., in which the samples were subjected to complete immersion, to the action of a film of the electrolyte and to the action of a current of the gas without and with water, gave results from which conclusions were drawn as follows: (1) CO_2 is not an essential agent for oxidation. Its presence to the extent of $2\frac{1}{2}\%$ in a wet gas contg. 1% of O accelerates oxidation about 10%; (2) CO_2 slowly removes Fe in the form of a soln. of $Fe(HCO_3)_2$; (3) liquid water is an essential agent of corrosion. Its effect is more marked when present in small than in large quantities; (4) none of the products of corrosion has a retarding effect upon further corrosion; (5) the relative rates of corrosion are, very pure iron, 100, wrought iron, 150, steel, 190; (6) $(NH_4)_2SO_4$ considerably accelerates the rate of oxidation; (7) the chief agencies of corrosion are O, H_2O and certain compds. of NH_3 ; (8) rust is formed even with wrought iron although more slowly than with steel; (9) troubles from transported oxides are to be avoided by (a) covering internal surfaces with protective coating, (b) removing H_2O completely from the system, and (c) limiting the amt. of O in the finished gas. A. E. GALLOWAY

Absorption of carbon dioxide from gas mixtures containing it by means of water under pressure. C. ZERBE. *Brennstoff-Chem.* 5, 53–6(1924).—After a detailed account of the work of Blair, Wheeler and Reilly (C. A. 17, 3071) Z. describes an attempt to remove completely about 10% of CO_2 contained in a mixt. of CO and H_2 by scrubbing the gas, under a pressure of 150 atm., with water. The attempt was unsuccessful and the quantities of CO and H dissolved by the water were excessive. B. C. A.

Determination of paraffin hydrocarbons in technical gas analysis. H. TROPSCH AND E. DITTRICH. *Brennstoff-Chem.* 5, 325(1924); cf. C. A. 19, 719.—The use of wire-form Cu oxide in the silica combustion tube leads, sooner or later, to the formation of Cu silicate. Lining the tube inside with thin asbestos paper is not altogether satisfactory, but good results are obtained by passing a mixt. of O and the gas to be analyzed through a quartz tube contg. asbestos coated with a small quantity of Cu oxide, the possibility of explosion being eliminated by inserting thin Al wire into the capillaries. B. C. A.

Benzene research. Second report of the Joint Benzole Research Committee. W. H. HOFFERT. *Gas J.* 170, 654–5(1925); cf. C. A. 19, 3009.—*Sulfur in benzene.*—Certain benzene motor spirits had a marked corrosive action on Cu and brass, forming Cu_2S and CuS as a result of the presence of free S. The action on Cu of solns. of free S in pure benzene was studied. Impurities in the benzene tend to prevent corrosion.

of the Cu and the concn. of free S required to cause corrosion depends on the nature and amt. of impurities. The Ormandy and Craven method used for detg. free S in benzene is described. *Active carbon vs. silica gel.*—H. detd. the relative adsorptive capacities of the active carbons and a silica gel by satg. at 20° with a benzene-air mixt. contg. 0.86% by vol. of benzene. Urbain carbon showed 36% by wt. adsorption, coconut charcoal 32%, Bayer T carbon 28% and silica gel 18%. The adsorptive efficiency for each was 98%. C. showed a preferential adsorption for benzene unaffected by H₂O vapor up to the break point. Silica gel removes H₂O vapor quant. and shows a fairly high capacity for benzene. Adsorptive variations with temp. were detd. The adsorptions by wt. of adsorbent were C 15 to 30%, silica gel 8 to 14%; or g./100 cc. adsorbent space, C 5.8 to 11.6 and silica gel 5.7 to 10.0 g. *Active-carbon plants.*—A report of several plants using active C for recovery of benzene is given. A. E. GALLOWAY

Some methods of benzene plant control. Valuation of light oil. R. R. MURRAY. *Gas World* 82, Coking sect., 41-3 (1925).—M. describes a simple method by which the value of a light oil could be stated in its actual content of washable products. A no. of samples collected from works were analyzed and distd. by (1) the ordinary retort method with thermometer $\frac{3}{4}$ in. from the bottom; (2) the Engler distn. flask method. Fractions were cut in 5° stages over the whole boiling range of the oil. The totals of the percentages obtained below 125° corresponded to the percentages of water-white products obtained by washing, the difference varying from 0.3 to 3.6%. By the distn. method up to 125° for detg. the water-white value were found differences between lab. and actual plant yields varying between 0.2 and 5.0% over a period of 1 yr. This method is used in the detn. of the satn. content of benzenized and debenzenized oils. The wash oil is distd. up to 160° and 100 cc. of the distillate distd. up to 125° for the water-white value. To test absorbing oil, a standard absorbing oil was prepd., which could retain its fluidity without an undue proportion of light creosote. According to this method a good absorbing oil should have a small percentage of steamed distillate and the difference in fluidity before and after steaming should be small. The retort test is of no importance as a criterion. A. E. GALLOWAY

The carbonization of solid combustibles at a low temperature. H. VERDINNE. *Rev. universelle mines* 8 [7], 296-306 (1925).—A review and discussion dealing with present developments, with quant. data of yields of primary tar, etc., from various coals, schists, peats and lignites. C. C. DAVIS

Influence of temperature on the coke yield in the crucible coke test. H. STRACH AND CAMILLA MIKA. *Gas. u. Wasserfach* 69, 105-7 (1926).—Detailed tabulated results of tests in which standard procedure was followed (Teclu burner, 7 min. heating, etc.), except for changes in the gas heating value (range of 4050-4210 kg. cal./cu. m.) and in the air supply which gave such variations due to changes in the flame temp. that it is concluded that the test specifications should call for "heating for a period of 7 min. in such fashion that the temp. of the interior of the coke button rapidly reaches a temp. of 900°, at which temp. it is maintained throughout the test period," the temp. being detd. by a thermocouple. W. B. PLUMMER

New coking installations of the Mequin type. ERNST BLAU. *Gas Age-Record* 55, 831-2 (1925). H. G. BERGER

The utilization of waste heat from coke ovens. A. PARKER. *Gas World* 82, Coking sect., 34-8 (1925).—The principal methods of utilizing the available waste heat from coke-oven installations of 3 types (waste heat, recuperative and regenerative) have been considered; and estimates have been made of the amts. of energy which should be recovered from the waste gases, surplus gas and by the dry cooling of coke. The waste heat from coke ovens given in lbs. of steam at 100 lb. pressure (from water at 15°) per ton of coal is: waste-heat oven, 2,195; recuperative oven, 2,104; regenerative oven, 2,126; these are equiv. to 87.8, 84.2 and 85.0 kw.-hrs., resp. The waste heat from coke ovens given as kw.-hrs./ton of coal (surplus gas used in gas engines) is: waste-heat oven, 114.6; recuperative oven, 137.8; regenerative oven, 158.8. The data were obtained from plant operation. A. E. GALLOWAY

The flow of gases in the coke oven. W. FORSTER. *Gas World* 82, Coking sect., 48-52 (1925); cf. Smith, C. A. 19, 3369.—The gas in all cases flows outwards and upwards if the coal is crushed and contains a fair proportion of dust. The coke formation at the top of the oven is so shaped that the gases can be seen coming up the sides of the charge. The pressures in the center of the oven are 2 to 3 in. and are due to the advancing plastic mass rather than to gas evolution. Very little gas is evolved on the inside of the plastic layer as evidenced by the absence of NH₃ in the water and the gas could be lighted only with difficulty. If more than a moderate pressure of gas existed, the porous layer between the plastic layer and the solid coke could not exist. Sufficient

fissures are formed to carry the gases away. This and the porous structure between the plastic layer and coke is the path of travel.

The path of travel of the gases in the coke oven. A. THAU. *Gas World* 82, Coking sect., 59-60(1925).—The path of gases in an oven is inward. A perforated sheet iron box filled with coal was inserted crosswise in the oven. The box was withdrawn at the end of $\frac{1}{4}$ of the coking time and cooled in sand. Photographs show that the coking proceeds inward from the oven wall. Back of the advancing coking seam the fine porous structure of the semicoke with deposited carbon offers greater resistance to the gases than the plastic layer, and the path therefore must be inward.

The flow of gases in the coke oven. G. E. FOXWELL. *Gas World* 82, Coking sect., 56-8, 64-5(1925).—The vol. of gas passing through the coal is not the only factor affecting porosity, but the viscosity of the plastic mass is important and varies with the speed of carbonization. This speed is not the same at the center as against the oven walls. The orientation of the pores is evidence of the direction of flow of gases at the time of solidification of that particular piece of coke, but is no evidence of the path taken by the gases as a whole. The resistance of the plastic layer to the flow of gases depends entirely on the rate at which the coal is carbonized and on the temp. existing in diff. parts of the plastic coal. Contrary to theory, when gas passes through a porous mass the resistance decreases as the temp. increases; this is due to contraction and development of fine cracks in the coke. Only 10% of the volatile matter was evolved during the plastic stage (370-470°). F. discounts observations of Thau (preceding abstract) on cracks formed because they were taken after cooling the coke, and refutes the suggestion that the pore space of coke is too small for the gases to travel through by the statement that the pore space is 40-50% of the coke. A portion of the gases passes through the coal and a portion through the coke. The relative quantity that passes up each path is governed by the resistance. The resistances and area of cross-section of the two paths are not const. The quantity of gas taking each path will vary with the time elapsed since charging the oven, with the nature of the coal, the temp. of the oven, and the amt. of moisture in the coal. The path followed by a particle of gas from the position and at the instant of generation depends on the number and the position in the oven at which other particles are being generated. It also depends on the resistance of the coke, of the plastic layer and of the coal. The resistance of the plastic layer and the relative amts. of gas evolved at diff. portions in the charge are dependent on the nature of the coal and can be detd. in the lab. The value of the knowledge of the path of travel is detd. by the behavior of hydrocarbons under the action of heat and heated surfaces.

The flow of gases in the coke oven. L. H. SENSICLE. *Gas World* 82, Coking sect., 61-3(1925); cf. Smith, C. A. 19, 3369.—The gases pass upward through paths created in the plastic layer. These paths persist but a short time after rigidity has been reached and then become choked with deposited C. The plastic zone is the nucleus of chem. activity in the oven, and the seat of max. evolution of volatile matter. Subsidence in the charge with high-volatile coal and the V shape of the plastic layer are important points for consideration and illustrate the type of variable factor necessary to take into account in formulating a theory for any particular case.

By-product coking in Alabama. F. W. MILLER. *Trans. Am. Inst. Mining Met. Eng.* 71, 1106-11(1925); cf. C. A. 19, 570.

Refractories for blast furnaces and coke ovens (BOOZE) 19. Tables for technical gas calculations (MICHEL) 13. The blue oil of peat tar (Herzenberg, Ruhemann) 10.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Colloids in petroleum and in the petroleum industry. A. E. DUNSTAN, F. B. THOLE AND W. H. THOMAS. *J. Soc. Chem. Ind.* 44, 439-43T(1925).—A general discussion of oil-field and refinery emulsions, sludge in pipe-lines, "tar fog," treating of distillates, fuller's earth, clays, bauxite, vaseline and lubricating greases. No new material is presented.

Portable combustion apparatus for detection and measurement of small quantities of petroleum vapor. C. A. NEUSBAUM, P. L. DE VERTER AND E. W. DEAN. *Ind.*

Eng. Chem. **18**, 183-5(1926).—A convenient, accurate, portable app. that is used particularly for testing the atm. of tanks of ships is described. W. F. FARAGHER

Adsorption studies on the decolorization of mineral oils. T. H. ROGERS, F. V. GRIMM AND N. E. LEMMON. *Ind. Eng. Chem.* **18**, 164-9(1926).—Several oils and adsorbents were used in proving that Freundlich's equation applies accurately when the amt. of substance adsorbed is measured by the loss of color of the sample. *Measurement of color* expressed on a *true color scale* is described. Apparent deviations from the expected behavior are discussed. "Cracked" kerosene becomes colored in the presence of "clay"; the change was proved to be due to an oxidation. W. F. F

Agitation and mixing in petroleum refining. M. J. BURKHARD. *Chem. Met. Eng.* **32**, 860-1(1925).—Continuous treating-plants are discussed generally. A diagrammatic sketch of a plant in which treating-towers are replaced by orifice-tubes is presented. Treating units consist of 2 vertical runs of 4 in. pipe, each contg. 20 orifices. Orifices are 2 in. in diam., are staggered, and are spaced at 12 in. intervals. Settling units are of the usual type. W. F. FARAGHER

The disposal of petroleum foots oil. L. G. MARSH AND L. D. WYANT. *Bur. Mines. Repts. of Investigations* No. 2724, 7 pp.(1926).—Recycling foots oil through the stills, lowers the percentage of wax recovered, as was shown by lab. distns. It appears that half the foots oil could be distd. with steam, and the residue carried through the sweating oven as slack-wax or mixed with new slack-wax. The distillate could be mixed with the wax-distillate. The com. practicability of the process has not been established. The best procedure would be to return foots oil to presses mixed with new wax distillate, pressing first at relatively high temp., then at a lower temp. Gas oil of the new wax-distillate might be increased so that a single pressing of the mixt. would be feasible. W. F. FARAGHER

Oil shale in Santa Barbara County, California. F. D. GORE. *Bull. Am. Assoc. Petroleum Geol.* **8**, 459-72(1924).—The oil shale of California differs both physically and chemically from other shales from other parts of the United States and foreign countries. It is in a truer sense an oil-satd. diatomaceous shale from which oil may be extd. by the use of any well-known solvents such as benzene, CHCl_3 , pyridine, etc. The oil from the shale, when first obtained, has a gravity of about 14°Bé. and is very low in viscosity, bright green in color, which is lost when exposed to sunlight and becomes dark brown with an increase in viscosity. These changes are apparently due to oxidation hastened by the catalytic effect of the high S content of the oil. The removal of these S compds. is the chief difficulty to be met with in refining. Aromatic hydrocarbons constitute the largest percentage of the oil. Tar acids and nitrogenous oil are present in very small quantities. Shale oil readily emulsifies with the water present in the shale during the process of extn., and is more difficult to dehydrate than the ordinary crude petroleum. C. I. C

Asphalt and related bitumens in 1924. K. W. COTTRELL. *U. S. Geol. Survey. Mineral Resources of U. S. 1924*, Pt. II, 161-9(preprint No. 14, publ. Jan. 18, 1926). E. I. C

Melting point determination of asphalt. I. J. LAGERQUIST AND M. FREDMAN. *Svensk Kem. Tids.* **37**, 266-76(1925).—In the detn. of the m. p. of asphalt, differences in rate of increase in temp. in inner diam. of the tube and in thickness of the walls caused marked differences in results. These factors should be agreed upon and closely adhered to. Some of the deviations which do not affect the readings are the time interval between fixing the tube and the detn. and rate of cooling of the tube after it has been fitted. A. R. ROSE

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Testing explosives in experimental galleries for safety in fire damp and coal dust. M. LUPUS. *Z. ges. Schiess-Sprengstoffw.* **20**, 40-2(1925).—L. discusses the possible relation of brisance of an explosive to safety of the explosive in gas and dust. A blown-out shot, such as is produced in the gallery, causes an adiabatic compression which may raise the temp. of the gas high enough for its explosion. 550 g. of the explosive Car-bonite in 55-mm. cartridges fired in a 55-mm. hole, and 150 g. of the same explosive in 40-mm. cartridges fired in a 40-mm. hole, were sufficient to cause explosion in the gallery. The pressure per cm.^2 of bore hole area is practically the same in each case.

A gas explosion results from the compression of the gases from the explosive charge, even when no coal gas or dust is present in the gallery. Gas explosions may result from the high flame temp. of a slow explosive or from the high compression produced by a brisant explosive. Factors influencing the probability of explosion are the brisance and wt. of charge of explosive, length of tamping in proportion to explosive charge depth and diam. of bore hole.

C. G. STORM

Chemistry of the Nathan-Thomson-Rintoul process. R. K. VICTOR AND H. JANOS. *Z. ges. Schiess-Sprengstoffw.* 20, 89-91, 98-100(1925).—As a result of an extensive series of expts., the results of which are tabulated, it is concluded that the prevention of after-sepn. of nitroglycerin from the spent nitrating acid by the addn. of small quantities of H_2O (5%) is not to be attributed to increase in soly. of the nitrated product in the dild. acid, but that the phenomenon is more probably associated with oxidation processes.

C. G. STORM

Chlorate and perchlorate explosives. E. SPITALSKY AND E. KRAUSE. *Z. ges. Schiess-Sprengstoffw.* 20, 103-7, 119-23, 133-5(1925).—A study was made of the influence of increasing d. of various chlorate and perchlorate explosives on their brisance, and also of the effect of variations in the nature of the combustible ingredient on the explosive strength at the optimum d. of loading. The Pb-block compression test was used as the measure of brisance. Five definite methods of packing the explosives were used in order to obtain densities ranging from those of loosely filled cartridges to those of cartridges packed by hand compression in 10 sep. increments. Mixts. of 88 to 90% of $KClO_3$ with 12 to 10% of org. materials were tested to det. the effect of such variations in d. of the cartridges on the brisance. Different mixts. of paraffin, vaseline, asphalt, wax and rosin were used as the org. material. The effect of increased d. varied greatly with the compn. of the org. material. With some mixts. the max. brisance was obtained when the explosive was entirely uncompressed; with others, only when strong compression was used. Corresponding mixts. with $NaClO_3$ and NH_4ClO_4 showed higher brisance and much less effect of increased d. than the $KClO_3$ mixts. The optimum densities for max. brisance were for $KClO_3$ 1.15, for $NaClO_3$ 1.40 and for NH_4ClO_4 1.20. Whereas 90% $NaClO_3$ and 10% of a mixt. contg. 5% vaseline, 2.5% rosin and 92.5% paraffin is a strong explosive 90% $KClO_3$ and 10% of the same mixt. could not be exploded with the same strength of detonators. Each individual chlorate or perchlorate requires a particular compn. of org. material in order to make its energy properly available. At low d. of loading the proportion of org. material to oxidizing agent may vary over a wide range without appreciable effect on brisance. At higher d. the brisance is decreased by increasing the org. material so that a deficiency of O results. This effect is much more pronounced with $NaClO_3$ than with NH_4ClO_4 . As a result of their investigations the authors have developed the following compns. possessing highly satisfactory explosive properties:

	I	II	III
Oxidizing agent	$KClO_3$ 88%	$NaClO_3$ 90%	NH_4ClO_4 89%
Organic material	12	10	11
Compn. of org. material	{ Vaseline 5	5	8
	{ Paraffin 30	92.5	27
	{ Rosin 65	2.5	65

These explosives, designated "Almatrites," are less sensitive to friction than the Cheddites. The results of various chem. and phys. tests are given in detail.

C. G. S.

Measurement of pressures developed in closed vessels by the combustion of powder.

E. BURLLOT. *Mem. poud.* 21, 403-10(1924).

TENNEY L. DAVIS

Experimental determination of force and covolume of explosives. E. BURLLOT.

Mem. poud. 21, 411-90(1924).

TENNEY L. DAVIS

Utilization of heat in the stabilizing boiling of nitrocellulose. H. CARRIÈRE.

Mem. poud. 21, 491-3(1924).—The changes which occur during the stabilization of 1 kg. CP_1 (nitrocellulose of 13.4% N) absorb about 600 large cals. or about $\frac{1}{4}$ of all the heat supplied for the boiling treatment. CP_2 (12% N) correspondingly absorbs about 400 large cals. per kg., or about $\frac{1}{3}$ of the total heat supplied for the boiling treatment.

TENNEY L. DAVIS

Deflagration products of smokeless powder. H. C. KNIGHT AND D. C. WALTON.

Ind. Eng. Chem. 18, 287-91(1926).—Following the explosion of smokeless powder on the U. S. S. Trenton (cf. Bloch, C. A. 20, 823) this investigation has been made on the compn. and physiol. effects of the gases produced under conditions similar to those obtaining in the turret of that vessel. The development of notable quantities of CO and "nitrous

gases" was positively shown and malignant physiol. effects of these gases were demonstrated.

CHARLES E. MUNROE

The rate of detonation of mercury fulminate and its mixtures with potassium chlorate. L. R. CARL. *Army Ordnance* 6, 302-4(1926).—From the data obtained it is concluded that (1) the rate of detonation of Hg fulminate is a straight-line function of the d.; (2) the increase in rate due to increased d. is most rapid with the 80/20 mixt. and least with straight fulminate; (3) this limited no. of tests seem to show that additional confinement has no noticeable effect on the rate of the 80/20 mixt., while the rates of the 90/10 mixt. and the straight fulminate are very appreciably increased.

CHARLES E. MUNROE

Comparative tests on French pyroxylin sporting powders T and M and on the reputedly best foreign powders. MAURICE PORCHÉ. *Mem. poud.* 21, 133-43(1924).—French powders T and M gave about the same pressures and dispersions as English E. C. no. 3, Empire Nobel, Schultze, Nobel Ballistite, Normale, and Smokeless Diamond. Italian Acapina, German Trotschwill and Troisdorff, and Belgian Coopall no. 2 and Mullerite, but powder T gave the smallest variations of velocity and would, therefore, be expected to give the most regular penetration.

TENNEY L. DAVIS

The determination of sulfates in gun cotton. H. B. DUNNICLIFF. *Analyst* 50, 543-7(1925).—Heat 5 g. of material on a water bath with 50 cc. of concd. HNO_3 until dissolved. Cool, add 1 g. of NaClO_3 , evap. on a sand bath and heat the residue for 30 min. in an air oven at 120° . Treat with 20 cc. of HCl and 0.5 g. NaClO_3 and repeat the above evapn. and heating. Heat the residue with 0.5 g. of NaClO_3 and 20 cc. of concd. HNO_3 . Evap. on the sand bath, again heat at 120° and repeat with NaClO_3 and HCl . Dissolve the final residue in water contg. 1 cc. of HCl , boil, filter and ppt. BaSO_4 in the usual way. Run a blank, following the same procedure without any gun cotton.

W. T. H.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

New dyes and sample cards. PAUL KRAIS. *Z. angew. Chem.* 39, 143-6(1926).

E. J. C.

New dye intermediates—2,4-diaminophenyl oxide, 2-nitro-4-aminophenyl oxide and 2,4-diaminophenyl sulfide. M. T. BOGERT and R. L. EVANS. *Ind. Eng. Chem.* 18, 299-302(1926).—2,4-Dinitrophenyl oxide has been reduced successfully both to the 2-nitro-4-aminophenyl oxide and to the diamine. 2,4-Dinitro- and diaminophenyl sulfide have been prepd. from 2,4-dinitrochlorobenzene and their properties studied. From these derivs. of *m*-nitroaniline and *m*-phenylenediamine azo dyes have been produced by the usual methods.

L. W. RIGGS

Effect of variation in concentration of dyes in solution upon their quantitative determination by spectrophotometry. Methylene blue. R. W. FRENCH. *Ind. Eng. Chem.* 18, 298-9(1926).—The effect of variations in the concn. of the dye in soln. was studied with methylene blue. Variations within the customary limits used in this kind of detn., that is, 2 to 10 parts of dye per million of solvent, have a very appreciable effect on the values of the extinction coeff. This effect must be considered in spectrophotometric work. It is suggested that the use of alc. as a solvent would avoid such effects.

L. W. RIGGS

Causes of uneven dyeing of rayon. R. H. TIBA 4, 101, 103(1926).—Brief review with bibliography of 10 references.

A. PAPINEAU-COUTURE

New method of testing rayon, and textiles in general. ETIENNE BURLET. *Rev. textile* 23, 1135(1925).—Because of the variations in the normal H_2O contents of different kinds of rayon under various atm. conditions, B. suggests replacing the detn. of total H_2O by detn. of wt. when in equil. with atm. H_2O under given temp. and humidity conditions.

A. PAPINEAU-COUTURE

The design of a research laboratory for a textile manufacturing plant. G. B. HAVEN. *Proc. Am. Soc. Testing Materials* 25, II, 416-24(1925).

E. J. C.

The wetting capacity of some textile preparations. W. HERBIG and H. SEYFERTH. *Z. deut. Oel-Fett-Ind.* 45, 751-5(1925).—Mako-cotton yarn of 1 m. length in the form of skeins of 11-12 cm. was immersed in the test liquor, centrifuged and weighed, all under standard conditions. Five com. preps. were tested. The wetting capacity increases with the concn. to a certain limit, but varies with each liquor according to its concn. The plotted curves are steep to a mean concn. of about 10 g. per l. and then

become horizontal. Evaluation by the wetting capacity alone furnishes insufficient data for practical purposes; it is necessary to include the price in the diagrams to show the % of wetting obtained per money unit. Evaluation of wetting power on the basis of surface tension by means of the stalagmometer furnishes results which are at variance with factory experience.

Retting with urea. O. FLIEG. *Faserforschung* 4, 131-41 (1924).—At a retting temp. of 27-30° a concn. of 0.25% of urea accelerates the process and eliminates the foul smell as well as larger amts., and the liquor becomes less acid than in the absence of urea. The product has a better feel and the fibers are better sepd. than after a normal ret and the waste liquor is an excellent fertilizer.

P. ESCHER

B. C. A.

The significance of a definite regulation of atmospheric moisture in the textile industry. JULIUS OBERMILLER. *Z. angew. Chem.* 39, 46-51 (1926); cf. *C. A.* 19, 897.—The regulation of the moisture in the air is very important in the textile industry. In dyeing processes, large quantities of moisture are given off and frequently must be removed, to prevent harm to the thread in other stages of the process. In the spinning and weaving industries, a certain amt. of humidity is essential to prevent the thread from becoming brittle and to prevent the accumulation of too heavy charges of static electricity. The lower limit of relative humidity required in general is about 50%, although this is higher with increasing fineness of the work, in some cases being as high as 80-85%. Curves are shown in which the moisture content of various types of thread is plotted against the relative humidity of the amt. at 20°. From 10 to 75%, the curves are approx. straight lines, but above 75% the H₂O content rises rapidly. Thus the H₂O content is 1.8% for wool (1), 2.5% for artificial silk (2), 2.0% for raw silk (3), 1.8% for degummed silk (4), and 1.3% for cotton (5) at 2.5% relative humidity. At 35.0% relative humidity, H₂O content is 11.0% for (1), 8.5% for (2), 8.0% for (3), 7.3% for (4), and 5.5% for (5). At 75.0% relative humidity, H₂O content is 18.5% for (1), 17.5% for (2), 15.5% for (3), 13.5% for (4), and 11.0% for (5). For 100% relative humidity, H₂O content is >32.0% for (1), >40.0% for (2), >35.0% for (3), >35.0% for (4), >26.0% for (5). With increase in temp. from 20° to 25°, the H₂O content of the fiber at 75% atm. moisture decreases as follows: for wool it drops from 17.6 to 17.4%, for raw silk from 15.0 to 14.25%, for degummed silk from 13.35 to 12.7%, for American cotton from 9.5 to 9.35%, and for Indian cotton from 10.06 to 9.85%. The variation of strength with H₂O content is detd. by measuring tensile strength before and after immersion in H₂O. The results are as follows and are expressed in % of strength in the dry condition: cotton 110-120, wool 80-90, silk 75-85, acetate silk 65-70, Cu silk 50-60, viscose silk 45-55, nitro silk 30-40.

H. STOERTZ

Inks for use in the textile industry. ANON. *Tiba* 4, 45-9 (1926).—Thirty-four formulas are given.

A. PAPINEAU-COUTURE

The artificial viscose silk factory. ED. WURTZ. *Chem. App.* 12, 159 (1925).—The prepn. and drying of the cellulose are described (cf. *C. A.* 19, 1350). J. H. M.

Soluble silicates; their influence on hypochlorite. J. D. CARTER. *Ind. Eng. Chem.* 18, 248-52 (1926).—The usefulness of Na silicates in hypochlorite bleach is shown by their restraining action on the weakening of the fabric by the hypochlorite, the increase in the ash content of the fabric due to the deposition of SiO₂, probably in the hydrous form; and their marked ability to render cheese cloth and sulfite pulp brighter and whiter than when bleached with hypochlorite alone. The most alk. grade of com. silicate of soda is the most efficient.

L. W. RIGGS

CHAPLET, A.: *Les soies artificielles*. 2nd ed., revised and enlarged. Paris: Gauthier-Villars & Cie. 267 pp. Fr. 40.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Lead as raw material for the pigment industry. K. HARTMANN. *Farbe und Lack* 1925, 618-9.—A brief review of production data, of the smelting of Pb ores, of the common Pb salts and pigments, of attempts to prohibit the use of paints contg. Pb pigments, etc.

F. A. WERTZ

Practical plans for paint plants. GEO. SUTHERLAND. *Paint, Oil & Chem. Rev.* 81, No. 8, 12-4 (1926).—The design and layout of paint and varnish factories are discussed.

E. J. C.

The shading of the mineral colors. HUGO KÜHL. *Farbe und Lack* 1925, 617.—The various occurring shades of pigments of the same chem. compn. are due not only to variations in the size of the pigment particles, but perhaps also to the state of aggregation of the mols. Fe oxides, Pb chromates, and other pigments which occur in several different shades are reviewed briefly. F. A. WERTZ

Physical tests on lacquers. H. A. GARDNER AND H. C. PARKS. Paint Manufacturers Assoc. of U. S., *Circ.* No. 253, 174-94(1925).—Hot and cold H₂O immersion, bending, tensile strength and elongation, exposure tests, etc., give valuable information on the usefulness of lacquer films. Results of such physical tests on a number of lacquers of various compns are tabulated and given in detail. Illus. F. A. WERTZ

Corrosion in the works. C. O. HARVEY. *Chemistry & Industry* 44, 110-1(1925).—An excellent paint to prevent corrosion in chem. plants is made as follows: Treat coal tar with 10% CaO, heat gradually to 200°, maintain this temp. 15 min., add 4 lb. per gal. tar of a hard bituminous such as gilsonite, heat until homogeneous, cool to about 90°, and gradually stir in 1 vol. of crude benzene to 2 vol. of the molten mixt. F. H

Corrosion in the works. A. G. BYARD. *Chemistry & Industry* 45, 24(1926).—The crude C₆H₆ used in making the rust-inhibitive bituminous paints recommended by Harvey (preceding abstract) must be absolutely free from phenols and related substances, the mixing temp. must not be over 80°, and the tar should have the upper limit of d. 1.175, with as low a free C content as possible. Linseed-oil paints should never be used over bituminous paints, but the reverse practice has given excellent results with red lead coats that have been allowed to dry thoroughly. F. A. WERTZ

The isomerism of Guignet's green, a phenomenon of the particle size. VON LOTHAR WÖHLER AND J. DIERKSEN. *Z. angew. Chem.* 39, 13-6(1926).—It was previously shown (*C. A.* 2, 2765) that boric acid is not an essential constituent of Guignet's green, which appears to be 2Cr₂O₃·3H₂O; but a further study shows that the brilliant Guignet's green differs from the dull green Cr oxide hydrates in that it has undergone an increase in particle size. The role played by boric acid used in the com. manuf. of the pigment is that of agglomerating agent with resultant decrease of the sp. surface. Silica gel, and the alkaline salts with adsorption tendencies, such as Na₂CO₃, Na₂B₄O₇, n-sulfates, etc., have a similar effect. Heating 2 to 3 parts by wt. of a muddy gray-violet Cr oxide hydrate contg. 50% H₂O for 8 to 10 hrs. at 260-280° in an autoclave in the presence of one part of any of these agglomerating agents in 3 parts of H₂O, transforms it into the brilliant green pigment. The transformation action, therefore, occurs in concd. aq. solns as well as in fused H₃BO₃ solns. as in com. manuf. The addn. of Guignet's green to pptd. Cr oxide hydrate similarly favors transformation of the latter into the brilliant green. In accord with the discovery that an increase in the particle size is the cause of the color change, and that the H₂O is present as an adsorption compd., is the fact that with improvement of the brilliancy of the color the H₂O content is reduced continuously, as is the case with true adsorption compds., that the vapor pressure, however, is increased continuously as a necessary consequence of the reduced sp. surface. Vapor pressures were measured in a Hg-differential tensimeter against P₂O₅ at 20° to 80° and are plotted for a no. of greens of various brilliancies. The measurements are in accord with the vapor tension measurements found by other observers on other gels on aging and agglomeration (Zsigmondy, *Kolloid-chemie*, 3rd ed., p. 231(1920); cf. *C. A.* 15, 462). The reduced reactivity of the brilliant colored greens is further evidence of the decreased sp. surface. The amorphous character of the pptd. Cr oxide hydrate is not altered during the transformation into Guignet green. F. A. WERTZ

Chinese wood oil. I. W. NAGEL AND J. GRÜSS. *Z. angew. Chem.* 39, 10-3(1926).—The various theories advanced in explanation of the gel formation of tung oil on heating are reviewed. To study the gelatinization process, the Me esters were used instead of the glycerides. The β -eleostearic Me ester is easily produced by allowing 3% HCl in MeOH to react for 24 hrs. on α -eleostearic acid; transformation into the β -form occurs. α -Eleostearic Me ester is produced in almost theoretical yield from α -eleostearic acid and diazomethane in Et₂O; or more simply by the action of MeOH-KOH soln. on tung oil or its Et₂O soln. Contrary to expectation, this reaction, instead of causing sapon., converted the glyceryl ester into the Me ester. In the heating expts. on the Me esters at 240° in an atm. of CO₂, the progress of the polymerization was studied by detn. of I nos. Gel formation does not occur with the Me esters, but the I no. invariably falls to a min. of 80 to 90; this indicates the formation of a dimol polymer. The various possible formulas for such a polymer are given. On heating wood oil itself, the I no. of the oil, just prior to gelatinization, is 110 to 120. Wolff

(*C. A.* 7, 2125) has found that about 40% of a tung oil gel consists of unchanged oil, and 60% of polymerization product. The 1 no. found agrees fairly well with the calcd. 1 no. for 60% of dimol. polymerization product. To avoid the uncertainty of obtaining a sample of the oil just prior to gel formation, gelatinized oil was dissolved in 10% HCl in Et₂O, either in the cold or by boiling; after evapn. the residue showed the same 1 no. of 100 to 120 as the oil just before gelling and could again be gelatinized by repeated heating. All the possible formulas for the dipolymers are characterized by the formation of tetramethylene ring and attempts to identify this structure in the polymerized oils are being made. In expts. with esters of higher alcs., the tendency to gel formation increased with the mol. wt.; the glycol ester gels completely although it yields 36% distillate, as against 0 distillate for the glyceryl ester. Wood oil can be gelatinized by the action of 10% HCl in Et₂O by careful regulation of the conditions, usually in 7 hrs. in the cold. The same HCl-Et₂O soln. dissolves wood oil gel, so that the reaction is reversible similar to that found by Harries and Nagel with shellac (*C. A.* 18, 1057). The gel formation appears to be due to the tendency of the heavy dipolymer to form aggregates.

F. A. WERTZ

Reducing the fire hazard in varnish factories. D. HAMPEL. *Farbe und Lack* 1925, 620.

F. A. WERTZ

Exposure tests on some quick-drying coating materials. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 251, 150-67 (Nov., 1925).—The possible value of quick-drying coating materials including resin solns., plasticized resins, fatty acid solns., lacquers and similar products are quickly forecast by roof exposure tests on one coat work on black iron panels facing south at 45° to the vertical. Daily spraying with H₂O accelerates the tests. Results are more reliable than those obtained in indoor accelerated tests. Compn. and exposure results on several hundred coatings are tabulated. Illus.

F. A. WERTZ

Durability of a colored lacquer containing various resins. H. A. GARDNER. Paint Manufs. Assoc. of U. S., *Circ.* No. 252, 168-73 (1925).—Solns. of rosin, ester gum, damar, amberol, cumarone, shellac and other resins, gilsonite, etc., were added in definite proportion to a pigmented BuOAc nitro cotton-base lacquer. The resultant lacquers were then brushed on black iron panels and exposed outdoors to det. the relative effect of the various resins. The exposure data presented indicate that "hexol" gives better films than any of the other resins used, but final conclusions should not be drawn. Illus.

F. A. WERTZ

Sb sulfides (CURRIE) 6. Rapid oxidation of drying oils and "anti-oxygens" (TARADOIRE) 27.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The determination of the higher fatty acids insoluble in water. I. S. H. BERTRAM. *Z. deut. Oel-Fett-Ind.* 45, 733-6 (1925).—The following is a quant. method for detg. the higher fatty acids (palmitic acid and its homologs) in a fat or in a mixt. of fatty acids, based upon the splitting of the double C bond by oxidation with alk. KMnO₄ soln. Weigh 5 g. of the sample into a 300-cc. Erlenmeyer flask and boil under reflux for 1 hr. with 75 cc. 0.5 N alc. KOH; cool and titrate back with 0.5 N HCl. The difference between this result and that of a "blank" detn. without the fat gives the sapon. no. Transfer the soln. into a separatory funnel with 20 cc. alc. KOH and 75 cc. H₂O and shake out 3 times with petr. ether; wash the total petr.-ether ext. with dil. KOH, adding the wash water to the soap soln. Evap. the petr.-ether soln. to const. wt. and multiply by 20; this gives the % of unsapon. matter. Evap. all alc. from the soap soln. and dil. to about 200 cc.; cool, add 5 cc. of 50° Bé. KOH and a soln. of 30 g. KMnO₄ in 650 cc. H₂O, keeping the temp. below 25°; if the soln. does not remain violet-red, add more KMnO₄ soln. Shake well and allow to stand overnight. Decolorize with dil. H₂SO₄ and concd. NaHSO₃. Warm gently without boiling, until all MnO₂ has dissolved and the fatty acids form a clear layer. Shake out with petr. ether (b. 40-60°); wash the ext. 3 times with H₂O and evap. the petr.-ether soln.; the residue contains the satd. higher fatty acids and some volatile acids. Dissolve the residue, with 200 cc. H₂O, some NH₄OH and 30 cc. of 10% NH₄Cl soln. and ppt. hot with an excess of MgSO₄ soln.; boil, cool, filter on a folded filter and wash. Treat the filter with its ppt. in an Erlenmeyer flask with dil. H₂SO₄, re-ppt. with NH₄OH, NH₄Cl and MgSO₄ and filter

as before. Boil the filter paper plus ppt. with dil. H_2SO_4 , cool and shake out with petr. ether; wash the ext. with H_2O , evap. to const. wt. and the residue then represents the higher fatty acids insol. in H_2O . Check analyses with known amts. of added acids show the method to be accurate within a few tenths %. An extended bibliography with crit. comments accompanies the article. P. ESCHER

Distillation of fatty acids. O. HAUSAMANN. *Chem.-Ztg.* 50, 41-2(1926).—This is a discussion of the process with some remarks on air-cooling in place of water-cooling for condensing. Air-cooling permits fractionation of the distillate and sepn. of the colored and odorous portion by reason of the fact that the horizontal cooling coils can be tapped at different places. E. SCHERUBEL

Can neutral fat be distilled with steam? C. STIEPEL. *Z. deut. Oel-Fett-Ind.* 45, 765-6(1925).—Lab. expts. with steam distn. at 250° , on low-grade fats under factory conditions, re-established the fact that neutral fats distil with steam only in minute amts., requiring 1000 parts or more by wt. of steam for each part of fat. P. ESCHER

The world production of vegetable oils. HJALMER HEIMBÜRGER. *Tekn. Tids.* 56 (Kem. afd.), 1-6(1926).—A statistical survey. A. R. ROSE

Stabilizing agents for oils. E. DE'CONNO, E. GOFFREDI AND C. DRAGONI. *Ann. chim. applicata* 15, 475-84(1925).—Since atm. O plays the chief role in the drying and onset of rancidity of oils and since it has been shown by Moureu (*C. A.* 14, 1303; 16, 1439; 17, 564) that certain compds. such as phenols retard the oxidation of acrolein, expts. were carried out to det. whether these same antioxidants were equally effective in stabilizing vegetable oils. (Cf. Moureu and Dufraisse, *C. A.* 16, 3737.) To this end linseed oil and olive oil, both in the pure state and after addn. of a stabilizing agent, were oxidized by passing O through each for 24 hrs. at room temp. Changes in the properties were detd. by comparing the sapon. no., the acetyl no., the relative and abs. I nos. and the Hehner index before and after treatment with O. Judged by these criteria phenol, hydroquinol, resorcinol or pyrogallol increased the rate of oxidation of both types of oils. Since these compds. inhibit the oxidation of acrolein, they resemble in this diverse action the action of I (cf. Moureu and Dufraisse, *C. A.* 17, 1951, 18, 2635). Under the same conditions, however, benzoic and salicylic acids had a powerful stabilizing action, the former being the more effective with olive oil and the latter with linseed oil. This would indicate that the inhibitory action is due to the CO_2H group, the simultaneous presence of the OH group in turn fortifying this action with drying oils and weakening it with non-drying oils. To det. whether the anti-oxidant action was due to the CO_2H group itself or to the combined action of CO_2H and the C_6H_5 nucleus, the effect of HOAc and glycolic acid under similar conditions was detd. Both these retarded oxidation in the same manner as benzoic or salicylic acid, the presence of the OH group again favoring the stabilization of drying oils and the stabilization of non-drying oils. The most effective agent for linseed oil was glycolic acid, that for olive oil was HOAc, practically complete stabilization being effected with 0.1% and 0.5%, resp., under the conditions described. C. C. DAVIS

Rapid oxidation of drying oils and "anti-oxygens." F. TARADOIRE. *Compt. rend.* 182, 61-3(1926).—The retarding or inhibitory action of a large no. of anti-oxygen (Moureu and Dufraisse, *C. A.* 16, 1439) on the spontaneous combustion of cotton soaked with mixts. of drying oil, spirits of turpentine and drier was investigated. PhOH , β -naphthol and hydroquinone retard combustion. Guaiacol, α -naphthol, PhNH_2 , PhNMe_2 , Ph_2NH , quinuclidine and hexamethylenetetramine prevent it completely. Introduction of nitro groups in phenols and amines decreases the anti-oxidizing power, the activity decreasing with increase in the no. of groups introduced. With 2 g. S per 100 g. of soaked cotton, the temp. rose to 100° and then fell slowly, showing that S is inactive at ordinary temp. but becomes active at about 100° . A. P. C.

A survey of equipment used in modern soap manufacture. C. RICHTER. *Industria saponiera* 26, 1-3(1926); cf. *C. A.* 20, 673.—In conclusion presses and machinery for prepg. soap powders are described and illustrated. C. C. DAVIS

Determination of the turbidity point of soap solutions. H. SEYFERTH. *Z. deut. Oel-Fett-Ind.* 45, 766-7(1925).—Referring to Braun's article on the detn. of the turbidity point (*C. A.* 20, 673), S. suggests the use of 0.60% soap solns. (=0.36% fatty acids) in place of 3% solns. which are much too concd. for actual practice, and also recommends Herbig's simple app. for the detn., adding a side illumination to produce a Tyndall-cone effect in place of the closed mantle with opposite slits. P. ESCHER

The aging of liquid soap. C. W. CROWELL. *Soap* 1, 22(1926).—Liquid soap must be aged at least 1 month in order to obtain permanent clarification. To det. the

anhyd. soap content of liquid soaps make a standard hard H_2O by dissolving 1.787 g. $CaCO_3$ in HCl , evap., neutralize with NH_4OH and make up to 1 l. Into a 200-cc. oil bottle $1\frac{3}{4}$ in. in diam. and $6\frac{1}{4}$ in. high put 100 cc. of the standard hard H_2O from a calibrated pipet, add the unknown liquid soap dropwise, shaking after each addition until a permanent lather lasting 3 min. is formed when the bottle is resting on its side. The no. of cc. of unknown soap necessary to produce this permanent lather may be read directly as the % of anhyd. soap or % soap value. The total solids of the unknown soap may be obtained by multiplying the soap value by the factor 1.33. E. S.

Adsorption as a preliminary phase of alkaline saponification. E. L. LEDERER. *Z. deut. Oel-Fett-Ind.* 45, 749-51(1925).—From preliminary expts. L. concludes that the ionic combination of the alkali base with the fatty acids of the glycerides is preceded by an adsorption phenomenon that follows Freundlich's adsorption law, $y/m = c.x^n$, where y is the adsorbed part, x the unadsorbed part, m the amt. of the adsorbent, while c and n are consts., c of varying value and n of a value between 0.1 and 0.8. L. mixed 15 g. acid-free tallow with varying amts. of 3 N $NaOH$ at a temp. slightly above the m. p. of tallow, stirring until cold and keeping the vol. at 50 cc. L. then attempted to det. the free and combined alkali by direct titration and also by salting out the combined soap with $NaCl$. In both attempts addition of the electrolytes disturbed the degree of hydrolysis and the attempt to establish a definite relation between electrolyte content and degree of hydrolysis failed for want of a sufficient no. of observations. Similar detns. were made with 5 g. tallow and N $NaOH$ soln at 100° . Expts. with the ultramicroscope, which should show an optically empty field with CCl_4 as a solvent for castor oil and alc. for $NaOH$ (0.005 N in both cases), failed through the inability to introduce the solns. after the visual adjustment has been made. P. ESCHER

Sunflower (PIERAERTS) 11D.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

A review of sugar technology in 1925. ANON. *Facts about Sugar* 21, 184-6 (1926).—The review consists of the studies in beet culture, the beet spacing test, sugar cane agriculture, progress in chem. research, deterioration of sugar in storage, mech. problems, pressure evapn., improved defecation, changes in boiling system, the handling of mill juices and general tendencies. T. MARKOVITS

The sugar campaign of 1925 in Java. S. N. QUAR. *Facts about Sugar* 21, 82 (1926).—Some results attained in a season of record production and the importance of new cane varieties are given. T. MARKOVITS

Seed selection of sugar cane. A. H. ROSENFELD. *Facts about Sugar* 20, 1242-3 (1925).—An account of some demonstration expts. conducted at Tucuman and their results. T. MARKOVITS

Preservation of sugar-beet-pulps by means of lactic enzyme. L. D. GEMBLoux and No. 21 (1925); *Bull. assoc. inst. sup. fermentations Gand* 27, *Ann. soc. brasseurs* 35, 70(1926).—By addn. to the pulp, as it was being put in the silo, of lactic enzymes produced in the maturing of cream, the loss of solids was reduced from 33 to 24% and the pulp retained a fresh odor and flavor and underwent no butyric fermentation. A. PAPINEAU-COUTURE

Weighing raw sugar juices. W. F. ALEWYN. *De Suikerindustrie, Java; Facts about Sugar* 20, 1190-4(1925).—App. invented in Java for which exceptional accuracy is claimed. The operation of the app. is entirely automatic. T. MARKOVITS

Boiling methods and filterability. W. E. SMITH. *Facts about Sugar* 21, 134-6 (1926).—Relation of boiling practice to filtration qualities of raw sugars as shown by laboratory investigations. T. MARKOVITS

Development of the saccharimeter. F. T. DILLINGHAM. *Facts about Sugar* 20, 1210 3(1925).—A brief sketch of the history of the saccharimeter. T. MARKOVITS

Determination of the velocity of crystallization of saccharose. I. A. KUCHARENKO. *Sucre belge* 45, 3-8(1925).—The method of detg. the velocity of crystn. of saccharose in supersatd. soln. is described. The soln. for the test is drawn from the hot sirup filter into a bottle, the operation being so conducted as to avoid the entrance of dust

particles. The supersatd. soln. is further protected from contact with external crystals by being covered with a layer of pure water. Portions of this soln. are then placed in the thermostat and brought to the desired temp. A no. of seed crystals are measured and weighed and brought to the same temp. as the soln. which is then poured on the crystals. At the expiration of a definite time the crystals are removed, dried and weighed. The velocity of crystn. is then calcd. according to the formula given in the paper.

T. MARKOVITS

A method of preparing perfect sugar crystals. I. A. KUCHARENKO. *Sucre belge* 44, 112-3(1925).—In expts. on the velocity of crystn. of saccharose it is necessary to have perfect crystals for introducing into the test soln. K. gives a method of prepg these crystals by seeding selected crystals into a pure sugar soln. having a satn. coeff between 1.005 and 1.010 at lab. temp. The crystals are kept in the soln. in a thermostat until they are about 0.5 g. in weight. The crystals are examd. and those which do not show regular development are discarded. The process of selection is repeated several times until perfect crystals of the desired size are left.

T. MARKOVITS

Influence of mineral salts on the crystallization of sugar. A. F. KAUZNETZOV. *Zapiski; Sucre belge* 45, 9(1925).—A method of studying the effect of salts on the crystn. of saccharose is described. The carbonates of K and Na retard crystn., but their effect decreases with decreasing temp. The Ca salts of aspartic and nitric acids also retard crystn. Their melassigenic influence increases with decreasing temp. CaCl_2 accelerates crystn. Recent physico-chem. theories of crystn. are employed in this paper.

T. MARKOVITS

The composition of non-sugars. H. F. BOMOMTI AND W. R. MCALLEP. *Facts about Sugar* 21, 39-41(1926).—A study of the influence of boiling methods upon the compn. of non-sugars from a refining standpoint. The work indicated the compn. of non-sugar in com. sugar is influenced by the boiling method. By modifying boiling methods toward straight boiling the non-sugar can be improved with respect to ash, sulfates, non-settling matter and color, but the glucose % of non-sugar will be reduced. The washing required to bring low-polarizing sugar up to the required polarization adversely affects the compn. of the non-sugar from a refining standpoint.

T. M.

Hawaii's experience in the use of fertilizer (VERRET) 15.

29—LEATHER AND GLUE

ALLEN ROGERS

Behavior of deaminized collagen. Further evidence in favor of the chemical nature of tanning. A. W. THOMAS AND S. B. FOSTER. *J. Am. Chem. Soc.* 48, 489-501(1926).—Treatment of animal skin with HNO_2 yields a product of diminished N content. The isoelec. point of such "deaminized collagen" is in the region of p_H 3.5 to 4 as revealed by the dye technic, swelling and point of min. rate of tannage. "Deaminized" calf skin shows 2 points of min. plumping, p_H 4.0 and 8.3. It swells in solns. of p_H 6 to 10 to a remarkable extent in comparison with raw skin. From a purely chem. point of view, the more acid character of "deaminized collagen" in comparison with collagen is to be expected upon removal of N groups. If the combination between skin and org. tannins is fundamentally a chem. reaction between the N groups of the protein mol. and the acidic tannins, then collagen which has been impoverished in its N groups should show a diminished rate of tanning in acid solns. and a shift in the min. rate to a more acid region. This has been found to be true.

C. J. WEST

Aminohydroxysulfonic acids in the dyeing of hides. VITTORIO CASABURI. *Boll. uff. r. staz. sper. ind. pelli* 3, 61-9(1925).—"Epidermol C" of Cassella which lately has appeared on the market is recommended for different purposes and especially as a base in dyeing Cr-tanned hides and as a mordant in dyeing glove leather. It contains tanning material, apparently of the pyrocatechol group, $\text{Cr}(\text{OAc})_3$ and bisulfate. The combination of tanning and mordanting does not give results as good as a mordant alone. Of various compds. examd. H-acid was found to be the most suitable as it combines easily with Cr, Al, Fe, Cu, Mn, etc., yielding mordants. Their application is given in details.

M. LUTHY

Activities of pancreatic enzymes used in bating upon different substrates. J. A. WILSON AND H. B. MERRILL. *J. Am. Leather Chem. Assoc.* 21, 50-3(1926).—Detns.

of the hydrolytic powers of 9 com. pancreatins upon casein, collagen, elastin, keratose and olive oil show that the individual enzymes making up the com. material may be present in very variable proportions. In measuring the activity of pancreatin upon some particular material, that material itself and not some substitute must be used as substrate. In detg. the value of a pancreatin for bating, it is necessary to measure its activity separately upon each important constituent of the skin to be bated.

J. A. WILSON

Films of adhesives. J. W. MCBAIN AND D. G. HOPKINS. *J. Phys. Chem.* **30**, 114-25 (1926).—Detns. were made of the tensile strengths of thin films of high-grade glue and gelatin, purified gelatin, isinglass, and glue size. The first 2 adhesives gave values of approx. 5.5 tons per in. or twice that with glue size. Both refined isinglass and glue size have a tenacity of approx. 9500 lbs./sq. in. 10-15% of PbSO_4 , ZnO , aloxite or flint does not affect the tensile strength of the film appreciably but 66 $\frac{2}{3}$ % lowers it a great deal. $\text{K}_2\text{Cr}_2\text{O}_7$ increases the strength of the film while formalin has no effect. K alum, Na benzoate, Na formate, Na salicylate and glucose reduce the tensile strength. Films prepd. from 25% solns. of glue in H_2O or in 0.1 N HCl were equally tenacious, whereas those from glue dissolved in 5.1 N NaOH were much weaker. Heating such aq. alk., or acid solns. of glue continuously for 28 days at 55-58° causes a relatively slight loss in tensile strength, but higher temps. cause the films to become brittle.

HARRY B. WEISER

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Changes in the state of dispersion of rubber. F. EVERS. *Kautschuk Nov.*, 1925, 8; *Gummi-Ztg.* **40**, 887-8.—Since neither the hydrogenation nor the decompn. of rubber has so far yielded any definite information concerning the structure of the rubber mol., the latter problem was attacked by utilizing the *catalytic action of AlCl_3* . Plasticized rubber was boiled in PhCl or xylene with AlCl_3 . After the violent reaction had ended, the AlCl_3 was removed and the reaction products were pptd. with EtOH . The ppt. (6.4 g. from 10 g. rubber) resembled the rubber hydrochloride obtained in $(\text{CH}_2\text{Cl})_2$ and contained in %: C 80.86, H 10.03, Cl 3.13, though the analysis is only approx. This *disaggregated product* differed from the plasticized rubber in that it dissolved in C_6H_6 with swelling and in that it reacted violently with Br with evolution of HBr. *Its viscosity curves* were of similar character, though far apart. Thus 1% of plasticized rubber in C_6H_6 had a viscosity of 1.45 and 1.08 at 20° and 43°, resp., whereas after boiling in PhCl with AlCl_3 the values were 0.42 and 0.28.

C. C. DAVIS

The oxidizing capacity of a one-phase rubber gel compared with raw rubber. H. FEUCHTER. *Kautschuk Aug.*, 1925, 11; *Gummi-Ztg.* **40**, 888.—When thin films of "diffused rubber" (cf. *C. A.* **19**, 2576) and of smoked sheet were exposed to sunlight, the former oxidized much more slowly than smoked sheet, but nevertheless lost its elasticity faster. This seeming paradox is probably due to the action of the non-rubber colloids in raw rubber, which are themselves oxidized and thus protect the rubber phase. The results indicate in general that oxidation is not *per se* a criterion of aging, for only when the rubber phase itself has succumbed to oxidation does a rapid decrease in the elasticity occur.

C. C. DAVIS

The process of mastication. A discussion of theories of structure. E. A. HAUSER AND H. DANNENBERG. *Kautschuk Nov.*, 1925; *Gummi-Ztg.* **40**, 1043.—The two-phase theory of the structure of rubber in conjunction with the recently discovered structure of latex particles (cf. Hauser, *C. A.* **19**, 1962, 2280; **20**, 677) is adequate to explain the phenomena accompanying mastication and dispersion in solvents. See also Bary, *C. A.* **20**, 677.

C. C. DAVIS

New ebonite testing accessories for the Schopper machine. R. HOUWINK. *India Rubber J.* **71**, 227-8 (1926).

C. C. DAVIS

The problem of vulcanization. IV. Shell aggregation and the colloidal crystallization of rubber. H. FEUCHTER. *Kolloidchem. Beihfte* **21**, 171-94 (1925).—In extending and elaborating his earlier theory (*C. A.* **18**, 1765; **19**, 1207, 2576), F. develops the concept of rubber as a single-phase gel composed of an aggregation of chemically identical particles. These particles are spheroidal and are built up of a series of concentric shells of "polyprene" mols. or nuclei, such a structure involving colloidal polymerization. The spheroids or rubber *molecules* can exist as sep. individual units, in which case they are the latex particle, or they may be held together by chem. valency forces.

In the latter case the double binding system between the polyprene nuclei on the surface of the concentric spheres on the one hand, and between the surfaces of the adjacent spheres on the other, leads to a network which may be regarded as a gel skeleton of the single-phase gel. Under these conditions a phase crystn. exists, in which the network or gel skeleton is in an unstable state, for the disruptive forces are not great enough to allow of complete crystn. The concepts are in general hypothetical and are not supported by exptl. evidence. Furthermore no reference is made to the application of the theory to mastication, vulcanization or swelling, though the phenomena of elasticity, "grain" and crystn. are explained.

C. C. DAVIS

CHEMICAL ABSTRACTS

Vol. 20.

APRIL 20, 1926

No. 8

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

The ultrabalance. R. WAAG. *Umschau* 30, 115-7(1926).—A balance, sensitive to 1 part in 300,000,000 ($\frac{1}{10,000,000}$ g. for a 30 g. load) is described. Weighing to $\frac{1}{100,000}$ g. is made in the usual way, the pointer swing being observed with a lens. The $\frac{1}{1,000,000}$ g. readings are detd. and the $\frac{1}{10,000,000}$ readings are estd. by observing from a distance the movement of a spot of light reflected by a mirror on the balance beam.

R. L. DODGE

A new sorption balance. J. W. MCBAIN AND A. M. BAKR. *J. Am. Chem. Soc.* 48, 690-5(1926).—A flat, helical spring of silica is made by heating a SiO_2 rod and drawing it out quickly, then wrapping the resulting fiber about a C rod of suitable diam., heating the fiber at the point where it is being bent. The elongation of the spring under varying known wts. and at several temps. over the range in which it is to be used is detd. Elongations are read by means of a traveling microscope. The spring, from the end of which is suspended a bucket contg. the adsorbent, is supported within a glass tube contg. a thin-walled glass bulb holding the liquid whose vapor is to be adsorbed. After evacuating the system and sealing off the tube, the glass bulb is broken by a magnetic device. The downward movement of the spring measures the amt. of vapor adsorbed. Investigations of sorption above and below the crit. points can be made readily.

F. L. BROWNE

Fractionating column calculations. T. S. CARSWELL. *Ind. Eng. Chem.* 18, 294-5(1926).—The relationship between the height of the equiv. theoretical plate in cm (H. E. T. P.) and the radius in cm. (r) of packing rings with the diam. and height equal is $H. E. T. P. = 47 r$. The relationship between the H. E. T. P. and the substance distd. for a definite column and type of packing is $H. E. T. P. = k Md/T$, where M = mol. wt. of substance, d = d. of backflow, T = abs. b. p. of substance, and k = const.

W. L. MCCABE

A mobile refrigerating unit. H. F. PIERCE. *Ind. Eng. Chem.* 18, 270-1(1926).—The unit consists of a motor-driven compressor pump, a cooling coil, an expansion valve, and an expansion coil located in a brine tank and mounted on a small truck. A 35% alcohol-water mixt. replaces the usual brine soln. and works at temps. as low as -15° ; it possesses a refrigerating capacity nearly equal to that of a 25% CaCl_2 soln. A max. temp. deviation of $\pm 0.25^\circ$ over a 2-week period is recorded.

W. H. BOYNTON

Rotary positive-pressure pumps for transportation of liquids and gases. R. DE TEMPLE. *Tech. Ind. Schweiz. Chem.-Ztg.* 1926, 1-6.—Descriptive.

W. L. B.

Plants for removing mist. HACK. *Chem.-Ztg.* 49, 1054-6(1925).—An elementary presentation of the causes of mist (clouds) in factories, etc., and the means for removing it by proper ventilation and the use of preheated air. Illustrative calcs. are given.

W. C. EBAUGH

The Ljungström air preheater. WILHELM GUMZ. *Feuerungstechnik* 13, 217-20, 248, 9(1925).—The preheater (cf. Brolinson, C. A. 18, 2620) is described and discussed, and a series of boiler test results is presented.

ERNEST W. THIELE

An ebullition device for low temperature and vacuum distillation. A. F. O. GERMANN AND D. M. BROSEL. *J. Phys. Chem.* 29, 1528-32(1925).—A device is described for adapting the ordinary ebullition tube to obtain effervescent distn. without the use of any foreign gas and hence particularly useful in the purification of gases or in vacuum distn. Expts. on the purification of technical COCl_2 and mixts. of COCl_2 and SO_2 using the new app. and the simple distg. tube showed the superiority of the former. The phenomenon of ebullition is discussed.

R. E. GIBSON

Turbidimeter for accurate measurements of low turbidities. J. R. BAYLIS. *Ind. Eng. Chem.* 18, 311-2(1926).—A simple app. is described in detail for comparing the turbidity of liquids with samples of known turbidity. The turbidity values for the known standards are detd. with a Jackson candle turbidimeter. The comparison

method described readily detects a turbidity of 0.1 part per million, but is accurate only for turbidities less than 2. The turbidities are compared in glass tubes so arranged that a perfectly blue light is underneath the tubes, while white light shines through the tubes. Any matter in suspension reflects white light rays and cuts out some of the blue light.

R. L. DODGE

Enclosed continuous filter. J. F. WAIT. *Ind. Eng. Chem.* 18, 295-7(1926). A description of an app. for continuous filtration applicable to volatile fluids at elevated temps. A pressure differential up to 14 atm. is employed which does not expose the material to air.

W. L. MCCABE

A modified fusion pot. V. S. BABASINIAN AND R. D. BILLINGER. *Ind. Eng. Chem.* 18, 340(1926).—The Ni pot described was designed for alk. fusions of org. compds used in the lab. prepn. of dyes. It can be used as an autoclave for high-pressure work.

E. J. C

Combined distillation and return cooler. L. E. LÖFBERG. *Chem.-Ztg.* 50, 86(1926); 1 cut.—The app. consists of 2 superimposed sections. If H_2O is used in the lower section it acts as a return cooler; if in the upper section, it acts as a distn. cooler.

J. H. MOORE

Report on a leak in a chlorine container at the Zinnwerke Wilhelmsburg G. m. b. H. FR. BÖRNER. *Chem.-Ztg.* 50, 85-6(1926).

J. H. MOORE

New stopper for a Kjeldahl flask, with rustless steel wire holder. RUDOLF WEBER. *Chem.-Ztg.* 50, 86(1926); 1 cut.

J. H. MOORE

Apparatus for determining the apparent specific gravity and the porosity of substances. HEINRICH HERBST. *Chem.-Ztg.* 50, 49(1926); 1 cut.—The method is based on the displacement of Hg by the substance.

J. H. MOORE

A new electrical recorder. T. R. HARRISON. *J. Optical Soc. Am.* 12, 165-72(1926).—Description of recording millivoltmeter of the d'Arsonval galvanometer type for use with thermocouples, radiation pyrometers, resistance thermometers, thermal cond. gas analysis app., etc. The instrument embodies many new features contributing to ruggedness, convenience of operation and accuracy. The manufacturers are the Brown Instrument Co., Philadelphia, Pa.

R. L. DODGE

Apparatus for electrical heating and evaporating. ANON. *Chem.-Ztg.* 50, 49(1926); 1 cut.—C filament lamps form the heating element.

J. H. MOORE

An electrode vessel jacketed for work at various temperatures. S. O. RAWLINGS. *Chemistry & Industry* 45, 73(1926).—The customary electrode of H, Ag, etc., is immersed in the usual way in the liquid to be examd. The liquid container is a double-walled glass vessel. The space between the walls is kept full of running H_2O from a thermostat maintained at the working temp. The inner vessel is connected by a three-way cock either to a waste tube or to the remainder of the app., consisting of a salt bridge of satd NH_4NO_3 soln. and a calomel electrode.

R. L. DODGE

Lunettes-Lumina, a new laboratory instrument. HERMAN WEISZ. *Ann. chim. anal. chim. appl.* 7, 326(1925).—An Austrian firm has placed on the market a kind of blue glass spectacles which permit one to distinguish between colors under artificial illumination as in daylight.

W. T. H

Microscope and ultra-violet light (LUCAS) 9. Use and revivification of decolorizing C (BLOCK) 18.

Apparatus and heat-exchange system for liquefying and separating constituents of air or other gaseous mixtures. R. F. MEWES AND R. K. E. MEWES. *Brit.* 236,608, Feb. 4, 1924.

Apparatus for evaporating brine, etc. R. FRANCE. *Brit.* 242,018, Aug. 23, 1924. The app. comprises an open pan and a tubular heater through which the soln. undergoing evapn. is circulated by a pump.

Apparatus for filtering water, wine, beer, oils or other liquids. J. M. HINCHLEY AND STREAM-LINE FILTER CO., LTD. *Brit.* 236,608, March 4, 1924.

Filter bed for water or other liquids. F. B. LEOPOLD. *U. S.* 1,572,398, Feb. 9. Structural features.

Apparatus for destructive distillation of material in contact with a bath of molten metal. A. M. DUCKHAM. *U. S.* 1,572,779, Feb. 9. A chain carrying transverse plates moves through the distg. chamber and serves to depress the material undergoing distn. into intimate contact with a bath of molten metal.

Apparatus for making extracts, emulsions, suspensions, etc. N. BENDIXEN, W. E. McKECHNIE AND E. L. RRID. *Brit.* 242,020, Aug. 27, 1924. A corrugated or serrated

grid is arranged in a liquid container around a screw propeller or similar device which forces material outwards against the grid.

Storing gases in absorbent material. GAS ACCUMULATOR CO. (United Kingdom), LTD. Brit. 242,241, Nov. 1, 1924. Vessels for storing C_2H_2 and the like are filled with cellulose, sawdust, kapok or similar material which is rendered capable of resisting local explosions without charring by treatment with $CaCl_2$ and Na silicate or with substances reacting to form Cu or Zn resinate or similar insol. compds.

Gas-fired shaft furnace for burning lime, cement, dolomite, etc. R. DE BAR-TOLOMEIS and SOC. ANON. FORN ED IMPIANTI INDUSTRIALI. Brit. 236,776, Oct. 8, 1924.

Rotary "continuous" furnace or kiln. A. H. PEHRSON. U. S. 1,572,805, Feb. 9.

Device for discharging a container into another below the first. AUGUST SOMMERMEYER. Norw. 42,208, Nov. 23, 1925. Mech. features.

Thermionic valves. S. R. MULLARD and MULLARD RADIO VALVE CO., LTD. Brit. 241,996, Aug. 1, 1924. A cathode is formed by making a fine tube of a mixt. of Th or other electron-emitting material with W, Mo or other metal of high m. p. and mounting the tube on a filament of W, Mo or similar refractory metal. The Th may be produced in the mixt. by reduction of thoria by H. A W wire is inserted in the tube and may be etched or partially dissolved by $NaNO_3$ to prevent overheating on the ends. The use of U also is mentioned.

Thermionic valves. GENERAL ELECTRIC CO., LTD. AND C. J. SMITHELLS. Brit. 241,984, July 28, 1924. A coating of electron-emitting material (preferably carbonates of alk. earth metals) is applied to a conductor by reducing the material, suspended in a liquid, to a fine state of subdivision by use of a colloid mill. The conductor is subsequently heated in a vacuum or inert gas to convert the carbonates to oxides. From 5 to 50 such coatings may be successively applied.

Thermionic valves. E. Y. ROBINSON. Brit. 236,615, March 26, 1924. A tubular or sheet metal cathode comprises a core such as W or Mo and a coating of Pt (or an alloy) or Ni upon which a covering of electron-emitting material is deposited. The Pt or Ni may be deposited electrolytically. Cf. C. A. 19, 911.

Thermoelectric element. O. HERMANN. U. S. 1,572,117, Feb. 9. An alloy of Ni 81, Mo 17 and V 2% is used for negative thermoelec. elements together with positive elements comprising Ni 40 and Cu 60%.

Thermostatic device for controlling fuel valves. O. SCHWIMMER. U. S. 1,572,969, Feb. 16.

Thermostat. T. S. BEACHAM. Brit. 236,716, June 17, 1924.

Thermostat for regulating steam valves, etc. J. M. KNEPPERS. Brit. 236,784, October 20, 1924.

Thermometer. M. FLEISCHER. Brit. 242,228, Nov. 3, 1924.

Photometer. H. LUX. U. S. 1,572,544, Feb. 9.

X-ray tube. C. C. VAN VOORHIS. U. S. 1,573,105, Feb. 16. Gas such as He is introduced into the tube by applying the gas to the surface of the tube and heating the latter to permit diffusion.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

Albert Richaud (1864–1925). "G. M." *J. pharm. chim.* [8], 2, 311–4 (1925).—An obituary. S. WALDBOTT

James Lewis Howe. S. C. LIND. *Ind. Eng. Chem.* 18, 434 (1926).—A brief biography, with portrait. E. J. C.

Aurel Babes. ST. MINOVICI. *Bull. soc. chim. România* 7, 63–4 (1925).—Obituary with a list of articles published by B. A. PAPINEAU-COUTURE

Meetings of the international nomenclature committees, Paris, October, 1925.

A. M. PATTERSON. *Ind. Eng. Chem.* 18, 320–1 (1926).—Tentative decisions for both inorg. and org. nomenclature are unofficially reported. E. J. C.

Radii of atoms and ions. W. P. DAVEY. *Chem. Rev.* 2, 349–67 (1925).—D. defines as the radius of the atoms and ions in crystals the half distance of the closest approach of the atoms, i. e., the "packing radius" of the individual fields of forces, which latter may or may not be spherical. Numerous values are given and are shown to be a periodic function of the no. of electrons in the outer shell. 11 references. G. C.

Separation of hafnium and zirconium by fractional precipitation of their phosphates from a solution containing oxalic acid. J. H. DE BOER. *Z. anorg. allgem. Chem.* 150,

210-6(1926).—Freshly pptd. and wet phosphates of Zr and Hf are sol. in oxalic, phosphoric and sulfuric acids, forming complex compds. which easily decompose. Thus heating or addn. of EtOH or a mineral acid to the soln. in oxalic acid or of water to that in H_3PO_4 or H_2SO_4 suffices to ppt. the phosphates. The content of Hf in this ppt. expressed by the fraction $\text{Hf}/(\text{Hf} + \text{Zr})$ is higher than in the original soln. The pptn. from concd. satd. oxalic acid with HCl gave the best results, permitting the prepn. of a 97% pure product after 26 fractional pptns., whereas several hundred fractional crysts. are necessary when the original method of Hevesy with the double fluorides is used (cf. *C. A.* 10, 1672). A vacuum X-ray spectrograph was applied for the detn. of Hf pyrophosphate in the individual fractions, the intensity of the La_1 -line having been compared with that of La_1 of tantalum pentoxide. The results were confirmed by chem. analysis. Metallic Hf obtained from the phosphate by a series of reactions have d. 12.1. F. K.

The possible enhanced activity of newly formed molecules. F. R. GOSS AND C. K. INGOLD. *J. Chem. Soc.* 127, 2776-81(1926).—In many org. reactions in which it seems obvious that an intermediate product is first formed which subsequently decomposes to give the final products, it is found that subjecting the pure intermediate product in question to the same exptl. conditions fails to bring about the formation of the final products expected. The suggestion is made that "intermediates may be produced in a reactive condition in which they are capable of changes which cannot occur after the energy assocd. with the formation of the compd. has been dissipated." F. L. B.

Isotropic ions and structure of the molecules and crystal lattices. F. HUND. *Physik. Z.* 26, 682-5(1925).—The shape of the mols. and of the crystal lattice in which a substance crystallizes can be explained in terms of isotropic ions; therefore one cannot infer the structure of the ion from the crystal structure and the shape of the mols. This does not imply, however, that isotropic properties are the only controlling factors. G. CALINGAERT

Dielectric constant and molecular structure. K. T. COMPTON. *Science* 63, 553-5 (1926).—An address. G. CALINGAERT

The crystalline structure of chrysoberyl. W. LAWRENCE BRAGG AND G. B. BROWN. *Proc. Roy. Soc. (London)* 110A, 34-63(1926).—Ionization spectrometer measurements and X-ray photographs taken with a revolving crystal have been used to examine the structure of chrysoberyl, BeAl_2O_4 . The unit cell, contg. 4 mols., is orthorhombic with a , b , c equal to 4.42, 9.39, 5.47 A. U., resp. The structure belongs to the space-group V_h^{16} . Because they scatter X-rays so feebly, the Be atoms could not be located. Oxygen atoms are arranged in hexagonal close-packing, slightly distorted by the presence of Al atoms in spaces between six O atoms. Relative intensities are used to det. the parameters governing the positions of Al and O atoms. The structure is somewhat analogous to that of spinel, MgAl_2O_4 , although in the latter crystal the O atoms are in cubic close-packing. R. J. HAVIGHURST

The crystal structure of the high-temperature (β -) modification of quartz. R. W. G. WYCKOFF. *Am. J. Sci.* 11, 101-12(1926).—Data from powder and spectrum X-ray photographs of quartz above its inversion point, and from Laue photographs show that each Si atom is surrounded by a tetrahedron of O atom and each O atom is equally distant from two Si atoms. There is no evidence for the existence of chem. mols. in the crystal. Cf. *C. A.* 20, 318. R. J. HAVIGHURST

A röntgenographic determination of the atomic arrangement in the mixed crystal series gold-copper and palladium-copper. C. H. JOHANSSON AND J. O. LINDE. *Ann. Physik* 78, 439-60(1925).—Certain Debye-Scherrer interference maxima which Bain found from an alloy of Cu-Au contg. 75 at. % Cu, and which he attributed to a regular arrangement of the solute atoms (Au) in the lattice of the solvent (Cu) in accordance with Tammann's theory of a "normal distribution" in the lattice of a solid soln., have been obtained by J. and L. but are attributed to a compd. Cu_3Au . The existence of this compd., as well as one Cu-Au, is shown by elec. cond. measurements of Kurnakov, Zhemchuhni, and Zasedatlev. The authors have obtained extra lines from the alloy contg. 50% Cu, which correspond to a tetragonal face-centered lattice with axial ratio $a:c = 1.078$. These extra lines, as well as minima in the resistivity curves, were not obtained unless the alloys were cooled very slowly through the region of transition to the new compds. The solid soln. contg. 75% Au showed no trace of extra lines. In the system Pd-Cu, the face-centered cubic lattice goes over to a body-centered "CSC" lattice at 40 at. % Pd and reverts to the face-centered lattice at 50% Pd. Between 40 and 50% Pd, there was no trace of lines due to the face-centered lattice when a carefully annealed sample was used. Between these limits, the solid solns. show an abnormally large cond. R. J. HAVIGHURST

The crystal structure of argon; investigation of the structures of nitrogen and oxygen at liquid-hydrogen temperature. J. DE SMEDT and W. H. KEESOM. *Physica* 5, 344-6(1925); cf. *C. A.* 19, 1816.—The structure of solid A has been detd. and the results of Simon and von Simon fully confirmed (*C. A.* 18, 3128). Face-centered cubical structure was found, $d_{100} = 5.40$ A. U. ± 0.06 . The d at about 20° abs. is 1.68. Debye-Scherrer diagrams of solid O_2 and N_2 at 29° abs. showed as a preliminary result that the symmetry is probably lower than regular, tetragonal, hexagonal or trigonal. The work is being continued.

Crystal structure of germanium tetraiodide. F. M. JAEGER, P. TERPSTRA AND H. G. K. WESTENBRINK. *Verslag. Akad. Wetenschappen Amsterdam* 34, 721-40; *Proc. Acad. Sci. Amsterdam* 28, 747(1925).—The crystal structure of GeI_4 is detd. by Laue and spectral photographs, and some angles are measured directly. The unit cell is cubic and contains 8 mols., $d_{100} = 11.89$ A. U. The space group symmetry is T_h^6 , the same as in SnI_4 (Dickinson, *C. A.* 17, 1740), the crystal form is dyakisdo-decahedral.

Crystal angles, measured under the microscope. E. A. HILL. *J. Am. Chem. Soc.* 48, 651-4(1926).—A new method is described for the measurement, under the microscope, of solid crystal angles, and of the slope angles of crystal faces, by the use of the ordinary eye piece micrometer disks and the graduations of the fine adjustment screw.

The structure of molecules in relation to their optical anisotropy. II. Benzene and cyclohexane. K. R. RAMANATHAN. *Proc. Roy. Soc. (London)* 110A, 123-33(1926); cf. *C. A.* 19, 1973.—The method of the previous work is extended to the study of benzene and cyclohexane. Each atom is assumed to be isotropic. If the six C atoms in benzene are assumed to lie in a plane with their centers at the corners of a regular hexagon, the calcd. optical anisotropy comes out too high. If the C atoms are arranged on a puckered ring, with hydrogens joined to carbons at the tetrahedral angle, the calcd. and observed values of the optical anisotropy agree well, when the at. refractivity of C is assumed to be that of diamond, and the at. refractivity of H to be that in gaseous hydrogen. Calcd. and observed values of molar refractivity are also in good agreement. In the case of cyclohexane, the 6 extra H atoms are supposed to be attached to the C atoms alternately above and below the approx. plane of the C ring. The calcd. anisotropy agrees fairly well with the observed value. A simple glass app. is described for the measurement of the imperfection of polarization of the light scattered by vapors which require heating for their production.

The effect of three-dimensional (wechselseitige) compression on aluminum. G. SACHS and E. SCHIEBOLD. *Z. Ver. deut. Ing.* 69, 1557-61, 1601-4(1925).—By alternate hammering of Al cubes on the three perpendicular cube faces the metal was hardened, although the original cube form was maintained. The degree of hardening is not so great, for the same amt. of deformation, as in the case of hammering in one direction only. X ray examn. by the Debye-Scherrer method shows that, in the case of deformation by pressure in one direction only, the crystallites line up with (110) axes (cube face diagonals) parallel to the axis of deformation, but maintain a fortuitous orientation in other respects. In the case of three-dimensional compression the crystallites assume the positions made possible by a superposition of the three separate one-dimensional pressure effects. There are three equiv. positions of the Al single-crystal cubes, in each of which two pair of cube faces make angles of 45° with cube faces of the large test piece.

The relation between detecting power and crystal habit in galena and pyrite. P. GAUBERT. *Compt. rend.* 182, 143-6(1926).—Octahedral faces of galena are usually good detectors, while cube faces are poor ones. Especially pure crystals are poor detectors. In pyrite, the cube faces are better detectors than the octahedral faces. According to G.'s theory, detector action is produced by some impurity which has syncrystallized with the crystal, modifying its habit and forming thin layers parallel to the new faces.

Melting points of barium, strontium and calcium oxides. E. E. SCHUMACHER. *J. Am. Chem. Soc.* 48, 396-405(1926).—A new method for detg the m. ps. of certain oxides is described and illustrated. By this method BaO , SrO and CaO m. 2196° , 2703° K. and 2849° K., resp.

Recrystallization and loss of strength as shown by röntgenographs. G. SACHS AND E. SCHIEBOLD. *Z. Metallkunde* 17, 400-2(1925).—This is a study of the relation between crystal form and mech. strength of Al wire, drawn and heated to different temps. as revealed by Röntgen-ray photographs. Wire contg. 99.6% Al, drawn from 8.75

to 1.18 mm., was used and heated to various temps., mech. strength and röntgenographs being studied between 100° and 600°. Photographs are shown for room temp., 150, 200, 250, 300 and 550°. The strength drops sharply from 24.4 kg./sq. mm. at room temp. to 11.0 kg./sq. mm. at 250° and then rises slightly on account of the effect of impurities, being still as high as 11.7 at 550°. A curve is shown. From the röntgenographs it is seen that considerable loss in strength can take place with very little effect upon the crystal lattice, and no simple relation between strength and Röntgen-ray picture can be found. The röntgenographs, however, make possible the detn. of the lattice form and lattice const. of the material examd., the size of the individual reflecting spheres and their position with respect to the Röntgen rays. A diagram is shown from which the position of the various rings in the röntgenograph can be detd., using $\text{MoK}\alpha$ and $\text{K}\beta$.

H. STOERTZ

The potentials of thallium-antimony alloys. G. VINOGOROV AND G. PETRENKO. *Z. anorg. allgem. Chem.* 150, 258-60 (1926).—R. Williams made the assumption of the existence of a compd. SbTl_2 without being able to prep. it in a pure state (cf. *Z. anorg. allgem. Chem.* 50, 129 (1906)). The measurements of the potentials of the combination $\text{Tl-Sb alloy} | 1\text{N TiCl}_4 | \text{Tl}$, in which Tl-Sb alloys of various compns. were used, actually indicated the presence of this compd.

EMIL KLARMANN

Occurrence of monopolarity in pressed powders. F. TREY. *Physik. Z.* 26, 849-62 (1925).—T. compares the properties of natural detectors with those of artificial ones made of pressed powders.

G. CALINGAERT

Remarks about the growth of crystals. P. TERPSTRA. *Verslag. Akad. Wetenschappen Amsterdam* 34, 776-8; *Proc. Acad. Sci. Amsterdam* 28, 794 (1925).—A discussion of the formulas derived by Valetton (*C. A.* 18, 1407, 3502).

G. CALINGAERT

Crystal form of some position isomers of dinitrotoluene. F. M. JÄGER. *Verslag Akad. Wetenschappen Amsterdam* 34, 848-52 (1925).—The crystal form is given for 5 of the 6 possible isomers. 2,3-: Rhombic bipyramidal, $a:b:c = 0.6352:1:0.3721$, cleavage along 0.001. 2,4-: Monoclinic prismatic, $a:b:c = 0.8553:1:0.5236$, $\beta = 84^\circ 37' 30''$, habitus prismatic along c . 2,6-: Rhombic bipyramidal (pseudo-hexagonal), $a:b:c = 0.5725:1:0.5324$, habitus extended along c . 3,4-: Monoclinic prismatic, $a:b:c = 0.8320:1:0.2465$, $\beta = 88^\circ 25'$, prismatic needles along c . 3,5-: Monoclinic prismatic (pseudorhombic), $a:b:c = 0.4691:1:0.5276$, $\beta = 89^\circ 51'$. From EtOAc the last crystallizes with 1 mol. of solvent as short monoclinic prisms, $a:b:c = 0.7143:1:0.3853$, $\beta = 73^\circ 58' 30''$. There is no analogy between these forms and those of mono- and trinitrotoluenes.

G. CALINGAERT

Physical properties of tungsten at high temperatures. C. ZWIKKER. *Physica* 5, 249-60, 319 (1925); cf. *C. A.* 19, 3056.—A new set of detns. is given, differing in some respects from those of Langmuir (*C. A.* 10, 1298) and of Worthing (*C. A.* 19, 2170). Light intensities and temps. were all detd. on a microphotometer bank by comparison with a standardized pyrometer lamp, of which the brightness (H)/current (i) curve is known. From H the apparent black temp. S was calcd. by means of Wien's equation. A second standardization without color filter allows measurements of surface brightness B . In order to convert black temp. S into true temp. T detns. were made of the emission coeff. e_λ { $\log_2 e_\lambda = c_2/2.303 \lambda [(1/T) - (1/S)]$ }. Two different types of W black-body radiators were constructed for this purpose (hollow W cylinders heated either by thermionic bombardment or by d. c.); the ratio of inside and outside brightness yields e_λ as a function of T . The color temp. T_c was found by measuring at different temps. the ratio of red to white radiation for black body and ordinary W. From these measurements the pseudoemissive power e_c ($e_c = e_\lambda E_{\lambda T} / E_{\lambda T_c}$) can also be evaluated. Values of B for black-body radiation in international candles/sq. cm. detd. in this manner (one I. C. equals 1.111 Hefner candles of 1922) are at $T = 1300^\circ$, $B = 0.015$; $T = 1500^\circ$, $B = 0.819$, $T = 2000^\circ$, $B = 50.1$, $T = 2600^\circ$, $B = 915$. From temp. and energy equil. in an "ideal" piece of W wire (no heat loss by conduction) the sp. resistance was calcd.; from the increase in resistance with time is calcd. the rate of evapn. as a temp. function. The latter was found to be in g. metal per sq. cm. per sec.: $\log_{10} m = 11.92 - (4.84 \times 10^{-4}/T) - 0.368 \log T - 0.00016 T$. From the $1/T$ coeff. follows for the heat of evapn. at zero abs. 221,000 cal./g. atom. The satd. vapor pressure of W in mm. Hg follows from $\log p = 12.02 - (4.84 \times 10^{-4}/T) + 0.132 \log T - 0.00016 T$; the metastable sublimation point is at 5220° abs. As to the temp. distribution on the W filament Z. finds that $\epsilon/T_m = A - 10^{-10}$ in which A is an arbitrary const., x measures the distance from some point on the wire, a is a const. $= 2.303 \sqrt{K_m T_m / 14 \eta_m}$, T_m is max. temp. of filament, k_m heat cond. and η_m total radiation/cm.² both for T_m . From pyrometric observations k_m and the Thomson effect σ were found. In a specially constructed tube

with 10^{-7} mm. vacuum the thermoelec. emission was detd.: $i = 60.2T^2e^{-52230/T}$ amps./cm. ($\phi = 4.50$ v.) for an anode potential zero. Part of the tabulated data follow: at 1500° abs. ($\lambda = 0.665\mu$) $\epsilon_\lambda = 0.451$; $S_\lambda = 1421^\circ$; $\epsilon_c = 0.387$; $T_c = 1517^\circ$; $B = 0.370$ I. C./cm.²; $\rho = 40.2 \mu$ Ohmcm.; total radiation $\eta = 5.52$ watts/cm.². At 2000° abs. in the same order: 0.440; 1859° ; 0.371; 2033° ; 23.2; 56.7 ; 24.0 . At 2500° : 0.427; 2275° ; 0.353; 2557° ; 279; 74.0 ; 69.4 . At 3000° abs.: 0.415; 2675° ; 0.337; 3094° ; 1490; 92.3 ; 162. At 3400° abs.: 0.407; 2978° ; 0.323; 3533° ; 4080; 107.8 ; 291. The cond. k varies from 1.22 watts/cm. per degree at 1800° abs. to 1.43 at 2800° abs.; the Thomson effect in μ V per degree from -18 at 1800° to -30 at 2400° .

B. J. C. VAN DER HOEVEN

The isomorphism of the molybdates of the rare earth metals with those of calcium, strontium, barium and lead. F. ZAMBONINI AND R. G. LEVI. *Atti accad. Lincei* [6], 2, 149-52, 225-30, 303-5, 377-83, 462-5(1925); cf. *Rivista ital. di min.* 54-5(1915); 18, 947; C. A. 19, 1529; Z. *Kryst.* 44, 80(1908).—Röntgenographic detns. made by the methods and app. previously used by L. using the Debye and Scherrer method show that CaMoO_4 , SrMoO_4 , BaMoO_4 and PbMoO_4 all have the same structure. The data are given in full. For the Ca, Sr and Ba compds. the value of a shows a gradual increase which is a linear function of the at. wts. of Ca, Sr and Ba. This fact was also observed by Vegard for the nitrates. The deviation from a linear function of the at. wt. is somewhat greater in ϵ_b . Z. and L. found the variation in the molybdates of Ca, Sr and Ba to be a linear function of the at. wts. within $\pm 1\%$. The data on the röntgenographic structures of the molybdates of La, Ce, Pr, Nd and Sm are given in the 4th paper, and in the last paper the deductions from these data are given. The isomorphism among these compds. is perfect. The spectrograms show identity in structure with only unimportant exceptions. The data show that in the isomorphous series of molybdates of the alk. earth metals and of those of the Ce group the elementary solids contain equiv. vols. of these compds. This fundamental question for the subject of isomorphism is decisively answered. In this series of molybdates the vol. of the elementary solid decreases regularly with increases in the at. wt. and in the at. no. (cf. Goldschmidt, *et al.*, C. A. 18, 316). Since these molybdates all possess the same structure this should also be revealed in their mixed crystals. Mixed crystals of CaMoO_4 with 6.5 to 29% $\text{Ce}_2(\text{MoO}_4)_3$ were examd. in detail by these methods but no particular structural characteristics were found. In the elementary solids CaMoO_4 and $\frac{1}{3}\text{Ce}_2(\text{MoO}_4)_3$ play an equal and replaceable role. In comparing the reticular constns. of the Ce earth molybdates with those of the alk. earths and Pb it is found that that of Sm is most like that of Ca while the values for the other rare earths fall between those for CaMoO_4 and SrMoO_4 . All 5 of the rare earth molybdates are completely miscible in PbMoO_4 while $\text{Sm}_2(\text{MoO}_4)_3$ gives mixed crystals in greater proportions with CaMoO_4 . E. J. W.

The determination of the melting point of graphitic carbon. EUGEN RISHKEVICH AND FRIEDRICH MERCK. Z. *Elektrochem.* 32, 42-7(1926); cf. C. A. 19, 1513, 2594.—The method used consisted in the measurement of the temp. of the interior of a hollow graphite rod. The graphite was Acheson graphite of 99.9% C and was elec. heated in an atm. of N-free argon. The av. value obtained for the m. p. was $3845^\circ \pm 45^\circ$, the av. deviation from the mean being about 20° .

J. H. PERRY

The kinetic theory of diffusion. S. ROSSELAND. *Physica* 5, 381-4(1925).—Mathematical.

B. J. C. VAN DER HOEVEN

Equal viscosities. O. FAUST. Z. *anorg. allgem. Chem.* 150, 175-6(1926).—Notes on a paper by Herz (cf. C. A. 19, 3392). There seems to be a connection between the mol. assocn. and the deviation from the regularity in the relationship of inner friction to the crit. temp.

EMIL KLARMANN

Vapor pressure of arsenic trioxide. E. R. RUSHTON AND FARRINGTON DANIELS. *J. Am. Chem. Soc.* 48, 384-9(1926).—Although octahedral As_2O_3 (m. 275°) is metastable above 100° , the rate of change to the stable monoclinic form (m. 315°) is so slow as to permit measurements of the vapor pressure of the former up to 250° or higher, depending on the rate of heating. The equation for the vapor-pressure curves are: octahedral $\log P = -(6670/T) + 13.728$; monoclinic form given provisionally as $\log P = -(6100/T) + 12.26$; and liquid, $\log P = -2732/T + 6.513$. From the Clausius-Clapeyron equation the heats of vaporization are calcd. as: liquid, 31.5 cal.; octahedral, 77.1 cal.; monoclinic 71 cal.

JAMES M. BELL

Adjusted vapor pressures of zinc and cadmium. C. G. MAIER. *J. Am. Chem. Soc.* 48, 356-64(1926).—The standard free-energy equation $\Delta F_T^\circ = -RT \ln K = \Delta H_0 - \Delta F_0^\circ T \ln T - \frac{1}{2} \Delta G_1 T^2 - \frac{1}{6} \Delta G_2 T^3 - \dots + IT$, has been employed for fusion, sublimation and vaporization of Zn and Cd. From the best available data calcons. are made of Σ , which has been plotted against $1/T$, where $\Sigma = -R \ln K + \Delta F_0^\circ T \ln T + \frac{1}{2} \Delta G_1 T^2 + \frac{1}{6} \Delta G_2 T^3 + \dots$. This plot should be a straight line with slope ΔH_0 and intercept I.

The best possible straight lines are drawn through the points, and the following equations have thus been derived: For Zn, vaporization, $\Delta F_T^\circ = 30,540 + 2.24 T \ln T - 41,760$; sublimation, $\Delta F_T^\circ = 31,515 + 0.10 T \ln T + 0.0015T^2 - 29,932T$; fusion, $\Delta F_T^\circ = 975 - 2.14 T \ln T + 0.0015T^2 + 11.828T$; vapor pressure of liquid, $\log p_{mm} = 12.0013 - 6670/T - 1.1265 \log T$; vapor pressure of solid, $\log p_{mm} = 9.4181 - 6883/T - 0.05029 \log T - 3.277 \times 10^{-4}T$. Similar values for Cd are: vaporization, $\Delta F_T^\circ = 26,645 + 2.50 T \ln T - 43,068T$; sublimation, $\Delta F_T^\circ = 27,050 + 0.46 T \ln T + 0.0013T^2 - 31,301T$; fusion, $\Delta F_T^\circ = 405 - 2.04T \ln T + 0.0013T^2 + 11.767T$; vapor pressure of liquid, $\log p_{mm} = 12.287 - 5819.4/T - 1.2572 \log T$; vapor pressure of solid, $\log p_{mm} = 9.717 - 5907.8/T - 0.4323 \log T - 2.840 \times 10^{-4}T$.

JAMES M. BELL

Distillation of immiscible substances. E. ØMAN. *Svensk. Kem. Tids.* 37, 558 (1925).—The proportionate concns. of 2 components of the vapor in the distn. of 2 immiscible fluids are calcd. from their resp. partial vapor pressures obtained from a graph.

A. R. ROSE

A brief history of the investigation of internal pressures. T. W. RICHARDS. *Chem. Rev.* 2, 315-48 (1925); cf. *C. A.* 19, 1368.—Comprehensive survey of the subject, both in its historical development and its present status, with 84 references.

G. C.

Praseodymium, neodymium and hydrogen. A. SIEVERTS AND E. ROELL. *anorg. allgem. Chem.* 150, 261-76 (1926).—An attempt to establish whether the adsorption of H by Pr and Nd leads to solid solns. or definite chem. compds. No reaction between Pr and H takes place at room temp. It starts at 300° on fresh surfaces. The substances obtained form gray or black masses that do not yet melt at 1100°. They decompose in air slowly, forming oxides and nitrides. The conditions of the adsorption resemble generally those with Ce and La, the amts. of H absorbed at temps. between 700° and 1200° being nearly the same. The adsorptive ability of Nd is distinctly smaller than that of Pr. The disson. pressure expts. do not permit a conclusive answer as to whether or not these "hydrides" and those of Ce and La belong to the group of the "salt-like" hydrides of the type of LiH as suggested by G. F. Hüttig (cf. *Z. angew. Chem.* 38, 803 (1925); *C. A.* 20, 1187).

EMIL KLARMANN

Negative adsorption. VIII. The behavior of kaolin against aqueous solutions of alcohol and some salts. M. A. RAKUZIN AND A. N. NESMEJANOW. *Biochem. Z.* 160, 288-90 (1925); cf. *C. A.* 19, 2213.—In contrast to gelatin, freshly ignited kaolin did not raise the concn. of EtOH either in dil. or concd. solns. Neg. adsorption by kaolin was observed in CuSO_4 solns.

F. A. CAJORI

Viscosity of colloids in presence of electrolytes. N. R. DHAR. *J. Phys. Chem.* 29, 1556-67 (1925).—The greater the hydration of a substance the greater is its viscosity. When the particles of a sol to which an electrolyte is added, adsorb more of the ions of opposite charge than of ions having the same charge, the charge on the sol is decreased, which causes increased hydration with the concomitant increase in viscosity. The viscosity measurements on solns. of gelatin and albumin are explained by assuming that the particles have a natural tendency to disintegrate. Suspended particles of isoelectric gelatin are assumed to disintegrate and consequently, the smaller particles will adsorb more water and the viscosity of the system will increase. The addition of acids or alkalis increases the viscosity as a result of the peptization which accompanies the preferential adsorption of H or OH ions.

HARRY B. WEISER

Equilibrium in colloid systems. O. K. RICE. *J. Phys. Chem.* 30, 189-204 (1926).—The phase rule is deduced in a form directly applicable to colloids and by its use the inference was drawn that equil. exists only when the particles are all of one size or of a few definite sizes both when they are charged and when they are not. The stability of the equil. has been examd. and 2 types of stability, temporary and permanent, have been found. The conditions for stability and the relation between the two kinds have been taken up and the considerations applied to coagulation.

HARRY B. WEISER

Theory of peptization. K. C. SEN. *J. Phys. Chem.* 29, 1533-47 (1925); cf. *C. A.* 19, 2291.—For peptization, a high degree of adsorption and a suitable concn. of electrolyte is necessary. Peptization is sp. for different substances depending on the nature of the adsorbent and of the peptizing agent. Peptization by H ion is less for acids contg. multivalent anions that are strongly adsorbed. Most colloids in aq. soln. are formed by adsorption of an ion or of an ion-peptized colloid; peptization by an undissociated salt is improbable. The stability of a sol depends on the formation of a surface film, which is usually elec. in origin.

HARRY B. WEISER

Effect of temperature of formation on the physical character of hydrous alumina. J. H. YOE. *J. Phys. Chem.* 29, 1419-22 (1925).—Hydrous Al_2O_3 formed at various temps. between 0° and 100° is very gelatinous, the most voluminous preps. resulting at lower

temps. Al_2O_3 pptd. at 66° with NH_4OH and the mixt. heated to boiling, does not give a granular ppt. as claimed by Taylor (C. A. 5, 2050).

Apparent viscosity of colloidal solutions and a theory of neutral colloids as solvated micelles capable of aggregation. J. W. MCBAIN. *J. Phys. Chem.* 30, 239-47 (1926).—The linking together of colloidal particles or micelles to form larger aggregates is caused by bonds of union which are as local and sp. as the processes operative in adsorption or residual affinity. These bonds are loosened by the substitution in them of various chemicals. This generalized form of solvation is the essential factor in gelatinizing and peptizing nitrocellulose and in explaining the apparent viscosity of the resulting systems. The disunion of the bonds between micelles can be accomplished by mech. means only when aggregation is on an excessively coarse scale. H. B. W.

Studies of colloid particles in an alternating-current field. OTTO BLÜH. *Ann. Physik* 76, 177-94; *Physik. Z.* 26, 722-4 (1925).—For the uniform movement of a charged colloid particle in an elec. field the equation $v = BK$ holds, where v is the velocity of the particle, K the potential gradient and B , the mobility of the particle, a const. In an a.-c. field of frequency ν the relation $A\nu = B$, a const., where A is the amplitude of oscillation of the particle, would hold if B is independent of ν . A Bredig Ag sol was observed under the cardioid ultramicroscope, in a cell 6μ thick and provided with 2 Ag electrodes between which an a. c. of 50, 177, or 308 cycles could be imposed. The amplitude of vibration of the same particle could be measured at 50 cycles and again at either 177 or 308 cycles. The av. value of the product $A\nu$ for 85 particles was found to be 7% greater for $\nu = 177$ than for $\nu = 50$, and 15% greater for $\nu = 308$ than for $\nu = 50$. As a tentative explanation of the increased mobility of the particles at higher frequencies it is suggested that the a. c. may tend to separate the charged particles from their "atmospheres" of oppositely charged ions, thus decreasing the effective radius of the particles and consequently the viscous resistance to movement through the dispersion medium. F. L. BROWNE

The color of colloidal silver and mercury. RUDOLF FEICK. *Ann. Physik* 77, No. 8, 573-96 (1925).—(There is a repetition of page nos. 573-588 in vol. 77.) A study of the absorption relations in Ag hydrosols showed that the color cannot be accounted for on the basis of the simple Mie theory. Either the theoretical basis must be extended or concessions must be made in the Maxwell-Garnett theory. The radiation and absorption by colloidal Hg sols predicted by theory were found to be in agreement with the observed facts within the limits of the merely qual. data so far available. From the fact that even in Hg sols Mie's assumptions are obviously very closely verified, it is concluded that the theory comprises the nucleus of the complex problem of the colors of colloids. F. L. BROWNE

The permeability of membranes. L. MICHAELIS. *Naturwissenschaften* 13, 33-42 (1926).—A review of recent work by M., Fujita and Dokan (cf. C. A. 19, 3192, 3274; 20, 321). B. J. C. VAN DER HOEVEN

Structure of gelatin gels. E. O. KRAEMER. *J. Phys. Chem.* 29, 1523-7 (1925).—Hg particles about 200-250 μ in radius were mixed with dil. gelatin systems before gelation. Cinematographic records of the Brownian motion of the particles were made and the magnitudes of the displacement were measured by projection on a ruled screen. Brownian motion was prevented in gels of 0.5% and over, but appeared on gentle warming owing to the breaking down of the gel structure. The latter was not uniform as evidenced by the appearance of Brownian movement in isolated spots, which spread, forming channels. In 0.3% gels a measurable Brownian movement persisted. The observations show that the structure of weak gels is considerably finer than the indicating Hg particles but there is no reason for believing it to be mol. in magnitude. HARRY B. WEISER

The swelling and dispersion of some colloidal substances in ether-alcohol mixtures. E. W. J. MARDLES. *J. Chem. Soc.* 127, 2940-51 (1925).—"A study has been made of the swelling and the dispersion action of ether-alcohol mixts. on colloidal substances. The explanation of the high dispersing action of the mixed liquids must be sought in the cause of the colloidal substances swelling initially to a greater extent in the mixts. than in the liquids taken singly, there being a close correlation between the swelling and the dispersing action. The attraction between a colloidal particle and the mols. of the mixed dispersion medium, due to the presence of mutually reactive groups, whereby complexes are formed, appears to reach a max. with certain combinations of liquids because of the special spatial arrangement and interlocking of the various mols. in the complex resulting from their size, from the relative strengths of their affinity bonds, etc., so that it is necessary in any explanation to consider the relative sp. characters of the liquids and the colloidal substance. With increase in the solvent power of the liquid

mixts. for cellulose nitrate, the change in d . increases and the sols become relatively less viscous. The surface tensions of the organosols are either the same as, or slightly higher than, that of the pure dispersion medium." F. L. BROWNE

Reversible permeability of membranes and its relation to cell metabolism. CHARLES GURCHOT. *J. Phys. Chem.* 30, 83-105(1926).— $\text{Cu}_2\text{Fe}(\text{CN})_6$ membranes are coagulated by low concns. of MeOH , $\text{HC}_2\text{H}_3\text{O}_2$, NaCl , KCl and CaCl_2 , thereby becoming permeable to sugar. A $\text{Cu}_2\text{Fe}(\text{CN})_6$ sol. is flocculated by aq. EtOH , but is peptized by alkalis and H_2O . The coagulation is due to selective adsorption rather than decrease in surface tension and is reversible. The membrane is granular in structure, the particles exhibiting a strong adsorption for water which fills the spaces more or less completely. Bartlow's [*Phil. Mag.* [6], 10, 1; 11, 595(1906)] expts. with alc., Walden's [*Z. physik. Chem.* 10, 699(1892)] expts. with acids and Czapek's [*Ber. deut. botan. Ges.* 28, 159(1910)] expts. with alcs. and acids can be explained by coagulation of the membrane. Intermittent permeability in living membranes is probably a question of reversible coagulation. HARRY B. WEISER

Antagonistic action of ions in the neutralization of sols. H. B. WEISER. *J. Phys. Chem.* 30, 20-33(1926).—The pptn. values of mixts. of electrolytes may be additive or may be greater or less than the additive values. The factors detg. the pptn. concn. of salt pairs are (1) the effect of each pptg. ion on the adsorption of the other, (2) the stabilizing action of the ion having the same charge as the sol and (3) the relatively greater adsorbability of ions at lower concns. The antagonistic action of ions of the same charge is important in raising the critical concns. above the additive value only in case the ions show a marked difference in adsorbability. Variation from the additive relationship with mixts. having a common pptg. ion results only when there is an appreciable difference in the adsorbability of the stabilizing ions. The influence of diln. of sol on the pptn. value of an electrolyte is detd. by the nature of the anion, the cation and the sol. The "general diln. rule" enunciated by Ghosh and Dhar fails to take all of these factors into account and is necessarily limited in its applicability. Strong adsorption of the stabilizing ions of an electrolyte is not essential for "acclimatization" of sols in case there is strong adsorption of the pptg. ion during fractional pptn.; on the other hand, strong adsorption of the stabilizing ion is essential in case the successive diln. of the sol by fractional pptn. is the detg. factor. In either case acclimatization to a greater or less degree is a necessary concomitant of fractional pptn. H. B. W.

Solubility of sodium iodide in ethyl alcohol. F. F. KING AND J. R. PARTINGTON. *J. Chem. Soc.* 129, 20-2(1926).— NaI was made from I_2 , H_2S and Na_2CO_3 , recrystd 3 times from H_2O , and dried at 120° in H_2 . EtOH was dried successively with CaO , AgNO_3 and Ca ; d_4^{25} 0.7851. The soly. found was 42.57 ± 0.3 g. NaI in 100 g. EtOH at 25° . The d_4^{25} of the soln. was 1.037. A. W. FRANCIS

Solubilities of sodium, potassium and calcium ferrocyanides. I. MONICA FARROW. *J. Chem. Soc.* 129, 49-55(1926).—The solubilities and ds. of the satd. solns of the 3 purified salts in H_2O were detd. from 24.9° to 99.7° . The K and Ca salts gave smooth soly. curves, but the Na salt showed a break at 81.5° , indicating transition of $\text{Na}_4\text{Fe}(\text{CN})_6 \cdot 10\text{H}_2\text{O}$ to a lower hydrate. This was confirmed by f. p. and dilatometer. The Ca salt has 11 H_2O and not 12 as formerly supposed. A. W. FRANCIS

The solubility products of mercury halides in water. A. E. BRODSKII AND I. M. STHERSTHEVER. *Z. Elektrochem.* 32, 1-4(1926).—The e. m. f. of the cell $\text{Hg} | \text{Hg}_2(\text{NO}_3)_2(c_0) | \text{KNO}_3 \text{ satd.} | \text{KCl}(c) \cdot \text{Hg}_2\text{Cl}_2 | \text{Hg}$ and the corresponding cell with bromides, were measured for 8 values of c_0 and 2 or 3 values of c . The results are readily extrapolated to $c = 0$, so that the soly. products in water may be calcd. For Hg_2Cl_2 at 11° it is 2×10^{-19} ; at 15° , 3.4×10^{-19} ; at 19° , 5.3×10^{-19} ; at 26.5° , 12.2×10^{-19} ; for Hg_2Br_2 , at 19° , 2.7×10^{-23} ; at 26.5° , 5.7×10^{-23} ; for Hg_2I_2 , at 11° , 1.7×10^{-30} ; at 15° , 4.9×10^{-30} ; at 19° , 11.8×10^{-30} ; at 26.5° , 63×10^{-30} . The values for Hg_2I_2 are obtained indirectly from the e. m. f. of the cell $\text{Hg} | \text{Hg}_2\text{Cl}_2 \cdot \text{KCl}(0.1N) | \text{Kl}(0.1N) \cdot \text{Hg}_2\text{I}_2 | \text{Hg}$, and the soly. product of Hg_2Cl_2 . B. H. CARROLL

The influence of minute traces of water on the equilibria of solution. I. ERNST COHEN AND W. D. J. VAN DOBBENBURGH. *Proc. Acad. Sci. Amsterdam* 28, 702(1925) — See C. A. 20, 137. E. J. C.

Unstable states of solutions of sodium behenate. MARY E. LAING. *J. Chem. Soc.* 127, 2751-5(1925).—The stable form of Na behenate at room temp. in concns. between 0.05 and 0.5 N is a hard, white curd. By heating to about 88° the curd melted to a fairly mobile, milky liquid. Rapid cooling produced a clear, very mobile liquid which was stable for a few hrs. Detns. were made of the p_H , elec. cond., and f. p. lowering of the solns. The unstable, mobile liquids are hydrolyzed to an abnormally large

extent. The largest constituent is neutral undissocd. colloid, the next largest being colloidal acid Na soaps with the equiv. quantity of free NaOH. There is a very small proportion of dissocd. soap.

F. L. BROWNE

Stability of solutions of carbon dioxide. A. KLING AND A. LASSIEUR. *Compt. rend.* 182, 130-1 (1926).—Ammonia- or base-free distd. H_2O , satd. with CO_2 , decomposes readily and completely, the p_H value dropping to that of highly purified distd. H_2O , *i. e.*, 5.8. Boiling hastens the decompn. No direct test, however, could be given to show the difference between purified water and 0.00001 N CO_2 soln., both having a p_H of 5.8.

P. B. P.

Influence of solubility. I. The temperature coefficients. F. OLIVERI-MANDALA. *Gazz. chim. ital.* 55, 759-68 (1925).—The application of van't Hoff's isochore to certain data selected from the literature leads to the following erroneous deductions: (1) that the increase in soly. of Br in solns. of KBr and that of I in aq. solns. of KI is not due to a chem. phenomenon on the basis of the smallness of q or that because of the small affinity between the halogen and the dissolved substance the compds. supposed to exist in aq. soln. are very unstable; (2) that caffeine forms addn. compds. in H_2O soln. with NaOBz that are much more stable than the preceding ones as judged by the high values of q ; (3) that NH_3 forms addn. compds. with chlorides and alkali carbonates in aq. soln.; (4) that salicylic acid forms very stable addn. compds. with *d*-glucose because of the high value of q . The results lead O.-M. to conclude that van't Hoff's isochore formula cannot be applied when one wishes to calc. the heat of soln. in cases of influence on soly. and consequently inaccurate results are obtained by using the magnitude of the heat of soln. as a criterion of chem. action between solute and the solvent in question. II. The molecular coefficients of solubility. *Ibid* 769-74.—The influence of soly. is expressed by the following formulas: (1) $(l_0 - l)/l = 1/n$ and (2) $(l - l_0)/l_0 = 1/n$ where l_0 and l represent the soly. of the compd. in H_2O and in the soln. and n indicates the concn. of said soln. With formula (1) O.-M. calcs. the mol. lowering of soly. and with (2) the mol. increase in soly. The results obtained in this way complete the previous paper and show: (1) that in phenomena dealing with influence on soly. it may be that with non-electrolytes as well as with electrolytes the ratio (concn. of dissolved compd.: concn. of soln.) is in general a function of the concn. of the soln., *i. e.*, it does not follow the law of mass action. The type of such functions is different not only in phenomena of the same nature, *e. g.*, in the cases of soly. of halogens in solns. of halides, but varies also in the same cases in certain limits of concn. Thus while data of the soly. of I in dil. solns. of KI (Noyes, Seidensticker, *Z. physik. Chem.* 27, 357 (1898)) show that the ratio I:KI is independent of the concn. of KI, the data of Weith and Dossios on more concd. solns. show that this ratio is an exponential function of the KI concn. In the field of org. chemistry no regularity has been observed in the phenomenon of influence of soly. in the sense that in some cases the ratio between the concn. of substance added and that of the soln. is independent of the concn. of the soln. and in other cases increases or diminishes with increase of concn. III. Quinine hydrochloride and antipyrine. E. OLIVERI-MANDALA AND E. CARLI. *Ibid* 774-82.—In this paper a well-known case of influence on soly., *i. e.*, the influence of antipyrine (I) on the soly. of basic quinine hydrochloride (II) in H_2O was examd. in detail. Basicine (a com. mixt. of II and caffeine) is very sol. in H_2O and has a greater therapeutic action than II alone and fails to give rise to the secondary clinical phenomena characteristic of II alone. Other similar instances are cited. Recently, Schepelmann (*J. pharm. chim.* 5, 266 (1912)) used a soln. of I + II as a local anesthetic; the presence of I prevents the bad effects arising from the injection of II alone. It is not known at present whether or not in these cases combination occurs between the 2 compds. in soln. Expts. were performed to det. if the increase in soly. of II in H_2O in aq. solns. contg. I was due to the formation of a mol. complex. The methods of cryoscopy and the detns. of the soly. coeffs. at various temps. were used. The results show that the soly. of II in H_2O is considerably increased by the addn. of I and that the ratio between the soly. of II and the concn. of I (coeff. of soly.) increases slightly with increase of the concn. of I. The ratio of the concn. of II to I is nearly independent of the temp., *i. e.*, the heat of soln. of II in H_2O is nearly equal to that of II in solns. of I and on the basis of deductions in the first paper this means that II does not act chemically upon I because the thermal effect is nearly zero. The cryoscopic results, however, show clearly that I combines with II in aq. soln. to form nondissocd. complex salts. IV. Acetanilide-antipyrine, acetanilide-pyramidone. E. OLIVERI-MANDALA AND F. FORNI. *Ibid* 783-8.—From the expts. on the soly. of these pairs in H_2O it is concluded that so far as the influence of antipyrine on the soly. of acetanilide in H_2O (which is considerable) is concerned this is not due to combination of the 2 compds., if the temp. coeff. of soly. is taken as the criterion. In the case of pyramidone, which

exercises a small influence on the soly. of acetanilide in H_2O , there is a more pronounced tendency to the formation of such complex as judged by the same criterion.

E. J. WITZEMANN

The inter-ionic attraction theory of ionized solutes. V. Testing of the theory by solubility experiments at higher temperatures. W. P. BAXTER. *J. Am. Chem. Soc.* **48**, 615-21 (1926); cf. *C. A.* **19**, 3408.—The soly. of $AgIO_3$ has been detd. at 75° in pure H_2O and in the presence of different salts in various concns. The results conform, up to an ionic strength of 0.01 *M*, with the limiting equation of Debye and Hückel [*C. A.* **17**, 2665; Debye, *C. A.* **18**, 190, 3514], and supplement the earlier work of Bronsted and La Mer [*C. A.* **18**, 1602] in affording a verification of the ion-attraction theory at very small concns. The results also afford a confirmation of the theoretical effect of varying the temp. and of the concomitant variation of the dielec. const. when H_2O is the solvent.

PER K. FRÖLICH

The ionic activity product of water in glycerol-water mixtures. JAMES COLVIN. *J. Chem. Soc.* **127**, 2788-92 (1925).—In mixts. of glycerol and H_2O contg. up to 40% glycerol, detns. were made of (1) the H -ion concn. by means of the H_2 electrode and (2) the OH -ion concn. by means of the Donnan-Allmand HgO electrode. The dissoc. const. of H_2O remains const. over the range of concn. studied. The ionic activity product does not exhibit appreciable change.

F. L. BROWNE

Hydration of strong electrolytes, the viscosity of their aqueous solutions and the dilution law. J. N. SUGDEN. *J. Chem. Soc.* **129**, 174-97 (1926).—The hydration of sucrose and some strong electrolytes has been detd. from the distribution of $AcOH$ between their aq. solns. and amyl alcohol. The results indicate that the hydration is independent of diln. and is an additive property which may have either a pos. or a neg. value. The concns. employed were as high as 2 *N*. A modified hydration theory is suggested according to which only cations are hydrated while anions depolymerize the solvent mols. The first process tends to decrease and the second to increase the activity of the water. Hydration is, therefore, a composite effect, the salts having neg. hydration nos. being those in which the influence of the anion predominates. Solns. of such salts have abnormally high vapor pressures. The hydration theory has been correlated with viscosity phenomena and a semi-empirical equation established by means of which hydration values can be calcd. from viscosity data. A hydration correction has been applied to calcns. of the degree of dissocn. of strong electrolytes from f. p. measurements and evidence is adduced in favor of a cube-root diln. law $(1 - \alpha) = K\sqrt[3]{n}$. Many salts have been shown to obey the law with great exactness and those which do not do so are extreme cases in which the application of the correction is least certain. Corroborative evidence for the new theory has been obtained from a consideration of the cond. ratios of a no. of strong electrolytes.

JAMES M. BELL

Hydrolytic dissociation curves. J. O. W. BARRATT. *Biochem. J.* **19**, 875-81 (1925).—B. has collected together some of the equations and curves dealing with interactions between a weak base and a strong acid and *vice versa*.

BENJAMIN HARROW

Activity coefficient of hydrochloric acid in concentrated solutions of strong electrolytes. H. S. HARNED. *J. Am. Chem. Soc.* **48**, 326-42 (1926).—Measurements of cells of the type: $H_2 | HCl (m_1) MCl (m_2) | HgCl | Hg$, where $m_1 + m_2$ is const., have been made. At const. total molality up to 3*M* the logarithm of the activity coeff. of the acid varies linearly with the acid concn. Revised measurements of the above cells contg. acid at 0.01 and 0.1*M* and chlorides at various concns. are presented. Fifteen series of results with univalent electrolytes may be calcd. within narrow limits from Hückel's approx. equation (*C. A.* **19**, 1649). From the data on the mixts. the consts. of the individual electrolytes were computed by Debye and Hückel's theory (*C. A.* **17**, 2665) and were shown to be very nearly the same as the consts. derived from data on the individual electrolytes. The activity coeffs. of $CaCl_2$, $SrCl_2$, $BaCl_2$ are calcd. by Hückel's equation and the activity coeff. of HCl in these salt solns. may be calcd. These calcns. show excellent agreement between observed results and the general theory of Debye and Hückel. In fact, nothing seriously contradictory to the general theory has developed from the numerous results in chloride solns. The theory cannot, however, be applied to solns. of alk. hydroxides without the introduction of another factor.

JAMES M. BELL

The application of the Nernst osmotic theory to non-aqueous solutions. A. E. BRODSKII. *Z. Elektrochem.* **32**, 5-6 (1926).—Measurements on the cell $Hg | Hg_2Cl_2 \cdot KCl (c_1) | KCl (c_2) \cdot Hg_2Cl_2 | Hg$ and the corresponding cell with bromides, in water, 50% $EtOH$ and abs. $MeOH$, vary unaccountably from the values calcd. by the theory of Nernst (*Z. physik. Chem.* **4**, 150 (1889)).

B. H. CARROLL

Hydrogen electrode studies of the precipitation of basic chromates, borates and carbonates. H. T. S. BRITTON. *J. Chem. Soc.* 1926, 125-47.—The H-ion concns., which govern the pptn. of basic salts contg. weak acid radicals are the same as those at which the hydroxides are pptd. (cf. *C. A.* 20, 26). The following chromates, borates and carbonates were studied: Th, Al, Cr, Be, Zn, the following chromates: Nd, Sa, Y, Co, Ni: and the following borates and carbonates: Zr, Mn, Mg. Cases of delayed pptn. occurred with Zr and Th solns. The precipitability of the different bases as basic salts depends on the capacity of the precipitant to produce the p_H at which the hydroxide is pptd. In cases where this p_H is only just attained the pptn. is partial. In several cases the conditions for the pptn. of normal salts have been discussed. The mode of dissocn. (*C. A.* 19, 225) of chromic acid has been shown to account for the action of alkali metal chromates in pptg. basic salts. JAMES M. BELL.

Formation and growth of silver nuclei in the decomposition of silver oxalate. J. Y. MACDONALD AND C. N. HINSHELWOOD. *J. Chem. Soc.* 127, 2764-71(1925).—A sensitive method is described for making direct measurements of the instantaneous rate of reaction in a chem. change where gas is evolved and an account is given of its application to the investigation of certain interesting phenomena relating to the thermal decompn. of $(CO_2Ag)_2$, which takes place according to the equation $(CO_2Ag)_2 = 2Ag + 2CO_2$. The rate of this reaction is governed entirely by the formation and growth of Ag nuclei in the space lattice of the oxalate crystals. These processes are sensitive to the presence of adsorbed ions and to O. The latter has a very pronounced poisoning effect on the Ag nuclei. It is thought that the nuclei of Ag are formed at the crystal surface rather than in the interior. E. P. WIGHTMAN.

The oxidation of oxalic acid by potassium permanganate. GEORG SCHEFF. *Biochem. Z.* 160, 390-7(1925).—If $Na_2C_2O_4$ and H_2SO_4 are allowed to react with an excess of $KMnO_4$ at 70° for long times more $KMnO_4$ is reduced than can be accounted for on the basis that 3 mols. $KMnO_4$ are reduced by 5 mols. $H_2C_2O_4$. If the duration of the reaction is always the same the amt. of reduced $KMnO_4$ is proportional to the $H_2C_2O_4$ present. F. A. CAJORI.

Principles and methods of catalytic investigation. H. S. TAYLOR. *Can. Chem. Met.* 10, 35-8(1926).—An address. E. J. C.

The catalytic decomposition of hydrogen peroxide in an acid chlorine-chloride solution. R. S. LIVINGSTON AND WM. C. BRAY. *J. Am. Chem. Soc.* 48, 405-6(1926).—Certain corrections are made in the derivation of equations of a previous paper (*C. A.* 19, 3411). These do not, however, affect any of the conclusions. C. C. DAVIS.

Catalytic activation of titania. W. A. RUDISILL AND C. J. ENGELDER. *J. Phys. Chem.* 30, 106-13(1926).—Factors affecting the catalytic activity of TiO_2 were detd. by passing the vapors of $EtOH$ over various prepn. at 350° and noting the vol. and compn. of the gaseous products of decompn. With increasing temp. of ignition, the activity and C_2H_4 production decreased. To produce a good dehydrating catalyst the ignition temp. must be low. Catalysts made by pptg. from sulfate or chloride solns. and by hydrolysis were most efficient, while those pptd. from oxalate were the least active, gave the lowest % of C_2H_4 and the highest % of C_2H_6 . The activity increases with the degree of fineness of the catalyst. A prepn. from sulfate soln. was very active after 10 hrs.' use. HARRY B. WEISER.

Studies of dynamic isomerism. XX. Amphoteric solvents as catalysts for the mutarotation of the sugars. T. M. LOWRY AND I. J. FAULKNER. *J. Chem. Soc.* 127, 2883-7(1925); cf. *C. A.* 19, 2642.—"Pyridine, which is inactive when dry, gives, when mixed with about twice its wt. of H_2O , a max. velocity of mutarotation which is about 20 times as great as the velocity for solns. of the same sugars (glucose and tetramethylglucose) in pure H_2O . Cresol, like pyridine, has no appreciable catalytic properties when H_2O is not present, showing that acids and bases may alike be rendered ineffective if used in the absence of H_2O . Mixts. of cresol and pyridine, each sufficiently dry to give only a negligible velocity of mutarotation, when mixed in the proportion of about 2 parts of cresol to 1 part of pyridine, are again about 20 times as active as H_2O in promoting the mutarotation of tetramethylglucose." These facts lead to the conclusions that "(1) it is impossible for a proton to wander directly from one position to another within the mol. of sugar and (2) in order to effect this transfer, it is necessary to provide a medium into which a proton can escape from the sugar and from which a proton can be provided to replace the proton thus lost by the sugar." F. L. B.

Fourth report of the Committee on Contact Catalysis of the Division of Chemistry and Chemical Technology of the National Research Council. H. S. TAYLOR. *J. Phys. Chem.* 30, 145-71(1926).—The subject of contact catalysis is reviewed with special regard to the progress made during the last 4 years. In discussing the results of recent

research an attempt is made to interpret such data in light of Taylor's theory. According to this the properties of the contact agent are to be differentiated from the bulk properties of the substance of which the catalyst is composed, while the properties of the individual atoms or mols. of the catalyst, with the changes in these properties induced by position and arrangement in the catalyst particle, are of importance in catalytic change. The ensuing problems for future research along these lines are outlined.

PER K. FRÖLICH

Contact catalysis. A. MITTASCH. *Ber.* 59B, 13-36(1926).—Review of catalysis from the days of Döbereiner and up to the present with emphasis upon the theoretical and practical aspects of contact catalysis, especially of gas reactions catalyzed by solid materials. Numerous references. In reviewing the various theories of catalysis M. comes to the conclusion that the theory of intermediate-compd. formation is the most plausible one in consideration of the fact that there is no real distinction between adsorption and compd. formation. This being admitted, there is no fundamental difference between catalytic and non-catalytic reactions. Understanding of the mechanism of catalysis, however, is limited and can only progress with the study of the structure of the atom and the mol. on the one hand, and with studies in the field of reaction kinetics on the other hand.

PER K. FRÖLICH

Equilibrium in the system arsenic pentoxide, barium oxide, water (acid section). S. B. HENDRICKS. *J. Phys. Chem.* 30, 248-53(1926).—The stable compds. in the acid division of the system BaO , As_2O_5 , H_2O at 30° are $\text{BaHAsO}_4 \cdot \text{H}_2\text{O}$, $\text{BaH}_4(\text{AsO}_4)_2 \cdot 2\text{H}_2\text{O}$, and $3\text{As}_2\text{O}_5 \cdot 5\text{H}_2\text{O}$. Alkali treatment of $\text{BaHAsO}_4 \cdot \text{H}_2\text{O}$ give hydrous $\text{Ba}_3(\text{AsO}_4)_2$.

HARRY B. WEISER

Elimination of salt from sea-water ice. W. G. WHITMAN. *Am. J. Sci.* 11, 126-32(1926).—Sea-water ice contg. entrapped salt will eliminate the salt under the influence of a temp. gradient through the ice. The salt diffuses as brine through the ice toward the warmest part of the ice-cake. Below the eutectic temp., -21° , diffusion will not take place. Expt. shows that the process of diffusion will occur independently of gravity. The phenomenon is satisfactorily explained by the effect of temp. upon the equilibrium relationship between ice and salt water.

R. J. H

Heterogeneous equilibria between the sulfates and nitrates of sodium and potassium and their aqueous solutions. I. The ternary systems. M. A. HAMM. *J. Chem. Soc.* 1926, 199-205.—The available published data on the ternary systems at 25° and at 90° have been completed in this paper. (1) System $\text{K}_2\text{SO}_4\text{--KNO}_3\text{--H}_2\text{O}$ at both temps. belongs to the simplest type with neither hydrates nor double salts. (2) System $\text{KNO}_3\text{--NaNO}_3\text{--H}_2\text{O}$ at 90° is of the same type. (3) System $\text{K}_2\text{SO}_4\text{--Na}_2\text{SO}_4\text{--H}_2\text{O}$ at 25° has three solid phases, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, K_2SO_4 and glaserite contg. Na_2SO_4 in solid soln. At 90° the solids are Na_2SO_4 , K_2SO_4 and glaserite contg. Na_2SO_4 in solid soln. At both temps. glaserite is decomposed by water. (4) System $\text{Na}_2\text{SO}_4\text{--NaNO}_3\text{--H}_2\text{O}$ at 25° has the solid phases, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$, Na_2SO_4 , $\text{Na}_2\text{SO}_4 \cdot \text{NaNO}_3 \cdot \text{H}_2\text{O}$, which is darapskite, and NaNO_3 . No evidence of the double salt $3\text{NaNO}_3 \cdot 4\text{Na}_2\text{SO}_4$ of Massink (*C. A.* 11, 3184) was found. At 90° the only solid phases are the anhydrous salts. II. The quaternary system, $\text{H}_2\text{O--Na}_2\text{SO}_4\text{--NaNO}_3\text{--K}_2\text{SO}_4\text{--KNO}_3$. *Ibid* 206-14.—In addition to the solid phases at 25° found in the ternary systems (cf. above) a new solid of unknown comp. was encountered. At 90° only the anhydrous salts and glaserite were found.

JAMES M. BELL

Influence of minute traces of water on solubility equilibria. II. F. COHEN AND S. MIYAKE. *Verslag Akad. Wetenschappen Amsterdam* 34, 933-8(1925); cf. *C. A.* 20, 137.—Min. traces of H_2O increase the soly. of salicylic acid in C_6H_6 and CHCl_3 and of *o*-nitrobenzoic acid in CHCl_3 . No influence could be detected in the salicylic acid- CCl_4 and anthracene- C_6H_6 equil.

G. CALINGAERT

Influence of pressure on the equilibrium of binary systems. II. N. A. PUSHIN. *Z. phys. Chem.* 118, 447-59(1925); cf. *C. A.* 20, 1021.—Data are given showing the influence of pressure on the T - x diagram of urethan-benzene. The eutectic point, situated at 4.2, 4.4% (by weight) urethan for 1 atm. rises steadily with pressure and is at 59.4° , 80% urethan for 4050 kg./sq. cm. pressure. The dt/dp values vary for the eutectic mixt. from 0.0220 at $p = 500$ kg./sq. cm. $t = 15.1^\circ$ to 0.0088 at $p = 3500$ kg./sq. cm. and $t = 54.8^\circ$. The theoretical conclusions of the first article were confirmed.

B. J. C. VAN DER HOEVEN

Elements with anomalous valences. M. GOMBERG. *Chem. Reviews* 2, 301-14(1925).—A review from which G. derives the viewpoint that most elements are capable of existing in 1 or more states of anomalous valence.

G. CALINGAERT

Technical expressions in Werner's theory of inorganic complex salts. THEODOR STRECHER. *Z. angew. Chem.* 39, 36-8(1926).—One of the most serious obstacles to a better

understanding of Werner's coördination theory, is the clumsy nomenclature used, S objecting to such terms as "secondary valence" and "coördination numbers." To avoid the necessity of designating N as both quinquevalent and tervalent, S. suggests the substitution of "ortig" for "wertig" in speaking of coördination nos., and in forming NH_4Cl from NH_3 , N would not be spoken of as going from the tervalent to the quinquevalent conditions, but from the "dreiertigen" or 3 place to the "vierortigen" or 4 place condition, with no change in "wertigkeit" or valence. S. also suggests a change in nomenclature when referring to org. bases and their addn. salts such as R, R.HCl, $(\text{R.H})_2\text{SO}_4$, etc. He suggests the use of the ending "ium" as in ammonium chloride. Thus with the base Quinine, we would have for R.HCl, "quininium chloride," for $(\text{R.H})_2\text{SO}_4$, "quininium sulfate," and for RCH_2Br , "quininemethylum bromide."

H. STOERTZ

Phase diagrams of binary systems containing arsenic tribromide as one component. N. A. PUSHIN AND S. LÖWY. *Z. anorg. allgem. Chem.* 150, 167-74(1926).—Phase diagrams have been taken of binary systems contg. AsBr_3 as one component and SbBr_3 , $\text{PhNH}_2\cdot\text{HCl}$, resorcinol, PhOH , α -naphthol or ethylurethan, resp., as the other. The system AsBr_3 - SbBr_3 gives an uninterrupted series of solid solns. AsBr_3 forms with $\text{PhNH}_2\cdot\text{HCl}$ a mol. compd. which decomposes above 133° . The binary systems AsBr_3 with resorcinol, phenol, α -naphthol and urethan, resp., form only mech. mixts. in the cryst. state. The 3 latter show characteristic eutectic points. EMIL KLARMANN

The systems formed by certain inorganic compounds with liquid sulfur dioxide. P. A. BOND AND H. T. BRACH. *J. Am. Chem. Soc.* 48, 348-56(1926).—With liquid tetrahalides (SnBr_4 , CCl_4 , SnCl_4 and TiCl_4), SO_2 forms mixts. which are but partially miscible at low temps. The relative positions of the *crit. mixing temps.* are in accordance with those which might be predicted from the polarities, internal pressures and m. ps. of the compds. involved. In no case did the formation of a compd. occur above the m. p. of SO_2 , though this might have taken place where solid phases were present. The *crit. soln. temp.* of SnBr_4 - SO_2 was 48.6° , of CCl_4 - SO_2 was -29.3° and of TiCl_4 - SO_2 was 11.9° . SnCl_4 - SO_2 formed an unusual case, in that the curve for the 2-liquid-phase system lay completely below the curve for the soly. of solid SnCl_4 in SO_2 over the same compn. range. A metastable binary-liquid system was found for SnCl_4 - SO_2 . C. C. DAVIS

The reaction of sulfite with unsaturated compounds. ERIK HÄGGLUND AND ANDERS RINGBOM. *Z. anorg. allgem. Chem.* 150, 231-53(1926).—While this reaction has been studied exhaustively from the preparative standpoint, little was known about its mechanism, although some information on the nature of the ethylene double bond was to be expected. H. and R. studied, as a kinetic reaction, the addn. of sulfite to the fol' wing unsatd. compds.: acrylic, crotonic cinnamic, triphenylacrylic, sorbic, fumaric, maleic, citraconic and mesaconic acids. The temp. of reaction was 80° . The amt. of sulfite bound by the resp. compd. was detd. by titration of the excess with 0.1 N I_2 . It was established that none of the compds. reacted with the I_2 -soln. The addn. of sulfite was found to be a bimol. reaction, except in the case of acrylic acid. The latter reacts much faster than any other acid. Only bisulfite reacts while the neutral sulfite does not take part in the reaction. The *cis*-form reacts more easily than the *trans*-form. The acid salt of fumaric acid reacts faster than the neutral one while the acid salt of maleic acid reacts much more slowly than the neutral. There is a conformity with Werner's theory of the changing valence of the C atom, the reactivity depending on the wt. of the radical attached to the C atoms which carry the double bond. The same phenomenon was observed by Schlenk and Mark (*C. A.* 17, 755) in the bromination of unsatd. compds. Thus ethylene absorbs Br very eagerly, stilbene much more slowly, while no Br is taken up by tetraphenylethylene. EMIL KLARMANN

A new form of the mass-action law for condensed and two-phase systems. RICHARD LORENZ. *Naturwissenschaften* 13, 81-2(1926); cf. *C. A.* 20, 863.—For condensed systems, molten salts and metals, L. and van Laar have derived a mass-action law (*C. A.* 19, 3412) of the form $x(1-y)/(1-x)y = Ke^u$, the first four terms being concns., K a const., $u = (\alpha/RT)[\{x^2 - [(1-x)^2/(1+r)]\}/(1+rx)^2] - (\alpha'/RT)[\{y^2 - [(1-y)^2/(1+r')]\}/(1+r'y)^2]$. The last term is calcd. from a and b functions of the components as indicated by van Laar (die Zustandsgleichung). An example of application of this law is now given in the $\text{Cd} + \text{PbCl}_2 = \text{CdCl}_2 + \text{Pb}$ equil. Whereas the *C* const. according to the classical mass-action law runs from 110 to 11.56 in a certain range, the new K is a very satisfactory const. B. J. C. VAN DER HORVEN

The potentials of cadmium-magnesium alloys. G. VINOGRADOV AND G. PETRENKO. *Z. anorg. allgem. Chem.* 150, 254-7(1926).—An attempt to ascertain whether potentiometric measurements are suited for establishing the existence of a chem. compd. in an uninterrupted series of solid solns. Previous studies of the phase diagram, the elec.

cond. and the hardness of alloys of this system showed that a compd., CdMg, exists in 2 modifications with the point of transition lying at 245.5° . V. and P. measured the potentials of the combination Cd-Mg alloy | 1*N* MgSO₄ | Mg. Somewhat different results were obtained with quenched and slowly cooled alloys. A distinct discontinuity in the potential curve indicated the existence of a compd. with 50 atom % Cd.

EMIL KLARMANN

Calorimetric researches. IX. The heat of combustion of *d*- and mesotartaric acids, racemic acid and a number of their derivatives. J. COOPS and P. E. VERKADE *Rec. trav. chim.* **44**, 983-1011 (1925). (In English.)—The thermochem. investigations on the stereoisomeric tartaric acids and their derivs. are still in the early stage. So far only heats of combustion have been detd. for cryst. compds. and only a few derivs. have been investigated. The app. and method were previously described (V., C. and Hartman, *C. A.* **16**, 3578; **19**, 2445). The detn. of the heat capacity of the calorimetric system was previously described (V. and C., *C. A.* **17**, 3638; **19**, 205). All heats of combustion detd. hold for an isothermal reaction at the initial temp. of the measurements, *i. e.*, 19.5° . The mean heat of combustion of *d*-tartaric acid is 1840.8 cal.₁₈ of racemic acid 1826.8 cal.; of meso-tartaric acid 1844.9 cal.; of NH₄ *d*-bitartrate 2050.5 cal.; of NH₄ biracemate 2037.4 cal.; of NH₄ mesobitartrate 2047.5 cal.; methylammonium *d*-bitartrate 2808.7 cal.; the biracemate 2798.2 cal.; the meso-bitartrate was unsuited for this detn. on account of its extraordinary hygroscopicity; ethylammonium *d*-bitartrate 3413.2 cal.; the biracemate 3401.4 cal.; the meso-bitartrate could not be purified; aniline α -bitartrate 4442.6 cal.; aniline biracemate 4434.4 cal.; the aniline meso-bitartrate could not be purified; benzylammonium biracemate 4785.3 cal.; the meso-bitartrate 4791.7 cal.; the *d*-bitartrate gave unsatisfactory results; *d*-tartramide 2889.4 cal.; meso-tartramide 2885.1 cal.; *d*-tartaric diethylamide 5213.3 cal.; the *dl*-compd. 5214.3 cal.; the meso-compd. 5219.4 cal. The 2 following equations may be derived from the heats of combustion of *d*- and meso-tartaric acids and of racemic acid: $\Delta(d-dl) = 2.1 \pm 0.1$ cal. and $\Delta(m-d) = 0.6 \pm 0.1$ cal. both at 19.5° . $\Delta(d-dl)$ could be called the heat of racemization of solid *d*- (or *l*-) tartaric acid. From data on the mol. heat of soln. values for the difference had previously been calcd. by other workers which are practically identical with those obtained from the heats of combustion. In any case this difference is only about 0.8% of the measured heats of combustion. The difference $\Delta(m-d) = 0.6$ is not a true comparison between the energy contents of these 2 acids which would have to be measured while these compds. were in the state of non-associated vapor, which is of course impossible. Both in the cryst. state and in dil. aq. soln. the sym. intramol. inactive acid has a greater energy content than the asym. optically active acid and this difference is doubtless connected with their different spatial grouping. In 1889 Stohmann, Kleber and Langbein said that of isomeric acids, that which possesses the largest dissocn. const. also possesses the largest heat of combustion. This rule does not always hold for isomers having a closely related constitution. meso-Tartaric acid has a larger heat of combustion yet a smaller dissocn. const. than *d*-tartaric acid. Examn. of the data shows that there is no question of a const. group value for the substitution of H with OH. Under no consideration can the heat of combustion be regarded as an additive quantity which may be calcd. by means of similar group values. A comparison of the data shows that for the 4 pairs *d*-bitartrate and biracemate derivs. studied the heat of combustion of the former is 2.0-2.3 cal. higher than for the latter, suggesting certainly that these compds. at 20° are racemic like racemic acid itself. This is not true for the diethylamide derivs. The soly. of these compounds in 96% EtOH at 17.5° showed marked differences; the racemic acid deriv. is the more sol. compd. In a satd. soln. of the latter compd. *d*-tartaric diethylamide is readily sol. The racemic acid deriv. is, therefore, certainly a racemic compd. Stohmann has stated the rule that with isomeric compds. those having the highest m. ps. should have the lowest heat of combustion. This is true in 2 of the 4 pairs investigated in this paper. Calcns. can be made from the data given regarding alterations in the heats of combustion of a substance on replacing one group with another but such calcns. will be made in Paper XII on the basis of more extensive material. E. J. W.

Experimental determination of the thermal conductivities of gases. H. GREGORY and C. T. ARCHER. *Proc. Roy Soc. (London)* **110A**, 91-122 (1926).—By means of the method of having a hot wire mounted coaxially in a glass tube G. and A. have detd. the thermal cond. *K* of dry, CO₂-free atm. air and dry H. Using values exptly. detd. they have been able to make correction for the losses due to convection, radiation, conduction along the leading wires and for the glass wall. Temps. were measured by using each pair of Pt wires in the app. as a compensated Pt thermometer. Readings were taken by means of a Callender-Griffiths bridge. Changes in pressure (0.001-

760 mm.) were obtained by means of a motor-driven Gaede mol. pump. Pressures below 0.5 cm. were read by using a McLeod gage. For air $K_{12.002} = 0.0604$, $K_{9.479} = 0.0600$, $K_{7.437} = 0.0596$, $K_0 = 0.0583$; for H $K_{4.218} = 0.04088$, $K_{3.289} = 0.04079$, $K_{2.355} = 0.04068$, $K_0 = 0.04043$. The % error $K_{(air)}$ for the lowest temp. gradient has been calcd. to be 0.33%, for the highest 0.27%. Diagrams of the app. and elec. connections are given.

E. R. SCHIERZ

Thermal decomposition of sulfates. GERMAINE MARCHAL. *J. chim. phys.* 22, 559–82(1925); cf. *C. A.* 19, 3201; 20, 346.—(1) Previous work on the decompn. of $NiSO_4$ indicates that dissoen. begins at 690° , and at 840° the pressure reaches 1 atm. M. finds 12.6 mm. at 700° , 114 mm. at 800° and 1030 mm. at 900° for the total pressure. The equil. is attained very slowly, requiring at least 1 hr. at 890° . The heat of dissoen. calcd. from the pressure data is 62.8 cal. (2) Previous data on $CaSO_4$ are not concordant. M. finds pressure = 11.5 mm. at 700° , 38 mm. at 800° , 291 mm. at 900° and 1441 mm. at 1000° . Heat of dissoen. is calcd. = 50.6 cal. (3) $CdSO_4$ dissoen. pressure = 15.2 mm. at 780° , 770 mm. at 1060° and 2345 mm. at 1120° . (4) $Ga_2(SO_4)_3$ is the most easily decomposed of the sulfates studied. The dissoen. pressure reaches 12 mm. at 560° , 625 mm. at 680° and 885 mm. at 700° . (5) $MnSO_4$ decomposed according to the scheme $3MnSO_4 = Mn_3O_4 + 2SO_3 + SO_2$. The total dissoen. pressure is 18.3 mm. at 820° , 527 mm. at 1000° and 2000 mm. at 1100° . (6) $Ag_2SO_4 = 2Ag + O_2/2 + SO_3$ represents the decompn. of this salt. The total pressure = 14.6 mm. at 820° , 51.0 mm. at 900° , 203 mm. at 1000° and 708 mm. at 1100° . The total pressure at equil. is the pressure exerted after a balance has been established among the dissoen. products according to the equation $2SO_3 = 2SO_2 + O_2$ (cf. *C. A.* 20, 346). M. uses the term "beginning of dissoen." loosely, meaning the temp. at which the total pressure reaches approx. 10 mm. Hg. *Ibid* 23, 38–60(1926).—Dissoen. pressure of $CaSO_4$, the effect of addn. of SiO_2 , Al_2O_3 , kaolin and Fe_2O_3 on its decompn., and some possible industrial applications are considered. The total dissoen. pressure of pure $CaSO_4 = 8$ mm. at 1000° and 67.7 mm. at 1200° . At these temps. the evolved gases dissoen. almost completely to SO_2 and O_2 . Addn. of any of the above named substances increases the dissoen. pressure, the effect of kaolin being the most marked. In presence of SiO_2 , whether amorphous, or powdered cryst., pressure = 10.5 mm. at 940° and 817 mm. at 1280° . With Al_2O_3 added, pressure = 9.0 mm. at 1000° and 200 mm. at 1280° . With kaolin ($Al_2O_3 \cdot SiO_2$) the pressure reaches 173 mm. at 1000° and 1070 mm. at 1170° . The action of Fe_2O_3 is slightly greater than that of Al_2O_3 , pressure = 12.5 mm. at 1000° and 273 mm. at 1280° . Cr_2O_3 acts very irregularly, apparently absorbing all the SO_2 formed, so that the gases evolved are almost pure O_2 . It should be possible to utilize the above facts industrially in production of H_2SO_4 .

F. C. KRACEK

The dissociation and specific heat of chlorine and hydrochloric acid gas at high temperatures. KURT WOHL AND WALTER KADOW. *Z. physik. Chem.* 118, 460–74 (1925).—Improved methods of calcn. are applied to W.'s old data on explosions of $H_2 + Cl_2$ in presence of excess H_2 , Cl_2 or HCl , and to some new data confirming results already obtained (*C. A.* 18, 3522). The heat of dissoen. of Cl_2 is $57,000 \pm 2000$ at zero abs. at const. vol. The sp. heat of Cl_2 and HCl can be represented by the formulas $1963 + (E_{Cl_2} - 93)/(T - 291)$; $4.963 + E_{HCl}/(T - 291)$, where E_{Cl_2} and E_{HCl} are Einstein functions with $\beta\nu$ equal 902 and 3420, resp. Data on the degree of dissoen. of HCl are consistent with accepted values by other methods.

F. R. BICHOWSKY

The specific heat of hydrogen. G. H. DIEKE. *Physica* 5, 412–9(1925).—From the band spectrum of mol. H the occurrence of half quantum nos. in mol. rotation has become apparent. The author, therefore, recalcd. the Ehrenfest (*C. A.* 7, 3069) and Reiche (*C. A.* 14, 2879) theory. The results shown in curves do not give conclusive evidence in favor of any of several possible auxiliary suppositions; at high temps. discrepancies are notable. A tabulation of values for the moment of inertia is given; the work of Schrödinger (*C. A.* 19, 1089) and of Kemble and van Vleck (*C. A.* 17, 3639) is discussed.

B. J. C. VAN DER HOEVEN

Determination of the equivalent humidity in a differential calorimeter by means of thermoelectric piles. A. K. NOYONS. *Compt. rend. soc. biol.* 93, 845–9(1925).

S. MORGULIS

The heat of adsorption of gases by coal and charcoal. A. G. R. WHITEHOUSE. *J. Soc. Chem. Ind.* 45, 13–20T(1926).—The heats of adsorption of CO_2 , SO_2 , CH_4 , O_2 , N_2 and CO by 4 samples of English coals and 1 sample of an activated charcoal have been measured at 0° . The heat evolved per cc. of gas adsorbed progressively decreases as addnl. gas is adsorbed. In this respect the charcoal and the different types of coal were similar. The data obtained for the heat evolved (cals. per cc. gas adsorbed) are CO_2 , 0.346–0.255; SO_2 , 0.627–0.359; CH_4 , 0.245–0.199; O_2 , 0.19–0.17; N_2 , 0.22–

0.17; and CO, 0.198–0.188. The rates of adsorption for the coals and the charcoal are different. The gases studied were adsorbed much more rapidly by the charcoal than by the coals, the difference being most marked for CH_4 and N_2 . N_2 is adsorbed slightly more rapidly than CH_4 by coal, but in smaller amts., while SO_2 and CO_2 are adsorbed at a much greater rate and in larger amts. than CH_4 . The slow rate of adsorption in the case of coal may be accounted for by there being a small no. of large (distributory) capillaries, or, by obstructions of these capillaries by certain of the constituents of the coal. The simple exponential equation, $h = mx^n$, connecting the total heat evolved per g. of adsorbent with the total volume of gas adsorbed per g. of adsorbent, has been found to be valid throughout the range covered by the expts. However, heats of adsorption cannot be completely expressed by any simple exponential equation.

J. H. PERRY

Micro-determination of melting points, and transition points. D. VORLÄNDER AND ULRICH HABERLAND. *Ber.* 55B, 2652–6(1925).—An elec. heated microscope stage, designed by Gutmann for qual. observations and made by Zeiss, has been used for the quant. detn. of m. p. and transition points. The technic and advantages of the method are described. The temp. is not measured directly, but an amp.-temp., or a watt-temp. calibration curve is used. The watt-temp. curve is preferable because of the inconstancy of the resistance of the Pt heating element of the stage. A list is given of org. compds. m. 91–234° which are suitable for calibrating the stage. A comparison is made of the transition points of several monotropic and enantiotropic cryst. org. liquids, and of anhydrous AgClO_4 (rhombic and regular cryst. phases) as detd. microscopically and thermometrically.

R. H. LOMBARD

The ratio: internal latent heat of vaporization–molecular superficial energy, in connection with the law of corresponding states. J. J. VAN LAAR. *Verslag Akad. Wetenschappen Amsterdam* 34, 803–15; *Proc. Acad. Sci. Amsterdam* 28, 781(1925).

G. CALINGAERT

Temperature coefficient of the dielectric constant of liquid and solid hydrogen. W. WERNER AND W. H. KEESOM. *Verslag Akad. Wetenschappen Amsterdam* 34, 745–51(1925).—The dielec. const. ϵ of H_2 is measured by an improvement of the Wolkfe and Kammerlingh Onnes method (*C. A.* 19, 758). At the b. p., 20.36° K., $\epsilon_B = 1.2311 \pm 0.0002$. The ϵ curve between the b. p. and f. p. is linear. In the neighborhood of the f. p. ϵ (liq.) = 1.2533, ϵ (sol.) = 1.206–1.209. For solid H_2 , ϵ drops with the temp.

G. CALINGAERT

Isotherms of diatomic gases and their binary mixtures. XXXIII. Isotherms of oxygen at temperatures ranging from -40° to -150° and pressures from 3 to 9 atmospheres. G. P. NIJHOFF AND W. H. KEESOM. *Verslag Akad. Wetenschappen Amsterdam* 34, 905–12(1925).—Exptl. detn. of the normal vol. of O_2 , by an improvement of the Kammerlingh Onnes method (*ibid.* 7, 176(1898)).

G. CALINGAERT

The analog of Clapeyron's law for the vaporization of electrons. J. DROST. *Verslag Akad. Wetenschappen Amsterdam* 34, 1016–20(1925).—The formula $d \ln N_0 / dT = \epsilon / KT^2$ is derived for the vaporization of electrons, in which N_0 = concn. of "electron gas" and ϵ = energy of vaporization of the electrons.

G. CALINGAERT

The absolute value of the entropy of real gases. III. VLADIMIR NJEGOVAN. *Z. Elektrochem.* 31, 631–3(1925); cf. *C. A.* 19, 1651.—The so-called integration const. in the expression for the entropy of a gas is displayed for real gases as a function of the internal energy. The true const. of integration must be zero in accord with the third law.

F. R. BICHOWSKY

Further note on the paper. An investigation into the derivation of the absorption isotherm. ALEXANDER GORBACHEV. *Z. physik. Chem.* 118, 357–60(1925); cf. *C. A.* 19, 3186.

F. R. BICHOWSKY

Hydrogen-ion concentration. II. Applications. JEAN BARBAUDY. *Rev. gén. sci.* 36, 694–704(1925); cf. *C. A.* 19, 3195.—Review of the application of p_H detns in volumetric analysis, glue, tanning and dyeing industries, study of soils, jam, sugar and brewing industries, blood analysis, Ni plating and activated sludges.

A. P.-C

Conductance of solutions of alkali metals in liquid ammonia and in methylamine. G. E. GIBSON AND T. E. PHIPPS. *J. Am. Chem. Soc.* 48, 312–26(1926).—The conductances of solns. of Na and K in NH_3 and of Cs, CsI and K in methylamine have been detd. at temps. below -33° . The results in NH_3 are in agreement with those of Kraus (*C. A.* 15, 1849). The temp. coeff. of conductance, $d \log R / dT$ is independent of temp., that is, the conductance is an exponential function of temp. at all dilns. The metals are less ionized in methylamine than in NH_3 . The min. in the mol. cond. occurs at a lower concn. in NH_3 than in methylamine. The results are in accord with the view

that the neg. carriers are electrons largely combined with solvent molcs., the degree of solvation diminishing as the temp. rises.

Electrolysis of oxides dissolved in fused boric acid or borates. JAMES M. BELL ANDRIEUX. *Compt. rend.* 182, 126-7(1926).—By electrolysis of borax at about 800° in a carbon crucible with a cathode of Fe which can be cooled internally, a metallic lump can be obtained, which consists of pure Na inside, then a layer of Na and B and of pure B, covered by a coat of solid electrolyte. Addn. of slightly sol. oxides, e. g., Al_2O_3 or BeO , almost entirely prevents reduction of the electrolyte by Na. High temps. favor the reduction and decrease the production of Na and increase that of B. Oxides of metals less electropositive produce the free metals.

The diffusion gas-electrode. ALFRED SCHMID. Enke, Stuttgart, *Separate* 1923, 5-57.—S. studies the polarization of a H_2 -halogen chain, with the ultimate purpose of forming a cell to convert combustion energy directly into elec. energy. The sorption of gases by noble metals is (1) by absorption and capillary diffusion, which consists of a mech. penetration of the gas into the pores of the metal—no activation, but a satn. process—or (2) by a true soln.—an activation. Between cryst. Pt and Pt black all transition stages were produced by electrodeposition. C electrodes may be covered with amorphous, shiny metallic Pt and these are characteristic of (1). A hollow arc-lamp carbon is boiled with NaOH several hrs., polished with fine sand and rubbed clean with alc. It is rotated at 100 r. p. m. in a platinizing soln. ($PtCl_4$, 1/3%; citric acid N/15; H_2SO_4 , M/15) and a current of 1-2 milliamp. per $cm.^2$ is passed through it for 150 min. (about 0.05 g. Pt deposited). Water (70°) is drawn through the electrode by suction to wash it. The penetration of the gas through the metal is a result of the porosity of the latter and properties such as sorption and passivity of Pt are discussed from this viewpoint. Similar halogen diffusion electrodes were built. The p. d. of the chain $H_2 | N HCl | Cl_2$ at 20° and 760 mm. is 1.360 v.; that of $H_2 | N HCl | N KBr | Br_2$ is 1.080 v.; and that of $H_2 | N HCl | N KI | 0.5 N I_2$ is 0.5400 v. dE/dt for t between 20° and 40° is —0.00100 for these cells. The heat of neutralization of HCl and NaOH as calcd. from the Gibbs-Helmholtz equation agrees within 5% of the accepted value of 13.7 cal. The best delivery cited of the H_2 electrode was 230 milliamps. at 0.43 v. (original p. d. was 1.080 v. at O current). Up to this current polarization did not set in.

The effect of the electrode material on oxidation potentials. J. A. V. BUTLER, W. E. HUGH AND D. H. HEY. *Trans. Faraday Soc.* 1926 (advance proof), Jan. 18.—The independence of oxidation potentials of the electrode material when this takes no appreciable part in the cell reaction is confirmed. Electrodes of Pt, Pd, Ir, Os, Au, Rh and Ru give the same oxidation p. d. (0.1905 ± 0.0001 v.) for the cell $Hg | Hg_2Cl_2, KCl N | K_3Fe(CN)_6, 0.005 N, K_4Fe(CN)_6, 0.005 N, KCl N | M$. Electrodes of Mo, W, Ni, Ag and Hg do not give const. p. ds. In a cell of lower oxidation p. d. ($CuCl, CuCl_2$ mixt. in aq. NH_3) the potential is the same (within 0.0001 v.) for electrodes of Pd, Ir, Au, Os, Rh, Ru, Ag, Ni and Hg, whereas it is not const. for electrodes of Mo, W, Ta, As, Sb. Se (metallic) and graphite give const. p. ds. differing from Pt by 0.3 and 0.6 milliv., resp.

The transference numbers of sodium and hydrogen in mixed chloride solution. MILLICENT TAYLOR. *J. Am. Chem. Soc.* 48, 599-603(1926).—Transference nos. have been detd. in a soln. of NaCl contg. HCl. Contrary to the results of Schneider and Braley (*C. A.* 17, 2218), T. finds that only simple ions and no complex ions are present in this type of soln.

The electrostatic virial of strong electrolytes. E. Q. ADAMS. *J. Am. Chem. Soc.* 48, 621-6(1926).—A virial term for the energy of strong electrolytes in aq. solns. derived from the dielec. const. of H_2O should be denoted by ΔF (free energy at const. pressure) and not by ΔU (total internal energy) since the detn. of the dielec. const. of H_2O involves measurements of the elec. work obtainable by discharging at const. pressure a condenser filled with H_2O . Only if the dielec. const. is independent of temp. are the 2 thermodynamic functions, ΔF and ΔU , equal. The conclusions arrived at by Milner, Debye and Hückel and by Noyes are discussed in light of this fact. The osmotic pressure can be calcd. from ΔA and from ΔF , without a knowledge of the temp. coeff. of the dielec. const. of H_2O .

The change in potential of the hydrogen electrode with pressure. G. TAMMANN AND H. DICKMANN. *Z. anorg. allgem. Chem.* 150, 129-46(1926).—The change in potential of a 0.1 N H electrode has been detd. for pressures up to 3000 kg./ $cm.^2$. The potentials measured nearly coincide with the potentials calcd. on the assumption that H is a perfect gas, while allowance for the deviation from the perfect-gas law leads to calcd. values higher than those obtained by expt. In the empirical formula derived

for the change with pressure in potentials of the H electrode, the internal pressure brought about by dissolved neutral salts may be substituted for the external pressure. The agreement between the values thus calcd. for the effect of dissolved neutral salts on the potential and the values experimentally detd. are quite satisfactory. From the viscosity of the salt solns. it is possible to study the variations in activity of the H ions with internal or external pressure.

PER K. FRÖLICH

Remarks on the diamagnetism of bismuth. P. EHRENFEST. (*Physica* 5, 388-41 (1925).—The value of the diamagnetic susceptibility $\chi_{\text{Bi}} = 292$ is abnormally high. Pauli's relation (*C. A.* 15, 2773) $\chi = 2.85 \times 10^{10} \sum r_i^2 / \langle r^2 \rangle$ ($\langle r^2 \rangle$ is the mean square of the distance of one electron of the atom of the nucleus, $i = 1, 2, \dots, Z$ for Z the at. no.) leads to radii of the outer electron orbits (8 A. U.) larger than the distance between Bi and Bi in the crystal lattice (3.11 or 3.47 A. U.). E., therefore, concludes that some electrons in solid Bi have orbits, crystallographically defined, that enclose several at. nuclei. This is in agreement with (1) the strong change in susceptibility of Bi at the m. p. (tenfold decrease, also occurring for Sb and Ga); (2) the increase in elec. cond. at the m. p. for these three metals; (3) the anisotropy of χ in Bi crystals (100:70 parallel and perpendicular to principal axis). Between these orbits a complete coupling must exist, which prevents them from having a residual magnetic moment.

B. J. C. v. D. H.

The influence of a magnetic field on the resistance of superconductors. W. J. DE HAAS, G. J. SIZOO AND H. KAMERLINGH ONNES. (*Physica* 5, 447-52 (1925).—Preliminary report. Hg wires, of which the resistance was detd. in a magnetic field (potentiometric method) at temps. below its leap-point (4.2° abs.) showed a renewed actual resistance, the max. of which falls on a continuous curve with the ordinary resistance (without magnetic field) above the leap-point. The difference in character of superconductive and non-superconductive substances can be made to disappear by a sufficiently strong magnetic field. The resistance/ H isotherm at 3.79° and 3.96° abs. shows considerable hysteresis effect; going down from high H values, $W/H_{4.1}$ (W is resistance) decreases discontinuously in some 2 or 3 steps to zero; on again increasing H , $W/W_{4.2}$ has a lag of about 10 gaussers and then begins slowly but continuously to rise in an S curve up to the above-mentioned max. value. It is possible that the S curve consists of a great no. of small steps (the same effect was found for Sn). The max. is reached for about 40-80 gaussers, increase of the field strength to 300 gaussers makes no difference, neither does variation of the current d . (1-28 milliamps.). The Hg wires used were 10-15 mm. long, 0.02-0.05 mm. diameter, placed in a 16.5-cm. solenoid. The discontinuities and hysteresis may be due to sudden supercond. of the individual Hg crystals.

B. J. C. VAN DER HOEFEN

The constant paramagnetism of solutions. M. LE PAULE COLLET. (*Compt. rend.* 181, 1057-8 (1925).—In previous work C. and Weiss found the susceptibility of Cr in soln. to be 63.3×10^{-6} (cf. *C. A.* 18, 3533). This value was const. in the temp. range 14° to 50° for solns. and for the solid from 12° to 90°. They now find that the susceptibility of Co is also independent of temp. with the value 14.4×10^{-6} .

W. W. STIFLER

An experiment on the orientation of paramagnetic molecules. P. DERVE AND A. HUBER. (*Physica* 5, 377-81 (1925).—An effort was made to find out whether in a paramagnetic gas (NO) the mols. become oriented under the influence of a magnetic field, thus causing the appearance of an elec. moment m_s , detectable by a quadrant electrometer, of the order $m_s = \mu_s \mu_m H / 3kT$ (μ_s 's are mol. moments, H is magnetic field). No charging effect was noticed more than $1/1000$ of that expected (μ_s for NO estd. 0.6×10^{-19} e. s. u.; $\mu_m = 1.7 \times 10^{-20}$ e. m. u.). This shows that orientation is very unlikely and (unless μ_m is perpendicular to μ_s or $\mu_s = 0$) confirms the view of Ehrenfest (*Comm. Leiden Suppl.* 44b, 55) rather than that of Langevin.

B. J. C. VAN DER HOEFEN

Magnetic properties of single iron crystals. WALTHER GERLACH. (*Physik Z.* 26, 914-5 (1925).—A sample consisting of a single crystal of electrolytic Fe showed practically no hysteresis loss nor remanence. The I - H curve is given for it and for a specimen of similar dimensions of ordinary electrolytic Fe.

W. W. STIFLER

The magnetochemistry of closed chains. P. PASCAL. (*Compt. rend.* 181, 656-8 (1925); cf. *C. A.* 19, 2773).—The mol. magnetic susceptibilities computed by the additive principle for derivs. of 3, 4, 5 and 6 C atoms rings are compared with expt. There is a difference Δ between the exptl. and observed values, and it is shown that Δ is quant. proportional to the amt. of deformation of the C bonds from their usual positions at the tetrahedron corners, thus agreeing with the Baeyer strain theory.

S. K. ALLISON

Experiments on the electrical symmetry of nickel molecules. ALBERT PERRIER

AND CH.-E. BOREL. *Arch. sci. phys. nat.* **7**, 289-98(1925); cf. *C. A.* **18**, 616.—It has been shown previously for Fe that an elec. current, or the field which maintains it, excites or modifies the magnetization of the Fe through which it travels, in a manner longitudinal with respect to the elec. field and in the reverse sense. This would indicate that the Fe mols. possessed an elec. moment of opposite sense to their magnetic moment. This phenomenon is now studied in Ni, by more sensitive methods, which are described. The behavior of Ni at ordinary temp. is so complex that it was necessary to work at high temp. (Curie point). The results obtained at high temp. will be presented in a subsequent paper.

R. H. LOMBARD

An ebullition device for low temperature and vacuum distillation (GERMANN, BROSSEL) **1**. An electrometric and a phase-rule study of some basic salts of Cu (BRITTON) **6**. Warning against the customary process of making cooling baths from inflammable compounds and liquid air (STAUDINGER) **24**.

ACHALME: *La molécule d'hydrogène*. Paris: Payot. 5 francs. Reviewed in *Rev. prod. chim.* **29**, 8-9(1926).

ARRHENIUS, SVANTE: *Conférences sur quelques problèmes actuels de la chimie physique et cosmique*. Paris: Gauthier-Villars. 120 pp. Fr. 10. Reviewed in *Arch. Book Review Index* **8**, 298(1924).

BROWNELL, HERBERT AND WADE, FRANK B.: *The Teaching of Science and the Science Teacher*. New York and London: The Century Co. 322 pp. \$2.00. Reviewed in *J. Chem. Education* **2**, 1211(1925).

BRUUN, SVERRE: *Laerbok i kjemi for gymnasiet*. 4th ed. Oslo: Olaf Norli. 155 pp. Kr. 5.

DOIJER VAN CLEEF, G.: *Leerboek der scheikunde*. 2nd ed. by J. F. Roest. Haarlem: H. D. Tjeenk Willink & Zoon. 162 pp. Guld. 2.40.

DOWNING, ELLIOT ROWLAND: *Teaching Science in the Schools*. Chicago: University of Chicago Press. 185 pp. \$2.10. Reviewed in *J. Chem. Education* **2**, 1090(1925).

EMERY, DAVIS, BOYNTON, AND DOWNEY: *Chemistry in Everyday Life*. Chicago. Lyons and Carnahan. 667 pp. \$1.76. Reviewed in *J. Chem. Education* **2**, 1088(1925).

FRANK, J. O.: *How to Teach General Science, Notes and Suggestions of Practical Aid to Every Science Teacher*. Oshkosh, Wis.: Castle-Pierce Press. 194 pp. \$2.00. Reviewed in *J. Chem. Education* **2**, 1089(1925).

GOLDSCHMIDT, VIKTOR: *Atomgewicht und Atombau. Raum u. Raumsinn. Blutumlauf durch Kontakt-Promotion u. Pulsieren*. Heidelberg: Carl Winter. 30 pp. R. M. 1.20.

GYEMANT, ANDREAS: *Grundzüge der Kolloidphysik vom Standpunkte des Gleichgewichts*. Braunschweig: F. Vieweg & Sohn. 93 pp. R. M. 4.50.

HARTMAN, H.: *De Verbrandingswarmte van homologe en isomere dicarbonzuuren en dicarbonzuur-anhydriden*. Delft: W. D. Meinema. 126 pp. Guld. 2.75.

HELLWIG, WILHELM: *Der Satz chemischer und mathematischer Formeln*. 2nd ed. revised. Leipzig, Doltstr. 1: Deutscher Buchgewerbeverein. 48 pp. R. M. 2.

JAEGER, F. M.: *Inleiding tot de studie der kristalkunde*. Groningen: J. B. Wolters. 460 pp. Guld. 22.50.

KUHN, ALFRED: *Kolloidchemie*. Leipzig: Joh. Ambr. Barth. 122 pp. R. M. 4.20; paper binding R. M. 5.

LASSAR-COHN: *Die Chemie im täglichen Leben*. Gemeinverständl. Vorträge. 11 ed. newly revised by Max Mechling. Leipzig: L. Voss. 332 pp. R. M. 6.75.

MEERUM TERWOOT, P. C. E.: *Scheikundige Vraagstukken*. Amsterdam: H. J. Paris. 47 pp. Guld. 0.90.

MEURS, G. J. VAN: *Beginnelsen der scheikunde*. Part I. *Algemeene en anorganische scheikunde*. 2nd ed. revised with the coöperation of H. Ph. Baudet. Rotterdam: Nijgh & Van Ditmar. 340 pp. Guld. 3.25, bound 3.75.

MEYER, GUSTAV: *Leitfaden der Gegenwartschemie für höhere Schulen (nebst Geologie)*. Auf Grund d. period. Systems (Grundriss von Carl Oppenheimer) nach d. Richtlinien d. Schulreform bearb. I. *Anorganische Chemie*. Leipzig: G. Thieme. 185 pp. R. M. 3.20.

MEYER, RICHARD: *Chemie in Natur und Kultur*. Braunschweig. F. Vieweg & Sohn. 220 pp. R. M. 10.

MEYER, WILHELM: *Chemie für Mittelschulen und verwandte Anstalten mit bes.*

Berücks. d. Mineralogie u. Technologie. 7th ed. revised. Frankfurt a. m.: Diesterweg. 187 pp. R. M. 3.40.

NICOLAYSEN, CARL AND SCHULSTAD, OLAV: *Laerebok i kjemi for laererskoler, ungdomsskoler og husholdningsskoler.* 8th ed. Oslo: H. Aschehoug & Co. Kr. 2.20.

ROGERS, W. D.: *An Introductory Chemistry.* London: John Murray. 231 pp. 2s. 6d.

SHEPHERD, E.: *The Chemistry of the Home and Daily Life.* London: Selwyn & Broth. 96 pp. 1s.

SLIJPER, H. J.: *Beknopt leerboek der scheikunde en van hare toepassingen.* I. *Anorganische scheikunde.* II. *Organische scheikunde.* Zutphen: W. J. Thieme & Cie. Part I, 128 pp., Guld. 1.70. Part II, 63 pp., guld. 0.90.

SUNDORPH, TH.: *Kemi for Mellemsskolen. Tillæg til Fysik.* 8th ed. Copenhagen Gyldendal. 36 pp. Kr. 1.50.

SUNDORPH, TH.: *Kemi for Seminarier.* Copenhagen: Gyldendal. 48 pp. Kr. 2.35.

WOESTIJNE, KAREL VAN DE: *Beginnselen der chemie.* Rotterdam: Nijgh & Van Ditmar. 129 pp. Guld. 4, bound 4.90.

ZSIGMONDY, R., AND THIESSEN, P. A.: *Das Kolloide Gold.* Leipzig: Akademische Verlagsgesellschaft. m. b. H. 229 pp. M. 14. Reviewed in *Chem. Age* 14, 50(1926).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Mechanical models for the Zeeman effect. C. G. DARWIN. *Phil. Mag.* [7], 1, 161-95(1926). S. C. L.

Dimensional analysis viewed from the standpoint of the theory of similitudes MRS. T. EHRENFEST-AFANASSIEWA. *Phil. Mag.* [7], 1, 257-72(1926). S. C. L.

On the absolute value of entropy. M. SAHA AND R. SUR. *Phil. Mag.* [7], 1, 279-88(1926). S. C. L.

Chemical reaction in the silent discharge. E. WARBURG. *Z. tech. Physik* 6, 625-33(1925).—A general review of the factors affecting ozone formation in the Siemens tube. F. O. A.

Remarks on the quantum mechanics of Heisenberg. H. A. KRAMERS. *Physica* 5, 369-76(1925).—A phys. interpretation of some results of the Heisenberg (C. A. 20, 1026) theory. An electron bound to an atom is in its behavior towards an oscillating elec. field of high frequency asymptotically identical to a classical vibrator. B. J. C. v. D. H.

Regularities in the action of electromagnetic waves—nuclear decomposition. ERNST BRUMMER. *Z. Elektrochem.* 32, 7-13(1926).—General discussion, leading to the rule that with decreasing wave length the point of action approaches the at. nucleus. The wave length necessary for dissociation of N is calcd. from the energy of the α -particles producing this effect, and from the energy of the packing effect, agreeing on approx 10^{-11} cm. B. H. CARROLL.

A possibility of deriving the characteristic properties of nucleus and electron from the "metric" electromagnetic field. H. REISSNER. *Physik. Z.* 26, 925-32(1925).—A highly mathematical paper in which the problem is discussed both from the classical and from the quantum viewpoints. W. W. STIFLER.

A supposed relativity method of determining the size of a gravitating particle. H. T. H. PIAGGIO AND J. CRITCHLOW. *Phil. Mag.* [7], 1, 67-71(1926).—A singularity in Schwarzschild's soln. of Einstein's equations which has been widely interpreted as indicating a definite size for a gravitating particle, is shown to be merely a mathematical property of a transformation of coordinates, without any phys. significance. S. C. L.

Models of electron structure, quantum action, and the gravitational field. W. M. THORNTON. *Phil. Mag.* [7], 1, 13-31(1926).—Models are presented of the assumed structure of electrons and of protons as an aid in visualizing mechanically their various phenomena and behavior such as the attraction of opposite charges, the linkage in a H atom, the absence of magnetic field of a single orbit, reaction of radiation on atomic field, mechanism of quantum action, vibrations with zero energy, mass of protons and electrons, cohesion and gravitation, chem. combination and gravitational force, existence of electrons in the nucleus, radioactivity and the He atom, generation of elec. charges,

Faraday's Law of electromagnetic induction, a possible magneton or unit of magnetism, and the diameters of vortex filaments. S. C. L.

Are the magnetic moments of atomic nuclei detectable by α -ray deflection? WALTER WESSEL. *Ann. Physik* 78, 757-85(1925).—A math. discussion of how a parallel, small bundle of α -rays will be deflected by a thin layer of at. nuclei when these nuclei possess a magnetic moment. MARIE FARNSWORTH

Researches on mesothorium. II. D. K. YOVANOVITCH. *J. chim. phys.* 23, 1-37(1926).—The method of purifying the Ms-Th II is to dissolve the mixts. of salts and ppt. the Ra, Ba, etc., with concd. HCl. Rare earth salts are then added and pptd. with NH_4OH which carries down the Ms-Th II. For purification this is redissolved in HCl and repptd. The Rd-Th is removed by pptg. a trace of $\text{Th}(\text{NO}_3)_4$ with H_2O_2 . The active deposit of Ra is pptd. with H_2S after adding a trace of $\text{Bi}(\text{NO}_3)_3$ and $\text{Pb}(\text{NO}_3)_2$. The Ms-Th II and rare earths are finally pptd. as oxalates. This very pure sample gives $T = 6.18$ hrs. By fractionation of the rare earths of the Ce group, the Ms-Th II is concd. in the more basic fraction (La). A complete magnetic spectrum of the β -rays of 43 lines is given. The velocity of the most rapid ray is 0.9983 that of light and the velocity of the slowest 0.36. A possible interpretation of the very rapid rays is given. MARIE FARNSWORTH

The life period of the metastable states of neon and mercury. H. B. DORGELO. *Physica* 5, 429-42(1925); cf. *C. A.* 20, 335.—The life period of $\text{Ne } s_3$ at 18° is $1/240$ sec., of s_3 $1/2000$ sec. The s_3 period changes considerably with temp. of the absorption tube; at 171° it is $1/1650$ sec., at -196° $1/10$ sec. For Hg the $2p_1$ and $2p_2$ conditions are metastable; their life period, as measured from 5461 and 4046 lines, was strongly dependent upon the presence of impurities. The max. period found for $2p_1$ was $1/200$ sec.; for $2p_2$ it is longer. Traces of H (second-order collisions) completely destroy the metastable possibilities [contrary to results of Marshall (*C. A.* 19, 603); cf. Eckardt, *C. A.* 19, 2164]. At higher temps. (200°) λ 4358 is strongly adsorbed; it remains visible at 90° for 8×10^{-6} sec. after excitation (measured with high-frequency circuit). The life period of neon s_3 is probably largely detd. by second-order collisions; the difference in energy between s_3 and s_4 of only 0.05 v., i. e., of the order of the heat energy of the atoms, explains the temp. influence upon it. Similar explanations hold for the other metastable atoms. Destruction by diffusion to the walls plays only a minor role at ordinary temps. B. J. C. VAN DER HOEVEN

Atomic weight of isotopic lead in cleveite from Aust-Agden, Norway. ELLEN GLEDITSCH, MME. DORENFELDT HOLTAN AND O. W. BERG. *J. chim. phys.* 22, 253-63 (1925).—The at. wt. of Pb in a sample of very pure cleveite, contg. 78.7% U_3O_8 , 0.95% ThO_2 , 11.41% PbO , 3.00% C_2O_3 , and small amts. of SiO_2 , Fe_2O_3 , Al_2O_3 , CaO , MgO and rare earths, from Aust-Agden, Norway, was detd. by 2 methods. (1) Direct detn., weighing PbCl_2 followed by conversion to PbSO_4 yielded 206.17 for Pb in cleveite and 207.22 for ordinary Pb. (2) An indirect method involving the comparison of the ds. of satd. solns. of the isotopic and ordinary $\text{Pb}(\text{NO}_3)_2$ yielded $d_4^{19.94} = 1.417941 \pm 0.000009$ and 1.419475 ± 0.000025 , resp. 1 l. of the satd. soln. (19.94°) contains 501.109 g. $\text{Pb}(\text{NO}_3)_2 = 1.522067$ g. mols. (detd. on common $\text{Pb}(\text{NO}_3)_2$; mol. soly. is the same for all isotopes of a given at. no.). If the at. wt. of common Pb is taken = 207.18, this detn. yields 206.17 ± 0.02 for the at. wt. of Pb from this sample of cleveite. F. C. KRACK

The δ -rays produced by α -particles in different gases. J. CHADWICK AND K. G. EMMELÉUS. *Phil. Mag.* [7], 1, 1-12(1926).—The production of δ -rays by α -particles has been studied by photographing the tracks produced in a Wilson expansion chamber. The objects were to det. (1) the energy and direction of emission; (2) the dependence of the production on the velocity of the α -particle; and (3) the dependence on the gaseous medium. The tracks were studied in H_2 , He, air and A. The δ -rays appear to result from a collision of an α -particle with an electron in the atoms through which it passes. It is assumed that the α -particle and electron behave as point-charges and that the inverse-square law of force is followed. The ranges of the δ -rays in the different gases have the same ratio to the air-range as for α -particles in the same gases. The max. velocity that can be given to the electron is twice that of the impinging α -particle. S. C. LIND

Action of radon on mixtures containing ammonia and an oxide of carbon. K. C. BAILEY. *Sci. Proc. Roy. Dublin Soc.* 18, 165-8(1926).—The action of radon on mixts. of CO with NH_3 and CO_2 with NH_3 was investigated. $\text{CO} + \text{NH}_3 = \text{H}_2\text{O} + \text{HCN}$ (*Ann.* 38, 62(1841)) is considered the normal reaction. $\text{CO} + \text{NH}_3 = \text{H}_2 + \text{HOCN}$ (*J. Chem. Soc.* 87, 433(1905)) was obtained by Jackson and Northall-Laurie. Radon

causes the 2nd reaction to take place. A catalyst is necessary for the first reaction. The reaction with CO_2 produced cyanate and urea. Quantitatively the expts. with CO_2 were unsatisfactory. B. expects to repeat. Similar expts. with ultra-violet light instead of radon are in progress. L. D. R.

The radioactive phosphorus-arsenic-iron-sulfate springs of the diadochite caves (fairy grottos) of Saalfeld in Thüringen. ANON. *Gas u. Wasserfach* 69, 28-9 (1926). The mineral content of these springs is very high, one showing (g/l.) As_2O_5 4, P_2O_5 80, H_2SO_4 110, Fe 130, Al 20, Mn 0.2, Mo 0.15, Cu 0.1, its d. being 1.31, its residual radioactivity being 30 Mache-units/l. Analyses of the gas arising from the springs showed 91.5% N_2 , 6.8% CO_2 , 1.7% noble gases. Analyses of solid deposits, and of other springs similar to the above, are given. W. B. PLUMMER

The mobility of gaseous ions in HCl gas and HCl air mixtures. L. B. LOEB. *Proc. Nat. Acad. Sci.* 12, 35-41 (1925); cf. *C. A.* 19, 10, 1814.—Mobility measurement made in pure dry HCl gas given the av. mobility for the positive ion at 20° and 760 mm. pressure as 0.65 cm./sec. per volt/cm. and for the negative ion as 0.56 cm./sec. per volt/cm. This measurement of a negative mobility, definitely less than a positive mobility constitutes the first exception to a general rule previously assumed from observation which indicated that the neg. ion has a mobility either equal to or greater than the pos. ion, but not less. The inverse-pressure law of mobilities holds for both positive and negative ions down to 16.3 mm. pressure. The const. of attachment of electrons to HCl mols. to form negative ions was nearly as low as that for Cl_2 gas. Measurements of mobilities in mixts. of air and HCl showed unmistakable signs of a cluster ion formation in this gas, the mobilities being lowered by marked amts. for fractions of a percent of HCl gas. G. L. CLARK

The mobility of gas ions in HCl mixtures and the nature of the ion. L. B. LOEB. *Proc. Nat. Acad. Sci.* 12, 42-8 (1926); cf. *C. A.* 19, 1814.—The preceding results indicate the ability of the ion to gather around it a higher concn. of HCl than is present in the rest of the gas; i. e., a definite labile cluster formation. Upon the basis that air and HCl mols are attracted to an ion with forces varying inversely as the 5th power, calcns. show that in a mixt. of 0.2% HCl and 99.8% air a cluster on the av. would consist of 1 HCl and 1 air mol. The mobility equations previously derived by L. do not include the effect of increased concn. of active mols. G. L. CLARK

Electron conduction in rarefied gases. A. D. FOKKER. *Physica* 5, 334-41 (1925). In a homogeneous elec. field, taking the atoms as perfectly elastic immovable spheres and the electron density low enough, so as not to disturb the field, F. finds for the flow of electrons: $i = \frac{1}{3} [(X/\sqrt{2Xx})\rho - \sqrt{2Xx}(d\rho/dx)]$; l is mean free path, X the acceleration in the field, ρ the electron density. The density is not influenced by the field strength and is for a homogeneous field $\rho = B\sqrt{x} \log(a/x)$, in which B and a are integration consts. The current is proportional to the sq. root of the elec. force. B. J. C. VAN DER HOEVEN

Ionization equilibrium in a stationary radiation field. J. WOLTJER, JR. *Physica* 5, 406-11 (1925).—Saha and Swe (*C. A.* 19, 1811) have given a relation for the degree of ionization of a gas as depending upon the reaction equil. of neutral atoms, ions, electrons and irradiating light impulses. Following a different method W. arrives at a similar result (cf. *C. A.* 20, 143). His equation becomes identical with the one of S. and S. on assuming that only light of one frequency can ionize. B. J. C. v. d. H.

The part taken by different energy levels in the emission of thermoelectrons. H. J. VAN LEEUWEN. *Physica* 5, 347-50 (1925).—On the basis of the classical statistical theory it is shown for the electron equil. of a heated body with multiple energy levels that the no. of free electrons is proportional to $e^{-\epsilon_1/kT}$ in which ϵ_1 is the energy of the first step (outer orbit). This result is in agreement with the expts. but contrary to a result of Richardson (*C. A.* 18, 3536). The assumption is used that a limited no. of places are available for electrons in each level and that these numbers are of the same order of magnitude for the different levels. B. J. C. VAN DER HOEVEN

Zeeman effect of molybdenum. E. WILHELMY. *Naturwissenschaften* 13, 49-50 (1926).—Preliminary report in which 39 wave lengths are tabulated. The results are in agreement with and complete data of Catalan (*C. A.* 18, 1427) and of Kiess (*C. A.* 17, 3453). B. J. C. VAN DER HOEVEN

Intensity measurements of Stark effect. T. TAKAMINE AND SVEN WERNER. *Naturwissenschaften* 13, 47-8 (1926).—Hansen, T. and W. have given measurements (*C. A.* 18, 3541) on the Stark effect in Hg; in the present paper a preliminary account is given of a continuation of this work. It is shown that the intensity of both $2p-4p$ (parhelium) and $2p-4p$ (orthohelium) in the Stark spectrum is proportional to the

square of the elec. field intensity (all measurements were done on the light component parallel to the field). Another theoretical conclusion, that the intensity of a new line is *inversely* proportional to the difference between influenced term and nearest hydrogen term, was also confirmed from the intensity ratios $J_{2P-4P}/J_{2P-4D} = 0.025$, $J_{2P-4P}/J_{2P-4D} = 0.0015$, $J_{2P-4P}/J_{2P-4D} = 0.4$; $J_{2P-4P}/J_{2P-4D} = 0.3$ (all for $E = 13,200$ v./cm.). The intensity of new lines increases for higher members of the same series $J_{2P-mP}/J_{2P-md} = 0.025, 0.4$ and 1.0 for $m = 4, 5$ and 6 , resp.; little polarization for $m = 4$, strong for $m = 6$ was found.

B. J. C. VAN DER HOEVEN

The low-voltage arc in mercury vapor. RICHARD RUDY. *J. Franklin Inst.* **201**, 248-50(1926).—Because of the existence of reverse fields as high as 10 v. in the presence of a it is possible to get the whole v.-amp. curve below the crit. 5 v. F. O. A.

The relation between temperature and minimum sparking potential. E. F. BURTON. *Phil. Mag.* [7], **1**, 219-24(1926).—The min. sparking potentials in air between solid brass cylinders was detd. over a range of temps. from -190° to $+200^{\circ}$. The min potential dropped from 505 to 346 v. while the density of the air relative to 0° changed from 3.37 to 0.58. S. C. L.

Langevin's theory of ionic mobility. H. R. HASSÉ. *Phil. Mag.* [7], **1**, 139-59(1926).—An exhaustive review and recalcn. of the Langevin equation (*Ann. chim. phys.* [8], **5**, 245(1905)) is given with crit. discussion of other methods of detg. and calcg. ionic mobility. Comparison is made between the predicted and exptl. mobilities. While agreement is fair for most gases, the disagreement is so great for H_2 and He as to suggest that the agreement for other gases may be accidental. The paper is preliminary in character and serves chiefly to point out the difficulties and unsatisfactory state of measuring and especially of interpreting ionic mobilities. S. C. LIND

The absorption of hydrogen in potassium vapor arcs. R. D. RUSK. *Phil. Mag.* [7], **1**, 97-109(1926).—When a low-voltage arc is passed through a mixt. of He and K vapor at temps. of 40° to 180° beginning with initial pressure of about 1 mm. or less, a reduction in pressure results owing to the formation of KH. The reaction is more rapid the higher the temp. The reaction is attributed to some active form of H not formed at less than 16 v. K ions do not unite with mol. H_2 since absorption should then occur at 4.3 v., the ionization potential of K. R. gives reasons for believing that the active form of H is atomic and extends this view to the thermal union, calcg. a dissociation of H_2 at 300° and 760 mm. of 1.75×10^{-11} from Nernst's reaction isobar, while the rate of reaction would give a value about 16 times higher, assuming combination on first collision. S. C. LIND

The intensities of the Zeeman components of multiple lines. W. C. VAN GEEL. *Physik* **33**, 836-42(1925).—The rule for the intensities of the Zeeman components of multiple lines proposed by Hönl is found to agree well with expt. for an octet system (Mn), a septet system (Cr) and a quintet system (Cr). H. C. UREY

The screening doublets of the Bowen-Millikan ultra-violet spectra. ALBRECHT UNSÖLD. *Z. Physik* **33**, 843-48(1925).—The energy of the valence electron is expanded in terms of s/Z , s being the screening const. and Z the at. no. and the quantum conditions applied. The calcd. values for $\Delta\sqrt{\nu}$ agree well with those observed for S(VI), P(V), Si(IV), Al(III) and Mg(II). H. C. UREY

Total reflection and the variation of the index of refraction of X-rays in the vicinity of an absorption discontinuity of the mirror. M. DE BROGLIE AND J. THIBAUD. *Compt. rend.* **181**, 1034-5(1925). GEORGE L. CLARK

The symmetry of X-ray interferences. P. P. EWALD. *Physica* **5**, 363-9(1925). (in German).—Equal reflecting power of any crystal plane from both sides (centrosymmetry) is essential for symmetry of the interference pattern. On the basis of the Laue-Bragg theory this equality fails if the different atoms of one plane produce waves with differences in phase relative to the impinging wave. The dynamic theory of reflection, which includes interaction of primary and secondary radiation, always leads to the centrosymmetrical condition and thus proves the general validity of the Friedel rule (C. A. **8**, 1911). B. J. C. VAN DER HOEVEN

Changes in the cathode of the arc discharge. R. SEELIGER. *Physik. Z.* **27**, 22-41(1926).—A crit. discussion and summary of work in this field, with emphasis on the following topics: (1) different forms and definition of the arc discharge; (2) qual. theory of the cathode field; (3) current distribution in the cathode; (4) the burning patch; (5) disadvantages of the thermal arc theory. H. R. MOORE

Origin of penetrating radiation in the atmosphere. FRANZ BĚHOUNEK. *Physik. Z.* **27**, 8-10(1926).—The ionization in a modified Kolhörster app. (*Science Abstracts* **25A**, 1388) is plotted as a function of the thickness of the Pb walls. The currents are

const. as soon as the wall attains a thickness of 10 cm. and this is ascribed to a residual activity of the app. Direct measurements of the absorption coeffs. of γ -rays from Ra C confirm the formula of Ahmad and Stoner (*C. A.* **18**, 3312). The conclusion is reached that highly penetrating radiation is not of cosmic origin, but is due to radiation of radioactive products (cf. Thibaud, *C. A.* **18**, 3001).

H. R. MOORE

Theory of the continuous X-ray spectrum. M. SANDOVAL VALLARTA. *J. Math. Physics* **5**, 1-7(1925).—A quantum theory of the continuous X-ray spectrum is based upon the following assumptions: (1) The continuous spectrum is due solely to the stoppage of electrons at the anticathode; (2) radiation from an electron due to a fortuitous loss of kinetic energy takes place in accord with Bohr's frequency relation; (3) conservation of energy and momentum hold for the system consisting of electron, anticathode atom and light quantum. Making use of the principle of variation of mass with velocity for both atoms and electrons and the law of inertia of energy for the emitted light quantum, V. obtains an expression for the high frequency limit of the spectrum, ν_0 , which differs slightly from that given by the Einstein-Planck formula $T_1 = h\nu_0$, where T_1 is the kinetic energy of the electron. The difference between the two expressions would not be detectable for anticathode elements heavier than Al and for voltages above 1 kv.

R. J. HAVIGHURST

The soft X-ray absorption limits of certain elements. URSULA ANDREWES, ANN C. DAVIES AND FRANK HORTON. *Proc. Roy. Soc. (London)* **110A**, 64-90(1926).—By a photoelec. method, voltages corresponding to the crit. values of the electron energy associated with some of the longer wave-length absorption stages of the 7 successive elements Cr, Mn, Fe, Co, Ni, Cu, Zn, have been measured. Comparison of measured absorption limits and emission lines shows that the generally accepted value of an absorption limit, obtained by spectroscopic methods, corresponds not to ionization of the atom by the detachment from it of an electron in the sub-group concerned, but to the transportation of the electron from the sub-group to the periphery of the atom, i. e. to the levels of the most loosely bound electrons. For the more deeply seated levels within the atom, the quantity of energy required to move an electron to the periphery differs very little from that required to effect its complete detachment from the atom. The values obtained in this investigation are associated with absorption of energy by electrons in the M_I and $M_{II,III}$ sub-groups and their transference to virtual orbits outside the normally occupied region of the atom, and not to actual ionization of the atom.

R. J. HAVIGHURST

The scattering coefficient for hard X-rays. W. BOTHE. *Z. Physik* **34**, 819(1925)

The elementary process of the scattering of light by an electron may be considered as follows. The electron, initially at rest, absorbs classically and stores up the energy in some non-classical manner while it is being accelerated by the light pressure. The mass of the stored up energy is to be added to that of the electron in computing the acceleration. When it has reached the "effective velocity" $\bar{\beta}$ it then radiates this energy at the frequency which would appear if light were scattered classically by an electron with the velocity $\bar{\beta}$. It is shown that this conception leads to the same formula for $\bar{\beta}$ in terms of the initial frequency as that previously obtained by A. H. Compton on the pure light-quantum theory. The expression for the ratio of the actual scattering coeff. to the classical does not agree with that obtained by Compton, but appears to fit the exptl. data better.

S. K. ALLISON

The distribution of energy in the continuous X-ray spectrum. M. H. BELL. *Phil. Mag.* [7], **1**, 50-67(1926).—From the cor. exptl. curves given by Dauvillier for a standard Coolidge tube under different const. potentials and currents, an empirical expression of the form $y = a(e^{-bx} - e^{-ax})$ has been found to represent the energy-distribution curve with considerable accuracy. By subdividing the form of a sinusoidal potential wave into a no. of intervals during which an appropriate const. potential is supposed to act, the application of the empirical expression produces an integral distribution curve, which agrees very well with an exptl. curve given by Dauvillier for approx. equal conditions. It is suggested that the energy-distribution curve can, in the same way, be predicted when the forms of the potential and current waves are known. The importance of the knowledge of the energy distribution curve for any type of machine in its application to clinical practice is stressed, and the method of standardizing treatment in terms of the characteristics of the energy distribution curve is suggested as being more precise than the former method of subjecting the patient to a certain no. of erythema doses.

S. C. L.

Observations on the spreading of X-ray pulses. A. JOFFÉ AND N. DOBRONRAVOV. *Z. Physik* **34**, 889(1925).—X-rays were generated in a small tube with an Al target and

a cathode ray beam of photoelectrons from an Al point. Pulses were emitted from this tube at intervals of about 10^{-8} sec. The beam from this tube was allowed to fall on a positively charged Bi particle suspended in a Millikan condenser. At intervals of about 30 min. the loss of an electron by the particle could be observed. Conclusion: The total energy of the pulse is radiated within a solid angle of at most 10^{-6} . S. K. A.

The natural X-ray spectrum of radium B. ERNEST RUTHERFORD AND W. A. WOOSTER. *Proc. Cambridge Phil. Soc.* **28**, 834-7(1925).—An expt. is described which indicates that the natural L spectrum of Ra B corresponds to an element of at. no. 83, thus establishing the fact that the γ -ray emission follows the escape of the disintegration electron from the nucleus. C. C. KIESS

The β -ray spectrum of the natural L-radiation from radium B. D. H. BLACK. *Proc. Cambridge Phil. Soc.* **28**, 832-3(1925).—The analysis of the β -ray spectrum due to the natural L radiation of radium B. *Ibid* 838-43. —These 2 papers describe and tabulate the spectrum of low-energy β -rays of Ra B resulting from the action of L X-rays of the atom on the M, N and O levels of the same atom. Analysis of the spectrum indicates that the L radiation comes from an atom of at. no. 83, supporting the theory that after the ejection of a nuclear β -particle the γ -rays which are emitted act on the various at. levels. The fact that the β -ray spectrum of Th B has been found to be practically the same as that of its isotope Ra B is additional support of this conclusion. C. C. KIESS

Zeeman effect and multiplet structure. ARTHUR BRAMLEY. *J. Frank Inst* **201**, 16(1926). C. C. KIESS

The free-path length of the light stimulation and its disturbances. BALEBAIL DAS-ANNACHARYA. *Ann. Physik* **77**, 597-626(1925).—Measurement of light emission of flying atoms of H-canals rays at varying H-pressures. The results as applied to the disson. theory agree with the conditions in aq. solns. JOHN T. STERN

Intensity of absorption lines in cadmium spectrum. W. KUHN, *Naturwissenschaften* **13**, 48-9(1926).—The method used formerly for Tl vapor (*C. A.* **19**, 3210) was now applied to Cd vapor. For $1S-2P$ ($\lambda = 2288$ A. U.) f was found to be 1.20 ± 0.05 , for $1S-2p_2$ $f = (1.9 \pm 0.2) \cdot 10^{-3}$. It appears (cf. Kronig, *C. A.* **19**, 3060) that the ratio of intensities of intercombination lines for Hg and Cd approx. equals the ratio of the squared distances of the triplet components ($2p_2-2p_0$) for Hg and Cd (6398 and 1713, resp.). From the presence of two 5,1 orbits in normal Cd the $f_{1S-2P} > 1$ is explainable; both electrons take part in the light dispersion. As concluded from correspondence principle the $2P$ term of Cd has a main quantum no. of 5. B. J. C. VAN DER HOEVEN

The fine structure of Balmer lines. G. HANSEN. *Ann. Physik* **78**, 558-600(1925).—Although the structures of H lines have been investigated many times, the results are not certain within $10^{-4}\%$ and the divergences are partly inexplicable because details of the investigations have not been given with sufficient completeness. The earlier measurements are critically discussed and then a full description is given of an investigation of the 5 first members of the Balmer series, a preliminary account of which has already been given (cf. *C. A.* **20**, 543). The source was a long tube cooled in liquid air. Three different Lummer-Gehrcke plates were used for the resolution of the line structures, the performance of the interferometers being tested in an examn. of Cd and He lines. The observations were made photographically and then the interference patterns were drawn by a registering photometer. The evaluation of these curves is described and uncorrected results of the doublet sepn. of 5 lines are given. Two lines, H_{α} and H_{β} , show dissymmetry which suggests a third component for each. The measured sepn. of the doublets are not in good agreement with the Sommerfeld-Kramers theory but this may be accounted for by a Stark effect for time changes and space inhomogeneities in interat. elec. fields. The "half-width" of H_{α} is estd. to be 0.07 A. U., which indicated a temp. of about 230° K. on the assumption of pure Doppler widening. It may be expected that further components may be sepd. if the tube is cooled in liquid H_2 . W. F. MEGGERS

Secondary standards of wave length in the spectra of neon and iron. G. S. MONK. *Astrophys. J.* **62**, 375-86(1925).—In order to det. the consistency and reproducibility of standard wave lengths a series of comparisons was made of the primary standard as emitted by the Michelson tube, by a Cd arc *in vacuo* between Cd-filled C poles, and by a Cd discharge tube of improved form. Within the errors of measurement all 3 sources gave the same wave lengths when compared with Ne lines. Then 110 lines (3445.152 to 6677.991 A. U.) from the standard Fe arc were measured relative to Ne lines. The observed values to the violet of 6000 A. U. agree well with the last observations reported

from the Bur. of Standards while to the red of 6000 A. U. they are systematically about 0.002 A. U. lower than the Bur. of Standards values. W. F. MEGGERS

Effect of the solvent on the ultra-violet spectrum of the solute. H. FISCHER. *Ann. méd. légale* 2, 334-5(1922).—Solvents have a considerable quant. and qual. effect on the spectra of solutes. On the whole, C_6H_{14} and C_6H_{12} give the best spectra, next come H_2O , H_2O and abs. EtOH. EtOH frequently causes considerable change in the spectra, and also H_2O at times. The latter has proved particularly valuable with alkaloids and their salts. A. PAPINEAU-COUTURE

Ultra-violet absorption spectra of narcotine and of its decomposition products. PIERRE STEINER. *Ann. méd. légale* 2, 338-40(1922); cf. *C. A.* 17, 2832.—Narcotine shows a large absorption band with max. for $\lambda = 3115$ A. U. and absorption coeff. $\epsilon = 5000$ approx. at this wave length. As little as 0.07 mg. can be detected in soln. in 1 cc. H_2O . Hydrocotarnine and opianic acid do not show as great adsorption as narcotine and the absorption of the latter is nearer the red end of the spectrum. A. PAPINEAU-COUTURE

The analysis of certain molecular spectra. D. M. DENNISON. *Phil. Mag.* [7], 1, 195-218(1926).—D. extends the consideration of mol. structure as revealed by the positions and fine structure of the infra-red bands to HCl, HBr, HI, CO_2 and NH_3 . The treatment is similar to that employed for CH_4 (*C. A.* 20, 147). S. C. LINE

The effect of solvents on the absorption spectrum of a simple azo dye. W. R. BRODE. *J. Phys. Chem.* 30, 56-69(1926).—A Hilger sector photometer and quartz spectrograph were used to observe the absorption of 30 org. solvents and of solns. in them of the dye benzeneazophenol. The position in the spectrum of the absorption limits of the solvents is shown graphically. In a table are given the observed frequencies and extinction coeffs. of the absorption bands of the dye in each of the solvents. From the observations it is concluded that for this dye, and probably for other simple azo dyes, Kundt's law does not hold which states that the absorption band is displaced redward in the spectrum with increasing index of refraction of the solvent. The absorption band of the dye in mixed solvents appears to be that of the most polar solvent even if this solvent is present in a low percentage. It appears as though the dye is entirely dissolved in the more polar solvent and this soln. is then suspended in the other solvents. C. C. KRESS

The explanation on the correspondence principle of the spontaneous appearance of spectral lines of the type $ms-nd$. GEORG JOOS. *Physik. Z.* 26, 729-30(1925). The line $1s-3d$ of K has been observed under conditions which preclude intermol. electric fields as responsible for its appearance. For such lines there is a change of 2 units in the azimuthal quantum nos. An explanation based on the correspondence principle is offered on the assumption that the angular velocity of the line of apsides is varied depending on the angle which it makes with a fixed direction in the core of the atom. C. C. KRESS

Doublet and triplet separations in optical spectra as evidence whether orbits penetrate into the core. D. R. HARTREE. *Proc. Cambridge Phil. Soc.* 22, 904-18(1925). Comparison of the doublet and triplet seps., of terms in optical spectra is made with Landé's formula to det. whether or not the corresponding orbits penetrate the atom core (*C. A.* 18, 3321). Except for Li-like atoms the evidence presented indicates that all p orbits of doublet and triplet spectra penetrate the core. The evidence for d orbits is not conclusive, though for Cs I and Tl I the d terms correspond to penetrating orbits. In complex spectra characterized by multiplet groups of lines Landé's formula appears to hold if the terms belong to a Rydberg sequence. C. C. KRESS

The absorption spectra and excitation stages of naphthalene and some of its methyl derivatives. HENRY G. DE LASZLO. *Z. physik. Chem.* 118, 369-414(1925).—A brief review of the theory of band spectra and a description of observations and measurements of the band spectra of naphthalene and some of its derivs. are given. The absorbing media were solns. in hexane and vapors in a heated quartz tube. The wave lengths observed are tabulated. Naphthalene as vapor and in soln. has an absorption spectrum of about 400 sharp narrow bands with fine structure between 3200 and 2820 A. U. in the ultra-violet and a group of broad continuous bands without fine structure between 2820 and 2500 A. U. Some of the fine-structure bands are arranged into P, Q and R, series. The moment of inertia of the mol. calcd. from the classical theory (3.45×10^{-40} g./sq. cm.) is far too small. It is suggested that the true moment of inertia is a multiple of this value and from the infra-red absorption spectrum a value 96×10^{-40} g./sq. cm. is derived. The absorption spectra of α - and β -methyl-naphthalene are displaced redward as compared with naphthalene, being more pronounced for the β -compd. than for the α -compd. The absorption bands of solns. in hexane are

more displaced than those of the vapors. The bands of the B-compd. are more numerous and more intense than those of the α -compd., some exhibiting fine structure. Other derivs. studied were 2,6- and 2,7-dimethylnaphthalene (*C. A.* 19, 1374). Of these the 2,6-compd. exhibited very strong bands. The effect of the CH_3 group on the absorption spectra is to cause a blending or fusion of the bands.

C. C. KIESS

Spectroscopic investigation of chemiluminescence. K. LILIKOV AND A. TERENIN. *Naturwissenschaften* 13, 83(1926).—The light emitted by the reaction $\text{I}_2 + \text{Na}$, K or Rb contains those lines of the alkali spectra of which the excitation energy is less than the heat of reaction, the first member of the series with the highest intensity. Also some bands were observed, probably corresponding to the fluorescence or absorption bands of alkali vapor. No emission, whatever, by the I_2 mol. could be detected, nor any "affinity" spectrum. The lines emitted were noticeably broadened, D_1 more than D_2 , showing that the emitting atoms have high speeds, due to excess kinetic energy as a result of the reaction.

B. J. C. VAN DER HOEVEN

Magnetic behavior of phosphors. E. RUPP. *Ann. Physik* 78, 505 7(1925), cf. Lenard, *Ann. Physik* 15, 425; *C. A.* 4, 1840; Schmidt, 15, 3246; Tomaschek, 19, 935.—The magnetic susceptibility, χ , is greater for the center mols. of the phosphor base, than for those of the unheated compd. Different bands of the same heavy metal added to the phosphor base arise from different valence combinations of this metal with the base. The absorption edge of Class I in Schmidt's nomenclature is due to trivalent combination; II to bivalent; and IV to a univalent combination. $\chi = A + B\theta + C/\theta$ where θ is abs. temp. ($290 < \theta < 570^\circ$) and $C/\theta = 0$ when θ is the temp. of the upper momentary state attained in prep. the phosphor. The paramagnetism of the whole center disappears when this temp. is exceeded. A phosphor whose time of phosphorescence had been reduced from 253 to 268 sec. by adding a trace of Fe showed an χ of -70 (original $\chi = -110$). Unexplained quant. relations between χ and the violet shift or doublet sepn. of the emission lines hold for the rare earth phosphors. χ does not change with the magnetic field strength in the range between 7000 and 20,000 gauss. χ for the heavy metal at. in the phosphor (and for a corresponding compd.) follows: $\text{CaMn}\alpha$, $\text{ZnMn}\alpha$, ZnMn , $+5.7 \times 10^{-4}$ (MnS , 3.86×10^{-3}); $\text{CaBa}\alpha$, -2.78×10^{-4} ($\text{Bi}(\text{NO}_3)_3$, $+1.14 \times 10^{-9}$); $\text{CaCu}\alpha$, -5.7×10^{-6} (CuS , -1.54×10^{-5} ; Cu_2S , -2.1×10^{-6}); $\text{SrAg}\beta$, -11×10^{-6} (AgI , -4.9×10^{-5}). In a well-formed ZnS phosphor, excited phosphor is more paramagnetic than the unexcited form. The magnetic moment of the bivalent Mn at. in a $\text{Mn}\alpha$ phosphor is 4.8×10^{-20} cm.²/g./sec.⁻¹ or 17 magnetons. R. proposes a model and explains various magnetic relations of the phosphor. Assuming spacial quantization, univalent Mn should have 6, bivalent 5 and trivalent 4 magnetons. A new method is developed to measure χ . A spherical phosphor grain is allowed to fall through a viscous liquid and its velocity with (ω_2) and without (ω_1) a magnetic field is observed. $\chi = \mp g(1 - \omega_2/\omega_1)/(H dH/dx)$.

D. S. VILLARS

Photocells and thermoelements. F. GOOS AND P. P. KOCH. *Physik. Z.* 27, 41-2 (1926).—A microphotometric study of photoelec. cells and thermopiles shows that the former are much more responsive to radiation since the inertia is less than the 10th power of the thermopile value.

H. R. MOORE

The photographic blackening law for homogeneous X-rays. W. BUSSE. *Z. Physik* 34, 11(1925).—Recently Jönsson (*C. A.* 18, 3537) has investigated the time-density curves for homogeneous X-rays and found, contrary to previous experimenters, that it is curved, even for small densities. B. has repeated the work of Glocker and Traub and others, using homogeneous X-rays, and finds, in agreement with previous results, that the Bunsen law holds up to densities of 0.6. He ascribes the results of Jönsson to the method of development used.

S. K. ALLISON

Active nitrogen. RICHARD RUDY. *J. Franklin Inst.* 201, 247-8(1926).—The decay of active N is bimolecular, but it takes a 100° rise in temp. to double the rate. A magnetic field of 500 gauss has no effect. The active modification is thought to be analogous to metastable Ne, which has a life of 0.004 sec. The afterglow in N is excited by about 11.4 v.

F. O. A.

The decomposition of nitrogen pentoxide and infra-red radiation. H. AUSTIN TAYLOR. *J. Chem. Soc.* 48, 577-82(1926).—No noticeable acceleration of the decompn. of N_2O_5 occurs in the presence of infra-red radiation between the limits 2μ and 8μ inclusive of the 2 absorption bands at 3.4μ and 5.8μ exhibited by the gas. A general discussion on the application of radiation to chem. reaction is presented with special reference to unimolecular reactions. The simple radiation theory would suggest a much larger decompn. of N_2O_5 than is actually observed.

MARIE FARNSWORTH

The photochemical inactivity of infra-red radiation with special reference to the

decomposition of nitrogen pentoxide. FARRINGTON DANIELS. *J. Am. Chem. Soc.* 48, 607-15(1926).—Infra-red radiation does not cause the photochem. decompn. of N_2O_5 . CO_2 , HCl gas or the oxidation of C_2H_5OH vapor. The sensitivity of the tests and the possible decompn., calcd. from the energy input, are critically discussed. At least 99 1/2% of the radiation actually absorbed is chemically inactive. There is a slightly increased decompn. at room temp. due to thermal effects, which disappears at 0°. The "radiation hypothesis" of chem. reaction is thus rendered improbable, for it is difficult to see how ordinary thermal reactions can be caused by radiation emitted by the walls of the contg. vessel, if the radiation itself is inactive. MARIK FARNSWORTH

WOLF, FRANZ: **Die schnellbewegten Elektronen.** Stand u. Entwickl. d. heutigen Kenntnis, mit bes. Rücksicht auf d. Vorgänge beim radioaktiven Zerfall. Brunswick, F. Vieweg & Sohn. 125 pp. R. M. 7.50.

4 -ELECTROCHEMISTRY

COLIN G. FINK

Electric furnaces show good results. ANON. *Elec. World* 87, 465 (1926). Two 250-lb. Detroit elec. furnaces are producing 25 heats in 18 hrs. A table shows that the total av. melting cost per ton is \$11.86 the production being about 50% brass and 50% phosphor bronze. In 1925 a 0.5-ton Pittsburgh elec. furnace was installed to melt charges of cast-iron scrap and steel turnings and punchings. From 12 to 14 heats are produced in 24 hr. The total av. melting cost is \$14.48 per ton when loose borings and turnings are used as the charge. It is expected that this cost will be lowered and be less than the purchase price of such castings. A. D. S.

Some new centers of electrochemical industry. II. Electrolytic alkali and chlorine J. B. C. KERSHAW. *Ind. Chemist* 2, 75-8(1926), cf. *C. A.* 19, 2783. E. H.

Electric heating furnaces in the American iron and steel industry. VALFRID MATSSON. *Jernkontorets Annaler* 109, 603-25(1925). C. A. ROBAK

The electrotechnical development of the Swedish iron works during recent years. FRITHIOF HOLMGREN. *Jernkontorets Annaler* 109, Supplementary issue, 10(1925). C. A. ROBAK

Carborundum production in Europe. ANON. *J. four élec* 34, 227(1925). A brief review of the history, properties and production, in some European factories. C. J. BROCKMAN

Induction brass furnaces save 30%. D. ST. PIERRE DU BOSE. *Elec. World* 87, 505(1926).—Each of 5 Ajax induction furnaces (4 of 100 kw. capacity and 1 of 125 kw.) is now provided with a transformer with 12 secondary taps so that the voltage successively applied to a new charge can be changed from 20 v. to 180 v. and finally to 320 v. when the furnace is poured the voltage is reduced to 95 v. The investment has resulted in a net saving of 30% over the previous cost of melting and a 50% reduction in labor. On an av. 24 heats are poured per furnace per 24-hr. day, 750 lbs. being poured at a time so that 400 lbs. of molten metal always remains in the furnace to complete the secondary loop; in other words the holding capacity of the furnace is 1150 lbs. The life of the one-piece cast lining is 3900 heats and both yellow and red brass are melted at an av. of 10 1/4 lbs. per kw. hr., or an av. consumption of 2000 to 2200 kw. hr. per furnace per day. A. D. SPILLMAN

Electrolytic deposition of cadmium and other metals on aluminum. C. H. DESCH AND E. M. VELLAN. *Trans. Faraday Soc.*, Feb., 1925 (advance proof), 2 pp.—For cleaning and prep. the surface of Al vessels previous to electroplating, sand blasting is most satisfactory; after this treatment the metal may be either plated with Cu for 1 min. in a cyanide bath and again sand-blasted or made the anode for 1/2 min., then the cathode for 1/2-1 min., in a soln. contg. 200 g. of $FeCl_2$ and 175 g. of $CaCl_2$ in 1 l. of water, and again sand-blasted. The most resistant deposits of Cd were obtained from an electrolyte made as follows: a satd. soln. of 100 g. of $CdSO_4$ in water is treated with NH_3 till clear, 3 g. of peptone are added and the soln. is diluted to 1 l. so as to contain 2.5% of free NH_3 ; the soln. is electrolyzed for 24 hrs. between an amalgamated Cd anode and a Cd cathode before use. For electroplating Al the same anode is used with a c. d. 5-7 amp. per sq. ft. The deposits do not peel off even on bending and resist the salt spray test for a few days and ordinary atm. conditions for many months. Al. thinly coppered, may be coated with quite thick deposits of Fe from ferrous NH_4 sulfate electrolytes and with Ni from the usual boric acid-Ni-sulfate-chloride bath. B. C. A.

The secondary reaction in the discharge of lead storage batteries. C. FÉRY and C. CHÉNEVEAU. *Compt. rend.* **181**, 606(1925).—F. and C. verify the reversible reaction of the Pb accumulator which F. previously presented (cf. C. A. **19**, 1099) by measuring the variation in wt. of the plates on charging and on discharging. A hydrostatic balance was used. Their results disagree with those of the theory of double sulfation. This they explain by considering the liquid of the battery as a satd. soln. of lead sulfate in acidulated water and that a secondary reaction: $\text{Pb} + \text{Pb}_2\text{O}_3 + \text{H}_2\text{SO}_4 = 2\text{PbO}_2 + \text{PbSO}_4 + \text{H}_2\text{O}$ takes place at the positive plate besides the reaction F. previously presented. They reject the theory of double sulfation. A. D. S.

The growth of the storage battery, 1882-1926. ANON. *World Power* **5**, 160-5 (1926). C. G. F.

Manufacture of iodine by electrolysis of its salts. L. PISSARIEVSKII AND S. TEL'NUI. *J. Chem. Ind. (Russia)* **1**, 13-5(1924).—In operating with acid solns. of I salts, I is deposited on the anode and seps. from it easily; the consumption of current is not much more than theoretical. The drawback to this method is that considerable quantities of I volatilize in the course of the operation. P. and T., therefore, recommend operating with neutral or slightly alk. solns. In the latter case, the alkali metals, which sep. on the cathode, react with water and become transformed into hydroxides; these, in turn, react with I, which has sepd. on the anode, to form iodide and iodate. When the stage is reached at which $\frac{1}{6}$ of the I in the soln. is transformed into iodate and $\frac{5}{6}$ of the I remains in form of iodide, the electrolysis is stopped, the electrolyte is poured into a bottle and acidified, whereupon I is pptd. according to the equation $6\text{H}^+ + 5\text{I}^- + \text{IO}_3^- = 3\text{I}_2 + 3\text{H}_2\text{O}$. Expts. show that in order to obtain 1 kg. of I it is necessary to use 1.7 kw. hrs. and about 228 cc. H_2SO_4 (d. 1.83). The presence of chlorides is not harmful, as the Cl sepd. by electrolysis merely displaces the equiv. amt. of I from its salts. H which seps. on the cathode decomposes the iodate formed and this results in an expense of current. To obviate this, the intensity of the current must be increased on the cathode and the cathode must be sepd. by a diaphragm, or by a glass tube. I obtained by electrolysis of ash lyes in acid soln. contained about 1% S; I obtained by electrolysis of the same lyes in alk. soln. contained practically no S and no Cl.

BERNARD NELSON

Properties of the single conductor. New fundamental relations. C. HERING. *J. Am. Inst. Elec. Eng.* **45**, 31-9(1926). C. G. F.

STEINACH, HUBERT AND BUCHNER, GEORG: **Die galvanischen Metallniederschläge und deren Ausführen (Galvanostegie und Galvanoplastik).** 4th Ed. revised by Georg Buchner and Alfred Wagrinz. Berlin: M. Krayn. 188 pp. \$1.50. Reviewed in *J. Inst. Met.* **33**, 605(1925).

Properties and testing of magnetic materials—effect of heat treatment (SPOONER)

Storage battery. M. BROWN. U. S. 1,573,298, Feb. 16. Structural features

Storage battery. R. N. CHAMBERLAIN. U. S. 1,573,300, Feb. 16. Structural features.

Storage battery electrodes. R. C. BENNER. U. S. 1,572,512, Feb. 9. In prepg. active material for positive electrodes, a mixt. contg. PbO_2 and another Pb compd. of lower d., e. g., PbSO_4 , is treated with a soln. of alkali such as 20% NaOH soln. to form bonding compds. in the mixt.

Storage battery electrodes. H. G. WEIR. U. S. 1,572,586, Feb. 9. In order to regulate the porosity of storage battery plates, a paste is prepd. embodying as initial ingredients PbO and Pb_2O_3 or other Pb-contg. sulfatable material and a Pb compd. such as PbSO_4 , having a d. less than that of the active material to be prepd. and the proportions of this Pb compd. are varied in accord with the varying characteristics of the particular batch of the oxides or other Pb-contg. sulfatable material used. The mixt. is placed upon a support and converted into active material.

Electric battery. SOC. ANON. LE CARBONE. Brit. 236,884, July 12, 1924. Tubular C electrodes are rendered impervious to liquids but permeable to gases, e. g., by treating them with paraffin in C_6H_6 soln. and evapg. the solvent or by exposure to tar vapors, and used with an electrolyte of NH_4Cl soln. and Zn electrode.

Electrodes for protecting condenser parts from corrosion. R. D. MERSHON. U. S. 1,572,404, Feb. 9. Structural features.

Sectional electrodes for electric furnaces. A. T. HINCKLEY. U. S. 1,572,534,

Feb. 9. Sections of C electrodes are joined by screw threads and are locked together to prevent rotation.

Electric furnace for the manufacture of electrodes. E. A. A. GROENWALL. Swed 60,154, Jan. 26, 1926. Mech. features.

Electric furnace. M. H. BENNETT. U. S. 1,572,634, Feb. 9.

Electric resistance furnace adapted for heating material in a crucible. P. H. BRACE. U. S. 1,572,881, Feb. 16.

Electric resistance furnaces adapted for heat-treatments. G. M. LITTLE. U. S. 1,572,893-4, Feb. 16.

Refining aluminum or other metals electrolytically. D. H. TILSON. U. S. 1,572,253, Feb. 9. In putting an electrolytic cell into operation for refining Al or other metal, a layer of molten electrolyte, *e. g.*, mixed fluorides, is first established in the cell followed by 2 successive layers of molten metal of different densities, *e. g.*, an Al, Cu and Si alloy and Al. A crust from the electrolyte layer is congealed on the sides of the cell to form part of a side-lining before the second metal is established and the side-lining is afterward completed.

Copper from ore. W. E. GREENAWALT. U. S. 1,572,114, Feb. 9. A Cu soln. obtained by leaching Cu ore with an acid soln. is alternately subjected to the action of a reducing agent such as SO_2 and to electrolysis to deposit Cu and regenerate acid for further leaching. When the soln. becomes fouled with impurities from repeated use a portion of it is diverted to a sep. electrolytic circuit and its acidity is reduced and the diverted foul soln. is further subjected alternately to a reducing agent and to electrolysis. U. S. 1,572,115 relates to similar methods. App. is described. Cl. C. A. 19, 1400.

Alkali metal phosphates. C. M. HOFF. U. S. 1,572,846, Feb. 9. A soln. of Na_2HPO_4 or other alkali metal phosphate is electrolyzed in a diaphragm cell and the alkali metal phosphate contents of the anode and cathode liquors are separately recovered in order to obtain purified products such as NaH_2PO_4 and Na_3PO_4 .

Electric resistance conductors. NEDERLANDSCH TECHNISCHE HANDEL MAATSCHAPPIJ GIRO. Brit. 236,880, Feb. 5, 1924. Rods, bars, strips or layers are formed of hard or soft vulcanized rubber contg. finely powd. graphite.

Rectifiers and similar gaseous discharge devices with heated filamentary cathode. E. W. BREISCH. U. S. 1,572,882, Feb. 16.

Electrolytic condensers, rectifiers and lightning arresters. R. D. MERSHON. U. S. 1,572,403, Feb. 9. Heat liberated by internal elec. losses serves to produce boiling and agitation of the electrolyte.

Electric incandescent lamp. R. E. MYERS. U. S. 1,572,670, Feb. 9. Lamp bulbs are filled with H and are formed of lime glass (free from Pb) or other material resistant to the action of H so that blackening during operation is avoided.

5—PHOTOGRAPHY

C. E. K. MEES

New Buri process. ANON. *Camera (Luzern)* 4, 105-6(1925).—The Buri powder process, formerly suited only for making direct reproductions of positives, has now been modified to permit making prints from negatives. A gelatin-coated paper is soaked in H_2O , dusted with the color in powder form, sensitized with dichromate, exposed under the negative and developed either in soapy H_2O or in sawdust and H_2O . A positive in colored relief is thus produced. In making reproductions of positives, the gelatin coated paper is first sensitized with dichromate, then exposed under the positive allowed to swell in warm H_2O to produce relief and finally dusted with the powder, which is wiped off with a wad of cotton. The color is taken up more strongly by the less exposed portions, producing a direct positive. M. W. SEYMOUR

Emulsion color photography. W. EISSFELDT. *Phot. Ind.* 23, 1330-1(1925).—E. discusses the advantages and also the difficulties of his method of color photography according to which the color is produced after development by the oxidation of leuco dye bases with which the Ag halide grains have been treated. The method consists in separately sensitizing each third of a AgBr emulsion to one part of the spectrum, then, by a procedure not disclosed, bringing about the attachment to each of the leuco bases of a dye of the complementary color, mixing, washing, exposing, developing and fixing. The Ag of the image is then replaced by $\text{Cu}_2\text{Fe}(\text{CN})_6$, whereupon, after washing, the leuco bases become oxidized. AgBr when color sensitized retains its blue sensitivity

To overcome this serious disadvantage E. hopes that a substance may be found which will desensitize specifically for blue. A. P. H. TRIVELLI

Halation and halation prevention. J. RHEDEN. *Phot. Rund.* 63, 69-78(1926).—Halation may be caused either by reflection or diffusion or by both. The effect may be hindered to a large extent by using a red colored layer between the glass and the emulsion for ordinary or orthochromatic plates or a brown MnO_2 layer for panchromatic, which entirely prevents halation; by using a less sensitive $AgCl-AgBr$ emulsion between the glass and regular emulsion or by backing the plate with a suitable dark colored material which does not reflect the light and is removed in the developer or the fixing bath. Methods for measuring anti-halation properties are described and a table comparing the halation obtained with 48 varieties of plates and films is given. V. MOYES

Fogging action of hydrogen peroxide. W. CLARK. *Phot. J.* 66, 78-84(1926).—Single layer plates used in this research are liable to fog from handling in prepn. H_2O_2 action resembles that of light and accidental fog must be minimized. H_2O_2 may act directly or by way of chemiluminescence. In the latter case agents which engender decompn. of the soln. should increase fog, whereas fog is greatest in soln. stabilized by acid. C. investigates the fog given by H_2O_2 in the presence of catalase from potatoes, the decreased quantity deciding against the chemiluminescence theory. While the true mechanism still remains obscure previous suggestions concerning the interaction of H_2O_2 and a "hydroxide body" are found untenable. K. C. D. HICKMAN

Development with leuco bases. LÜPPO-CRAMER. *Phot. Ind* 23, 1329-30(1926).—L.-C. discusses E. O. Langer's expt. on the development of Ag halide emulsions with the leuco bases of phenosafranine, pinakryptol green and methylene blue. He points out that similar developing power with the leuco bases of malachite green, fuchsin and indigo had been described by Abribat. Neither Lumière and Seyewetz, nor L.-C. succeeded in observing any developing action by any leuco base, provided that the latter was free from impurities such as hyposulfite or $FeSO_4$. A. P. H. TRIVELLI

Investigations on the effect of desensitizers on sensitized plates. H. STAMM-REICH AND H. THÜRING. *Z. wiss. Phot.* 23, 363(1925).—S. and T. have examd. the action of 9 desensitizing dyes on ordinary (non-color sensitive), orthochromatic (erythrosin and pinaflavol bathed), and panchromatic (ethyl red and dicyanin bathed) plates. In all cases the greatest desensitizing action occurs in the ultra-violet and blue, and for each kind of plate tetramethylsafranine and Nile blue 2B are the most effective. Compared with the ordinary and orthochromatic, the panchromatic plates require the use of appreciably more concd. soln. of the desensitizing dyes. The dyes, methyl green, crystal violet, Nile blue, phenosafranine and others which desensitize ordinary plates, may, in certain concn. as Lüpbo-Cramer has observed for phenosafranine, actually increase the color sensitivity of orthochromatic or panchromatic plates. C. E. K. M.

Opalescence in spirit-dried negatives. J. I. CRABTREE. *Brit. J. Phot.* 72, 723(1925).—The opalescence frequently produced in negatives when dried with alc. has been attributed to various causes, including the use of alc. contg. rosin or naphtha, insufficient fixing or washing of the emulsion, the presence of Ca salts in the wash H_2O , etc. These factors may influence the amt. of opalescence produced but they are not the only detg. factors, since it is possible to obtain severe opalescence by immersing a film of plain gelatin free from lime in pure grain alc. and drying at $95^\circ F$. The amt. of opalescence produced is greater the more rapid the drying and the higher the temp. of drying; but, even if the film is insufficiently fixed and washed, opalescence rarely occurs if drying is conducted at $70^\circ F$. The opalescence is apparently due to a change of the gelatin by the alc. to a dehydrated modification which is also produced by adding alc. to a soln. of gelatin in warm H_2O . Hard gelatin is more readily pptd. than soft gelatin. J. I. CRABTREE

Imbibition printing. II. E. J. WALL. *Am. Phot.* 19, 668-76(1925); cf. C. A. 20, 154.—W. considers the character of the paper surface and the dyes best suited for imbibition printing. Directions are given for making the final transfer of the dyed image to the paper support. G. E. MATTHEWS

Desilverization of fixing baths. A. STEIGMANN. *Filmtechnik* 1, 316-7(1925); cf. C. A. 19, 1543.—Modification of the original hyposulfite method of Ag recovery of S. It is not necessary to make the recovery bath alk., and 5-6 g. of $Na_2S_2O_4$ with an equal wt. of anhyd. Na_2SO_3 are used for each l. of exhausted fixing bath. The value of the "hypo" recovered is greater than that of the $Na_2S_2O_4$ used. The use of a FeS gel is discussed as a Ag recovery material. J. F. ROSS

Electrically deflagrated mercury filament as a flash light for instantaneous photography. K. SUYEHIO. *Nagaoka Anniversary Volume, Tokyo 1925*, 23-7.—Elec-

trically deflagrated wires give flashes of long duration compared with those from Hg threads in narrow capillary tubes. The max. flash intensity resulted from 80 v. impressed on a 10 mm. filament of 0.324 mm. diam. The flash lasted less than $\frac{1}{1000}$ sec.
K. C. D. HICKMAN

Photomechanical printing surfaces. L. PEPE and D. DENAGY, Brit. 236,621, April 4, 1924. A coating which is sensitized with chromate comprises a hyaline gelatinous neutral soln. of lactic casein, legumin, gluten, fibrin or a combination of these substances prepd. in purified form. Details of purification and other treatment are given.

Polychromatic "security" print. R. LAMP'LE, U. S. 1,573,006, Feb. 16. Adjoining designs are printed in distinctive colors such as aniline green and aniline blue which produce about the same degree of blackness of the negative when they are photographed with and without color filters.

Photographic transfer processes for ornamenting sheet metal, stone, etc., in imitation of natural wood grain or other designs. L. G. NICOLL, Brit. 236,714 and 236,715, June 17, 1924.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

An electrometric and a phase rule study of some basic salts of copper. H. T. S. BRITTON, *J. Chem. Soc.* 127, 2796-2807 (1925).—Of the many basic sulfates and chlorides of Cu which have been reported, only 1 definite sulfate and 1 definite chloride exist at 25°, namely, $4\text{CuO} \cdot \text{H}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$ and $4\text{CuO} \cdot 2\text{HCl} \cdot 3\text{H}_2\text{O}$. Similar nitrate and bromide compds. are produced by pptn. with alkali under similar conditions, $4\text{CuO} \cdot 2\text{HNO}_3 \cdot 2\text{H}_2\text{O}$ and $4\text{CuO} \cdot 2\text{HBr} \cdot 2(?)\text{H}_2\text{O}$. The similarity in compn., form, color and the fact that they are pptd. from soln. at about $[\text{H}^+] = 10^{-8.6}$ seems to be due to an intrinsic property of either the Cu atom or the CuO mol. The constitution of these basic salts is discussed with reference to Werner's coördination theory. According to the manner of mixing and the quantity of alkali used, either apparently amorphous or gelatinous ppts. may be obtained by adding alkali to a soln. of CuSO_4 , CuCl_2 or CuBr_2 . Observations were made on the darkening of suspensions of basic Cu salts on boiling. The behavior of the $\text{Cu}|\text{Cu}(\text{OH})_2, \text{NaOH}$ electrode is erratic and the value of Jellinek and Gordon (*C. A.* 19, 1520) for $[\text{Cu}^{++}][\text{OH}^-]_2$ is untrustworthy. R. H. LOMBARD

The bromination of zinc in the presence of various organic solvents. A. RAYNAUD, *Compt. rend.* 181, 1069-71 (1925).—In continuation of expts. on the action of Br on metals in various liquids (cf. *C. A.* 8, 1712, 3288, 3437; 9, 787; 14, 2767) Zn and Br were kept in contact for 3 months at room temp. alone and in the presence of H_2O , Et_2O , C_6H_6 , CCl_4 , octane and petr.-ether. Only with H_2O and Et_2O did the Zn and Br react. With insufficient H_2O or Et_2O , the reaction ceased before completion, indicating in accordance with the view of Gautier and Charpy (*Compt. rend.* 113, 597 (1891)), that in the presence of Zn the H_2O or Et_2O is decompd. by the Br and that the ZnO is then transformed to ZnBr_2 by the HBr. With Et_2O , a viscous liquid was obtained which did not fume in the air and which decompd. above 110° with liberation of Et_2O . Likewise pure ZnBr_2 on digestion with Et_2O (the soly. of ZnBr_2 in Et_2O being about 45%) gave a similar liquid, which, however, on drying crystd. to white, deliquescent plates. In both cases analysis showed the product to be the compd. $\text{ZnBr}_2 \cdot \text{Et}_2\text{O}$. The results indicate that a solvent promotes the reaction of a metal and a halogen only when it dissolves both Br and the bromide formed and also forms an addn. product with the bromide. Also in *Bull. soc. chim.* 39, 195-201 (1926). C. C. DAVIS

A polarimetric study on organic and inorganic dimolybdomalates. An application of Oudemans' law. E. DARMOIS and P. GABIANO, *Compt. rend.* 182, 269-71 (1926). Previous investigations have shown that molybdic and malic acids are capable of formation of a complex anion. The Na and NH_4 salts have the formula $4\text{MoO}_3 \cdot 2\text{C}_4\text{H}_6\text{O}_6\text{M}_2 \cdot x\text{H}_2\text{O}$ (M being the alkali metal). Additional compds. were prepd. of Li, K, Ca, Ba, Cu, Ni, MeNH_2 , PhNH_2 , Et_3NH and *p*-toluidine. They contain varying amts. of water of crystn. The investigation of the rotatory power confirmed the law of Oudemans (constancy of mol. rotation). The polarization is due to the anion $[4\text{MoO}_3 \cdot 2\text{C}_4\text{H}_6\text{O}_6]^{IV}$. Similar conditions were found with the rotatory dispersion. EMIL KLARMANN

Complex molybdates with organic bases. CLARA DI CAPUA, *Gazz. chim. ital.* 55, 909-16 (1925).—It is known that in many cases it is possible to obtain in the form of complexes types of salts not stable in the simple form (Parravano, *Pasta, Gazz.* 37,

II, 252(1907)). Molybdates of bivalent metals with org. bases were prepd. in this way. On mixing a 0.5 *N* soln. of NH_4 molybdate with $\text{Co}(\text{NO}_3)_2$ and the calcd. amt. of $\text{C}_6\text{H}_5\text{N}$ a peach-red *cobalt pyridine molybdate*, $\text{MoO}_3 \cdot \text{CoO} \cdot 4\text{C}_6\text{H}_5\text{N}$, was pptd.; on washing this with EtOH and Et_2O it became a violet compd. $\text{MoO}_3 \cdot \text{CoO} \cdot 2\text{C}_6\text{H}_5\text{N} \cdot 2\text{H}_2\text{O}$; washed with $\text{C}_6\text{H}_5\text{N}$ and dried in the air it became $\text{MoO}_3 \cdot \text{CoO} \cdot \text{C}_6\text{H}_5\text{N} \cdot 2\text{H}_2\text{O}$; if washed with EtOH and Et_2O and dried in the desiccator it became $\text{MoO}_3 \cdot \text{CoO} \cdot 1.5\text{C}_6\text{H}_5\text{N}$. Thus from the original salt 3 others were derived. A similar mixt. treated with urotropine (Ur) gave a ppt. which was sol. in excess Ur. From this soln. a violet *cobalt urotropine molybdate*, $\text{MoO}_3 \cdot \text{CoO} \cdot \text{Ur} \cdot 2\text{H}_2\text{O}$, was sepd. which was washed with EtOH and Et_2O and dried in air. If the above soln. was kept at 0° a dark red easily sol. salt, $5\text{MoO}_3 \cdot 2\text{CoO} \cdot 2\text{Ur} \cdot 12\text{H}_2\text{O}$, sepd. which washed with EtOH and Et_2O gave $3\text{MoO}_3 \cdot \text{CoO} \cdot \text{Ur} \cdot 6\text{H}_2\text{O}$ (I); from the mother liquors a red salt, $5\text{MoO}_3 \cdot 2\text{CoO} \cdot 2\text{Ur} \cdot 12\text{H}_2\text{O}$ (II), sepd. which when washed with EtOH and Et_2O gave $3\text{MoO}_3 \cdot \text{CoO} \cdot \text{Ur} \cdot 6\text{H}_2\text{O}$. If the mixt. was prepd. at 25° a red ppt. sepd. which washed with EtOH and Et_2O and dried in the air gave $6\text{MoO}_3 \cdot 3\text{CoO} \cdot 2\text{Ur} \cdot 12\text{H}_2\text{O}$; from the mother liquors II was obtained and this on washing with EtOH and Et_2O gave $3\text{MoO}_3 \cdot \text{CoO} \cdot \text{Ur} \cdot 9\text{H}_2\text{O}$, a modification of I. A mixt. of 0.5 *N* Co and 2 *N* guanidine molybdate solns. at $35-40^\circ$ pptd. $12\text{MoO}_3 \cdot 12\text{CoO} \cdot \text{Gu} \cdot 22\text{H}_2\text{O}$ (Gu = guanidine). With twice as much Gu molybdate at $25-30^\circ$ $7\text{MoO}_3 \cdot 7\text{CoO} \cdot 2\text{Gu} \cdot 18\text{H}_2\text{O}$ sepd. From the mother liquors crimson red $2\text{MoO}_3 \cdot \text{CoO} \cdot 2\text{Gu} \cdot 4\text{H}_2\text{O}$ sepd. An excess of $\text{C}_6\text{H}_5\text{N}$ added to a soln. of NiCO_3 and MoO_3 at $15-20^\circ$ gave a pale blue salt, $\text{MoO}_3 \cdot \text{NiO} \cdot 5\text{C}_6\text{H}_5\text{N} \cdot \text{H}_2\text{O}$. Ur and Ni molybdate solns. did not crystallize at 0° ; at 15° a pale blue salt $8\text{MoO}_3 \cdot 3\text{NiO} \cdot 2\text{Ur} \cdot 36\text{H}_2\text{O}$ (III) sepd.; from the mother liquors a turquoise blue salt $8\text{MoO}_3 \cdot 2\text{NiO} \cdot 3\text{Ur} \cdot 16\text{H}_2\text{O}$ sepd. III is quite sol. in excess of Ni salt as well as in excess of Ur; from both solns. apple green $6\text{MoO}_3 \cdot 3\text{NiO} \cdot 2\text{Ur} \cdot 16\text{H}_2\text{O}$ sepd. Ni molybdate solns. with excess Gu molybdate sepd. $6\text{MoO}_3 \cdot \text{NiO} \cdot 5\text{Gu} \cdot 12\text{H}_2\text{O}$. MgCO_3 was dissolved in the calcd. amt. of MoO_3 and on treating with Ur sepd. $\text{MoO}_3 \cdot \text{MgO} \cdot \text{Ur} \cdot 10\text{H}_2\text{O}$. A similar soln. treated with $\text{C}_6\text{H}_5\text{N}$ gave $\text{MoO}_3 \cdot \text{MgO} \cdot 7\text{H}_2\text{O}$. When a 14% Ur soln. is added to a mixt. of MnSO_4 and $(\text{NH}_4)_3\text{MoO}_4$ a yellow powder, $3\text{MoO}_3 \cdot 2\text{MnO} \cdot \text{Ur} \cdot 5\text{H}_2\text{O}$, is pptd. A satd. soln. of Gu_3MoO_4 with 2 *N* MnSO_4 pptd. yellow $12\text{MoO}_3 \cdot 12\text{MnO} \cdot \text{Gu} \cdot 18\text{H}_2\text{O}$. Gu almost always gives products of complex compn.

L. J. WITZEMANN

Heavy metal vanadates and their ammoniates. EPHRAIM FRITZ AND GOTTFRIED BECK. *Helvetica Chim. Acta* 9, 38-51(1926).—Alkali-free vanadates of Ni, Co, Cu, Zn, Cd, Mn and Be were prepd. by the addn. of the metal sulfate to an acid Ba vanadate. BaSO_4 pptd. out, leaving the acid heavy metal vanadate in soln. This latter was crystd. out by concn. of the soln. or by addn. of alc. The compn. of the salts is $2\text{MeO} \cdot 3\text{V}_2\text{O}_5 \cdot 12$ or $15\text{H}_2\text{O}$. They lose their water of crystn. at 220° . When exposed to NH_3 for periods of several days, these compds. take up 6 mols. of NH_3 for each heavy metal atom. Digestion in liquid NH_3 increases the velocity of NH_3 absorption. The color changes are those observed in the formation of other hexammines, consequently true compd. formation and not adsorption is supposed to take place. The following compds. were also prepd.: $3\text{PbO} \cdot 2\text{V}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$; $2\text{CuO} \cdot 5\text{V}_2\text{O}_5 \cdot 5\text{H}_2\text{O}$; $3\text{SrO} \cdot 2\text{V}_2\text{O}_5 \cdot 2\text{H}_2\text{O}$.

R. J. HAVIGHURST

Silicon-nitrogen compounds with bridging silicon. ROBERT SCHWARZ AND WALTER SEYAUER. *Ber.* 59B, 333-7(1926).—It has been reported by Besson (cf. *Compt. rend.* 110, 518(1890)) that Si_2Cl_6 forms an additive compd. with NH_3 having the formula $\text{Si}_2\text{Cl}_6 \cdot 10\text{NH}_3$. This finding could not be corroborated by S. and S., who observed a replacement of all Cl atoms by NH_3 . The reaction was carried out with liquid NH_3 . The compd. obtained represents a polymerization product of a *bisaminoiminosilane*, $(\text{Si}(\text{NH})(\text{NH}_2))_2$. At -10° NH_3 is split off and a polymeric product of *triminodisilane*, $\text{HN} \cdot \text{Si}(\text{Si}(\text{NH})\text{NH}_2) \cdot \text{NH}$, results. Both compds. are violently decompd. by air and hu-

midity with production of NH_3 . Water and alkali solns. produce H, the amt. of which directly depends upon the amt. of Si in the "bridge." Si_2Cl_6 reacts with PhMgBr , forming a mixt. of monosilane derivs. The fraction b₁₇ 166° was identified as *diphenyldichloromonosilane*.

EMIL KLARMANN

Hydronitric acid as product of desolvation of ammononitric, hydrazonitrous and ammonohydrazonitrous acids. Experimental formation of sodium trinitride by ammonolysis of sodium nitrate with sodium amide. A. W. BROWNE AND FRANK WILCOXON. *J. Am. Chem. Soc.* 48, 682-90(1926).—Hydronitric acid may be regarded not only as ammononitric acid, but also as hydrazonitrous or as ammonohydrazonitrous acid. NaNO_3 undergoes ammonolysis in contact with fused NaNH_2 , with formation of NaN_3 . At 175° , a yield as high as 65.7% has been obtained on the basis of the equation: $\text{NaNO}_3 + 3\text{NaNH}_2 = \text{NaN}_3 + 3\text{NaOH} + \text{NH}_3$.

R. J. HAVIGHURST

The reaction of boric acid on alkaline carbonates in solutions. B. L. VANZETTI *Gazz. chim. ital.* **55**, 939-44(1925).—In a previous paper (*C. A.* **19**, 2461) the slow decomposition of alk. carbonates by hot solns. of a weak acid like H_3AsO_3 was described. The expts. were repeated with H_3BO_3 and partly with H_2AsO_3 . In a 150-cc. flask a dil. soln. of Na_2CO_3 was treated with the calcd. amt. of As_2O_3 and heated to boiling, while H_2 was passed in at the rate of ≈ 60 bubbles per min. The H_2O vapor was refluxed into the flask, the gas was dried and the CO_2 absorbed and weighed. The absorption app. was changed rapidly at stated intervals. In this way the rate of CO_2 evolution was detd. The data with H_3AsO_3 confirmed the earlier results. Four series of expts. were done with H_3BO_3 . The decompn. of the carbonate is continuous in this case as with H_3AsO_3 and becomes practically complete. The fact that the process is absolutely continuous shows that the series of equil. during the decompn. is uninterrupted in the sense that there are no special conditions for the stable formation of any definite compd. in soln. H_3AsO_4 , H_3PO_3 , H_3PO_4 , H_2SeO_3 , H_2TeO_3 and H_2FeO_4 are to be investigated in a similar manner.

E. J. WITZEMANN

Production of arsenic subsulfide. Reduction of certain arsenic compounds by sodium hyposulfite. WALTER FARMER and J. B. FIRTH. *J. Chem. Soc.* **1926**, 119-25. When As compds. are reduced with $\text{Na}_2\text{S}_2\text{O}_4$ one product is As_2S_3 , contg. 12.7% S, insol. in colorless NH_4SH . In moderately acid solns. arsenious compds. yield ppts. of As_2S_3 but arsenic compds. yield ppts. approx. $\text{As}_2\text{S}_3 \cdot \text{As}_2\text{S}_5$ in compn., and only half as much As_2S_3 is pptd. Increase in acid concn. increases the amt. of As_2S_3 pptd. In alk. soln. pptn. takes place at the b. p. of the mixed solns. Compds. contg. 4-11% S were prepd. Arsenates give practically no ppt. The subsulfide is probably formed by the interaction of the arsenious compd. and the hyposulfite, whereas As_2S_3 is formed from $\text{Na}_2\text{S}_2\text{O}_4$ itself a decompn. product of the hyposulfite. This explains the formation in acid soln. of As_2S_3 . In no case is all the As pptd., the max. being 99.24% with 10 g. of hyposulfite for 1 g. of As_2S_3 and only 57.25% from arsenic solns.

M. O. LAMAR

Action of hydrogen fluoride on compounds of selenium and tellurium. I. Selenium dioxide. E. B. R. PRIDEAUX and J. O'N. MILLOTT. *J. Chem. Soc.* **1926**, 167-74.—When HF is passed over SeO_2 contained in a Pt bottle with inlet and outlet rapid absorption of HF takes place, the temp. increases and the SeO_2 liquefies. As much as 75% by wt. of the product may be HF. The colorless liquid fumes strongly but the fumes contain only HF. Cu is rapidly attacked but glass only slowly if H_2O is absent. Evapd. *in vacuo* over dehydrating agents a sirup is formed. From the colorless liquid, $\text{SeO}_2 \cdot 5\text{HF}$ may be sepd. by freezing or by distn. Metzner (*Ann. chim. phys.* **15**, (1898)) has prepd. analogous Te compds., using aq. HF. An oxyfluoride is unlikely on account of the order of the affinities of F and O for H.

M. O. LAMAR

Pyridine ferriformates. R. WEINLAND and LUDWIG ENGEL. *Arch. Pharm.* **264**, 33-45(1926).—The following complex derivs. were prepd. and characterized: Addn. of a cooled mixt. of $\text{C}_6\text{H}_5\text{N}$ (4.0) and 90% CH_2O_2 (5.1) to an aq. soln. of FeCl_3 (2.7 g. $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ in 10 cc. of H_2O) yields brown-red crusts, $\text{Fe}_3(\text{CHO}_2)_6(\text{OH})\text{Pyr}$ + $2\text{H}_2\text{O}$, by other very definite procedures the compds. $\text{Fe}_4(\text{CHO}_2)_6(\text{OH})_4\text{Cl}_2\text{Pyr}_6$, grayish green unstable, smelling persistently of $\text{C}_6\text{H}_5\text{N}$; $\text{Fe}_8(\text{CHO}_2)_{16}(\text{OH})_8(\text{ClO}_4)_3\text{Pyr}_{10}$, black in reflected yellowish green in transmitted light, stable; the similar Bz compd. $\text{Fe}_8(\text{BzO})_{16}(\text{OH})_8(\text{ClO}_4)_3\text{Pyr}_{12}$, grayish green powder, $\text{Fe}_6(\text{BzO})_{12}(\text{OH})_6(\text{ClO}_4)_2\text{Pyr}_4$; $\text{Fe}_3(\text{BzO})_6(\text{OH})_3(\text{CNS})\text{Pyr}$, orange-red powder; $\text{Fe}(\text{CHO}_2)_2\text{Cl} \cdot \text{H}_2\text{O}$, yellowish green powder, $\text{Fe}(\text{CHO}_2)_2\text{Br} \cdot \text{H}_2\text{O}$, brownish red powder. Constitutional formulas are presented.

W. O. E.

Observations on the ferro- and ferricyanides. N. TARUGI. *Gazz. chim. ital.* **55**, 951-75(1925).—Baudisch and Bass (*C. A.* **16**, 4137) considered the constitution of ferro- and ferricyanides which T. dealt with many years ago (*IV Congr. Intern. di Chim. Appl.* **1906**, 116). T. reviews the question of the constitution of Prussian and Turnbull's blue. Preps. of the former were obtained by treating $\text{K}_3\text{Fe}(\text{CN})_6$ with an excess of pure FeSO_4 . The product was washed with H_2O to eliminate sulfate and dried in an oven to const. wt. From numerous analytical data obtained with such preps. and without reference to any theoretical point of view, it was found in all the blues examd. that a percentage of O is present that cannot be attributed to analytical error. This result was confirmed in various ways and with analytical procedures of abs. exactness and with reciprocal control. These results make it probable that none of the blues that arises from ferrocyanide and Fe^{+++} salts or from ferricyanides and Fe^{++} salts is derived from the hypothetical acids of B. and other authors.

E. J. WITZEMANN

The action of hydrogen sulfide on a neutral solution of potassium permanganate. H. B. DUNNICLIFF and S. D. NIJHAWAN. *J. Chem. Soc.* **1926**, 1-7.—If H_2S is passed into a soln. of KMnO_4 the products formed are colloidal hydrated MnO_2 (which later

coagulates), S, K_2SO_4 and $K_2S_2O_8$. An excess of H_2S leads to the pptn. of MnS . At the same time $K_2S_2O_8$ is changed to K_2SO_4 and S is pptd. Not all the S is pptd. at once, that in colloidal soln. seps. only on standing. M. O. LAMAR

Action of phosgene on beryllium oxide. Preparation of beryllium chloride. C. MATIGNON AND J. CATHALA. *Compt. rend.* **181**, 1066–8 (1925).— $COCl_2$ is a particularly valuable agent for prepg. volatile chlorides from oxides and is preferable to S_2Cl_2 (cf. M. and Bourion, *Ann. chim.* **5**, 127 (1905)) under such conditions. With BeO the yield increases both with increase of temp. and with increase in the velocity (pressure) of the current of $COCl_2$. The reaction becomes appreciable at about 350° and is fairly rapid at 1000° . In doubling the rate of the $COCl_2$ current, the rate of the reaction is increased to a degree depending upon the temp., but which is roughly 1.5 times. The results indicate that in the prepn. of chlorides by this new method, as high a temp. as practicable should be chosen. C. C. DAVIS

The action of sodium hypophosphite on stannic chloride. A. TERNI AND C. PADOVANI. *Atti accad. Lincei* [6], **2**, 501–5 (1925).— H_3PO_2 and alk. hypophosphites react with solns. of heavy metal salts in 3 ways: (1) Reduction of salts of max. soly. to salts of min. soly., e. g., $CuCl_2$ and $HgCl_2$ to $CuCl$ and $HgCl$, resp. The reduction may go further to the formation of the free metal. (2) Reduction to the free metal may take place directly as with Bi, Sb and Au salts or through intermediate compds. as Cu hydride and Ag hypophosphite which when slightly heated sep. the metal. (3) The formation of a stable and insol. hypophosphite, which is sometimes sol. when heated as in the case of Pb. T. and P. studied the action of alk. hypophosphites on $SnCl_4$. When dil. solns. were used no visible action occurred. With concd. solns. of hypophosphite and with pure $SnCl_4$ or dild. with an equal vol. of H_2O a white ppt. of a complex (I) $SnCl_4 \cdot Sn(H_2PO_2)_4 \cdot 3H_2O$ is formed which was washed with $EtOH$ and Et_2O . I is completely insol. in common solvents; it is sol. in cold HCl but only in hot H_2SO_4 . Washed with H_2O it hydrolyzes and may lose all Cl without, however, giving a product of const. compn. I is decompd. by HNO_3 , giving metastannic acid. It is easily sol. in alk. sulfides and in solns. of $(NH_4)_2C_2O_4$. I has the reducing properties of a hypophosphite. I is easily dehydrated at 140° , but at 100° only 1 mol. H_2O is lost. At 190° I decomp. with the evolution of PH_3 . In the decompn. by heat the mass becomes red. If heating is interrupted at this time and the mass taken up with concd. HCl a red substance is sep'd., which was filtered off, washed with abs. $EtOH$ and dried *in vacuo* over H_2SO_4 . This compd. having extraordinarily strong reducing power for metallic salts reacts with great avidity with H_2O_2 . It gives PH_3 with alkalis. In HNO_3 it is ignited with a bright flame. It contains 88.57% P and in all its properties corresponds to P_4O . E. J. WITZEMANN

Purification of phosphoric oxide. G. I. FINCH AND R. P. FRASER. *J. Chem. Soc.* **129**, 117–9 (1926).—A 36×2 -in. inclined Fe pipe with a 2.25-in. opening 12 in. from the upper end, to which is attached a 2-in. rounded delivery elbow, comprises the app. in which the sublimation is carried out. A current of O at the rate of 3 l. per min. is maintained through the tube. The charges of P_2O_5 are introduced into the bright-red-hot tube by removing the cap-cover of the 2.25-in. opening. The P_2O_5 rapidly sublimates and is caught in a wide-mouth glass bottle closely fitted to the receiver end. The app. produces 500 g. per hr. of P_2O_5 5 times as bulky as ordinary P_2O_5 . M. O. LAMAR

Studies in the chemistry of hydrogen. II. The systematization of the solid metal-hydrogen compounds. G. F. HÜTTIG. *Z. angew. Chem.* **39**, 67–75 (1926); cf. *C. A.* **19**, 2593.—H may be combined as electropositive, as metallic and as electronegative H. The H compds. of the elements vary in their general characteristics depending on the position of the element in the periodic table. The groups contg. the elements related to C, N, O and F form stable gaseous hydrides of definite chem. compn. This tendency of H to behave as an electropositive element reaches its max. in the halogen group. With most of the metals, such as Al, Mg, Cr, Mn, Fe and the related elements, H forms metallic hydrides which have the characteristics of alloys or solid solns. This tendency of H to function as a metal reaches its max. in the elements of the Ni-Pd-Pt groups, particularly Pd. These combinations do not have a definite chem. compn. but vary continuously. From extensive studies of the equil. pressure of H in such systems there are many conflicting data. It appears that the atoms of H have no definite location with reference to the space-lattice of the metal but that they move freely within the lattice. The compds. of H with the alkali metals partake more of the nature of salts, where H functions as an electronegative element. This characteristic reacifies its max. in the compd. with Li. These compds. again may have definite compns. corresponding to the ordinary stoichiometrical relations, though they sometimes deviate. The more important generalizations are: (1) The affinity of an element for H is less,

the further removed the element is from the column of max. H affinity. (2) The relations expressed by stoichiometric formulas correspond to ideal limiting cases. The metallic compds., and to some extent the salt-like compds., differ from the ideal to a measurable extent, so that in the former case stoichiometric relationships are almost unknown. (3) If, in a H compd., the atoms of one component have great mobility and the atoms of the other component slight mobility, such a system approaches the limiting case where the atoms of the one move within the atoms of the other in a manner corresponding to the osmotic diffusion law. The quantity of the freely moving atoms may vary within definite limits. (4) Between the different methods of combination of H, there is an equil. so that the different types gradually merge into one another. There is an extensive bibliography.

A. W. KENNEY

Meetings of the international nomenclature committees (PATTERSON) 2.

BÖRSEKEN, J. and MANERI, A. G. VAN: **Beknopt leerboek der scheikunde voor gymnasia, lycea en h. b. s. Part II. Scheikunde der metalen en organische scheikunde.** Groningen: J. B. Wolters. Guld. 1.90, bound 2.25.

HOLLEMAN, A. F.: **Leerboek der chemie. Part I. Leerboek der anorganischen chemie.** 8th ed. revised, with the cooperation of E. H. Buchner. Groningen: J. B. Wolters. 586 pp. Guld. 12.50.

RASMUSSEN, HANS and SIMONSEN, KRISTEN: **Uorganisk Kemi for Mellemkolen.** 9th ed. Copenhagen: Gyldendal. 40 pp. Kr. 1.50.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

A new method for the electrolytic separation of metals. D. J. BROWN. *J. Am. Chem. Soc.* **48**, 582-3 (1926).—A series of expts. with solns. contg. Cu, Bi, Sb or Sn indicates that it is possible to substitute a wire of the metal that is being deposited for the auxiliary electrode used by Sand in sepsns. in which the cathode e. m. f. is controlled

W. T. H

Radiometric microanalysis. RUDOLF EHRENBURG. *Biochem. Z.* **164**, 183-90 (1925).—Methods are discussed for detg. Ca, P, NH₃ and S by means of an electroscope and Th B.

S. MORGULIS

Some rules with respect to the use of normal solutions prepared from "fixanal" substances. W. BÖTTGER. *Oesterr. Chem.-Ztg.* **29**, 4-6 (1926).—Since the caustic alkali used in "fixanal" tubes is not absolutely free from carbonate, the titer is not exactly the same against phenolphthalein as against methyl orange. In diluting, moreover, CO₂-free water should be used and on standing the NaOH attacks glass so that the titer changes. Since ordinary distd. water contains substances that reduce KMnO₄, only water that has been distd. with KMnO₄ should be used in KMnO₄ work. In short, unless great care is taken in the use of "fixanal" standards, the same effects will be produced that occurred before "fixanal" tubes were used and to overcome which was one of the advantages claimed for these standards.

W. T. H

The potentiometric standardization of titanium trichloride solutions. I. AL KOLTHOFF, O. TOMÍČEK and CONMAR ROBINSON. *Z. anorg. allgem. Chem.* **150**, 157-62 (1926); cf. *C. A.* **19**, 449. —K₂Cr₂O₇ is very suitable for standardizing TiCl₃ solns. but when near the end point it is advisable to add a little CuSO₄ to accelerate the reaction. The standardization of TiCl₃ against Cu⁺⁺ is not satisfactory as the e. m. f. jump at the end point is not very marked and the titer obtained is always a bit low. In the presence of thiocyanate ions, the results are better in both respects but even then CuSO₄ is not entirely satisfactory as a standard.

W. T. H

A new indicator principle in acidimetry and alkalimetry. Turbidity indicators. KARL NAEGELI. *Kolloidchem. Beihefte* **21**, 305-411 (1926).—Certain very weak organic acids are quite insol. in water but dissolve readily in dil. alkalies. When acid is added to the alk. soln. of the salt, a turbidity results at a definite concn. of the H ion. It is, therefore, possible to use such substances as indicators in acidimetry and alkalimetry and in some respects the results are better than with the ordinary indicators. In this thesis the theory governing the use of org. colloids as indicators is discussed in great detail and a bibliography of over 250 papers is appended. Particular attention is paid to the titration of substances of very low acidity such as boric acid, arsenious acid, phenol, *p*-chlorophenol, glycine, asparagine, veronal, alanine, leucine and tyrosine where the end point is in the neighborhood of $p_H = 11$ and many of the results obtained were

remarkably good. Six substances are mentioned as possible indicators of this type but the work described was done almost entirely with isonitrosoacetyl-*p*-aminoazobenzene and isonitrosoacetyl-*p*-toluenazo-*p*-toluidine. The results obtained in these indicators are altogether reproducible. The effects of practically all substances or conditions likely to cause trouble were carefully studied. The colloidal-chemical properties of the ppts. were studied, with the surprising result that they were found to be cryst. in nearly every case.

W. T. H.

The equilibrium between metal chloride, hydrogen sulfide, metal sulfide and hydrochloric acid and separations based upon it. Experiments with cadmium, bismuth and lead. W. MANCHOT, G. GRASSI AND A. SCHNEEBERGER. *Z. anal. Chem.* 67, 177-95 (1925).—Contrary to what might be expected from the title of this paper, no attention is paid to the mass-action law, soly.-products, or permissible use of significant figures. H_2S was introduced into 110 cc. of solns. contg. 0.223 g. of Cd with varying amts. of HCl until there was no indication of further pptn. Sometimes the CdS did not begin to form until after 5 days and sometimes 16 days was required to complete the pptn. It was found that a soln. contg. 10 g. HCl in 100 cc. would not give a ppt. of CdS when satd. with H_2S but one contg. 5 g. HCl would give complete pptn. Between these limits lies a field in which the pptn. is incomplete. If a soln. of $HgCl_2$ and $CdCl_2$ contg. 19 g. HCl per 100 cc. is satd. with H_2S , all the Hg will be pptd. and no Cd, provided the ppt. is washed with acid of the same concn. If 100 cc. of soln. contg. $SbCl_3$, $CdCl_2$ and 8 g. of HCl is satd. with HCl at the temp. of a boiling water bath, then dild. with 100 cc. of water and again satd. with the gas, all of the Sb is pptd. in about 40 min. and no Cd. In the case of Bi, all of 0.6 g. Bi in 100 cc. is pptd. when as much as 14 g. of HCl is present and none if 16 g. HCl. On the basis of this result, it is clear that the region of partial pptn. is much narrower than in the case of Cd and it is much more difficult to keep the Bi in soln. If, however, a soln. contg. about 0.1 g. of Bi and Hg in the presence of 18 g. HCl is dild. to 100 cc. and satd. with H_2S , all the Hg is pptd. and the HgS can be washed free from Bi with acid of the same concn. Pb can be sepd. from Hg in the same way as Cd from Hg. No attention is paid to the effects caused by other anions and cations in soln.

W. T. H.

Volumetric determination of iron in hydrochloric acid solution. W. MANCHOT AND F. OBERHAUSER. *Z. anal. Chem.* 67, 196-7 (1925).—To the Fe soln. reduced to the ferrous condition by H_2SO_4 , electrolytic Cd, or otherwise, add about 1 g. of KF and 20 cc. of 15% HCl or H_2SO_4 . Add a measured excess of 0.1 N Br in N KBr and after 2 min. add a slight excess of standard arsenite soln. and titrate this last excess with Br soln. Instead of KF, enough H_3PO_4 can be added to make the soln. contain 2-10% of this acid. Instead of the Br soln. a standard soln. of $KBrO_3$ can be used, it being then necessary to add about 2 g. KBr to the soln.

W. T. H.

The accurate determination of ferrous iron in insoluble silicates. O. HACKL. *Z. anal. Chem.* 67, 197-204 (1925); cf. C. A. 19, 3073.—Owing to the difficulty in detg. ferrous Fe in silicates, it was thought possible that the oxidation of the bivalent Fe by the atm. and the resulting error might be obviated if the treatment with HF was made to take place in the presence of some oxidizing agent such as $K_2Cr_2O_7$ and then the excess of dichromate detd. by titration. Circumstances have prevented the completion of the expts. but certain facts have been ascertained which will be of interest to any one else attacking the problem. It was found that ferric Fe is pptd. quant. by NH_4OH even in the presence of excess fluoride; pptn. of $Fe(OH)_3$ in the presence of chromate causes some chromate to be pptd.; pptn. of $Fe(OH)_3$ by adding K_2CO_3 does not cause appreciable co-pptn. of Cr even when considerable HF is in the soln.

W. T. H.

Ammonium oxalate, a reagent for distinguishing between potassium and sodium salts. J. MEYERFELD. *Z. anal. Chem.* 67, 150-1 (1925).— $Na_2C_2O_4$ is much less sol. in water than is $K_2C_2O_4$. The former salt ppts. when a satd. soln. of $(NH_4)_2C_2O_4$ is mixed with a satd. soln. of NaCl.

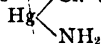
W. T. H.

Detection of titanium and of uranium by means of "spot" tests. N. A. TANANAEV AND G. A. PANCHENKO. *Z. anorg. allgem. Chem.* 150, 163-6 (1926).—If a drop of Ti sulfate soln. is brought into contact on filter paper with a drop of dihydroxynaphthalenedisulfonic acid soln. an intense brown coloration is obtained which serves to detect 0.005 mg. TiO_2 in a drop. The color is a little weakened by addn. of $SnCl_2$, which reagent prevents interference by Fe^{+++} or UO_2^{++} . For UO_2^{++} a suitable test is the ferro-cyanide reaction. To test for Ti and U in the presence of one another, a suitable soln. can be obtained from an ore by fusing with $K_2S_2O_7$ and extg. with a little water. • Neutralize a drop of the soln. with NH_4OH and add a drop of Na_2S soln., mix with an excess of concd. $(NH_4)_2CO_3$ soln. and filter. $Ti(OH)_4$, together with various sulfides, will be on the filter and the U will pass into the filtrate. Moisten a filter paper with the filtrate and

then with a drop of ferrocyanide soln. To test for Ti, add some SnCl_2 to the original soln., warm gently and transfer a drop of the clear soln. to a filter paper that has been touched with dihydroxynaphthalenedisulfonic acid soln. Other methods of applying these tests are also given.

Set of borax bead standards. E. R. CALEY. *J. Chem. Education* **3**, 189-90 (1926).—Directions are given for making and preserving a set of typical borax beads for use in qual. analysis.

The reaction of amide formation with mercurous salts. F. FRIGL AND A. SUCHARIPA. *Z. anal. Chem.* **67**, 134-40 (1925).—In the reaction between Hg_2Cl_2 and NH_3 , it seems likely that $\text{Hg}-\text{Cl}$ is formed first which changes slowly into



Determination of nickel as nickel dioxide. LUDWIG MOSER AND WLADIMIR MAXY MOWICZ. *Z. anal. Chem.* **67**, 140-2 (1925).—Vaubel (*C. A.* **17**, 249) made the astonishing statement that ignition of hydrated nickelic oxide yielded NiO_2 . A series of expts. confirms the view previously held that ignition of $\text{Ni}(\text{OH})_2$ yields chiefly NiO . There is some higher oxide present, probably Ni_2O_3 .

Notes on qualitative analysis. I. The volatility of the compound formed when barium sulfate is treated with concentrated sulfuric acid. F. KRAUSS. *Chem.-Ztg.* **50**, 33 (1926).— BaSO_4 on a Pt wire gives very little, if any, coloration in the Bunsen flame. The green Ba flame is obtained, however, if the BaSO_4 is moistened with HCl , but a still better flame test results by adding concd. H_2SO_4 . If BaSO_4 is moistened with concd. H_2SO_4 , heated, cooled and covered with methanol, then, on carefully heating and bringing near a Bunsen flame, the Ba flame test is obtained without the alc. taking fire. If BaSO_4 in a small tube is covered with concd. H_2SO_4 and then an air stream is passed through the tube and directed against a flame, a distinct green coloration results which is stronger if methanol is added to the reaction mixt. These 3 expts. show that the $\text{BaSO}_4\cdot\text{H}_2\text{SO}_4$ compd. is noticeably volatile and the Ba test is likely to interfere with the flame test for H_2BO_3 more than has ordinarily been supposed.

The influence of citrates on the precipitation of barium sulfate. M. L. NICHOLS AND O. J. THIES, JR. *J. Am. Chem. Soc.* **48**, 302-9 (1926).—It has been known for nearly 70 years that the presence of alkali citrate interferes with the pptn. of BaSO_4 and it was thought that a sol. double salt is formed. The present investigation makes clear that BaSO_4 is peptized by citrate anions so that it remains in colloidal soln. The colloidal BaSO_4 is in an extremely fine state of subdivision. If it is desired to ppt. BaSO_4 in the presence of citrate, it is advisable to add, at the start, somewhat more than sufficient HCl to convert the citrate anion into citric acid. Then a satisfactory ppt. of BaSO_4 can be obtained.

The determination of calcium by the conversion of the oxalate to carbonate. H. W. FOOTE AND W. M. BRADLEY. *J. Am. Chem. Soc.* **48**, 676-8 (1926).—Fresenius always recommended weighing Ca as CaCO_3 after pptn. as CaC_2O_4 but lately chemists have preferred igniting strongly and weighing as CaO . If the oxalate is heated to a temp. of $675-800^\circ$ for 15 min. in a current of CO_2 , it is changed completely to CaCO_3 and it is not necessary to moisten the mass with concd. $(\text{NH}_4)_2\text{CO}_3$, as in the classic method of Fresenius. A porcelain Gooch crucible covered with a Rose crucible lid and resting in a smaller porcelain crucible, which is heated with the full flame of a Bunsen burner, is suitable for maintaining the proper temp. The ppt. should be heated slowly until it is perfectly dry. This method is accurate and more rapid than the method of weighing as CaO .

Standardization of the analysis of zinc ores. ANON. *Rev. universelle mines* [7], **8**, 307-15 (1925).—The procedure for detg. Zn recommended by the Belgian Association of Standardization is given in complete detail. This is based on the method of Schaffner (1855), whereby the Zn is pptd. in NH_4OH soln. by aq. Na_2S of known concn with PbCO_3 as indicator.

Determination of free calcium ions by the method of Brinkmann and van Dam. HANS SCHULTEN. *Biochem. Z.* **164**, 47-52 (1925).—In the method of Brinkmann and van Dam Na oxalate is added in varying amts. to a soln. of CaCl_2 and the first resulting turbidity is noted at the end of 30 min. The soly. product of CaC_2O_4 is, therefore, 0.056, i. e., the same value as was found by Kohlrausch by his elec. cond. method. S. criticizes this procedure on the ground that under the exptl. conditions a supersatn. really is produced, the agreement by the turbidometric and electrometric methods being due to the fact that both are affected by the same source of error. He, therefore, proposes a modification of the original method to avoid this error, which consists in titrating the

Na oxalate with the unknown Ca^{++} soln. until the turbidity just disappears. By this method supersatn. is avoided, but the method is encumbered with serious technical difficulties.

S. MORCULIS

The determination and separation of rare metals from other metals. VI. Determination of the solubility of complex cesium and rubidium compounds and their suitability in analytical reactions. LUDWIG MOSER AND ERICH RIETSCHEL. *Monatsh.* 46, 9-22 (1925); cf. *C. A.* 19, 2180-1.—The sensitiveness of the reactions between Cs and Rb ions and the following reagents was detd. and values for the soly. of each ppt. obtained were: HClO_4 , $\text{C}_6\text{H}_5(\text{NO}_2)_3\text{OK}$, $\text{Na}_3\text{Co}(\text{NO}_2)_6$, $\text{NaHC}_4\text{H}_4\text{O}_6$, SbCl_3 , SnCl_4 , SnBr_4 , BiCl_3 , Na silicomolybdate, and phosphotungstic acid. The ppts. may be classified into 3 groups: (a) those of perfectly definite compn., (b) complexes of more or less indefinite compn. and (c) insol. ppts. which are likely to be more or less hydrolyzed so that a definite compd. can be obtained only at certain H^+ concns. The perchlorates, picrate and bitartrates belong to the first class and can alone serve for quantitative work except perhaps under very narrow conditions. The picrates are the least sol. but the soly. of these Cs, Rb and K salts are practically identical. There appears to be no truly sp reagent for either Cs or Rb ions. The most reliable test for them in the presence of K is the test with silicomolybdic acid, although the reaction with SnBr_4 can serve this purpose. For the detection of Cs and Rb, the test with phosphotungstic acid is the most delicate and next comes that with $\text{Na}_3\text{Co}(\text{NO}_2)_6$.

W. T. H.

A new method for separating iron from mercury. GEORG SPACU. *Z. anal. Chem.* 67, 147-50 (1925).—If a mercuric salt is treated with thiocyanate and pyridine in excess, a complex Hg compd. is obtained which remains in soln. but a ferric salt subjected to the same treatment is completely pptd. as $\text{Fe}(\text{OH})_3$. To 100-150 cc. of a dil. soln. contg. Hg and Fe, add 3-4 times as much solid KCNS as the combined wt. of Fe and Hg in soln. To the dark red soln. add pyridine dropwise until the color changes to yellowish brown. Add 3-4 drops of pyridine in excess, heat to boiling, filter and wash with hot water. Ignite the ppt. and weigh as Fe_2O_3 . To the filtrate add HCl, ppt. with H_2S and weigh the HgS. If HNO_3 is present in the original soln., evap. to dryness and dissolve the residue in water.

W. T. H.

New methods for determining copper, arsenic and mercury. RICH. ROSENDAHL. *Chem.-Ztg.* 50, 73-4 (1926).—For the As detn. in metal, dissolve 5 g. in HNO_3 , fume with H_2SO_4 and add 12 N HCl until the soln. is 6 N in HCl. If considerable Cu^{++} or Fe^{+++} is present it is advisable to reduce first with SnCl_2 . Add 5 g. NaH_2PO_4 and heat for 30 min. at about 85° . Cool, filter off the As and wash well with water. Place the ppt. and filter in a beaker contg. pure FeCl_3 and 50 cc. of concd. HCl. Boil 10 min., add 50 cc. more of concd. HCl and repeat the boiling to distil off AsCl_3 . Finally add sufficient MnSO_4 titrating soln. and titrate the ferrous salt (formed by the reduction of the As) with KMnO_4 in a vol. of 750 cc. All metals except Hg can be present. Ores, slags, etc., can be fused with Na_2O_2 and the aq. ext. acidified with HCl after boiling till all peroxide is decompd. It is also possible to dissolve the pptd. As in HNO_3 and evap. to fumes with concd. H_2SO_4 . Then by heating for 20 min. with about 1 g. of S, all the As can be reduced to the trivalent condition and, after dilg. and boiling off SO_2 , the soln. can be titrated with I_2 in the presence of NaHCO_3 ; but it is better, after boiling off SO_2 , to dil. to 250 cc., add 122 cc. of concd. HCl and a known amt. of antimonious salt soln. and titrate with KMnO_4 . The presence of Sb apparently catalyzes the oxidation of the As. To det. Cu, dissolve in HNO_3 if a metal, or fuse with Na_2O_2 if an ore. Fume with H_2SO_4 in the first case and make acid with H_2SO_4 in the second. Dil. with water, boil a few min., make slightly ammoniacal, add 6-7 g. of tartaric acid, 5 g. of NaH_2PO_4 and boil at least 20 min. Filter off the Cu and wash with water which has been freed from air by boiling. Dissolve the Cu on the filter with a soln. of HCl and FeCl_3 and titrate the resulting Fe^{++} by the Zimmermann-Reinhardt method. About 2 mg. of Cu are not pptd. by the NaH_2PO_4 so that a correction must be made. To det. Hg, dissolve in HNO_3 , evap. with H_2SO_4 and heat with S to reduce any quinquivalent As. Dil. with 20 cc. of water, add 50 cc. of concd. HCl and boil 10 min. to remove AsCl_3 . Dil. with water, add 5 g. NaH_2PO_4 and boil until the soln. is clear. Decant off the liquid, wash the Hg with water, dry and weigh as such.

W. T. H.

Determination of copper in sulfide ores. TH. HECZKO. *Z. anal. Chem.* 67, 151 (1925).—Attention is called to a misprint in a former article (*C. A.* 19, 3444).

W. T. H.

Determination of molybdenum as molybdic acid after previous precipitation as molybdenum sulfide. WILLY HARTMANN. *Z. anal. Chem.* 67, 152-5 (1926).—Many valuable suggestions are made with respect to the analysis of ores contg. Mo, W, Sn and Zn. A moist ppt. of MoS_3 is easily roasted to MoO_3 .

W. T. H.

The progress of toxicology. E. KOHN-ABREST. *Bull. soc. chim.* **37**, 773-812 (1925).—A review with frequent reference to K.'s textbook. Considerable space is devoted to the detn. of CO in blood and air and of CO₂ in air. MARY JACOBSEN

Toxicological test for mercury. KOHN-ABREST. *Ann. chim. anal. chim. appl.* **7**, 353-5(1925).—To 100-200 g. of finely divided material, add a little water to form a fluid paste, 0.1 the original wt. of KClO₃ and 0.2 the original wt. of concd. HCl. Heat until the org. matter is destroyed, taking the precaution to pass the evolved gas into water to catch any HgCl₂ that may distil off. Unite the 2 solns. and treat with H₂SO₄ to reduce the excess of KClO₃ and any arsenate that may be present. Ppt. HgS, Sb₂S₃ and As₂S₃ by means of H₂S. Use a part of the ppt. to test for As and Sb and the remainder for Hg. To test for Hg, dissolve in aqua regia, evap. off the excess acid in the cold, using a vacuum and dissolve the residue in warm water. Filter and make the filtrate slightly acid with HCl. Introduce a brass spiral to ppt. Hg. If there is any deposit, heat in a glass tube to distil off the Hg, collecting it in a cold part of the tube. By means of I₂ vapors change the gray deposit to red iodide. Dissolve the HgI₂ in 1 cc. of 1% KI soln., add 1 cc. of slightly ammoniacal gum arabic and 1 cc. of satd. H₂S soln. Mix and compare the color produced with that obtained similarly with known amts. of Hg. W. T. H

Determination of nitrogen in industrial products. V. EDWARDS. *Ind. Chemist* **1**, 122-3(1925).—Stress is laid on the usefulness and convenience of Kjeldahl's method. A detailed description of the Kjeldahl-Gunning method (CuSO₄ in place of Hg, however, and some points to be observed in the Jodlbauer method (using phenol) are given. The phenol-H₂SO₄ should be poured on quickly, especially when ammonium salt and nitrate are both present. If the nitric N is appreciable E. recommends detn. first of the NH₄ and org. N by the Kjeldahl-Gunning method and then on a sep. portion to apply E.'s modification of the Pelouze method (Sutton's Vol. Analysis, 11th ed.) in which the Fe soln. is boiled till viscid, then dild., cooled and titrated with K₂Cr₂O₇. The Jodlbauer method gives almost correct results with NH₄NO₃, KNO₃, urea nitrate, C₆H₅NO, nitronaphthalene, nitroaniline, picric acid, dinitrobenzene and K *p*-bromochloronitrophenol. The ordinary Kjeldahl-Gunning method gives good results with quinine, strychnine, aniline, atropine, diphenylamine, naphthylamine, pyridine, benzidine and aldehyde-ammonia. E. G. R. ARDAGH

Kjeldahl-Pregl method applied to nitro compounds. ADALBERT ELEK AND HARRY SOBOTKA. *J. Am. Chem. Soc.* **48**, 501-3(1926).—A micro-Kjeldahl method is described using 3-10 mg. of the sample, 50-100 mg. glucose, 1 g. K₂SO₄, a small crystal of CuSO₄, and 3 cc. H₂SO₄, which gives satisfactory results in the detn. of N in nitro, azo and similar compds. C. J. WICK

Estimation of nitrate-nitrogen by a modification of Kjeldahl's method. S. K. DEB. *Ind. Chemist* **1**, 452-3(1925).—A series of results indicates the suitability of the Kjeldahl method for the detn. of total N when Na₂S₂O₃ and thiosalicic acid are used for the reduction of nitrates. W. T. H

The quickest micro-method for determining nitrogen. A. KULTJUGIN AND I. GUBAREFF. *Biochem. Z.* **164**, 437-41(1925).—In N detns. by ashing with H₂SO₄ there is a source of error due either to insufficient heating or to escape of NH₃ if the heating is too prolonged. The use of concd. H₂O₂ obviates this difficulty. The detn. is carried out as follows: transfer 0.5 cc. of the soln. to a test tube and heat with 0.05 cc. concd. H₂SO₄ over a micro-burner until the fumes just appear. Cool and add 0.03 cc. of perhydrol. Heat until H₂SO₄ fumes reappear, and for 15 sec. longer. After cooling, dild. with 15 cc. of doubly distd. H₂O, mix with 0.3 cc. 50% NaOH, and nesslerize with 0.5 cc. reagent. The control is prepd. in such a way that an NH₄Cl soln. contg. 0.05 mg. per cc. is added from a micro-buret until the color produced by nesslerization of the known matches exactly the unknown sample. The quantity of 0.02-0.05 mg. N are detd. A blank on the known with perhydrol is needed as the latter may contain N. S. MORGULIS

Determination of hypoiodites and iodates, hypobromites and bromates, iodates and bromates in the presence of one another. E. SCHULERK. *Z. anal. Chem.* **67**, 142-7 (1925).—To det. iodate in the presence of hypoiodite, add an excess of 5% phenol soln. which reacts with HIO but not with HIO₃, and sat. with CO₂. Then add KI, make acid with H₂SO₄ and titrate with thiosulfate. A similar procedure serves for the detn. of bromate in the presence of hypobromite. To det. iodate and bromate when both are present, add satd. SO₂ soln. until the odor of SO₂ is marked. Heat to boiling for about 10 min. to ensure the complete reduction of iodate and bromate to iodide and bromide. Cool, neutralize with N NaOH and titrate the iodide as previously described (C. A. 19,

2464, method III). In another portion, det. iodate and bromate together by titrating the I_2 liberated with KI in acid soln. W. T. H.

Electrometric titration of phosphate. SVEN BODFORSS. *Svensk Kem. Tids.* **37**, 296-300 (1925).—When PO_4^{---} is titrated electrometrically, the $UO_2(AcO_2)$ method of Pincus being used, a marked change in e. m. f. is noticed at the end point when a $K_4Fe(CN)_6$ -Hg electrode is used instead of Pt. A. R. ROSE

Determination of hydrocyanic acid in gaseous mixtures. G. E. SEILL. *Ind. Eng. Chem.* **18**, 142-3 (1926).—When I_2 reacts with HCN in the presence of $NaHCO_3$, the products are NaI, CNI, CO_2 and H_2O . In acid soln. a mixt. of CNI and HI yields IICN and I_2 . H_2S and I_2 unite to form HI and S. Based on these reactions, it is easy to det. HCN rapidly when present with H_2S . The vol. of I_2 required to react with HCN and H_2S and then the amt. of I_2 liberated on adding HCl are detd. W. T. H.

Theoretical and recorded pressures in oxygen bomb determinations. M. J. BRADLEY, C. Z. ROSECRANS and R. M. CORBIN. *Ind. Eng. Chem.* **18**, 307-9 (1926).—Pressures developed within an Illium O_2 bomb during the combustion of various wts. of crude petroleum, coals, benzene, kerosene and benzoic acid were measured and compared with the calcd. theoretical pressures, account being taken of the variation in the sp. heats of the products of combustion with the temp. and on the assumption that 50% of the heat of combustion is lost before the max. temp. is reached. W. T. H.

Determination of oxygen and hydrogen in metals by fusion in vacuum. LOUIS JORDAN and J. R. ECKMAN. *Ind. Eng. Chem.* **18**, 279-82 (1926).—By means of high-frequency induction it is possible to heat a sample of metal in a receptacle made of refractory oxide or a graphite crucible within a fused-silica vacuum chamber to 2000° while the walls of the silica tube remain sufficiently cool to maintain a good vacuum. Three methods of fusing ferrous alloys were tested: fusion in refractory oxide crucibles, fusion with Sb-Sn alloy and fusion in graphite crucibles, using 100 g. samples in the first case and 30 g. samples otherwise. The values for H_2 , seldom over 0.002%, agreed fairly well by all methods but with O_2 , sometimes over 0.1%, the best values were obtained in a graphite crucible. The absorption train used is suitable for the detn. of H_2O , CO_2 , CO and H_2 passing through the train at low pressures. Also in Bur. Standards, *Sci. Papers* **20**, No. 514, 445-82 (1925). W. T. H.

A colorimetric method for the estimation of hydroxylamine. G. W. PUCHER and H. A. DAY. *J. Am. Chem. Soc.* **48**, 672-6 (1926).—A colorimetric method is described which depends on the reaction of NH_2OH with C_6H_5COCl and $FeCl_3$. W. T. H.

Determination of nicotine in tobacco. HANS RUNDSHAGEN. *Chem.-Ztg.* **50**, 42 (1926).—The Tóth method for the detn. of nicotine has been modified so that it reads as follows: Treat 10 g. of dried tobacco powder with 2 g. powdered KOH and a little water. During 15 min., occasionally triturate to make sure that the nicotine is all released. While stirring with a spatula, add dry $CaSO_4$ until the mass becomes a homogeneous powder when pressed with a pestle. Transfer to a Kjeldahl flask and extract the nicotine with a mixt. of 50 cc. ether and 50 cc. petroleum ether. Close tightly and shake 15 minutes in a shaker. Centrifuge, pour off a part of the clear soln. mixt. through a filter and titrate with 0.1 N H_2SO_4 using iodeosin as indicator. W. T. H.

A modification of Schoorl's titration of sugars. I. M. KOLTHOFF. *Chem. Weekblad* **23**, 61-2 (1926).— Cu_2O is oxidized by KIO_3 -KI in a CO_2 atm.; the excess I is titrated back with $Na_2S_2O_3$. Quant. oxidation is effected by proper diln. and by reducing the Cu^{++} concn. with $K_2C_2O_4$. The method has the advantage of a sharp and permanent end point. MARY JACOBSEN

Determination of anisaldehyde. ÉTABLISSEMENTS A. CHIRIS *Parfums de France No.* **35**, 22 (Jan., 1926).—In the analysis of oils with high anisaldehyde contents or of concentrates obtained in the manuf. of this product, the bisulfite method gives low results because the aldehyde-bisulfite combination, when heated to convert it into sol. sulfonate, is partially (up to 50%) dissociated into aldehyde and bisulfite. To 10 cc. of sample in a 200-cc. aldehyde flask add a 7% Na metabisulfite soln. with const. stirring: the aldehyde dissolves rapidly, giving a clear soln., and the loss in vol. of the oil gives the % by vol. of aldehyde. Analysis of mixts. of known compn. of pure anisaldehyde with hydrocarbons, both alone and with anethole, have shown the method to be reliable. A. PAPINEAU-COUTURE

Measurements with the quinhydrone electrode. K. LINDERSTRÖM-LANG. *Compt. rend. trav. lab. Carlsberg* **16**, No. 3, 24 pp. (1925).—In detg. the H-ion concn. with the Büllman quinhydrone electrode in protein solns. contg. $(NH_4)_2SO_4$, it was found that the method was not unduly tedious and that the results are reproducible. It was desirable,

however, to det. the actual errors involved and this led to a series of expts which represents new detns. of the p. d. between the H electrode and the quinhydrone electrode in HCl-KCl solns. and in NaCl solns. as well as a study of the errors caused by protein and $(\text{NH}_4)_2\text{SO}_4$. For practical reasons it is not easy to det. directly the e. m. f. of the element Pt | quinhydrone | water | H_2 at 1 atm. | Pt at 18° but from the values obtained with HCl solns. of varying concn., the value with pure water is estd. to be 0.70475 ± 0.00005 v. The divergence between this value and that obtained previously by other investigators is probably due to the fact that there is a considerable electrolytic effect even with very dil. HCl and KCl. The alteration in the e. m. f. caused by adding NaCl when 0.01 N HCl replaces the water in the above element was detd. anew. Thus, when the NaCl was 0.5 N, the value became 0.70345, 0.1 N = 0.70199, 2 N = 0.69896, 3 N = 0.69581 and 4 N = 0.69223. It may be noted that the alteration caused at the lower concns. takes a course differing from that obtained later. In this respect NaCl behaves like KCl, the variation in the e. m. f. in dil. solns. being greater than that calcd. from soly. measurements. The alteration in the e. m. f. caused by $(\text{NH}_4)_2\text{SO}_4$ was found to be opposite to that caused by NaCl. The alterations caused by proteins such as casein, egg albumin and serum albumin were found to depend on the nature of the protein and sometimes also upon the acidity of the soln. The following formulas are given for the calcn. of p_{H} and $p_{a\text{H}}$ from measurements of the quinhydrone electrode: $p_{\text{H}} = [(0.36675 - E_{\text{Kln}})/0.0577] + Q$ and $p_{a\text{H}} = [(0.36905 - E_{\text{Kln}})/0.0577] + Q$, in which E_{Kln} is the e. m. f. corrected for the liquid junction potential of the element Pt | quinhydrone | titrated soln. | 3.5 N KCl | 0.1 N KCl calomel electrode at 18° and Q is the correction for the influence of dissolved substances as given in this paper for various concns. of HCl, NaCl, $(\text{NH}_4)_2\text{SO}_4$, egg albumin, serum albumin and casein.
W. T. H

Determination of dihydroxyacetone (CAMPBELL) 11B.

ALLEN, ALFRED HENRY: *Commercial Organic Analysis*. 5th Ed. revised by Samuel S. Sadtler, et al. 804 pp. \$7.50. Reviewed in *Tech. Book Review Index* 8, 296 (1924).

BABEL, HERMANN: *Quantitative Analyse*. Vol. 4. Gasanalyse. Leipzig: Joh. Ambr. Barth. 52 pp. R. M. 2.30.

CAVEN, R. M.: *Quantitative Chemical Analysis and Inorganic Preparations Part 2. Volumetric Analysis*. London: Blackie & Son. 215 pp. 5s.

DUPARC and BASADONNA: *Manuel théorique et pratique d'analyse volumétrique*. Paris: Payot. 216 pp. Reviewed in *Rev. chim. ind* 35, 25 (1926).

HEINRICH, FERDINAND: *Der Gang der qualitativen Analyse*. For chemists and pharmacists. 2nd ed. enlarged. Berlin: J. Springer. R. M. 2.40.

MEULEN, H. TER: *Onderzoekingen over de bepaling van zwavel in anorganische verbindingen*. Delft: W. D. Meinema. 86 pp. Guld. 2.25.

TAVERNE, N. J. A.: *Leidraad bij het onderwijs in analytische scheikunde*. 2nd ed. revised. Zwolle: W. E. J. Tjeenk Willink. 44 pp. Guld. 0.75.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Symmetry and forms of the diamond. G. FRIEDEL. *Soc. Geol. Belg. Livre jubilaire 1874-1924*, 141-56 (1925).—The object of this study was to det. whether the diamond is holohedral or antihemihedral. The weight of evidence is in favor of the provisional conclusion that it is holohedral.

Realgar from Långban. G. AMINOFF. *Geol. För. Förh.* 47, 344-5 (1925).—Crystals 3-8 mm. in size have been found at Långban, probably the first find in Sweden.

W. SIEGBLOM

Penroseite and truedellite: two new minerals. S. G. GORDON. *Proc. Acad. Natural Sci. Phila.* 77, 317-24 (1925).—Penroseite contains: Se 59.80, Ag 2.04, Pb 17.13, Cu 7.84, Ni 11.14, Co 1.34, Fe_2O_3 1.08, sum 100.37%. Its formula is possibly $2\text{PbSe} \cdot 3\text{Cu}_{2\text{e}} \cdot 5(\text{Ni}, \text{Co})\text{Se}_2$ or $\text{PbSe} \cdot \text{Cu}_2\text{Se} \cdot 3(\text{Ni}, \text{Co})\text{Se}_2$. Truedellite is uniaxial -, with $\epsilon = 1.495$, $\omega = 1.560$ ($\lambda = 579$); analysis gave: SiO_2 0.57, Al_2O_3 25.67, Fe_2O_3 1.00, CuO 1.56, MgO 0.66, Na_2O 1.58, SO_3 13.60, Cl 24.42, H_2O 36.60, less O = Cl, 5.49, sum 100.17%. Its formula is thus $\text{Al}_2(\text{SO}_4) \cdot 4\text{AlCl}_3 \cdot 4\text{Al}(\text{OH})_3 \cdot 30\text{H}_2\text{O}$. J. F. SCHAIERER

A new oxide mineral from Långban, magnetoplumbite. G. AMINOFF. *Geol.*

För. Förh. **47**, 283-9(1925).—This mineral crystallizes hexagonal but without indication of hemihedrism. The crystals are terminated with sharp pyramids. (0001):(10 $\bar{1}$ 1) = 77° 34'. Its cleavage is (0001), hardness about 6, color black, luster metallic, streak dark brown, and it is strongly magnetic. It is sol. with difficulty in HCl; sp. gr. = 5.517. Analysis gave: PbO 19.74, TiO₂ 4.82, Fe₂O₃ 54.65, Al₂O₃ 0.88, Cr₂O₃ 0.05, MnO 17.33, CaO 0.35, MgO 0.47, K₂O 0.14, Na₂O 0.16, H₂O 0.26, SiO₂ 0.15, SiO₂ (insol. in HCl) 0.21, other substances insol. in HCl 0.31, sum 99.52%. Deducting the SiO₂, the part insol. in HCl, and the H₂O and recalculating gives: PbO 20.02, MnO 17.58, CaO 0.36, MgO 0.48, Fe₂O₃ 55.43, Cr₂O₃ 0.05, Al₂O₃ 0.89, TiO₂ 4.89, K₂O 0.14, Na₂O 0.16, sum 100.00%, so that the probable formula is PbO.2Fe₂O₃. W. SERGERBLOM

Quenselite, a new mineral from Långban. G. FLINK. *Geol. För. Förh.* **47**, 377-84 (1925).—Quenselite is number 333 in the Långban list. Crystals are about 1 mm. in diam.; sp. gr. = 6.842; hardness = 2.5. The color is pitch black with metallic or adamantine luster, the powder dark brownish gray. It is sol. in weak acids. Compn. = PbO 69.51, Fe₂O₃ 0.39, MnO 23.21, CaO 0.97, MgO 0.30, K₂O 0.17, Na₂O 0.28, CO₂ 0.64, O 2.38, H₂O 3.02, sum 100.87%. The formula is probably 2PbO.Mn₂O₃.H₂O, a basic lead manganite. W. SERGERBLOM

X-ray diffraction measurements upon the pyroxenes. R. W. G. WYCKOFF, H. E. MERWIN AND H. S. WASHINGTON. *Am. J. Sci.* **10**, 383-97(1925).—From an examn. of their X-ray powder diffraction photographs it is shown that with the exception of clinoenstatite, babingtonite, spodumene, pyroxmangite, alamosite and sobralite (each of which has a pattern unlike any other), all of the different kinds of minerals usually grouped among the pyroxenes have the structure of either diopside, enstatite, wollastonite or rhodonite. From measurements of several typical augites, which in structure are like diopside, it is seen that the excess Fe₂O₃ and Al₂O₃ have no clearly marked effect on the X-ray diffraction pattern. Density calcns., combined with the X-ray spacing measurements, prove that these oxides cannot be present in the mols. in addn. to the diopside-like constituent; they do not, however, distinguish between the possibility (1) of fine-grained admixt. of the oxides themselves or of some other ferric and Al compds., or (2) of some sort of at. replacement involving these oxides. Comparative spacing measurements of minerals of known chem. compn. show that in these pyroxenes Fe⁺ replaces Mg with practically no change in shape or size of the resulting crystal. Mn⁺ seems to have a slightly larger and Ca a much larger effective vol. than these 2 metals.

GEORGE L. CLARK

Constitution of glauconite and celadonite. L. L. FERMOR. *Records Geol. Survey India* **58**, 330-7(1925).—From a mean of 12 analyses of glauconite, F. obtains 2R₂O₃ · (R₂O, R₂O) · 8SiO₂ · 4½H₂O; and from 5 of celadonite R₂O · 4(R₂O₃, RO) · 10SiO₂ · 6H₂O. No new analyses are included. J. F. SCHAIRER

Xenotime from Ytterby. G. K. ALMSTROM. *Geol. För. Förh.* **47**, 290-8(1925).—The xenotime shows cleavage parallel to a tetragonal prism, is optically uniaxial, +. It is somewhat cracked with dark decompn. products on the broken surfaces. Analysis gave: P₂O₅ 33.14, Ta acids 0.18, SiO₂ 2.27, ThO₂ 0.12, CeO₂ 1.04, ZrO₂ 0.76, Ce earth oxides 3.79, Gd earth oxides, 49.45, Al₂O₃ 1.49, Fe₂O₃ 0.91, BeO 0.04, CaO 4.82, MgO 0.31, K₂O 0.09, Na₂O 0.10, H₂O 1.17, sum 99.68%. W. SERGERBLOM

A monazite-bearing pegmatite near Normanville. R. GRENFELL THOMAS. *Trans. Proc. Roy. Soc. S. Australia* **48**, 258-68(1924).—Lenses of rutile and monazite in com. amts. are present in the border phases of the pegmatite. The monazite is traversed by an irregular net work of hydrated oxides of rare earths. A fresh unaltered monazite gave: P₂O₅ 26.88, Ce₂O₃ 25.09, La₂O₃ etc. 24.32, ThO₂ 10.70, Y₂O₃ and Er₂O₃ 4.00, CaO 2.60, TiO₂ 1.70, SiO₂ 1.65, Fe₂O₃ 0.85, PbO 0.55, H₂O (at 110°) 0.40, H₂O and gases (above 110°) 1.52, sum 100.26%. The Pb-Th ratio gives an age of 1,073 million years. An analysis of biotite gave: SiO₂ 37.10, Al₂O₃ 13.60, Fe₂O₃ 4.47, FeO 7.63, TiO₂ (6.75% of included rutile) 7.00, MgO 16.60, CaO 1.00, Na₂O 1.78, K₂O 8.91, H₂O (at 110°) 0.10, H₂O (above 110°) 2.77, sum 101.26%. J. F. SCHAIRER

New researches on the autunite of Lurisia. C. PORLEZZA AND A. DONATI. *Ann. chim. applicata* **15**, 518-34(1925).—The autunite ore of Lurisia has already been studied by Lencio (C. A. **8**, 887) and by P. (*Ricerche relative all'autunite di Lurisia*, Pisa 1921). It is composed of S-yellow and greenish yellow crystals, the latter contg. twice the amt. of As as impurity as the former. Chem. and spectrographic analysis revealed the presence of Fe, U, Mn, Ca, K, Na, Sr, Al, Si, P, Mg, Ba, Zn, Cu, Pb and As, besides spectrum lines which could not be identified. The Ra content of 9 samples varied greatly, 1 g. of Ra being present per 200, 333, 1000, 2000, 1600, 5000 and 8000 tons of sample and 2 samples contg. none. This renders the mineral of potential value as a com. source of Ra. C. C. DAVIS

The correlative value of heavy minerals. F. G. TICKELL. *Bull. Am. Assoc. Petroleum Geol.* 8, 158-68 (1924).—Heavy minerals most common in California oil field sediments are: amphiboles, pyroxenes, opaque minerals such as magnetite, ilmenite, etc., epidote, micas, garnets, zircon, tourmaline and others. Data for the recognition of mineral grains with a polarizing microscope are given. C. I. C.

The possible role of transportation in metalliferous deposits. L. DELAUNAY. *Soc. Geol. Belg. Livre jubilaire 1874-1924*, 113-5 (1925).—Geological. L. W. RIGGS

Origin of primary ore deposits. R. C. WILSON. *Chem. Eng. Mining Rev.* 18, 51-4 (1925).—Early theories regarding the origin of ore deposits are reviewed. The downward changes of ore deposits with an ideal reconstructed vein system as proposed by Emmons (C. A. 19, 2009) are applied to the Au deposits of W. Australia. L. W. R.

Platinum in industry and commerce. II. Minerals and ores of platinum. III. Geological characteristics of platinum occurrences. N. K. VISOTSKII. *Matter on the natural productive forces of Russia* 4, 109-343 (1923); *Mineralog. Abstracts* 2, 540, of C. A. 18, 3340.—On Mt. Rudnaya is found a pyrrhotite deposit contg. 1.47% Cu and 1.05% Ni and some Pt, Pd and Au. The ore carries about 0.5% Pt. The auriferous quartz veins of the Urals, Fe ore of Nizhne-Tagil and Goroblagodat, cupriferous sandstones and phosphorite nodules in govt. Vyatka all carry some Pt. J. F. S.

Mineral production of India during 1924. L. L. FERMOR. *Records Geol. Survey India* 58, 241-322 (1925).—Increases over 1923 total production of the following are recorded: coal, petroleum, Mn ore, Au, Pb ore, Ag, building materials, mica, Fe ore. Sn ore, KNO_3 , Cu, Zn, clays, MgCO_3 , bauxite, monazite, gypsum, ocher, zircon, asbestos, amber, cyanite and Bi ore. Decreases are recorded for NaCl, jadeite, Cr ore, gems, W ore, apatite, talc, BaSO_4 , ilmenite, alum, fuller's earth, soda and hyalite. J. F. S.

Sulfur deposits of New Zealand. E. P. DOW. *Proc. Australasian Inst. Mining & Metallurgy* No. 58, 29-46 (1925).—Geology, origin, mode of occurrence and mining methods are discussed. The deposits are small and isolated. A. BUTTS

Geology of a part of western Texas and southeastern New Mexico with special reference to salt and potash. H. W. HOORS. U. S. Geol. Survey, *Bull.* 780B, 126 pp (1925).—A review of the search for potash in this region from 1911 to 1921 is given. The prospects for salt in Texas and New Mexico indicate many billions of tons located where solar evapn. may be used. While these deposits cannot compete at present with those of other states, they constitute an extensive reserve. Potash has been found in a number of wells drilled for petroleum, and in a few instances drilled for potash. More extensive drillings are necessary before the economic importance of these potash deposits can be estd. L. W. RIGGS

Geology and resources of the Gallup-zuni basin, New Mexico. J. D. SEARS. U. S. Geol. Survey, *Bull.* 767, 52 pp. (1925).—The coal of this district is a good grade of semibituminous, which compares well with competing coals. The av. B. t. u. of 27 samples was 11,110. The total production of the district to the end of 1923 was over 19 million tons, the output for 1923 being 821,415 tons. Among other economic resources of the Gallup-zuni basin are fire clay, sand, building stone, adobe, crushed rock and an adequate water supply. Prospecting for petroleum has so far been unsuccessful. L. W. RIGGS

Kerogen and its relation to the origin of oil. E. A. TRAGER. *Bull. Am. Assoc. Petroleum Geol.* 8, 301-11 (1924).—Kerogen is the org. matter insol. at low temps and pressures which yields petroleum by natural or artificial distn. Although similar in appearance to resin, it is not a resin because of this insoly. in org. solvents such as alc., ether and CCl_4 , and because of the difference in its end products when distd. by the usual methods of destructive distn. Kerogen is most probably an intermediate product between an org. source, i. e., plants and animals, and petroleum. The most favorable conditions for the deposition and accumulation of such original org. deriv. material is in swamps, bogs, lagoons and within the zone of shore-line deposition. Part of the kerogen which is found today was an end product of biochem. decompn. prior to consolidation and is indigenous to the beds which contain it. Other occurrences are secondary to deposition, probably derived from org. detritus. Kerogen, when first formed, prior to being subjected to high temps. or pressures, appears brownish to dark orange in color, and is optically inactive. Heating kerogen to a temp. slightly less than the temp. of vaporization and then allowing it to cool converts it into a vitreous, lemon-colored, anisotropic substance. Kerogen can be converted into oil either by the aid of heat or by pressure. In the latter case, the pressure must be of such a nature as to allow mol. displacement. C. I. C.

The relation of oil shale to petroleum. F. M. VAN TUYL AND C. O. BLACKBURN. *Bull. Am. Assoc. Petroleum Geol.* 9, 1127-42 (1925).—See C. A. 20, 497. C. I. C.

Geology and rocks in the vicinity of Bolivar, Venezuela. L. DUPARC AND L. CUISINIER. *Soc. Geol. Belg. Livre jubilaire 1874-1924*, 185-211(1925).—The lithological and optical characters of these granitic rocks are described at length, and 12 chem. analyses are reported. L. W. RIGGS

Diabase from Gevle. H. VON ECKERMANN. *Geol. För. Förh.* 47, 299-310(1925).—The mineral compn. is chiefly tabular crystals of feldspar iddingsite, delessite, ores, apatite, serpentine and partly decompd. glass. Its chem. compn. is: SiO_2 47.10, TiO_2 1.24, Al_2O_3 17.06, Fe_2O_3 6.64, FeO 9.47, MnO 0.25, CaO 7.06, MgO 1.10, K_2O 1.48, Na_2O 2.44, P_2O_5 0.82, CO_2 0.54, Cl 0.16, S trace, H_2O (+110°) 3.18, sum 100.54%; sp gr. 2.905. Comparative calcn. shows: iddingsite 6.66, feldspar 55.81, delessite 4.77, apatite 2.74, ores 15.74 and glass 14.82%. W. SEGERBLOM

Chemical composition of the red potassium leptytes in the zinc ore fields at Ämmeberg. G. T. LINDROTH. *Geol. För. Förh.* 47, 498-503(1925).—A new analysis by J. gives: SiO_2 63.27, TiO_2 0.10, Al_2O_3 15.94, Fe_2O_3 3.16, FeO 0.40, MnO 0.15, MgO 1.22, CaO 3.16, BaO not detd., Na_2O 3.96, K_2O 8.12, P_2O_5 0.06, S not detd., H_2O 0.31, sum 99.85%. These are compared with data previously found by L. Yngström; SiO_2 and K_2O are lower and Fe_2O_3 and CaO are higher. W. SEGERBLOM

The lavas of Fouqué Kameni, Santorin, Greece. A. LACROIX AND CONST. A. KTENAS. *Compt. rend.* 181, 893-5(1925).—Chem. analyses are reported of lavas from this volcano erupted in the years 46, 1869 and 1925; also of a sample of one of the islets which appeared during or after an eruption. L. W. RIGGS

The geology of the Rhobell Fawr district. A. K. WELLS. *Quart. J. Geol. Soc.* 81, 463-538(1925).—An analysis of a dacite, an average spilite and a variolite are included. J. F. SCHAIRER

Eruptive rocks of Camena, Roumania. D. M. CADERE. *Anuarul Inst. Geol. Romaniei* 10, 121-299(1925). (Résumé in French).—Chem. analyses, phys. consts. and various ratios for 25 samples of eruptive rocks are assembled in 8 tables. L. W. R.

Basaltic lavas penetrated by the deep boring for coal at Bhusawal, Bombay. L. L. FERMOR. *Records Geol. Survey India* 58, 93-240(1925).—Chabazite in the vesicles of the traps crystd. between 374° and 280°. An analysis of chlorophaeie is given and its identity with palagonite shown. J. F. SCHAIRER

Palagonite-bearing dolerite from Nagpur: nature and origin of palagonite. D. N. WADIN. *Records Geol. Survey India* 58, 338-43(1925).—Palagonite is not a definite mineral but an amorphous decompn. product of variable compn. formed *in situ* in the rock. It is not the product of alteration of interstitial glass alone, but has been formed by the decompn. of the ferromagnesian constituents of basic rocks. J. F. S.

Geology of the Milton district, N. S. Wales. IDA A. BROWN. *Proc. Linnean Soc. N. S. Wales* 50, 448-65(1925).—A geological and lithological study. Chem. analyses of rock specimens from this district and of similar rocks of European and American localities are quoted. L. W. RIGGS

Some occurrences of spherulitic siderite and other carbonates in sediments. EDMONDSON SPENCER. *Quart. J. Geol. Soc.* 81, 667-705(1925).—The spherulitic siderite was formed by the absorption of Fe carbonate, humate, or possibly colloidal hydrates by fine grained and partly colloidal sediments. Ten analyses are included. J. F. SCHAIRER

Glauconite and cretaceous formations traversed by the Harchies shafts, near Mons, Belgium. L. CAYEUX. *Soc. Geol. Belg. Livre jubilaire 1874-1924*, 65-82(1925).—These deposits are described from a lithologic point of view. The glauconite is probably of bacterial origin. L. W. RIGGS

The Sulphur salt dome, Louisiana. P. K. KELLEY. *Bull. Am. Assoc. Petroleum Geol.* 9, 479-98(1925).—The Sulphur salt dome is a typical Gulf Coast salt dome, but is exceptional in its small area, in the great thickness of the cap and in the richness of its deposit of native S. The cap is composed of anhydrite and a mantle-like mass of "lime" rock covering the top and flanks of the anhydrite. The S is found as a secondary mineral in the transition zone between the "lime" rock and the anhydrite and has probably been pptd. from H_2S or metallic sulfides in soln. After a long history of vain expensive attempts to mine the S, the Frasch process was perfected, by which the S is melted in place and pumped in liquid form to the surface. The total production to date has been about 9,000,000 tons of S with a gross value of \$150,000,000. Heavy oil was encountered in the early S wells, but not in com. quantity. The flanks have not been well tested for oil. C. L. C.

Big Hill salt dome, Matagorda County, Texas. A. G. WOLF. *Bull. Am. Assoc. Petroleum Geol.* 9, 711-37(1925).—Big Hill is a characteristic Gulf Coast salt dome and has a distinct salt-dome mound, a sub-circular salt core intruded into Tertiary sedi-

ments and a thick cap on the top of the salt. The cap contains an extensive and important deposit of S. The cap is composed of (a) a "barren" cap above, (b) the S-bearing zone composed chiefly of limestone and grading below into (c) a thick deposit of barren anhydrite. The S is secondary and later than the limestone and anhydrite. The S is mined by the Frasch process. A review is given of the possible reactions for the formation of the S. A small quantity of oil was produced in the early days, mostly from the top of the cap.

Origin of North American salt domes. E. DEGOLYER. *Bull. Am. Assoc. Petroleum Geol.* 9, 831-76(1925).—Exploration of the known domes for cap-rock pools and S deposits from 1901 to 1916-1918 gave more information on the salt, anhydrite, gypsum, limestone, S and various minor minerals—the salt dome materials—and theories of deposition from soln. became the vogue. The development of important oil deposits in the lateral sands flanking the salt masses, from 1912 to date, concd. attention on the structural features of the dome. The deposition-from-soln. and the lifting-power-of-crystn. theories seemed to be inadequate to explain the sharp and considerable uplift caused by the formation of the salt core and cap rock, and, with a growing recognition of the similarity of the American salt domes to the salt structures of Germany, Roumania, Mexico and elsewhere, came a gradual swing to the theory of tectonic origin. This theory supposes that the plastic salt was forced by pressure to flow from originally bedded deposits into its present position. D. accepts the tectonic or pressure-flowage theory for the origin of American salt domes, and believes that the most serious objection raised by its opponents—the lack of evidence as to the existence of sedimentary deposits—is no longer tenable in view of the recent discovery of potash salts and fossil algae in the salt core of the Markham dome.

The American salt dome problem in the light of the Roumanian and German salt domes. D. C. BARTON. *Bull. Am. Assoc. Petroleum Geol.* 9, 1227-68(1925).—The American salt-dome problems are divisible into 2 parallel series, one comprising problems of description, the other problems of theory. The soln. of the latter is of necessity dependent upon the soln. of the former. The American salt domes consist of subcircular stocklike masses of salt, capped in most cases by limestone and gypsum-anhydrite intruded into and surrounded by sediments which dip quaquaversally away from the salt core. The domes show certain alignment. They occur in regions of geologic quiescence where there has been no compressive folding. In Roumania, the Carpathian-Subcarpathian domes consist of narrow, elongated, vertical intrusions of the Saliere salt, clays and marls along anticlinal axes and into a thick series of sediments. The domes are aligned along structural, mostly anticlinal, axes which reflect the effect of the Carpathian tectonics. Their origin has usually been attributed to tangential or tectonic thrust. The transylvanian domes are aligned on anticlinal axes which are sub-parallel to the periphery of the basin. The German salt domes are a phase of the K salt deposits in which the structural deformation has been worked out in detail. There is a complete gradation from undeformed sedimentary beds through broad anticlines with slightly swollen cores of salt (Stassfurt type), sharp anticlines where the salt core is starting to pierce the cover (Asse type), to broken anticlines in which the salt core has been squeezed up between the two flanks (Leine type), or to salt stocks (Hannovian type) in which a plug-like mass of salt has been intruded for thousands of meters vertically into the overlying sediments. The salt domes and ridges are aligned along anticlinal axes. Many of the domes seem to be at the intersection of axes. The upthrust of the salt cores is attributed to tectonic or isostatic upthrust. In view of the evidence of the Roumanian and German salt domes, in addition to what is known about the American domes, it would seem unreasonable to believe that the American salt domes are not the result of the plastic deformation and upthrust of a sedimentary salt series.

Caliche and pseudo-anticlines. W. A. PRICE. *Bull. Am. Assoc. Petroleum Geol.* 9, 1009-17(1925).—Observations in central Tamaulipas, Mexico, indicate that pseudo-anticlines may be formed by the deposition of caliche (CaCO_3) at shallow depths below the surface. The surface rocks are accordingly disturbed, and dips up to 17° have been observed on strata which are apparently in place. The max. vertical uplift of these caliche-formed pseudo-anticlines is about 15 feet; their length along the axis of the "buckle" may be as much as 2000 feet. Beneath the pseudo-anticline the strata are essentially horizontal. Caliche deposition is seen to be a factor in the process of weathering in semiarid regions; on the one hand, it moves and disrupts the rock beds and aids in the penetration of plant roots at the outcrop; on the other hand, it retards weathering and erosion by recementing the rock fragments.

Water analyses in oil production and some analyses from Poison Spider, Wyoming.

E. M. PARKS. *Bull. Am. Assoc. Petroleum Geol.* 9, 927-46(1925).—The use of analyses in detg. the source of oil-field waters is urged. The meaning of analyses and the different methods of graphic statement are illustrated. A new form of graph believed to be clearer and simpler to use is suggested. As an example of the use of water analysis, 19 analyses from the Tensleep, Dakota, Morrison and Sundance sands of South Casper Creek, Poison Spider and Notches, Wyoming, are tabulated and studied graphically, the conclusion being that the waters are distinguishable from the analyses. The geochem. relations between the oil and water are briefly reviewed. C. L. C.

Analyses of Wyoming oil-field waters. E. L. ESTABROOK. *Bull. Am. Assoc. Petroleum Geol.* 9, 235-46(1925).—In general, waters in Wyoming oil fields show a tendency toward a reduction in sulfate content and increase in carbonate and Cl content and general concn. with increasing depths unless the waters have been modified by circulation. Secondary salinity decreases with depth, and in cases of deeper sands disappears altogether. The Dakota sand waters show a content of sulfate at greater depths than the Frontier sand waters, on account of more rapid water circulation and general replenishment of sulfates to the deeper waters. In Wyoming fields, waters in contact with oils show a tendency toward the reduction of sulfates and increase in carbonates. Oils in contact with underground waters are altered and show a reduction in lighter fractions which results in lower gravity oil. The Salt Creek field shows alteration of the oil in a zone extending from 100 to 150 feet above the water line. In the Big Muddy field, the oil appears to be altered over the entire producing area, probably because of rapid water circulation which is shown by the high sulfate content of the water, tilted water table, and nearness of outcrops. C. L. C.

Calcium chloride waters from certain oil fields in Ventura County, California. F. S. HUDSON AND N. L. TALIAFERRO. *Bull. Am. Assoc. Petroleum Geol.* 9, 1071-88(1925).—While engaged in a detailed study of the South Mountain and Shiel's Canyon oil fields it was found that the chem. compn. of the underground waters differs considerably from that of the usual Calif. oil-field brines, in that CaCl_2 instead of NaCl is the chief constituent. The fact that this difference in compn. persists in the fields along the south side of the Santa Clara River indicates that these underground waters had a different origin or subsequent history from the waters in other fields, both in Ventura County and other parts of the state. Although CaCl_2 waters occur in other parts of the world, they are far from common and, therefore, seem to owe their origin to certain special conditions. H. and T. suggest their probable origin. C. L. C.

Probable origin of thermal waters of Aix-les-Bains, Savoy, and the role of the tectonic accidents in the thermalization and mineralization of the springs. W. KILIAN. *Soc. Geol. Belg. Livre jubilaire 1874-1924*, 97-102(1925).—A geological study.

L. W. RIGGS

Fulminating material. I. The thermic heterogeneities. E. MATHIAS. *Compt. rend.* 181, 1038-40(1925).—"Fulminating material" is the unknown substance which appears during thunder storms as spherical balls, which may explode with violence or disappear quietly. Theories of formation and temp. relations are discussed. **Fulminating material. II. Color. Chemical heterogeneities.** *Ibid* 1111-4.—Colors and odors of fulminating material are described. Admitting the odor of ozone during thunder storms, it is concluded that "pure" fulminating material has no odor. L. W. R.

Catalog of Swedish geological, paleontological, petrographic and mineralogical literature for 1924. F. E. ÅHLANDER. *Geol. För. Förh.* 47, 512-20(1925).—Continues with 144 titles the list described in C. A. 19, 2624. W. SEGERBLOM

Chemical transformations of kaolinite at high temperatures (ZHEMYATCHENSKI) 19. **Behavior of kaolin at high temperatures (ISKIUL)** 19. **The crystalline structure of chrysoberyl (BRAGG, BROWN)** 2. **Occurrence of S waters in the Gulf Coast of Texas and Louisiana, and their significance in locating new domes (HENNIGER)** 14. **Chemical relation of salt dome waters (MINOR)** 14. **Carbonization of coals (WHITE)** 21. **Ceramics and road materials in Canada (FRÉCHETTE, et al.)** 19. **Conversion of lignified plant matter into coal. III. Sugar formation as an intermediate stage of coal formation (SCHWALBE, SCHEPP)** 10.

BRAUNS, REINHARD: **Mineralogie**. 6th ed. revised. Berlin: de Gruyter & Co. 143 pp. R. M. 1.25.

FISCHER, HANNS: **Entstehung der Braunkohle**. 2nd ed. revised and enlarged by Fritz Plasche. Leipzig: R. Voigtländer. 80 pp. R. M. 3.

- HUMMEL, KARL: *Geschichte der Geologie*. Berlin: W. de Gruyter & Co. 123 pp. R. M. 7.50.
 SPIELMANN, PERCY EDWIN: *La genèse du pétrole*. Paris: Gaston Doin. x + 80 pp. Fr. 6. Reviewed in *Chimie et industrie* 15, 160(1926).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

The metal industry and its technical and scientific development in recent years. J. CZOCHRALSKI. *Z. Metallkunde* 18, 1-6, 43-50(1926). E. H.

A new regenerative muffle. ANON. *Metal Ind.* (London) 27, 74-5(1925). A muffle annealing furnace of regenerative type is described for which the combination of relative fuel efficiency of open-flame annealing with freedom from staining and over-heating of pot-annealing is claimed. Special methods for obtaining max. heat efficiency are mentioned. W. H. BOYNTON

The production and the available supplies of iron ore in Sweden. WALTER PERTERSSON. *Jernkontorets Annaler* 109, Supplementary issue, 7-18(1925).

The consumption of power in the Swedish iron industry and the prospects of development of the industry. TORSTEN HOLMGREN. *Jernkontorets Annaler* 109, Supplementary issue, 19-99(1925). C. A. ROBAK

Thermal regulation of a cupola furnace. E. PIWOWARSKY AND F. MEYER. *Stahl u. Eisen* 45, 1017-22(1925).—Systematic investigations were made on the thermal efficiency of an ordinary cupola with fore-hearth, in which the ratio of the total cross section of the tuyères to that of the smelting zone was 0.28. The temp. in the cupola at 5 points, the compn. of the waste gases and of the Fe and slag, and the heat balance were detd., both with const. coke charge and varying blast, and with const. blast but varying charges of coke. In the first case the output of Fe and the temps. of the Fe and slag fell as the quantity of air decreased, but the products of combustion and the thermal efficiency were little affected. In the second case increasing the quantity of coke charged diminished the output of Fe, the proportion of CO₂ to CO in the waste gases, and also the thermal efficiency, but the temps. of the Fe and slag rose. Excess of coke was more disadvantageous than a moderate deficiency or small excess of air. Diminution of the coke charged did not increase the waste of Fe if the proportion of charge coke did not fall below 7.5%. No connection was found between the mech. properties of the Fe and the quantity of charge coke or air blast used. B. C. A.

Blowing in, damping and blowing out blast furnaces. H. VON SCHWARZE. *Stahl u. Eisen* 45, 609-14(1925).—Newly built blast furnaces are generally dried by an air blast at 100° instead of by burning wood on the hearth. Furnaces are usually damped by charging a damping mixt. with lessened ore and increased coke content and contg. 5% of lime. The fire is put out as quickly as possible by quenching with water and the charge is afterwards dried in the furnace with a current of air. A new method of damping down by choking the furnace with gas is described. Pyrophoric C, produced by decompn. of the gas, was deposited in the furnace shaft where the brickwork was thin, and on access of air was rapidly oxidized, with such intense local heating that the deposits had to be quenched with water. The use of covering plates is being abandoned. As material for mending brickwork cracks, 3 parts by vol. of loam sand to 1 part of cement was used. Not many furnaces were scraped out after shutting down. Different methods of blowing in damped furnaces are described. The coke may be brought to ignition in the hearth by means of O, air, or petroleum. The hearth jacket must be carefully watched during damping, as cracks are liable to occur after shutting down and the quenching water should be allowed to stand in the hearth jacket as long as possible. Experience with furnaces melting special charges is given. In blowing out use was made of limestone, wet blast-furnace slag or ore. The temp. of the waste gases must be carefully watched to prevent damage to the filter-bags. B. C. A.

Production of cyanide in the blast-furnace process. H. BRAUNE. *Stahl u. Eisen* 45, 581-2(1925).—Swedish blast furnaces making Lancashire Fe and charged with a high proportion of ore yielded Fe of good quality at a slow rate of working, but above a certain rate of production the Fe became brittle and unsatisfactory. With slow working the reduction of the ore was completed above the tuyères, but at the faster rate the unreduced Fe compds. acted as catalysts in the formation of cyanides, which accounted for the brittleness of the Fe. The N content was 0.02%, compared with 0.003-0.005%.

in the former case. This formation of cyanide limits the size and rate of working of the Swedish charcoal blast furnace. An attempt to use the blast-furnace process for the production of KCN with grey Fe as a by-product was unsuccessful, as the unreduced Fe compds. did not come into the neighborhood of the tuyères. Similar catalytic formation of cyanides occurs in the converter process, *e. g.*, in underblown metal and in the open-hearth process if the slag is not carefully skimmed. B. C. A.

Scrap in blast-furnace burdens. F. BORMANN. *Stahl u. Eisen* 45, 2041-9, 2085-91 (1925); *Iron Age* 117, 481-2 (1926).—During the World War it became necessary to utilize scrap in blast furnace charges. Coke consumption is lowered about 30% and the output is increased about 60% by its use. The greater fuel value of the waste gases and the resulting larger excess of energy available are advantages. Disadvantages of using scrap include: the difficulty of loading and handling the scrap, greater loss of heat and use of cooling water, and changes in the compn. of the pig iron due to non-uniform scrap, and a lower total C in the pig iron. W. H. BOYNTON

The carbon-scrap process. G. L. SACHAROV. *Trans. Inst. Econ. Mineralogy and Petrography* (Russia) 1924, No. II, 1-53.—For the C-scrap process of steel making there are given the properties of carbonizers, the time period of charging the furnace, the duration of the smelting, the peculiarities accompanying the smelting, the bubbling period, conditions of removing the S from the Martin bath, deoxidation of steel, the character of the Mert system, and examples of charges. A good English summary is given at the end of the article. J. S. JOFFE

Desulfurization, degasification and deoxidation processes for high-grade cast iron. J. MEIJTENS. *Stahl u. Eisen* 45, 449-57 (1925), cf. C. A. 16, 2833.—The influence of limestone, fluorspar and increased Mn content as desulfurizing reagents is described. The expts. of Walter showed that salts of alkali and alk. earth metals have a favorable desulfurizing influence whether the Mn content is high or low and they could be applied without affecting the Si and C present. If such addns. are made to the ladle there is a difficulty in removing the slag, and different ladle designs for overcoming this difficulty are described. A later method involved the use of an Fe receiver, which was filled with slag-free Fe to which the desulfurizing addns. were made. Desulfurization was accompanied by degasification and deoxidation and it was found that low-S Fe could be made with a large amt. of scrap cast Fe in the charge. In later developments of the process a fixed forehearth (Rein-Durkopp) is used instead of a movable Fe receiver and a special overflow device (Luyken) to seal the forehearth from the furnace. Particulars of the upkeep and working of a desulfurizing installation are given and a table showing the mech. properties of cast irons before and after desulfurization. The decrease in S content amounts to 50-60%. Only a small increase in tensile and bending strength is shown, and a slight decrease in hardness, but the desulfurized Fe is more easily machined. Photomicrographs show no differences in structure of the Fe before and after desulfurization. The low-S Fe is suitable for castings sensitive to shrinkage strains, and the castings show greater resistance to wear. The desulfurized Fe has a diminished gas content. B. C. A.

Smelting secondary aluminum and aluminum alloys. III. Constitution and evaluation of high aluminum scraps. R. J. ANDERSON. *Metal Ind.* (N. Y.); 24, 63-5 (1926); cf. C. A. 19, 810. W. H. BOYNTON

Steel molding sands and their behavior under high temperature. A. L. CURTIS. *Engineering* 121, 216-8, 248-9 (1926).—See C. A. 19, 3466. E. H.

Converter for the calcination of low-grade calamines. E. F. PASELLA. *Rass. min. met. chim.* 64, 12-3 (1926).—A new type of converter is described, which is especially adapted to the calcination of low-grade Zn ores or ores in which Zn is only an accessory metal. The process is also applicable to the calcination of carbonates such as Fe carbonate, limestone and those used in cement manuf. For these purposes it is more economical than the Oxland or reverberatory type of furnace in that charcoal is intimately mixed with the ore and an agglomerated, more easily transportable product is obtained. The furnace is a bottomless truncated cone with steel walls 10 mm. thick, of 1.2 m. internal diam. at the top (orifice), 0.8 m. diam. at the bottom and 0.9 m. high. Much larger furnaces are, however, practicable. The base or grate is a movable steel plate with holes 4 mm. in diam. An artificial draft enters from below. The app. is pivoted so that when charged it is in unstable equil. and so can be easily tipped and discharged. It is charged at the top with a mixt. of finely divided ore and powdered wood charcoal (4-5% by wt. of the ore). Intimate mixing is indispensable. Coal or coke tends to form agglomerates, with unequal calcination. The grate is first covered with charcoal, the latter is ignited, the mixt. of ore and charcoal is added, the draft is turned on, the ore-charcoal mixt. is added progressively as combustion proceeds until the furnace

is full, at which time the operation is usually complete. A 3-h.-p. fan (supplying air at a pressure of 8–20 cm. of H_2O) is sufficient for 4 furnaces. Four hrs. are usually required to calcine 1200–1300 kg. of calamine.

C. C. DAVIS

Chemical stability of a number of metals and alloys, especially of those containing molybdenum. W. GUERTLER AND T. LIEPUS. *Z. Metallkunde* 17, 310–5(1925).—This is a preliminary investigation of the corrosion of heavy metals and their alloys by the common reagents (acids, bases, CO_2 + air, sea water, etc.). The results of the corrosion were noted after $\frac{1}{10}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4, 8, 16, 24 and 48 hrs. It was found that it is most difficult to obtain acid-proof alloys. A few quaternary alloys contg. Ni, Cr, Co and Mo and a ternary Ni-Cr-Mo alloy with 0.62% C resisted the action of HNO_3 fairly well, while a ternary Ni-Si-Mo alloy (90:3:7), a ternary Ni-Co-Mo alloy (10:31:56) and a ternary Co-Mn-Mo alloy (40:50:10) resisted the action of dilute HCl. A large number of alloys withstood the action of sea water quite well. The combined action of sea water and air was, however, not studied.

H. S. VAN KLOOSTER

Representation of recrystallization phenomena on the basis of grain growth by hot-work deformation. H. HANEMANN. *Z. Metallkunde* 17, 316–9(1925).—H. studied the grain growth of pure Cu at const. temp. (300°, 400°, 500°, 700° and 900°) as a function of the percentage deformation. The metal was elongated while hot and kept at const. temp. until the recrystn. was complete. It was then cooled and the grain size measured. The data obtained were plotted in a 3-dimensional diagram, the grain size vertically, and temp. of hot-work and percentage deformation at right angles in a horizontal plane. For small deformation no recrystn. took place. The max. amt. of deformation without recrystn. is the greater, the lower the temp. of hot-work. As soon as this limit is exceeded large values for the grain size are recorded. For still greater deformation H. finds that the grain sizes as a function of hot-work lie on hyperbolic curves. The curve representing the recrystn. as a function of the temp. is also hyperbolic and shows that the limit below which Cu cannot be recrystd. lies slightly above 200°. A number of conclusions are drawn from the diagram.

H. S. V. K.

Microscope and ultra-violet light. F. F. LUCAS. *Iron Age* 117, 555–7(1926).—The app. used for making photomicrographs by ultra-violet light is described and illustrated. The image of the specimen must be viewed and focused by means of a fluorescent screen. A Hg-vapor lamp is used for preliminary observation. A line from the Cd or Mg spectrum is used as the source of ultra-violet rays. Great exactness of focus is required but is difficult to attain. Failure to secure crit. illumination is also a frequent cause of poor results. Ultra-violet light has selective properties and is not absorbed in the same way as ordinary light by the steel constituents. Martensite needles may photograph either light or dark by ultra-violet light, and pearlite reflects it. The ultra-violet equipment is capable of giving superior results and of doubling the resolving power of the apochromatic system. (Note by abstractor: The results shown by the author, however, do not appear to be any better than those he has previously obtained with standard equipment.)

G. F. C.

Some attempts to measure the drawing properties of metals. WM. S. MONTGOMERY, JR. AND E. R. JENDERS. *J. Mech. Eng.* 48, 119–24(1926).—Samples of sheet-metal for drawing were tested by the scleroscope, Rockwell, Herbert pendulum, Erichsen, and metallographic methods, and the results were correlated with the actual drawing qualities as observed in manuf. A detailed discussion is given of 3 diff. ways of using the Herbert pendulum, which failed to give satisfactory evidence for judging drawing quality. The Erichsen test and photomicrographs were most reliable. Tests of indentation hardness both before and after deformation might be a good method.

G. F. C.

The tensile properties of metals at high temperatures. T. D. LYNCH, N. L. MOCHEL AND P. G. McVETRY. *Proc. Am. Soc. Testing Materials* 25, Pt. II, 5–26(1925).—The detn. of safe working stresses under high temp. conditions required long-time tests. Medium-C steel, 5% Ni steel, stainless Fe and cast Mn bronze were tested in tension at temps. up to 500°. The app. used for short and for long-time tests are described and illustrated. Stress-strain curves are shown, and the variations of the tensile properties with temp. are plotted. The short-time tests gave the following results: the elastic properties of the medium-C steel decreased with increasing temp., the ductility decreased to about 250° and then increased, and the tensile strength showed a min. at 100° and a max. at 275°; the Ni steel showed about the same results, with better ductility; the stainless Fe showed much less effect of temp. increase; the Mn bronze showed no change in elastic properties up to 260°, but a drop in tensile strength. The elongations of medium-C steel at 400° under stresses of 25,000 and 14,000 lb. per sq. in., resp., are plotted against time. Previous heat-treatment caused a lower final rate of extension. A

stress slightly lower than the proportional limit at a given temp. can be carried by medium-C steel indefinitely without continued extension. Mn bronze elongated more than steel in these long-time tests and showed no tendency to stop stretching at a stress 10% below the proportional limit at 260°. At a const. high temp. the stress varied linearly with the logarithm of the time to cause fracture. Medium-C steel stressed above the proportional limit for over 200 hrs. at 400°, and then tested at normal temp. showed decreased ductility, increased strength and elastic properties except the modulus which was not changed. The results were similar to those from cold-working and tempering and will be investigated further. G. F. C.

Fatigue of metals by direct stress. P. I. IRWIN. *Proc. Am. Soc. Testing Materials* 25, Pt. II, 53-65(1925).—Various objections to the bending type of fatigue test were overcome by using a magnetic machine producing direct tensile and compressive stresses alternating at 2000 cycles per min. with specimens carefully prepd. and held in ball-and-socket alignment seats specially designed to prevent bending stress, vibration, and non-axial loading. Extremely regular stress-cycle curves were obtained. The machine was calibrated by means of a standard bar, the strains being measured with a delicate optical app. Comparative results on four steels and Mn bronze showed that the endurance limit obtained by direct stress was the same as that obtained by flexural stress. In discussion, H. F. Moore stated that allowance should be made in practice for the failure to secure exact axial loading in most cases. G. F. C.

Some fatigue tests on non-ferrous metals. R. R. MOORE. *Proc. Am. Soc. Testing Materials* 25, Pt. II, 66-96(1925); cf. C. A. 19, 2629.—In the discussion McAdam claims that all non-ferrous metals show an endurance limit at from one to 100 million cycles, and that stress-cycle semi-logarithmic graphs that show no curvature are abnormal. "The endurance ratio does not decrease with cold working until the boundary between moderate and severe cold working has been passed." The variation of endurance limit with chem. compn. is shown by curves for alloys of Cu with Sn, Zn, Al and Ni. Moore questions the strength of McAdam's evidence for the existence of an endurance limit for Ni, Monel metal, and some other alloys, and claims that 600 million cycles are not too many for worth-while results. Templin quotes results showing that duralumin after testing at 8000 lbs. per sq. in. for two billion cycles was not impaired in tensile strength, proportional limit or elongation. G. F. C.

Typical static and fatigue tests on steel at elevated temperature. T. McLEAN JASPER. *Proc. Am. Soc. Testing Materials* 25, Pt. II, 27-52(1925); cf. C. A. 19, 2629.—In discussion, J. K. Wood explained the changes in properties of steel at high temp. by changes in the viscosity of the plastic or amorphous phase. H. J. French questioned Jasper's claim that working steel at a blue heat gave the best strengthening effect. The life of metal at high temp. is reduced more by sustained loading than by alternating stress, on account of flow or creep. Data on flow of 0.24% C steel at different temps. and stresses are presented by charts. The stress-strain relations at high temps. should receive more attention. V. T. Malcolm gave the results of long-time tensile tests of cast C and Cr-Ni steel and described the app. used. At 540° the latter will endure 11,000 lbs. per sq. in. for long periods without deformation. T. D. Lynch, N. L. Mochel and P. J. McVetty questioned Jasper's claim that little or no advantage is gained by heat-treating a steel to be used above the bluing temp., and suggested that it should read "above the drawing temp. given the steel." Jasper replied that stressing above the bluing temp. seemed to have about the same effect on steel as annealing. Short-time tests should be correlated with the very long-time tests so that the time required by the latter may be saved. In some instances the difference in results may be only a small percentage. G. F. C.

Fatigue failures in steel. F. W. ROWE. *Metal Ind.* (London) 28, 133-5(1926).—In 85% of all cases the endurance limit of steel is between 40 and 55% of its tensile strength. The endurance limit cannot be correlated with other properties. Sharp notches often cause failure irrespective of quality of metal. The addn. of metal to a machine part may weaken it if abrupt changes in section are produced thereby. Roughening of the surface reduces the fatigue range. G. F. C.

A process for the prevention of embrittlement in malleable cast iron. L. H. MARSHALL. *Trans. Am. Inst. Min. & Met. Eng.* Feb., 1926, 8 pp.(advance copy); *Iron Age* 117, 558-60(1926); cf. C. A. 19, 1679.—Normal malleable castings often become brittle after hot-dip galvanizing. The brittleness is caused, not by the preliminary pickling nor by the Zn but by heating to the galvanizing temp., 460° and rapid cooling. Quenching from 600° to 800° improved the impact value, while quenching from 300° to 550° spoiled it. By quenching from 650° before galvanizing, the galvanized malleable castings were prevented from becoming brittle at normal or abnormally low temp.

(-30°), at which even plain malleable castings become brittle. The app. used in the com. application of this process is described. G. F. C.

A study of the shrinkage process in white and gray cast iron. PETER BARDENHEUER AND CARL FBBEFELD. *Mitt. K.-W. Inst. Eisenforsch.* **6**, 45-60(1925); *Stahl u. Eisen* **45**, 825-34, 1022 7.—In continuation of the investigation by Wüst and Schitzkowski (*Mitt. K.-W. Inst. Eisenforsch.* **4**, 105-24(1923)) concerning the effect of foreign material on the shrinkage of iron, the authors have studied the process of shrinking in white and gray cast iron. The change in length of a test bar cast in a sand mold was measured by the automatically registered displacement of two cross wires, 8-10 mm. in diameter passing through the ends of the bar and held in a suitable frame. On plotting the shrinkage in percent against the time curves are obtained which show that there is an initial expansion during the eutectic solidification which must be ascribed to a sudden decrease in the gas solubility during solidification. Experiments on bars of Swedish pig iron showed a smaller expansion *in vacuo* than in air. Pig iron rich in Mn did not expand on solidifying *in vacuo*. There is a normal shrinkage down to where the solid solution changes to pearlite (pre-pearlitic shrinkage) when a retardation in shrinkage or even a slight expansion is noticed and thence another normal shrinkage (post-pearlitic shrinkage). The difference in total shrinkage (=sum of pre- and post-pearlitic shrinkage) for white cast iron (about 1.88%) and gray cast iron (av. 1.24%) is mainly due to the difference in pre-pearlitic shrinkage, the post-pearlitic shrinkage being practically the same for both. The authors have found that the pre-pearlitic shrinkage can be reduced at will (even down to zero) by raising the temperature of the sand mold, thereby reducing the rate of cooling, decreasing the hardness and increasing the quantity of separated graphite (flakes become thicker). An example is given where the cracking of a cast iron frame having a heavy cross beam was avoided by preheating the sand mold to 500° . Curves and tables are given demonstrating the effects of Si, Mn, P and S on the shrinkage of gray cast iron. Elements which favor the separation of secondary graphite, like Si, decrease, and those that hamper the graphite separation (Mn, S) increase the shrinkage. Phosphorus, up to 3% has little or no effect on the shrinkage.

H. S. VAN KLOOSTER
Phenomena of graphite formation in gray pig iron. E. PIWOWARSKY. *Stahl u. Eisen* **45**, 457-8(1925).—A peculiar fracture was observed in cast-iron rods of 20 mm diam. (total C 3.2%, graphite 3.15%, Si 3.1%) made from Swedish charcoal pig iron and cast at a low temp. (1250°) in dry sand molds. The fracture consisted of a bright outer zone and core with a dark intermediate annulus, the only constituents present being graphite and ferrite. The differences in color are attributed to the type of graphite formation. In the bright zones the graphite occurred as small nodules, crystg. directly from the molten metal. The sand mold was coated with graphite, which probably acted as nuclei for the formation of graphite in the Fe. The middle zone was subjected to undercooling and the crystn. velocity was greater, whereby the size of the graphite lamellae increased. The core was not undercooled and in addn. was subjected to tensile stresses set up by the solidified outer zone. Similar observations were made on a cast iron contg. total C 3.65%, graphite 3.49%, Si 2.86%, cast from a temp. only 75-100 above melting point. The middle zone contained some combined C and the structure showed that the graphite formation proceeded from well-marked centers with considerable velocity. B. C. V.

Dilatometric investigation of the A_3 and A_4 transformations in pure iron. SEI KICHI SATO. *Sci. Repts. Tohoku Imp. Univ.* **14**, 513-27(1925).—The question as to whether Fe will expand or contract at the A_4 transformation was investigated by means of a differential dilatometric couple of Fe and Co, heated in a C-ring elec. furnace. The difference in elongation between the 2 parts of the couple was measured by a mirror system. Electrolytic Fe contg. only 0.006% C and 0.006% S was used. Contraction on heating through the A_3 point was observed, and abnormal expansion at the A_4 point, equal to about $\frac{3}{10}$ the contraction at A_3 . The results are shown by tables and diagrams, where the thermal dilatation curve of delta-Fe appears to form a continuation of that of alpha-Fe. The lattice parameters of alpha and gamma Fe as detd. by X ray analysis are quoted in confirmation of the dilatometer measurements. G. F. C.

The determination of the heat of precipitation of cementite from alpha and beta martensites. MASUO KAWAKAMI. *Sci. Repts. Tohoku Imp. Univ.* **14**, 559-68(1925).—Since by dilatometric investigation of a slowly heated quenched steel contractions at 170° and 340° are observed, cementite must ppt. more easily from one kind of martensite than from another. The former is called alpha, and the latter beta martensite. Yamada has measured the total heat of pptn. of cementite from both kinds. With about the same calorimeter, but with a nitrate mixt. fusing at 180° as the thermostat liquid,

tests were made with quenched and with tempered specimens of the same steels. From plotted temp. observations the difference due to cementite pptn. from alpha martensite was detd. That only alpha and not beta martensite decomposed in these tests was checked by dilatometric examn. The method used is described in detail. Alpha and beta martensites are definite phases, although not quite stable. The heat of pptn. of cementite from alpha martensite increases proportionately to the C content, like that from alpha plus beta martensite. In eutectoid steel the former is 3.7 cal. per g; Yamada's value of 6.57 cal. for the latter is approx. confirmed. G. F. C.

The solidus line in the iron-carbon system. SEIJI KAWA. *Sci. Repts. Tohoku Imp. Univ.* **14**, 529-36(1925).—The Fe-C solidus line was detd. by the elec. resistance method, in a C-ring elec. furnace with coal-gas atm. The resistances of specimens 0.5 cm. in diam. were measured over lengths of 5 cm. The expts. were made during heating at a rate of 150° per hr. and results from decarburized specimens were rejected. The soly. line of cementite into austenite was detd. by the same method in a nichrome furnace, during cooling after heating to complete soln. of the carbide. The results are tabulated and plotted on charts. The solidus line was found between that of Carpenter and Keeling and that of Gustowsky. G. F. C.

The rapid determination of structural or constitutional analysis. J. E. FLETCHER AND J. G. PEARCE. *Bull. Brit. Cast Iron Research Inst.* No. **11**, 17-20(1926).—A simple method for computing the structural compn. of cast Fe by wt from the chem. analysis is described and illustrated. The method involves the use of graphs, which are given. The phosphide eutectic contains 6.9% P and 1.9% C. Pearlite contains 13.5% Mn and Fe carbides. The microscope reveals the structural compn. by vol. G. F. C.

The limit of malleability of steel in the hot state as a function of its carbon content. E. COTEL. *Rev. universelle mines* [7], **9**, 27-9(1926).—The limiting % of C in steel which is malleable when hot has not been definitely established and moreover this value is different for rolling and for forging. It is probable that this limit for rolling is 0.95-1.0% C, i. e., when the structure is pearlitic alone. When hot the malleability of steels with C above 1% is very low and at 1.7% C it becomes inappreciable. A diagram with the % C abscissa and the temp. as ordinate is developed to show the field of practical malleability. The extreme limit for forging corresponds to 1.3% C or at the very most to 1.4%. Consequently Fe-C alloys from 1.3 to 1.4% C to 2.2% are neither steels nor cast Fe, but rather metals which are to be regarded as semi-steels. C. C. DAVIS

Study of the fragility of cold-rolled steel. GEORGES DELBART. *Compt. rend.* **182**, 131-3(1926); cf. *C. A.* **19**, 2015, 3244.—The resistance to shock, by the pendulum method, of notched bars of cold-rolled and annealed steels is given. Four steels are considered, analyzing C 0.115-0.48, Si 0.056-0.178, S 0.020-0.027, P 0.020-0.034 and Mn 0.50-0.78%. Annealing is done at successive 100° intervals up to 1000° and values for resistances at the various temps. are given. In the steels annealed below 700°, coarsened cementite is present; between 700° and 850° a mixt. of sorbite and globular pearlite is evident; and above 850° only sorbitic pearlite obtains. A max. of resistance results by rolling and annealing quickly to 700°. P. B. PLACE

Effect of the range of working temperature on the selection of steels for airplane motor valves. CHARLES GRARD. *Compt. rend.* **181**, 1143-5(1925).—On "forcing" the motor the exhaust valves are heated to about 900°, but the power developed per l. of gasoline is increased, with possibility of reducing the wt. of the engine per h. p. The valve-metal working under these conditions should be reversible (no transformation point in the range of working temps.), light, resistant to corrosion by the exhaust gases, and have a high resistance to shock and sufficient resiliency and hardness. G. found the most satisfactory steel to be one with C 0.4, Si 2.5 Cr 12%, which, after air-hardening at 1200° and tempering at 900°, had the following properties: Ac over 900°; d. 7.8; tensile strength (cold) \leq 92 kg./mm.²; elongation (cold) \leq 12%; resiliency (cold) \leq 4; Brinell hardness, cold 280, at 900° slightly less than 40 (slightly increased by addn. of 1.5% W). Valves made from this metal mounted on a 450-h. p. Lorraine motor stood at 50-hrs. endurance test and at the end had the same polish and texture as before the test. A. PAPINEAU-COUTURE

The behavior under stress of the iron crystals in steel. I and II. H. H. LESTER AND R. H. ABORN. *Army Ordnance* **6**, 120-7, 200-7(1925).—Information was sought regarding the stress and strain values in the crystals of steel under tension below and above the yield point and the effect of C content and heat treatment on those values. The conclusions were that individual crystals do not indicate the values of any of the elastic properties of the aggregate on account of irregularities in the elastic region due to strain recoveries and stepped slip; the individual Fe crystals take up the elastic loads

and may be under less stress and strain after plastic deformation, when the stress is carried in part by disorganized, imperfectly elastic material due to block slip; sorbite contains C in soln. in α Fe as a mol. dispersion of Fe carbide, causing distortion of the crystals, and increased slip resistance; sorbite also has a low crystal modulus and, therefore, less susceptibility to cracking. "Steel owes its strength to the nature of the bonding, the mutual interference between adjacent crystals, the effect of distorted crystal planes due to dissolved carbide, the effect of disorganized material formed during plastic deformation, and other effects." The proportional limit is the stress at which stepped slip begins to merge into block slip, while at the yield point block slip is predominant. The materials used were blued shim stock 0.003 in. thick, of 1.13% C annealed shim stock of 1.03% C; and steel ribbon of 0.15% C. The methods used for obtaining stress-strain curves are described. The theory and practice of X-ray test as applied in this work are discussed in detail. X-ray spectra of stressed and unstressed specimens of the same material were obtained at the same time on adjacent films. The delicate app. for stressing these specimens is described and illustrated. The spacings of the spectra lines on the films were measured repeatedly at different times to insure accuracy. Part II gives the results of tests and measurements in tables and diagrams.

G. F. C.

Effect of temperature on the behavior of iron and steel in the notched-bar impact test. R. H. GREAVES AND J. A. JONES. *J. Iron. Steel Inst.* (advance proof), Sept. 1925, 40 pp.; cf. *C. A.* 20, 567. G and J. studied the effect of temp. on the behavior of Swedish bar Fe, Armeo Fe, straight steels (0.13–0.52% C) and alloy steels (Ni-, Ni-Cr-, Ni-Cr-Mo-, and Cr-V-steels) in the notched-bar impact test. They also investigated the influence of the forms of the test pieces on the impact figures and compared the results of impact and of slow-bending tests. Load-extension expts. were performed at different temps., showing the effect of the rate of straining. The main results are represented in a number of diagrams. The general character of the impact figure-temp. curves is the same for all materials: a first max. occurs at temps. between -20° and 250° depending on the kind of ferrous alloy, the form of the test piece and of the notch, and the amt. of previous cold work. This max. is followed by a min. between 500° for Armeo Fe and 650° for some heat-treated alloy steels. Finally a second max. appears between 650° and 800° . For pure Fe this second max. is much lower than the first but medium-C steels and alloy steels give exceedingly high impact figures in this range.

H. S. VAN KLOOSTER

The Widmannstätten structure in iron-carbon and iron-nickel alloys and in meteorites. TUTO M KASÉ. *Sci. Repts. Tohoku Imp. Univ.* 14, 537–58 (1925).—The conclusions of others as to the origin of Widmannstätten structure are briefly reviewed. K. investigated its production in steel and its origin in meteorites. Steel showed this structure when heated above 1000° and cooled in air but not when quenched or slowly cooled. The Osmond-Koozeboom Fe-Ni equal. diagram is untenable, and has been corrected by K. Fe-Ni alloys show Widmannstätten structure from the presence of 2 solid solns. after quenching from above the A_{c3} point. Chem. analyses of the constituents of meteorites showed that tenite contains varying amts. of Ni and more phosphide than camacite. The Ni content of tenite probably depends on the P content, and is normally about 27% at room temp. Magnetic tests indicated that a meteorite contained 2 phases of about 7% and 25% Ni, resp., and these tests did not show the presence of a sep. P compd. Dilatometer tests showed that the tenite did not contain 30% Ni. Scleroscope hardness tests gave irregular results, averaging about the same for camacite and tenite. The microstructure of a meteorite after various heat-treatments showed that after annealing at a high temp., rapid cooling gave the Widmannstätten structure, while slow cooling gave a homogeneous solid soln.; and the Neumann bands were removed by annealing at 560° . P and C are not favorable to the formation of Widmannstätten structure; Mn, Cr and S were also found unfavorable, while Co and generally Cu were not unfavorable. Long exposure to a very high temp. and subsequent rapid cooling produces this structure in meteorites and Fe-Ni alloys. Photomicrographs illustrate the structures observed.

G. F. C.

Season cracking in small-arms ammunition. N. H. MURDZA. *Army Ordnance* 6, 269–72 (1926).—Since the War, a loss of \$7,000,000 or more has resulted from season cracking of small-arms ammunition. The hypotheses that have been advanced to account for season cracking are briefly discussed. The cause may be either mech. or chem. Internal stress in a cartridge case is desirable, and only partial annealing of the neck is permissible. Tests for a stressed condition are metallographic, Hg acceleration, baby Brinell, or taper-tool. An outdoor weathering test for corrosion effects is mentioned. Season cracking did not occur in one lot of old ammunition which was protected from

corrosion by an identifying stain and lacquer. Some Russian cases had been annealed too much so that the bullets were not held properly. Although season-cracking was prevented, 60% of this ammunition was useless. Thicker-walled cartridge cases are desirable, and new rifle designs should allow such a change to be made. G. F. C.

Origin of quenching cracks. HOWARD SCOTT. *Bur. Standards, Sci. Papers* 20, No. 513, 399-444 (1925).—In the investigation of gage steels it was found that certain samples cracked when quenched in oil, but not when quenched in water. A brief review of previous literature is given, but an explanation was not found there. With solid cylinders of an oil-hardening steel contg. 0.9% C, 1.2% Mn, 0.2% Si, 0.5% Cr, and 0.5% W, on continuous quenching with agitation, deep-seated cracks not associated with sharp changes of contour were caused by tangential stress, which was tensional at the surface, and they did not develop to visual size until after the specimens reached ordinary temps. throughout. Cracks occurred only on oil-quenching of cylinders between $\frac{3}{4}$ and $1\frac{1}{2}$ in. in diam., and only on water-quenching for diams. between $\frac{1}{4}$ and $\frac{1}{2}$ in., because under other conditions the surface stresses were compressional. The rare cracks occurring when the surface is in compression start at the center, where the stress is tensional. Permanent tensional stress at the surface is generated in cooling only when the steel is plastically deformed while the coeff. of expansion is negative. An instrument for measuring expansion on air-cooling after quenching is described, and tests of deep-hardening steels with it showed that the transformation Ar_2 occurring at a low temp. is accompanied by an expansion, first linear while the steel is still plastic, and later decreasing. A theoretical study of the stresses developed in terms of the temp. drop or difference between center and surface, at the temp. of effective elasticity of the surface, showed that the surface stress increases, with the temp. drop, to a max. in tension, then passes through zero to a high value in compression, also that under certain conditions the tensional stress is proportional to the linear expansion during Ar_2 , and to the temp. drop. To avoid quenching cracks in pieces of simple shape either a much more rapid quenching medium should be used, or the cooling through the hardening transformation should be retarded by the use of hot oil. The tendency to crack can also be reduced by increasing the alloy content of the steel, or in high-C steel by raising the quenching temp., so as to lower Ar_2 until it is barely completed at ordinary temp. Cracks from temporary tensile stress at the surface may be caused by rapid cooling below Ar_2 and such cooling should be avoided for steels where Ar_2 is high. Similar cracks may also be caused by differential tempering on fast heating of quenched steel. To minimize grinding cracks, hardened tool-steel should be tempered around 150-80°, where a max. contraction occurs, before grinding. G. F. C.

Quenching liquids. J. HÉBERT. *Tech. moderne* 18, 65-71 (1926).—Discussion of the effects of the temp. and compn. of the quenching liquid on the hardness of steels. On quenching in water, increase in temp. up to 30-40° does not affect the hardness; from 30-40° up to 90° the hardness decreases with increase in temp., and from 90° to 100° there is no change. The following solns. give greater hardness than pure water. NaCl (max. at 150 g. per l.), H_2SO_4 (max. at 30 cc. per l.), $K_4Fe(CN)_6$ (effect begins only above 5 g. per l.), Na_2CO_3 (only up to 50 g. per l. with max. at 25 g. per l.), NaOH (effect begins only above 20 g. per l.), NH_4Cl (only up to 150 g. per l. with max. at 50 g. per l.), HCl (only slight increase in hardness, with max. at 50 g. per l.). Addns. of $Ca(OH)_2$, soap and gum arabic decrease the hardness. A. PAPINEAU-COUTURE

Tests on steel poles. ANON. *J. Elec.* 56, 137-43 (1926).—A report on an elaborate test on design, quality of steel, mech. properties, etc. C. G. F.

Changes of length of carbon steels. L. E. DAWKE. *Stahl u. Eisen* 45, 786-8 (1925).—The change of length during slow heating and cooling of a series of C steels contg. 0.06 to 0.75% C was detd. The contraction occurring on heating at 720° diminished with increasing C, but very slowly above the eutectic point. The change is made up of 2 opposing influences, viz., contraction due to the α to γ Fe transition and expansion due to the soln. of pearlitic cementite. In hypereutectic steels the expansion due to the soln. of free cementite increases proportionately to the C content. In the cooling curves the end of the γ to α Fe dilatation is marked by a "hook" for steels contg. more than 0.1% C, which increases with the C content and is due to the delayed formation of pearlite. Curves obtained on tempering steels hardened at 900° and 1100° showed that the increase in vol. on hardening rapidly diminished on tempering. Test-pieces contg. more than 0.25% C hardened at 1100° showed 2 inflections in the tempering curves which were more marked as the C increased. Hypereutectic steels quenched at 1100° showed an expansion at 300° which increased with the C percentage. Four test-pieces contg. 1.7% C were quenched at 900°, 1000°, 1100° and 1200°, resp. The dilatation at 300° increased with rising temp. and the structure was increasingly austenitic.

The expansion at 300° is, therefore, connected with the γ to α iron transformation accompanied by the formation of martensite and agrees with the density curves of Maurel (*C. A.* 4, 1975) and the hardness curves for steels contg. austenite showing a max. at 300–400°.

B. C. A.

Primary etching (of steel). P. OBERHOFFER. *Stahl u. Eisen* 45, 223–4 (1925). Etching expts. were made on Thomas rail steel cast into 100 × 100 mm. section and rolled to 20 mm. square. The cold-forged material showed a clear primary banded structure and the hot-forged specimens an indistinct structure. On annealing the cold-forged steel for 3 hrs. and cooling in air, the structure became indistinct and, on heating the hot-forged steel for a short time above A_{c3} and cooling in air, the structure became clear and more so on quenching from the same temperature. Both the hot-forged and the cold-forged steel after annealing at 900° and cooling in air showed the same primary banded structure. Conclusion: The appearance of clear and indistinct primary banded structure in medium hard steel is conditioned by the form of the secondary structure and depends on the total effect of the primary etching medium in showing up the differences of concn. within the mixed crystals and secondarily in distinguishing between ferrite and pearlite. If the secondary structure is smaller or equal to the primary band width, the structure is clear, if greater, the structure is indistinct. The secondary grain structure is more rapidly increased by high temp. than the primary.

B. C. A.

High-speed steel, its physico-chemical nature and technical properties. G. Z. NESSELSTRAUSS. *Ann. Inst. Phys.-Chem. Anal. Leningrad* 2, 484 (1924).—Investigation of the microstructure and thermal transformations in chrome-W steel contg. 0.4% C, 4% Cr, and 19.5% W renders apparent a rough parallelism between the processes occurring in the steel on cooling and heating, and the transformations taking place in the hypereutectic steel on disturbance of its physico-chem. properties. The most active constituent of high-speed steel is the C, in spite of its small proportion; the presence of Cr increases the soly. of the C in the Fe. The role of the W is to raise the temp. at which the austenite is converted into martensite and thus cause the so-called secondary hardness, which is found to an unimportant degree in ordinary C steel. By suitable thermal treatment it is possible to impart to high-speed steel a very fine and uniform structure free from brittleness, the metal being then unsuitable for the manuf. of high-speed tools.

B. C. A.

Chrome steel for permanent magnets. P. OBERHOFFER AND O. ERMICKE. *Stahl u. Eisen* 45, 537–40 (1925).—Cr steel of the compn.: 1% C, 1.6–2% Cr, 0.25% Mn, 0.15% Si, is used largely in Germany for permanent magnets in place of the more expensive W steel. The metal is usually cast in 220-kg. ingots, which are cleaner, less porous and less segregated than 100-kg. ingots. Annealing at 1150–1200° for 20 hrs. completely equalizes the compn. and structure without affecting in any way the magnetic properties. The ingots are heated to 940–1150° during 30–60 min. for rolling into bars, which are then hardened at the required temp., quenched and tempered. The magnetic properties increase to a max. with rise of hardening temp. and then decrease; the height of the max. depends on the time of heating, quenching temp. and rapidity of quenching. The remanence increases and the coercivity decreases as the temp. of the subsequent tempering is raised, especially between 250° and 350°, corresponding with ptn. of carbide and the development of a troostitic structure. Mech. work produces alterations in the magnetic properties which do not seem to follow any definite law.

B. C. A.

The magnetic properties of nickel steels. J. WULFSCHMIDT. *Krupp. Monatsch.* 6, 228–32 (1925). cf. *C. A.* 19, 3464.—Curves for the variation of magnetization of Ni steels with the Ni content at room temp. as detd. by 4 methods are given and compared. In most cases previous results are confirmed.

C. J. BROCKMAN

Permax, a new ferro-nickel having remarkable magnetic properties—comparison with permalloy. H. TSCHERNING. *J. phys. radium* 6, 300–4 (1925).—The magnetic behavior of a specimen of the new Fe-Ni alloy, Permax, was compared with that of a specimen of Permalloy, by the fluxmeter method. Permax was found to have very low hysteresis at high fields but high hysteresis at low fields. The permeability is high for a field of 1 gauss and the “knee” in the curve occurs at about 2 gauss. At higher fields the permeability is moderate. At low fields there is a very marked “magnetic viscosity.” Permax lacks the remarkable properties of Permalloy.

W. W. S.

The properties and testing of magnetic materials. X. Effects of heat treatment. T. SPOONER. *Elec. J.* 23, 24–9 (1926); cf. *C. A.* 19, 2799.—Curves and tables show the effects of heat treatment upon the magnetic properties of steel. The coercive force, max. permeability and resistivity line up well with the rate of cooling, but the residual induction does not. Certain alloying elements added to C steels have decided effects.

Mn, Ni, Cr, etc., do not essentially alter the transformations referred to but simply slow them up. Irreversible high-temp. magnetic effects are summarized. These elements not only slow up these transformations but reduce the permeability and raise the coercive force for a given C content. Time is as important as temp. in heat treatment. It is necessary to study the effect of heat treatment on the particular size and shape. A brief bibliography is appended.

W. H. BOYNTON

The properties and testing of magnetic materials: Effect of temperature. T. SPOONER. *Elec. J.* **23**, 79-83(1926); cf. *C. A.* **20**, 896

C. G. F.

The relation between the equilibrium diagram and the magnetic susceptibility in binary alloys. HIKOZÔ ENDÔ. *Sci. Repts. Tohoku Imp. Univ.* **14**, 479-512(1925).—The Weiss electromagnetic method of testing was used to det. the relation between magnetic susceptibility and the concn. of binary alloys with more complicated equil. diagrams than the systems investigated previously. The app. used is described and illustrated. The microstructures, elec. resistances and thermal crit. points of some systems were also examd. The magnetic susceptibility-concn. curve for the Cu-Sn system agrees with the Ishihara diagram, except that Cu_3Sn is shown to dissolve 2% Cu. In the Zn-Sn system no soly. of Zn in solid Sn was shown. For a mixt. of 2 constituents the curve becomes straight, while for a solid soln. it is a curved line. The Bi-Sn system was studied by several methods and all agreed in showing solid soly. of 16% Bi in Sn, and of 0.9% Sn in Bi. The Cu-Zn diagram of Imai was confirmed, 3 compds., Cu_2Zn_3 , CuZn_2 and CuZn_4 , being found. The Pb-Tl diagram of Lewkonja was confirmed. The Bi-Pb diagram of Barlow was confirmed except that only 4% Pb was found to be sol in solid Bi. The Sb-Sn diagram of Williams, the Sb-Cu diagram of Reinmann and the Bi-Zn diagram of Arnemann, etc., were all confirmed. In the Sb-Pb system a soly. of 5% Pb in Sb at 250° was found by several methods, but no solid soly. of Sb in Pb. The eutectic contains 12.5% Sb and no compd. is formed. The Bi-Te diagram of Monkenmeyer was confirmed by all the methods of investigation, a compd. Bi_2Te_3 being formed, in which both Bi and Te are slightly sol. The magnetic method did not confirm the complete solid soly. of Cu and Mn as shown by the equil. diagram of the Cu-Mn system.

G. F. C.

Recent advances in the manufacture of ferromagnetic materials. E. GUMLICH. *tech. Physik* **6**, 670-82(1925).—A review dealing with the magnetic properties of com. Fe, electrolytic Fe, various ferrous alloys (contg. Si, Al, Mn, Co, Ni and C) and the so-called Heusler alloys.

H. S. V. K.

The microstructure of aluminum-iron alloys of high purity. F. H. DIX, JR. *Proc. Am. Soc. Testing Materials* **25**, Pt. II, 120-36(1925); cf. *C. A.* **19**, 2803.—In the discussion by McAdam and Dix it was stated that the term "eutectic" was loosely used to describe a kind of structure rather than a definite alloy. Coalescence of the constituents of the Al-FeAl₃ eutectic is favored by the presence in it of 25 times as much Al as FeAl₃. Surfusion gave eutectic structures in alloys not of eutectic compn. and also caused the presence of Al crystals in hyper-eutectic alloys, because of the slight inclination of the line representing the sepn. of Al on the equil. diagram and the steep slope of the similar line for FeAl₃. Surfusion has a similar effect on the eutectic in the Al-Si system. High pouring temp. as well as rapid chilling gave fine eutectic structures with Fe contents above the slowly cooled eutectic compn.

G. F. C.

Transformations of certain aluminum alloys under the effects of deformations. LÉON GUILLET. *Rev. métal.* **23**, 48-52(1926).—Deformation after hardening favors transformations in duralumin, while it apparently has no effect on hardened Al-Cu-Mn alloy (Cu 5.40, Mn 1%). Study of the resistivity does not shed any light on the transformations of these light alloys.

A. PAPINEAU-COUTURE

Study of the system aluminum-zinc. O. TIEDEMANN. *Z. Metallkunde* **18**, 18-21(1926).—Alloys of Al and Zn with Zn ranging from 0 to 20% in increments of 2.5% were studied with respect to strength and elongation after heat treatment and subsequent quenching. Each series was heat treated at 240°, 300°, 350°, 400°, 450° and 500° and detns. were made with immediate quenching and with quenching after 6 weeks. Curves are shown for each temp., strength and elongation being plotted against % Zn, as well as differences in these characteristics with immediate quenching or quenching after 6 weeks. These curves and an equil. diagram are discussed in detail. New equil. relations are found at 275° with 6% Zn.

H. STOERTZ

Hardening of light aluminum-copper alloys containing over 5% of copper. • LÉON GUILLET AND JEAN GALIBOURG. *Compt. rend.* **181**, 1107-8(1925).—Brinell hardness and elec. resistivity for alloys contg. 7-45% Cu, after various heat treatments are tabulated, showing that: quenching and tempering considerably affect the hardness of the alloy, which can often be doubled by the optimum treatment; the resistivity is increased by

quenching and in many cases also by tempering. The latter fact, already observed in the case of duralumin, is abnormal. Micrographic examn. showed that the phenomena are similar to those occurring in duralumin after similar treatment. Accidents occurring with internal-combustion-engine pistons (Cu 12-3%, Al 88-97%) were considerably reduced by quenching at 475° and tempering for 1 hr. at 250°. The investigation furnishes an excellent example of a class of alloys which can be hardened by quenching though they show no transformation point.

A. PAPINEAU-COUTURE

Impact tests according to Schüller-Moser and the impact resistance of a few brasses, copper and aluminum at low and high temperatures. F. SAUERWALD AND H. WIELAND. *Z. Metallkunde* 17, 358-64, 392-9(1925).—This is a study of impact tests on non-ferrous metals and alloys. The total work expended in fracturing a sample is made up of the work required to overcome the elastic resistance of the sample and the hammer, the work required to produce the plastic deformation which takes place in the test piece, and the work involved in overcoming the cohesion of the smallest cross section of the material. The size of the test piece, the wt. of the hammer, the angle of its cutting edge and the method of detg. the vol. of the deformed section are discussed at length. The deformed area can be brought out more plainly by etching and polishing, grinding with emery or coating with shellac. Photographs are shown. The complete impact test involves the detn. of S , the work done by the hammer, S_0 , the work done by the hammer divided by the area of cross section of the test piece; V the vol. of metal flow produced by the blows of the hammer, and S_v , the work done by the hammer divided by V . Brass contg. 58, 63, and 72% Cu is studied, as well as Al and Cu. Curves are plotted showing the variation of impact resistance with diam. of sample, and with variations of temp.

H. STOERTZ

Annealing, quenching and tempering of a few commercial nickel brasses. F. M. OSTROGA. *Rcv. métal.* 22, 776-86(1925).—Three types of brasses: Cu 50.42, 44.70, 39.65; Ni 6.25, 10.34, 14.75; Pb 0.17, 0.21, 0.17, Zn 42.90, 44.10, 45.20%, resp., were investigated by means of the Chévenard differential dilatometer (C. A. 11, 2743), by the Brinell hardness tester and micrographically. By quenching, with or without tempering, it is always possible to harden the metal, as compared with its annealed condition. This hardening is attributable to a structural change and is more pronounced the finer the structure. Quenching gives either the state that is stable at high temps. or the $\alpha + \beta$ state. No martensitic state could be detected after any of the treatments applied. The dilatometric curves are normal. The derived cooling curve shows 2 breaks, the corresponding points of which are generally found on the heating curve as well.

A. PAPINEAU-COUTURE

A study of phosphor bronzes based on thermal investigations of copper-phosphor-tin alloys. L. C. GLASER AND H. J. SEEMANN. *Z. tech. Physik* 7, 42-6(1926).—The authors studied a small part of the Cu-P-Sn diagram contg. the technically important phosphor bronzes. The alloys were made up with pure electrolytic Cu and Sn, and a Cu-P alloy with 15.4% P. A ternary eutectic (80.7% Cu, 4.5% P and 14.8% Sn) is formed at 628°.

H. S. v. K.

Amalgams of gold and mercury. G. T. BRITTON AND J. W. MCBAIN. *J. Am. Chem. Soc.* 48, 593-8(1926).—The system Au-Hg was carefully redetd. for concns. from 0 to 55% Au by analysis of the liquid in contact with the solid phase at temps. up to 410°. The soly. of Au in Hg at room temp. is only 0.2%. The liquidus reaches a max. for 14.6% Au at 342°, indicating the existence of a compd. AuHg₄. A eutectic occurs at a concn. of 22% Au and 320°.

H. S. VAN KLOOSTER

Antifrictional (bearing) alloys, their composition, properties and testing. A. K. ZAITZEV. *J. Russ. Met. Soc.* 1925, Pt. I, 304-58.—Various types of babbitts were tested and analyzed. The results show the possibility of a rational choice of babbitts for practical purposes. An accurate and rapid method for a mechanical test of the materials subject to friction has been worked out. The article is accompanied by a series of tables, charts and drawings.

J. S. JOFFE

Mechanical properties of zinc. G. SACHS. *Z. Metallkunde* 17, 187-93(1925). The hardness, tensile strength, ductility and pliability of Zn at ordinary temps. and at the temp. of liquid air have been detd. after varying mech. and heat treatments. The hardness and tensile strength increase at both temps. with the severity of the rolling. With a slow speed of rolling the sheets are stronger before annealing than after, but with a rapid rate of rolling the annealed sheets are stronger. At -180° the strength of the cold-rolled sheets increases with the rapidity of rolling, whereas that of the subsequently annealed sheets remains const. Strips cut parallel to the direction of rolling are more pliable but have a lower tensile strength than those cut perpendicular to this direction, and this difference is not completely removed by annealing. The tensile strength and

structure of cold-rolled Zn are not affected by aging at the ordinary temp., but aging for 30 min. at 50° results in an increase of tensile strength, ductility and pliability. Heating for short periods at higher temps. results in a slow decrease in the values for the tensile properties and at 350° an extremely rapid fall takes place, and the metal becomes very coarsely cryst. Primary recrystn. commences at 50°, at which temp. the irregular structure of cold-rolled Zn slowly changed to a finely cryst. polyhedral structure. Secondary recrystn. progresses rapidly at about 350° until the whole of the metal is converted into large hexagonal crystals. B. C. A.

Tantalum, tungsten and molybdenum. E. W. ENGLE. *Trans. Am. Inst. Min. Met. Eng.* Mar., 1925 (advance copy), 18 pp.—The phys. properties of Ta, W and Mo are compared with those of Pt, Ni, and Cu, and an account is given of the chief uses of the metals. Ta has a much greater elec. resistance but a smaller temp. coeff. than Mo or W, and is also much softer, its Brinell hardness being only 46 compared with 290 for W and 147 for Mo. W may be readily filed and ground, but cannot be machined easily, whereas both the other metals are readily machinable. Mo is by far the most volatile of the 3 metals and has the greatest tendency to recrystallize on heating. Mo is very resistant to corrosion by HCl, but is markedly attacked by some of the weaker org. acids, while Ta is attacked only by HF. Mo wire wound on a zirconia refractory makes a satisfactory elec. furnace for temps. up to 2000°, providing that an atm. of H is maintained around the heating coil. Ta finds application as an electrode in an electrolytic valve rectifier, a lead sheet being used as the other electrode and "accumulator acid" contg. 1% of FeSO₄ as electrolyte, and also, on account of its great affinity for O, H, and N, as an absorbing medium for the last traces of gas in radio tubes. The presence of more than 0.05% C in Ta may be detected microscopically by the formation of black patches between the crystal grains, such metal may be rolled into sheets, but these are usually brittle and show seams on the surface. A bath contg. 3 lb. of NiSO₄, 6 oz. of MgSO₄ and 4 oz. of boric acid per gal. showed that an adhesion equal to 27 tons per sq. in. could be obtained. There appeared to be a certain amt. of growth of the Fe crystals by the deposition of Ni as well as a keying action of the Ni into the pickled base, but the strength of the joints must be ascribed primarily to actual cohesion between the crystals of the 2 metals. B. C. A.

Action of "hot wall": a factor of fundamental influence on the rapid corrosion of water tubes and related to the segregation in hot metals. C. BENEDICKS. *Trans. Am. Inst. Min. Met. Eng.* Feb., 1925 (advance copy), 30 pp.—Although it is known that dissolved air in water has a serious corrosive effect on water tubes, it is not conceded that the gradual liberation of air from water or the presence of entangled air can account for localized corrosion of, e. g., boiler tubes, and to account for this a condition designated as "hot wall" is introduced. Hot wall is a condition converse to that produced by permitting a gas contg. a vapor to come into contact with a cold object on which part of the vapor will be condensed if the plate is below the dew point. Thus if a liquid (water) contg. a gas (air) comes into contact with a hot plate, a new gaseous phase is produced and bubbles of gas sep. on to the plate. This is supposed to occur in boiler tubes, and the gas bubble being non-conductive causes a hot spot on the tube, and any chemically corrosive action which may be proceeding more or less slowly will be accelerated by the rise in temp. This view may explain the localized corrosion which occurs when different metals are used in construction. The remedy is to remove dissolved air prior to the contact of water with metal tubes. Exptl. data have been obtained by passing water at detd. velocity over heated nichrome strips. The action of the hot wall is a special case only of the spontaneous concn. differences that may occur in a primarily homogeneous soln. when subjected to locally different temps. (Ludwig-Soret action), and the application of this phenomenon to segregation in molten alloys is considered. B. C. A.

The action of water containing ammonia on pipes and boiler plates. M. TILGNER. *Chem.-Ztg.* 50, 48(1926).—Water contg. 8–15 mg. NH₃/l. showed a strong corrosive action, other conditions of use and H₂O compn. begin normal. W. B. P.

The behavior of iron, bronze and brass in solutions of the salts and salt mixtures contained in waste liquors from the potash manufacture at ordinary temperature and at temperatures and pressures prevailing in steam boilers. O. BAUER, O. VOGEL and K. ZEPF. *Mitt. Materialprüfungsamt Kaiser Wilhelm Inst. Metallforschung* 1925, No. 1, 62 pp.—A systematic detn. of iron, bronze and brass corrosion in resting and moving solns. of MgCl₂, NaCl, MgSO₄, Na₂SO₄, CaCl₂, various mixts. of these, in potash waste liquors, in various river waters and in distd. water. A number of tables are given including the exact data for salt concns. used, analysis of the potash waste liquor and the corrosion results obtained over a period of 30 days. The following conclusions are

drawn: Bronze and brass are only slightly attacked by the salts and waters. Mg salts at ordinary temp in a concn. corresponding to 112-9 German degrees of hardness are not dangerous to iron. Mg salts in the feed water to the steam boiler must be regarded as a danger, increasingly so with the concn. The explanation of this is given in the hydrolytic decompn. of Mg salts at high temp. and pressure, producing the effects of acid.

D. THURSEN

Production of oxide films on copper at ordinary temperature. U. R. EVANS. *J. Chem. Soc.* 127, 2484-91(1925), cf. *C. A.* 19, 1398.—E. gives a detailed description of his method for producing oxide films on thin Cu-foil by aerated electrolysis in 0.1 N NaOH soln. The expts. were carried out in open vessels and also in vessels enclosed in glass bell-jars placed in a thermostat. The latter arrangement permitted evacuation and regulated admission of purified air at the bottom of the cathode foil. The coloring is due to the H stored in the Cu. Alternate oxidation and reduction cause the formation of porous surface films of visible thickness showing the well-known interference colors.

H. S. V. KLOOSTER

Tensile properties of soldered joints under prolonged stress. J. R. FREEMAN, JR. AND G. W. QUICK. *Metal Ind.* (New York) 24, 7-10(1926).—Tensile tests of Pb, Sn, and 50-50 solder were made by applying definite stresses to wires 6 in. long and 0.1 in. in diam., and measuring the elongation with time up to 28 days. Pb was found to support a stress of 415 lbs. per sq. in. without failure. Sn showed constantly increasing elongation under stresses greater than 230 lbs. per sq. in., and solder gave the same result under stresses above 70 lbs. per sq. in. The test specimens of soldered joints were lap-joints of galvanized Fe and sheet-brass, each soldered with Sn, 50-50 solder, and 60-40 Pb-Sn, resp. The app. for securing const. pressure and temp. in making the specimen is described and illustrated. No creep was observed in any soldered-joint specimen at shearing stresses up to 400 lbs. per sq. in. No specimen joined with Sn failed at this stress. The joints made with solder showed failures at 400, but not at 200 lbs. per sq. in. The 50-50 solder failed before the 60-40, and the galvanized Fe joints failed before the brass joints.

G. F. C.

What occurs in the oxy-acetylene cutting of steel. S. W. MILLER. *Acetylene J.* 27, 222-32(1925).—In cutting steel of over 0.35% C the zone near the cut may contain minute cracks which should be removed by machining if the piece is to be subjected to severe stresses. Heavy billets should be preheated to dull redness to avoid stresses set up during cutting. A no. of photomicrographs are given.

W. B. PLUMMER

Welding of carbon and alloy steel tubing for aircraft. J. B. JOHNSON. *Acetylene J.* 27, 278-86(1925).—Typical tubing used for aircraft members which are subjected to severe stress has 0.25-0.35% C, 0.4-0.6% Mn, 0.8-1.1% Cr, 0.15-0.25% Mo, the welding wire used having 0.08% C (max.), 0.15-0.35% Mn, 0.04% S (max.), 0.04% P (max.). A Cr-Mo welding wire had no especial advantages. A 3.5% Ni steel welding wire was also used successfully. Photomicrographs of welds are given.

W. B. PLUMMER

Autogenous welding of light metals. THEO. KAUTNY. *Autogene Metallbearbeitung* 18, 3-7, 63-5(1925). *J. Inst. Metals* 33, No. 1, 513(1925).

E. J. C.

Electric spot-welding aluminum or duralumin. J. W. MEADOWCROFT. *J. Am. Weld. Soc.* 3, No. 9, 10-11(1924); *J. Inst. Metals* 33, No. 1, 512(1925).

E. J. C.

Gas-welding aluminum. S. W. MILLER. *J. Am. Weld. Soc.* 3, No. 3, 41-50(1924); *J. Inst. Metals* 33, No. 1, 512(1925).

E. J. C.

Hints for welding an aluminum casting. E. E. THUM. *J. Am. Weld. Soc.* 3, No. 5, 26-30(1924); *J. Inst. Metals* 33, No. 1, 513(1925).

E. J. C.

Fusion welding of aluminum. C. F. NAGLE, JR. *J. Am. Weld. Soc.* 3, No. 3, 39-44(1924); *J. Inst. Metals* 33, No. 1, 513(1925).

E. J. C.

Welding gray cast iron by acetylene. F. POLITZ. *Stahl u. Eisen* 45, 653-8(1925).

The thermal processes in welding gray cast iron were investigated. One end of a rod, 21 mm. diam. and 150 mm. long, was heated by means of an acetylene burner and the temps. at various points throughout its length were detd. From the data thus obtained a series of heating and cooling curves was constructed. The temp. on cooling was equalized throughout the rod in 15 min. When the end was heated to m. p., no temp. above the pearlite point was recorded at 15 mm. distance. This localized heating in welding tends to set up strains which are liable to form cracks. In cold welding the temp. differences in the neighborhood of the weld amount to about 1100°, but in hot welding the whole object is heated to 900°, and the differences are only about 200-250°. Except in highly strained parts, however, cold welding can be carried out without special precautions, as the stresses are not so severe as generally assumed. A no. of welds illustrating correct and faulty work were made and subjected to tensile and hardness tests and metallographic examn. In cold welding the structure of the weld was fine

grained and contained ledeburite, but in hot welding it consisted only of pearlite and graphite. In the latter case the weld was softer but withstood a breaking load 50% greater. Excess of O or acetylene, long heating or overheating deteriorated the weld. The addition of ferric oxide, up to 1.5%, to the welding powder favored the formation of graphite on cooling and softened the weld without reducing its strength. B. C. A.

Effect of 3-dimensional compression on Al (SACHS, SCHIEBOLD) 2. Tar-distilling plant at a steel works (ANON.) 21. Heating metals to render them workable (U. S. pat. 1,572,975) 13.

BABLIK, H.: **Galvanizing**. Trans. from original by C. T. C. Salter. London: E. & F. N. Spon. 12s. 6d. Reviewed in *Met. Ind.* 28, 130 (1926).

BOTHE, ADOLF: **Das Kupferschweißverfahren insbesondere bei Lokomotiv-Feuerbüchsen**. Berlin: Julius Springer. 56 pp. G. M. 2. Reviewed in *J. Inst. Met.* 33, 604 (1925).

GAMBER, OSWALD: **Die Herstellung des Cereisins und die Gewinnung der Chloride der seltenen Erden**. Vienna: A. Hartleben. 126 pp. R. M. 4; linen binding R. M. 5.

GÜNTHER, HANNS (WALTER DE HAAS): **Der Weg des Eisens vom Erz zum Stahl**. 1st ed. Ein techn. Bilderbuch. Stuttgart: Dieck & Co. 110 pp. R. M. 5.50, half-linen, binding, R. M. 7.50.

LIPINE, V. N.: **Métallurgie de la fonte, du fer et de l'acier. I. Propriétés générales du fer et l'effet produit sur celui-ci par différents éléments. Fabrication de la fonte**. Leningrad, 1925: Edition du département technique et scientifique du Conseil Suprême de l'Économie Nationale d'U. S. S. R. 1010 pp. (In Russian.) Reviewed in *Rev. métal.* 23, 63-4 (1926).

Lead and silver from sulfide ores. H. HEY. U. S. 1,572,388, Feb. 9. Sulfide ore is heated in the presence of gaseous HCl under non-oxidizing conditions to effect preferential chloridizing of the Pb and Ag present without chloridizing other sulfides in the ore and the Pb and Ag chlorides are then leached out.

Smelting crude zinc-bearing material. W. A. OGG. U. S. 1,573,013, Feb. 16. A retort is charged with a mixt. of Zn-bearing material such as ore or concentrate and reduction fuel such as coal, coke and pitch in such quantity as to produce a vol. of metal vapors in substantial excess of the capacity of the condenser. Spelter is recovered to the full capacity of the condenser and vapors passing from the condenser are further treated for additional recovery of metal values, e. g., by burning them with air. U. S. 1,573,014 specifies a similar process in which a chloride such as NaCl is also used and in which vapors passing through the condenser are deposited as a fume, treated with H₂O to leach out the chloride which the fume contains and in which the wash H₂O is mixed with fresh crude material and fuel and briquetted for use in a subsequent charge in the retort. U. S. 1,573,015 specifies prepg. a charge mixt. contg. the Zn-bearing material, fuel and a fluxing halide such as NaCl or CaCl₂ and subjecting it to a similar operation as in U. S. 1,573,014 except that Zn is pptd. from the wash H₂O from the fume-leaching operation before the wash H₂O is mixed with fresh material.

Treating mixed lead-zinc sulfide ores. N. C. CHRISTENSEN. U. S. 1,572,268, Feb. 9. Finely ground ore is treated with an acid concd. brine to dissolve the Pb and some of the Zn as chlorides and to drive off S as H₂S. The H₂S is treated with lime to form Ca sulphydrate and the latter is used to ppt. (from the brine soln.) first PbS, and then ZnS. Cf. C. A. 19, 2925.

Concentrating oxidized ores by flotation. S. CROASDALE. U. S. 1,573,226, Feb. 16. Ore contg. Cu or other oxidized minerals is subjected to flotation treatment completely to recover these values (without forming any visible film of metallic sulfide on the surfaces of the particles) by treating the ore in the presence of Ca pentasulfide, a frothing agent such as hard wood creosote and a relatively large quantity of petroleum or shale oil or other hydrocarbon material contg. a substantial proportion of olefine hydrocarbons.

Zirconium and other refractory metals. J. W. MARDEN and C. C. VAN VOORHIS. U. S. 1,573,083, Feb. 16. Zr or similar refractory metals are produced by heating together a metal oxide, e. g., ZrO₂, an alkali metal such as Na and an alkali or alk. earth metal halide (the base of which is different from the alkali metal used) such as BaCl₂, in the absence of O and N.

Retort furnace for continuous treatment of ores. W. P. JOBSON. U. S. 1,572,291, Feb. 9.

Apparatus for separating solid particles from blast furnace gases, etc. E. DAN-HARDT. U. S. 1,572,888, Feb. 16.

Side-blast converter furnace for ferrous metals. T. LEVOZ. U. S. 1,572,892, Feb. 16.

Reversible open-hearth furnace for making steel. N. F. EGLER. U. S. 1,572,912 Feb. 16.

Smelting or heating furnace (using coal dust as fuel). E. VOGT and L. KIRCHHOFF. U. S. 1,572,336, Feb. 9.

Tapping trough, slag sweeper, and skimmer for open-hearth furnaces. F. B. MCKUNE. U. S. 1,572,864, Feb. 9.

Gas- or oil-fired detinning furnace. A. W. CALVERT. Brit. 236,677, April 16, 1924.

Steel. T. J. BRAY. U. S. 1,572,179, Feb. 9. After deoxidation of steel in a furnace, steel is poured into a mold and an artificial effervescence is created in the metal immediately following the pouring, *e. g.*, by adding Na_2CO_3 or CaCO_3 .

Open-hearth steel. J. D. JONES and E. E. LITZ. U. S. 1,573,004, Feb. 16. In operating an open-hearth furnace, the bath is heated by a plurality of simultaneously operated and sepd. high velocity flames, circularly arranged and radiating from the wall towards the center of the furnace.

Rust-proofing iron and steel. J. H. GRAVELL. U. S. 1,572,354, Feb. 9. A rust-proofing bath comprises H_2O , H_3PO_4 and NaH_2PO_4 which, combining with pickling and foreign acids, tends to prevent formation of a sludge.

Annealing iron articles. H. T. GRAFTON and C. W. WEESNER. U. S. 1,572,600 Feb. 9. Purified producer gas is used substantially free from O and contg. insufficient moisture to stain the Fe articles being annealed.

Fine powders of metals or other substances. E. PODSZUS. U. S. 1,573,017, Feb. 16. Whirling currents of gas or air of great force and velocity (induced by propeller in a disintegrating chamber) are utilized for disintegrating Cu, tombac, Pb or other materials.

Alloy steel. W. P. WOODSIDE and C. N. DAWE. U. S. 1,572,458, Feb. 9. An alloy steel which is suitable for bolts, gears, bearings, etc., comprises C 0.10-0.23, Mn 0.30-0.60, Ni 1.40-1.75, Mo 0.20-0.30 and Fe 97-98.1%.

Alloys resistant to alkalis. N. V. HYBINETTE. Brit. 236,931, July 12, 1924. Fe is alloyed with Ni 18-40 and Cr 28-40% with or without up to 10% Co and up to 2% Cu. C 1.5, Si 1 and Al and Mn 0.5% each may be present.

Aluminum alloy. A. PACZ. U. S. 1,572,502, Feb. 9. An alloy which is suitable for molds for rubber goods comprises Al 70, Cu 15-27.5 and Si 2.5-15 parts. U. S. 1,572,503 specifies an alloy suitable for die casting, comprising Al with Ni $2\frac{1}{2}$ -10 and Si $2\frac{1}{2}$ % or more. Other metals may be present also.

Aluminum alloy. E. R. CROSBY. U. S. 1,572,382, Feb. 9. An alloy which forms close-grained castings consists mainly of Al together with Si about 5 and Sn about 2%.

Aluminum alloy. R. L. JOHNSTON. U. S. 1,572,357, Feb. 9. An alloy which is silver white and forms good castings comprises Sn 5-10 and Si 5-6%, the balance of the alloy being Al.

Aluminum-copper alloy. Z. JEFFRIES and R. S. ARCHER. U. S. 1,572,487, Feb. 9. Castings are made from an Al alloy contg. Cu 3-5.5% and are heated to about 500-540° for at least 7 hrs. and then cooled, in order to improve tensile strength. U. S. 1,572,488 specifies casting an alloy of Al contg. also about 3-10% of Si and about 5-15% of Zn, then heating the casting to a temp. (about 500-515°) slightly below the m. p. of the eutectic and maintaining the temp. until the Si particles have been sufficiently altered to improve the phys. properties of the casting.

Aluminum alloy. R. L. JOHNSTON, R. S. ARCHER and Z. JEFFRIES. U. S. 1,572,489, Feb. 9. An alloy adapted for chill-casting, etc., comprises Al alloyed with Si 3-10, Cu 2-5, and Zn 15% or less. U. S. 1,572,490 specifies Al alloyed with Si 8. Zn 10 and Cu 2.5%.

Nickel alloys. P. D. MERICA. U. S. 1,572,744, Feb. 9. A "principal melt" such as Ni or Monel metal is deoxidized with Mg and then mixed with molten Al to produce an alloy for steam turbine blades, etc.

Nickel alloy. P. GIRIN. U. S. 1,572,996, Feb. 16. Alloys which resist oxidation comprise Ni 50-80, Cr 8-25, W 0.5-8, Mn 1-5 and C 0.3-1%, together with Fe. Cf. C. A. 19, 2322.

Nickel alloys. J. H. L. DEBARS. U. S. 1,572,593, Feb. 9. Alloys which are suitable for cutting tools comprise Ni 15-30, Cr 40-60 and W 15-40%.

Purifying antimony or its alloys. UNITED STATES SMELTING, REFINING AND

MINING Co. Brit. 236,782, Oct. 16, 1924. Impurities such as As and Cu are removed by treating the molten metal to be purified with NaOH or Na₂CO₃ or equiv. compds. which exert a selective action on the As. Temps. of 480–540° are suitable with NaOH and the material may be agitated mechanically or by air or steam. An inert material such as cement, slag, firebrick, clay or sand may be added to facilitate removal of dross and alkali; Cu may be removed by use of S at 295–315° (preferably before removal of As).

Castings of aluminum-silicon alloys. R. S. ARCHER and J. D. EDWARDS. U. S. 1,572,459, Feb. 9. After the mold is filled with molten alloy, the latter is rapidly cooled to cause the Si to take the form of minute particles.

Casting metal ingots. F. B. MCKUNE. U. S. 1,572,865, Feb. 9. A mold is filled with molten metal and a portion of the metal is chilled in the mold while another portion is maintained hot by flowing a stream of fresh molten metal across it.

Casting copper fins on cast iron cylinders. C. P. GRIMES. U. S. 1,572,428, Feb. 9. Features of heat treatment and mech. arrangement are specified.

Reducing metal oxides. W. B. HAMILTON and F. REID. Brit. 236,739, July 29, 1924. Oxides such as ores of Cr, W, Ni or Mn are added to a reception slag formed on top of a bath of molten metal together with C, in successive charges. Cf. C. A. 19, 630

Removing oxide from ferrous metals. R. PORTER and J. C. WHETZEL. U. S. 1,572,848, Feb. 9. Articles of ferrous metal are first immersed in an alk. soln. such as a 30% NaOH soln. and then pickled in an acid pickling bath.

Pickling metal articles. H. S. MARSH and R. S. COCHRAN. U. S. 1,572,155, Feb. 9. Metals such as steel sheets are pickled in a H₂SO₄ soln. contg. H₂S which serves to prevent spotting.

Apparatus for galvanizing metal sheets. C. PLETSCH. U. S. 1,572,953, Feb. 16

Solder for aluminum, etc. A. L. PENNER. Brit. 236,747, Aug. 7, 1924. See U. S. 1,556,022 (C. A. 19, 3476)

10—ORGANIC CHEMISTRY

CHAS. A. ROUITLER AND C. J. WEST

Siegmund Gabriel. A. Personal part. JAMES COLMAN. **B. Scientific part.** AUGUST ALBERT. *Ber.* 59A, 7–26(1926).—An obituary, with portrait. R. J. C.

Opportunities for research in aliphatic chemistry. J. F. NORRIS. *Ind. Eng. Chem.* 18, 262–4(1926).—The needs of and fields for research in aliphatic chem. are discussed and various problems relating especially to the field of petroleum are briefly outlined.

Ring-chain tautomerism. R. R. GARRAN. *Chem. Eng. Mining Rev.* 17, 452–5 (1925).—Brief discussion of the work on this subject published in some 15 papers by Thorpe and Ingold in *J. Chem. Soc.* since 1922; no specific references are given.

C. A. R.

Conversion of lignified plant matter into coal. III. Sugar formation as an intermediate stage of coal formation. C. G. SCHWALBE and RUDOLF SCHEPP. *Ber.* 58B, 2500–2(1925); cf. C. A. 18, 3047; 19, 2789.—It is universally conceded that the formation of humic acids is a precursor of the process of coal formation. That the humic acids found in nature may be formed from sugars produced by the hydrolysis of cellulose by org. acids is indicated by the fact that from cellulose heated at 170° with 2% (CO₂H)₂ glucose can be isolated as the phenylhydrazone and 4 l. of 1% glucose heated with 80 g. (CO₂H)₂ at 130° yields a brown alkali-sol. humic acid which, pptd. with HCl, well washed and heated at 180° with excess of 35% MgCl₂, yields a coal-like material entirely similar to that previously obtained from cellulose with MgCl₂ and differing from ordinary peat as respects its soly. in NaOH and in the absence of any considerable amts. of C₆H₆- and C₆H₅-EtOH-sol. substances. Cellulose is not of itself alone capable of producing coal. S. and S. believe that lignin as well as cellulose takes part in coal formation, and to test this view they subjected pine wood to carbonization in 2 stages, first heating it with (CO₂H)₂ under pressure and then 8 and 100 hrs., resp., with MgCl₂. The coal-like substances obtained in the 2 cases had the following properties: C 62.2, 71%; H 4, 3.8%; soly. in C₆H₆ 3.4, 5.6; in EtOH-C₆H₆ 11.3, 12.2; coke yield 46.4, 47.1; soly. in concd. Na₂CO₃ 4.9, 2.2. They are closely related, therefore, to the natural coals, standing somewhere between peat and anthracite. C. A. R.

Reduction of aromatic nitro cyano compounds. H. RUPE and H. VÖGLER. *Hel-*

vetica Chim. Acta **8**, 832-8(1925).— o - $O_2NC_6H_4CH_2CN$, shaken in aq. alc. EtOAc with H_2 and "Ni catalyst," freed from Ni and solvents, and treated with Ac_2O , gave o -AcNHC $_6H_4CH_2CN$, while the p -isomer, under the same conditions except that fresh catalyst was added after the reaction became slow, yielded p - $H_2NC_6H_4C_2H_4NH_2$ HCl. Similarly, at first in the absence of H_2O , p - $O_2NC_6H_4CN$ gave p - $H_2NC_6H_4CHO$ HCl while the product from the m -compd. was isolated as m -acetaminobenzaldehyde, m. 122° semicarbazone, yellow-brown, decomp. above 280° . m - $H_2NC_6H_4CHO$ was purified by pptg. from PhH-C $_7H_8$ with ligroin, yellow flocks; *oxime*, yellow-brown, m. 195° . o - $O_2NC_6H_4CN$, in the absence of H_2O , yielded o - $H_2NC_6H_4CONH_2$, sapond. by dil. HCl to NH_4 anthranilate-HCl, the crystal measurements of which are given. o - $O_2NC_6H_4CH:NPh$ in aq. alc. EtOAc yielded o - $H_2NC_6H_4CH_2NHPh$, while o - $O_2NC_6H_4NH_2$ gave o - $C_6H_4(NH_2)_2$. Thus the C : N group is protected from reduction only in the o -derivative.

M. HEIDELBERGER

Catalytic reduction of cyano compounds of naphthalene. H. RUPE AND A. METZGER. *Helvetica Chim. Acta* **8**, 838-48(1925); cf. R. and Becherer, C. A. **18**, 255, and preceding abstr.—In this series the protective action of the NH_2 group on the CN radical was even more marked than in the PhH series, not being confined to o -NH-1,5- $O_2NC_{10}H_6CN$ (I) is best purified by recrystn. from alc., using bone-black; in EtOAc alc.- H_2O , with 2 parts "Ni catalyst" and H_2 it yields 1,5- $H_2NC_{10}H_6CN$; *Bz deriv.*, using $BzCl$ and C_6H_5N , m. $211-2^\circ$, is not reduced further under the above conditions. Similarly, 2,5- and 1,2-I gave the NH_2 , CN derivs. Other groups failed to prevent reduction of the CN group, but modified its course. 1,4- $NCC_{10}H_6SO_3Na$ in H_2O with 2 part-catalyst gave in 4 hrs. a trace of material volatile with steam, and on adding HCl and concg., 4-sulfonaphthomethylamine, needles, quite sol. in H_2O (yield 81%); *Ba salt*, needles, 1,5- $BrC_{10}H_6CN$ (best prepd. in 40-50% yield according to Hausmann, *Ber.* **9**, 154b (1876)), on steam distn. of the reduction products, yielded 12% 1,5-bromonaphthaldehyde, m. $102-3^\circ$, purified over the semicarbazone, m. $257-9^\circ$; *oxime*, m. $133-4^\circ$. The portion of the non-volatile products insol. in hot dil. HCl, freed from impurities sol. in Et_2O , gave 7% di-[5,1-bromonaphthylmethyl]amine, m. 142° ; *HCl salt*, and *nitrate* needles. From the above hot dil. HCl soln. there sepd. on cooling the *HCl salt*, needles, of 5-bromo-1-naphthylmethylamine. The base sinters $138-9^\circ$, m. 141° (decomps.) *nitrate*, *oxalate*. 2,5- $NCC_{10}H_6Br$ gave 15% 5-bromo-2-naphthaldehyde (II), 62% primary base, and 2.5% of what was probably the HCl salt of the sec. base. II, m. 78° , purified over the *oxime*, m. 178° ; semicarbazone, m. 270° , difficultly hydrolyzable phenylhydrazone, m. 151° , almost colorless, turns yellow, then red when exposed to light. 5,2-Bromonaphthylmethylamine, m. $111-2^\circ$; *HCl salt*, *nitrate*, *acid oxalate*, all needles. o - HOC_6H_4CN gave a greenish product from which Ni was removed by addn. of $H_2C_2O_4$ to the dil. HCl soln., leaving di-[o -hydroxybenzyl]amine, m. 162° , difficultly combustible.

M. HEIDELBERGER

Reduction of aliphatic cyano compounds. Cyanoacetylurea. H. RUPE, A. METZGER AND H. VOGLER. *Helvetica Chim. Acta* **8**, 848-52(1925).—At $60-70^\circ$ in 60 part H_2O , with H_2 and 2 parts "Ni catalyst" $H_2NCONHCOCH_2CN$ (I) yielded uracil, (II) according to I + $H_2 \rightarrow H_2NCONHCOCH:NH + H_2O \rightarrow H_2NCONHCOCH_2CH(OH) + NH_3 \rightarrow N.CO.NH.CO.CH_2.CH$, or III $\rightarrow H_2NCONHCOCH:CH(OH) \rightarrow HN.CO.NH.CO.CH:CH$, the first scheme involving a new formula for II. In alc-

H_2O PhCHAcCN yielded PhCH $_2$ Ac in the portion volatile with steam after adding HCl, and, crystg. on the Ni, α -acetophenylacetaldehyde aldimine, PhCHAcCHNH. leaflets, m. 96° , indicating the reduction to have gone according to: PhCHAcCN + $H_2 \rightarrow PhCHAcCH:NH + H_2O \rightarrow PhCHAcCHO + NH_3 \rightarrow PhCa:CHOH + H_2O \rightarrow PhCH_2Ac + HCO_2H$. In alc. H_2O -EtOAc EtCN absorbed only 26% of the theory of H_2 , most being recovered unchanged (cf. also v. Braun, Blessing, and Zobel, C. A. **18**, 675). BuCN gave Am_2NH , b $_p$ $95-7^\circ$; *HCl salt*, decomp. 275° ; *oxalate*, m. $210-11^\circ$. It thus behaved like iso-BuCN (R. and Hodel, C. A. **19**, 825).

M. HEIDELBERGER

Synthetic methanol. R. FABRE. *J. pharm. chim.* [8], **2**, 113-7(1925).—A review
S. WALDBOTT

The photochemical oxidation of methyl and ethyl alcohols by potassium dichromate. MIROSLAV SCHWARZ. *Z. Elektrochem.* **32**, 15-7(1926).—The oxidation of both EtOH and MeOH by $K_2Cr_2O_7$ in light goes only to the corresponding aldehydes. With MeOH, the $K_2Cr_2O_7$ is reduced to Cr_2O_3 ; with EtOH, to a brown compd. of unknown compn. The aldehyde formed is less than that calcd. from the $K_2Cr_2O_7$ reduced; the yield increases as the reaction progresses.

B. H. CARROLL

Catalytic oxidation of vinylalkylcarbinols to vinyl alkyl ketones in the presence of palladium black. RAYMOND DELABY. *Compt. rend.* **182**, 140-2 (1926).—Though previous attempts to obtain vinyl alkyl ketones from the corresponding secondary alcs. had been futile (cf. C. A. **19**, 2185), success was attained by the aid of Pd black prepd. by the reduction of PdCl_2 by HCHO (cf. Breteau, C. A. **5**, 1401). With cold $\text{CH}_2\text{:CHCH(OH)Et}$ and Pd black alone, heat was evolved and rapid conversion to 50% Et_2CO occurred and with secondary satd. alcs., e. g., BuOH , there was no reaction even after boiling several hrs. This indicates that the H atoms of the CH(OH) group are particularly active only when in proximity to a double bond. The best results were obtained by bubbling O into the alc., warm if necessary, passing the O-alc. mixt. over the Pd black (the temp. of the latter being raised progressively to 110°), condensing the gaseous products in CO_2 -snow (maintaining a vacuum of 30-40 mm. throughout the system) and sepg. the H_2O from the supernatant ketone. The latter is best identified by its fixation of Et_2NH on the double bond and formation of a picrate and semicarbazone of this addn. product (cf. Blaise and Marie, C. A. **2**, 2376). $\text{CH}_2\text{:CHCH(OH)Et}$ gave 20% $\text{CH}_2\text{:CHCOEt}$. In prepg. $\text{CH}_2\text{:CHCOPr}$, the catalyst was heated to 100° at the beginning. *Diethylaminoethyl Pr ketone*, b_{20} $92-5^\circ$; *picrate*, m. 81° . The disadvantage of the method is the necessity of reduced pressures. C. C. DAVIS

Action of sodium on alkyl disulfides. C. G. MOSES AND E. E. REID. *J. Am. Chem. Soc.* **48**, 776-7 (1926).—Na and alkyl sulfides in dry Et_2O do not give definite products but most disulfides react readily to give Na alkyl mercaptides. The same products are obtained in abs. EtOH . Mg does not react under these conditions. C. J. WEST

Asymmetric sulfur atom. I. A case of isomerism in compounds with two equal asymmetric sulfur atoms. E. WEDEKIND. *Ber.* **58B**, 2510-8 (1925).— $(\text{CH}_2\text{SEt})_2$, b. $207-10^\circ$, somewhat ill-smelling oil, is obtained in 40 g. yield from 24 g. Na in 96% alc. cautiously treated with 62 g. EtSH and then slowly with 94 g. $(\text{CH}_2\text{Br})_2$, 20 g. allowed to stand 8 days, protected from light and heat, with 38 g. MeI gives 40 g. crude *ethylene bis[ethylmethylsulfonium iodide]*, $(\text{CH}_2\text{SMetI})_2$ (I), sepd. by fractionation from dil. alc. into a higher melting α -form (II), becomes slightly discolored 145° , decomp. 154° , and a β -form (III), decomp. $123-4^\circ$ (yield, 2.5 and 1.5 g., resp., from 10 g. crude I). Both, when pure, are snow-white and extraordinarily easily sol. in H_2O , decomp. when dried on the H_2O bath and become slightly yellow on long standing in the air. When crystd. under the same conditions, II appears under the microscope as very fine, faintly doubly refractive needles in bundles and III as more strongly doubly refracting prismatic rods; of II, 0.74 and 1.64 g. dissolve in 100 cc. of 85 and 75% EtOH , resp., at 18° ; of III, 1.14 and 4.40 g. *Salts* of the 2 forms, other than the iodides, do not differ materially in appearance and decompn. temp.; the following were prepd. ($\text{R} = \text{C}_8\text{H}_{17}\text{S}_2$): RIH_2Cl_6 , m. 191° ; RCDI_4 , decomp. $147-8^\circ$; RPICl_6 , red-yellow decomp. 236° ; RAu_2Cl_4 , golden yellow, decomp. 225° ; *picrates*, $\text{C}_{18}\text{H}_{24}\text{O}_{14}\text{N}_6\text{S}_2$, yellow, m. 170° ; RCl_2O , decomp. 227° . Theoretically, I should exist in 2 inactive (*dl* and *meso*) stereoisomeric forms, but all attempts to resolve either II or III into active antipodes have hitherto failed. The *d-camphorsulfonates*, m. 183° , on fractionation from Me_2CO give fractions all of which show $[\text{M}]_D$ $101.4-107.3^\circ$ in H_2O (calcd. for 2 *d-camphorsulfonate* ions, 103.4°). The *d-bromocamphor- π -sulfonate* of II seps. from Me_2CO contg. a few drops of alc. in long needles which, allowed to stand under the mother liquor overnight, change into thick stout prisms; both forms m. $157-9^\circ$; different fractions show $[\text{M}]_D$ $499.5-538.2^\circ$ (calcd. for 2 sulfonate ions 546°). The isomer from III, m. 160° , $[\text{M}]_D$ $479.6-520.4^\circ$. $\text{CH}_2(\text{CH}_2\text{SEt})_2$, obtained in 16 g. yield from 16 g. Na, 41 g. EtSH and 67 g. $\text{CH}_2(\text{CH}_2\text{Br})_2$, b. $228-31^\circ$, gives with MeI *trimethylenebis[ethylmethylsulfonium iodide]* in needles, m. 112° , which it has not as yet been possible to sep. into isomers. C. A. R.

Further studies in luminescent Grignard compounds. W. V. EVANS AND E. M. DIEPENHORST. *J. Am. Chem. Soc.* **48**, 715-23 (1926).—The property of Grignard compds. of giving off light on oxidation is more general than has been noted, prevailing with aliphatic as well as with aromatic compds. The only Grignard compds. that do not give this light are those in which the Mg is attached to a radical of low mol. wt. A list of 30 luminescent Grignard compds. is given. The RMgBr compds. give the most light, the RMgI compds. are poor light givers, although they are readily formed; the RMgCl compds. are slightly dimmer than the Br compds. The *p*-position ranks first as to light-giving power, with the *o*- and *m*-positions much inferior. A solvent influences the intensity of the light only as it affects the concn. of the Grignard compd. and the speed with which it can be oxidized. Photographs of the chemiluminescence spectrum of the oxidation of *p*- $\text{BrC}_6\text{H}_4\text{MgBr}$, *p*- $\text{ClC}_6\text{H}_4\text{MgBr}$ and α - $\text{C}_{10}\text{H}_7\text{MgBr}$ are given. C. J. WEST

Some alcohols containing the trichloromethyl group. J. W. HOWARD. *J. Am. Chem. Soc.* **48**, 774-5 (1926).—EtMgBr (from 32 g. EtBr) and 37 g. Cl_3CCHO give 13 g. trichloromethylethylcarbinol, b_{680} 99°, d_{20}^{20} 1.488; acetate, b_{680} 164-5°; benzoate, b_{680} 217-8°. Trichloromethylpropylcarbinol, b_{686} 115°, d_{20}^{20} 1.481, in 10-11 g. yield from 33 g. PrBr; acetate, b_{686} 168-9°; benzoate, b_{686} 197-8°. Trichloromethylbenzylcarbinol, b_{686} 97°, d_{20}^{20} 1.365, in 10-11 g. yield from 35 g. PhCH_2Cl ; acetate, b_{686} 159-60°; benzoate, b_{680} 210-1°.

C. J. WEST

Hydrogenation of ketones in the presence of pure and impure platinum blacks. M. FAILLEBIN. *Compt. rend.* **182**, 138-40 (1926).—It has already been shown (C. A. 17, 723; 18, 662) that the nature of the reduction of ketones and aldehydes with Pt black depends upon whether the latter is pure or contains other metals such as Fe. Two suppositions are possible: (1) that the 2nd metal modifies the process of formation of the Pt black and changes its character or (2) that the Pt-Fe mixt. is merely pure Pt black intimately mixed with the 2nd metal. If the latter is true, removal of the Fe without impairing the activity of the Pt black should leave a product with the catalytic activity of pure Pt black which had never contained Fe. It was found possible to ext. most of the Fe with a mixt. of equal vols. of CH_3Ac_2 and HOAc in the presence of air. The Pt black thus obtained was unlike that contg. Fe in its catalytic properties, for it closely resembled pure Pt black prepd. without the addition of any traceous metal. Similar results were obtained with Pt-Al mixts.

C. C. DAVIS

Some amidines of the holocaine type. I. A. J. HILL AND ISADORE RABINOWITZ. *J. Am. Chem. Soc.* **48**, 732-7 (1926).—One mol. equiv. of the appropriate nitrile and alk. in Et_2O , treated with 1.25 equivs. of HCl (cooling) gave the following yields of eth. HCl: acetimino Et, 83%; valerimino Me, 80%; phenylacetimino Et, 85%. $p\text{-H}_2\text{NC}_6\text{H}_4\text{OEt}$ reacts with these salts in dry Et_2O , giving the following bis- $[p\text{-ethoxyphenyl}]$ compds.: acetamidine (I), m. 117-8° (12.3% yield); valeramidine (II), m. 96° (6.7%); phenylacetamidine (III), m. 111° (4.5%). The free imino ethers were liberated from the HCl salts with K_2CO_3 and treated with 1 equiv. of $p\text{-H}_2\text{NC}_6\text{H}_4\text{OEt}$, giving $p\text{-ethoxyphenylacetamidine}$ (IV), m. 111-3° (30% yield); phenylacetamidine, m. 88-9° (15%); valeramidine (V), m. 86° (31%). Propionyl- $p\text{-phenetidine}$, m. 120° (90%); butyryl deriv., m. 108-10° (75%); isovaleryl deriv., m. 122° (65%). These were treated with 1 equiv. of PCl_5 in C_6H_6 and then with $p\text{-H}_2\text{NC}_6\text{H}_4\text{OEt}$, giving sym-bis- $[p\text{-ethoxyphenyl}]$ propionamidine (VI), m. 84° (25%); butyramidine (VII), m. 106° (21%); isovalamidine, m. 108° (20%); $p\text{-ethoxyphenyldiethylacetamidine}$, m. 119-20° (24%). The following phenylureides were prepd.: I, m. 164-5° (quant. yield); II, m. 102-3° (quant. yield); III, m. 118° (52% yield); IV, m. 164° (60%); V, m. 158° (64%); VI, m. 100° (quant.); VII, m. 105° (quant.).

C. J. WEST

Glycerolphosphoric acids derived from lecithin. P. KARRER AND HARRY SALOMON. *Helvetica Chim. Acta* **9**, 3-23 (1926); cf. C. A. 10, 3069.—Ba glycerol- β -phosphate (I) $(\text{CH}_2\text{OH})_2\text{CHOPO}_3\text{Ba}$ and Ba glycerol- α -phosphate (II), $\text{CH}_2(\text{OH})\text{CH}(\text{OH})\text{CHOPO}_3\text{Ba}$, are easily sepd. since only I with $\text{Ba}(\text{NO}_3)_2$, NaNO_3 or KNO_3 readily forms an insol., well-crystd. double salt (III), $\text{C}_3\text{H}_7\text{O}_6\text{PBa}_2 \cdot \text{Ba}(\text{NO}_3)_2$, 100 cc. H_2O at 18° dissolving 0.8 g. Crystd. Na glycerolphosphate (Kahlbaum) was found to be a mixt. of the α - and β -isomers in which the latter predominates. When used as a quant. estimation of the β -isomer, a soln. of 0.8 g. $\text{Ba}(\text{NO}_3)_2$ in 10 cc. H_2O is added to 1 g. mixt. of I and II in 10 cc. H_2O ; after 12 hrs. the ppt. is filtered, washed with 4 cc. cold H_2O , EtOH, Et_2O , dried and weighed; 0.2 g. is added to this wt. to correct for soly. The % of I in the following phosphatides were found to be as follows: crystd. egg lecithin (cf. C. A. 20, 431) 80, egg lecithin obtained by freezing out from Et_2O 84, abs. alc. difficultly sol. fraction from egg (cephelin ?) 45, abs. alc.-insol. fraction from egg (sphingomyelin ?) 73, lecithin fraction from brain 78, com. egg lecithin 70. I was also obtained from pea lecithin. Ba glycerolphosphates from various com. preps. derived from egg lecithin were found optically inactive (cf. C. A. 14, 1660); however, a 35% soln. of 1 prepn. from crystd. lecithin in a 2-dm. tube gave -0.4° and from this about 80% I was obtained; since I has no asym. structure, II would have an unusually high rotatory power; but when a sample of pure II was prepd. by first sepg. I and then repeatedly recrystg. II it was found to be optically inactive. Because of this it is believed that the optical activity of com. raw materials previously examd. by other investigators is due to compds. other than II. Sapon. of the lecithins was accomplished with cold 10% $\text{Ba}(\text{OH})_2$ (cf. Willstätter and Lüdecke, *Ber.* 37, 3754 (1904)), pptn. of the excess $\text{Ba}(\text{OH})_2$ with CO_2 , concn. of the filtrate by evapn., pptn. of I and II with EtOH, the mother liquors contain considerable glycerolphosphate as choline salt from which II can be obtained by concn. and treatment with alc. $\text{Ba}(\text{OH})_2$. When III is treated with

N H_2SO_4 equiv. to 66% of the Ba, filtered from the $BaSO_4$, evapd. *in vacuo* at room temp. over P_2O_5 , dissolved in abs. alc., filtered and again evapd. as above, the free acid is obtained; this is converted to **I** with $Ba(OH)_2$ in dil. alc. soln. When **I** is converted to the Na salt with Na_2CO_3 or Na_2SO_4 , treated with $AgNO_3$ and then $EtOH$ to ppt. the Ag salt, dried, treated with 8 mol. MeI and then 3 mol. Ag_2O , heated, dild. with Et_2O , the excess MeI distd. off, the residue extd. with Et_2O , the ext. evapd. and the residue distd. *in vacuo*, there is obtained *di-Me glycerol- β -phosphate di-Me ether*, $b_{0.8}$ 126–8° (70% yield), optically inactive. To obtain **II** from a mixt. of raw materials it is best to remove **I** as **III** by adding 80% of $Ba(NO_3)_2$ necessary to convert all of the mixt. to the salt, allow to stand, filter off the **III**, evap. the filtrate, filter, heat the filtrate to ppt. **II**, filter hot, repeatedly dissolve and heat to ppt. (**II** is less sol. in hot soln.). *Di-Me glycerol- α -phosphate di-Me ether* (**IV**) was prepd. by adding a soln. of 2 mol. $AgNO_3$ to the raw material of mixed **I** and **II** in H_2O , adding $EtOH$, filtering off the ppt., washing with 50% $EtOH$, then 95% $EtOH$ and finally with Et_2O , drying *in vacuo* and then methylating as given above for the β -isomer; it $b_{0.8}$ 110–2°, $[\alpha]_D - 3.2^\circ$; it is not certain if this is pure material as the β -isomer might be present in a small amt. Attempts to hydrolyze these di-Me esters to the dimethoxyglycerols were not successful. *Ba glycerol- α -phosphate di-Me ether*, $CH_2(OMe)CH(OMe)CH_2OPO_3Ba \cdot H_2O$, was obtained by heating **IV** in sealed tubes for 24 hrs. with 5% HCl , pptg. the Cl with Ag_2CO_3 , pptg. the Ag with H_2S and adding $Ba(OH)_2$, the anhyd. compd., which may contain the β -isomer as an impurity, gives $[\alpha]_D^{20} 3.11^\circ$. N. A. LANGE

Resolution of α -glycerolphosphoric acid into optically active forms. P. KARRER AND P. BENZ. *Helvetica Chim. Acta* 9, 23–5 (1926); cf. preceding abstrs.—Ba α -glycerolphosphate in cold water was poured into boiling aq. quinine sulfate, the hot soln. was filtered, cooled, the sepd. crystals of *quinine salt* (**I**) filtered, washed with H_2O and dried *in vacuo*; recrystd. from hot H_2O and dried over P_2O_5 *in vacuo* at 100°, it m. 155°; crystd. from $EtOH$, it m. 155°, $[\alpha]_D -144.7^\circ$. Ba α -glycerolphosphate (**II**) is obtained when **I** is treated in hot H_2O with $Ba(OH)_2$ soln. until alk., cooled, the excess Ba pptd. with CO_2 , filtered, the filtrate extd. with $CHCl_3$, the ext. concd. *in vacuo*, and alc. added; a 2% aq. soln. in a 2-dm. tube showed no optical activity. When **II** in H_2O is treated with $AgNO_3$ and $EtOH$ a *Ag salt* is obtained which when dried and treated with 8 mol. MeI, then with Ag_2O , heated 4 hrs., Et_2O added, the Et_2O and MeI removed by distn. and the residue distd. gave *di-Me l-glycerol- α -phosphate di-Me ether*, $CH_2(OMe)CH(OMe)CH_2OPO_3Me_2$, $b_{0.4}$ 110°, $[\alpha]_D -1.76^\circ$ (cf. C. A. 13, 609). N. A. L.

The optical rotation of arabic acid and arabates of alkali metals. M. A. RAKUZIN. *Biochem. Z.* 160, 285–7 (1925).—The $[\alpha]_D$ of arabic acid was found to be -27.86° , a value different from that usually assigned to it. Arabates of the alkali metals showed a lower $[\alpha]_D$ than the free acid, the $[\alpha]_D$ of the arabates rising with the at. wt. of the metal. F. A. CAJORI

A case of mutarotation. Application to the study of the saponification of ethyl oxalate by water and dilute acids. E. DARMOIS. *Compt. rend.* 181, 1137–9 (1925).—It has already been shown (C. A. 19, 786) that $(CO_2H)_2$ reacts with NH_4 molybdomalate with a resulting change in the rotatory power of the soln. If NH_4 molybdomalate is treated with a sol. ester of $(CO_2H)_2$ instead of $(CO_2H)_2$ itself, the depression of the rotatory power is no longer instantaneous, the rate of change depending upon the concn. of the ester and upon the temp. The max. *l*-rotatory effect is, however, the same as that caused by $(CO_2H)_2$, indicating that progressive sapon. of the ester occurs. This offers a means of studying the *sapon. of oxalic esters*, e. g., $(CO_2Et)_2$. It was further shown that dil. aq. $(CO_2Et)_2$ on standing undergoes a depression in its rotatory power, this change increasing with time and that if this soln. is mixed with NH_4 molybdomalate the rate of change of the rotatory power of the mixt. depends upon the preliminary time of standing of the $(CO_2Et)_2$. This was due to the formation of HO_2CCO_2Et , which in independent expts. was found to react with great rapidity with NH_4 molybdomalate, the time required for a HO_2CCO_2Et soln. of $1/3$ the concn. of a $(CO_2Et)_2$ soln. to annul the rotation of an NH_4 molybdomalate soln. being only $1/2000$ that required by the $(CO_2Et)_2$. The sapon. of $(CO_2Et)_2$ by 0.05 N HCl is almost twice as rapid as in H_2O , the H^+ ion being an active catalyst and sapon. in H_2O being auto catalytic. C. C. DAVIS

A new method for preparing *l*-tartaric acid. KNUT PARCK. *Svensk Kem. Tids.* 37, 249–51 (1925).—The *dl*-acid is treated with α -benzylphenolphthaleinamine in H_2O , giving the *l*-tartrate of d -benzyl phenolphthaleinamine, m. 72° (yield 18%), which is recrystd. on the water bath. The acid is sepd. as $Pb[CHOHCO_2]_2$. A. R. ROSE

Reactions of carbon disulfide. I. With ammonium hydroxide. E. WERTHEIM.

J. Am. Chem. Soc. **48**, 826-30 (1926).—A soln. of 200 cc. NH_4OH (d. 0.90) and 40 cc. CS_2 , shaken 2 hrs. on a Camp machine or allowed to stand 10-15 hrs. with frequent shaking, gives, when shaken with MeI , 51.5% of Me trithiocarbonate, which decomps. partially on distn. EtBr gives 44% of the *Et ester*, which also dists. with decompn. The *benzyl ester* results in 48% yield. Solns. which have stood for a few days show evidence of contg. NH_4SH in small amts. After 1 month there were obtained 33% of EtSH and 42% Et_2S_2 :C.S. PhCH_2SH was obtained in 40% yields. After 3-4 days very small amts. of H_2S are evolved; this is present in considerable proportions after a week. The reaction between NH_3 and CS_2 assumes entirely different equil. in abs. EtOH and in solns. contg. H_2O . BzH (20 g.), 20 g. CS_2 and 150 cc. NH_4OH give after 24 hrs. 50% of thiobenzaldine (Laurent, *Ann.* **38**, 323 (1841)). C. J. WEST

Acetyl derivatives of thiourea and urea. Constitution of thiourea. ALBERT HUGERSHOFF. *Ber.* **58B**, 2177-87 (1925); cf. Kohmann, *C. A.* **9**, 2654; Werner, *C. A.* **11**, 252.—From 30 g. thiourea (I) and 45 g. Ac_2O on the H_2O bath are obtained unchanged I, 5 g. of the mono-Ac deriv. (II), m. 165-6°, of I, and 35.5 g. of a "tri-Ac deriv." $\text{C}_3\text{H}_3\text{N}_3\text{O}_3\text{S}_2$ (III), yellow, m. 151-2°, 60 g. I and 120 g. Ac_2O give 91 g. III and 8.8 g. II, while 3 g. I with 9 g. Ac_2O gives 4.5 g. III, which is also obtained in 2.9 g. yield from 1.18 g. II and 1.60 g. of the di-Ac deriv. (IV) of I in boiling alc. III dissolves with yellow color in exactly 2 mols. of cold N NaOH and is reprecipitated by 2 equivs. N H_2SO_4 , on standing several days the yellow ppt. gradually changes into the white needles of II. If the yellow NaOH soln. is heated to boiling, addn. of 2 equivs. H_2SO_4 produces traces of H_2S and, on cooling, a much smaller ppt. of III; evapn. of the mother liquors and ppt. leaves a residue from which III and I can be isolated by successive extrn. with EtO and alc. III dissolves immediately, without color, in 25% NH_4OH and evapn. yields I. It likewise dissolves at once in 94% H_2SO_4 with evolution of heat and elimination of AcOH and on pouring into H_2O yields 77.62% II. With PhNH_2 in EtO 8.34 g. III yields 6.0 g. II and 3.12 g. AcNHPh ; with $p\text{-MeC}_6\text{H}_4\text{NH}_2$, 5.0 g. II and $\text{AcNH}(\text{C}_6\text{H}_4)\text{Me}$. $\text{C}_6\text{H}_5\text{N}$ does not react with III. III (40 g.) slowly dissolves in 250 cc. H_2O on the H_2O bath, the yellow soln. gradually becoming lighter in color and finally almost colorless after 4 hrs.' heating; a little H_2S and S and 31.3 g. II are formed. From 3 g. II and 9 g. Ac_2O on the H_2O bath is obtained 3.1 g. IV, m. 150-1°, which dissolves in 1 mol. cold NaOH and is reprecipitated by 1 equiv. H_2SO_4 , but if the soln. is heated to boiling II seps. on cooling; the II again dissolves in 1 mol. NaOH and on boiling yields I. With PhNH_2 and $p\text{-MeC}_6\text{H}_4\text{NH}_2$ on the H_2O bath IV smoothly yields II and the corresponding AcNHR ; with boiling H_2O it gives II. I and IV do not react with each other in warm alc. II in 25% NH_4OH gives I, which is also obtained with dil. HCl . I cautiously fused and then cooled solidifies to an apparently homogeneous cryst. mass which with Ac_2O on the H_2O bath yields 44.7% II. H. explains the above facts by assuming that I has the dimeric structure $\text{H}_2\text{NC}(\text{NH})\text{SH} \cdot \text{H}_2\text{NC}(\text{NH})\text{SH}$, being a salt-like compd. in which half of the mol. functions as a base, the other as an acid. Such a structure accounts for the formation of III on acetylation and the non-formation of IV until the salt-like union has been broken (e. g., by the addn. of a stronger acid). The fact that the m. p. and crystal form of I change when it is fused and resolidified and that the solidified melt gives II on acetylation is due, according to H., to rearrangement, during the fusion, of the basic half of I which, however, remains bound to the acid half, thus preventing the salt-like combination of the I with itself. On the basis of his addn. theory as to the acetylation of derivs. of I (cf. Gibson, *Diss. Göttingen*, 1901), H. assigns to IV the structure $\text{AcN}:\text{C}(\text{SH})\text{NHAc}$. Unlike I, urea, being unable to form a salt with itself, does not yield a tri-Ac deriv.; when it is heated with Ac_2O , a vigorous reaction sets in suddenly at about 120-30° and on cooling the mono-Ac deriv. seps. in 32% yield; Werner's yield of 78% with H_2SO_4 can also be obtained without H_2SO_4 by cautious heating on the H_2O bath, but the di-Ac deriv., to which H. gives the structure $\text{AcNHC}(\text{NAc})\text{OH}$, could be obtained only with H_2SO_4 . The Ac group in the mono-Ac deriv. is held very firmly; heating with PhNH_2 at 170° gives NH_3 and sym. acetylphenylurea, m. 183°. C. A. R.

Synthetic glucosides of pyrimidine derivatives. I. Synthesis of methylisocytosine- β -D-glucoside. AMANDUS HAHN, H. FASOLD AND L. SCHÄFER. *Z. Biol.* **84**, 35-40 (1926).—The Ag salt ($\text{C}_4\text{H}_6\text{N}_3\text{OAg}$) of methylisocytosine is formed by the interaction of the NH_4OH soln. of methylisocytosine with AgNO_3 . 10 g. of the dried Ag salt is refluxed for 1 hr. with 180 cc. dry xylene contg. 17 g. acetobromoglucose. The mixt. is filtered while hot into 1800 cc. petroleum ether. White or pale yellow amorphous flakes sep. These are washed well with petroleum ether and added slowly to 150 cc. of satd. alc. picric acid. The picrate of the tetraacetylglucoside (m. 150°) is formed and may best be recrystd. from hot alc. From it the free glucoside may be obtained.

The dried CHCl_3 soln. of the picrate is poured slowly with const. stirring into petroleum ether. Free tetraacetylmethylisocytosine-*d*-glucoside forms needles, m. $442-5^\circ$. It is slightly sol. in water and easily sol. in MeOH and EtOH, is *l*-rotary ($\alpha_D^{25} = -19.1^\circ$), does not reduce Fehling soln. By boiling 1 min. with *N* HCl glucose is split off. From the Ac product methylisocytosine-*d*-glucoside may be prepd.: 6 g. of the free Ac deriv. in 180 cc. MeOH is mixed with 20 cc. of 10% NH_3 in MeOH. After 16 hrs. at 4° the crystals of the methylisocytosine-*d*-glucoside (m. 190°) form. It is sol. in water and slightly sol. in MeOH and EtOH, is *l*-rotatory ($\alpha_D^{24} = -66.91^\circ$), reduces Fehling soln. only after heating with *N* HCl.

FRANCES KRASNOW

Reducing power of the methylated sugars. GÁZA ZEMPLÉN AND GÉZA BRAUN. *Ber.* **58B**, 2566-70 (1925).—The Irvine method for detg. the structure of disaccharides (hydrolyzing the completely methylated disaccharide and isolating the cleavage products in substance) requires considerable amts. of material. It occurred to Z. and B. that if the reducing powers of the different trimethylglucoses formed in the hydrolysis of various reducing disaccharides differ sufficiently the point of union of the 2 glucose components in the disaccharide might be detd. with as little as 0.1 g. of the latter. Under identical conditions of hydrolysis (2.5% HCl and 3 hrs' boiling) the following results were obtained (reducing power of glucose according to Bertrand = 100): 2,3,5-trimethyllevoglucosan (I) 10.6; 2,3,5-trimethylglucose 9.8; 2,3,5-trimethylmethylglucoside 9.4; 2,3,6-trimethylglucose 27.1; 2,3,5,6-tetramethylglucose 13.6; 2,3,5,6-tetramethylmethylglucoside 12.5; heptamethylmethylgentiobioside 12.1; heptamethylmethylcellobioside 20.2. The I, obtained in 70% yield from 12 g. levoglucosan in 9 cc. H_2O treated dropwise with 39 cc. Me_2SO_4 (neutralized with NaOH) and, in the course of 1.5 hrs., with 70 cc. of a soln. of 100 g. NaOH in 175 cc. H_2O , then heated 0.5 hr. on the H_2O bath, and extd. with CHCl_3 , b_D^{20} $170-80^\circ$ (bath temp.), m. 66° , $[\alpha]_D^{17} -59.4^\circ$ (H_2O), $[\alpha]_D^{16} -58.95^\circ$ (abs. alc.), $[\alpha]_D^{17} -58.92^\circ$ (CHCl_3).

C. A. R.

Synthesis of a disaccharide glucoside. BURCKHARDT HELFERICH, WILHELM KLEIN AND WILHELM SCHÄFER. *Ann.* **447**, 19-26 (1926); cf. *C. A.* **19**, 250.—The previously prepd. triphenylmethyltriacyl- α -methylglucoside with 4 mols. PBr_5 on the H_2O bath for 20 min. gives 21% of acetodibromoglucose, thus establishing the position of the Ph_3C residue as in the 6-position. By using 1 mol. PBr_5 and heating 5-10 min. there results a mixt. of Ph_3CBr and triacyl- α -methylglucoside 6-bromohydrin; the Ac groups are removed by satg. the MeOH soln. at 0° with NH_3 and the resulting product is treated with BzCl , giving 50% of 2,3,5-tribenzoyl- α -methylglucoside 6-bromohydrin, m. 122° , $[\alpha]_D^{18}$ 90.9° ($\text{C}_6\text{H}_5\text{N}$); this was also obtained from 2,3,5-tribenzoyl- α -methylglucoside, m. 143° , with PBr_5 . Reduction with Zn in AcOH gives 75% of tribenzoyl- α -methyl-*d*-isorhamnoside, m. $139-40^\circ$, $[\alpha]_D^{19}$ 106.7° , which is sapon. by NH_3 in MeOH to α -methyl-*d*-isorhamnoside, b_1 162° , m. $98-9^\circ$ (80% yield) and further by 10% acid to *d*-isorhamnose, identical with Fischer's product.

C. J. WEST

Synthesis of gentiobiose. BURCKHARDT HELFERICH, KARL BAUERLEIN AND FRIEDRICH WIEGAND. *Ann.* **447**, 27-37 (1926).—Sapon. of acetofluoroglucose by 1% MeONa in abs. MeOH gives 84% of *d*-glucosyl fluoride, m. $118-25^\circ$, has a normal mol. wt in H_2O , $[\alpha]_D^{18}$ 96.7° (H_2O), is relatively stable towards alkalis, reduces Fehling soln. in the heat and with BzCl in $\text{C}_6\text{H}_5\text{N}$ yields a *tetra-Bz* deriv., m. $110-2^\circ$, $[\alpha]_D^{22}$ 110° ($\text{C}_6\text{H}_5\text{N}$); with $(\text{PhO})_2\text{Ba}$ it gives β -phenolglucoside. Ph_3CCl in $\text{C}_6\text{H}_5\text{N}$ gives 6-*triphenylmethylglucosyl fluoride*, softens 135° , m. 140° (decompn.), $[\alpha]_D^{14}$ 58.4° ($\text{C}_6\text{H}_5\text{N}$), whose *tri-Ac* deriv., m. $147-8^\circ$, $[\alpha]_D^{20}$ 119.6° and *tri-Bz* deriv., m. about 95° , $[\alpha]_D^{18}$ 75.1° ($\text{C}_6\text{H}_5\text{N}$); satg. a CHCl_3 soln. with HCl and allowing to stand 25 min. at room temp. gives 2,3,5-tribenzoylglucosyl fluoride, which was not purified but condensed with acetobromoglucose, giving 6-[*tetraacetyl- β -glucosido*]-2,3,5-tribenzoylglucosyl fluoride, m. $195-6^\circ$, $[\alpha]_D^{23}$ 15° ; with NH_3 in MeOH this yields 95% of gentiobiosyl fluoride, sinters 180° , decomps. $215-20^\circ$, $[\alpha]_D^{20}$ 33.47° ; hepta-Ac deriv., m. $162-3^\circ$; CaCO_3 in H_2O gives gentiobiose, identified as the octaacetate, m. $190-2^\circ$ and the osazone, m. $170-3^\circ$. Gentiobiose is, therefore, a β -6-glucosidoglucose.

C. J. WEST

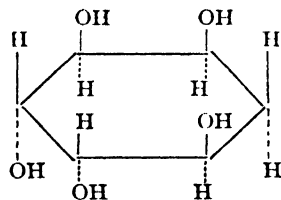
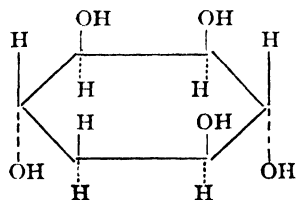
New syntheses of isomaltose and of gentiobiose. AMÉ PICTET AND ALFRED GEORG. *Compt. rend.* **181**, 1035-7 (1925).—Di-levo-glucosan (cf. Pictet, *C. A.* **16**, 2313) is an anhydride of isomaltose and can be converted to isomaltose by digesting with a small amt. of concd. HCl at room temp., evapg. *in vacuo* with KOH, dissolving in H_2O , adding Ag_2CO_3 , filtering and evapg. A mixt. of glucose and isomaltose is obtained from which the glucose is removed by fermentation. Instead of isomaltose being a direct product of the partial hydrolysis of di-levo-glucosan it is possible that hydrolysis is complete,

with glucose as sole product and that the glucose is then converted to isomaltose by HCl. This was disproved by the fact that di-levo-glucosan and AcBr gave on standing and pouring on ice a white powder (by analogy probably an octaacetate of isomaltose bromohydrin) which on sapon. with $\text{Ba}(\text{OH})_2$ gave isomaltose. This synthesis should be of value in detg. the constitution of isomaltose. Acetylation of isomaltose prepd by the method of Fischer, with Ac_2O and NaOAc , gave 2 products: (1) about 97% of a hitherto unknown acetate of isomaltose and (2) about 3% of the β -octaacetate of gentiobiose (cf. C. A. 9, 1181). Sapon. of the latter gave gentiobiose. This indicates that in the prepn. of isomaltose from glucose by the method of Fischer, a small amt of gentiobiose is formed, which represents the 1st synthesis of gentiobiose ever accomplished by purely chem. means.

Investigations on cellulose and lichenin by use of X-ray spectrum. E. OTT. *Helvetica Chim. Acta* 9, 31-2 (1926).—By means of the Debye and Scherrer method of crystal analysis and using a tube with a Cu target, the reflection angles for cellulose (from H_3PO_4 pptn.), oxycellulose and hydrocellulose are found to be identical, thus establishing the identity of the cryst. portions of these substances and the cryst. substance in lichenin.

Amylooctadextrin. PETER KLASON AND KNUT SJÖBERG. *Svensk Kém. Tids.* 37, 290 5 (1925). The discussion in this paper pertains to terminology and leads to the term amylooctadextrin for the amyloextrin yielding disaccharides on further digestion. Enzymic digestion ends with a resistant residue, $(\text{C}_{12}\text{H}_{20}\text{O}_{10})_2$, which is $1/2$ of the dextrin. The dextrin is considered as $(\text{C}_{12}\text{H}_{20}\text{O}_{10})_4$, mol. wt. 2610.

The configuration of *d*-quercitol. P. KARRER. *Helvetica Chim. Acta* 9, 116 7 (1926).—Of the 10 configurations possible for *d*-quercitol (I) 4 are eliminated on the grounds of symmetry. Four of the remaining 6 are eliminated by the fact that I yields mucic acid on oxidation (Kiliani and Scheibler, *Ber.* 22, 517 (1889)). I, therefore, has one of the following configurations



REYNOLD C. FUSON

Dinitro-sym-trihydrazinobenzene and several other derivatives of dinitro-trichlorobenzene. W. BORSCHIE AND W. TRAUTNER. *Ann.* 447, 1-18 (1926).—1,3,5-tri- $(\text{O}_2\text{N})_2\text{C}_6\text{HCl}_3$ (I) and $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ in EtOH give the difficultly sol. hydrazine salt, reddish brown, m. 169° (decompn.), of nitrodichlorobenzazimidole, yellow, m. 196° (decompn.). II (below) and $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ in hot EtOH give 80% of dinitro-sym-trihydrazinobenzene, orange-red, explodes without melting. I and EtOH- NH_3 3 hrs. at 100° give a mixt. of 1,3-diamino-4,6-dinitro-5-chlorobenzene, yellow, turns brown at 185° and m. 206° (decompn.), and 1,3,5,4,6- $(\text{H}_2\text{N})_3\text{C}_6\text{H}(\text{NO}_2)_2$, decomp. about 298° . I and piperidine in EtOH contg. AcONH_4 give the yellow 1-piperidino-4,6-dinitro-3,5-dichlorobenzene, m. 108° ; increasing the amt. of piperidine gives the 1,3,5-tripiperidino deriv., citron yellow, m. $147-8^\circ$. All reactions between I and PhNH_2 give the trianilino deriv., m. $179-80^\circ$; the di-*p*-toluidino deriv., bright red, m. 231° ; di- β -naphthylamino deriv., dark red, m. 225° (decompn.). AcONa and AcNH_2 , 30-40 min. at 160° , give dinitrodichlorophenol, yellow, m. 120° , analyzed as the *p*-anisidine salt, yellow, m. 195° (decompn.). PhONa gives the 1-*Ph* ether, m. 108° . I, Na and Ph OH (excess) on the H_2O bath give 2,4-dinitro-1,3,5-chlororesorcinol di-*Ph* ether, m. $129-30^\circ$. If the reaction mixt. is finally heated to 125° for 4 hrs., there results dinitrochloroglucitol tri-*Ph* ether (II), m. $110-1^\circ$. $\text{CHNa}(\text{CO}_2\text{Me})_2$ and I in EtO give a mixt. of di-*Me* 2,4-dinitro-3,5-dichlorophenylmalonate, m. 132° , and a di-*Me* 2,4-dinitrochlorophenylmalonate (?), brownish, m. 105° ; the 5-*Cl* deriv., prepd. from 1,3,4,6- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{Cl}_2$, yellow, m. $70.5-1.5^\circ$. Et 2,4-dinitro-3,5-dichlorophenylacetate, m. 124° . Nitration of 3,5,4- $\text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{Me}$ gives 2,4-dinitro-3,5-dichlorotoluene, m. 127° . 3,5,2,4- $\text{Br}_2(\text{O}_2\text{N})_2\text{C}_6\text{HMe}$ and EtOH- NH_3 give 3,5-diamino-2,4-dinitrotoluene, orange-yellow, m. 210° ; the 3,5-dianilino compd., garnet-red, m. $163-4^\circ$; 3,5-dihydrazino deriv., dark red with 2 H_2O , decomp. 173° ; an excess of $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ heated several hrs. gives a methylhydrazinonitrobenzazimidole, bright red, decomp. 176° . EtONa or PhONa does not give characteristic products.

The *di-Ac deriv.* of 3,5,4,2-Br₂(O₂N)(H₂N)C₆HMe, m 170°. 3,5,2,6-Br₂(O₂N)₂C₆HMe and EtOH-NH₃ give impure NH₃ derivs.; the 3,5-*di-p-toluidino deriv.*, orange, m. 191°. N₂H₄·H₂O gives 7-methyl-6-nitro-1-hydroxy-5-bromobenzotriazole, decomp. 236°. EtONa gives 1-methyl-2,6-dinitro-5-bromophenyl 3-Et ether, m. 133°. C. J. WEST

Infra-red absorption spectra of organic derivatives of ammonia. III. Di- and triphenylamine. F. K. BELL. *J. Am. Chem. Soc.* **48**, 813-7(1926); cf. C. A. **20**, 841.—The infra-red absorption spectra, between 1 and 12μ, of molten Ph₂NH (65°) and Ph₃N (145°) are reported. They show, in the region between 2.8 and 3.4μ, the same qual. differentiation between PhNH₂ and Ph₂NH and Ph₃N as in the case of PhNH₂ and the alkyanilines. The significance of the absorption spectra of these compds. in connection with the study of the 3.3μ band of the alkyanilines is indicated. IV. Mono-, di-, and tribenzylamine. *Ibid* 818-23.—The infra-red absorption spectra of PhCH₂NH₂, (PhCH₂)₂NH and (PhCH₂)₃N are reported between 1 and 12μ, the (PhCH₂)₃N being examd. at 105°. These compds. follow, with certain qualifications, the same qual. differentiation previously found to exist between the 3 classes of amines of the aryl and arylalkyl types. In (PhCH₂)₂NH and (PhCH₂)₃N both the 3.3μ band and the 3.5μ band have been resolved. A new band characteristic of the C₆H₅ nucleus has been located at 5.1μ. C. J. WEST

Mechanism of the formation of triphenylguanidine and phenylthiocarbimide from thiocarbanilide. W. J. S. NAUNTON. *J. Soc. Chem. Ind.* **45**, 34-5T(1926).—It is probable that the (PhNH)₂CS momentarily forms carbodiphenylimide, which then combines with the mercapto form of the (PhNH)₂CS to give an unstable S compd., which breaks down into triphenylguanidine and phenylthiocarbimide. T. S. CARSWELL

Standardization of the Sandmeyer reaction, with special applications. H. S. FRY and I. W. GROTE. *J. Am. Chem. Soc.* **48**, 710-4(1926).—Cl, Br and I introduced into the *p*-haloamines give practically identical av. yields of the dihalobenzenes when the diazonium salt is added to either a hot or cold CuX soln. The av. yield for the 9 possible replacements at 0° to 5° is 76%, as compared with 74% if the same replacements are made at 100-5°, the max. difference in any single case was only 10%. The character of the halogen atom already present in the *p*-haloaniline or the presence of a NO₂ group as in *p*-O₂NC₆H₄NH₂ appears to have little if any effect upon the yield of the *p*-halogen deriv. The yields of the *o*-, *m*- and *p*-C₆H₄X₂ and the *o*-, *m*- and *p*-Cl and BrC₆H₄NO₂ are greatest when Br and least when Cl replaces the NH₂ groups. With the single exception that *m*-ClC₆H₄NH₂ gave a greater yield of *m*-C₆H₄Cl₂ than of *m*-ClC₆H₄Br, the general rule appears to hold that the yields of the substituted derivs., from the point of view of the halogen atom introduced, follow the relative order Br > I > Cl. The variations, however, between the 2 extremes are slight in most cases. The *o*- and *m*-ClC₆H₄NH₂ gave markedly lower yields of the corresponding C₆H₄Cl₂ and ClC₆H₄Br than did the *p*-, and some 25% lower than the corresponding products obtained from the O₂NC₆H₄NH₂. The resp. isomeric products are formed, however, in both cases in the following relative quant. order: *p* > (or =) *o* > (or =) *m*. CuCl₂ and CuBr₂ may be substituted satisfactorily for CuCl and CuBr in the standardized cold method as applied to the *p*-haloanilines. The yields with CuCl₂ are 20-30% lower than those obtained with CuCl. Conversely the yields with CuBr₂ are 6-7% higher than those obtained with CuBr. C. J. WEST

Nitro- and aminoformazyls. EUG. BAMBERGER, ROB. PADOVA and ERNEST OERMEROD. *Ann.* **446**, 260-307(1925).—An improved method is given for the prepn. of C nitroformazyl (I). On heating with AcOH or better with a mixt. of AcOH, Me₂CO and AmNO₂, there results C-hydroxydiphenyltetrazolium betaine (II), explodes 176°; *HCl salt*, m. 193°; *perchlorate*, explodes 194°; *iodide*, yellow; *picrate*, golden yellow, m. 169° (decompn.); *chloroplatinate*, flesh colored, m. 196° (decompn.); *Hg salt*, (C₆H₅N₄O)₂·HgCl₄, m. 209.5°; if the prepn. of II is carried out in AcOH-H₂SO₄ there results as a by-product, a compd., C₇H₅N₃O₂, m. 85-86°, which was not further studied. Reduction of II by H₂S in NH₃-EtOH gives OC(NHNHPh)₂, m. 171°. whose *dinitrosamine* m. 95°, it is very unstable and soon no longer gives the Liebermann reaction; in EtOH Cu(OAc)₂ gives a dark red, then pale violet ppt.; HgCl₂ gives a violet-blue, unstable ppt. AgNO₃ gives a violet soln. from which a dark gray ppt. seps. Oxidation gives II. H₂O₂ gives diphenylcarbazone, m. 150°, whose *di-Bz deriv.*, m. 265.5-6.5° and is also obtained from BzCl or Bz₂O and II. Reduction of II by H₂S-NH₃ in EtOH in the cold gives dihydroformazyl mercaptan, m. 164-5° (decompn.), crystg. with 1 Me₂CO, identical with Fischer's diphenylsulfocarbazine (*Ann.* **190**, 118(1878)); *formazyl mercaptan*, PhN:NC(SH):NNHPh, dark violet, nearly black needles with steel-blue luster, m. 178° (*Cu salt*, greenish black needles with metallic luster, m. 191.5-2°; *Pb salt*, red, m. 230°, decomp. 235°; *Hg salt*, decomp. about 220°; *diiodide*, brownish green, m.

135°); further oxidation of these products gives *diphenyltetrazolium thiobetaine*, pale yellow, explodes 180.5° (depends on rate of heating). Reduction of I with NaSH in $\text{Me}_2\text{CO}-\text{NaOH}$ gives *C-aminoformazyl (formazylamine) (III)*, crystg. with 1 H_2O , dark brownish red powder, m. 135–6° (decompn.); the warm aq. soln. is colloidal; it crystals from Me_2CO or CHCl_3 with solvent of crystn.; concd. H_2SO_4 gives a violet-blue soln. it dyes silk in a dil. acid bath a reddish brown; the aq. soln. reduces AgNO_3 in the cold the *HCl salt (IV)* ppts. from Et_2O in violet scales, m. 141–2°; the red MeOH or EtOH soln. deposits the base upon addn. of H_2O . III and Ac_2O give *phenylazophenylmethyl triazole*, m. 178–8.5°; the color varies from canary-yellow to orange-yellow, depending upon the solvent. Heating the IV with concd. HCl gives *C-amino- α -chloroformazyl*, Bordeaux-red, crystg. with 1 EtOH , m. 146° (decompn.), gives a deep violet-red soln. in 2 N NaOH , isolated through the *HCl salt*, turns red 110°, m. 175–6° (decompn.). The α -*Br deriv.*, dark red with green luster, m. 125–5.5°, crystals with 1 EtOH ; the EtOH -free base, m. 114–5.5°. Oxidation of III in EtOH with AmNO_2 in the presence of dry HCl gives *C-aminodiphenyltetrazolium chloride (V)*, m. 269°; the concd. aq. soln. is not pptd. by NaOAc ; the aq. soln. can be evapd. to dryness without material decompn.; *dichromate*, orange-yellow, decomps. 189° (depending upon rate of heating and size of tube); *dichromate-HCl*, $\text{C}_{26}\text{H}_{26}\text{N}_{10}\text{Cr}_2\text{O}_7\text{Cl}_2$, orange-yellow, m. 175° (decompn.); *chloroplatinate*, pale yellow with bronze luster, m. 249°; *permanganate*, violet-red, decomps. 106–10°; Ag_2O gives a strongly alk. soln. of the free hydroxide. V gives with HCl and NaNO_2 *nitrosoiminodiphenyltetrazolium betaine (VI)*, orange-yellow, m. 177°; *HCl salt*, m. 168°, immediately hydrolyzed by H_2O ; the AgNO_3 salt is pale yellow, decomps. 157–61°; the *chloroaurate*, orange-yellow, m. 119–22°; heating with 2 N HCl gives V. Heating VI in 96% EtOH 3–4 hrs. gives the *iso deriv.*, orange-yellow, m. 154–5°, PhOH and some concd. H_2SO_4 give a carmine-red soln. Heating with HCl for 2 hrs. gives V. V, BzCl and 2 N NaOH give the *benzoyl-C-iminodiphenyltetrazolium betaine*, golden yellow, m. 232°; *HCl salt*, m. 280.5°; *chloroplatinate*, flesh-colored, m. 198° (decompn.); *dichromate*, citron-yellow, m. 170.5°; *permanganate*, violet, explodes at 144.5°. The *Bz deriv.* is fairly stable and heating with $\text{EtOH}-\text{KOH}$ or aq. NaOH for several min. is without effect. Sapon. with 2 N HCl gives V. Reduction of the *Bz deriv.* by H_2S $\text{NH}_3\cdot\text{EtOH}$ gives a *compd.* $\text{C}_{20}\text{H}_{17}\text{M}_6$, m. 222–3°. C. J. WEST

Influence of substituents in the components on the equilibrium in binary solutions. XLVIII. Binary systems of azobenzene with acids. ROBERT KREMANN AND KARL ZECHNER. *Monatsh.* 46, 171–6(1925); cf. *C. A.* 19, 1703—Simple eutectics were formed in binary mixts. of PhN_2Ph with the following acids: BzOH , AcOH , $\text{Cl}_3\text{CHCO}_2\text{H}$, $\text{Cl}_3\text{CCO}_2\text{H}$, cinnamic, salicylic and succinic. Complete temp.-m. p. diagrams are given. XLIX. The binary systems of cinnamaldehyde and salicylaldehyde with phenols. ROBERT KREMANN AND EDUARD ZECHNER. *Ibid* 177–92—The m. p. diagrams for $\text{PhCH}:\text{CHCHO}$ (I) with the 2 naphthols and with $o\text{-NO}_2\text{C}_6\text{H}_4\text{OH}$ could not be produced over the entire concn. range as highly viscous solns. resulted which resisted crystn. With $p\text{-NO}_2\text{C}_6\text{H}_4\text{OH}$, pyrocatechol, and $m\text{-C}_6\text{H}_4(\text{OH})_2$, compds. of 1 mol. I with 1 mol. phenol were observed. With $m\text{-NO}_2\text{C}_6\text{H}_4\text{OH}$ and $m\text{-C}_6\text{H}_4(\text{OH})_2$, compds. of 1 mol. I with 1 mol. phenol were formed. $o\text{-HOC}_6\text{H}_4\text{CHO}$ (II) has less tendency to compd. formation than I. Simple eutectics are given with PhOH , α - and $\beta\text{-C}_{10}\text{H}_7\text{OH}$, 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$, 1,4- $\text{C}_6\text{H}_4(\text{OH})_2$, $o\text{-NO}_2\text{C}_6\text{H}_4\text{OH}$ and 1,2,4- $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{OH}$. With picric acid, compds. were formed contg. 1 and 2 mols. of II to 1 of picric acid. L. Binary systems of acids and amines. ROBERT KREMANN, GUSTAVE WEBER AND KARL ZECHNER. *Ibid* 193–224.— BzOH gave simple eutectics with PhNH_2 and α - and $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$; with $p\text{-MeC}_6\text{H}_4\text{NH}_2$ compds. contg. 1 and 2 mols. of acid to 1 of amine were formed; with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ the addn. compd. contd. 2 mols. acid to 1 of diamine; with m - and $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ only equimol. compds. were formed. With salicylic acid, equimol. compds. were formed with $p\text{-MeC}_6\text{H}_4\text{NH}_2$, α - and $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$, and all 3 isomeric $\text{C}_6\text{H}_4(\text{NH}_2)_2$. Cinnamic acid gave simple eutectics with α - and $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$, $p\text{-MeC}_6\text{H}_4\text{NH}_2$, and $m\text{-C}_6\text{H}_4(\text{NH}_2)_2$; with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ an equimol. compd. is formed; with $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ a deep-seated chem. reaction occurs. Succinic acid gave a simple eutectic with $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ and an equimol. compd. with $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$. chem. reaction takes place with o - and $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$. AcOH gave a simple eutectic with α - and $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$ and with $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$; with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ a compd. of 1 mol. diamine to 2 mols. acid was formed; with $m\text{-C}_6\text{H}_4(\text{NH}_2)_2$, the compd. contd. 1 mol. diamine to 4 mols. acid. For comparison, systems of $\text{CO}(\text{NH}_2)_2$ (I) were studied, and the following compds. with 1 mol. I were detected: 2 mols. AcOH , 1 mol. salicylic acid, with BzOH a liquid compd. was indicated; with succinic acid a secondary reaction, accompanied by loss of NH_3 , took place. T. S. CARSWELL

The photo-oxidation of organic compounds by chromates. I. PLOTNIKOV. Z.

Elektrochem. **32**, 13–5 (1926).—P. is undertaking a general investigation of the subject, using sunlight as the source. This article gives a description of suitable app., and lists of dyes stable and unstable in light in mixed soln. with $K_2Cr_2O_7$. B. H. C.

Mercurization of nitrobenzene and substitution in the benzene nucleus. OTTO DIMROTH. *Ann.* **446**, 148–54 (1925); cf. Holleman, C. A. **17**, 3487.—D. submits a revision of his work on the mercurization of $PhNO_2$ (cf. *Ber.* **35**, 2033 (1902)) which is quoted by H. The *o*-HgCl deriv. is the principal product with about 15% of the *m*-deriv. and a relatively small amt. of the *p*-deriv. A method is given for the detn. of *o*- and *p*- $BrC_6H_4NO_2$ in the presence of the *m*-deriv., which depends upon the fact that $N_2H_4 \cdot H_2O$ reacts with the 1st 2 but not with the *m*-deriv. Since the HgCl compds. can be transformed into Br derivs., this becomes a method for detg. the compn. of a mixt. of these compds. C. J. WEST

Mercuration of aromatic sulfonic acids. Preliminary paper. F. C. WHITMORE AND LOUIS EHRENFELD. *J. Am. Chem. Soc.* **48**, 789–91 (1926).—The mercuration of aromatic SO_3H acids takes place with extreme ease and rapidity, that of the Na salts is a much slower process. *p*- $MeC_6H_4SO_3H$ (190 g.) in 750 cc. H_2O and 35 cc. $AcOH$, treated with 320 g. $Hg(OAc)_2$ in the same amt. of solvent, gave 81 g. of an insol. material, from which no satisfactory product was obtained, and 135 g. of 2-hydroxymercuritoluene-4-sulfonic acid, crystg. with 2 H_2O ; the H_2O is lost over $CaCl_2$, while drying *in vacuo* over P_2O_5 gives the inner salt, $C_7H_5O_3SHg$; the structure was established by replacing the $HgOH$ group by I. C. J. WEST

Identification of phenols by means of the spectroscope. II. H. WALES AND S. PALKIN. *J. Am. Chem. Soc.* **48**, 810–3 (1926); cf. C. A. **18**, 2302; **19**, 2550.—Absorption spectra max. are reported for solns. of azo dye derivs. of 45 phenolic compds. in H_2O , $EtOH$ and Me_2CO . C. J. WEST

Oxidation of arylmagnesium halides. HENRY GILMAN AND AGNES WOOD. *J. Am. Chem. Soc.* **48**, 806–10 (1926).—In a study of the optimal conditions for the prepn. of phenols by the oxidation of arylmagnesium halides it is shown that the yields are strictly limited by the oxidation of Et_2O ; the Et_2O_2 so formed reacts with unaltered $RMgX$ compd. to give a sec. alc. Thus $PhMgBr$ gave 3% of Ph_2 and 18% of $PhMe \cdot CHOH$. The av. yield of $PhOH$ at 0° was 26%; at -5° 29%; at -60° , 21.2%. After refluxing the $PhMgBr$ in Et_2O (without passing O through the soln.) for 8 hrs., the av. yield of $PhOH$ was 6.8%; replacing most of the Et_2O by C_6H_6 gave 16.1% $PhOH$; in $PhMe$ at 108° for 6 hrs., there resulted 21.9% $PhOH$. The rate of the addn. of O appears to have little effect on the yield of $PhOH$. *p*- MeC_6H_4MgBr gave 15.3% *p*- MeC_6H_4OH , 16% (*p*- MeC_6H_4), 11% $PhMe$ and 11% *p*- $MeC_6H_4CHMeOH$. Yellow HgO and $PhMgBr$ in Et_2O - $PhMe$ at 108° for 19 hrs. gave 15.1% $PhOH$; Ag_2O in Et_2O for 10 hrs. gave 18% $PhOH$ and Na_2O_2 in Et_2O for 5 hrs. gave 14.5% $PhOH$. C. J. W.

Orientation in the benzene ring. The bromination of pyrogallol 2,6-dimethyl ether. A. A. LEVINE. *J. Am. Chem. Soc.* **48**, 797–800 (1926).—2,6-(MeO) $_2C_6H_2OH$ and Br in CS_2 give 80% of 3-bromopyrogallol 2,6-di-Me ether (I), b_{40} 185 – 90° ; oxidation with Cr_2O_3 in 50% $AcOH$ gives 90% of 3,3'-dibromo-2,6,2',6'-tetramethoxybiphenone (dibromocedriret), gray, m. 254° , which is reduced by SO_2 in moist Me_2CO to dibromohydrocedriret, m. 262° (Hayduck, *Ber.* **9**, 929 (1876)); and 5% of 3-bromo-2,6-dimethoxy-*p*-benzoquinone (II), reddish yellow, m. 148° . Chlorination of I in CS_2 gives 85% of the 4,5-di-Cl deriv., m. 127 – 8° ; *Bz* deriv., m. 114 – 5° ; *Ac* deriv., m. 97 – 8° . Oxidation gave 45% of the 5-Cl deriv. of II, red, m. 164 – 5° , also obtained by chlorinating II. 2-Bromosyringic acid, m. 155° (95% yield), on oxidation with Cr_2O_3 in H_2SO_4 gives 62% of II. The combined orienting effect of the 2 MeO groups is thus greater than that of the HO group. C. J. WEST

Preparation of some alkyl and aryl derivatives of phloroglucinol. EMIL KLARMANN AND WM. FIGDOR. *J. Am. Chem. Soc.* **48**, 803–5 (1926).—*n*-Phlorocaprophenone, m. 118° (air-dry, 95°); reduction with amalgamated Zn and 5% HCl gives 70% of hexylphloroglucinol, m. 108° . 2,4,6-Trihydroxydiphenylmethane, oily (50% yield). 2,4,6-Trihydroxydiphenylethane, m. 159 – 60° ; $FeCl_3$ gives a pink ppt.; yield, 65%. $AcCl$ gives a mixt. of the di-*Ac* deriv., m. 135 – 6° (gives a brown ppt. with $FeCl_3$), and a tri-*Ac* deriv., heavy oil. These derivs. are highly germicidal to *B. typhosus*, the $PhOH$ coeff. being about 8. C. J. WEST

Fungi dyestuffs. V. Constitution of polyporic acid. FRITZ KÜGL. *Ann.* **447**, 78–85 (1926); cf. C. A. **20**, 406.—The polyporic acid of Stahlschmidt (*Ann.* **187**, 177; **195**, 365) is 3,6-dihydroxy-2,5-diphenyl-1,4-benzoquinone, m. 118° , which makes up 18% of the wt. of *Polyporus nidulans* Fr.; the di-*Ac* deriv. m. 209° ; di-Me ether, m. 192° ; a micro Zn distn. gives terphenyl, m. 206 – 7° ; oxidation with Cr_2O_3 gives only $PhOH$; a crystallographic comparison is also given. C. J. WEST

The preparation of saccharin. P. DUROCHER. *La nature* 53, ii, 361-4(1925).—An illustrated description of large-scale production, including the chemistry involved.

C. C. DAVIS

Remarks concerning the work of Ernst Waser. Phenylalanine series. VI. Decarboxylation of tyrosine and leucine. GÉZA ZEMPLÉN. *Helvetica Chim. Acta* 9, 115(1926).—A polemic (cf. Waser, *C. A.* 20, 1067).

REYNOLD C. FUSON

The catalytic reduction of several acid chlorides. FRITZ ZETZSCHE, CHRISTIAN FLÜTSCH, FLORIAN ENDERLIN AND ALFRED LOOSLI. *Helvetica Chim. Acta* 9, 182-5 (1926); cf. *C. A.* 16, 865; 20, 380.—Reduction of batches of 2 g. sym. *o*-C₆H₄(COCl)₂ (I) in tetralin with 1 g. 2.5% Pd-kieselguhr catalyst at 150° and with increasing amts. of regulator (2.5-25 mg. quinoline S) showed a very slight sp. influence of the regulator and it is believed that a combination with I occurs, thus poisoning the system. After filtering off the catalyst, washing it with Et₂O, shaking the filtrate with NaHSO₃, standing a day, then treating with NaOAc, AcOH and PhN₂H₃, phenyl-1-hydroxyphthalazine is obtained; the residue from the Et₂O on evapn. *in vacuo* was extd. with H₂O from which the *phthalide* was obtained; repeated extn. of the catalyst with hot glacial AcOH yields *bipthalide*, m. 332°. Attempts to reduce benzyl-, methylbenzyl- and diethylmalonyl chlorides to the malonic dialdehydes were not successful although reduction occurred below 100°, yielding oils with no aldehydic properties. Almost equally unfruitful were the attempts to prep. dialdehydes of pyridinecarboxylic acids and this is believed to be due to the fact that acid chlorides of lutidine- (II) and collidinedicarboxylic acids (III) can only be obtained as double compds. with POCl₃, the latter poisoning the aldehyde regulators. Use of SOCl₂ gave resinous products. Dry II in CHCl₃ with PCl₅ forms a compd., m. 200-30°, which is probably the *acid chloride-POCl₃ double compd.* and is pptd. from soln. with ligroin; when treated with PhNH₂ in EtOH, pptd. with H₂O and recrystd. from dil. alc. it yields the *anilide*, m. 278-81° (decompn.). Similarly from III the *acid chloride-POCl₃ double compd.* (IV), m. 125-32° and the *anilide*, m. 288-90°, were obtained. Reduction of IV in xylene or in BzOH gave 15% of *aldehyde* isolated as the *diphenylhydrazone*, yellow, m. 146-9° (decompn.). Heating of β,α-C₁₀H₆(OH)CO₂H with Ac₂O and 3 drops H₂SO₄ below 80° for 0.5 hr., pouring into H₂O and crystg. from H₂O the oil which solidifies on standing gave *2-acetoxynaphthalene-1-carboxylic acid*, m. 130.5-15°; in CHCl₃ with PCl₅ this gave the *acid chloride*, m. 140-1°.

N. A. LANGE

The constitution of chlorinated derivatives. A. CORNILLOT. *Compt. rend.* 181, 1071-3(1925).—When the compds. obtained by chlorination of phthalonic acid derivs. (cf. *C. A.* 18, 1281; 19, 265) are treated with C₆H₆ and AlCl₃ under suitable conditions, a previously unknown series of compds. is formed. With Et phthalonate the best results are obtained by mixing the Et ester of the phthalonic acid deriv. with 4.5 times its wt. of C₆H₆, adding the AlCl₃ progressively and then extg. the resin for a long time with dil. HCl. On agitating the C₆H₆ soln. with NaHCO₃ soln. a small amt. of *benzhydrol-o-carboxylic acid*, *o*-HO₂CC₆H₄CH(OH)Ph, is pptd., leaving in soln. *Et α-phenylphthalidecarboxylate*, O.CO.C₆H₄ CPhCO₂Et, m. 70°, the constitution of which was

proved by its inability to form a semicarbazide, and its decompn. by alkalis or acids to EtOH, CO₂ and α-phenylphthalide. These reactions show that the phthalonic ester has the formula already attributed to it and that the substitution of Ph for Cl weakens considerably the bond between the CO₂H group and the side chain. C. C. D.

Bisphthalidecarboxylic esters. ANDRÉ CORNILLOT. *Compt. rend.* 182, 142-3 (1926).—In continuation of work on the substitution of Cl in chlorophthalidecarboxylates by other groups (cf. preceding abstr.) the action of organo-Zn compds. was studied. The latter bring about a union of 2 mols. thus: 2 C₆H₄.CO.O.C(CO₂Et)Cl →

C₆H₄.CO.O.C(CO₂Et)C(CO₂Et).O.CO.C₆H₄. This new *compd.* should have 2

optically inactive isomers, in agreement with which it was found that MeZnI or MeZnBr and C₆H₄.CO.O.C(CO₂Et)Cl gave 2 *products* of identical compn., cryoscopic prop-

erties, etc. One was composed of short needles, m. 188°, the other of elongated needles, m. 159°, about twice as much of the 2nd being formed as of the 1st. They are decompd. by alkalis to form a mixt. of phthalonic and phthalidecarboxylic acids. A mixt. of the 2 isomers can also be obtained by boiling C₆H₄.CO.O.C(CO₂Et)Cl in

alc. with reduced Ag.

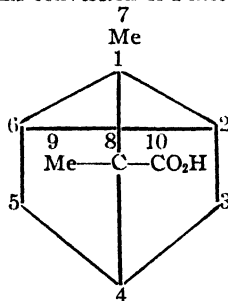
C. C. DAVIS

Higher terpene compounds. XXVII. Azulene. L. RUZICKA AND E. A. RUDOLPH.

Helvetica Chim. Acta 9, 118-40(1926); cf. *C. A.* 20, 421.—The high-boiling fraction (110–70° at 12 mm.) of yarrow oil was treated with H_3PO_4 and by exn. with petroleum ether a H_3PO_4 addn. compd. of *chamazulene* (I) resulted. Decompn. with H_2O yielded crude I which was converted into its *picrate* (II), m. 115° (from EtOH or MeOH). On treatment with 5% NaOH II gave pure I (yield 1.6%), b_{12} 161°, d_4^{20} 0.9883; *styphnate*, m. 95–6° (from EtOH or MeOH). Camomile oil treated similarly gave I (4.6% yield). Similarly, from the dehydrogenation products of the sesquiterpene hydrocarbons from eucalyptus oil was obtained *eucazulene* (2.4% yield based on the amt. of sesquiterpenes used), $b_{0.5}$ 135°; *picrate* (from EtOH), m. 118–20°; *styphnate* (from EtOH or MeOH), m. 122–3°. From the dehydrogenation product of *guaiane* (III) was obtained in the same way *guaiazulene* (IV) (12% yield based on guaial or 20% based on III), b_{11} 164°, d_4^{18} 0.9759; *picrate*, black needles, m. 122°; *styphnate*, black needles (from MeOH), m. 105–6°. Oxidation of I with $KMnO_4$ failed to give either Me_2CO or a phthalic acid. Reduction of I with Na in moist Et_2O or in EtOH destroyed the blue color, yielding a greenish oil; in AmOH Na gave a greenish oil, b_{11} 118–24°, d_4^{20} 0.9177, n_D^{20} 1.5200. This analyzed approx. for *hexahydrochamazulene* (V). *Octahydrochamazulene* (VI), b_{11} 119°, resulted when I was reduced catalytically with Pt black at 0.1 atm. in EtOAc. V and VI when heated with S gave I. II reduced similarly with Pt black gave *octahydroguaiazulene* (VII), b_{11} 123–5°, d_4^{20} 0.8872, n_D^{20} 1.4834. VII heated with S gave IV. III reduced with Pt black gave *dihydroguaiane*, b_{15} 124–5°, d_4^{20} 0.8955, n_D^{20} 1.4894.

REYNOLD C. FUSON

Constitution of teresantallic acid. I. RUZICKA AND FR. LIEBL. *Helvetica Chim. Acta* 9, 140-4(1926).—The aldehyde of *teresantallic acid* (I) yields a *semicarbazone*, m. 217°, which on reduction (in a closed tube at 180°) with Na in EtOH yields *tricyclene* (II) which is converted into isoborneol (III) and finally into camphor (IV). Since in the formation of III from II the OH group is attached to C atom 2, this atom must be a part of the labile ring of I. This conversion of I into IV is, therefore, a strong argument in favor of the structure



R. C. F.

Esters of camphylcarbinol. II. RUPE AND (MISS) M. SCHAEFER. *Helvetica Chim. Acta* 8, 853-65(1925).—Camphylcarbinol (I), prepd. by reduction of methylene-camphor (II), was esterified with various acid halides in C_6H_5N . Letting stand overnight, heating 1-3 hrs. on the H_2O bath, treating cold with dil. HCl, shaking out with Et_2O and washing with dil. HCl, dil. aq. NaOH, and finally $KHSO_4$ soln., drying over $MgSO_4$, removing the Et_2O , finally at 40–50° in *vacuo*, and then distg. in a high vacuum maintained by a good Hg pump. The esters decomp. to some extent on distn. in an ordinary vacuum into II and the acid. Even at the low pressures reached, at which the b. ps. given below were measured, a trace of decompn. occurred, becoming appreciable in the

case of the sorbic ester. It was expected that in the reaction $C_8H_{14} \begin{matrix} \diagup C:CHOH \\ \diagdown CO \end{matrix} \rightarrow$

$C_8H_{14} \begin{matrix} \diagup CHCH_2OH \\ \diagdown CO \end{matrix}$ 2 optical isomers would result, but the I behaved as if homogeneous, and only in the case of the isobutyrate were 2 forms observed. **Esters of camphylcarbinol:** Formate, acetate (Akermann, *Diss.*, Basel, 1919). **Propionate** (III), by using $EtCOBr$, b. (see above) 63°, m. 28–36°, $[\alpha]_D^{20}$ 41.52°, $[\alpha]_D^{20}$ 55.37°, $[\alpha]_{Hg}^{20}$ 68.69°, $[\alpha]_D^{20}$ 99.26°, d_4^{20} 1.0430; in another prepn. d_4^{20} 1.0420, $[\alpha]_D^{20}$ 54.75°. **Isobutyrate**, b. 61°, crystd. partially after several weeks, the *solid isomer* (IV), m. 31.5–3.0°, $[\alpha]_D^{20}$ 23.48°

in PhH, the liquid portion (V) showing $[\alpha]_D^{20}$ 36.85° in PhH (10% solns.). *Butyrate*, b. 73°, d_4^{20} 1.0254, $[\alpha]_D^{20}$ 53.45°. *Valerate*, b. 82°, d_4^{20} 1.0140, $[\alpha]_D^{20}$ 49.18°. *Hexahydrobenzoate*, b. 95°, d_4^{20} 1.0507, $[\alpha]_D^{20}$ 49.49°. *Phenylacetate*, b. 120°, d_4^{20} 1.0902, $[\alpha]_D^{20}$ 40.94°. *Hydrocinnamate*, b. 141°, d_4^{20} 1.0791, $[\alpha]_D^{20}$ 38.56°. *Cinnamate*, thick oil, b. 145°, d_4^{20} 1.1004, $[\alpha]_D^{20}$ 46.06°. *Crotonate* (VI), b. 79°, d_4^{20} 1.0506, $[\alpha]_D^{20}$ 56.5°. *Sorbate*, yellow, b. 99°, d_4^{20} 1.0433, $[\alpha]_D^{20}$ 54.55°, changes in several days to a resin. In the prepn. of VI it was found necessary to oxidize MeCH:CHCHO to the acid with O₂ in order to obtain it free from halogen (Duchesne and Delépine, C. A. 19, 634); the Na salt with PCl₅ under Et₂O gave the chloride, b. 120°, but even with these precautions VI contained 0.37% Cl. Na sorbate was converted into the chloride in the same way. Tables of data for the different wave lengths are given and the rotatory dispersions shown to be quite normal, mean values for the esters being: $[\alpha]_F/[\alpha]_D$ 2.36, λ_D 591.5, λ_D^0 0.09271, P. R. D., 189.06, values very close to those for derivs. of II. When $1/\alpha$ is plotted against λ^2 for III, IV and V (Lowry and Dixon), the curves are not entirely straight lines, possibly because of the presence of several asym. C atoms, which might make the exptl. curve the resultant of two others. Other previously observed regularities are also pointed out.

M. HEIDELBERGER

Action of nitrogen tetroxide on caoutchouc. FRIEDRICH EMDEN. *Ber.* 58B, 2522-7 (1925).—This work was undertaken to det. whether Weber's "dinitrocaoutchouc," C₁₀H₁₆O₄N₂ (I) (*Ber.* 35, 1947 (1902)), is really capable of existence, and, if not, what the primary product of the action of N₂O₄ (E. worked around 0°, i. e., at temps. at which N₂O₄ is practically not at all dissociated into NO₂) is. The crude caoutchouc was carefully purified, the N₂O₄ was not passed directly into the caoutchouc soln. but previously dissolved to satn. in CCl₄ at room temp., the reaction was carried out at a low temp. under such conditions (caoutchouc soln. slowly added to the N₂O₄ soln. that from the 1st instant of reaction the N₂O₄ was present in considerable excess, and the action was not continued more than 2 hrs. at most. In this way was obtained a pure white product very sensitive to heat, sinters 90-5° (incipient decompn.), reduces hot Fehling soln., does not dissolve in aq. NH₄OH even after several days but gradually dissolves in dil. aq. NaOH. When covered with Me₂CO it is at first insol. but after several days (a few hrs. if warmed) it dissolves without a residue to a clear red-brown soln., from which it can be reprecip. by H₂O but in a slightly yellowish form which is now easily sol. in Me₂CO at room temp.; the soln. in hot Me₂CO is not accompanied by liberation of CO₂ or other gases; the Me₂CO-sol. form is the more stable. The products obtained from *Ilex* caoutchouc and from guayule do not differ from each other and have a remarkably const. compn., even though the conditions of prepn. varied widely (temp. from -15° to 4°, length of reaction from 10 to 90 min.). The av. C, H and N content (46.45, 6.04, 10.78%) agrees remarkably well with that calcd. for C₁₀H₁₆O₄N₂ (II); the yields (which varied but little under different conditions) also agreed well with the calcd. I is, therefore, probably not capable of existence; the addn. of N₂O₄ to caoutchouc is accompanied by an oxidation and the *nitrosate* II may be regarded as the primary product of the reaction. If allowed to stand 24 hrs. at room temp. with an excess of N₂O₄ soln. the II becomes easily sol. in Me₂CO and in dil. NH₄OH and NaOH and when refluxed in Me₂CO now evolves 0.1 mol. CO₂.

C. A. R.

Superheating of homogeneous organic compounds. II. Experiments with mono- and diketones. SIEGFRIED SKRAUP AND SIEGFRIED GUGGENHEIMER. *Ber.* 58B, 2488-2500 (1925); cf. C. A. 19, 266.—Aliphatic-aromatic ketones are considerably more stable towards high temps. than the corresponding hydrocarbons, the compds. *p*-MeOC₆H₄COR being stable up to 360° where R = Et, Pr and iso-Pr and up to about 340° where R = Me. Only at very high temps. are they attacked, with loss of H₂O and autocondensation, followed by the rapid formation of resinification and carbonization products in which no simpler org. split products can be detected. Replacement of Ph in diketones by *p*-ClC₆H₄ results in increased sensitiveness to temp. but a decreased tendency in the products to undergo secondary reactions. Study of diketones of the type ArCO(CH₂)_nCOAr (*n* = 2 to 5) showed that, as with paraffin chains, those with an even no. of C atoms are distinctly more reactive than those with an odd no. The 1,4-, 1,6- and 1,7-diketones suffer a loss of H₂O essentially similar to that produced by condensation agents; the sensitiveness to temp. and to dehydrating agents runs closely parallel. From *p*-MeOC₆H₄COMe (phenylhydrazone, m. 142°, decomp. on long standing) heated 15 hrs. at 320-30°, 70% is recovered unchanged; after 24 hrs. at 325-35° and 2 hrs. at 350°, 60%; after 50 hrs. at 310°, 70-80%. After 20 hrs. at 360-80°, some combustible gas was obtained on opening the tube, the contents of which

consisted of H_2O , a few oily drops and a completely carbonized mass from which a few drops of the unchanged ketone were isolated by vacuum distn.; 72 hrs. heating at $340-50^\circ$ gave similar results. Of $p\text{-MeOC}_6\text{H}_4\text{COEt}$ (obtained in 73% yield from 1 mol. each of EtCOCl and PhOME with 1 mol. AlCl_3 in PhNO_2 at room temp.), 85% is recovered unchanged after 15 hrs. at $320-30^\circ$, 80% after 50 hrs. at $330-40^\circ$, 60% (together with a small amt. of a substance, $b_{11} 190^\circ$, m. $135-40^\circ$) after 45 hrs. at $340-60^\circ$; 100 hrs. heating at $360-80^\circ$ resulted in complete carbonization. From $p\text{-MeOC}_6\text{H}_4\text{COPr}$ heated 20 hrs. at $300-10^\circ$, 92% is recovered unchanged; after 18 hrs. at 360° , 80%; 100 hrs. heating at $360-80^\circ$ results in almost complete carbonization but a small amt. of the ketone can still be isolated as the phenylhydrazone. Of $p\text{-MeOC}_6\text{H}_4\text{COCHMe}_2$, 86% is unchanged after heating 15 hrs. at 360° . $(\text{CH}_2\text{Bz})_2$, heated 18 hrs. at $300-10^\circ$, gave 80% α, α' -diphenylfuran, m. 88° . $\text{CH}_2(\text{CH}_2\text{Bz})_2$, m. 65° (obtained in 65% yield by sapon. of $\text{CH}_2(\text{CHBzCO}_2\text{Et})_2$, m. $87-8^\circ$, which, in turn was obtained in 97% yield from $\text{BzCH}_2\text{CO}_2\text{Et}$), after 20 hrs. at $320-30^\circ$ gave 20% unchanged diketone, PhCOMe and a dark viscous oil (presumably condensation products of PhCOMe and $\text{CH}_3\text{:CH-COPh}$). *Di-p-chlorobenzoylpropane*, obtained in poor yield from $\text{CH}_2(\text{CH}_2\text{COCl})_2$ and C_6H_6 , m. 117° ; like $\text{CH}_2(\text{CH}_2\text{Bz})_2$ it is unchanged by heating 5 min. on the H_2O bath with concd. H_2SO_4 ; likewise it can be almost completely recovered after heating 4 hrs. alone at 302° , and when heated 22 hrs. at $325-35^\circ$ in a small flask in a slow current of N it yields only a trace of an oil having an PhCOMe odor and yielding a phenylhydrazone, m. 110° . $(\text{CH}_2\text{CH}_2\text{Bz})_2$ (4 g.) heated 20 hrs. at $300-10^\circ$, gave 0.6 g. unchanged diketone and 1.5 g. of viscous yellow oil, $b_{14} 200-25^\circ$, yielding with ether-petroleum ether a small amt. of crystals, m. 90° , behaving towards Br in CS_2 and towards KMnO_4 in Me_2CO like benzoylphenylcyclopentene (Bauer, C. A. 8, 3181); 2 hrs. heating at 340° gave only an ill-defined polymerization product and short heating on the H_2O bath with concd. H_2SO_4 resulted in oxidation to BzOH . *Di-p-chlorobenzoylbutane* (I) (obtained in 75% yield from 10 g. $(\text{CH}_2\text{CH}_2\text{COCl})_2$, 100 g. PhCl and 14 g. AlCl_3 at $50-5^\circ$), m. $166-7^\circ$; at the same time is formed 13% of δ -*p-chlorobenzoylvaleric acid* (II), m. 130° . With 20 g. AlCl_3 (which had largely fallen to a powder in the stock bottle) in 130 g. PhCl at 50° , then at 60° and 80° and finally a few min. at 90° , 12 g. of the chloride gave 20% I, 28% II and chlorophenylchlorobenzoylcyclopentene (III), m. 130° (with coarsely granular AlCl_3 quickly pulverized before use, the yields of I and II were 65 and 20%, resp.); III, however, cannot be obtained from preformed I with AlCl_3 in PhCl . Heated on the H_2O bath with 2 cc. concd. H_2SO_4 until dissolved and allowed to stand overnight, 0.5 g. I gives 0.1 g. of the isomer (IV), m. 108° , of III. From 5 g. I heated alone 24 hrs. at $255-65^\circ$ are obtained 0.2-0.3 g. unchanged I, less than 0.1 g. $p\text{-ClC}_6\text{H}_4\text{CO}_2\text{H}$, 0.7 g. IV, 1.3 g. of a mixt. of III and IV and 1 g. of polymerization products; 50 hrs. heating at $320-30^\circ$ or 45 hrs. at 280° gives chiefly polymerization products, accompanied by carbonization and formation of $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$; $\text{CH}_2(\text{CH}_2\text{CH}_2\text{Bz})_2$ is unchanged by cold concd. H_2SO_4 and oxidized to BzOH on heating, heated 28 hrs. at $325-30^\circ$ it gives small amts. of Bauer's isomeric cyclohexene derivs. m. $75-80^\circ$ and 110° ; 8 hrs. heating at 340° results largely in resinification. *Di-p-chlorobenzoylpentane*, m. 112° , is obtained in 75% yield, together with 23% ϵ -*p-chlorobenzoylcaproic acid*, m. $139-40^\circ$, from $\text{CH}_2(\text{CH}_2\text{CH}_2\text{COCl})_2$, PhCl and AlCl_3 ; it is not attacked by H_2SO_4 at 100° , while 6 g. heated 13 hrs. at $285-95^\circ$ gives a little $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$, 0.1 g. of yellowish needles, $\text{C}_{13}\text{H}_{16}\text{OCl}_2$, m. 156° , and a dark viscous oil.

C. A. R.

Beckmann rearrangement. VI. Configuration of benzophenone, acetophenone and benzaldoximes. JAKOB MEISENHEIMER, PAUL ZIMMERMANN and UDO V. KUMMER. *Ann.* 446, 205-28 (1925); cf. C. A. 19, 2819.—2-Bromo-3,5-dinitrobenzoic acid, pale yellow, m. 213° , results in 86% yield from $o\text{-BrC}_6\text{H}_4\text{CO}_2\text{H}$ in concd. H_2SO_4 and 5 mols. KNO_3 at 50° , and a final temp. of $130-40^\circ$. Transformed into the acid chloride by PCl_5 and treated with C_6H_6 and AlCl_3 there results 97% of 2-bromo-3,5-dinitrobenzophenone, pale yellow, m. $153-4^\circ$. With NH_2OH this does not yield an oxime but gives at once 98% of 2-phenyl-4,6-dinitroindoxazene (I), orange-yellow, m. $242-3^\circ$ (decompn.), probably identical with the product of Cathcart and Meyer (*Ber.* 25, 3296 (1892)). In EtOH-KOH this yields the K salt of 2-hydroxy-3,5-dinitrobenzophenone, red, decomp. $180-200^\circ$; in H_2O it gives I. I is not changed by heating with 4 parts concd. H_2SO_4 for 12 hrs. 2,3,5- $\text{Cl}(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{Bz}$ and 2,3,5- $\text{MeO}(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{Bz}$ with NH_2OH likewise give I. 2-Chloro-5-nitrobenzophenone oxime (II), pale yellow, m. 180° , results nearly quant. by heating the ketone, $\text{NH}_2\text{OH} \cdot \text{HCl}$ and EtOH at $140-50^\circ$ for 2.5 hrs. Soln. in dil. NaOH gives 2-phenyl-4-nitroindoxazene (III), pale yellow, m. 143° . Beckmann rearrangement of II with PCl_5 in Et_2O gives 63% of 2-chloro-5-nitrobenzamidide, m. 158° , identical with a synthetic product from 2,5- $\text{Cl}(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{COCl}$ and PhNH_2 ; there is

also formed a *compd.* $C_{13}H_{10}O_6N_2ClP \cdot H_2O$, m. 136–8°. *2-Bromo-5-nitrobenzophenone*, pale brown, m. 121°; *oxime*, pale yellow, m. 195–6°. With dil. alkali it gives **III**. Beckmann rearrangement gives 77% of 2,5-Br(O₂N)C₆H₃NHAc, m. 168–9°, and 14% of the *compd.* $C_{13}H_{10}O_6N_2BrP$, m. 135–9°. *2-Methoxy-5-nitrobenzophenone*, pale yellow, m. 129°, in 82% yield from the Cl deriv. and MeONa; *oxime*, m. 195°. Concd. KOH gives 94% **III**. The Beckmann rearrangement gave *2-methoxy-5-nitrobenzanilide*, m. 194°, identical with the synthetical product which results in 95% yield from the Cl deriv. and MeONa. 2-BrC₆H₄Ac, b₁₁ 113–4°, on nitration at –1° to –3° with fuming HNO₃, gives 93% of *2-bromo-5-nitroacetophenone* (IV), m. 88–9°, which gives with Br in AcOH 90% of *2,ω-dibromo-5-nitroacetophenone*, m. 66–7°. NH₂OH in AcOH gives *N-di-[2-bromo-5-nitrophenacyl]hydroxylamine dioxime*, crystg. with 1 EtOH, m. 167–75°, after drying, 195° (decompn.); in HCl other products result which are being investigated. IV *oxime*, m. 171° (α-form) and 132° (β-form); the β-form is the more sol. in all solvents; soln. of the β-form in EtOH contg. a little H₂O gives the α-form; the same change occurs on melting the β-form. Both forms (the β-form more readily) yield *2-methyl-4-nitroindoxazene* (V), m. 129°; boiling EtOH-KOH gives a *compd.*, m. 165°, probably *2-hydroxy-5-nitroacetophenone oxime*. Since the β-form gives V in the cold, the α-form only on boiling, the formation of V is a suitable method of detg. the content of the 2 forms in a mixt. The Beckmann rearrangement of the α-form with PCl₅ gives 2,5-Br(O₂N)C₆H₃NHAc; the mixt. of the 2 forms with concd. H₂SO₄ (0.5 hr. at 100°) gives 50% of 2,5-Br(O₂N)C₆H₃NH₂, no other rearrangement product was observed. Attempts to prep. a di-NO₂ deriv. of 2-BrC₆H₄Ac gave only 2,5-Br(O₂N)C₆H₃CO₂H. α-2,5-Cl(O₂N)C₆H₃CH₂NOH and PCl₅ in abs. Et₂O give nearly quant. 2,5-Cl(O₂N)C₆H₃CN, m. 105–6°. With Na₂CO₃ in dil. EtOH there results 2,5-HO(O₂N)C₆H₃CN, m. 197°, whose Na salt forms yellow needles. Heating the nitrile above its m. p. gives a *polymer*, yellow, does not m. 250°, changed by NaOH to a red powder. Since the usual methods of prep. the β-oxime failed, it was prep. as follows: *2-Chloro-5-nitrobenzyl chloride*, m. 66° (35% yield from *o*-ClC₆H₄CH₂Cl and fuming HNO₃ at 30–40°); NH₂OH gives *N-di-[2-chloro-5-nitrobenzyl]hydroxylamine*, m. 225°, unchanged by boiling CrO₃ in AcOH or by KMnO₄ in Me₂CO; fuming HCl at 150° is also without action. The product obtained according to Brady and Bishop (C. A. 19, 2650), crystd. from C₆H₆, gives 20–5% of the β-oxime, yellow, m. 176°, on melting the β-form is changed largely into the α-form. *2-Hydroxy-5-nitrobenzal dioxime*, m. 225° (80% yield); it is unchanged after boiling 3 hrs. with acid. *Propionyl-α-benzil monoxime*, m. 70°; 10% NaOH at room temp. gives nearly quant. the decompn. products, BzOH and PhCN. *Cinnamoyl-α-benzil monoxime*, m. 117°. C. J. W.

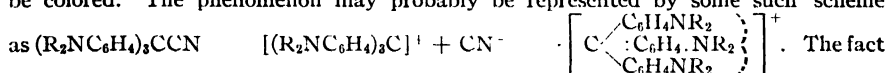
Preparation of 2,4-dihydroxydiphenylmethane and of 2,4-dihydroxydiphenylethane
 EMIL KLARMANN. *J. Am. Chem. Soc.* **48**, 791–4 (1926) — *2,4-Dihydroxydiphenyl methane*, m. 76–7°, b₁₂ 210–5°, results in 50% yields from *m*-C₆H₄(OH)₂, PhCH₂Cl and AlCl₃ in PhNO₂ and in 30% yields by reducing the corresponding ketone with amalgamated Zn and 1.3 HCl. *2,4-Dihydroxydiphenylethane*, m. 131°, results in 70% yields by reducing *m*-dihydroxydesoxybenzoin, m. 121°. Both *compds.* show a high germicidal action, the PhOH coeff. being 22 and 40, resp. The corresponding *p*-HOCH₂CH₂Ph is only 4.6 times stronger than PhOH. C. J. WEST

Coupling reaction of the Grignard reagent. I. The *o*- and *p*-cyanobenzyl halides.
 R. C. FUSON. *J. Am. Chem. Soc.* **48**, 830–6 (1926). — *p*-NCC₆H₄CH₂Br or *p*-NCC₆H₄CH₂I and EtMgI give amorphous products which contain halogen but no N. *o*-NCC₆H₄CH₂Br, b₄ 124°, m. 71.5–2.5°, and EtMgI give 42.5% *s*-bis-[*o*-cyanophenyl]ethane (I), m. 138.5–9.5°; *o*-NCC₆H₄CH₂I, m. 76.5–78.5° (97% yield from the bromide and NaI), and EtMgBr give 25% of the same coupling product. MeMgI may replace the EtMgBr with about the same yield. EtOH-KOH and I give 70% of *s*-bis-[*o*-amino phenyl]ethane, m. 241–2°, while further heating (38 hrs.) gives 50% of *s*-bis-[*o*-carboxy phenyl]ethane, m. 226–8°. C. J. WEST

Triphenylmethane group. HAKON LUND. Univ. Copenhagen, *Diss.* 1926, 7–102. — When MeO groups are introduced in the *p*- and *o*-positions in the C₆H₅ rings of Ph₃COH, *compds.* are produced that react with increasing readiness with H⁺ to form water and the substituted cation Ph₃C⁺. The change from Ph₃COH, which is almost entirely unionized in concd. HCl, to its hepta-MeO deriv., which is highly ionized in aq. HCN, is gradual. In the solid state the normal carbinyl chlorides are colorless when the no. of substituents is less than 4 and colored when the tetra- or higher MeO derivs. are produced. The latter are salts, almost completely dissociated in Me₂CO as well as in H₂O. Some of the highly substituted carbinols may be used as indicators, being colorless in basic and colored in acid solns. L. believes that the rearrangement of the triarylmethyl group from the alkyl to the ionic form does not involve a special orientation of the

MeO groups, that the quinonoid structure idea of color should be modified, and that the oxonium theory has no foundation whatever. E. O. ELLINGSON

Photochemical rearrangements in the triphenylmethane series. III. J. LIFSCHITZ. *Ber.* 58B, 2434–40(1925); cf. *C. A.* 15, 2282. It was shown in the earlier papers that derivs. of di- and triaminotriphenylmethanes rearrange, on exposure to light of short wave length, into the isomeric dye salts from which they are formed spontaneously in the dark. Similar phenomena have been observed not only with *p,p'*-(HO)₂ derivs. (benzaurin (I)), but also with derivs. in which the Ph residues are not substituted. Thus, I, converted into the colorless carbinol or cyanide by treatment with excess of alkali or KCN, resp., again assumes its characteristic color on illumination, and the same is true of phenolphthalein (II) and the unusually stable Ph₃CCN (III), Ph₃CSO₃H (IV) and Ph₃CSCN (V) give with ultra-violet light either salt-like isomers or Ph₃COH and the corresponding acid; in none of these cases is any color produced as the result of the illumination itself. III and V, when pure, are absolute non-electrolytes; perfectly pure, carbinol-free III gives with AcOH·H₂SO₄ or pure concd. H₂SO₄ no trace of color, and V in CHCl₃ c.: in freshly prepd. cold alc. soln. gives no SCN⁻ reaction; carbonium properties appear in III only after illumination, SCN⁻ reactions in V after illumination, heating or standing in soln. Ph₃CH derivs. can, therefore, exist in a non-electrolyte and an electrolyte form and the latter need by no means be colored. The phenomenon may probably be represented by some such scheme



that perfectly colorless solns. of certain Ph₃CH derivs. show strong ionic reactions and considerable elec. cond. supports the mol. compd. theory of Pfeiffer (elaborated by L., *C. A.* 19, 820, and earlier papers) to explain the phenomena of halochromism as against the isomerism theory (cf. Hantzsch, *C. A.* 16, 1414). The decolorization of I by alkalis (Meyer and Gerloff, *C. A.* 18, 2889) proceeds the more rapidly the greater the concn. of the alkali; alc. hinders the reaction; the rapidity of the restoration of the color in uviole or quartz by Hg light increases with increase in diln. of the soln. and decrease in the degree of alky. III, freed from the last traces of carbinol by shaking in C₆H₆ with concd. H₂SO₄, forms in H₂SO₄ and AcOH colorless solns. which, however, gradually become more and more intensely yellow on illumination, but the solns. in pure C₆H₆ and AcOH remain colorless during the illumination and become yellow only on subsequent addn. of H₂SO₄; analogous solns. kept in the dark do not assume this characteristic color even on heating. IV and its Na salt in H₂O rapidly deposit Ph₃COH on illumination. The freshly prepd., perfectly colorless solns. of V in cold MeCN (distd. from P₂O₅) have a mol. cond. of 1.37, 2.395 and 3.838 for *V* = 50.37, 100.73 and 201.46, resp., at 25.1°; in well-stoppered flasks they remain colorless for weeks, and the cond. increases only slightly. From all of its solns., whether or not they already show SCN⁻ reactions, the V crystals unchanged. The golden yellow solns. of Ph₃CN:NPh are decolorized quite rapidly when exposed to light of short wave length. C. A. R.

Formation of triphenylmethyl in the ethyl acetoacetate synthesis. F. F. BLICKE. *J. Am. Chem. Soc.* 48, 738–9(1926).—Ph₃CB₃ and the Na deriv. of AcCH₂CO₂Et in Et₂O–C₆H₆ react to form Ph₃C (isolated as the peroxide) and Ph₃CCH₂CO₂H, m. 177–8°. C. J. WEST

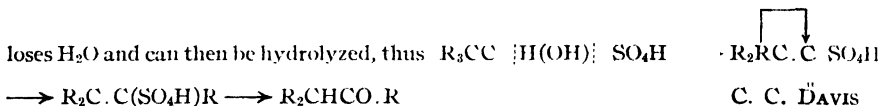
2-(2-Hydroxy-3-methylbenzoyl)-3,4,5,6-tetrachlorobenzoic acid, iso-*o*-cresol-tetrachlorophthalein and some of their derivatives. W. R. ORNDORFF and CARLSLE SCHADE. *J. Am. Chem. Soc.* 48, 769–73(1926).—2-(2-Hydroxy-3-methylbenzoyl)-3,4,5,6-tetrachlorobenzoic acid (I), m. 219–20°, from *o*-MeC₆H₄OH and Cl₄C₆(CO)₂O; diacetate, m. 182°; in some expts. there resulted an anhydride, m. 242.5°, which, however, does not give I with alkalis; Zn salt, light yellow with 3 H₂O, increasing in color when anhyd. Ba salt, with 9.5 H₂O. When I is heated with 7% aq. NaOH, there results 4-methyl-5,6,7-trichloro-8-xanthonecarboxylic acid, m. 286–9°; Na salt; acetate, m. 275–80°. With *o*-MeC₆H₄OH I gives iso-*o*-cresol-tetrachlorophthalein, m. 258–60° (decompn.); the alk. soln. is deep blue; di-Na salt, dark blue, forming a red soln. in H₂O and changing to blue on the addn. of alkali; diacetate, m. 224–7°; di-Me ether, m. 261–4° (decompn.). C. J. WEST

Transposition of trisubstituted aldehydes to disubstituted ketones. ORÉKHOFF

AND TIFFENEAU. *Compt. rend.* 182, 67–9(1926).—The transposition $\text{RRRC} \cdot \text{CHO} \cdot$



RRCH.CO.R, now identified for the 1st time, probably occurs in the majority of cases of dehydration of trisubstituted glycols of the cyclic series studied by various authors. It was first reported by Daniloff for Ph_3CCHO (cf. *J. Russ. Chem. Soc.* **49**, 282(1917); **51**, 97(1919)). Extending the study to aryldialkyl- and alkyl diarylacetaldehydes, which were of special interest because they are probably intermediate products of the dehydration of arylglycols by concd. H_2SO_4 , isomeric ketones were obtained by dissolving the aldehyde in concd. H_2SO_4 at room temp. and adding ice-water. The nature of the transposition varied with the aldehyde. Thus MePh_2CCHO gave only MePhCHCOPh , PhMe_2CCHO only PhMeCHCOMe and PhEt_2CCHO only PhEtCHCOEt , whereas EtPh_2CCHO gave both Ph_2CHCOEt and EtPhCHCOPh . In each case the transposition products were identical with those formed in the dehydration by concd. H_2SO_4 of the glycols from which the aldehydes were derived. These transpositions of aryldialkylglycols and from alkylhydrobenzoins to ketones (cf. Tiffeneau and Orékhoff, *C. A.* **15**, 3477; **16**, 1232, 2504; **17**, 3028; **18**, 70) are not of the semipinacol type, but are the result of a double migration: (1) migration of Ph, transforming the glycol to a trisubstituted aldehyde (exclusive elimination of tertiary OH) and (2) a Ph or alkyl migration, transforming the aldehyde to a ketone. The mechanism of this transportation is still in a hypothetical state. It is probably not a simple exchange, for with Ph_3CCHO heat does not favor the change but decomps. it to CO and Ph_3CH , but more likely involves a *halochromic addn. compd.* $\text{R}_3\text{CCH}(\text{OH})\text{SO}_4\text{H}$, which in turn



C. C. DAVIS

An example of an ether of a ketone hydrate. J. BOUGAULT. *Compt. rend.* **182**, 136-8(1926).—It has already been shown (cf. *C. A.* **19**, 3265) that $\text{PhCH}_2\text{CH}_2\text{C}(\text{OH})(\text{CO}_2\text{H})\text{OC}(\text{CH}_2\text{CH}_2\text{Ph})(\text{OH})\text{CONH}_2$ cannot be converted to the corresponding dibasic acid by acids or alkalis, owing to decompn. Further study shows that with HCl in HOAc, 2 different products are formed, depending upon the proportion of HCl used. They are *isomeric lactones*, m. 120° and 82° , resp., and are very different in compn. and in reactions. $\text{PhCH}_2\text{CH}_2\text{C}(\text{OH})(\text{CO}_2\text{H})\text{OC}(\text{CH}_2\text{CH}_2\text{Ph})(\text{OH})\text{CONH}_2$ (5 g.), HOAc (30 g.), HCl (d. 1.17) (20 cc.) and H_2O (80 cc.) refluxed 4 hrs. evolved CO_2 and gave a yellow sirup which, after washing with H_2O , and crystg. from Et_2O , gave the *compd.* $\text{PhCH}_2\text{CH}_2\text{CH} \begin{array}{c} \text{O} \\ \text{C}:(\text{CHCH}_2\text{Ph}) \end{array} \cdot \text{CO} \cdot \text{O}$, m. 120° (*loc. cit.*). It

formed with very dil. NaOH a *Na deriv.* (without rupture of the lactone chain) which was pptd. by excess NaOH, and which regenerated the original lactone when treated with even the weakest acids. Boiling dil. alkalis formed, by hydration, $\text{PhCH}_2\text{CH}_2\text{CHO}$ and $\text{PhCH}_2\text{CH}_2\text{COCO}_2\text{H}$, the yield of the latter being quant., that of the former very small owing to rapid resinification in the air. The 2nd product, m. 82° (*loc. cit.*) was not studied. C. C. DAVIS

Catalytic reduction of α -nitronaphthalene to α -naphthylamine. A. N. PARKETT AND ALEX. LOWY. *J. Am. Chem. Soc.* **48**, 778-82(1926).— $\alpha\text{-C}_{10}\text{H}_7\text{NO}_2$ (I) (5 g.) in 100 cc. glycol contg. 0.2 g. Pd black is reduced in 7.5 hrs. under $3\frac{1}{2}$ atm. pressure, giving 89.4% $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ (II); 84.6% in 3 hrs., and 98.4% at $6\frac{2}{3}$ atm. in 3 hrs. The % of reduction increases with an increase in temp. from 50° to 100° . The efficiency of solvents increases in the order: $\text{C}_2\text{H}_5(\text{OH})_2$, $\text{C}_2\text{H}_4(\text{OH})_2$, H_2O and iso-PrOH. Pd and Pt oxides produce high % of II in 1.5 hrs. Molten I was reduced by Pd oxide with a yield of 93.9% and with Ni with a yield of 14.3%. C. J. WEST

α -Naphthyl isocyanate as a reagent for alcohols. V. T. BICKEL AND H. E. FRENCH. *J. Am. Chem. Soc.* **48**, 747-51(1926).— $\alpha\text{-C}_{10}\text{H}_7\text{CNO}$ reacts well with primary and sec. alcs., giving good yields of urethans; tert. alcs. do not react well. The presence of moisture is not detrimental to the reaction with alcs. of low mol. wt., or with those which do not require heat for the reaction, but seriously interferes with reactions in which the mixt. is heated. The urethans are sepd. from the dinaphthylurea by its insolub. in hot ligroin. Urethans of the following alcs. were prepd.: methyl, m. 124° ; benzyl, m. 134.5° ; cinnamyl, m. 114° ; phenylethyl, m. 119° ; lauryl, m. 80° ; amyl, m. 68° ; furfuryl, m. $129-30^\circ$; m-xylol, m. 116° ; o-methoxybenzyl, m. $135-6^\circ$; ethylene glycol, m. 176° ; trimethylene glycol, m. 164° ; glycerol, m. $191-2^\circ$; ethylene bromohydrin, m. $86-7^\circ$; trimethylene bromohydrin, m. $73-4^\circ$; ethylene chlorohydrin, m. 101° ; trimethylene chlorohydrin, m. 76° ; phenylmethylcarbinol, m. 106° ; phenylethylcarbinol, m. 102° ; menthol, m. 119° ; borneol, m. 127° ; isoborneol, m. 130° ; cholesterol, m. 160° ; benzoin, m. 140° ; diphenylcarbinol, m. $135-6^\circ$; cyclohexanol, m. $128-9^\circ$; 2-methylcyclohexanol, m. $154-5^\circ$;

3-isomer, m. 122°; 4-isomer, m. 159–60°; methylhexylcarbinol, m. 63–4°; diethylcarbinol, m. 71–2°; Ph₃COH, Et₃MeCOH and citronellol did not react. Triphenylcarbinyl sym-tribromophenolate, m. 74–5°. The corresponding Bu ester could not be prepd.

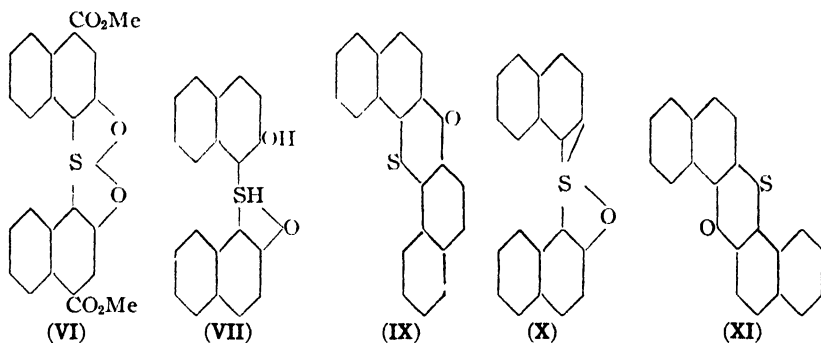
C. J. WEST

The influence of substituents on the formation and on the stability of some cyclic compounds. MICHELE GIUA. *Atti accad. Lincei* [6], 2, 343–6 (1925).—The work of Stollé and Knebel (*C. A.* 15, 3479) on the condensation of (COCl)₂ with phenols is reviewed. G.'s earlier work (*C. A.* 12, 1169) on the action of (COCl)₂ on β-C₁₀H₇OEt, which was confirmed by Staudinger (*C. A.* 15, 3445) and Stollé (*l. c.*) is reviewed. In this paper, the action of CH₂(COCl)₂ on β-naphthol (I) which was expected to give benzoxycoumarin, but gave the β-dinaphthyl malonate (II) instead, is described. 14.4 g. I in 50 cc. CS₂ and 14.1 g. CH₂(COCl)₂ were heated about 1 hr. on the H₂O bath. 12 g. AlCl₃ was then added and after HCl ceased to be evolved the CS₂ was evapd., leaving a pasty mass which was decompd with H₂O and a few drops of HCl. The pasty mass solidified slowly and was distd. with steam. The residue was crystd. from glacial AcOH and gave II, m. 146–7°. II sapond. with EtOH + KOH gave I. II does not react with FeCl₃ in H₂O or in EtOH.

R. J. WITZEMANN

2-Hydroxy-4-naphthoic acid and attempts to prepare an unsymmetrical naphthoxin. RUDOLF LESSER AND GEORGE GAD. *Ber.* 58B, 2551 9 (1925); cf. *C. A.* 20, 909; Royle and Schedler, and Butler and R., *C. A.* 17, 2178.—The present work shows beyond doubt that 2-hydroxy-4-naphthoic acid (I), m. 218–9° (cor.), has the normal structure with a double bond between C atoms 1 and 2; its acetate (II) m. 173–4° (R. and S. give 169–70°); benzoate, m. 222–3°; Me ether, prepd. with Me₂SO₄, m. 159°; chloride of II, from II in boiling C₆H₆ with SOCl₂, m. 96 7°; amide of II, m. 180–1°, converted by cautious hydrolysis with concd. KOH into the amide of I, m. 209–11°; anilide of II, m. 178–9°; anilide of I, m. 112–3°, possesses no affinity for plant fibers, unlike the 2,3-C₁₀H₆(OH)CONHPh, couples with p-O₂NC₆H₄N NPh to 1-p-nitrobenzene-azo-2-hydroxy-4-naphthoic anilide, red, m. 295–6°, sol. in concd. H₂SO₄ with cherry-red color. Me ester of I, obtained with MeOH-HCl, m. 91–2°. 1-Br deriv. of I, from I in AcOH suspension with 2 atoms Br at room temp., m. 231–2°. 1-Benzeneazo deriv. of I, red, m. 273° (decompn.), forms a monobasic Na salt, red needles with 2 H₂O. The dye obtained by coupling I with p-diazobenzenesulfonic acid (which yields a red dibasic Va salt) gives with Na₂S₂O₄ in a slight excess of NaOH and subsequent acidification with AcOH the 1-NH₂ deriv. (III) of I, m. 201° (decompn.) (yield, nearly quant.); if the Na₂S₂O₄ soln. is not acidified, the Na salt of III seps. on cooling, acidification with concd. HCl gives the HCl salt; on boiling with dil. HCl III loses CO₂ and gives 1,2-C₁₀H₆(NH₂)OH; N,O-di-Ac deriv. of III, from III in boiling Ac₂O-NaOAc, m. 225° (decompn.). With equal vols. of HNO₃ (d. 1.4) and H₂O in ice, III gives the yellow to orange 1,2-naphthoquinone-4-carboxylic acid, m. 173° (decompn.) (Heller, *C. A.* 6, 1440, gives 164–5°), whose yellow oxime, m. 181–2° (decompn.), is obtained by boiling the acid with 1 mol. NH₂OH.HCl in alc.; the isomeric 1-nitroso-2-hydroxy-4-naphthoic acid, red-brown, m. above 300° and sol. in concd. H₂SO₄ with blue-green color, is obtained in poor yield and not quite free of unchanged I when a Na₂CO₃ soln. of I contg. a large excess of NaNO₂ is poured with stirring into dil. HCl. 1,2-Diazo-oxide-4-naphthoic acid (1 g. from 3 g. III in cold H₂O rubbed to a paste with cold satd. aq. CuSO₄ and treated in ice with concd. aq. NaNO₂), yellow, deflagrates 151°, couples slowly with m-C₆H₄(OH)₂ in Na₂CO₃. 1,2,3-C₁₀H₆(NH₂)(OH)CO₂H (IV), obtained quant. by reduction with Na₂S₂O₄ of the dye obtained from p-diazobenzenesulfonic acid and 2,3-C₁₀H₆(OH)CO₂H, yellowish, m. 241° (decompn.) (Möhlau, *Ber.* 28, 3090 (1895), gives 205.5°), smoothly gives on diazotization in the usual way (drop-wise addn. of the Na₂CO₃ soln. of the IV, contg. the calcd. amt. of NaNO₂, to dil. HCl) the diazo oxide, stout dark yellow rodlets or needles with blue-black surface luster rubbing to a yellow powder, m. 182–3° (decompn.) (yield, almost quant.). The different behavior of III and IV towards HNO₃ is explained by assuming that III contains a double bond between the 1- and 2-, IV between the 2- and 3-C atoms, and that the rearrangement of the double bonds is effected only during the diazotization. The Me ester (20 g.) of I in CCl₄ with S₂Cl₂ gives 18.5 g. of the sulfide, C₂₀H₁₈O₆S (V), m. 210–1° (dibenzoate, m. 225°); 8 g. of this in cold Et₂O suspension with 20% NaOH and Br yields 6.2 g. of the dehydrosulfide, dark red, m. 188–9°, which does not react with PhNHNH₂ or other hydrazines and, therefore, has the so-called spiran structure (VI); the o-position not being occupied in this case, the non-reactivity of the VI cannot be accounted for on the basis of steric hindrance as suggested by v. Auwers and Kehrman for the corresponding deriv. of 2,3-C₁₀H₆(OH)CO₂Me. VI (4 g.) in boiling C₆H₆ with fuming HCl and Zn dust gives 2 g. of the isosulfide, m. 146°, sol. in cold dil. NaOH with yellow color and,

unlike the normal sulfide (V), oxidized back to VI in such a soln. by $K_3Fe(CN)_6$; in Et_2O in the presence of $NaHCO_3$ it quant. decolorizes I; its *dibenzoate*, m. 147–8°. All the sulfides described in the earlier papers give, even with an excess of KOH, only monobasic *K salts* while V alone forms a dibasic *salt*, and L. and G. now agree with v. A. and K. that the non-reactivity of those dehydrosulfides which did not react with $PhNHNH_2$ was due to steric hindrance as the result of the *o*-position being occupied. Although L. and his collaborators have established the structure of the isosulfides, Hinsberg (*C. A.* 18, 254) still maintains his so-called "S isomerism" theory, chiefly on the basis of the fact that Nolan and Smiles obtained from β -naphthol isosulfide (VII) a naphthoxin isomeric with that obtained from β -naphthol sulfide (VIII), and according to H., these 2 compds. cannot be structural isomers. L. and G. have confirmed the findings of N. and S. but believe that VIII loses H_2O normally and forms the sym. 2,1,2',1'-naphthoxin (IX), while VII, through the hypothetical intermediate compd. (X), gives the unsym. 1,2,2',1'-naphthoxin (XI). Attempts to prep. an unsym. naphthoxin failed. K 1-carbethoxynaphthalene-2-sulfonate, from 1,2- $C_{10}H_6(OH)SO_3H$ and $ClCO_2Et$ in alk. soln., was converted with PCl_5 into the *sulfonyl chloride*, m. 127–8°, which was reduced in MeOH suspension with Zn dust and concd. HCl to the exceedingly sensitive 1-naphthol 2-mercaptan, m. around 100°; in all attempts to condense the mercaptan with 2,1- $C_{10}H_6(OH)I$ the mercaptan decompd. before reaction set in. Neither 1,2'- nor 2,2'-dinaphthyl ether reacts with S_2Cl_2 . A mixed 4-chloro-naphthol 2'-naphthol 2,1'-sulfide, m. 167–8° (decompn.), was finally obtained (in 6 g. yield), from 17.8 g. 1,4- $C_{10}H_6(OH)Cl$ and 2- $C_{10}H_7OH$ with S_2Cl_2 refluxed in $CHCl_3$ (some 4-chloro-1-naphthol 2-sulfide, m. 172°, is also formed), but all attempts to condense the mixed sulfide to a naphthoxin failed.



C. A. R

Biacene (biacenaphthylidene) and its keto derivatives. KAROL DZIEWONSKI AND TADEUSZ LITYNSKI. *Ber.* 58B, 2539–44 (1925).—Biacenedione (biacenaphthylidenedione) (I), orange-red, m. 287–8°, is obtained in about 10% yield from acenaphthene and $K_2Cr_2O_7$ heated in AcOH 2–3 days at 40–50°; it dissolves in concd. H_2SO_4 with green color changing to red on addn. of a little concd. HNO_3 . Biacenone (biacenaphthylidenone) (II), golden yellow, m. 258°, is conveniently prepd. by refluxing acenaphthylene dibromide in concd. alc. soln. with concd. HCl for 3–4 hrs; it dissolves in concd. H_2SO_4 with intense violet color and is reprecipitated unchanged by H_2O , but if allowed to stand a long time in the soln. it undergoes a deep-seated alteration and the color changes to blue-red; its picrate, bronze-red, m. 224°. Acenaphthenone, m. 121–3°, sol. in concd. H_2SO_4 with yellow-green color, is an intermediate product in the prepn. of II and remains in the alc. mother liquors from the II. Biacene (biacenaphthylidene) (III), reddish golden yellow, m. 271–3°, can easily be prepd. by refluxing I or II with Zn dust and NaOAc in Ac_2O ; it dissolves in concd. H_2SO_4 with green color soon changing to indigo-blue in transmitted and fiery red in incident light; after a time the dichroism phenomenon disappears and the soln. finally assumes an olive-green color; its picrate, crimson, m. 214° (decompn.).

C. A. R.

Composition of rubicene. KAROL DZIEWONSKI AND JETZY SUSZKO. *Ber.* 58B, 2544–6 (1925).—As the exptl. results reported by Pummerer and Ulrich (*C. A.* 20, 412) differ materially in some respects from those obtained by D. and S., whose paper appeared in a journal not very readily accessible (*Bull. acad. Polon.* 1921, 67), D. and S. give a brief summary of their work and reproduce the results of the 4 analyses (made

on 0.15–0.19 g. samples) on the basis of which they assigned to P.'s rubicene the compn. $C_{26}H_{12}$ instead of $C_{26}H_{14}$ (found C 95.99–96.53, H 3.99–4.10%). C. A. R.

Compounds of the diphen succindene series. XII. Colorless and colored isomeric hydrocarbons of the diphen succindene series. K. BRAND AND T. SASAKI. *Ber.* **58B**, 2546–50 (1925); cf. C. A. **18**, 1660.---9,12-Dipropylidiphen succindan-9,12-diol (I), obtained in 25% yield from diphen succindan-9,12-dione (II) in C_6H_6 with $PrMgBr$ in Et_2O , m. 121–2°; boiled in $AcOH-HCO_2H$ (50:30 by vol.) or in alc. contg. a few drops of concd. HCl it gives a mixt. of the red 9,12-dipropylidiphen succindan-9,11-diene (III), m. 135–6°, and the colorless isomeric 9,12-dipropylidenediphen succindan (IV), m. 157–8°, which is oxidized by $CrO_3-H_2SO_4$ to $EtCHO$ and II. Both III and IV give with Pd -charcoal and H in aq. alc. the same 9,12-dipropylidiphen succindan (V), m. 98–9°. *Di-iso Pr isomers:* of I, prisms with 3 $MeOH$ or $EtOH$ which they quickly lose in the air, falling to a powder, m. 132–3°; of III, red to brown-red, m. 178–9°; of IV, colorless, m. 189°, oxidized by $CrO_3-H_2SO_4$ to Me_2CO and II; of V, m. 80–1°. C. A. R.

Dimorphism of furfuryl furate. J. E. ZANETTI AND P. F. KERR. *J. Am. Chem. Soc.* **48**, 794–7 (1926); cf. C. A. **19**, 1705. α -Furfuryl furate, m. 19.5°, d. 1.330, belongs to the monoclinic system, prismatic class; rhombic prism (hOl)(hkl); pinacoids (100)(001); crystal angles are given. The crystals pass with extreme ease to the β -form, the pressure exerted in removing the crystals or the mechanical disturbance caused by scratching their surface unintentionally being sufficient to cause this change. The β -form, m. 27.5°, d. 1.395, belongs to the triclinic system, pinacoidal class; pinacoids (100)(010)(hkl)(Ohl)(hkl)(hkl), crystal angles are given. The pseudomorphism of the β -form is discussed. C. J. WEST

Vinylene-homologous furals. W. KONIG. *Ber.* **58B**, 2559–66 (1925); cf. C. A. **19**, 3488; Vorländer, Fischer and Kunze, C. A. **19**, 2940.---A whole series of vinylene-homologous aldehydes, $R(CH:CH)_nCHO$ has been prepd. and studied, in the present paper are reported the results obtained with 5-[α -furyl]pentadien-1-al (I) and 7-[α -furyl]heptatrien-1-al (II) ($R = OCH_2CHCH_2CH_2C$, $n = 2$ and 3, resp.). I and II may

also be designated as α -strepto-di- and α -strepto-trivinylene-fural, resp. The max. of absorption in $\mu\mu$ and the persistency (thickness of layer in mm. down to which absorption bands persist) for the compds. $n = 0, 1, 2$ and 3 are, resp.: 272, 0.55, 314, 0.45; 350, 0.41; 373, 0.39. The colors of the addn. products formed by the 4 compds. with $SnCl_4$ in C_6H_6 are, resp.: colorless, lemon-yellow, orange, brick-red, with concd. HCl in alc.: colorless, green-yellow, orange, violet-red. Furfuracrolein ($n = 1$), m. 51°, is obtained in 60% yield from 100 g. furfural in 2 l. H_2O and 10 g. $NaOH$ at 0° treated in the course of 3.5 hrs. with 200 g. of 40% AcH and stirred 1.5 hrs. longer at 0°, protected from air and light it is indefinitely stable; in sunlight in evacuated quartz vessels it becomes discolored and deposits a substance no longer sol. in alc.; when pure, it dissolves in concd. HCl with greenish yellow color; its oxime, m. 123°. I, obtained in about 25 g. yield, under the most favorable conditions, from 100 g. furfural in 2 l. of 7.5% $NaOH$ at 20° treated in the course of 2.25 hrs. with 200 g. of 40% AcH and stirred 20 min. longer, b. 130–60°, yellow leaflets of faintly aromatic odor, m. 66°, volatile with steam, sol. in concd. HCl with orange color; oxime, very faintly yellowish white, m. 127°; phenylhydrazone, yellow, m. 153°. II, obtained in about 0.3 yield along with I, golden yellow, m. 111°, sol. in concd. HCl with violet-red color, gives a deep green color with salts of aromatic amines; phenylhydrazone, golden yellow, m. 183°, decomp. in the light. C. A. R.

Substituted pyrrole alcohols, pyrrolethioaldehyde and a pyrrolamine. HANS FISCHER AND ADOLF STERN. *Ann.* **446**, 229–41 (1925). Pyrrole alcs. are obtained by catalytic reduction in $EtOH$ or by reduction with $Al-Hg$ in Et_2O of pyrrole-aldehydes. 2,5-Dimethyl-3-carbethoxy-4-hydroxymethylpyrrole, m. 131°; heating at 150° for 2 hrs. gives the corresponding methane deriv. 2,4-Dimethyl-3-carbethoxy-5-hydroxymethylpyrrole, m. 119°. 2,4-Dimethyl-5-carbethoxy-3-hydroxypyrrole, m. 146°. Catalytic reduction in $AcOH$ gives the corresponding methane deriv. directly. The action of H_2S upon the pyrrole-aldehyde in $EtOH-HCl$ gives the thio deriv.; 2,5-dimethyl-3-carbethoxy-4-thioformylpyrrole, m. 231°; 2,5-dimethyl-5-carbethoxy-3-thioformylpyrrole, m. 246.5°; 1-phenyl-2,5-dimethyl-3-carbethoxy-4-thioformylpyrrole, m. 246°. 1,2,5-Trimethyl-3-carbethoxypyrrole-4-azobenzenesulfonic acid, orange-yellow leaflets. $Al-Hg$ and the NO_2 deriv. give 2,4-dimethyl-5-carbethoxy-3-aminopyrrole, m. 125.5°, whose picrate, m. 191° and HCl salt, m. 291°. Diazotized, it gives with $\beta-C_{10}H_7OH$ the 3-azo- β -naphthol, light red, m. 234°. Me_2SO_4 gives the compd. $C_{11}H_{13}O_2N_2$, m. 87°. C. J. WEST

Synthesis of 2,4-dimethyl-5-ethylpyrrole-3-propionic acid. HANS FISCHER AND BRUNO WALACH. *Ann.* **447**, 38-48 (1926).—Improved methods are given for prep. 2,4-dimethylpyrrole (32%) and 2,4-dimethyl-5-ethylpyrrole (77%); the latter in HCN, satd. with HCl, gives the imine-HCl, which is decompd. with ice and finally made alk. with 30% NaOH, giving 77% of 2,4-dimethyl-5-ethyl-3-formylpyrrole (I), m. 128°. *oxime*, m. 118.5°; *nitrile*, m. 112°; *aldazine*, m. 207°; *semicarbazone*, yellow, m. 203°; *azlactone*, orange-red, m. 193°; *benzoylaminoacrylic acid* from this, m. 183°. $N_2H_4 \cdot H_2O$ and Et_2O give the isomeric phyllopyrrole (2,3,4-trimethyl-5-ethylpyrrole), b_p 114-5°, m. 38-9°. I, $CH_2(CO_2H)_2$ and piperidine in $EtOH$ give 58% of 2,4-dimethyl-5-ethylpyrrole-3-acrylic acid, m. 205°, which is reduced by Na-Hg in dil. NaOH to the 3-propionic acid, m. 43-4°. 2,4-Dimethyl-3,5-diethylpyrrole, $C_8H_{14}(CO)_2O$ and $AcOH$, heated at 190° for 6 hrs. gives kryptopyrrole, identified as the picrate, m. 135°. 2,3,4-Trimethylpyrrole is obtained in 70% yield from 2,4-dimethyl-5-carbethoxy-3-formylpyrrole, $N_2H_4 \cdot H_2O$ and $EtONa$ by heating 12 hrs. at 140-60°.

Synthesis of tetra(2-ethyl-3-propionyl-4-methylpyrrol)ethylene, xanthopyrrole-carboxylic acid and transposition of several pyrroles. HANS FISCHER AND JOSEF KLARER. *Ann.* **447**, 48-63 (1926).—2-Ethyl-3-propionyl-4-methyl-5-carboxypyrrole, m. 180° (dec. compn.), results by heating the carbethoxy deriv. with concd. $EtOH-KOH$ 8 hrs. on the H_2O bath; heated above its m. p., it gives 2-ethyl-3-propionyl-4-methylpyrrole, b. 283°, m. 90°. With $HCHO$ and HCl there is formed bis-[2-ethyl-3-propionyl-4-methylpyrrole]methane, needles, which, heated in $EtOH$ with $FeCl_3$, yields the methene-III (I), bright red, m. 183°; this also results from the free pyrrole, HCO_2H and HCl, the free methene, yellow, m. 167°; *Cu salt*, yellow with metallic luster, m. 220°; *Co salt*, dark green, m. 274°; *Zn salt*, orange-yellow needles; *Cd salt*. 2-Ethyl-3-propionyl-4-methylpyrrolazobenzene-sulfonic acid, prisms which explode on heating. 2-Ethyl-3-propionyl-4-methylpyrrole-phthalide, yellow, m. 105° (88% yield). 2-Ethyl-3-propionyl-4-methyl-5-formylpyrrole, m. 140°, from the pyrrole HCN and HCl; *oxime*, m. 212°. Tetra-[2-ethyl-3-propionyl-4-methylpyrrol]ethane, m. 249°, from the pyrrole, glyoxal HCl or HNO_3 ; if the condensation is carried out with $AcOH$ and 1-2 drops concd. H_2SO_4 the product is deep red and shows 2 bands at 526-504 and 487.7-468.4 μ . $FeCl_3$ gives the corresponding ethylene deriv., yellow, m. 209°; with concd. $FeCl_3$ soln. there results a quant. yield of I. Reduction with Na-Hg at 35° gives the ethane, but $HI-AcOH$ gives 2-ethyl-4-methylpyrrole (II), b_{40} 93°, also obtained by heating 2-ethyl-3-propionyl-4-methyl-5-carbethoxypyrrole (III) with H_2SO_4 ; *picrate*, yellow, m. 86°; *azobenzene-sulfonic acid deriv.* III and $N_2H_4 \cdot H_2O$ in $EtOH$ give 2-ethyl-3-propyl-4-methylpyrrole, golden yellow oil, b_{12} 82°, unstable in the air, forming a resin; *picrate*, m. 168°. The methene of II was analyzed as the perchlorate, bright red, decomp. 240°, the *Cu salt* green leaflets with metallic luster, the *Co salt*, green leaflets with a metallic luster, and the *Fe salt*, m. 190°. *Et* 2-ethyl-4-methyl-5-carbethoxypyrrole-3- β -methylmalonate, m. 78°, by heating III, $MeCH(CO_2Et)_2$ and concd. HCl 3 hrs.; sapon. gives the free acid, m. 162°, with evolution of CO_2 and formation of 2-ethyl-4-methyl-5-carbethoxypyrrole-3-propionic acid, m. 138°; sapon. gives 90% of 2-ethyl-4-methyl-5-propionic acid (xanthopyrrolecarboxylic acid), m. 126° (*picrate*, m. 143°; *phthalide*, yellow, m. 133°).

C. J. WEST

Thiazoles. IX. Further studies on derivatives of 2-phenylbenzothiazole M. T. BOGERT AND HUGH BLAKE CORBITT. *J. Am. Chem. Soc.* **48**, 783-8 (1926); cf. C. I. **20**, 600.—6-Chloro-2-phenylbenzothiazole, m. 156.7° (all m. p. are cor.), results in 30-5% yields by the action of PCl_5 upon 2-phenylbenzothiazole, in 21.4% yield from the 6- NH_2 deriv. through the diazo reaction and in very low yields from *p*- ClC_6H_4NH :CPh and S at 252°. It does not give a higher Cl deriv. nor was the Cl replaced by Br with LiBr. The 6- NO_2 deriv., m. 196°. If 20% excess HNO_3 is used a *di-NO_2* deriv. is formed, m. 223°. 2-[*m*-Nitrophenyl]benzothiazole, m. 186.8-7.3°, in 35% yield from (*o*- $H_2NC_6H_4S$) $_2Zn$ and *o*- $O_2NC_6H_4COCl$. Reduction with Sn and concd. HCl gives 32% of the *NH_2* deriv., m. 140.4-40.9°; the $EtOH$ soln. shows a greenish blue fluorescence. 6-Hydroxy-2-phenylbenzothiazole, m. 228-9° (39.3% yield from the NH_2 deriv. through the diazo compd.). 2-[*p*-Hydroxyphenyl]benzothiazole, m. 228.6-29°, results in 69% yield from the corresponding NH_2 deriv. or in 47% yield from *p*- HOC_6H_4CHO . Nitration gives a bright yellow mononitro deriv., m. 199.2-97° (47.1% yield), sol. in NaOH with a yellowish red color, which is reduced to an *NH_2* deriv., m. 234.5-5.5° (20% yield), whose solns. exhibit a weak bluish fluorescence and darken on exposure to the air. The insol. reddish orange diazonium salt couples with β - C_6H_4OH to give a rich violet or purple ppt.

C. J. WEST

Benzo- γ -pyrones. G. WITTIG, FR. BANGERT AND H. E. RICHTER. *Ann.* **446**, 155-204 (1925).—2- HOC_6H_4Ac and $AcOEt$ with Na give 65% of 2-acetylacetophenol.

m. 90.5–1.5°; soln. in concd. H_2SO_4 gives a *quant.* yield of 2-methylchromone; boiling with Ac_2O and $AcONa$ for 2 min. gives 85% of 2-methyl-3-acetochromone, m. 88.5–9.5°. 2-Acetylaceto-5-methylphenol, m. 76–7° (60% yield); 2,7-dimethylchromone, b_{15} 192–3°, m. 97.5–8.5°; the 3-aceto deriv., m. 107.5–8.5° (85–90% yield). 2,6-Dimethyl-3-acetochromone (I), m. 114.5–5.5° (85–90% yield). 2-Acetylaceto-3,5-dimethylphenol, m. 116–7° (75–80% yield), gives quant. 2,5,7-trimethylchromone, b_{15} 177°, m. 55 6°, also gives 90% of the 3-aceto deriv., m. 112–3°. 2-Acetylaceto-1-naphthol, deep yellow, m. 110.5–1.5° (85–90% yield), gives quant. 2-methyl-[1,2-naphtho- γ -pyrone], m. 174–4.5°, and a nearly theoretical yield of the 3-aceto deriv., m. 143–4°. 1-Acetylaceto-2-naphthol, m. 152° (decompn.), gives quant. the pyrone derivs. Heating a mixt. of 20 g. 2,4-AcMeC₆H₃OH, $AcOH$ and $AcONa$ 18–20 hrs. during which time the temp. rises from 160° to 220° gives a mixt. of I, 2,6-dimethylchromone (II) and 4,6-dimethylcoumarin (III); the reaction mixt. in $AcOH$, treated with $NH_2OH \cdot HCl$ and $AcONa$, gives a mixt. of the monoxime of I, yellow, m. 100–100.5°, and the dioxime, m. 222–4°, sepd. by the greater insoly. of the monoxime in C_6H_6 ; both of them are sepd. by their soly. in $NaOH$; II and III are sepd. by transforming II into its oxonium salt by HCl ; the above mixt. may also be sepd. by pptg. II as its oxonium salt from Pt_2O , then removing I as the oxime mixt. The relative ams. formed are: using the 1st method of sepn., 52% I, 16% II and 24% III; using the 2nd method, 48% I, 12% II, 24% III. In the case of 2-HOC₆H₄Ac the acid method cannot be used, since 2-methylchromone does not form a HCl salt; the reaction mixt. is treated with $EtONa$ and the product liberated by $AcOH$ is taken up in Pt_2O and extd. with $NaOH$, the Pt_2O contains the 4-methylcoumarin (1.8 g. from 30 g. HOC₆H₄Ac); the alk. ext. contains the 2-HOC₆H₄COCH₂Ac, which is transformed into 2-methylchromone (14% of the theory from HOC₆H₄Ac) by H_2SO_4 . 2,6-AcMeC₆H₃OH, Ac_2O and $AcONa$ give 35% 2,8-dimethylchromone and 15% 4,8-dimethylcoumarin. 2,5-AcMeC₆H₃OH gives 20% 2,7-dimethylchromone and 12% of 4,7-dimethylcoumarin. 2,3,5-AcMeC₆H₃OH gives 57% of 2,5,7-trimethyl-3-acetochromone and 6.5% 2,5,7-trimethylchromone, whose oxonium chloride, m. 152° (decompn.). 2-Aceto-6-nitrophenol, yellow needles, m. 98.5–9.5°, in 10% yield from 2-HOC₆H₄Ac and HNO_3 in $AcOH$; the poor yield is due to the oxidation to the acid. 2-Aceto-4-methyl-6-nitrophenol (IV), yellow, m. 130–30.5°, in 77% yield from the phenol, H_2SO_4 and KNO_3 ; more energetic nitration gives 25% of a 2,6-dinitro deriv., m. 147–7.5°, also obtained in 80% yield from the mononitro deriv. IV, Ac_2O and $AcONa$ give 25% of 2,6-dimethyl-3-aceto-8-nitrochromone, brown, m. 146.5–7.5°. 2,1,4-AcC₆H₃(OH)₂ and $AcCl$ give the di-Ac deriv., which, heated with Ac_2O and $AcONa$ 15 hrs. at 180°, gives 2-methyl-3-aceto-6-acetoxychromone, m. 120–1°, sapond. by 4 parts concd. HCl and 1 part H_2O to 2-methyl-3-aceto-6-hydroxychromone, m. 215 6°. Heating 2-methyl-7-acetoxychromone with $AlCl_3$ gives 66% of 2-methyl-7-hydroxy-8-acetochromone (V), m. 186–7°; $EtONa$ gives 2,4-diaceto-1,3-dihydroxybenzene, m. 88 9°. Heating V with Ac_2O and $AcONa$ 2.5 hrs. gives α, α' -dimethyl- β' -aceto-benzo-1,2,5,6-di-[γ -pyrone], m. 210 1°. 4-Chlorophenyl propionate, b. 234–6°; with $AlCl_3$ it gives 2-propionyl-4-chlorophenol, m. 56.5–7.5°, whose propionate, b_{11} 170°. Ac_2O and $AcONa$ give 95% of 2,3-dimethyl-6-chlorochromone. $(EtCO)_2O$ and $EtCO_2Na$ give 95% of 2-ethyl-3-methyl-6-chlorochromone, m. 66–7°. $(ClCH_2CO)_2O$ and $ClCH_2CO_2Na$ give 50% of 2-chloromethyl-3-methyl-6-chlorochromone, m. 125.5–6.5°. 4,2-Me($EtCO$)C₆H₃OH, Bz_2O and $BzONa$ give 86% of 3,6-dimethylflavone, m. 93°. 4-Chlorophenyl butyrate, b. 249–51°; 2-butyro-4-chlorophenol, m. 49–50°; 2-methyl-3-ethyl-6-chlorochromone, m. 103–4° (95% yield); 3-ethyl-6-methylflavone, m. 73–4° (70% yield). 3-Propyl-6-methylflavone, b_{12} 265°, m. 77–8° (85% yield). 3-Isopropyl deriv., m. 150° (85% yield). 2-Phenylaceto-4-chlorophenol, b_{20} 280–5°, m. 66–7°; 2-methyl-3-phenyl-6-chlorochromone, m. 127–8°. 2,6-Dimethyl-3-phenylchromone, b_{10} 229–30°, m. 91° (80% yield). 2,3-Diphenyl-6-chlorochromone, m. 178–9° (95% yield); monoxime, pale yellow, m. 206–6.5°. 2,3-Diphenyl-6-methylchromone, m. 170° (95% yield). 2-Styryl-3-phenyl-6-methylchromone, m. 179°. 2-Methyl-3,6-dichlorochromone, yellowish, m. 155.5–6.5°. 2,6-Dimethyl-3-chlorochromone, m. 145–6°; the by-product, 2,6-dimethyl-3-hydroxychromone (VI), m. 188–9°, was synthesized from 4-methylphenyl bromoacetate, b_{60} 180–1°, through 2-bromoaceto-4-methylphenol, m. 45.5–6.5°, and the Ac deriv. of VI, m. 119.5–30.5°. 4-Chlorocoumaranone, Ac_2O and $AcONa$ give 3-acetoxy-4-chlorocoumarone, b_{20} 165–7°, m. 30.5–1°; heating with 30% H_2SO_4 gives 2-keto-1,2'-dehydro-1,2'-di-[4-chlorocoumarin], red, m. 210–1°; heating at 190° gives a yellow modification, which m. 321°. 4-Chlorocoumaranone semicarbazone, m. 237–8° (decompn.). 2-Aceto-4-chlorophenyl acetate, b_{11} 156–7°; during the distn. there is formed some 2-methyl-3-aceto-6-chlorochromone, m. 126.5–7°. Heating 2,4-ClAcC₆H₃OH (or its Ac deriv.) with $(EtCO)_2O$ and $EtCO_2Na$ for 5 hrs. at 190° gives a mixt. of about 4 parts 3,4-di-

methyl-6-chlorocoumarin, m. 140–1°, and 1 part *2-ethyl-6-chlorochromone*, m. 137–8°, sepd. by the EtONa method. $(\text{PrCO})_2\text{O}$ and PrCO_2Na give *2-propyl-3-butyro-6-chlorochromone*, m. 65–6°, and a small amt. of a compd. m. 120–5°, possibly *3-ethyl-4-methyl-6-chlorocoumarin*. Bz_2O and BzONa give a mixt. of *6-chloroflavone*, m. 181°, isolated through the action of EtONa, giving *2-benzoylaceto-4-chlorophenol* (VII), yellow, m. 107–8°, and *3-benzoyl-6-chloroflavone* (VIII). BzCl gives the benzoate of VII, m. 128.5–9.5°; attempts to condense this to VIII failed. *2-Formylaceto-4-chlorophenol*, m. 148–9°, in 1.3 g. yield from 3 g. *2,4-AcClC₆H₃OH*, HCO_2Et and Na; soln. in concd. H_2SO_4 gives quant. *6-chlorochromone*. *2,4-AcClC₆H₃OH* (5 g.), 10 g. PhCH_2COCl and 12 g. AcOPh give 6 g. *3-phenyl-4-methyl-6-chlorocoumarin*, m. 190.5–1.5°. *2-Benzoyl-4-chlorophenol*, m. 93–4°; Ac_2O and AcONa give *4-phenyl-6-chlorocoumarin*, m. 147–8°. PhCH_2COCl and $\text{PhCH}_2\text{CO}_2\text{Na}$ give *3,4-diphenyl-6-chlorocoumarin*, pale yellow, m. 163.5–4°. *2-Acetylaceto-3,5-dimethylphenyl Me ether*, m. 59–60°. *2-Aceto-4-chloro-5-methylphenyl Me ether*, m. 79–80°. *2-Aceto-4-chloro-5-methylphenyl acetate*, b_{12} 165–7°, m. 35–6°; with $(\text{EtCO})_2\text{O}$ and EtCO_2Na there results 65% of *3,4,7-trimethyl-6-chlorocoumarin*, m. 162–3°. *2-Methyl-4-acetophenyl acetate*, m. 60–1°; propionate, b_{14} 168–9° (semicarbazone, m. 192–3°). *2,6-Dimethyl-3-propionylchromone*, m. 81–2°. *2-Isobutyro-4-chlorophenol*, Ac_2O and AcONa give *2-acetoxy-2,3,3-trimethyl-6-chloro-8-acetochromanone*, b_{12} 176–9°, m. 79.5–80°; heating with 2 *N* NaOH 0.25 hr. gives iso-PrAc and *3-aceto-5-chlorosalicylic acid*, m. 173–4°. The theory of the reactions is discussed.

C. J. WEST

Some derivatives of 4-aminopyridine. ERNST KOENIGS, HANS FRIEDRICH AND HANS JURANY. *Ber.* 58B, 2571–6 (1925); cf. Chichibabin and Ossetrova, *C. A.* 20, 396.—The methiodide of 4-aminopyridine (I), prepd. according to C. and O., m. 184–5° (C. and O., 187–8°); it is apparently more stable towards alkalis than the isomer of the α -series, for it is repptd. mostly unchanged from H_2O by concd. KOH. Treated with AgCl and then with H_2PtCl_6 it gives an orange chloroplatinate, m. 230–2° (decompn.) which, with C. and O., the authors believe is identical with that obtained from *N*-methyl-4-pyridone-imide (for which C. and O. give 226–7°). They do not think, however, that the methiodide is a pyridone-imide but rather that the *N*-methylpyridone-imides are changed back by acids into the corresponding salts of *N*-methylpyridines which would explain what C. considers the "very remarkable" behavior of the former towards alkalis and acids, viz., that alkalis smoothly decomp. them into NH_3 and *N*-methylpyridones while, unlike the ketone-imides, they are resistant towards acids. *4-Methylaminodipicolinic acid* (II), from the 4-Cl acid and 33% NH_2Me at 150°, reddish, m. 245–55° (foaming); occasionally other products were obtained, probably because the temp. rose too high; in 1 case was obtained the *dimethylamide* of II, m. 269°, easily sol. in acids and repptd. by alkalis. Carefully distd. *in vacuo* II gives about 50% 4-methylaminopyridine, faintly yellow, m. 108–10° (C. and O., 115–8°); picrate, yellow, m. 172° (C. and O., 168.5–9.0°); chloroplatinate, orange, m. 232° (C. and O., 214–5°). *4-Dimethylaminopicolinic acid* (7.8 g. from 7 g. of the 4-Cl acid with 33% NH_2Me at 140–50°), yellowish brown, m. 248° (decompn.), sol. in alkalis and hot dil. HCl, gives on distn. under atm. pressure 70% of *4-dimethylaminopyridine* (III), m. 114°, which, from its structure, cannot rearrange into a pyridone-imide, yet still closely resembles I. It forms, to be sure, on evapn. of its soln. in excess of HCl, a *HCl* salt, m. 76°, which, however, is apparently partially hydrolyzed (Cl, only 18.3%); chloroplatinate, orange, m. 265° (decompn.); chloroaurate, red-yellow, m. 176–8°; picrate, yellow, m. 204°. In these salts III functions as a mono-acid base. *4,4'-Dipyridylamine-2,6-dicarboxylic acid* (5 g. from 4.5 g. 4-chlorodipicolinic acid and I at 150°), m. 255° (decompn.), sol. in alkalis and concd. acids; *2,6,2',6'-tetracarboxylic acid* (9 g. from 6 g. 4-chlorodipicolinic acid and 4-aminodipicolinic acid at 150°), brownish, m. 272° (decompn.), sol. in alkalis and concd. acids. The tetra- CO_2H acid on cautious dry distn. gives in moderate yields *4,4'-dipyridylamine*, light yellow, sinters about 110°, m. 138°, does not evolve NH_3 with boiling NaOH, gives no color in H_2SO_4 with HNO_3 . *chloroplatinate*, of the base red-yellow needles with 1 H_2O , decomp. above 280°. *picrate*, lemon-yellow, m. 170–4°; the corresponding derivs. from the di- CO_2H acid m. 134°, 260° and 168–70°, resp., and are believed to be identical with those obtained from the tetra- CO_2H acid.

C. A. R.

Preparation and properties of methylisopropylquinoline yellow. MAX PHILLIPS AND M. J. GOSS. *J. Am. Chem. Soc.* 48, 823–6 (1926).—Cymidine (64 g.), 80 g. concd. HCl, 60 g. paraldehyde and 30 g. nitrocymene give 22.5% of *methylisopropylquinoline* (2,8-dimethyl-5-isopropylquinoline), m. 78.2° (cor.), mol. wt. in boiling C_6H_6 , normal; chloroaurate, yellow micronedles. With $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$ and ZnCl_2 it gives 61% of *methylisopropylquinoline yellow* (*methylisopropylquinophthalone*), yellow, m. 220.4°.

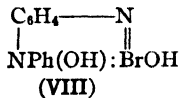
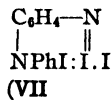
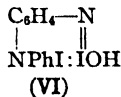
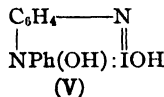
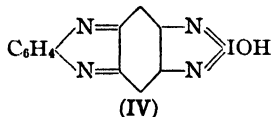
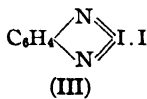
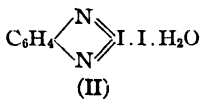
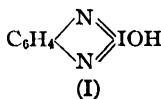
Heated with fuming H_2SO_4 (23% SO_3) at 150° for 2 hrs. and then neutralized, there resulted the *Na disulfonate deriv.*, yellow, dyes wool and silk a greenish yellow; its fastness is equal to that of the corresponding deriv. of quinoline yellow. A comparison of the absorption of these 2 new dyes and of the corresponding quinoline yellow and its disulfo deriv. failed to indicate any appreciable displacement in the absorption max. through the Me-iso-Pr substitution.

C. J. WEST

Condensation of 9-methylacridine with formaldehyde and the preparation of 9-acridinecarboxylic acid. A. W. HOMBERGER AND H. JENSEN. *J. Am. Chem. Soc.* **48**, 800–2 (1926).—9-Methylacridine and 20% HCHO give 75% of *acridyl monomethylol* (I), yellow, m. $155-6^\circ$; *HCl salt*, yellow needles; *picrate*, golden brown, m. 186° ; *Bz deriv.*, m. 159° . With 40% HCHO there results *acridyldimethylol*, S-yellow, m. 194° ; *HCl salt*, dark yellow, m. $250-65^\circ$ (decompn.); *picrate*, yellow, m. 195° . Oxidation of I with CrO_3 in H_2SO_4 gives acridine-9-carboxylic acid, yellow, m. 300° (decompn.).

C. J. WEST

Heterocyclic compounds containing quinevalent iodine or bromine. G. HUGEL. (*Compt. rend.* **182**, 65–7 (1926)).— $\text{C}_6\text{H}_4(\text{NH}_2)_2$ is so easily oxidized that even FeCl_3 forms 2,3-diaminophenazine. By using HIO_3 or HBrO_3 , intermediate products of a type hitherto unknown were isolated. Very dil. cold aq. solns. of $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$ and HIO_3 (equimol. wts.) form instantly an amorphous black ppt. (exothermic reaction), which is but slightly sol. in all solvents, giving a yellow-brown color. From its analogy with piazthiol, the name *piaziodonium hydroxide* is suggested, the constitution being I. It is a very feeble base and does not form salts with concd. or dil. acids, except HI. In aq. suspension with HI (*i. e.*, $\text{H}_2\text{SO}_4 + \text{KI}$) it is converted to another black, amorphous compd. of the compn. II, which crysts. at 30° to the compd. III. At $50-5^\circ$ this suspension again changes, becoming greenish and still less sol. Heated to boiling, I is liberated, and on cooling derivs. of 2,3-diaminophenazine and 2,3-hydroxyaminophenazine are obtained. This new reaction is not limited to $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$. Thus 2,3-diaminophenazine gives the compd. IV and $\text{o-H}_2\text{NC}_6\text{H}_4\text{NHPh}$ gives the compd. V and compd. VI, metallic green crystals. The iodonium function of VI reacts only with difficulty, but if 1:1 H_2SO_4 and a large amt. of KI are used, the compd. VIII is obtained, metallic blue-black crystals. HBrO_3 forms analogous compds. but not HClO_3 . $\text{o-H}_2\text{NC}_6\text{H}_4\text{NHPh}$ and HBrO_3 give the compd. VIII, metallic green crystals.



C. C. DAVIS

Some orthoxazine derivatives. E. P. KOHLER. *J. Am. Chem. Soc.* **48**, 754–63 (1926).—Triphenylbutanetrione oxime (I) (15 g.), in 100 cc. abs. MeOH, boiled 20 min. gives an av. yield of 65% of 3,4,6-triphenyl-5-hydroxy-6-methoxyorthoxazine (II), turns red at 160° , m. 173° (decompn.); all solus. are yellow, that in CHCl_3 turning more or less rapidly pink and purple. II, suspended in a small amt. of Et_2O , gradually deposits I, while in MeOH there appears the hydroxyisoxazoline; II is stable in the dry state in the dark but in the light gradually turns yellow. *Na deriv.*, colorless but yellow in soln. *Benzoate*, m. 163° and cannot be hydrolyzed to II; O_3 gave only small amts. of benzil and $\text{PhCH(OH)CO}_2\text{H}$. *Me deriv.*, m. 147° (decompn.), from MeI and MeONa. II and PhMgBr give 3,4,6,6-tetraphenyl-5-hydroxyorthoxazine (III), lemon-yellow, m. 220° (decompn.). *Benzoate*, m. 217° . 4-Br deriv., crystg. with 1 C_6H_6 , m. 160° . 4-Cl deriv., m. 165° . Neither deriv. is attacked by O_3 . 4-Nitro deriv., m. 150° (decompn.). III, EtI and EtONa give 2-ethyl-3,4,6,6,5-ketoorthoxazine, m. $167-8^\circ$; the corresponding *Me deriv.*, m. $189-90^\circ$.

C. J. WEST

Chemical studies on polychrome methylene blue. W. J. MACNEAL AND J. A.

KILLIAN. *J. Am. Chem. Soc.* **48**, 740-7(1926).—Methylene blue (I) treated with $K_2Cr_2O_7$, both in rather high dilns., gives the steel-blue *dimethylene blue chromate*, $(C_{16}H_{18}N_3S)_2CrO_4 \cdot 6H_2O$; EtOH removes I. Heating this with dil. HCl without access of air gives methylene azure B (trimethylthionine) (II) (Kehrmann, *Ber.* **39**, 140; (1906)), which may be salted out as the bromide, chloride, $ZnCl_2$ double salt or the iodide; the chloride is the most, the iodide the least sol. in H_2O . The dye is unstable and in hot H_2O tends to oxidize to form III. Oxidation of methylene blue with free access of air gives methylene azure A (III) if the reaction be acid, as does the oxidation of the $ZnCl_2$ salt of II; it is less sol. than II and may be salted out readily in the form of the chloride. Dimethylthionine or methylene violet of Bernthsen may be prep'd from II or III by heating in dil. alk. soln. in the presence of a complex sol. NH_4 salt of Ag or Cu or in the presence of alk. zincate or chromate. The metal evidently enters into the formation of a very sol. dye ion and tends to protect the respective free base from pptn. until hydrolysis has sep'd. the metal amine group from the dimethylthionine residue with the pptn. of the latter. Better yields are obtained from methylene blue than from the azures. These reactions lend support to the *p*-quinonoid conception of Bernthsen and of Hantzsch in regard to the structural formula of the methylene blue dyes. C. J. WEST

What is an alkaloid? E. J. SCHORN. *Pharm. J.* **116**, 113-6; *Chemist & Druggist* **104**, 161-3(1926).—An exact chem. definition of an alkaloid is difficult if not impossible to formulate as shown by a crit. analysis of 13 standard definitions. Pptn. with alkaloidal reagents, including the Sb reagent of Caille and Viel (*C. A.* **17**, 2289) may supply a practical basis for the characterization of alkaloids. In discussion, Barger said that colchicine does not fit into any of the suggested definitions because of its unusual chem. structure. S. WALDBOTT

Dyes from the alkaloids of ipecacuanha. F. L. PYMAN. *J. Am. Chem. Soc.* **48**, 836(1926).—Reply to Palkin and Wales (*C. A.* **19**, 2550). Neither emetine, *O*-methyl psychotrine nor emetamine couples with *p*- $O_2NC_6H_4N_2X$ but psychotrine gives a dye, whose NaOH soln. is purple. C. J. WEST

Dyes from the alkaloids of ipecacuanha. A reply. S. PALKIN AND H. WALES. *J. Am. Chem. Soc.* **48**, 836-7(1926).—A reply to Pyman (preceding abstr.). Ipecac must contain a hitherto undetected alkaloid which either is an amine or, if a phenol, is not removed from its soln. in Et_2O by alkali. C. J. WEST

So-called ecgonidine dibromide of Einhorn. HANS LINDEMANN AND HERMANN HEINEMANN. *Ann.* **447**, 85-96(1926); cf. Einhorn, *Ber.* **23**, 2874.—Ecgonidine-HBr and Br in AcOH give the *perbromide*, $C_8H_{14}O_2NBr_4$, m. 154° (decompn.); this is unchanged by warm AcOH but H_2O , EtOH or Me_2CO gives the HBr salt, m. 222° . The HCl salt likewise gives a perbromide, m. 242° , which, warmed with AcOH, yields 3-bromo-4-chlorotropam-2-carboxylic acid-HBr, m. $186-9^\circ$ (82.5% yield); with Ag_2CO_3 the free acid, m. 168° , results. With dil. HCl or upon crystg. the HBr salt from HCl, there results the *N*-HCl salt, m. 214° , whose *chloroplatinate*, yellowish red, decomp. at 250° , and *chloroaurate*, yellow, m. 214° . The above HBr salt, reduced by $SnCl_2$ and concd. HCl, gives a mixt. of ecgonidine-HCl and HBr. The possible constitution of these compds. is discussed. C. J. WEST

Digitoxin. A. WINDAUS AND C. FREESE. *Ber.* **58B**, 2503-10(1925).—Digitoxin (I) was purified by digesting the crude glucoside with about 20 parts $CHCl_3$, evap. the ext., crystg. the residue from dil. alc. (after treatment with blood charcoal), pptn. from $CHCl_3$ with Et_2O and recrystg. from boiling $AcOEt$, dil. alc. or $CHCl_3$ - Et_2O until pearly rectangular tables, m. $255-7^\circ$ and easily sol. in $CHCl_3$, were obtained. The losses were very large; "digitaline crystallise" yielded about 34% purified I and much material difficultly sol. in $CHCl_3$, Merck's "Digitoxin crystall." gave 55% I and no $CHCl_3$ insol. material, while the crude glucosides of digitalis leaves obtained from various firms yielded 10-35% I and up to 25% gitoxin. Pure I crystd. from $CHCl_3$ - Et_2O or $AcOEt$, m. $255-6^\circ$, from aq. Me_2CO 255° , from aq. EtOH $233-5^\circ$ (air-dry); 1 g. dissolves in 10.8 g. $CHCl_3$ at 10° and in 380 g. $AcOEt$ at 20° ; air-dried, it contains C 63.04, H 8.37%, while the vacuum-dried product has C 63.99-64.25, H 8.50-8.74, mol. wt. in camphor 682-827 (av. 746), mol. wt. by titration 694-732 (av. 708). These values agree well with those calcd. for the formula $C_{41}H_{66}O_{13} \cdot H_2O$ for the air-dried and $C_{42}H_{66}O_{13} \cdot 0.5H_2O$ for the vacuum-dried product. As noted by Cloetta (*C. A.* **15**, 707) distn. of I in a high vacuum yields a sublimate (II), the compn. of which, however (C, C 55.65, H 7.98; W. and F., 55.67, 8.03%) agrees better with the formula $C_8H_{10}O_2$ than with that ($C_8H_{14}O_4$) given by C. II, therefore seems to be an anhydro digitoxose. Further evidence in favor of this view is the fact that, while according to C.'s formulation hydrolysis of I should give 47.21% digitoxigenin, W. and F. in an expt

carried out with all the precautions usual in quant. analysis actually obtained 49.15%; the formulation which they suggest (without claiming that its correctness has been proved), viz., $C_{42}H_{86}O_{13} \cdot 0.5H_2O + 3H_2O \rightarrow C_{24}H_{38}O_4 + 3C_6H_{12}O_4$ calls for 49.3%. According to W. and F.'s formula is, therefore, closely related to gitoxin, $C_{40}H_{78}O_{14}$, from which it differs only by one O atom; both glucosides split off 3 mols. digitoxose and contain aglucones likewise differing only by one O atom. To test whether both really have the same C skeleton, the method of Bandte (*C. A.* 17, 3746) and of Schwarte (*C. A.* 20, 208) was followed. Anhydrodigitoxigenin, m. 183–4°, with colloidal Pd and H in aq. MeOH gave 75% of the *tetrahydro deriv.* (III), m. 146–7°, which with CrO_3 yielded *tetrahydroanhydrodigitoxigenone* (IV), m. 240–1° (oxime, m. 217°; (decompn.)), and this by Clemmensen's method gave the *HO lactone*, $C_{24}H_{38}O_2$ (V), m. 181°. III, IV and V are, however, not identical but isomeric with the corresponding compds. obtained from dianhydrodigitoxigenin (digitaligenin). It would seem, therefore, that the 3 cardiac diacides of digitalis thus far prepd. in pure state are derived from 2 singly unsatd. HO lactones, $C_{24}H_{36}O_4$ and $C_{24}H_{36}O_5$, both of which contain 4 hydrogenated rings and are, therefore, closely related to the bile acids. On dehydration, hydrogenation and a few other chem. transformations they are converted into 2 satd. lactones, $C_{24}H_{38}O_2$, which are isomeric (presumably stereoisomeric); the isomerism may, however, be an artifact; possibly in the hydrogenation of the 3rd double bond of digitaligenin the added H atoms assume a spatial position different from that which they occupy in anhydrodigitoxigenin. *Addendum.*—Both Cloetta and W. and F. found 183–4° as the m. p. of anhydrodigitoxigenin (VI), while Kiliani gives 215–20°. W. and F. suspected that K.'s product might be contaminated with unchanged digitoxigenin, but examn. of a sample of K.'s product showed that it cannot be converted into the true VI with alc. HCl; it is much more difficultly sol. than VI in $AcOEt$, m. const. 223° after repeated crystn., is shown by color reactions to be free from digitaligenin and is an isomeric β -VI; perhaps it is derived from K.'s hydrated β -I. Toxigenone, obtained by oxidation of VI with CrO_3 , has been repeatedly analyzed by K. who found C 75.81–76.02, H 7.95–8.26, and assigned to it the formula $C_{19}H_{24}O_2$. If in the oxidation only the sec. alc. grouping is oxidized to C:O, the product should have the compn. $C_{19}H_{24}O_2$ (C 78.21, H 8.71%). The low C content, which W. and F. have also regularly obtained in their own analyses, must be due to solvent of crystn. held very firmly; that the compd. still contains 24 C atoms has been proved by its conversion into III. Digitoxigenone, the product of the oxidation of digitoxigenin with CrO_3 , should have the compn. $C_{24}H_{34}O_4$; K. assigned to it the formula $C_{19}H_{26}O_4$, but this is far from being correct; recrystn. of a sample of his material raised the m. p. 14° and the C and H contents 2.3 and 0.7%, resp.

C. A. R.

Saponins. II. *Gypsophila-sapogenin*. P. KARRER AND H. LIER. *Helvetica Chim. Acta* 9, 26–30 (1926); cf. *C. A.* 18, 2711.—When albsapogeninic acid (I) is treated with concd. H_2SO_4 , CO is evolved and when the reaction mixt. is poured on ice a white ppt. (?) is obtained which, after drying and recrystg. from glacial $AcOH$, contains 78.78% C, 9.99% H, mol. wt. 433, and m. 306°. Similarly albsapogenol, gypsophila-sapogenin (II) and albsapin on treatment with concd. H_2SO_4 evolve CO. Reduction of I in glacial $AcOH$ with Zn and HCl, the product being recrystd. from $AcOH$, washed with $EtOH$ and dried, gave a non-acidic compd., $C_{27}H_{44}O_2$ or $C_{27}H_{42}O_2$, m. 314°. II oxidized with CrO_3 in $AcOH$ and then poured into H_2O gave a ppt. (III) which, crystd. from $AcOH$, m. 226°; it is a *monobasic acid*, $C_{26}H_{40}O_6$, mol. wt. 492, and forms a *dioxime*; as the $AcOH$ mother liquors from the oxidation reaction contain several other compds. it is not certain if III is a pure substance.

N. A. LANGE

Remarks on my work "silk fibroin." RUDOLF BRILL. *Ann.* 446, 307–8 (1925); cf. *C. A.* 18, 381.—B. discusses the relation between the compds. obtained by Bergmann (*C. A.* 19, 638) and his X-ray study of silk fibroin.

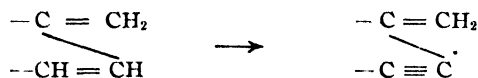
C. J. WEST

Cholesterol. HANS FISCHER AND ALFRED TREIBS. *Ann.* 446, 241–59 (1925).—Cholesterol (I) (5 g.), heated to boiling for 10 min. at 300 mm. and then distd., gives 0.6 g. pseudocholestene, m. 78°, identified as the dibromide, m. 116°, and its dihydro deriv., m. 69–70°, also by a crystallographic examn. of the 3 compds. and comparison with known preps. Attempts to increase the yield by passing HCl into molten I gave the ether of I and α -cholesterylene. Decompn. of I by passing its vapors over a heated Pt wire at 250° (11 mm.) gave about 10% of $C_{10}H_8$, a small amt. of styrene, a *hydrocarbon*, $C_{14}H_{12}$, m. 91–2°, b. about 300°, very volatile with steam, whose dark yellow *picrate*, m. 155°; a *hydrocarbon*, $C_{18}H_{14}$, m. 203°, b_{15} about 200°, not volatile with steam, whose yellow *dibromide*, m. 217°; and a *hydrocarbon*, $C_{14}H_{10}$, m. about 124°, whose orange *picrate*, m. 139°. The gaseous products contained about 5% H, 30% unsatd. and 65% satd. hydrocarbons; traces of C_2H_2 could be detected. When styrene

is heated at 20–30 mm. and 300–40°, there results about 1% of $C_{10}H_8$, distyrene and other compds. of high mol. wt. Similar treatment of 23 g. of the acid $C_{27}H_{44}O_4$ (from I and NaOBr) gave only 0.05 g. $C_{10}H_8$; other definite products could not be isolated. The hydrocarbon $C_{10}H_{18}$ (Mauthner, *Monatsh.* 17, 41(1896)), b. 387°, d. 0.9733, n_D^{20} 1.5317, $[\alpha]_D^{20}$ 54.51°, mol. wt. in boiling $CHCl_3$ normal, gave, on distn. of 33 g. at 60–80 mm. and 300°, only a very small amt. of $C_{10}H_8$ and a compd., m. 252°. The octane-octene mixt. formed in the prepn. of $C_{10}H_{18}$, b. 112–6°, d_4^{20} 0.7065, n_D^{20} 1.3955, contains about 25% satd. hydrocarbon, isolated by shaking with H_2SO_4 contg. 7% SO_3 , b. 113–6°, d_{20} 0.69823, n_D^{20} 1.3922, and is probably *isooctane*. A small amt. of $C_{10}H_8$ is isolated from the decompn. products of cholic acid. Attempts to dehydrogenate I with S, Br-AlBr₃ and I led to no definite products. Since I is reduced to coprosterol in the intestine, it was thought that the catalytic reduction of the oleic ester of I might lead to the same results; the only product was the stearic ester, the I mol. not being reduced. Reduction in tetralin with Ni or Pt gave a little stearic ester, free stearic acid and non-cryst. derivs. of I. Reduction of I under similar conditions gave a poor yield of reduced I ether and a compd. $C_{27}H_{46}O$, m. 133–4°, which is not I. The distn. of the oleic ester of I at 13 mm. gives about 50% of α -cholesterilene.

C. J. WEST

The action of benzoyl peroxide on a dimethylchlorohemin. WILLIAM KÜSTER AND W. RUFF. *Z. physiol. Chem.* 151, 98–113(1926).—An attempt was made to add O. by means of a mild oxidizing agent, to the unsatd. side chains of hemin, in a manner analogous to the oxidation of $CH_2:CHOEt$ to 1:1 glycolide. $(BzO)_2$ in $CHCl_3$ acts upon dimethylchlorohemin, changing entirely the characteristic spectrum of the pigment. About $1/3$ of the hemin is converted into a cryst. substance with a single faint absorption band at $\lambda 635-40$. Instead of the addn. of O it appears from analysis of the product that a removal of 2 H has occurred. The new substance adds 2 Br and shows 2 absorption bands. The Br addn. product when treated with NaOH loses both Cl and Br in an amt. equiv. to the 2 added Br. Replacement of 1 Br by OH gives a cryst. monobromomonomethoxyl deriv. which is easily methylated by CH_3N_2 . It is believed that the dehydrogenation gives an acetylene linkage, thus,



The simultaneous removal of Cl and Br may be accounted for by an exchange of positions of the 2 atoms. The Fe is more easily removed from the dehydrogenation product than from the dimethylhemin, as might be expected from the greater reactivity toward HCl due to the greater unsatn. $PhNH_2$ and pyridine remove Cl less readily, the former 75% and the latter 60% of the amt. present, from the dehydrogenation product. Pyridine produces a change which prevents the replacement of OH by Cl when HCl is added whereas after the $PhNH_2$ treatment the Cl may be restored.

A. W. DOX

Meetings of the international nomenclature committees (PATTERSON) 2.

DIELS, OTTO: *Einführung in die organische Chemie*. 5th ed. revised. Leipzig: J. J. Weber. 332 pp. R. M. 13.

LUFF, ARTHUR P. and CANDY, HUGH C. H.: *A Manual of Organic Chemistry*. London: Cassel & Co., Ltd. 268 pp. 6s. Reviewed in *Chem. News* 132, 61(1926).

TAVERNE, N. J. A.: *Leidraad bij het onderwijs in de scheikunde. Part III Organische scheikunde*. Zwolle: W. E. J. Tjeenk Willink 118 pp. Guld 1.15. bound 1.75.

WADE, J.: *Introduction to the Study of Organic Chemistry*. Revised and enlarged ed. London: G. Allen and Unwin, Ltd. 646 pp. 8s. 6d.

WIBAUT, J. P.: *De verhouding tusschen theorie en experiment in de organische scheikunde*. Amsterdam: D. B. Centen. 20 pp. Guld. 0.80.

Phenols. V. L. OIL PROCESSES, LTD., O. D. LUCAS and E. L. LOMAX. Brit. 242,092, Nov. 24, 1924. Phenols are extd. from crude oils by use of NaOH or other caustic alkali in a soln. of over 20% strength. The alkali phenolate soln. first obtained is used for further extn. of phenols. On subsequent diln. of the soln. the phenols sep. The partly exhausted soln. is re-concd. and used for treating another quantity of oil. If caustic alkali solns. of over 30% strength are used, the neutral oils which are also taken up by the soln. may be removed by steam distn. before the diln. to sep. phenols

Halogenated alcohols from halogenated aldehydes. H. MEERWEIN. U. S. 1,572,742, Feb. 9. In prepg. a halogenated alc. from the corresponding halogenated aldehyde, *e. g.*, butylchloral, the latter is dissolved in a primary alc., *e. g.*, EtOH, and treated with Al alcoholate.

Condensation products of compound aliphatic-aromatic ketones with polyalcohols. J. ALTWEGG and E. F. CHERMETTE. U. S. 1,572,176, Feb. 9. Compd. ketones, *e. g.*, acetophenone, are caused to react with polyals., *e. g.*, glycerol, in the presence of EtOH or other primary als. contg. small proportions of H_2SO_4 or other inorg. acid, to form condensation products. Acetophenone-glycerol, b_p 134° and may be used to give suppleness to cellulose acetate films.

Catalytic decomposition of ethyl alcohol. K. E. SKAERHLOM. Swed. 60,035, Dec. 29, 1925. An addn. to Swed. 57,583 (C. A. 19, 1430). In the production of C_2H_4 , Et_2O or AcH from alc. the gas mixt. from the catalyzer furnace is passed through a heat-exchanging app. there giving off its excess of heat to the satd. alc. vapor from the alc. boiler.

1,8-Aminonaphtholsulfonic acids. I. GUBELMANN and J. M. TINKER. U. S. 1,573,056, Feb. 16. 1-Naphthylaminesulfonic acids and salts contg. a sulfonic group in the 8-position are fused with caustic alkalies in the presence of NH_3 .

Polymerized styrene and its homologs. I. OSTROMISLENSKY. Brit. 236,891, July 12, 1924. Styrene and its homologs are polymerized by heating to different temps. and for different times to form 3 series of compds. designated as α -, β -, and γ -metastyrenes. Various tough, hard or brittle compds. are described with which dyes, pigments, org. peroxides, $CaCl_2$, nitro compds., quinones, etc. may be mixed to control their properties. Cf. C. A. 20, 424.

Alkyl formates. R. WIETZEL. U. S. 1,572,698, Feb. 9. CO is caused to react on dehydrated MeOH, EtOH or other alc. in liquid form in the presence of NaOMe, NaOEt or other metal alcoholate, under pressure and at temps. of 30–150°.

Naphthophenothiazines, etc. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 236,795, Nov. 7, 1924. Quinonoid derivs. of 2,1-naphthophenothiazines are obtained by reduction of 2-hydroxy-3-(2'-nitrophenylmercapto)-1,4-naphthoquinone or a substitution product and, if necessary, treating with an acid. S dyes may be obtained from this compd. after sulfonation and reduction, which give yellow-green dycings or blue-green on after-chromed wool. Other related reactions are described.

Solid stable diazo compounds. F. GÜNTHER and F. LANGE. U. S. 1,572,715, Feb. 9. Stable solid compds. are obtained by adding $Zn(OH)_2$, $ZnCl_2$ or other compd. of Zn to a soln. of a diazotized aromatic amine which is free from azo groups (thus excluding diazotized amino azo compds.) while taking care that the soln. contains sufficient Cl ions to permit formation of a double compd. of Zn and diazonium chlorides. NaCl may be added to the reaction mixt. The stability of the products may be further increased by the addn. of Na_2SO_4 or other harmless salts.

Chloro derivatives of methane. C. B. CARTER and A. E. COXE. U. S. 1,572,513, Feb. 9. A mixt. comprising $MeCl$, CH_4 and Cl is passed through a reaction chamber maintained at a high temp. (usually about 400–500°) and the $MeCl$ and Cl are maintained in about equal vols., to produce 80% CH_2Cl_2 , 15% $CHCl_3$ and 5% CCl_4 . Cf. C. A. 19, 3272.

Salts of urea from cyanamides. J. BRESLAUER and C. GOUDET. U. S. 1,572,638, Feb. 9. A concd. soln. of free cyanamide is treated with H_2SO_4 and a quantity equiv. to this acid of a salt such as NH_4NO_3 or $Mg(NO_3)_2$ contg. the acid radical of the salt of urea to be prepd. so as to produce the salt directly. Cf. C. A. 20, 97.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Extractives of muscle: a new iminoazole phosphorus compound. W. D. LANGLEY. *Proc. Soc. Exptl. Biol. Med.* 22, 234(1925).—An unstable phosphoric acid compd. was obtained from muscle. Its empirical formula is $C_{14}H_{21}O_{11}N_4P_4H_2O$. A nearly pure Cu salt resulted from the repeated pptn. from a concd. aq. soln. by alc. It is very hygroscopic and loses 4 mol. of H_2O when heated at 120°. Its only color reaction is that for the iminazole ring; if this is due to carnosine, the org. residue would be $C_6H_6O_6$ which might come from some carbohydrate decompn. product. The substance is

highly unstable and should correlate the chemistry of carnosine and a carbohydrate, and possibly of loosely bound phosphoric acid in muscle. C. V. B.

The influence of protein on the diffusibility of calcium. R. F. LOEB AND E. G. NICHOLS. *Proc. Soc. Exptl. Biol. Med.* 22, 275(1925).—Pure solns. of euglobulin, of pseudoglobulin and of albumin were isolated from ascitic fluid. The presence of these proteins in Ca solns of p_H 6–8 decreased the diffusion of Ca through collodion membranes. Probably Ca proteinate was formed. C. V. B.

Individual blood investigations. IV. The formation of hemins from hemoglobin A and the existence of two hemoglobins Aa and Ab. WILLIAM KÜSTER. *Z. physiol. Chem.* 151, 56–85(1926); cf. C. A. 18, 3065.—Hemoglobin may be regarded as a tribasic complex acid which carries the Fe in the anion. Two of the dissociable H atoms belong to the 2 carboxyls of the globin and the other H to a carboxyl of the prosthetic group. The 2 carboxyls of the prosthetic group are different; hence 2 hemoglobins must exist. In Hb Aa the stronger carboxyl is bound to the prosthetic group, in Hb Ab the weaker. In the isolated prosthetic group quite different linkages prevail as compared to Hb. The isolation of the prosthetic group as hemin is preceded by a transformation of Hb into methemoglobin. This occurs at the moment the prosthetic group goes into soln, i. e., not in the coagulation of the blood but in the extn. with MeOH and H_2SO_4 . In the formation of met-Hb the cation loses 1 H equiv. and the anion becomes bivalent, the OH adding to the Fe to form Fe^{+++} and the H (AcOH method) or the Me (MeOH H_2SO_4 method) to 1 of the carboxyls. Either method can yield 2 transformation forms, according to whether the H adds to the carboxyl of the prosthetic group or to a carboxyl of the globin. Hb Aa and Hb Ab then yield 2 methemoglobins each, of which 2 are identical; hence Hb Aa and Hb Ab can give identical AcOH-hemins. Four forms are possible, 1 of which would have a betaine structure. If the Me enters the carboxyl of the prosthetic group 2 methemoglobins may result from each Hb. All 4 are different. In the cleavage to globin and hemin 8 isomeric mono-methylated hemins may then be formed. If only the globin COOH is methylated an unmethylated hemin results from the cleavage. The product of further methylation is detd. by the form of the monomethylated hemin. Four isomeric dialkylated hemins are possible. The assumption of betaine structures applies also to hematoporphyrin and chlorophyll.

A. W. DOW

Yeast maltase. VI. RICHARD WILLSTÄTTER AND EUGEN BAMANN. *Z. physiol. Chem.* 151, 242–72(1926).—The p_H optimum for yeast maltase is 6.75–7.25; p_H 6.1 is less favorable than neutrality, and p_H 7.5 much more so than 6.1. The kinetics of the reaction on maltose depends to an extraordinary extent on the degree of purity of the enzyme. Yeasts and autolyzates followed in all cases (30–60% hydrolysis) a time-reaction curve which deviates from that of a monomol. reaction. In the form of $Al(OH)_3$ adsorbates and elutions therefrom, however, the enzyme gives a different curve, indicating progressive inhibition during the course of the reaction. This is not due to destruction of enzyme because of its higher purity, since the enzyme is completely protected in the sugar soln. For equal extents of cleavage the product of enzyme amt. and reaction time is const. The phenomenon suggests the removal of some substance which counteracts the inhibition by the glucose formed. The mere filtration of aged autolyzates was sufficient to change the curve from the 1st to the 2nd type, while the reverse occurred when the filtrates were allowed to stand 4–6 hrs. Filtration did not, however, alter the rate of maltase action of a freshly prepd. autolyzate. The behavior of the $Al(OH)_3$ adsorbates is by no means uniform. Some follow the 2nd curve while others deviate from both curves. The detn. of enzyme activity and the comparison of enzyme amts. are more difficult with maltase than with sucrase. All yeast exts. if carefully preserved show an increase in maltase activity. It is possible, therefore, to det. maltase values, but only apparent enzyme amts. A 2nd difficulty is the alteration of the kinetics of the reaction. The use of a cell poison in prepg. the autolyzate results in an acid reaction which is favorable to sucrase but unfavorable to maltase. The method of prepn. is based therefore upon neutralization of this acid after destruction of the cells by EtOAc. It is thus possible to bring the maltase content of the yeast quant. into soln.; EtOAc is preferable to PhMe or $CHCl_3$. After 10–15 min. treatment with EtOAc the liquefied yeast is dild. and neutralized with NH_4OH . One g. of phosphate buffer per 100 cc. enzyme soln. is added, and this maintains a const. p_H in spite of proteolysis. Liquefaction may also be effected by $(NH_4)_2HPO_4$ or NaCl. Ordinary beer yeasts have the power of directly fermenting maltose, without preliminary hydrolysis, through the action of a special component of the zymase complex. The maltose is fermented in so short a time that hydrolysis is negligible. Maltase is even more rapidly liberated and brought into soln. than

sucrase. The EtOAc method with neutralization gives a quant. yield of enzyme soln. contg. only 5–10% of the yeast mass. In working with maltase solns. it is important to keep them at 0°, not merely in an ice box. Maltase is much less stable than sucrase. At 30° the maltase disappears in 1 day, at room temp. in several days but at 0° it may be kept a week. Instead of loss of enzyme there is then an increase in apparent maltase units up to 67%, due probably to alteration or sepn. of inhibitory substances or even to formation of new enzyme from a precursory stage. **VII. Separation of maltase and sucrase.** *Ibid* 273–85.—The view of Michaelis that adsorbents, on account of their acidic or basic properties, act upon enzymes or enzyme complexes of opposite electrochem. nature and thus aid in the sepn. of mixts. is no longer sufficient to explain the differences observed. With an alumina gel of the formula AlO_2H , which does not react appreciably with 38% HCl nor with 4% NaOH, the adsorption is highly selective and cannot be accounted for by the assumption of basic or acidic properties. The AlO_2H is prepd. by the action of NH_4OH on $\text{Al}(\text{OH})_3$ at 250°. In its selective adsorption of maltase it is far superior to fresh or briefly aged $\text{Al}(\text{OH})_3$. With many autolyzates it yields a pure maltase by a single operation of adsorption and elution with $(\text{NH}_4)_2\text{HPO}_4$, while at the same time the sucrase soln. is freed from maltase with very little loss. This selective adsorption may be amplified by a method of selective elution. Both maltase and sucrase are liberated from the $\text{Al}(\text{OH})_3$ adsorbate by faintly alk. phosphate or a phosphate mixt. of p_{H} 6.8. Primary alkali phosphate (KH_2PO_4), however, liberates the sucrase completely and almost exclusively while the maltase alone remains in the adsorbate and can be recovered. The operations should be carried out at 0° to avoid loss of maltase. A. W. Dox

Plant proteases. II. Hydrocyanic acid activation and inhibition of plant proteases. RICHARD WILLSTÄTTER, WOLFGANG GRASSMANN AND OTTO AMBROS. *Z. physiol. Chem.* 151, 289–306 (1926); cf. *C. A.* 18, 3390.—It was previously shown that HCN added to papain has the effect of a kinase. Papain hydrolyzes gelatin though not intensely, but does not hydrolyze peptones. Papain-HCN hydrolyzes gelatin vigorously, and also peptones. Another difference between the enzyme and its cyanohydrin is now reported: the latter hydrolyzes native egg albumin, the former does not. A comparison of plant proteases shows that they comprise tryptic enzymes, of which some are activated by HCN and others inhibited. Bromelin, the protease of pineapple, is similar to papain in this respect, while the protease of the pumpkin differs sharply. For the activation of bromelin H_2S is equally as effective as HCN, but it is somewhat less effective in activating papain. It is not improbable that papain and bromelin are identical and that the lower activation is due in the one case to association with a natural activator. Pumpkin protease is decidedly inhibited by HCN and still more so by H_2S . It acts upon gelatin best in faintly alk. medium and on peptone at p_{H} 6.3. It is easily adsorbed from faintly acid soln. by $\text{Al}(\text{OH})_3$, while papain is adsorbed only from slightly ammoniacal soln. It acts with difficulty on gelatin but readily on fibrin, thus differing from papain-HCN. Both enzymes, however, are analogous to trypsin + enterokinase. **III. Substrate and activity optimum in some proteolytic reactions.** *Ibid* 307–17.—Papain, with or without HCN activator, shows an optimum for gelatin cleavage which coincides approx. with the isoelec. point of the substrate, *viz.*, p_{H} 5.0. Other substrates were tested in order to det. whether the enzyme is adjusted to the undissoc. proteins. In the hydrolysis of albumin peptone the max. cleavage (p_{H} 5.0–5.2) is approx. at the isoelec. point (4.8), and with blood fibrin the activated enzyme gives a sharp optimum at p_{H} 7.1–7.3 (isoelec. point 7.2). Thus the reaction optima with papain coincide with the isoelec. points of the substrates. Bromelin gives an optimum cleavage of gelatin at p_{H} 4.5–5.0, and of albumin peptone at p_{H} 5.0. Pumpkin protease behaves quite differently. The optimum p_{H} for cleavage of peptone is at 6.3, and for gelatin at slight alk. For fibrin the optimum of this enzyme is practically the same as that for papain. Pumpkin protease is evidently a different type of protease from papain and bromelin. A. W. Dox

Spectrochemical investigations on porphyrins and hematin. I. The identification of coproporphyrin and the significance of spectrochemical methods for porphyrin and porphyratin investigation. II. The hematin occurring in the blood serum of sick persons. O. SCHUMM. *Z. physiol. Chem.* 152, 1–17 (1926).—The difficulty of distinguishing between coproporphyrin and Nencki's hematoporphyrin when only small amts. of material are available may be overcome by the use of concd. H_2SO_4 as a solvent. Pure hematoporphyrin in concd. H_2SO_4 shows the main absorption band 5μ nearer the red than the corresponding band of coproporphyrin under the same conditions. In 25% HCl the difference is only half as great. This method serves also to distinguish Nencki's hematoporphyrin from Zaleski's mesoporphyrin, Willstätter's hemoporphyrin

and the author's coproporphyrin, but not from α -porphyrin or uroporphyrin. Hematoporphyrin and uroporphyrin, however, are readily distinguished after treatment with Br. A systematic scheme is outlined by which the identification of a porphyrin may be performed, and certain precautions in technic and the use of app. are recommended. The hematin occurring in the serum of patients having pernicious anemia or hematoporphyrin has been more conclusively identified as α -hematin.

A. W. DOX

Röntgenographic studies on chitin. H. A. GONELL. *Z. physiol. Chem.* **152**, 18-30 (1926).—Thirteen diff. chitin preps. from animal and plant sources were examd by the X-ray method. Of these 11 contained the same crystd. substance. The differences were merely in arrangement and size of the crystallites and in the content of amorphous substance. In the interpretation of the diagrams it was concluded that the elementary substance contains 18 acetylglucosamine anhydride mols., of which 1, 2, 3, 6 or all contained in 1 crystallite may form a group.

A. W. DOX

Specific dynamic action. E. AUBEL. *Ann. physiol. physicochim. biol.* **1**, 31-46 (1925); *Physiol. Abstracts* **10**, 173.—Sp. dynamic action (Rubner) is explained on the hypothesis that an endothermic reaction can only occur to the accompaniment of an associated reaction capable of furnishing the energy necessary for the first. Food substances may give rise to sp. dynamic action even in case of their not being converted to glucose.

H. G.

Surface tension in biology. VIII. The surface tension of some substances used in medicine. W. KOPACZEWSKI, M. BEM AND G. DE CASTRO. *Arch. intern. pharmacodynamie* **29**, 69-83 (1924); *Physiol. Abstracts* **10**, 140; cf. *C. A.* **18**, 3605.—Observations of the effects produced on surface tension by numerous substances are tabulated. Plant and animal preps. in use do not represent from this point of view the active principles to which their utility is ascribed—e. g., liver exts. have a high surface tension, while it is well known that their "active principle" lowers it. It is suggested that emetics, purgatives, etc., may owe their activity to the increase of surface tension of human serum which they produce.

H. G.

Influence of innervation on the creatine content of muscles. D. G. C. TERVAERT AND J. G. DUSSEER DE BARENNE. *Arch. néerland. physiol.* **9**, 392-4 (1924); *Physiol. Abstracts* **10**, 151; cf. *C. A.* **17**, 816.—The amt. of decerebrate rigidity in the leg muscles of 1 side was varied by stimulation of the peroneal nerve on the same and opposite sides. The muscles of the opposite limb were removed before decerebration to act as a control. More creatine was invariably found in the excited rigid muscles than in those of the control side.

H. G.

Desensitization of the heart for β -rays. G. J. VAN DEN BOVENKAMP. *Onderzoek. Physiol. Lab. Utrecht* **5**, 119-35 (1925); *Physiol. Abstracts* **10**, 154.—Frog's hearts were brought to a standstill by perfusing with Ringer to which U had been added just to balance the K. The radioactive effects of U are due to positive α -rays, while the effects of K are due to negative β -rays. On adding to the fluid different cytolytic substances such as mono-basic fatty acids, alcs., blood serum and certain alkaloids, the radio-physiol. equil. is shifted to the α -side. This effect is due to the desensitization of the heart for β -rays. Rabbit serum heated to 36° behaves as unheated serum towards this shifting. Cu, Ag and Au oligodynamic doses produce the same shift of equil. and desensitization of the heart for the β -rays of K.

H. G.

α -Rays and heart action. J. N. VOORSTAD. *Onderzoek. Physiol. Lab. Utrecht* **5**, 151-69 (1925); *Physiol. Abstracts* **10**, 154.—A galvanoplastic ppt. of Po on Cu can act as an α -radiator, and can stimulate a heart to beat which has been previously brought to a standstill by removing the K. External α -radiation and internal β -radiation cause stoppage; similarly with the reverse application. External and internal α -radiation are additive unless the maximal dosage is exceeded. Perfusion with Ringer contg. emanation gives more const. results than external α -radiation. The action of α -ray cannot be explained chemically. β -Radiators produce paradoxa and equilibria under the above conditions.

H. G.

Note on the penetration of hydroxyl ions into gelatin jellies. J. GRAY. *Proc. Cambridge Phil. Soc. Biol. Sect.* **1**, 237 (1925); *Physiol. Abstracts* **10**, 207.—Expts. on the penetration of ions into gelatin jellies show that a differential permeability to weak and strong alkalis is no proof of the presence of a fatty substance in the membrane in question. The suggestion is made that Mg and Ca are necessary to the living cell because they form some intracellular ppt. having the properties of a membrane.

H. G.

The origin of the potential differences between the interior and exterior of cells. J. B. S. HALDANE. *Proc. Cambridge Phil. Soc. Biol. Sect.* **1**, 243 (1925); *Physiol. Ab-*

tracts 10, 206.—“The observed facts as to the permeability of cells to electrolytes account quantitatively for the injury potentials and H-ion concns. of tissues. These can be calcd. from their Cl and H₂O contents.”

H. G.

Physical chemistry of the globulins. VII. The behavior of acid and alkali globulins on the addition of salts. MONA ADOLF. *Kolloidchem. Beihefte* 21, 241–81(1926); cf. *C. A.* 19, 1285.—The addn. of salts to acid solns. of globulins causes a decrease in the H ion, though in no case was complete neutralization effected. This action increases with increasing valency of the anion and decreasing valency of the cation. Alkali-globulin solns. may likewise be rendered acidic by the addn. of salts. The *cond.* of solns. of acid or alkali globulins contg. salts is less than the sum of the conds. of the constituents. This diminution is only partially due to the change in H ion and free charge on the globulin ion. It is dependent on the concn. of the salt added. The *viscosity* of acid-globulin solns. decreases on the addn. of neutral salts, approaching a const. value. The *migration velocity* of the protein ion also diminished, vanishing *e. g.*, on the addn. of 0.2 N KCl to globulin chloride. The action of the salt on the protein ion increases with increasing valency of the salt ion of opposite charge. Bivalent and trivalent ions may thus reverse the direction of migration. The Cl ion of neutral Na globulinate solns. in the presence of various chlorides was detd. The increase in the Cl ion on shaking with Hg₂Cl₂ is attributed to the formation of a complex.

ARTHUR GROLLMAN

Teaching of biochemistry. C. J. FARMER. *Proc. Assoc. Am. Med. Colleges* 36, 95–102(1925).—Stress is placed on the related phys. chemistry and on precise quant. rather than qual. expts.

JOSEPH S. HEPBURN

Chlorocruorin: a pigment allied to hemoglobin. H. M. FOX. *Proc. Roy. Soc. (London)* 99B, 199–220(1926).—The blood plasma of certain polychete worms contains chlorocruorin, a pigment, in soln. The concd. soln. is red, the dil. soln. green. Chlorocruorin exists in an oxidized form and a reduced form; these forms are characterized by adsorption spectra; the absorption bands resemble those of oxyhemoglobin and reduced hemoglobin, but are nearer the red end of the spectrum. Oxychlorocruorin is reduced by a vacuum or by living tissue; air reoxidizes the reduced form. Chlorocruorin has less affinity for O₂ than has hemoglobin; its affinity is increased by an increase in *p*_H. The sp. chlorocruorins differ in affinity for O₂, the affinity being greatest in *Myxicola*, and decreasing in *Spirographis*, *Sabella*, and *Branchiomma* in that relative order. In an atm. of O₂ at atm. pressure, the chlorocruorin of *Myxicola* is satd. with O₂, while the chlorocruorins of the other 3 species are unsatd. The blood of *Spirographis* has a total O₂ capacity of 9.1 vol. % in air and 10.2 vol. % in O₂. The absorption spectrum of oxychlorocruorin is characterized by a high value of the absorption ratio α/β , a low value of the absorption ratio γ/γ' and the presence of an extra small band in the visible region between β and γ ; the wave length of the α band axis varies with the species. The Stokes band, produced by reduction with hyposulfite, has a summit with a buttress on either side and thereby differs from the bands yielded by mammalian and Arenicolan hemoglobin. Chlorocruorin has a greater affinity for CO than for O₂. Light dissociates CO-chlorocruorin more readily than CO-hemoglobin. Metachlorocruorin has a spectrum which differs considerably from that of methemoglobin. Chlorocruorohematin, in both acid and alk. aq. soln., has characteristic spectra, unlike those of hematin under the same conditions; dissolved in a mixt. of Et₂O and glacial AcOH, it yields a spectrum similar to that of hematin in the same solvent, but with the bands moved toward the red. Chlorocruorochromogen closely resembles hemochromogen spectroscopically, but its bands are nearer the red and do not attain their final position immediately after prepn. The chlorocruorochromogens of all species have the axis of the α band at the same wave length. The α band of NH₂-chlorocruorochromogen has a position different from that of the same band of the NH₂ compds. of hemoglobin, heliocorubin and actinohematin; therefore, the hematin of chlorocruorin is not the same as that of these other pigments. The hematin group of chlorocruorin contains Fe which is united to a porphyrin. This porphyrin differs from hematoporphyrin, having a similar spectrum but with bands shifted toward the red; it is sol. in CHCl₃.

JOSEPH S. HEPBURN

The biologic action of urea. O. WELTMANN AND A. GOTZMANN. *Z. ges. expl. Med.* 47, 369–85(1925).—The resistance of different urines to infection with nitrite-forming bacteria depends only partly on different *p*_H values and is independent of the concn. In heated urine nitrite-forming bacteria form less nitrite than in unheated urine and the substance in the urine changed by heating is probably urea. Heated solns. of urea inhibit the action of nitrite-forming bacteria, probably by inhibiting the growth of the bacteria and by weakening their reducing power. NH₄ cyanate is prob-

ably the biologic active principle in a heated soln. of urea. Solns. of urea on standing at incubator temp. are probably converted to NH_4 cyanate, and show the same power of inhibiting nitrite formation. K cyanate has a similar action in inhibiting nitrite formation. Whether NH_4 cyanate plays a role in human pathology must be left at present as an open question.

HARRIET F. HOLMES

A contribution to the knowledge of the lipases of the blood. V. JEDLIČKA. *Z. ges. expl. Med.* 47, 534-41(1925).—Serum lipase is not adsorbed by cholesterol or its palmitic acid ester. Pancreatic lipase is adsorbed by cholesterol and by its palmitic acid ester. Pancreatic lipase is adsorbed by cholesterol palmitate only in a protein-free medium and by cholesterol also in a protein-contg. medium as serum. That pancreatic lipase is not inhibited in action in serum is probably due to the fact that the cholesterol is present in the form of a cholesterol ester. The inhibition of the action of pancreatic lipase by the stroma of erythrocytes is probably due to the fact that the cholesterol in the erythrocytes is present as free cholesterol and not as a cholesterol ester. Serum lipase differs from pancreatic lipase not only by a different behavior with atoxyl but also by physico-chem. characteristics as indicated by cholesterol adsorption tests.

HARRIET F. HOLMES

The causes of animal pigmentation. X. The role of dopa in the cocoons of some moths and wasps and notes on the chemical site of melanin formation. HANS PRZIBRAM. *Arch. mikroskop. Anal. Entwicklungsmech.* 102, 624-34; *Ber. ges. Physiol. expl. Pharmakol.* 29, 353.—Expts. with the cocoons of *Cimbex* and *Lophyrus* confirmed P.'s findings on *Eriogaster* and *Saturnia* that melanin is formed by the action of H_2O on dopa (*dihydroxyphenylalanine*). The pigmentation of the cocoons can, therefore, be considered as "protective pigmentation." Dopa was never observed as an intermediate in the formation of melanin from tyrosine. The point of attack of the enzymic, photo-sensitive tyrosinase action is very likely in the side chain, since the reaction is common to dopa and tyrosine, but is unknown in pyrocatechol.

MARY JACOBSEN

The nature of photoactivity. THEO BRANDESS. *Fortschr. a. d. Geb. d. Röntgenstr.* 32, 352-6(1924); *Ber. ges. Physiol. expl. Pharmakol.* 29, 331.—The so-called photoactivity is a purely chem. action on the plate. There is no proof of a light action.

MARY JACOBSEN

Vital tissue staining under the influence of Röntgen rays. CARL HOLTERMANN. *Strahlentherapie* 17, 158-74(1924). **The influence of Röntgen and Radium rays on vital stains.** *Ibid* 362-5; *Ber. ges. Physiol. expl. Pharmakol.* 29, 532-3.—Vital staining with trypan blue (1%) and lithion carmine (5%) in white mice is subject to great variations, the kidney alone presenting certain regularities. With trypan blue the glomeruli present a picture characteristic for the increase of stain fixation. Double staining (trypan blue and lithion carmine) produces about the same picture as Röntgen irradiation alone. The different degree of fixation in the various areas of the upper capillary system is accentuated by Röntgen irradiation. The characteristic effect appears even if the organ stained has not been directly irradiated (irradiation of the head only). While the kidney glomerulus does not fix lithion carmine, the spleen follicle takes both dyes. Gravid animals fix the dyes only with difficulty or not at all. Placenta and membranes remain impermeable even under the influence of Röntgen rays. Different vital stains behave differently. There is additivity of the lesions produced by irradiation and dye. The changes occurring in vital staining are of a general, not local nature. Ra does not produce most of the characteristic Röntgen effects but the sensitization to the stain is considerably higher. Possibly the differences between the biol. effects of Ra and Röntgen rays are based on the dominance of either general or local effects.

MARY JACOBSEN

The biological basis of actinic action. W. CASPARI. *Strahlentherapie* 18, 17-36(1924); *Ber. ges. Physiol. expl. Pharmakol.* 29, 330.—Bibliography for the last years and comprehensive review of 42 papers on the subject.

MARY JACOBSEN

The influence of radioactive substances on the digestion of casein by trypsin. YASU NAGAI. *Strahlentherapie* 18, 212-9(1924); *Ber. ges. Physiol. expl. Pharmakol.* 29, 646.—Irradiation with Th X and Ra-Th although exceeding therapeutic doses had no effect.

MARY JACOBSEN

Present status of our knowledge of the constitution of the coloring matter of blood. COSTIN NENITZESCO. *Bul. soc. chim. România* 7, 102-16(1925).—An address.

A. PAPINEAU-COUTURE

The electric capacity of suspensions with special reference to blood. H. FRICKE. *J. Gen. Physiol.* 9, 137-52(1925).—The sp. capacity of a suspension is defined as that capacity, which combined in parallel with a certain resistance, electrically balances 1 cm. cube of the suspension. The sp. capacity of a suspension of spheroids is expressed

by the formula, (1): $C = C_0 \alpha g(1-r_1)/r$, where C is the sp. capacity of the suspension, C_0 the static capacity of 1 sq. cm. of spheroid membrane, r and r_1 are the sp. resistances, resp., of suspension and suspending liquid, $2g$ the major axis of spheroid and α a const. previously derived (cf. Fricke, *Phys. Rev.* 26, 678(1925)). The formula, (2), $C = C_{100}(1-r_1)/r$, holds for practically any suspension regardless of the form of the particles. C_{100} is the sp. capacity of a suspension with a concn. of 100%. Both formulas hold only when the frequency is so low that the impedance of the static capacity of the membrane surrounding a single particle is high as compared with the resistance of the interior of the particle. They also hold for suspensions of homogeneous particles when polarization takes place at the surface of each particle provided the polarization resistance is low as compared with the impedance of polarization capacity. A method is given for measuring the capacities of suspensions between 800 and 4.5 million cycles. Measurements of the capacity of suspensions of red blood corpuscles of the dog showed that formula (2) is correct and that C_0 is independent of frequencies up to 4.5 million cycles and independent of the suspending liquid. This furnishes further evidence for the theory that C_0 represents the static capacity of the corpuscle membrane. From these data, the thickness of the corpuscle membrane is found to be 3.3×10^{-7} cm. A discussion of the polarization of electrodes is included. CHAS. H. RICHARDSON

The electric resistance and capacity of blood for frequencies between 800 and 4.5 million cycles. H. FRICKE AND S. MORSE. *J. Gen. Physiol.* 9, 153-67(1925).—A formula is derived for the sp. resistance of red corpuscles and serum. Calves' blood was used. CHAS. H. RICHARDSON

Some general properties of proteins. M. L. ANSON AND A. E. MIRSKY. *J. Gen. Physiol.* 9, 169-79(1925).—The processes of denaturation and coagulation of hemoglobin resemble those of other proteins. When proteins are denatured they are probably polymerized. Hemoglobin is probably depolymerized into hemochromogen. Native proteins can be regarded as aggregates of denatured proteins. Globins and histones should be regarded as denatured proteins rather than a distinct group of proteins. The denaturation of proteins is a reversible process but the flocculation of the denatured protein makes it appear to be irreversible. When proteins are denatured a non-polar group is uncovered. The 2 most sensitive tests for the specificity of proteins (absorption spectra and precipitin reactions) show that proteins are highly sp. only when they are in the native form. No new exptl. data are offered. There is a bibliography of 22 titles. CHAS. H. RICHARDSON

The effect of radioactive radiations and X-rays on enzymes. IV. The effect of radiations on solutions of invertase. R. G. HUSSEY AND W. R. THOMPSON. *J. Gen. Physiol.* 9, 211-5(1925).—The inactivation of invertase by β radiation is explained quantitatively in the same manner previously stated for pepsin and trypsin (cf. C. A. 17, 2590, 3681). C. H. R.

The effect of radiations from a mercury arc in quartz on enzymes. I. The effect of ultra-violet radiation on pepsin in solution. R. G. HUSSEY AND W. R. THOMPSON. *J. Gen. Physiol.* 9, 217-9(1925).—"Pepsin in soln. is inactivated by the radiations from a Hg arc in quartz. It would seem that the effective radiations are those in the ultra-violet region of the spectrum. The form of the curve describing the course of the inactivation is the same as that found for monomol. chem. change." C. H. R.

Formation of complexes between proteins and hydroxides of trivalent metals. Method of desalbumination by the alums. L. C. MAILLARD AND W. WUNSCHENDORFF. *Compt. rend.* 181, 941-2(1925).—Hydroxides of Al, Cr and Fe were studied. Two cc. of serum, 5 cc. H_2O and 25 cc. of 5% ordinary K alum are well mixed and 10 cc. of 0.5 N NaOH and 0.5 cc. of bromothymol (2 in 1000) are added. The NaOH is then added drop by drop until the liquid is yellowish orange. The mixt. is then filtered. The filtrate is colorless; its p_H is 7.0; it is entirely free from proteins and practically free from Al. The complex ppt. of serum and alum under these conditions does not absorb NH_4 salts, urea or uric acid when added to the mixt. L. W. RIGGS

Mineral elements associated with oxyhemoglobin in horse blood. A. DESGREZ AND J. MEUNIER. *Compt. rend.* 181, 1029-31(1925).—Following the first crystn. of hemoglobin the elements K, Na, Ca, Li and slight traces of Mn are found to be fixed in its mol. The spectrum shows K to be present in much the largest amt. A second crystn. diminishes the proportion of K without causing a sensible variation in Ca. The desiccation in the air of the product of the second crystn. transforms the pigment into 2 forms, one sol. free of Li and retaining Ca, the other insol. having fixed apparently all of the Li. K does not reappear in either of these portions. L. W. R.

Physicochemical properties of certain constituents of the serum. F. VLES AND A. DECLOUON. *Compt. rend.* 181, 1189-91(1925); cf. C. A. 18, 3067; 19, 3312.—A

further study of the displacement of the isoelec. point of normal and pathologic serums is reported.

L. W. RIGGS

Physiologic action of ultra-violet rays transmitted by the thin glasses in common use. J. RISLER AND FOVEAU DE COURMELLES. *Compt. rend.* 182, 173-4 (1926).—The skin injury caused by ultra-violet rays was tested under various conditions. The max. sp. action appears to be from rays of the length 2960-3050 Å. U. **Remarks on the preceding communication.** DANIEL BERTHELOT. *Ibid.* 175.—The findings of Risler and deCourmelles confirm the observations of Foucault in 1843. It is noted that at high altitudes the solar rays produce erythema with those unaccustomed to living at such altitudes.

L. W. RIGGS

Relationship between the albumins of different organs. KAKUZO SAKURABAYASHI. *Tohoku J. Exptl. Med.* 6, 427-9 (1925).—An intimate biological relation appears to exist between the albumins of the liver and kidney; but between the lungs and the spleen or between these and other organs no such biologic relation was found. Both normal and immunized serums react so definitely upon the antigens and anti-serums that their biological behavior is known. The liver and kidney have a common antigen

L. W. RIGGS

Reversible permeability of membranes and its relation to cell metabolism (GURCHOT) 2.

POHLMANN, J.: **De scheikunde der eiwitten.** Leiden: Uitgeversvennootschap Futura. 252 pp. Guld. 7.50.

ROBERTSON, T. BRAILSFORD: **The Chemical Basis of Growth and Senescence.** No. 9 of Monographs on Experimental Biology, ed. by Loeb, Morgan and Osterhout Philadelphia: J. B. Lippincott Co.

SCHOLTA, ALFRED: **Die biochemische Lebens- und Heilweise. Die Grundlagen e. biochem. Ernährg. u. der Julius Henselschen u. Dr. Schüsslerschen biochem. Heilweise.** Oldenburg i. O.: Schulzesche Hofbuchdr. u. Verlagsbuchh. 44 pp. R. M 1

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Determination of pepsin in gastric juice. P. ROSTOCK. *Münch. med. Wochschr* 71, 1311-2 (1924).—The liquid contg. pepsin is allowed to act on coagulated blood fibrin. The course of the digestion due to the action of pepsin is shown by the increase in n of the liquid measured by an immersion refractometer.

B. C. A.

Clinical colorimetric determination of hemoglobin. H. KAMMERER AND A. SCHAULIN. *Münch. med. Wochschr.* 71, 1271-3 (1924).—Blood, after diln. with water contg. CO, is compared colorimetrically with standard carboxyhemoglobin solns. B. C. A.

A micro method for determining momentarily the sedimentation velocity of the blood. G. C. VAN WALSEM. *Nederland. Tijdschr. Geneeskunde* 69, II, 1981-4 (1925). One part of a 2.85% $K_2Cr_2O_7$ soln. and 4 parts of blood are sucked into a micropipet, this is closed by a rubber band. After mixing, the settling is observed in this pipet directly.

R. BEUTNER

Methods for the determination of protein groups in human blood serum. I. W. STARLINGER AND K. HARTL. *Biochem. Z.* 160, 113-28 (1925).—A detailed critic of various current American and European methods for detn. of serum proteins, especially those in which the salted-out proteins are detd. by their N content. II. *Ibid* 129-46.—A detailed critic, with exptl., data, of the methods using the n of serum as the basis for the detn. of serum proteins. III. *Ibid* 147-54.—Crit. consideration, with exptl. data, of those methods for the detn. of serum proteins that are dependent on interferometric, polarimetric or nephelometric data. Methods in which viscosity data are combined with refractometric data are studied.

F. A. CAJORI

Determination of chlorine in small amounts of tissue. E. URBACH AND P. FANTL. *Wiener klin. Wochschr.* 38, 384-5 (1925).

E. J. C.

The occurrence of copratin and the identification of blood in feces. O. SCHUMM. *Z. physiol. Chem.* 151, 126-9 (1926).—Bile usually gives the pyridine-hemochromogen reaction which may be due to traces of α -hematin from contamination with blood. Copratin was not found. In the meconium copratin is found in about 1 case out of 20, while the pyridine-hemochromogen test is always positive. When a small amt. of blood enters the digestive tract, e. g., from occult bleeding, it is occasionally observed that the feces show the copratin spectrum in the $CHCl_3$ ext. when the hemochromogen test is negative. The benzidine test is too sensitive to be conclusive, except that a negative test is positive evidence of the absence of hematin. Thus far no food

plant has been found to contain copratin; hence the copratin test is more sp. than the hemochromogen test.

A. W. DOX

Determination of small amounts of lead in animal tissues. ROKURO NAKASEKO AND ISAMU NAKANO. *Kyoto Med. J.* Aug. 1925.—After the destruction of org. matter by concd. HNO_3 , concd. HNO_3 and H_2SO_4 or ashing, dissolve in HNO_3 , neutralize with NH_4OH and make 0.1 N with HNO_3 . Sat. with H_2S , filter, dissolve the ppt. in HNO_3 , neutralize with NH_4OH , acidulate with AcOH and ppt. with 1 drop of 10% K_2CrO_4 . Filter and treat the ppt. with 1 cc. 6 N HCl , 1 cc. of 5% KI and 1 cc. of starch. After 1 minute titrate with 0.001 N $\text{Na}_2\text{S}_2\text{O}_3$. From 2 N HNO_3 Pb can also be deposited as PbO_2 by a current of 0.05 ampere at 0.5 volt and the ppt. dissolved in 5 cc. of 5% KI and 1 cc. of AcOH . The soln. can then be titrated with thiosulfate.

W. T. H.

Phenolphthalol, its preparation and reaction toward oxidases and peroxidases. G. D. BUCKNER. *Am. J. Physiol.* 74, 354-8(1925).—Phenolphthalol was prepd. by the modified method of Baeyer. It is a sensitive reagent for oxidases and peroxidases but has no advantage over phenolphthalin. Human blood can be detected in a diln. of 5×10^{-6} . It is excreted unaltered after abdominal injection into the guinea pig or *Tapes decussatus*. Neither the blood nor the fresh or dried tissues of the latter gave an oxidase reaction, except the abdominal organs and their contents.

M. J.

The miostagmin reaction of malignant tumors. M. ASCOLI. *Ergebn. inn. Med. Kinderheilk.* 25, 944-87(1924); *Ber. ges. Physiol. explil. Pharmacol.* 29, 385.—Comprehensive review and detailed technic.

MARY JACOBSEN

Experiences concerning cholecystography. MAX EINHORN, W. H. STEWART AND E. J. RYAN. *Arch. Verdauung-krankh.* 36, 245-62(1926).—Graham's method of cholecystography has great diagnostic value. The intravenous injection of tetrabromophenolphthalein is often accompanied by reactions. In contrast to this tetraiodophenolphthalein is harmless in large doses. The latter is, therefore, to be preferred.

FRANCES KRASNOW

A new use for phosphotungstic and phosphomolybdic acids in the determination of uric acid in milk and blood. G. REIF. *Biochem. Z.* 161, 128-38(1925).—The blue color which appears in certain solns. of phosphotungstic acid is due to the presence of traces of molybdic acid. A soln. contg. 3.0 g. Na tungstate, 2.0 g. Na_3PO_4 , 0.05 g. MoO_3 and 25 g. H_2O is proposed as a uric acid reagent. The mixt. is warmed, and then neutralized to litmus with HNO_3 . It keeps indefinitely. In the detn. 10 cc. of unknown are treated with 0.5 cc. of 10% HCl and 1 cc. of reagent. The mixt. is quickly heated to boiling and then allowed to stand. Those substances in blood which interfere with the uric acid detn. may be extd. with CHCl_3 .

W. D. L.

Iron in nutrition. II. Quantitative methods for the determination of iron in biological materials. C. A. ELVEHJEM AND E. B. HART. *J. Biol. Chem.* 67, 43-51(1926).—Thompson's method (*J. Chem. Soc.* 48, 493) for the detn. of Fe may be used for materials relatively high in Fe and low in P. Walker's modification (*C. A.* 19, 2613) is satisfactory for materials somewhat rich in P. A new method is described for substances relatively low in Fe and high in P such as milk. The phosphate which interferes with the permanence of the color developed with KSCN is removed by pptn. with $(\text{NH}_4)_2\text{MoO}_4$, the Fe is then pptd. with KOH and the $\text{Fe}(\text{OH})_3$ dissolved in HCl and detd. colorimetrically.

A. P. LOTHROP

The quantitative determination of dihydroxyacetone. W. R. CAMPBELL. *J. Biol. Chem.* 67, 59-69(1926).—Dihydroxyacetone reduces boiling acid phosphate molybdate solns. directly while the reduction from an equal amt. of pure glucose is about $1/180$ as great. A colorimetric method is described and also a volumetric one which is considered preferable and in which the blue soln. is reoxidized by KMnO_4 . An empirical correction is made for the glucose and other reducing substances in the Folin-Wu blood filtrate. Examn. of several hundred samples of human blood failed to show any considerable amt. of dihydroxyacetone normally present in the blood. It is proposed to apply the method to the study of the metabolism of this substance.

A. P. LOTHROP

The tryptophan content of the important proteins found in foodstuffs and a new procedure for determining tryptophan. J. TILLMANS AND A. ALT. *Biochem. Z.* 164, 135-162(1925).—The Fürth-Nobel method for detg. tryptophan is unreliable as a quant. procedure, because pure tryptophan solns. yield a blue-violet, while protein solns. contg. tryptophan give a red-violet color, so that the direct color comparison is impossible. The tryptophan content of protein, even when the inequality of coloration is compensated by the use of proper glass filters, is too high. The methods of May and Rose and Folin and Looney have been found satisfactory but time consuming and difficult to carry out. The new method is based upon the reaction of protein with

formol and H_2SO_4 . This permits a direct detn. of the tryptophan in protein without the need of preliminary hydrolysis and at the same time the color produced is the same with pure tryptophan solns. as well as with protein. The yellow color reaction is obtained when the tryptophan-contg. material is treated with a little HCHO , then with an excess of 66% H_2SO_4 . The reaction is not given by any other known component of the protein mol. It is sensitive to at least 0.1 mg. tryptophan and the max. color develops in about 10 min. and remains unchanged for a considerable time. The best results are obtained with a single drop of a 2% HCHO soln.; the optimum concn. of the H_2SO_4 is 66–67% (by wt.). The H_2SO_4 must not be less than 60 nor more than 70%. Examd. by this method, human milk proteins show a higher tryptophan content than those of either cow or goat milk. The tryptophan content of cheese is not affected by the ripening process. Incidentally, it was found that the Fritzmann reaction for nitrates in milk is a specific tryptophan reaction. The tryptophan content of myosin from meat of various animals varies very little and the expectation that a method may be devised based upon the tryptophan reaction for differentiating between horse meat and beef was not realized. The tryptophan content of wheat protein is generally higher than that of oats, but the differences are not large enough to make a chem. differentiation possible. It was possible, however, to demonstrate that both of these vegetable proteins are made up of 4 distinct components. It has also been corroborated that zein lacks tryptophan and it is possible to detect adulteration of wheat flour with corn meal, since the tryptophan content of the alc.-sol. proteins of wheat flour should not be below 0.8%. The tryptophan content of various other cereals as well as legumes is not materially different from that of wheat or oats.

S. MORGULIS

A colorimetric micro-method for the determination of lactic acid in blood. BRUNO MENDEL AND INGEBORG GOLDSCHIEDER. *Biochem. Z.* 164, 163–74 (1925).—See C. A. 19, 3504.

S. MORGULIS

Phosphorus determination in small quantities of substance. KURT SAMSON. *Biochem. Z.* 164, 288–94 (1925).—The inorg. P in serum deproteinized with CCl_3COOH is pptd. with NH_4 molybdate, HNO_3 and NH_4NO_3 . The ppt. is removed by centrifuging and after washing is dissolved in NaOH . One cc. of $N/25$ NaOH corresponds to 0.0478 mg. P. Ppt. 0.5–1.0 cc. serum with 1 cc. 20% CCl_3COOH and after 10 min. centrifuge. Transfer the fluid to another tube, add 1 cc. of the acid to the ppt. and once more centrifuge. Ash the ppt. and dissolve in 0.5 cc. of 10% HNO_3 . To the soln. contg. the P add 1 cc. of 30% NH_4NO_3 soln., 0.4 cc. concd HNO_3 and 1 cc. 3% $(\text{NH}_4)_2\text{MoO}_4$ soln. with proper attention to thorough mixing. Place the tubes for 2–3 min. in boiling water until a definite yellowish green ppt. is formed. After complete cooling add 1 cc. abs. alc., which aids in settling the ppt. to the bottom, and centrifuge. Wash the ppt. 3–4 times with 1% KNO_3 soln., add abs. alc. and centrifuge. Repeat the washing until a drop of the fluid no longer reddens blue litmus paper. Dissolve the ppt. completely in $N/25$ NaOH and titrate the excess alkali with $N/25$ HCl using phenolphthalein. Microburets are used for the titration.

S. MORGULIS

A new method for the determination of cystine in protein (the iodine method). YUZURU OKUDA. *J. Biochem. (Japan)* 5, 217–27 (1925).—The principle of the method is the reaction of cystine with I after treatment with nascent H. Cystine alone among the amino acids reacts in this way, and therefore this procedure can be utilized for detg. the sum of cystine and cysteine. The reagents required are the same as those given in the cysteine method, but the KIO_3 soln. is standardized against a cystine soln. Dissolve 1.01 g. cystine in 50 cc. of about 5% HCl and add a few decigrams of zinc dust. Allow the reduction to proceed at room temp. for 30 min., shaking from time to time. Filter, wash and make up to 100 cc. with H_2O . Transfer 1 cc. of the fresh filtrate to a clean dry flask or test tube and mix with 19 cc. of an exactly 2% HCl soln., then add 55 cc. each of 5% KI and 4% HCl , and titrate with KIO_3 soln. until a permanent yellow color is produced. Take the temp. of the titration mixt. immediately upon completion of the reaction. Since the vol. of KIO_3 required varies with temp. 1-cc. portions (0.0101 g. cystine) should be titrated at several temps. and the results plotted in the form of a curve, from which the amt. necessary for any temp. can be read off directly. For detg. the cystine in protein 1–10 g. of the substance is boiled with 3 times its vol. of concd. HCl under a reflux condenser at first over a water bath, and later for 20 hrs. over a sand bath. Evap. under reduced pressure to remove all HCl , add a little H_2O and decolorize by heating for 30 min. with charcoal. To the cool filtrate add a little Zn dust and reduce at room temp. for 30 min., filter and make up to 100 cc. One-cc. portions are titrated to det. the concn. of the HCl , and the residual soln. is adjusted so that it contains exactly 2% HCl . Take a measured amt. of this soln. and make the vol. to 20 cc. with 2% HCl , then add the other reagents and titrate with KIO_3 as

before. If the original material contained both cysteine and cystine the former must be detd. separately, and the cystine calcd. from the difference between the total and free cysteine. Accurate results are obtained if the analyses are carried out under strictly comparable conditions of acid concn., cysteine concn., temp., etc. S. M.

Detection of carbon monoxide in the autopsy of corpses in an advanced stage of putrefaction. ETIENNE MARTIN. *Ann. méd. légale* 1, 20-3(1921).—CO which has caused death can be detected in the putrid exudations of cadavers. Even when there remains no blood in the heart and in the vessels, the putrid exudations which are present between the pleuras should be tested for CO. Spectral reactions and the 2.5% tannin soln. reaction have given positive results as much as 3 months after death. A. P.-C.

New process for the detection of sperm stains in medico-legal investigations. PELISSIER AND CORDONNIER. *Ann. méd. légale* 1, 64-8(1921).—The following technic is recommended for the detection of sperm in stains on fabrics: immerse about 0.25 sq. cm. of the fabric in 5% CH_2O for 24 hrs., wash, immerse 1 hr. in a 1:1 alc. (95%)—pyridine mixt., wash, immerse 6 hrs. in 3% AgNO_3 at 50° (with dense materials, e. g., wood, leave 12-24 hrs.), wash, reduce 6-7 hrs. in either (A) H_2O 100, formalin 5, pyrogallol acid 4, pyridine 8, or (B) H_2O 100, hydroquinol 1.6, Na_2SO_3 10, pyridine 8, wash in running water for 30 min., and let stand in distd. H_2O contg. a few drops of CH_2O . To mount, place a thread on the microscope slide in a drop of distd. H_2O , tease apart with a needle, evap. at moderate temp., add Canada balsam and cover. If a ppt. has formed during prepn remove by immersing in concd. NaOCl or $\text{Na}_2\text{S}_2\text{O}_3$ — Na_2SO_3 soln before mounting. If the spermatozoa have been bleached by the latter treatment, they can be intensified by treating 5 min. with 2% Au or Pt chloride soln. The fibers are practically colorless and the spermatozoa stand out as blackish brown, the head and tail being of different intensities owing to differences in the density of the protoplasm. The method has been tried out successfully on stains of known origin on silk, cotton, wool, burlap, linen which had been trampled and exposed to rain for several days, linen which had been heated to 80° , tissue paper, newspaper and wood shavings. A magnification of 250 diams. is amply sufficient for the examn. The advantages of this method of prepn. over the usual ammoniacal crythrosin method are discussed. When properly mounted the slide will keep practically indefinitely. A. P.-C.

Medico-legal examination of stains of fecal matters. HAZIME ASADA AND MATA-CHIRO KOMINAMI. *Ann. méd. légale* 2, 92-4(1922).—The stercobilin test can be applied to clothes stained with fecal matter as follows: if the stain is quite yellow, moisten with distd. H_2O , apply a piece of moistened filter paper, and when the latter has become colored add a drop of satd. HgCl_2 soln. In presence of stercobilin a brick-red color develops. If the stain is too light to transfer to paper, tease apart a small fragment of the cloth, divide into 2 portions, place side by side on a slide, moisten one portion with H_2O and the other with satd. HgCl_2 , and compare. The reaction may take a few min to develop. A. PAPINEAU-COUTURE

Diagnosis of asphyxiation by submersion by means of crystalline micro-particles from the water. E. STOCKIS. *Ann. méd. légale* 1, 43-8(1921).—The method is based on the passing of some of the asphyxiating water through the walls of the lung cells and capillaries and into the blood stream, together with the solid particles which it contains. The latter can be found in both sides of the heart. The constituent most generally selected for identification is SiO_2 ; but its detection is complicated by the presence of traces of SiO_2 in most of the usual reagents (including distd. H_2O) unless specially purified, and also of small quantities in normal blood and urine. Detn. of SiO_2 in the whole heart has given interesting results, but is delicate and tedious and prevents the use of the organ for other investigations. Preliminary autolysis of the heart at 37° requires more time, but facilitates subsequent incineration. Hearts of drowned corpses contained 10-20 mg. SiO_2 , while in other kinds of death it contained not over 5-6 mg. S. recommends withdrawing the liquid first from the left, then from the right side of the heart into a perfectly clean vessel (treated with H_2SO_4 and rinsed with filtered distd. H_2O), centrifuging, and examg. the deposit under a polarizing microscope on perfectly clean microscope slides kept in NH_3 aq. SiO_2 can also be detd. quant. in the centrifugal deposit. A blank should be run on the reagents used, and also, when possible, of the water in which the drowning occurred. A. P.-C.

Toxicological investigations on acute alcoholism in man. BALTHAZARD AND MARCELLE LAMBERT. *Ann. méd. légale* 1, 83-96(1921).—A detailed study of the Nicloux method (see Derome and Pepin, *C. A.* 19, 1391) from a toxicological and forensic standpoint. With pure alc. solns. the method is accurate to 1-2%, but in the analysis of blood, etc., the accuracy is about 5%, which is amply sufficient in forensic work. The amt. of alc. which can be normally present in blood during digestion is of the order

of 0.01 cc. per l., never over 0.04 cc., and quite negligible for legal work. Presence of AcOH, AcH and traces of fatty acids in the distillate does not affect the accuracy of the results. When the analysis is carried out before putrefaction has set in, the only oxidizable volatile substances which could introduce an error in the EtOH detn. are Et₂O and CHCl₃; and it is generally easily ascertained if the victim had taken any a short time before death. If putrefaction has set in, volatile oxidizable compds. are formed, which can be eliminated by distg. first from acid and then from alk. soln. In man, EtOH diffuses in all the humors and all the organs till its distribution is practically uniform, so that analysis of the blood is sufficient. The max. alc. content of the blood (in cc. per l.) represents exactly the quantity of alc. ingested (in g. per kg. of body wt.) within the preceding 2-3 hrs. Elimination from the blood is complete in 7-15 hrs. Presence of 3 g. per l., or over, of EtOH in the blood always corresponds to a condition of inebriety or drunkenness, even in confirmed alcoholics; while contents of 2-3 g. per l. can correspond to nervous troubles in subjects unaccustomed to alc. beverages.

A. PAPINEAU-COUTURE

The toxicological determination of alcohol. FLORENCE. *Ann. méd. légale* 2, 10-7(1922).—Critical discussion of the Nicloux method for detn. of EtOH in blood, urine, etc. F. considers that detn. is not sufficient but that EtOH should be identified qual., and outlines the various tests that can be applied, including the following: distil the suspected alc. liquid to half vol. from acid soln., redistil the distillate to half vol. from alk. soln., to 1-2 cc. add KMnO₄ soln. and a drop of H₂SO₄, warm very slightly, if decolorized add more KMnO₄ and repeat till the color remains permanently, neutralize with NaOH and add Nessler's reagent. An abundant (quant.) red ppt. indicates presence of EtOH. The Nicloux method is unreliable because of irregularities in the oxidation of EtOH. F. suggests adding an excess of K₂Cr₂O₇ and titrating the excess iodometrically; but even here there is some loss of AcH before the oxidation to AcOH is complete. Heating under a reflux condenser causes partial oxidation of the AcOH. With a doubly distd. liquid, the EtOH can be detd. from the surface tension by means of a Duclaux pipet, the accuracy of which is higher than 0.5 drop, corresponding to about 0.1% EtOH, when working with 5 cc. at 15°. The final result should be corrected for a loss of about 1% of the EtOH at each distn. NICLOUX. *Ibid* 18-9.—Reply to Florence's criticisms of his method. A. P.-C.

Examination of urine stains. V. BALTHAZARD AND N. ROJAS. *Ann. méd. légale* 2, 33-7(1922).—Richaud's reagent (Na phosphotungstate 25, concd. HCl 5, H₂O 250) is modified to Na phosphotungstate 1 g., H₂O 50 cc. Add a drop of reagent to the stain, and then a drop of NaOH soln. Urine gives a Prussian blue coloration, as strong as that obtained with the original reagent. A positive test is obtained after a 50:1 diln. of the urine, or with stains of known origin which had been previously washed. Pure saliva, blood serum, milk, gastric juice and fecal matters also give the reaction but with much slighter intensity, and not at all after diln. Blood, sperm, egg albumin and unstained fabrics do not give the reaction. The reaction is characteristic of uric acid and its derivs. alloxan and alloxantin. Prep. a concd. stock soln. of xanthrydrol in 95% EtOH, immediately before use mix a few drops with an equal vol. of AcOH, add 1-2 drops of reagent to the soln. of the stain or directly to a stained fiber on a microscope slide, cover with a coverglass, and seal the edges with paraffin to prevent evapn. In presence of urine characteristic xanthylurea crystals are formed, generally within 30 min., sometimes only after several hrs.; they are readily detected under low magnification. The reaction is characteristic of urea, and can be obtained to a slight extent with pure blood serum. Application of both tests with positive results is specific of urine stains, especially when the material was dild. before testing. A. P.-C.

Detection of wine in stomach contents. (MRS.) BALTHAZARD. *Ann. méd. légale* 2, 240-2(1922).—The most characteristic constituents are tartaric acid and coloring matter (for red wines only). The former can be detected by Denigès' reaction (2% resorcin with an equal vol. of H₂SO₄), by Pinerula's reaction (β-naphthol in H₂SO₄) or by identification of the crystals with a polarizing microscope. The coloring matter is identified by the green color it gives with NH₃, restored to wine-red by HCl or tartaric acid. The test can be applied to filter paper stained with the stomach contents and then dried. In doubtful cases, add a slight excess of NH₄OH to the stomach contents, sep. from the solid matter, add 50% alc., filter, ppt. the color with Hugoueney's aceto-tartaric reagent (*Bull. soc. chim.* 1891, 89), evap. off the alc., take up the color in dil. NH₄OH, and add HCl. The change from green to red, and inversely, can be obtained repeatedly. The reaction is given by red grape skins, violet plum skins, gooseberries, raspberries and blackberries. A. PAPINEAU-COUTURE

Determination of methemoglobin in blood. P. DUCOU. *Thesis*, Paris (1925); *Ann. méd. légale* 6, 84(1926).—Study of methemoglobin (I) showed that: (1) oxyhemoglobin (II) is converted into I *in vitro*, not only under the action of a large variety of chem. reagents, but also spontaneously when the blood is protected from putrefaction; (2) it is the latter condition that allows of its exptl. production in Nicloux's method, consisting in adding 10% of 90% alc. to the blood; (3) I contains 50% less O than II; (4) I is less stable than II; (5) I has an absorption band in the red portion of the spectrum, located at $\lambda = 633$ in acid medium, $\lambda = 601$ in alk. medium and $\lambda = 607$ in NaF soln.; (6) I does not form a compd. with CO; I can be detd. quant. either by Nicloux and Fontès' chem. method or by Balthazard and Philippe's phys. method; (8) acetanilide is a very active methemoglobinizing agent *in vivo*; (9) treatment for methemoglobinemia consists essentially in O inhalations.

A. PAPINEAU-COUTURE

Carbon monoxide in wounds from firearms. STOCKIS. *Rev. droit pénal intern. arch. méd. légale intern.* (Feb., 1922); *Ann. méd. légale* 2, 190(1922).—In most wounds from revolvers or automatic pistols, if the shot was fired from a distance of less than 20 cm., CO produced by deflagration of the powder or of the detonator can be detected in the blood in the immediate neighborhood of the wound, whether or not the skin was protected by clothes in this particular spot.

A. PAPINEAU-COUTURE

Microdetermination of lactic acid in blood. J. FREJKA AND K. VŠETEČKA. *Spisy Přírodovědeckou Fakullou Masarykovy Univ.* 1925, No. 60, 3-25.—A detailed investigation into the chief methods of detn. of lactic acid in physiol. fluids (urine, blood, muscle ext., etc.) with a view to devising a method for its microdetn. in blood. Detns. were carried out by the various methods before and after addn. of known amts. of lactic acid. The gravimetric method gave 83-84% of the amt. added to blood, and 88-90% in broth. The lactate sepd. contained about 14% impurities, reducing the actual lactic acid recovered to about 80%. In presence of β -hydroxybutyric acid the results are unreliable; comparison with the Mondschein method (C. A. 6, 2630, 2631) showed differences of 30-60%. Yoshikawa's polarimetric method (C. A. 8, 940) gave 99-100% in urine and 91-94% in liver ext.; but it is unsuitable for physiol. liquids which contain other optically active substances. Meissner's method (C. A. 9, 1188) gave 93-96% for broth, 95-100% for blood, 98-104% for urine and 80-92% for pure lactic acid. In presence of HCO_2H the results rose to 108-124%. The broth was prepd. by boiling without alkali to avoid, as far as possible, decompn. of sugars and other compds. to lactic acid. The high results obtained with urine are attributed to the presence of HCO_2H or other acids which can cause formation of lactic acid. Polonovsky's colorimetric method (C. A. 14, 3434) gave 90-97% and is recommended as a rapid routine method for the classification of samples. With pure lactic acid the Fürth-Charnass method (*Biochem. Z.* 26, 240) gave 86-92% with the theoretical factor 0.0045, and 96-102% with the empirical factor 0.0050. The modification using 0.02 N KMnO_4 (C. A. 5, 51) gave 95-98%, and the Schmidt-Oppenheimer modification 97-100%. The same method applied to broth extd. with Et_2O gave 95-96%, and to broth extd. with AmOH 89-95%. Detn. of lactic acid in presence of β -hydroxybutyric acid by the Mondschein method (C. A. 6, 2630, 2631) gave 93-96%. Detn. in urine *via* Dapper gave 87-88% and *via* Ishihara (C. A. 7, 2588) 93-96%. It was found that the ext. contg. the lactic acid was consistently contaminated by a small quantity of Et_2O , by aldehydes, ketones and other decompn. products of Et_2O , which can combine with SO_2 or with I if the Et_2O is removed by distn. Bellet's method (C. A. 7, 2531) gave 97.3-98.9% with blood and 98.4% with broth; with urine it gave 96.9-98% by the following modification: ppt. the urine with phosphotungstic acid, eliminate the excess of the latter with Ba(OH)_2 , and the excess of the latter in turn with Na_2SO_4 , acidify the concd. filtrate with H_3PO_4 , add anhyd. Na_2SO_4 , ext. with Et_2O and then proceed *via* Bellet. For microdetn. of lactic acid in blood, dil. 10 cc. with 10 cc. H_2O , ppt. with 8 cc. of freshly prepd. $\text{Hg(NO}_3)_2$, after 5 min. filter and wash, ppt. the excess of $\text{Hg(NO}_3)_2$ with KOH , neutralize the filtrate with HCl , filter, evap. on the water bath, add 1.5 cc. H_3PO_4 , sat. with anhyd. Na_2SO_4 , triturate with sand, ext. for 2 hrs. with a weighed amt. of boiling Et_2O , evap. a weighed aliquot of the ext. in presence of a little NH_3 , dil. with 50 cc. H_2O , evap. about 30 cc., acidify the residue with H_2SO_4 , and then oxidize *via* Bellet with 0.01 N KMnO_4 . The min. quantity of blood which should be taken is 5 cc. With 1 mg. lactic acid, the method gave a recovery of 97.3-102% on the pure acid, and 96-101% recovery in blood, which is sufficiently accurate for clinical work.

A. PAPINEAU-COUTURE

The estimation of small quantities of bismuth in the urine. C. A. HILL. *Lancet* 1925, II, 1281.—Org. matter is destroyed by low heat with HNO_3 . To the aq. soln. contg. HNO_3 , add 0.3 g. urea and 0.5 g. phenazone and, while shaking, add about 0.05 g.

KI crystals one at a time until the max. color develops. Compare with a standard contg. 0.62 g. BiCO_3 in 10 cc. HNO_3 (sp. gr. 1.4) made to 1 l. and then dil. 10 cc. of the to 1 l. For comparison take 10 cc. of this standard soln., contg. 0.05 mg. Bi, + 1 drop HNO_3 , made to 50 cc. and add reagents as specified above. F. B. SEIBERT

New method for the determination of the molecular weight of the proteins. TH. SVEDBERG AND ROBIN FAHRÆUS. *J. Am. Chem. Soc.* **48**, 430-8(1926).—A method is described for the detn. of the mol. wt. of proteins based upon the measurement of sedimentation equil. in a protein soln. exposed to a centrifugal force. Preliminary measurements are reported for CO-hemoglobin and methemoglobin, which indicate that hemoglobin solns. are built up of mols. contg. 4 groups of mol. wt. 16,700; that is, the mol. wt. of hemoglobin in aq. soln. is probably 68,000. C. J. WEST

Identification of creatine. R. J. WILLIAMS AND P. A. LASELLE. *J. Am. Chem. Soc.* **48**, 536-7(1926).—Creatine decomps. with marked effervescence at about 291 (cor.); it forms thin, tabular, monoclinic prisms, which, when observed perpendicular to the 100 face, appear orthorhombic; observed perpendicular to the clino-pinacoid (010) they show a max. extinction angle of 45° . Four out of 5 persons pronounced it tasteless, but a dry burning sensation was produced in the back of the mouth which was not noticeable for a min. or two but persisted for some time afterwards; the fifth described it as bitter. C. J. WEST

Measurements with the quinhydrone electrode (LINDERSTRØM-LANG) 7.

HECHT, VICTOR: **Wandtafel der wichtigsten chemischen und mikroskopischen Untersuchungsmethoden für das ärztliche Laboratorium.** 3rd ed. revised and enlarged. Vienna: M. Perles. R. M. 2.50.

KLEIN, WILHELM and STREUBER, MARIA: **Die gasanalytische Methodik des dynamischen Stoffwechsels.** Leipzig: G. Thieme. 99 pp. R. M. 5.40.

PINCUSSEN, LUDWIG: **Mikromethodik quantitative Bestimmung der Harn- u. Blutbestandteile in kleinen Mengen f. klin. u. experiment. Zwecke.** 3rd ed. revised and enlarged. Leipzig: G. Thieme. 166 pp. R. M. 4.50.

STEENSMA, F. A.: **Methoden der chemische en microscopische diagnostik.** 4th ed. revised and enlarged. Amsterdam: Scheltema & Holkema; K. Groesbeck & Paul Nijhoff. 290 pp. Guld. 8.50, bound 9.50.

Thermatologic electrode. T. KOBAYASHI. U. S. 1,573,116, Feb. 16.

C—BACTERIOLOGY

A. K. BALLS

Pigment formation by fungi. A. N. DANILOV. *Ber. deut. botan. Ges.* **43**, 27-33(1925).—The fungus *Isaria virescens*, Elenk. et Danil., growing on suitable media is able to produce a range of pigments. The formation of these pigments depends on light, temp. and the nature of the medium. For instance, a culture in the dark may be colorless, but on exposure to light rose, orange and red tints develop; increase in temp. favors the formation of dark brown colors. Mg stimulates, while Li suppresses pigment formation; Na is practically without effect. B. C. A.

The effect of the electric current on microorganisms. Electrical food conservation. MAX. KLEIBER. *Biochem. Z.* **160**, 312-24(1925).—An a. c. of 3-4 v. and 7-8 milliamps. did not diminish fermentation in beer wort or must. D. c. of the same strength and voltage, however, diminished yeast fermentation. The thermal death point of yeast was not altered by the elec. current. The action of the current is on the medium rather than on the cells themselves. These results apply to problems of *elec. silage*.

F. A. CAJORI

Lactic acid fermentation. II. A. I. VIRTANEN, H. KARSTRÖM AND R. BÄCK. *Z. physiol. Chem.* **151**, 232-41(1926); cf. *C. A.* **19**, 1878.—Glyceraldehyde, dihydroxyacetone, methylglyoxal and pyruvic acid are not utilized as sources of C nor fermented by the typical lactic acid bacteria, *Str. lactis* and *B. casei* etc. Dry preps. of the bacteria produce no lactic acid from these 3 C compds. On the other hand, the 3 trioses lose their power of reducing Fehling soln., much more rapidly in the presence of the dry prepn. Lactic acid bacteria contain no carboxylase. The presence of CaSO_4 does not influence lactic acid fermentation. A. W. DOX

Some results of the study of the metabolism of bacteria. H. BRAUN. *Krankheitsforschung* **1**, 251-6(1925).—If bacteria are grown upon meat exts. one does not usually recognize the intermediate products. Cultures grown on plain artificial media are hardier but not less virulent; they may lack several less essential chem. substances of the ectoplasm. Some species, as the human tubercle bacillus, may live upon air, ob-

taining N and C from impurities in air. While some bacteria can assimilate N from ammonia, others of the same culture, even sister cells, may lack this power. In synthetic media, if ammonia is the source of N and org. acids of C, much O_2 must be present. Study of the metabolism of bacteria offers a solution to many problems of the physiology of fermentation.

P. Y. JACKSON

The variation in the amount of soluble protein contained in old broth cultures of *B. typhosus*. J. W. CORNWALL. *Indian J. Med. Research* 13, 483-90(1926).—"The amt. of sol. protein in broth cultures of *B. typhosus* rises continuously to a max. which is reached after 7 to 12 weeks of incubation and then falls. This protein is derived from a soln. of parts of the bodies of dead bacilli. . . . The rise in the sol. protein curve indicates that a larger amt. of protein derived from the soln. of bacterial bodies is being added to the fluid than is being abstracted by degradation of protein." The fall in the sol. protein curve indicates the reverse.

FRANCES KRASNOW

Observations on Castellani's phenomenon. J. M. FIALLOS. *J. Trop. Med.* 28, 426-8(1925).—F. confirms Castellani's observation: That "2 bacilli, neither of which causes production of gas in certain C compounds, may do so when artificially mixed together, provided one of them is capable of producing simple acidity (never gas) in those C compds. and the other though inert on these compds. (*viz.*, does not produce either acid or gas) is capable of producing gas in glucose."

FRANCES KRASNOW

The behavior of pyrimidine derivatives in organisms. II. The action of *B. coli* on uracil and cytosine. AMANDUS HAHN AND L. SCHÄFER. *Z. Biol.* 83, 511-4(1925).—By means of *B. coli* activity, cytosine is deaminized to uracil; uracil is not acted upon. This behavior is analogous to that of yeast which likewise changes cytosine to uracil and does not attack uracil.

FRANCES KRASNOW

The antiseptic action of copper chloride in solvents of different dielectric constants. N. KLISSIUNIS. *Biochem. Z.* 159, 107-9(1925); cf. *C. A.* 19, 2354.—The antiseptic action of $CuCl_2$ in iso-AmOH, PrOH, iso-PrOH, EtOH, MeOH, $(CH_3)_2CO$, glycol, glycerol and H_2O is studied. Antiseptic action is shown only in EtOH, MeOH, glycol and H_2O .

W. D. L.

Acid agglutination of *Bacillus coli*. FR. SARTORIUS. *Z. Immunitäts.* 45, 478-92 (1926).—Freshly isolated strains of *B. coli* increase steadily in agglutinability. The optimal reaction for agglutination lies between 0.01 and 0.002 N HCl. Other mineral acids act similarly to HCl. Small concns. of salt in general increase agglutination in the presence of acid, while large concns. inhibit it.

E. R. LONG

The formation of fat by yeast. IDA S. MACLEAN AND D. HOFFERT. *Food Investigation Board, report for the year 1924. Dept. Sci. Ind. Research* 1925, 66-8; cf. *C. A.* 18, 998; 19, 1288.

L. W. RIGGS

KOPELOFF, NICHOLAS: *Lactobacillus Acidophilus*. Baltimore: The Williams and Wilkins Co. \$5.00. Reviewed in *Am. Food J.* 21, 60(1926).

GERRETSEN, F. C.: *Bacteriologische problemen voor biologen en chemie*. Groningen: J. B. Wolters. 28 pp. Guld. 0.75.

D—BOTANY

B. M. DUGGAR

The salt requirements of *Lupinus albus*. C. H. ARNDT. *Soil Science* 21, 1-6 (1926).—*Lupinus albus* was grown in sand and soln. cultures using standard methods, and the results were analyzed graphically by the triangle method. A total salt concn. of 0.0084 N with respect to cations was most favorable for growth. The ratios of 5:3:4 for K, Ca and Mg and 5:9:4 for NO_3 , PO_4 and SO_4 ions, resp., gave the best returns. A soln. composed of 0.0035 N KNO_3 , 0.6021 N $CaH_4(PO_4)_2$ and 0.0028 N $MgSO_4$ produced good growth even when the p_H value was less than 3.6. High concns. of PO_4 tended to produce chlorosis. No evidence was found which justified the application of the term "calciphobe" to the plant.

R. BRADFIELD

A brief note on the biochemical reactions of certain fungi, *viz.*, *Monilia krusei*, *M. macedoniensis* and *M. tropicalis*. E. C. SPAAR. *J. Trop. Med.* 29, 47-8(1926).—The investigation shows that the reactions are const. and agree with the findings of Castellani.

FRANCES KRASNOW

Extra feeding of carbon dioxide to plants. ANTONIN ROLET. *Rev. gen. sci.* 36, 541-6(1925).—A general review.

H. R. KRAYBILL

"Forcing" plants by means of hydrogen cyanide. G. GASSNER. *Ber. deut. bot. Ges.* 43, 132-7(1925).—Exposure to low concn. of HCN stimulates growth in a number of trees and shrubs. Species that are normally dormant during the winter may be forced into growth by regular treatment with the gas. The optimum concn. varies

for different species but in general an exposure of 1 hr. daily to an atm. contg. the equm of 11.3 g. liquid HCN per cu. m. gives satisfactory results. W. NEWTON

Supposed poisonous action of carbon monoxide on green plants. C. WEHMLER. *Ber. deut. bot. Ges.* 43, 184-8 (1925).—Seedlings of cress and barley are not injured when grown for 10 days in atms. contg. up to 50% CO. In contrast, seedlings wilt within 3 days in the presence of small amts. of H₂S, C₆H₆, CS₂, HCN and other poisonous gases. W. NEWTON

The seeds of Mercurialis species. P. GILLOT. *J. pharm. chim.* [8], 2, 129-31 (1925); cf. *C. A.* 20, 479.—Chem. analysis of the seeds of *Mercurialis annua*, *M. perennis* and *M. tomentosa* gave, resp.: H₂O 6.8, 9.58, 6.72%; fat 38.05, 26.45, 35.62%; protein 13.55, 19.43, 15.25%; cellulose 31.91, 39.55, 33.13%; reducing sugar 0.09, 0.30, 0.07%; hydrolyzable sugar 1.29, 1.49, 0.97%; starch 0.39, 0.10, —; ash 7.92, 4.10, 8.24%. The characters of the oil, obtained by cold pressure or extr. with petroleum ether, closely resemble those of linseed oil: d_{15}^4 0.934-0.937, n_D^{15} 1.4840-1.4861, I no. (Wijs) 201.5-215.5; Br no. (Hehner and Mitchell) 52-80. The possible uses of this oil as a siccative, notably in *art painting*, are pointed out. S. WALDBOTT

Effect of the concentration of K salts in soil media upon the carbohydrate metabolism of plants (ENGLIS, LUNT) 15.

LEPESHKIN, V. V.: *Lehrbuch der Pflanzenphysiologie auf physikalisch-chemischer Grundlage*. Berlin: J. Springer. 297 pp. R. M. 15; linen binding R. M. 16.50.

TOLLENAAR, DIRK: *Omzettingen van koolhydraten in het blad van Nicotiana tabacum*. Wageningen: H. Veenmann & Zonen. 142 pp. Guld 4.

I:—NUTRITION

PHILIP B. HAWK

Crystals of vitamin B from the mung bean. H. H. M. BOWMAN AND M. A. YEE. *Proc. Soc. Exptl. Biol. Med.* 22, 228-31 (1925).—Dry ground meal was thrice extd. in a reflux condenser with 80% CH₃OH and 2% HCl. The filtrates were freed from CH₃OH by evapn. at low pressures; fats and org. acids were removed by ether; the soln. was then acidified with H₂SO₄ and a ppt. obtained with phosphotungstic acid. The ppt. was then extd. with acetone and Ba(OH)₂, and the filtrate successively treated with H₂SO₄, Pb acetate and H₂S. The soln. was then evapd. and needle-shaped crystals were obtained; these were recrystd. from 80% C₂H₅OH. The pure crystals m. 320° were not identified as uric acid, amino acids or protein. They gave a yellow ppt with aq. Br and a blue color with Folin-McCallum reagent. Doses of 3 mg. intramuscularly cured pigeons of polyneuritis. C. V. B.

The experimental production of lack of carbohydrates, and the carbohydrate metabolism of the central nervous system. L. ASHER AND K. TAKAHASHI. *Proc. Soc. Exptl. Biol. Med.* 22, 238-40 (1925).—The method applied to rats consisted of feeding Witte peptone for a few days, followed by thyroid gland preps., the injection of phlorhizin by the Coolen method, and finally work on a treadmill. The carbohydrate of the liver was lowered 96%, of the muscle 85%, and the blood sugar to the low level of insulin hypoglycemia. The above method depleted the glycogen of the brain 20%. Convulsions in the rabbit following the injection of picrotoxin caused an 80% reduction in brain glycogen. C. V. B.

What is the saturation point? C. B. MORISON AND R. H. SHAW. *Baking Tech.* 5, 49-53 (1926).—The purpose of the investigation was to note the effects of a selected diet contg. various amts. of bread made from a known formula on the growth of lab. animals. Exptl. diets were prepd. from mixts. of the basic diet and dried ground milk bread contg. (1) 75% of the total calories as basic diet and 25% as the dried milk bread, (2) 50% of the basic diet and 50% as dried milk bread, (3) 25% of the calories as basic diet and 75% as milk bread. Graphs shown indicate good growth for diets 1 and 2 but not so good on 3. Results reported are based on a relatively short period of observation and are being continued to include a longer time. RUTH BUCHANAN

Mineral elements in nutrition with special reference to calcium and phosphorus. H. C. SHERMAN, et al. *Am. J. Pub. Health* 14, 513-7 (1925); *Expt. Sta. Record* 53, 161; cf. *C. A.* 19, 2691.—This rept. of the comm. on nutritional problems of the American Public Health Assoc. deals with the requirements of the human body for Ca and P and the importance of these elements as factors in nutrition and health. H. G.

The variations in the excitability of the vagus and vaso-motor apparatus, and the physiology of inanition. P. ALBERTONI. *Arch. sci. biol.* (Italy) 6, 439-61 (1924); *Physiol. Abstracts* 10, 175.—The blood of thyroparathyroidectomized dogs contains

toxic substances capable of lowering the av. blood pressure of normal ones. In the operated animals this is not observed because of a hyperactivity of the adrenals and pituitary body. Iodothyron (thyron) and endothyronin increase the pulse rate. The blood of hypermegalic subjects has sometimes a lowering effect on blood pressure. The active principles of the thyroid increase the excitability of the inhibitory center of the heart, but do not modify the action of adrenaline on the tonus of blood vessels. Inanition has *per se* no influence on blood pressure, but the increase due to adrenaline is smaller in fasting than in normal dogs. The increase caused by injections of glucose is the same in both sets of animals. In inanition the vaso-motor reactions due to asphyxia are weaker and the excitability of the vagus is greater than normally. In protracted inanition, however, the excitability of the vagus diminishes and finally disappears. The bilateral section of the vagus in fasting dogs is followed by an increase in the blood pressure somewhat greater than normal. The action of atropine on the vagus is not influenced by inanition, while that of pilocarpine may completely fail in advanced inanition. The vaso-motor response to elec. stimuli of the sympathetic is weaker in fasting than in normal animals. When the vagus or the sympathetic is stimulated, a modification in the distribution of the electrolytes in the cell membranes appears to occur.

H. G.

Effect of ultra-violet light on protein metabolism. S. YOSHIE. *Strahlentherapie* 18, 201-11(1924); *Ber. ges. Physiol. exper. Pharmacol.* 29, 579.—One hr.'s irradiation during 8 consecutive days caused in dogs a slight increase of the positive N balance with a slight decrease of amino acids in the urine. A further daily irradiation of 2 hrs. produced no change, a daily 4-hr. irradiation a negative N balance. Prolonged irradiation was followed by inhibited absorption of N compds. by the intestine and disturbance of health.

MARY JACOBSEN

The relation of calcium and phosphorus in the diet to the absorption of these elements from the intestine. W. J. ORR, L. E. HOLT, JR., L. WILKINS AND F. H. BOONE. *Am. J. Diseases Children* 28, 574(1925); cf. *C. A.* 18, 105.—Excessive amts. of Ca in the diet tend to increase the total absorption and retention of Ca, but tend to impair P retention. Excessive amts. of P in the diet exercise an unfavorable influence on the Ca metabolism, and are accompanied by an increase in the Ca lost in the feces. Formation of $\text{Ca}_3(\text{PO}_4)_2$ explains this behavior.

I. NEWTON KUGELMASS

Light and vitamin A. C. E. BLOCH. *Am. J. Diseases Children* 31, 315-22(1926).—Exposure to either C arc light or to sunlight does not cure xerophthalmia. Light cannot replace vitamin A nor supply it to the animal organism. Ultra-violet radiations are absorbed either by direct exposure or through articles of diet (cod-liver oil, yolk of eggs, milk, etc.).

I. N. K.

The effect of fermentation with specific microorganisms on the vitamin C content of orange and tomato juice. S. LEFKOVSKY, E. B. HART, E. G. HASTINGS AND W. C. FRAZIER. *J. Biol. Chem.* 66, 49-56(1925).—Attempts to det. the cause for the disappearance of vitamin C from fermented corn (silage) and fermented cabbage (sauerkraut) have been made. The actions of several organisms occurring in silage have been studied but it has not been shown that they destroy vitamin C. The destructive action of O_2 was eliminated in the expts. by excluding air from the fermenting mixts. by the use of vaseline plugs from $\frac{1}{2}$ to $\frac{3}{4}$ in. in thickness covering the inoculated juice. It is very probable that the destruction of vitamin C in fermenting plant tissues is to be referred to the O_2 still retained in the mass.

A. P. LOTHROP

Potassium in animal nutrition. III. Influence of potassium on total excretion of sodium, chlorine, calcium and phosphorus. H. G. MILLER. *J. Biol. Chem.* 67, 71-7(1926); cf. *C. A.* 17, 1272.—"The effect of high K on the total excretion of Na, Cl, Ca and P in mature rats receiving a ration of casein, dextrin, agar, yeast and milk has been studied over periods of 2 weeks duration. The introduction of K salts into the diet caused an immediate increase in total Na and Cl excreted, after which the amts. of these elements excreted were only slightly greater than on the basal ration. During certain periods of high K feeding the total Ca and P excreted increased a small amt. compared to a like period on the basal ration; however, the av. daily excretion of Ca and P was slightly increased over the low-K period. Considering the abnormally high level (0.1-0.2 g. daily) at which K was fed in this expt. and results obtained in previous expts., there is no reason to believe that K occurring in natural foodstuffs will cause an increased excretion of other elements when they are needed for normal physiol. development."

A. P. LOTHROP

Diabetic diets in grams per kilogram of body weight. H. GRAY. *J. Am. Med. Assoc.* 84, 14(1925).—In 140 diabetic children receiving an av. of 20 units of insulin per day the g. per kg. of body wt. were 2.6 for carbohydrate, 2.1 for protein and 4.1

for fat per 24 hrs. The total calories were 55 per kg. of body wt. A tabulation of the diets recommended by other authorities is given which is based on 120 cases. The av. of G.'s cases shows less protein intake and fewer calories than in the other clinics reviewed.

L. E. WARREN

McCOLLUM, E. V., and SIMMONDS, NINA: **Food, Nutrition and Health.** Baltimore, Md.: Pub. by Authors.

F—PHYSIOLOGY

ANDREW HUNTER

Liberation of phosphoric acid after fatiguing work of frog muscles. GUSTAV EMBDEN AND HERBERT HENTSCHEL. *Z. physiol. Chem.* 151, 167-202(1926).—Each stimulation of the isolated frog muscle (gastrocnemius and semimembranosus) brings about a residual increase in PO_4 after termination of the work period. The cleavage of PO_4 was not observed regularly after 275 individual stimuli at a definite frequency, but was noted invariably after 550 stimuli, and in general it gradually increased with increasing no. of stimuli. Under otherwise uniform conditions the liberation of PO_4 is greater in the more heavily loaded muscle. In long-continued tetanic stimulation, as well as in a sufficiently prolonged period of individual stimuli, the cleavage of PO_4 is regularly observed. With the semimembranosus, but not with the gastrocnemius, a brief tetanic stimulation, on the contrary, led to a distinct decrease in PO_4 . This is referred to a synthesis-promoting action of the lactic acid formed in tetanus. If the stimulation has not been too greatly prolonged, the liberated PO_4 is partially re-synthesized to lactacidogen or a similar substance during subsequent recovery in O. The synthesis can also take place when the stimulated muscle is placed in H, but the result is less uniform than with O. By the subsequent re-synthesis of the liberated PO_4 the results of expts. are brought into correlation where under otherwise uniform conditions a slower stimulation led to a smaller PO_4 cleavage than a more rapid stimulation. With uniform tempo of stimulus, muscles which were directly comparable showed immediately after the stimulation a greater liberation of PO_4 in air and in H than in O.

A. W. Dox

The influence of temperature on the formation of phosphoric acid during fatiguing muscular work. MANFRED ALTMANN. *Z. physiol. Chem.* 151, 203-8(1926).—Long-continued uniform stimulation of the 2 gastrocnemii of the frog showed that the PO_4 cleavage at the end of the stimulation period is largely dependent on the temp. At 25° a much greater increase in PO_4 occurs than at 5°.

A. W. Dox

The course of lactic acid formation in tetanus. G. EMBDEN, H. HIRSCH-KAUFFMANN, E. LEHNARTZ AND H. J. DEUTICKE. *Z. physiol. Chem.* 151, 209-31(1926).—With brief tetanic stimulation of isolated frog muscle, the lactic acid formation does not cease directly after termination of the stimulation and relaxation of the muscle, but continues during the next 5-30 seconds. The increase is often extraordinary, the rate frequently exceeding that of rest anaerobiosis by several hundred times. The lactic acid increase is, therefore, not dependent on the state of contraction, but can progress much further after cessation of the contraction. If these relations hold also for shorter tetani, as appears probable, the total lactic acid formation during a more extended period of work should no longer be referred to the actual time of contraction. If, therefore, a very considerable portion of the lactic acid is not formed until after the contraction, the energy liberated by exothermic lactic acid formation from carbohydrate, in addn. to the related exothermic processes (heat of neutralization with alkalis and proteins), is not sufficient as a sole source of energy, and it becomes necessary to seek other sources for the energy output during the moment of contraction. These sources might exist either in unknown exothermic chem. reactions or might be of a physicochem. (non-chem.) nature. The demonstration of colloid changes proceeding with positive heat tone during the contraction would be of the greatest significance. In fatiguing muscular activity, changes occur in the biol. behavior of the musculature and these are probably referable to a colloid change in the intrafibrillary proteins. It is conceivable that in the moment of contraction colloid changes occur and the energy discharged is of a physicochem. nature. Perhaps the exothermic chem. reactions, whether oxidative or fermentative, then serve to re-charge a sort of physicochem. accumulator which discharges in the moment of contraction. Rigor mortis may be regarded as a process similar to contraction, since it may be accompanied by a decrease in lactic acid without increase in PO_4 .

A. W. Dox

The effect of environmental temperature on metabolism. S. MORGULIS. *Am. J. Physiol.* 71, 49-59(1924); *Physiol. Abstracts* 10, 233.—The metabolism of dogs was

recorded by means of a Benedict closed circuit app. If the animal remains quiet, there is no change in the metabolic rate with rise of temp.; increase in heat rate and muscular tone may raise the metabolism, apart from actual movements (restlessness, shivering). This increase is produced reflexly; there is no special mechanism of chem. regulation of metabolism. An animal with its hair clipped is more sensitive to cold, and its metabolism is at a min. at a higher temp. Hence in metabolic studies the heat-regulating mechanism of the subject must be in equil.; this introduces an additional factor which must be controlled.

Metabolism of cattle during standing and lying. J. A. FRIES AND M. KRISS. *Am. J. Physiol.* 71, 60-83(1924); *Physiol. Abstracts* 10, 233.—In previous expts. no account was taken of the storage of heat by the platform on which the animal lay, with its subsequent radiation out when the animal assumed the standing posture. The amt. of this heat can be calcd. if it is assumed that the ratio of the CO₂ to the heat production is the same during the 2 periods. The true increase in heat production on standing as compared with lying is about 26 cal. an hr. for a cow of 400 kg.; the increase is proportional to the $\frac{2}{3}$ power of the weight of the animal. The day's heat production can thus be adjusted to a standard day of 12 hrs. standing and 12 hrs. lying. H. G.

The transformation of energy in the muscles. VII. **Origin of heat during muscular contraction.** O. MEYERHOF. *Arch. ges. Physiol.* (Pflüger's) 204, 295-331(1924); *Physiol. Abstracts* 10, 214; cf. C. A. 19, 3299.—The true heat value of water-free glycogen is 3815 cal., that of C₆H₁₀O₆·H₂O being 3799 cal., and that of glycogen in soln. 3790 cal.—i. e., 188 cal. more than the corresponding quantity of lactic acid. Fermentative hydrolysis of 1 g. glycogen hydrate to maltose + glucose liberates 10 cal. The heat of neutralization of lactic acid in muscle is about 185 cal. per g. At least 70 cal., perhaps as much as 120 cal., of the heat of contraction of muscle have yet to be accounted for. H. G.

Action of pituitary extracts on the respiratory center. U. G. BIJLSMA. *Arch. néerland. physiol.* 9, 422-3(1924); *Physiol. Abstracts* 10, 220.—Small doses stimulate, large doses inhibit, respiration in the decerebrate cat; the effect occurs after the use in blood pressure. H. G.

Creatinine tests for renal function. R. H. MAJOR. *Missouri State Med. Assoc. J.* 22, 54(1925); *Physiol. Abstracts* 10, 227.—The creatinine test consists in the estn. of the creatinine excretion before and after the introduction of creatinine into the circulation. In normal subjects the kidneys, in the hr. following the injection, excrete from 2 or 3 times as much creatinine as was excreted before injection. During the second hr. after injection 50-100% more is excreted than during the preinjection hr. In chronic nephritis the creatinine excretion the hr. after injection showed, as a rule, only a slight rise over that of the preinjection period. In some cases of severe nephritis the curve of creatinine excretion showed a fall. This type of curve is apparently of some prognostic import. It has also been found in exptl. U nephritis when the creatinine test is carried out every day; it appears in animals during the second and third day after administration of U, at the time when the nephritis reaches its max. intensity. H. G.

Contribution to the physiology of the stomach. Influence of experimental changes in blood sugar level on gastric hunger contractions. I. BALATAO AND A. J. CARLSON. *Pavlov's Jubilee Vol.* 1925, 125-32; *Physiol. Abstracts* 10, 160.—Hyperglucemia produced by intravenous injection of glucose inhibits gastric hunger contractions. Insulin hypoglucemia increases gastric tonus and the hunger contractions when the blood sugar concn. falls to 0.08 to 0.07%. As the blood sugar falls towards convulsion level the stomach shows alternate periods of atony and tetany. Glucose inhibits the gastric tetany of hypoglucemia. In diabetic dogs insulin produces a depression of gastric tonus and contractions, followed by increased tonus and contractions when the initial stage of hypoglucemia is reached. Intravenous injection of glucose does not inhibit gastric tonus and contractions in diabetic dogs except when hypoglucemia and gastric tetany are induced with insulin. It is suggested that gastric tonus and contractions increase with the reduction of the tissue glycogen. None of these effects can be produced by injections of lactose or NaCl. H. G.

The importance of the harderian gland in cholesterol metabolism. I. MOISSEJEFF. *Z. ges. exptl. Med.* 47, 359-68(1925).—In contrast to the adrenal, the harderian gland of the rabbit shows no accumulation of cholesterol or cholesterol esters, even with an increase in the cholesterol content of the organism. This gland is to be considered as a true excretory organ for cholesterol and presumably for other lipids and not as a storage place for cholesterol like the adrenal. HARRIET F. HOLMES

Studies of salivary amylase in infants in the first months of life. CESARE COCCHI.

Riv. clin. pediatr. **22**, 449-76(1924); *Ber. ges. Physiol. explil. Pharmacol.* **29**, 463.—An exhaustive critical review of the former studies and a detailed investigation of a large material. Salivary secretion was stimulated by a saccharine soln. After 2 hrs' incubation with sterile starch maltose was detd. by the method of Fehling-Arthus. Infantile saliva is always alk. The amylolytic power is already pronounced in the new-born and shows considerable variations independent of the age. One relation, however, is const. enough to serve as a diagnostic means. In children gaining in wt. the amylolytic power is increased after meals; in those not gaining or losing wt. the reverse is the case. With regard to starch there is no difference between the amylolytic power of infant and adult saliva. The latter, however, attacks compact lumps, e. g., boiled potato, more energetically than the former. Addition of boiled adult saliva to fresh infantile saliva increases its digestive power for potato lumps. The effect is independent of the reaction of the saliva and is apparently not due to activation by CNS compds, which are also present in infant saliva.

MARY JACOBSEN

The regulation of placental respiration. WALTHER SCHMITT. *Zentr. Gynäkologie* **48**, 489-96(1924); *Ber. ges. Physiol. explil. Pharmacol.* **29**, 266.—The respiration of the placenta is regulated automatically by its p_{H} which increases inversely with the degree of oxidation of the tissues and causes alternately dilation and constriction of the blood vessels.

MARY JACOBSEN

Lipoids and ovarian function. Critical remarks. ROBERT MEYER. *Zentr. Gynäkologie* **48**, 1570-5(1924); *Ber. ges. Physiol. explil. Pharmacol.* **29**, 456.—A contention against the works of Jaffé, Berberich and Jaffé, Yamauchi and Lang. The methods of lipid detn. are too imperfect to permit conclusions as to different chem individuals and their action. There is no proof for the existence of a corpus luteum menstruationis. In the *corpus luteum* the active lipid is cell-bound and the period of the highest activity is coincident with the intracellular lipid formation and not with that in which lipoids are detectable by staining. Liberation of lipoids is coincident with the period of regression. The free lipid is reabsorbed without exerting any action.

MARY JACOBSEN

Muscle fatigue. V. The lactic acid content of muscle during prolonged activity under physiological conditions. FRITZ BÜRGEL. *Z. Biol.* **81**, 253-62(1294); *Ber. ges. Physiol. explil. Pharmacol.* **29**, 226.—Unlike the isolated muscle the active muscle *in situ* does not show any accumulation of lactic acid. This is attributed partly to diffusion into the blood, partly to carbohydrate formation.

MARY JACOBSEN

Energy metabolism of normal new-born babies with special reference to the influence of food and of crying. J. R. MURLIN, RUTH E. CONKLIN AND M. ELIZABETH MARSH. *Am. J. Diseases Children* **29**, 1-27(1926).—234 observation periods on fifty new-born infants, from 6 hrs. to 15 days, have been made with a respiration app. with a max. error in the measurement of oxygen of 5%. The basal metabolism of resting infants averaged 6.67 cal. per hr., or 2 cal. per kg. and 29.16 cal. per sq. m. per hr. The respiratory quotient ranged from 0.66 to 1.16. The av. of all quotients is from 0.79 the first 24 hrs. to 0.75 the fourth, thence gradually upward to 0.85 on the ninth. The basal heat production is highest in the second 24 hrs. From this point it falls gradually on the basis of the surface to the sixth day, from which point it again rises steadily. Statistically, the surface area is a better measure of basal metabolism than body wt. There appears to be no correlation between heat production and pulse rate. Active healthy crying requires just as much again expenditure of energy as the basal (sleeping) metabolism. The accurate respiratory quotient is an index of the state of nutrition. The dynamic action of ordinary feedings or of supplementary feedings within the first eight days is very small. The largest recorded was 12% from a feeding of 10% lactose or dextrose.

I. NEWTON KUGELMASS

The respiratory metabolism in infancy and childhood. S. Z. LEVINE AND J. R. WILSON. *Am. J. Diseases Children* **31**, 324-34(1926).—The minimal energy requirement in 5 normal children was found to be within about 6% of the standards established by Benedict and Talbot. Body surface and body wt. were equally good standards for predicting the basal metabolism in these normal children of normal stature. In one overweight girl, the body surface was a better criterion for prediction than the body wt. In one diabetic boy, the lowering of the basal requirement was proportional to the degree of malnutrition. In one girl, the basal metabolism was not increased five hrs. after a light meal.

I. N. K.

The respiratory metabolism in infancy and childhood. II. Ketosis and the respiratory exchange in children. J. R. WILSON, S. Z. LEVINE AND HELEN RIVKIN. *Am. J. Diseases Children* **31**, 335-56(1926).—The results are based on data derived from measurements of the respiratory exchange of six children during the ketosis induced

by fasting and by high-fat and low-carbohydrate diets. A significant ketonuria appears in children at consistently lower metabolic fatty acid-glucose ratios than in adults. Children excrete a relatively greater quantity of ketone bodies at a given metabolic ratio above the threshold of ketosis. This fact may explain the more rapid development and the greater severity of ketosis in children than in adults. Children do not necessarily oxidize foods in the proportions contained in the diet; hence dietary data are unreliable in correlating the ketogenic balance with ketone body excretion. Normal children oxidize a higher proportion of carbohydrate and a lower proportion of fat than they receive in their diets. Sugar and CO_2 content of the blood fall during fasting and during the ingestion of low-carbohydrate, high-fat diets. The tendency of children to develop ketosis may be counteracted by giving diets high in carbohydrates and low in fat, especially in conditions associated with an elevated metabolism. I. N. K.

Blood as a physicochemical system. III. Deductions concerning the capillary exchange. L. J. HENDERSON AND C. D. MURRAY. *J. Biol. Chem.* 65, 407-17(1925); cf. *C. A.* 18, 2368.—Curves are given, constructed from known data, which give the specific diffusing capacities of the lung and tissue capillaries at different points of the arterio-venous cycle. It is assumed that the gaseous exchange between alveolar air and blood and between blood and the tissues is a simple diffusion process, that the rate of O_2 diffusion is detd. by the difference in its tension in the alveoli and the blood and that the tension of O_2 in the tissues is zero. It is calcd. that during moderate work the number of physiologically active capillaries in the lung are increased at least 5 times and those in the tissues to a still greater extent. This opening of the capillaries is accompanied by a like increase in the total flow of blood; this readjustment, however, will involve but little change in the blood flow per capillary and, therefore, in the compn. of the blood and in the physicochem. conditions of the environment of the cells.

A. P. LOTHROP

Oxygen exchange, blood and the circulation. A coördinated treatment of the factors involved in oxygen supply on the basis of the diffusion theory. C. D. MURRAY AND WM. O. P. MORGAN. *J. Biol. Chem.* 65, 419-44(1925).—The process of O_2 exchange is a system of 6 variables: (1) metabolic rate, (2) O_2 capacity of the blood, (3) O_2 satn. of arterial blood, (4) O_2 satn. of venous blood, (5) p_{H} of the serum, and (6) tension of O_2 in alveolar air or tissues. Curves are given, constructed from known data, showing the relationships between the 1st 4 variables which result from certain combinations of the last 2. The "specific diffusing capacity" [$\text{SDC} = \text{DC}/(\text{BF} \times \text{Hgb})$] is defined as the diffusing capacity of a capillary region, per l. of flow per min. (BF) of a blood of a certain total O_2 capacity (Hgb). Its reciprocal is called the "specific hemoglobin flow." This latter new term has been introduced to emphasize the important physiol. adjustment of the product, blood flow times O_2 capacity, to capillary area. "In that the discussion and the treatment of the various factors aim at giving a fairly complete description of the conditions for the diffusion and transport of O_2 in the body, it is hoped that this description may afford a basis for testing the physiol. role of the diffusion process and the distribution of physiol. function among the various factors under all sorts of environmental and pathol. states."

A. P. LOTHROP

The carbon dioxide excreted in one minute by one centimeter of nerve fiber. G. H. PARKER. *J. Gen. Physiol.* 9, 191-5(1925); cf. *C. A.* 20, 230.—One cm. of nerve fiber from the lateral-line nerve of the dogfish excretes about 4.2×10^{-4} mg. CO_2 per min. av.

C. H. R.

The shape of the mammalian erythrocyte and its respiratory function. E. PONDER. *J. Gen. Physiol.* 9, 197-204(1925).—A math. analysis of the form of the erythrocyte is given and the effect of form on respiration discussed.

C. H. R.

The form of occurrence of uric acid in urine. P. FLEURY. *J. pharm. chim.* [8], 2, 194-203(1925).—A succinct résumé of the facts made known by Ducung (1892), Rangier (*C. A.* 18, 1309), Maillard (*C. A.* 18, 2716) and Chelle and Rangier (*C. A.* 19, 850), enabling a rapid and exact detn. of uric acid in urine. The nature of the group combined with uric acid and rendering it sol. in normal urine is still unknown.

S. WALDBOTT

AUGUSTIN, MAURICE: *Le chlorure de sodium dans le sérum du cheval.* Meulan: Impr. Auguste Réty. 65 pp.

G—PATHOLOGY

H. GIDEON WELLS

Further action of anemic blood on blood corpuscle formation. G. FÖRSTER AND F. KISS. *Biochem. Z.* 160, 442-7(1925).—See *C. A.* 20, 429.

F. A. CAJORI

The metabolism of the healthy and the diseased organism after parenteral injections of milk. W. BUOMO. *Arch. Gynäkol.* 126, 291-309(1925).—The parenteral injection of milk in normal dogs increased the elimination of N, proportional to the amt. of milk used. The elimination of P in the urine was slightly increased. The same results are obtained in animals with slight infections not accompanied by an increased elimination of N and P before the injection. In infected animals in which there was an increased elimination of N, the milk injections were followed by a decrease in N and P elimination. Most gynecologic patients reacted to the milk injections with a marked persistent lowering in N and P elimination accompanied by clinical improvement. When the milk injections were not followed by a lowering of N and P elimination, there was no clinical improvement and in 1 case there was an aggravation of the condition.

HARRIET F. HOLMES

The importance of chemico-physical changes in the blood and blood sugar content curve in the female organism during pregnancy and outside. 1. In physiological conditions. 2. Hyperemesis gravidarum. E. FREY. *Arch. Gynäkol.* 126, 383-487 (1925).—A chem. study was made of the blood of women in various stages of pregnancy and during and after the puerperium. The sugar content of the blood was detd. before and after the oral administration of 20 g. glucose and compared with the findings in non-pregnant women. Many tables and graphs are presented. In the first months of pregnancy there is a low sugar content of the blood at the level of the lowest normal values. Administration of glucose is followed by slighter hyperglucemia, with a delayed return to normal glucose content. This indicates only a slight store of reserve glycogen. In the last months of pregnancy there is a disturbance of intermediary metabolism with a decreased breaking up of amino acids, leading to a high amino acid content in the blood and a decreased amt. of urea. The findings with regard to amino acids and urea indicate a relative insufficiency of the liver. As pregnancy advances there is a decreased hemoglobin content. At delivery the changes of the last months of pregnancy are increased. Soon after delivery, residual N and its components return to normal values. The serum globulins, however, are still more increased than at delivery and the sinking of the red blood cells is also increased. While hyperemesis gravidarum is probably a neurosis rather than a toxemia of pregnancy or a disturbance of metabolism, the glucose test gives a good indication as to whether a dangerous functional disturbance threatening life is present. Residual N value over 60 mg. and a hyperglucemia lasting over 175 min. after the administration of 20 g. glucose indicates a severe and dangerous hyperemesis.

HARRIET F. HOLMES

Further study of basal metabolism in pregnant women. E. KLAFFEN AND L. STECHER. *Arch. Gynäkol.* 126, 541-52(1925).—Detns. of basal metabolism in pregnant women indicated normal O consumption in most multigravidae and normal primi gravidae, and a lowering of the sp. dynamic protein quotient in too young or too old primigravidae and also in cases showing the dropsy or nephropathy of pregnancy.

HARRIET F. HOLMES

The relation of ovarian function to the calcium content of the blood serum. A HEYN AND K. HAASE. *Arch. Gynäkol.* 126, 646-70(1925).—Detns. were made of the Ca content of the blood in 89 women. Ca values higher than normal were found in cases of ovarian insufficiency, reaching the greatest height in functional amenorrhea. The natural menopause was followed by a lowering of the Ca content. Castration was followed by a lowering of the Ca content, which, however, regained the normal height within a year. It is improbable that the ovary has a direct influence on the Ca content of the blood.

HARRIET F. HOLMES

Physicochemical changes in the blood after experimental fever. H. BRUNETTI AND L. ELEK. *Z. ges. expil. Med.* 47, 265-75(1925).—A study was made in 21 patients of the physicochem. changes in the blood plasma after large doses of unspecific vaccines. There was no parallelism between the amt. of vaccines injected and the degree of fever. The greatest febrile reaction was observed in cases of splenomegaly, indicating the important role of the reticulo-endothelial app. in the immunobiological protective reactions. Especially high fibrinogen values were found in 2 cases of lymphogranuloma. The albumin values in percentage of total protein showed a decrease in diseases of the liver and an increase where the liver was normal. The H-ion concn. remained const. in 2 cases with a fever reaction and in 7 other cases rose from p_H 0.03 to 0.09.

HARRIET F. HOLMES

The behavior of protein and its fractions and also the chlorides and viscosity in venous and arterial plasma. H. BRUNETTI AND L. ELEK. *Z. ges. expil. Med.* 47, 277-84 (1925).—Comparative study of venous and arterial plasma showed in the venous blood a 1.59% higher protein content, a 3.57% higher albumin content as expressed in %

of total protein and higher specific viscosity of 11.06. The fibrinogen values were the same in both venous and arterial blood. In the arterial blood there was a higher chloride value of 12.36 mg. %.

HARRIET F. HOLMES

The effect on yeast fermentation of sugar of constituents of the urine and alcohol-free extracts of organs. A. GIGON AND H. ODERMATT. *Z. ges. expil. Med.* 47, 294-308 (1925).—The fermentation of a glucose-yeast mixt. is increased by the addn. of small quantities of human urine. Urine loses this activating power on heating, indicating that it is due to substances of a vitamin-like nature. The fermentation is increased also by glycocoll, sulfates and NaH_2PO_4 , is not affected by blood and is delayed by NaCl , urea, uric acid, phosphoric acid, phosphates, CaO and alc. Glucose added to the urine decreases its activating action, while an addn. to the urine of olive oil, casein or levulose has no effect. After the use of alc. in excess the enzyme-activating power of the urine is increased and is most marked 1-2 hrs. after taking alc. It is probable that in alcoholism the elimination of certain vitamin-like substances from the body by the alc. is the cause of various symptoms such as polyneuritis. Protein-free exts. from the motor nerve roots both in man and the dog have more effect in accelerating fermentation than protein-free exts. from the sensory nerve roots, indicating that the supply in vitamin-like substances is smaller in the sensory than in the motor roots.

HARRIET F. HOLMES

Water metabolism in diabetes mellitus and the effect on it of insulin. III. O. KLEIN. *Z. ges. expil. Med.* 47, 309-24(1925); cf. C. A. 19, 1597.—In severe diabetes the administration of large amts. of H_2O causes a retention of H_2O with hydremia. The administration of NaCl and carbohydrates with H_2O causes no retention of H_2O , while carbohydrates with H_2O cause a mobilization of H_2O with diuresis. In severe cases of diabetes that have been under insulin treatment for some time the administration of large amts. of H_2O leads to H_2O and NaCl diuresis and a concn. of the blood. When carbohydrates or NaCl is given with the H_2O , there is a retention of H_2O .

HARRIET F. HOLMES

The peptidase content of the paralytic with experimental malaria and other infections. H. PFEIFFER, F. STANDENATH AND R. WEEBER. *Z. ges. expil. Med.* 47, 386-405 (1925).—The peptidase content of the serum of a paralytic does not differ from that of a healthy individual of the same age. If a paralytic is infected with malaria the peptolytic index of the serum rises to 10-20 times the former value. Other febrile conditions such as erysipelas and advanced pulmonary tuberculosis also increase the peptolytic index of the serum. These changes in peptolytic index are not dependent on changes in H-ion concn. brought about by fever. The antitryptic titer of the serum follows the peptolytic index but the variations are not so great. The peptidases of the serum rise with the fever, and there is a decreased elimination of them in the urine at this time; the peptolytic index of serum and urine vary in the inverse direction. H. F. H.

The displacement of ions in the blood and its relation to kidney functions in pregnancy. D. ADLERSBERG AND F. KANDERS. *Z. ges. expil. Med.* 47, 466-86(1925).—In 25 normal pregnant women the CO_2 tension of the alveolar air and the alkali reserve of the blood were slightly decreased at all stages of pregnancy. The p_{H} of the blood, while within normal values, was displaced to the side of acidity. A displacement of the normal equil. was noted in the direction of hyperchloremia with hydremia or hypocarbonatemia. The kidney of pregnancy shows a tendency to a retention of chlorides and an increased excretion of carbonates.

HARRIET F. HOLMES

The content of the blood in amino acids and polypeptides in pregnancy at delivery and after delivery. H. SCHLOSSMANN. *Z. ges. expil. Med.* 47, 487-502(1925).—In pregnancy and in the puerperium there is an increase in the blood of residual N, amino acid N and polypeptide N. In the first days after delivery all of these N values increase, the polypeptide N to the greatest extent. In the toxemias of pregnancy the amino acid N is not increased but the polypeptide N increase in the blood parallels the severity of the clinical process. After venesection in severe toxemias of pregnancy there is an increase of polypeptide N in the blood, indicating that in toxemias the content of polypeptic N in the edematous fluids and tissues is higher than that in the blood stream. The same is true of residual N. It is undecided whether the increase of the polypeptide N in the blood is a cause or a result of the toxemia of pregnancy.

HARRIET F. HOLMES

The demonstration of pancreatic lipase in the serum in diseases of the pancreas. V. JEDLIČKA AND V. KREISINGER. *Z. ges. expil. Med.* 47, 513-33(1925).—While serum does not inhibit the action of pancreatic lipase, the erythrocytes exert a certain inhibition, perhaps through their lipid stroma. It is improbable that pancreatic lipase can enter the blood stream from a functional disturbance of the pancreas without

anatomical lesion. The diastase content of the blood is more sensitive than the lipase content, but the impossibility of a quant. differentiation of serum and pancreas diastase makes the detn. of diastase of no special diagnostic value for the clinician in diseases of the pancreas.

So-called "melanosis" of the colon. G. O. E. LIGNAC. *Krankheitsforschung* 2, 162-74(1925).—This consists of a deposit of amorphous pigment in the mucous membrane of the large intestine, appendix, etc., apparently following the presence of blood in the intestinal tract. Analysis shows no metal in the pigment; it is insol. in HCl, HNO₃, or H₂SO₄. It is resistant to post-mortem decay. In fuming HNO₃ it loses color like melanin of the skin, but it is less easily oxidized and absorbs Ag from AgNO₃ less readily, so "melanosis" is a misnomer. It is related to the blood pigments but is distinct from all now known.

The influence of calcium salts on the action of porphyrin in the animal body. G. O. E. LIGNAC. *Krankheitsforschung* 1, 177-93(1925).—Paramecia, treated with hematoporphyrin, die if exposed to light; erythrocytes similarly treated hemolyze. If 2.5 mg. hematoporphyrin-HCl is injected into white mice, they become very uneasy if exposed to sunlight and die in about 3 hrs. There is hyperemia of ears, nose and tail; the lungs are gorged with blood and there are pathological changes in the heart. If they are kept in the dark these changes do not occur. This suggests the liberation of poisons in the skin by the action of light. If the hematoporphyrin is followed by an injection of CaCl₂, death may not occur and all symptoms are milder. L. suggests that hematoporphyrin forms a metallic complex with Ca, which ppts. in the blood or tissues; or else the poisoning effect of the Ca is antagonistic. Ca may be used for congenital porphyrinuria, etc.

Changes in the reaction of skin after repeated treatment of the same spot. L. TÖRÖK, E. LEINER AND F. URBÁN. *Krankheitsforschung* 1, 371-406(1925).—If small quantities of morphine, horse serum, caffeine, etc., are injected into the skin and the injection is repeated as soon as the swelling has disappeared, the first 2 or 3 injections produce a progressive increase in swelling and inflammation, followed by a sudden decrease in sensitiveness to the treatment. Chemicals which cause inflammation have at first a greater and then a diminished effect, if time is allowed between applications for the swelling to disappear. Heat, cold, pain, or other phys. treatment have analogous effects. Injections of blood, washed blood cells, hemolyzed blood, or 4% oxy-hemoglobin cause no swelling; but if they are injected before morphine or histamine they diminish the swelling caused by these. Most of the expts. were on normal human skin.

Poisoning produced by protein decomposition products. H. PREIFFER. *Krankheitsforschung* 1, 407-44(1925).—The products (proteoses) may be absorbed from the intestine in cases of intestinal intoxication; or may be produced in the body by the decay of cells or tissues, as in malaria, abscess, bacteriolysis, etc.; by anaphylactic shock; or by the effects of radiant energy. The various sources and effects are reviewed in detail.

Changes produced by syphilis in the distribution of serum lipoids. E. K. WOLFF AND K. FRANKENTHAL. *Krankheitsforschung* 1, 445-56(1926).—A Wassermann negative serum has 87% of the cholesterol in the globulin fraction and 13% in the albumin; a positive serum has 79% in the albumin and only 21% in the globulin; (NH₄)₂SO₄ was used to ppt. the fractions. Pptn. with ZnSO₄, slightly acidified, shows practically 100% cholesterol in the globulin for a negative serum, 86% for a positive. Lipoid P is mainly in the albumin fraction for a positive serum, but largely in the globulin for a negative. Tables are given showing the results of a series of expts. and the results of other investigators are compared with these.

The action of ammonium hydroxide and ammonium chloride on the movement of the stomach. W. W. PRĄDZICZ-NEMINSKI. *Z. Biol.* 83, 454-62(1295).—NH₄OH and NH₄Cl soln. when poured into the stomach of a dog with a fistula calls forth movements. There is an increase in the amplitude of the periodical movements of the empty stomach and a change in the time for their appearance. When a sufficient amt. of these stimulants is applied, the stomach is put in a state refractive to succeeding impulses. The organ attempts, at the same time, to maintain normality. The similarity of the action of the 2 salts indicates that the effect depends on the cation, NH₄, and not on the anions, OH or Cl.

Coagulation of protein in drops. VII. Study of precipitation reactions by means of the drop method. V. MORAŠKO. *Biochem. Z.* 159, 280-5(1925); cf. Bečka and Simánek, *C. A.* 19, 2213.—In an attempt to classify the serum used in a precipitin reaction according to the species from which it came, the nature of the ppt. obtained is

compared with the ppt. formed in a drop of the serum by reagents, such as phenols, mineral acids, organic acids, HgCl_2 , CuSO_4 and FeSO_4 . These ppts. seem to be characteristic enough in appearance properly to classify the serum. W. D. L.

Physicochemical aspects of hemolysis. IV. The relation of the acidity of phosphate buffers to biologic hemolysis. REED ROCKWOOD. *J. Immunol.* **10**, 741-75 (1925); cf. *C. A.* **19**, 317.—Red cells have a strong power of altering acidity, even in isotonic buffer solns. In solns. satd. with CO_2 change in H-ion concn. due to the cell is much less marked. The effective range of H-ion concn. for biologic hemolysis is from about 6.0 to 8.3, with a broad optimum near neutrality. No significant change in the morphology of the cell occurs except in extremely acid solns. The effect of acid on amboceptor is similar to that of hemolysis as a whole. The hemolytic power cannot be restored entirely by changing acidity. Too strong acid destroys, not merely inactivates, part of the amboceptor. Complement is partly destroyed, but more largely merely inactivated. The point of max. combination of cell and amboceptor is well toward the acid side, and the amt. of combination gradually decreases as neutrality is approached. In extremely acid or alk. medium the complement is not present, either in the cell or in the supernatant fluid in a form in which it can be reactivated by neutralization. Complement can be split by HCl over a range of at least p_H 5.8-6.4. The addn. of alkali in the standard method makes it strongly alk., but keeps it in the range of optimal hemolysis. The complement can still be split, however, if less alkali is used. Filtration of the split complement increases the final alky., because of the acid mixt. which remains on the filter paper. The mixt. of mid piece and end piece which have been reunited is distinctly more alk. than a mixt. neutralized before centrifuging and washing the globulin. The results of complement splitting by CO_2 are variable, depending more on the heaviness of the protein cloud than on actual acidity. Failure is frequent at acidities which cause splitting in the case of HCl. Splitting of complement by dialysis was successful in only 1 case. In all the attempts there was no great change in the reaction of the solns. An attempt to split complement by acid phosphate solns. in the presence of an excess of amboceptor was not successful. A group of expts. based on those of Bronfenbrenner and Noguchi (*C. A.* **7**, 150) on complement splitting was carried out. With the use of HCl the acidity in the different tubes is similar, whether complement is split or not. Bubbling CO_2 through for 2 min. does not increase acidity. Reactivation of the HCl end piece depends on sp. factors, not on changes of acidity. The same is true of the end piece split by CO_2 . F. R. LONG

Antigenic character of heated protein. J. FÜRTH. *J. Immunol.* **10**, 777-89 (1925).—Heating blood serum or cryst. egg albumin to 100° creates a new antigenic specificity. Heating serum to 70° partly transforms it into this new antigen. Antisera obtained by injecting serum heated to 100° ppt. the antigen used strongly, but cause weak pptn. of unheated protein. Anti-cocto-serum of rabbits or guinea pigs prepd. with the serum of 1 species, heated to 70 – 100° , ppts. serums from other species. Antibodies are not produced by rabbits and guinea pigs when directly injected with their own heated serums. The ppt. formed by cocto-antigen and its cocto-precipitin fixes complement. Heterologous cocto-antigen does not fix complement in the presence of cocto-precipitin. There is a close parallelism between the severity of Arthus reaction with cocto-antigen and the cocto-precipitin content of the serum. Serum heated to 100° for 5 min. produces anaphylactic shock and incites uterine contraction in guinea pigs sensitized to cocto-antigen. E. R. LONG

Temperature increase from products of bacterial autolysis. JOSÉ CARRA. *Z. Immunitäts.* **43**, 464-9 (1925).—At the beginning of autolysis of staphylococci hyperthermic substance alone is produced. With the progress of autolysis, increasing amts. of substance causing a decrease in temp. are produced. E. R. LONG

The action of Röntgen, radium and ultra-violet rays on the components of the Wassermann reaction. GÜNTHER BRANN. *Z. Immunitäts.* **44**, 27-32 (1925).—Röntgen rays are practically without action on negative or positive serums in the Wassermann reaction. Occasionally a slight weakening of positive serums is caused. Röntgen irradiation has no effect on cholesterolized beef heart ext. or on complement, as far as the Wassermann reaction is concerned. Ra irradiation of complement (guinea-pig serum) weakens or destroys it. It has no action on human serums, either positive or negative. Irradiation by quartz lamp rays destroys complement, but has no effect on cholesterolized antigens or Wassermann negative or positive human serum. E. R. LONG

The problem of artificial complement. J. BORN. *Z. Immunitäts.* **44**, 33-43 (1925).—The artificial complement of Liebermann (MeOH soln. of Na oleate and CaCl_2) can replace natural complement in the hemolytic system. E. R. LONG

The theory of the colloid reactions in the cerebrospinal fluid. H. A. KREBS. *Z. Immunitäts.* **44**, 75-104(1925).—Negative suspensoids in the presence of cerebrospinal fluid proteins form an adsorption compd. with the globulin. This compd. acts as an amphoteric electrolyte. Its flocculation depends on the H-ion concn. at the isoelec. point. The isoelec. point is higher the smaller the globulin content of the compd. All conditions modifying the globulin content or the H-ion concn. of the medium modify flocculation. E. R. LONG

Investigations on lysocithin. I. The significance of lysocithin in the pathogenesis of intoxications and infections. S. BELFANTI. *Z. Immunitäts.* **44**, 347-63(1925).—Lysocithin (the product obtained from the action of lecithinase on lecithin) from egg or brain is a strongly toxic substance which dissolves erythrocytes and leucocytes and injures the brain and its capillary endothelium, with the production of edema and hemorrhage. Another group of lysocithins, in the pancreas, salivary glands and other tissues are inactive in the body, because held in check by antagonistic substances, particularly cholesterol. It is possible that the endogenous or exogenous enzymes, from bacteria, e. g., are capable of making this group of lysocithins toxic. **II. The action of lysocithin in vivo on animal tissues.** GUIDO GUERRINI. *Ibid* **45**, 249-68.—Lysocithin, from the poison of *Crotalus terrificus*, the substance "Y" of Belfanti and the poison of *Lachesis*, all have the same action on animal tissues. They are capillary poisons, causing extensive hemorrhage wherever injected, reminding one of the hemorrhagic septicemias. E. R. LONG

Influence of benzoin on the serologic activity of lipoids, with particular reference to the serum diagnosis of syphilis. T. OHASHI. *Z. Immunitäts.* **44**, 377-402(1925).—Mixts. of lecithin and benzoin increase the speed of serologic flocculation. Sensitiveness in the reaction with human serum is inversely proportional to the amt. of lecithin. Too small lecithin content is to be avoided in the serum diagnosis of syphilis. The best mixt. is 1 cc. 2% lecithin and 0.3 cc. 10% benzoin. This mixt. is diluted first with 3 parts physiol. salt soln. and after 10 seconds with 16 parts more. The activity of the mixt. decreases on standing. Increasing the benzoin increases sensitiveness, but decreases specificity. The addn. of cholesterol to lecithin decreases or increases activity according to the concn. Excess of cholesterol increases sensitiveness without avoiding non-specificity. Suitable quantities of cholesterol act as protective colloid, in relation to benzoin flocculation, while in stronger concns. cholesterol acts as a flocculating agent. E. R. LONG

Active immunization with non-toxic culture filtrates. II. Dysentery bacillus Shiga Kruse. R. KRAUS, T. AWOKI AND B. KOVACS. *Z. Immunitäts.* **45**, 42-8(1925). cf. Kraus and Imai, *Wien. klin. Wochschr.* 1925.—In the formation of dysentery toxin intermediate substances are produced, which are non-toxic, but on injection lead to sp. antitoxic immunity. E. R. LONG

Immunization with non-toxic bouillon culture filtrates of diphtheria and tetanus bacilli. MIZUHO NAKATA. *Z. Immunitäts.* **45**, 402-5(1925).—It was not possible to develop diphtheria and tetanus antitoxin by the use of non-toxic bouillon culture filtrates from a number of strains of tetanus and diphtheria bacilli. The results were in sharp contrast to those obtained by Kraus, *et al.* (preceding abstract) with non-toxic filtrates from dysentery bacilli. E. R. LONG

Dry complement and its use in the Wassermann reaction. V. I. ROMANOV. *Z. Immunitäts.* **45**, 74-80(1925).—Fresh guinea-pig serum dried at reduced air pressure retains its complementary action at least 1 month. The better it is dried the better it retains its activity. The titer of the dried complement, however, is somewhat weaker than its titer before drying. Weakly positive serums may fail to react with the dried complement. E. R. LONG

Active immunization against diphtheria by the use of toxoids. II. St. BÄCHER. R. KRAUS AND E. LÖWENSTEIN. *Z. Immunitäts.* **45**, 86-92(1925).—By treating formal toxoids with weak AcOH, preps. are obtained which retain their capacity to unite with antitoxin and incite immunity, but lead to little infiltration. Toxoids treated with alc. also retain their antigenic activity, but the reactions in guinea pigs are not appreciably lessened. E. R. LONG

Toxoids. III. Active immunization against venom. STEFAN BÄCHER, RUDOLF KRAUS AND ERNST LÖWENSTEIN. *Z. Immunitäts.* **45**, 93-6(1925).—Combined action of formalin and high temp. on venom (*Lachesis jararaca*) produced non-toxic toxoids which retained antigenic activity. The component of the poison causing hemorrhage and necrosis is little influenced by this treatment, and immunization with toxoids confers no protection against this effect. E. R. LONG

The Wassermann tuberculosis antigen. HANS RITTER AND HEDWIG KÖSTER.

Z. Immunitäts. 45, 111-24(1925).—Pinner (*Z. Tuberkulose* 41; cf. *C. A.* 19, 2979) is not correct in his statement that the activity of the Wassermann tuberculous antigen resides in the alc.-sol. fraction. It is true that alc. extn. injures the antigen, but the complement-fixing reaction obtained with the ext. is unspecific and does not depend on the active substance of the Wassermann antigen. E. R. LONG

Antigenic function of the Forssman lipoids and other lipid haptenes. R. DOERR AND C. HALLAUER. *Z. Immunitäts.* 45, 170-90(1925).—Rabbits immunized with a mixt. of alc. horse kidney ext. and foreign serum furnish 2 different antibodies, the Forssman amboceptor and a precipitin for foreign protein which are completely independent and can be sepd. from the immune serum by sp. combination with 1 of the 2 antigens. Activation of the Forssman lipoids with the production of complete antigen is not brought about through foreign serums, but occurs completely with aq. extn. of organs of the same species. Activation does not occur with intact foreign erythrocytes, but does occur with the dissolved protoplasm of such cells. Dissolved erythrocyte protein from erythrocytes of the same species is also active. E. R. LONG

Metal salt therapy. L. E. WALBUM. *Z. Immunitäts.* 43, 433-64(1925).—There is a relation between at. wt. and the action of metallic salts on the formation of agglutinins and amboceptor and bacteriocidal substances and blood lipase. The injection of small quantities of Mn salts facilitated the destruction of toxins. Injection of Cs and Ir protected mice against infection with certain bacteria of the paratyphoid group, but was ineffective against streptococci. Animals infected with tubercle bacilli and later injected with metal salts of many varieties died of tuberculosis intoxication but not of tuberculous infection. Al and Mn were most active in this manner; Au was less active and Cs least active. Studies on tuberculous guinea pigs showed that the concn. of metal salts required for therapeutic action is lower than that required to stimulate bacterial growth, and coincided with the optimum concn. for the stimulation of antibody production. Larger doses of the metallic salts favored the growth of the bacteria in the body, and decreased antibody production. E. R. LONG

Metal salts and antibodies. S. SCHMIDT. *Z. Immunitäts.* 45, 305-22(1925).—The results of Walbum (cf. preceding abstr.) are confirmed. $MnCl_2$ stimulates antibody production in the anti-diphtheria immunization of horses and goats. The injection of Ba and Pb favors antitoxin production in anti-diphtheria immunized sheep. All metals of the Ca and Mg groups favor the production of diphtheria antitoxin in horses, except Sr. The metals probably act by setting free antibodies already formed, rather than by stimulating the formation of new ones. E. R. LONG

The influence of organ extracts on complement fixation brought about by antigen-antibody reactions. KAZUO HOTTA. *Z. Immunitäts.* 45, 323-33(1925).—Alc. organ exts. favor sp. complement fixation brought about by antigen-antibody reactions. Increase in hemolysis is caused by alc. alone, but alc. organ exts. act more energetically. Alc. and alc. organ exts. are effective through their protein-pptg. power. They favor anticomplementary action in general by favoring globulin alteration. These investigations lend no support to the theory that the blood changes in syphilis consist in the simultaneous presence of spirochete antigen and antibody in syphilitic blood, and that the addn. of organ ext. leads to their reaction. E. R. LONG

The use of benzochol extracts in the Wassermann reaction. KAZUO HOTTA. *Z. Immunitäts.* 45, 442-52(1925).—The addn. of benzoin to cholesterolized beef heart exts. increased the activity of the latter, so that the reaction occurred with smaller amts. than are ordinarily used. These benzoin-cholesterol exts. (benzochol exts.) must be dild. 10-20 times before use. Although spontaneous flocculation occurs, such ext. dilns. are suitable for use for weeks. The reactive capacity in these flocculated specimens is bound with the ppt. The use of benzoin in the manner described is recommended for the Wassermann reaction, in view of its action in promoting sensitiveness. E. R. LONG

Experiments on the promotion of hemolysis. KAZUO HOTTA. *Z. Immunitäts.* 45, 453-60(1925).—The addn. of organ exts. to a mixt. of sheep blood, amboceptor and complement under certain conditions furthers hemolysis. This effect is particularly noticeable in those tubes into which the contents are blown, rather than allowed simply to run in. Blowing air through the tubes has the same effect. The promotion of hemolysis in these instances is probably to be attributed to the CO_2 content of the air blown in. Small amts. of HCl have the same action. Apparently organ exts. exert an enhancing effect on hemolysis when the medium is acid. E. R. LONG

Some effects on the flocculation and turbidity reactions used in the serum diagnosis of syphilis. ALFONS HILPERT. *Z. Immunitäts.* 45, 461-77(1926).—The addn. of guinea-pig serum in the Sachs-Georgi reaction usually weakens the reaction, but occa-

sionally strengthens it. The addn. of CaCl_2 has in general the same effect. The addn. of guinea-pig serum usually inhibits the reversible early flocculation. This is significant in view of the fact that the Wassermann reaction may be negative in spite of intense flocculation reaction. Inactivated serums are less sp. than active serums in turbidity reactions. The non-sp. reaction with inactivated serum can be prevented by the addn. of soda in 10% salt soln. Soda-salt addn., however, weakens or prevents the reactions characteristic for syphilis. Ten % salt soln. alone weakens reaction capacity to some extent.

E. R. LONG

Precipitin of hemoglobin. TETSURO ISHIKAWA AND KAKUZO SAKURABAYASHI. *Tôhoku J. Exptl. Med.* 6, 395-8(1925).—The hemoglobin precipitin is formed exclusively from the protein part of the hemoglobin.

L. W. RIGGS

BROWNING, CARL H.: **Immunochemical Studies.** London: Constable & Co 253 pp. 16s.

WELLS, H. GIDEON: **Chemical Pathology. Being a Discussion of General Pathology from the Standpoint of Chemical Processes Involved.** 5th ed. revised. Philadelphia: W. B. Saunders Co. 790 pp. \$8 50. Reviewed in *Ann. Clin. Med.* 4, 523 (1925).

H—PHARMACOLOGY

ALFRED N. RICHARDS

Bismuth in the treatment of syphilis. R. J. G. PARNELL. *J. State Med.* 34, 49-57 (1926).—Observations of treatment are made over periods of one and two years, respectively. Injections of metallic Bi cream were given into the buttock, care being taken not to inject into the blood stream, for metallic Bi is very toxic if introduced into the circulation. Metallic Bi cream is not a substitute for drugs of the arsphenamine type. It would appear to occupy a half-way position between Hg and neoarsphenamine. Compared with Hg it is far less toxic and of greater clinical therapeutic value; it appears to affect the serum Wassermann to a greater extent. It is valuable in cases unsuitable for arsenical therapy. Where prodromal treatment is desirable before establishing arsenical therapy Bi is safe and efficacious. Bi appears to have especially beneficial effects in glossitis and chronic leucoplakia of the mouth. It is tolerated well by cerebrospinal cases, and is given safely in cases with arsenical jaundice. In latent syphilis it appears to be the equal of arsphenamine and neoarsphenamine in its influence on the Wassermann reaction. In adjuvant treatment Bi should replace the use of Hg.

GEO. R. BANCROFT

Variations in physiological action of morphine derivatives with diverse substituent groups. A. ZAMPARO. *Loll. chim. Farm.* 64, 385-90(1925).—A crit. review of the physiol. action of morphine and its Me, Et, benzyl and Ac derivs. Substitution in a group (such as hydroxyl) modifies or suppresses its contribution to the general properties of the substance. The group in question functions either by attaching the mol. to the tissue, or else by producing a sp. effect after such attachment has been brought about by another group.

B. C. A.

Investigations of the action of narcophine on the digestion of meat in dogs. ED GARD ZUNZ. *Arch. intern. pharmacodynamie* 30, 1-63(1925); cf. *C. A.* 17, 1074, 2004 - Narcophine, which contains 29.28% morphine and 42.58% narcotine, was tested for possible synergistic effect on the digestive tract of the dog. Narcotine distinctly diminishes the emetic and purgative action of morphine in dogs. The general condition of the animals was more like that produced by opium minus morphine than by either complete opium or morphine-HCl. The contents of fundus, pylorus and duodenum were collected separately and the simple proteins detd. in each part of the stomach; N in the following forms was detd. in all 3 regions: NH_3 , amines, albumin, proteoses pptd. by half satn. with ZnSO_4 in acid medium, other proteoses (peptones) pptd. by phosphotungstic acid but not by ZnSO_4 , material pptd. by neither of these reagents. The biuret test was performed on the end-filtrates. The av. time required for complete emptying of the stomach in normal dogs was 11 hrs. The times corresponding to doses of 4, 8, 12 and 16 mg. narcophine were 21, 24, 26 and 30 hrs., resp. Twenty-five hrs. was required after 5 mg. of morphine meconate, which had an actual morphine content of 3.31 mg., the morphine content of 12 mg. of narcophine being 3.53 mg. One of the most striking actions of narcophine is its prolonged closure of the pyloric sphincter. The stomach retains cooked meat for periods longer than normal, in proportion to the dose of narcop. $1\frac{1}{4}$ - $1\frac{3}{4}$ hrs. elapse, for 4-16 mg. doses, between the ingestion of meat and its initial entrance into the pylorus. The chyme enters the duodenum immediately

thereafter. The evacuation of the stomach into the intestine is retarded in proportion to the dose of narcophine. The action of the digestive juices is retarded. The av. metaprotein content of the various portions of the digestive tract is increased in proportion to the dose. The stomach averages less proteoses and more peptones and peptides than normally. The reverse holds for the intestine; these changes become more marked with increasing doses of narcophine. There is a tendency to increased formation of NH_3 and aliphatic amines in the stomach.

T. B. GRAVE

The action of the hypno-anesthetics on the electrocardiogram. HENRIJEAN AND R. WAUCOMONT. *Bull. acad. roy. med. Belg.* [5], 5, 300-10(1925).— CHCl_3 and chloral produce atrioventricular block and "nodol" rhythm; with artificial respiration the intoxication is very much slower. Ether leaves the original rhythm undisturbed, until the heart is nearly dead.

R. BEUTNER

Does insulin possess a cardiovascular action antagonistic to adrenaline? PLUMIER-CLERMONT AND L. CAROT. *Bull. acad. roy. med. Belg.* [5], 5, 554-64(1925).—Insulin, injected intravenously, does not influence the arterial pressure nor the heart beat; it does not change the action of adrenaline, in any respect.

R. BEUTNER

Clinical and pharmacological investigations on dismenol, a new preparation against dysmenorrhea. J. A. VAN DONGEN. *Nederland. Tijdschr. Geneeskunde* 69, II, 1520-5 (1925).—Dismenol, a mixt. of *p*-sulfamidobenzoic acid and pyrimidone, has been tried in 31 cases of menstrual pain; in 14 cases no result was seen; in the other cases some relief was obtained, but not more than with other analgesic drugs. In expts. on the isolated uterus of cats suspended in Ringer soln., according to Magnus' method, *p*-sulfamidobenzoic acid relaxed the uterus when in the state of contractions after secacornine was added.

R. BEUTNER

The treatment of furunculosis with stannoxyl. S. POLIAKOFF. *Nederland. Tijdschr. Geneeskunde* 69, II, 2524-7(1925).—Stannoxyl, a mixt. of Sn and Sn oxide, gives relief in cases of multiple pyogenic abscesses. The dose is 0.5 to 1 g. by mouth per day.

R. BEUTNER

New observations on the question of the effect of "thyreoidins" on alcoholic fermentation. II. L. P. ROSENOW. *Biochem. Z.* 160, 269-71(1925); cf. C. A. 20, 929.—Com. thyroid exts. *Bacteriology* (thyreoidin) were found to contain substances that stimulate the fermentation of sugar by yeast.

F. A. CAJORI

Habituation to alcohol in man. K. HANSEN. *Biochem. Z.* 160, 291-7(1925).—The EtOH content of the blood of men was detd. at intervals after the taking of 0.5 g. of EtOH per kg. body wt. The peak of the curves obtained tended to be lower as the individual became habituated, through daily use, to the dose of EtOH.

F. A. C.

The action of santonin on blood sugar. A. STASIAK. *Biochem. Z.* 160, 298-306 (1925).—Daily doses of 0.2 to 0.4 g. of the Na salt of *santonin* by mouth produced in rabbits a hypoglucemia, hypotonicity and muscular weakness. Histological examn. showed degenerative changes in the liver and to these changes is ascribed the hypoglucemia and other effects of the drug.

F. A. CAJORI

Pharmacological investigations on some new proteinogenous cholines. T. GORDON-OFF. *Biochem. Z.* 160, 451-63(1925).—Alanineacetylcholine, $\text{MeCH}(\text{NMe}_2\text{I})\text{CH}_2\text{OAc}$, leucineacetylcholine, $\text{Me}_2\text{CHCH}_2\text{CH}(\text{NMe}_2\text{I})\text{CH}_2\text{OAc}$, and other acetylated derivs. of choline and amino acids produced similar pharmacol. action on the isolated frog heart, rabbit intestine and guinea-pig uterus as acetylcholine. Non-acetylated derivs. did not show pharmacol. activity and neither acetylated nor non-acetylated derivs. produced pharmacol. effects when injected into the intact animal.

F. A. CAJORI

Calcium metabolism and adrenaline. TAKEO INOUE. *Tokyo Ig. Kw. Z.* 36, 544-85(1922); *Japanese J. Med. Sci.* 2, 14-5(1924).—Subcutaneous injection of adrenaline in normal man caused an increase in the hourly excretion of Ca. Later there was a diminished Ca excretion. P excretion was usually increased following adrenaline, whereas NaCl excretion was diminished.

F. A. CAJORI

The chemotherapy of local suppuration: acriflavine and boric acid compared. J. G. GRAHAM. *Brit. Med. J.* 1925, II, 826.—A case with extensive burns was partly treated with both agents. Such better effects were obtained with the former, that the boric acid was discontinued.

A. T. CAMERON

The strength of insulin preparations. G. A. HARRISON, R. D. LAWRENCE AND H. P. MARKS (with introduction by H. H. DALE). *Brit. Med. J.* 1925, II, 1102-7.—Rabbits were prepd. for test by withholding food (but not H_2O) for 24 hrs. The av. reduction in the blood sugar was detd. over a period of 5 hrs. following injection (hourly detns.) and expressed as a percentage of the initial blood sugar. Six animals are desirable, but the hourly samples (0.2 cc.) can be added and 1 detn. made. In this way different samples can be accurately compared. Clinical tests on diabetics with different

samples standardized by the above procedure gave results in good agreement, the sugar curve following injection being used as criterion.

A. T. CAMERON

The thyroid and manganese treatment. Its influence on abnormal blood pressure. (Interim report.) H. W. NORR. *Brit. Med. J.* 1925, II, 1209-12; cf. *C. A.* 19, 3113.—Chiefly clinical.

A. T. CAMERON

The effect of pancreas preparations by the mouth upon carbohydrate metabolism. P. J. CAMMIDGE. *Brit. Med. J.* 1925, II, 1216-8.—Rats fed raw fresh pancreas showed no fall in blood sugar, and unchanged respiratory quotient in 5 to 6 animals (that in the 6th was doubtful). No effects were obtained with a no. of com. pancreas preps. fed by mouth.

A. T. CAMERON

Action of pituitary extract administered by the alimentary canal. H. H. KNAUS. *Brit. Med. J.* 1926, I, 234-5.—No pressor effect was observed in the cat when the ext. was given by mouth, stomach, small intestine or rectum. No influence on uterine muscle was found when the ext. was given by stomach or small intestine, but given by mouth, after a latent period of 8 min. there was marked influence on the uterus increased tone and automatic movements. The oxytocic compd. is, therefore, absorbed by mouth; there was also slight absorption by rectum.

A. T. CAMERON

A comparative study of the effect of two different preparations of iodine upon the preoperative basal metabolic rate in exophthalmic goiter. R. R. FITZGERALD. *Can. Med. Assoc. J.* 16, 159-61 (1926).—Lugol's soln. was compared with I in HI. Lowering of the basal metabolic rate was effected in nearly all cases, with either soln., each producing the same diminution in about the same length of time, but nearly 4 times the amt. of I in HI was necessary for the same clinical effect as with Lugol's soln.

A. T. CAMERON

The use of insulin in surgery and obstetrics. F. N. G. STARR AND A. G. FLETCHER. *Surgery, Gynecol., Obstetrics* 42, 194-5 (1926).—A clinical paper indicating the value of insulin and intravenous glucose in surgery and pregnancy with diabetics.

A. T. C.

Anatomic alterations in experimental poisoning by cocaine with special reference to the glands of internal secretion. G. FALCO. *Arch. farm. sper.* 40, 164-219 (1925).—Acute exptl. poisoning by cocaine produces, in the dog, guinea pig and rabbit, lesions in the organs concerned in 3 fundamental functions: those of the central nervous system already studied by other investigators, those of the vital organs (kidney, liver and heart) and those of the testes. The last are characterized by a diminished spermatogenic activity with increase in interstitial tissue. The mode of action in this case is probably similar to that of EtOH.

A. W. DOX

Histological investigations on some organs of rabbits after death from acute and subacute poisoning by disodium methylarsenate (arrenal). P. TESTONI AND STEFANO CASTAGNA. *Arch. farm. sper.* 40, 257-68 (1925).—Degenerative changes were noted, particularly in the liver, kidney and intestine, after subcutaneous injection of the drug. In acute poisoning the lesions were exclusively hemorrhagic.

A. W. DOX

Anatomo-pathological investigations on some organs of rabbits after death from acute and subacute poisoning from sodium cacodylate. P. TESTONI AND P. BISSIRI. *Arch. farm. sper.* 40, 269-82 (1925).—Degenerative and hemorrhagic lesions were observed in the kidney, liver, intestine and suprarenals, and mainly hemorrhagic lesions in the lungs, bone marrow and spleen. More damage was done by subcutaneous than by intravenous injection, probably because of less opportunity for elimination by the lungs.

A. W. DOX

Therapeutic use of caustic soda. GEORGES DENIGÈS. *Bull. soc. pharm. Bordeaux* 63, 313-4 (1925).—D. employed a 4% soln. of NaOH, administered by stomach tube, in the treatment of gastric ulcer. Contrary to what would be expected, this strongly caustic soln. does not produce vomiting or hemorrhage, except in rare cases.

A. G. DU MEZ

Bryonia alba: a typical animal proving. T. G. MITCHELL. *J. Am. Inst. Homeopathy* 19, 105-6 (1926).—Administration of alc.-free tincture of bryonia to guinea pigs for a period of several weeks, either by mouth or hypodermically, produced loss of body wt., congestion of the brain, cervical glands, lungs, pleura and synovial membranes, anemic kidneys and blood in the contents of the stomach, cecum and urinary bladder.

JOSEPH S. HEPBURN

Arnica montana. H. S. STIMPSON. *J. Am. Inst. Homeopathy* 19, 213-5 (1926).—Guinea pigs were killed by administration of lethal doses of arnica; they were subjected to autopsy immediately after death, and then exhibited a tendency to hemorrhage, disintegration of the intestinal mucosa and cloudy swelling. Administered to anesthetized rabbits, arnica increased the respiratory rate and the rate of beating of the left ventricle, and decreased the blood pressure and the tonus of the cardiac muscle.

Applied to the isolated intestine in Tyrode soln., arnica produced a cessation of contraction, and first an increase, then a decrease in tonus; this action was not antitided by camphor. In the Langendorff perfusion method, arnica produced a definite slowing of the heart.

JOSEPH S. HEPBURN

Effects of ultra-violet radiation upon involuntary muscle, and the supposed physiological interference of visible rays. Y. AZUMA AND LEONARD HILL. *Proc. Roy. Soc. (London)* 99B, 221-9(1926).—Ultra-violet rays antagonize the action of adrenaline, but not that of emetine, upon involuntary muscle. The increased tone, produced by these rays, is dependent upon the presence of Ca in the nutrient fluid.

J. S. H.

The action of secretin from nettles on the secretion of bile. M. DOBREFF. *Z. ges. expil. Med.* 46, 243-62(1925).—Secretin isolated from the leaves of the nettle, *Urtica dioica*, is an active cholagog and increases the secretion not only of H₂O but also of solid constituents. Young leaves give a more effective secretin than old leaves. The strength of the secretin does not alter on standing. Another nettle, *Urtica urens*, gives a secretin which is less powerful as a cholagog, resembling in its action the secretin from spinach. It is probable that the same substance in plant secretins is responsible for the increased secretion of both stomach and liver.

H. F. H.

The influence of vagotropic substances on the concentration of hydrogen and hydroxyl ions in the saliva in man. J. LUKOMSKY AND M. GURARY. *Z. ges. expil. Med.* 47, 285-93(1925).—The H-ion concn. of the saliva is decreased by subcutaneous injection of pilocarpine and increased by subcutaneous injection of atropine.

HARRIET F. HOLMES

The behavior of intravenously introduced bismuth in the body and its excretion. A. MEMMESHEIMER. *Z. ges. expil. Med.* 47, 151-65(1925).—The intravenous injection of an adsorption combination of Bi with As, known as Salluen, brings about a marked shock to the stability of the colloids of the blood as shown by changes in refractive index, viscosity and surface tension. Bi is demonstrable in the blood chiefly in a dialyzable form in the serum and in a non-dialyzable form in the plasma. Small quantities of Bi are found in the liquor cerebri in man. The colloidal combination splits off Bi slowly and the Bi is taken up to a considerable extent by the reticulo-endothelial system. Excretion of Bi through the kidneys and intestine is slow, so there is a long-continued action of the Bi.

HARRIET F. HOLMES

Influence of radiotherapy on uric acid excretion. SEBASTIANO DI FRANCESCO. *Actinoterapia* 4, 193-20(1924); *Ber. ges. Physiol. expil. Pharmacol.* 29, 410. —No increase of uric acid was found in urines during or immediately after Ra or Röntgen irradiation. In 24-hr. urines examd. on several consecutive days an increase was found in 3 cases of carcinoma and 2 of myoma. It is attributed to the destruction of tumor cell nuclei.

MARY JACOBSEN

The effect of histamine on cerebrospinal fluid pressure. F. C. LEE. *Am. J. Physiol.* 74, 317-25(1925). A definite fall in cerebrospinal fluid pressure was produced by 0.02-2 mg./kg. histamine, with a slight rise after the min. It was closely paralleled by the arterial pressure which after the min. rose above its original value. The venous pressure curve presented the mirror image of the arterial pressure curve. While the blood capillaries of the viscera are markedly dilated in histamine shock the blood capillaries of the brain do not dilate, as was confirmed by direct observation and histological examn.

MARY JACOBSEN

A note on differences of capillary activity. F. C. LEE. *Am. J. Physiol.* 74, 326-33(1925); cf. preceding abstr. —Histamine and 30% NaCl lowered arterial and cerebrospinal fluid pressure while lymph flow and pressure were increased. These as well as previous expts. establish a fundamental difference in behavior between the capillaries of various organs. The passage of particles of India ink from lymph vessels to the liver indicate a high degree of permeability of the blood vessels of the liver.

MARY JACOBSEN

The regulation of the flow of bile. G. E. BURGET. *Am. J. Physiol.* 74, 583-9(1925).—The pressure in the bile duct is increased by pilocarpine and physostigmine and reduced to a min. by adrenaline and atropine. Since these drugs act on the tonus of the intestinal musculature it is concluded that the flow of bile is regulated mainly by intraabdominal pressure and by tonicity and peristalsis of the duodenum.

M. J.

Studies of response to continuous intravenous injection of large amounts of glucose. J. D. BOYD, H. M. HINES AND C. E. LEESE. *Am. J. Physiol.* 74, 656-73(1925).—Dogs received injections of glucose extending over 2-4 hrs. at a rate of 4 g./kg. per hr. The injection was assoc. with a rapid rise of blood sugar in the first few mins. tending to assume a plateau, a 50% increase in heat production, slight rise in body temp. and a slight decline in plasma p_H and CO₂ content, the latter being independent of the p_H

of the injected soln. The degree of hyperglucemia is not an index of the assocd. glucosuria. About 20% of the injected glucose is excreted. The respiratory quotient indicates predominant sugar combustion but there is no positive evidence of fat formation. After the injection is completed blood sugar and heat production rapidly return to normal. Qualitatively the effects are similar in different dogs, but quantitatively they differ considerably. MARY JACOBSEN

The effect of insulin on the morphological blood picture, with a note on the relation of diet to the convulsions induced by insulin. V. E. LEVINE AND J. KOLARS. *Am. J. Physiol.* **74**, 695-707(1925); cf. *C. A.* **19**, 3315.—Rabbits fed on alfalfa (base-producing) invariably fell into convulsions; those fed on oats and cabbage (acid-producing) did not. These and the results of other authors suggest that insulin convulsions are due not to hypoglucemia but to a state of inadequate nutrition resulting in nervous instability. The latter becomes manifest under the action of insulin. MARY JACOBSEN

The influence of alcohol. I, II. H. L. HOLLINGWORTH. *J. Abnorm. Psychol. Soc. Psychol.* **18**, 204-37(1924); *Ber. ges. Physiol. expll. Pharmacol.* **29**, 448.

Therapy of infantile leishmaniasis. S. CANNATA. *Pediatrics (Riv.)* **33**, 1309-11(1925).—Na Sb tartrate is an anti-*Leishmania* specific and effects relatively rapid improvement and recovery even in cases resistant to Sb tartrate. The tolerance even for high doses is good. MARY JACOBSEN

Excretion of mercurochrome given intravenously. R. L. COWEN. *Am. Med.* **31**, 732-4(1925).—The excretion of the dye from the normal kidney starts within 3 min after intravenous administration. It is excreted as rapidly by the diseased kidney; hence it is not an index of renal function. Thirty % or more is excreted within 24 hrs. In one case the dye was seen in aural secretions. None was noticed in the spinal fluid. Excessive doses are followed by excretion into the lacrimal and intestinal secretions. None is excreted into the seminal vesicles; hence it has no therapeutic value. F. K.

Treatment of frambesia with novasurol. W. FISCHER. *Arch. Schiffs-Tropen Hyg.* **29**, 339-42(1925).—F. reports great success in curing frambesia by the injection of novasurol. FRANCES KRASNOW

Behavior of "yatren" in the organism. ADOLF KESSLER. *Arch. Schiffs-Tropen Hyg.* **29**, 380-7(1925).—"Yatren" cannot be administered by inunction. I is split off in the organism. The elimination of I and "yatren" in the urine is greater after intravenous or intramuscular injection. When "yatren" is administered *per os* there is a delay and decrease in the amt. excreted by the urine. FRANCES KRASNOW

A case of ulcer tropicum cured with neoarsphenamine and cupric sulfate solution. A. TERDSCHANIAN. *Arch. Schiffs-Tropen Hyg.* **29**, 449-50(1925).—Report. F. K.

Mechanism concerning the therapeutic action of bismuth in syphilis after intravenous injection. S. SEI AND W. WEISE. *Arch. Schiffs-Tropen Hyg.* **29**, 554-9(1925). The Bi soln. is rapidly distributed to all organs and hence also to the syphilitic tissues. Much is lost through the kidneys. Small doses act more effectively. F. K.

Chemotherapeutic studies on antimony. PAUL UHLENHUTH, PHILALETHES KUHN AND HANS SCHMIDT. *Arch. Schiffs-Tropen Hyg.* **29**, 623-50(1925).—Aromatic Sb compds. are classified and their action on trypanosomes is discussed. F. K.

Pulmonary hemorrhage after acute carbon tetrachloride poisoning. T. TAKASAKA. *Deut. Z. ges. ger. Med.* **6**, 488-99(1925).—In cases of acute CCl_4 poisoning there is always pulmonary hemorrhage. The greater the dose the more severe is the bleeding and the more hasty is death onset. The blood is hemolyzed. No rupture of vessels is observed. In addn. there appears often a fatty degeneration of liver, kidney and heart. F. K.

Chemotherapy of antimonial compounds in kala-azar infections. XVIII. Further observations on certain derivatives of *p*-aminophenylstibinic acid continued. U. N. BRAHMACHARI AND JUDHISTHIR DAS. *Indian J. Med. Research* **13**, 693-4(1926). cf. *C. A.* **20**, 591.—Condensation of acetamide with *p*-aminophenylstibinic acid: To 4 g. of *p*-aminophenylstibinic acid, treated with an aq. soln. of NaOH until dissolved and made alk. with a slight excess, is added 1 g. dichloroacetamide. The mixt. is heated at 60-70°, the soln. kept alk. by small addns. of NaOH, filtered and the filtrate cooled on ice. Dil. HCl is added in excess, the ppt. thus formed washed 2 times in dil. HCl and 5 times in water and dissolved in NaOH. The soln. is made neutral, filtered and concd. Abs. alc. gives a ppt. which is dried over CaCl_2 . FRANCES KRASNOW

Critical tests of tetrachloroethylene, new anthelmintic, with special reference to its use in puppies. A. S. SCHLINGMAN. *J. Am. Vet. Med. Assoc.* **68**, 225-31(1925).—"Tests on 31 puppies and dogs indicate that C_2Cl_4 is as effective as CCl_4 for the removal of hookworms, the drug removing all of these worms present..... The effectiveness of C_2Cl_4 against whipworm was variable..... No effect on tapeworms was noted. The

safety of C_2Cl_4 for puppies is higher than CCl_4" Trial in cases of human hookworm diseases is recommended.

Neosarsphenamine in the treatment of amebic dysentery. P. T. LANTIN. *J. Philippine Islands Med. Assoc.* 5, 269-75(1925).—Eleven cases were treated. Neosarsphenamine "shows signs of considerable therapeutic value against chronic amebic dysentery."

FRANCES KRASNOW

A summary of recent developments in the chemistry of leprosy therapy. G. A. PERKINS. *J. Philippine Islands Med. Assoc.* 5, 369-73(1925).—Chemotherapy in leprosy depends on the chaulmoogra group of oils and fixed vegetable and animal oils not in the chaulmoogra group. The distinguishing characteristic of the former is that they contain a large % of chaulmoogric acid. The therapy may be administered orally using the oil-bearing seeds or subcutaneously using pure oil. Ethyl esters of chaulmoogric acid are more active than the oil. The Na salt of the acid is still more active and may be used intravenously. Of the oils not in the chaulmoogra group, cod-liver oil is the most important. Soy-bean oil has been reported as favorable. It is believed that the effects produced by these oils, when administered intramuscularly or subcutaneously, are due to their unsatn. Ingestion has no apparent effect. In this respect the latter 2 oils differ from the oils of the chaulmoogra group. These act, although to a lesser extent, when ingested. Olive oil has practically no effect. F. K.

The effect on leprosy of certain oils not in the chaulmoogra group. BONIFACIO DE VERA. *J. Philippine Islands Med. Assoc.* 5, 374-8(1925).—Four groups of oils are considered, depending on the degree of unsatn.: highly unsatd. oils as cod-liver oil; moderately unsatd. oils as soy-bean oil and its esters; slightly unsatd. ones as olive oil and its esters; and practically satd. ones as coconut oil and its esters, ethyl stearate and ethyl margarate. In general, the greater the unsatn. the greater the curative value.

FRANCES KRASNOW

Phosphorus in the treatment of various diseases. ALDO CASTELLANI. *J. Trop. Med.* 28, 377(1925).—Discussion.

FRANCES KRASNOW

A note on the treatment of amebic dysentery with stovarsol. F. M. JOHNS AND CHAILLE JAMISON. *J. Trop. Med.* 28, 378-9(1925).—Stovarsol gives results which compare favorably with other means for the treatment of amebic dysentery. F. K.

Bilharzia treatment. Experience gained from more than 3000 tartar emetic injections. Precautionary measures. Results obtained. P. H. J. LAMPE. *J. Trop. Med.* 29, 4-10(1926).—"The tartar emetic injection, when applied with the necessary discernment and tactfulness, will in the long run enjoy the popularity indispensable in combating the diseases, bilharziasis and filariasis."

FRANCES KRASNOW

A cured case of quinine idiosyncrasy. F. HAPKE. *Arch. Schiffs-Tropen Hyg.* 29, 343-4(1925).—Report.

FRANCES KRASNOW

The action of sodium and calcium ions on the frog heart and their influence on the heart tone. ERNST HOLZLÖHNER. *Z. Biol.* 83, 107-19(1925).—The work of Sakai is confirmed. By means of lowering the NaCl in a bathing soln. the sp. action of Na ions becomes recognizable. The action of the inorg. ions is detd. by the ratio: $(\text{K}-\text{Na})/\text{Ca}$. The optimum value of this ratio varies for the upper and lower heart. The effect of a decrease in NaCl is not dependent on the hypothetical disson. of dextrose. Contrasting effects between 6% and 1% NaCl is independent of the p_H of the 2 solns. A rise in the contraction accompanies a decrease in Na. This is also a sp. action of Ca increase uncompensated by increase in K or Na.

FRANCES KRASNOW

Hypertensive hyperglucemia. G. FRITZ AND B. PAUL. *Biochem. Z.* 157, 263-70(1925).—Hypertension produced in cats and rabbits by means of strychnine preceded by curare, BaCl_2 and strophanthin is compared by measurement of blood pressure and sugar, with hypertension produced by compression of the aorta. W. D. L.

Influence of the ions calcium, potassium and magnesium upon the mechanism of secretion by the gastric glands. Y. MUKOYAMA. *Biochem. Z.* 157, 303-32(1925).—After intravenous injection of salts, such as CaCl_2 , MgCl_2 or KCl into dogs with Pavlov blind sacs, the gastric secretions into the sacs were collected. While MgCl_2 and KCl stimulated, CaCl_2 depressed the flow of gastric juice. W. D. L.

The diuretic action of chlorophyll. T. GORDONOFF AND T. AMAKAWA. *Biochem. Z.* 157, 333-8(1925).—After the intravenous or peroral application of Na chlorophyllin to rabbits, the urine excretion increased to a max. in 2 hrs. The increase was not uniform, and in many cases was not great. The chlorophyll was largely excreted in the urine, which became green in color. W. D. L.

Influence of insulin upon the sugar exchange of the isolated rat's liver. I. F. BERNHARD. *Biochem. Z.* 157, 396-413(1925).—To det. whether or not insulin has an effect upon the sugar metabolism of the isolated warm-blooded liver, rat's liver was

perfused with Ringer or Tyrode soln., with and without the addn. of glucose and of insulin to the perfusate. Reducing sugar was detd. every 0.5 hr. Glycogen was detd. at the beginning and at the end of the expt. With sugar present in the perfusate, a sugar deficit was found, which deficit increased as the sugar present increased. A synthesis of glycogen could not be demonstrated, but with increasing amts. of glucose, the hydrolysis of glycogen was repressed. The addn. of insulin doubled the amt of glucose which disappeared. The concn. of sugar in the liver was directly proportional to the concn. of sugar in the perfusate. W. D. L.

The extra-hepatogenous bile pigment formation in surviving organs. IV. The surviving spleen of dogs treated with collargol and with colloidal iron. Z. ERNST AND J. FÖRSTER. *Biochem. Z.* 157, 492-500(1925).—See C. A. 19, 1006. W. D. L.

The glycogen content of the liver. I. The behavior of blood sugar and liver glycogen under the influence of morphine. N. FRANK AND J. FÖRSTER. *Biochem. Z.* 159, 48-52(1925).—The hyperglucemia, and the decrease of liver glycogen in rabbits under the influence of morphine occur simultaneously, the max. change being noted in 2.5 hrs. These changes are, within limits, independent of the amt. of morphine used W. D. L.

Hormonal regulation of intermediary carbohydrate metabolism. II. Demonstration of the insulin-adrenaline antagonism in the living frog. A. GOTTSCHALK. *Biochem. Z.* 159, 502-6(1925); cf. C. A. 19, 3302.—Frogs with adrenaline injected show less marked insulin convulsions than similar frogs without adrenaline. Likewise, frogs in insulin convulsions may be relieved by injection of adrenaline. Therefore, insulin and adrenaline are antagonistic. W. D. L.

The problem of distribution. I. Organic lead compounds. R. EHRENBERG. *Biochem. Z.* 161, 337-8(1925).—The distribution of injected Et_3PbCl and Ph_3PbCl in the various organs of the body is not uniform. The lungs and kidney retain none, but the blood and brain retain a considerable amt. W. D. L.

Influence of the cations of Ringer solution upon the smooth musculature of guinea-pig uterus. M. KOCHMANN. *Biochem. Z.* 161, 390-400(1925).—Certain ions are omitted from Ringer solns. and replaced by others, so that the soln. is again isotonic with blood, and the effect of the modified soln. upon the uterus muscle observed. The effect of ions depends not alone on the ratio of K to Ca, but also upon the amt. of Na present W. D. L.

Adsorption of protein decomposition products by the form elements of guinea in vivo and in vitro. V. Influence of quinine upon the adsorption of diphtheria toxin by erythrocytes. B. SBARSKY AND L. SUBKOWA. *Biochem. Z.* 161, 406-15(1925). cf. C. A. 19, 3108.—Quinine *in vitro* is strongly bound by blood corpuscles and diminishes the power of the cells to adsorb protein hydrolytic products. By detg. the effect of injected quinine in prolonging the life of rabbits inoculated with diphtheria toxin, no such decreased adsorption of the toxin occurs. The difference is due to the fact that blood *in vivo* is in circulation. W. D. L.

Use of organic mercurials particularly mercurochrome. E. C. WHITE. *Am J. Pub. Health* 16, 153-5(1925). H. B. LEWIS

The effect of histamine on the blood chlorides. T. G. H. DRAKE AND F. F. TISDALL. *J. Biol. Chem.* 67, 91-100(1926).—Histamine has been suggested as the possible toxic agent in the intoxication of intestinal obstruction; a marked decrease in blood chloride has also been observed after the exptl. production of high intestinal or pyloric obstruction. Expts. performed to det. whether subcutaneous injection of histamine produces a reduction of the concn. of blood chlorides give evidence of a definite reduction which, however, bears no relation to the degree of intoxication. The reduction does not appear until the intoxication has been present for some hrs. and is not the result of a loss of Cl in the gastric secretion. A. P. LOTHROP

The antagonistic action of insulin and hypophyseal hormone on water content. I. SEREBRYSKI AND H. VOLLMER. *Biochem. Z.* 164, 1-8(1925); *Klin. Wochschr.* 4, 2256-7.—In expts. on urine secretion carried out according to Volhard's procedure both the pituitary hormone and insulin have an antidiuretic action. The combination of the 2 hormones, however, causes not a summation of their effects but a mutual inhibition so that pituitary and insulin together lead to a smaller water retention than pituitary alone. It is assumed that insulin inhibits centrally the blocking influence exerted by the pituitary on the kidney. S. MORGULIS

Quinine distribution in the organism of the dog. L. M. TCHAPKEWITCH. *Biochem. Z.* 164, 53-60(1925).—The essential feature of these expts. is the fact that by a special operative technic canulae were permanently inserted in the blood vessels leading to various internal organs and samples of blood could be painlessly collected at any time.

The quinine was detd. directly in the blood by the method of Giemsa and Schaumann. The liver and spleen were found to retain the largest amt. of quinine. Quinine leaves the organism in an unchanged state through the kidneys (30%) and this excretion commences a few min. after parenteral administration.

S. MORGULIS

The curve of the disappearance of bilirubin injected intravenously into dogs. J. P. BOUCKAERT AND R. APPELMANS. *Compt. rend. soc. biol.* 93, 843-5(1925).—Fifteen mg. of bilirubin injected intravenously into dogs causes a sudden rise of the bilirubin of the serum which disappears after 1-2 hrs. Following, however, mild P poisoning for several days, or ligation of the bile duct, the excretion of the bilirubin seems to be blocked.

S. MORGULIS

Studies of partial bromination of phlorhizin. III. KEIZO MISAKI. *J. Biochem.* (Japan) 5, 287-91(1925); cf. *C. A.* 20, 422.—The glucosuric effect of phlorhizin is greatly reduced by bromination. 0.2-1 g. of dibromophlorhizin in 5% Na_2CO_3 or in suspension in olive oil was injected into rabbits or dogs, the urine being collected after 6 hrs. by catheterization. The blood sugar was also studied. The expts. show that the blood sugar level remains unaffected by the administration of the dibromophlorhizin.

S. MORGULIS

A study of animal tissue respiration and the effects of insulin, adrenaline, thyroxin and hypophyseal preparations. GUNNAR AHLGREN. *Skand. Arch. Physiol.* 47, Supplement, 266 pp.(1925); cf. *C. A.* 19, 1901.—This extensive monograph is prefaced by a detailed description of the methylene blue method for the study of tissue respiration, and a general discussion of the various factors. From the study of the effect of insulin on tissue respiration it is concluded the utilization of glucose without the intermediate step of lactic acid depends upon the intactness of a triple system consisting of insulin + $\alpha\beta$ -glucose + glycomutin. The absence of insulin, as in pancreas diabetic condition, leads to acidosis; absence of glucose results from insulin intoxication; inactivation of the glycomutin occurs in phlorhizin poisoning where acidosis appears in spite of the presence of glucose and of insulin. The $\alpha\beta$ -glucose is not a direct H-donor, and for oxidative processes in the organism it is attacked either by preliminary splitting to lactic acid (without the aid of insulin) or through conversion to a highly reactive α -glucose under the combined influence of insulin and glycomutin. Glycogen and other polymers of glucose, fructose and galactose can be oxidized in the tissues without passing through the lactic acid intermediate stage and without the aid of insulin. Adrenaline like insulin also increases the rate of tissue oxidation. But the 2 hormones act as physiol. antagonists, probably because they affect differently the glucose transformation by glycomutin, thus: Insulin accelerates the change $\alpha\beta$ -glucose \rightarrow α -glucose, while adrenaline accelerates the change α -glucose \rightarrow $\alpha\beta$ -glucose. The exact nature of this chem. change is, of course, not understood, as is also the considerable stimulation of tissue oxidation by a small concn. of adrenaline. Thyroxin influences the respiration of muscle from thyroidectomized animals to the extent of increasing this to the level of normal muscle tissue. The smallest effective doses of the 3 hormones were as follows: for insulin, approx. 10^{-16} ; for adrenaline, 10^{-15} and for thyroxin 10^{-17} - 10^{-18} . Pituitrin, like thyrosin, also stimulates tissue oxidation. Unlike thyroxin, however, it loses its effect completely when the tissue has been preserved aseptically at room temp. for 2 hrs. In this respect pituitrin behaves like insulin; unlike insulin, its effect does not depend upon the presence of $\alpha\beta$ -glucose. Pituitrin concns. of 10^{-8} - 10^{-9} produce a rise of 25-30% in tissue respiration; at concns 10^{-4} - 10^{-5} inhibition instead of acceleration takes place; while the min. effective concn. is 10^{-11} - 10^{-12} . The study of the combined effect of 2 hormones gives the following result: insulin and adrenaline, insulin and thyroxin, adrenaline and thyroxin, adrenaline and pituitrin are invariably antagonistic to each other; insulin and pituitrin are synergic; while the combination of thyroxin with pituitrin produces sometimes antagonistic and sometimes synergic effects.

S. MORGULIS

Lethal poisoning by barium carbonate. DUFOUR. *Ann. méd. légale* 1, 29-33 (1921).—D. describes in detail the results of an autopsy performed after BaCO_3 poisoning, of interest on account of the rarity of such occurrences.

A. P.-C.

Elimination of alcohol from the organism of dogs accustomed to ingestion of alcohol. BALTHAZARD AND LARUE. *Ann. méd. légale* 1, 291-2(1921).—Contrary to Pringsheim (*C. A.* 3, 917) B. and L. found that in a dog which had been accustomed to take alc. its elimination took place in the same manner and required the same length of time as in a dog which had not been so accustomed.

A. PAPINEAU-COUTURE

Action of experimental alcoholism on testicles: histological and chemical study. ALEXANDRE KROSTITCH. *Thesis*, Strasbourg, 1921; *Ann. méd. légale* 2, 196(1922).—Chem. investigation showed that the testicle fixes more EtOH than the other important

organs. K.'s histological investigation shows that the seminal epithelium is particularly sensitive to the action of EtOH, which destroys the seminal cells in inverse order of their generation, the spermatogonia being the last to remain. The persistency of the generative layer renders possible the regeneration of the epithelium; but the seminal cells may suffer from alc. degeneracy, which may account for hereditary blemishes in the children of alcoholics. The interstitial gland resists alc. intoxication better than the seminal epithelium. Alcoholism can thus induce sterility without incapacity.

A. PAPINEAU-COUTURE

The localization of arsenic in acute experimental intoxication. A. LOPÈS D'AN DRADE. *Ann. méd. légale* 2, 229-30(1922).—The bulb and cerebellum retain the largest proportion of As and then, in decreasing order, the brain, the kidneys, the liver and the digestive organs (stomach and intestines). No appreciable difference was found when the poison was administered *per os*, hypodermically or intravenously. A. P.-C.

Elimination and fixation of therapeutic neoarsphenamine. E. KOHN-ARREST AND J. A. SICARD. *Ann. méd. légale* 2, 70-91(1922).—Examn. in 1911-18 of the viscera of 116 corpses taken at random from those which were sent to the morgue, but excluding those where death might have been due to As poisoning, showed: 99 contained not over 0.3 mg., 13 contained 0.3-0.8 mg., 3 contained 1-2 mg. and 1 contained 2.4 mg. As, in the whole of the viscera. Results are given of the examn. of the viscera of a no. of patients who had been given neoarsphenamine treatment, the exact history of which in each case was known, of the examn. of cerebrospinal fluid of patients undergoing treatment, and of the examn. of the viscera of rabbits after subjecting them to the treatment. *Conclusions:* (1) elimination of neoarsphenamine injected intravenously is very rapid, as much so as that of other arsphenamine preps., but when injected subcutaneously it is only about half as rapid; (2) the following organs contain As in increasing order of magnitude, lungs, intestines, spleen, kidneys, liver; the brain contg. practically none (not over 0.0002 g.) after intense intravenous treatment and somewhat more (0.0002-0.00075) after subcutaneous treatment; (3) presence of several mg. of As in the brain is an indication of As intoxication. In the interpretation of toxicological analysis, presence of up to 1 mg. of As in the whole of the viscera is of no importance; presence of 1-3 mg. would indicate a therapeutic As treatment; presence of 3-7 mg., with due regard to its distribution, may be merely an indication of a neoarsphenamine treatment dating back 2-25 days, the As being in the course of natural elimination; presence of 0.1 g. or more indicates poisoning. A. PAPINEAU-COUTURE

Clinical experimenting with intarvin. STERN. *Med. Klin.* 21, No. 26(1925). *Bull. soc. hyg. aliment.* 13, 524(1925).—Clinical tests on 5 diabetic patients did not prevent aggravation of the disease: in every case there was an increase in the acetone compds. in the blood. Intarvin was found to be disagreeable to the taste, and some of the patients could not tolerate it. A. PAPINEAU-COUTURE

Action of the base tropine (tropanol) on the circulation. RENÉ HAZARD AND L. J. MERCIER. *Compt. rend.* 181, 934-6(1925).—Tropine injected intravenously into the dog in doses of 0.01 to 0.05 g. per kg. produces a marked lowering of the blood pressure, a const. slowing of the cardiac rhythm and an increased amplitude of the cardiac pulsations. L. W. RIGGS

Double hyposulfite of gold and sodium in the treatment of syphilis. L. FOUYNIER AND P. MOLLARET. *Compt. rend.* 181, 943-5(1925).—Au Na hyposulfite has a strong antisyphilitic action when given in frequent doses of about 1 g. Its administration is followed by a disappearance of treponemes, the rapid cicatrization of sp. lesions and an attenuation or even disappearance of the Bordet-Wassermann reaction. In doses of 0.5 g. or less its action is slower and sometimes doubtful. L. W. RIGGS

Action of yohimbine and of the active alkaloids of ergot on the vaso-motor sympathetic innervation of the kidney. RAYMOND-HAMET. *Compt. rend.* 182, 170-3(1926).—Apart from yohimbine the active alkaloids of ergot (ergotamine, ergotoxine, ergotinine) are alone in different degrees, able to cause the paralysis of the renal vaso-constrictor and this action is proposed as a physiol. measure of the activity of the exts. of ergot. L. W. RIGGS

Effect of nicotine upon the adrenaline output from the suprarenal glands. TADASHI SUGAWARA. *Tôhoku J. Exptl. Med.* 6, 430-58(1925).—Cats were used in all the expts. Nicotine, intravenously injected in doses of 0.025 to 0.5 mg. per kg., caused a briefly continued increase of the adrenaline output. This increase, which continued not longer than 2 min., was followed by a depressant stage which lasted many min. At the time of max. depression no adrenaline could be detected in some cases. The effect of nicotine subcutaneously administered in doses of 0.4 to 1.0 mg. per kg. is of the same nature but inferior and the duration of the accelerating stage is somewhat longer. The ad-

renaline output of the cats, the splanchnic nerves of which were then or previously divided, showed the same tendency toward nicotine. Nicotine acts on the supranrenal medulla itself.

L. W. RIGGS

Gas metabolism and minute volume. II. Vegetative nervous system. TSUROMU ODAIRA. *Tôhoku J. Exptl. Med.* 6, 523-33(1925); cf. C. A. 20, 241.—Rabbits were used in all these expts. Intravenous injection of 0.2 to 0.55 mg. per kg. atropine sulfate was followed by no change in O consumption, but the minute volume (m. v.) was quite strongly increased. From 1.0 to 2.0 mg. pilocarpine per kg. given intravenously reduces the gas exchange and to a much greater degree the m. v. Thus the diminution of the gas exchange by pilocarpine is secondary to the lowering of the blood circulation. The action of pilocarpine upon gas exchange and m. v. is completely neutralized by atropine. Intravenous injection of choline in doses of 2-5 mg. per kg. reduces the gas exchange alone, but doses of 10 mg. per kg. reduced both gas exchange and m. v. Atropine neutralizes the action of choline. **III. Gas metabolism and minute volume during heat-puncture hyperthermia; and the influence of antipyretics, inner secretions and vegetative nerve poisons on both.** *Ibid* 534-65.—Heat-puncture hyperthermia is accompanied by an increase of gas metabolism and m. v. The administration of quinine to rabbits previously subjected to heat-puncture caused a lowering of body temp., gas metabolism and m. v.; atropine caused a similar but less pronounced lowering. Na salicylate caused a fall in body temp. but acted only slightly on the other factors. Adrenaline in doses of 0.025 to 0.5 mg. per kg. caused a pronounced decrease in gas metabolism and m. v. Atropine, which had no effect on the gas exchange of the normal rabbit, caused an increase in the gas exchange and m. v. in the heat-punctured animal. Pilocarpine and choline lower the gas exchange, body temp. and m. v. of heat-punctured rabbits. Pituitrin lowered the temp. and gas exchange more in heat-punctured than in normal rabbits. On the contrary the m. v. is less changed than with normal animals. Insulin lowered the temp. of heat-punctured rabbits, but had less effect on the gas exchange and m. v. than was the case with normal animals.

L. W. RIGGS

Non-volatile aliphatic compounds in general anesthesia. R. K. LAMBERT. *Lancet* 1925, I, 121-3.—Non-volatile aliphatic compds. in general and more particularly a mixt. of isopral and hedonal are recommended as anesthetics. The completion of anesthesia by gases may be facilitated and the duration of their use reduced by a preliminary use of these anesthetics.

F. B. SEIBERT

The therapeutic properties of stovarsol (acetylaminophenylarsinic acid "190"). C. LEVADITI. *Lancet* 1925, II, 593-5.—Administration by mouth proved successful in syphilis, yaws, spirillary infections in general, ameboid dysentery, intestinal lamblia-sis, blastocystic diarrheas and malaria.

F. B. SEIBERT

The efficacy of tryparsamide in the cure of African sleeping sickness. C. C. CHESTERMAN. *Lancet* 1925, II, 965-7.

F. B. S.

Experimental and clinical investigations of mercurochrome. A. T. TODD. *Lancet* 1925, II, 1017-19.—Mercurochrome is a powerful antiseptic of low toxicity, rapid and deep penetrability and causes little irritation. It does not ppt. albumins and is stable for long periods in normal NaCl soln. Its antiseptic properties are augmented by acidity and are diminished by increased density of solvent and are, therefore, relatively feeble and unlikely to be of value in general infections where acidities are near to normality.

F. B. SEIBERT

Novasurol: a new diuretic. A. R. GILCHRIST. *Lancet* 1925, II, 1019-21.—It is a diuretic of great value in cardiac failure.

F. B. S.

Margosa oil in the treatment of cancer. K. K. CHATTERJI. *Lancet* 1925, II, 1063-5.—The ethyl ester of margosic acid and Cu margosate with or without irradiation are recommended in the treatment of cancer.

F. B. S.

Borocaine: a new local anesthetic. E. WATSON-WILLIAMS. *Lancet* 1926, I, 16-7.—Exptl. methods of estg. toxicity and efficiency showed 3 drugs to be in the proportion—cocaine-HCl, 1; novocaine, 0.15; borocaine E, 0.09. The efficiency of the drugs as measured by the production of deep anesthesia in the nose, after application to the mucous surface, is in the proportion—cocaine-HCl, 1; novocaine, 0.11; borocaine, 0.09.

F. B. SEIBERT

Methemoglobin restitution. III. Experiments in the living animal. KYUICHI SAKURAI. *Arch. exptl. Path. Pharm.* 109, 214-32(1925); cf. C. A. 20, 442.—In fatal aniline intoxication of cats the administration of thiosulfate has a favorable influence upon the symptoms accompanying the disturbance, and the formation of methemoglobin is reduced. Nevertheless the treated animals die, probably because of an effect on the central nervous system. In nitrite intoxication of cats the intravenous injection of thiosulfate has an unquestioned favorable effect on the non-narcotized animal.

The number of animals which survive a lethal dose are greatly increased. In narcotized animals thiosulfate injected intravenously markedly reduces the percentage of methemoglobin in the blood. With large doses of nitrite (0.035 g. per kg.) thiosulfate therapy is of no value. In rabbits no comparable therapeutic effects can be observed.

G. H. S.

Action of strontium ions on the heart in cold-blooded and warm-blooded animals. S. HIRSCH AND ALB. OPPENHEIMER. *Arch. expl. Path. Pharm.* **110**, 89-102(1925).—The frog heart arrested by NaCl soln. regains its activity by substituting a Sr-contg. soln. Ringer soln., in which the Ca is replaced by equimol. amts. of Sr, is less effective than is a normal Ringer soln., or a K-free Sr soln. The diminished effectiveness of Sr under these conditions, as compared with Ca, is in part due to the fact that Sr exerts a weaker antagonistic effect toward the paralyzing action of K than does Ca. Doubling the Sr content of the soln. renders it more effective. As regards the duration of activity of the frog heart no Sr combination is equiv. to normal Ringer soln. Continued perfusion of the rabbit heart with a Sr soln., in which Sr is substituted for Ca, causes a reduction in amplitude, a lengthening of systole, a shortening of diastole, a marked retardation of pulsation and often arrhythmia. Prolonged perfusion with K-free Sr-Locke soln. leads to the same changes, but they are abolished by injections of Ca. The reduction of frequency caused by Sr is apparently due to the action of the Sr on the heart muscle itself. When Ca or Sr is introduced directly into the canula through which normal Locke soln. is flowing it appears that about 2 times as high a concn. of Sr as of Ca must be injected to obtain the same systolic effect upon the normally beating heart. Continued perfusion with a Locke soln. contg. Sr causes a marked contraction. Expts. on both the frog and the rabbit heart clearly indicate the Sr is in no way superior if it is equal, to Ca in the effects produced.

G. H. S.

Effect of choline and some choline esters on the blood pressure after extirpation of the adrenals. S. GLAUBACH AND E. P. PICK. *Arch. expl. Path. Pharm.* **110**, 212-24 (1925).—Cholazyl (a chloroacetylcholine chloride-urea compd.) induces a fall in blood pressure in a concn. which is $1/10$ that of the choline necessary to exert a comparable effect. After treatment with atropine an increased blood pressure can be produced with $1/4$ to $1/6$ as much cholazyl as choline. In most instances where a bilateral adrenalectomy has been performed cholazyl fails to cause an increased blood pressure or if it occurs it is much weakened, while after a like surgical treatment choline as a rule causes the characteristic increased pressure. Even unilateral adrenalectomy reduces the pressor property of cholazyl. After adrenalectomy the amt. of cholazyl necessary to increase blood pressure is 4 times the normal effective dose, the effect resembling a nicotine-like stimulation of the sympathetics. A reaction of this type is not induced by choline nor by a normally active dose of cholazyl. In both normal and adrenalectomized animals ergotamine reverses the action of cholazyl as to its power to increase blood pressure; as is also the case with adrenalectomized animals which have undergone nicotine paralysis.

G. H. S.

Point of attack of insulin. E. FRANK, M. NOTHMANN AND A. WAGNER. *Arch. expl. Path. Pharm.* **110**, 225-40(1925).—In the animal with pancreatic diabetes, also under the influence of insulin, the tissues, particularly the muscle, withdraw increased amts. of sugar from the blood. This indicates a peripheral effect of insulin, rendering it highly probable that in the diabetic animal the sugar balance in the muscle is impaired.

G. H. S.

Analysis of the vascular effects of medicinal substances. I. G. GANTER. *Arch. expl. Path. Pharm.* **110**, 317-38(1926).—Detn. of the relative size of the vessels was made by detg. the rapidity of the fall in pressure in an arterial bed by compression for a few secs. of the chief artery leading in from the general circulation. The pressure due to closure of the vascular bed falls only to a fixed point if the test is made during the period of increased pressure consequent to adrenalectomy.

G. H. S.

Thoracic duct lymph of dogs. IV. Effect of oral administration of sugar and the intermediary water and ion movement. ROBERT MEYER-BISCH AND FRANZ GÜNTHER. *Arch. ges. Physiol.* (Pflüger's) **210**, 763-80(1925); cf. *C. A.* **19**, 3544.—The thoracic duct lymph and the blood were studied in dogs after the oral administration of dextrose and levulose. Changes in both blood and lymph occurred regularly, referable in large part to reduction in water, being revealed in the blood by an increase in hemoglobin, red cells and serum albumin, in the lymph by a reduced flow of lymph with a coincident increase in its content of protein, K and Ca. The Cl content of the lymph remained unchanged or slightly decreased. In the animals to which sugar had been given the infusion of hypertonic NaCl solns. altered the flow and compn. of the lymph in a manner entirely unlike its normal effect. The increased lymph flow, as well as the diln., is

lacking, despite the fact, as shown by the Cl values, that a very considerable hyperosmosis occurred. The factors increased by the sugar are restored to normal. In the blood, however, a diln. occurs just as in an untreated animal. Obviously the distinctive lymphagog action of intravenously administered hypertonic NaCl is prevented by the ingestion of sugar. G. H. S.

Relations between chemical constitution and irritation. E. G. PRINGSHEIM AND F. MAINX. *Naturwissenschaften* 13, 1090(1925).—It was previously found that the flagellate *Polytoma wella* occurring in decaying protein solns. lives on bacterially deaminized fatty acids. It was now found that many aromatic and aliphatic compds. (acids, alcs., oxyacids, aldehydes and ketones) also attract it by chemotaxis, even though they are in several cases undigestible. Maximal attraction was observed for compds. with 4 C atoms in every homolog series independent of ramification of the chain. Substitution of H by Cl influences the chemotaxis only slightly; OH instead of H causes it to decrease considerably. Polyvalent acids and alcs. are inactive (e. g., sugars). No relation between this phenomenon and the phys. properties (state of ionization, soly.) of the substances could be found. B. J. C. VAN DER HOEVEN

DIXON, WALTER E.: *A Manual of Pharmacology*. 6th ed. revised. London. E. Arnold. 490 pp. 18s.

DUPUIS, ALBERT: *Contribution à l'étude de l'action de la pilocarpine dans les rétentions d'urine d'origine nerveuse*. Paris: A. LeGrand. 60 pp.

HANSEN, KLAUS: *Zur Theorie der Narkose. Untersuchungen über die Verteilung der indifferenten Narkotika in dem tierischen Organismus*. Oslo: Olaf Norh. 262 pp. Kr. 15.

NICLOUX, MAURICE: *L'oxyde de carbone et l'intoxication oxycarbonique*. Paris: Masson & Cie. 254 pp. Fr. 22.

I—ZOOLOGY

R. A. GORTNER

Induction of melanism in the Lepidoptera and its subsequent inheritance. J. W. H. HARRISON AND F. C. GARRETT. *Proc. Roy. Soc. (London)* 99B, 241-63(1926).—Melanism may be induced (1) by introduction of non-melanic strains of insects from unaffected into melanic areas and feeding upon the local food plants, or (2) by feeding insects in non-melanic areas with food plants artificially charged with certain metallic compds. such as $Pb(NO_3)_2$ or $MnSO_4$. Melanism of the most pronounced type, which is thus induced, is then inherited as a simple Mendelian unit character. J. S. H.

New study on natural and cultural pearls. L. BOUTAN. *Ann. sc. nat. (Zool.)* 6, 1-91(1923); *Physiol. Abstracts* 10, 205-6.—Pearls are formed of an org. framework secreted by epithelial cells (ectodermal), permeated by a deposit of Ca carbonate secreted by migratory cells of mesodermal origin. There is no difference in the mode of formation, compn. or surface structure between natural and cultural pearls. H. G.

The action of ions present in sea-water on certain invertebrates. C. HEYMANS. *Arch. intern. pharmacodynamie* 29, 123-40(1924); *Physiol. Abstracts* 10, 143.—It is shown that in the medusa, *Pelagia noctiluca*, there is a balanced action of Ca, Mg, Na and K on the rhythmic pulsations and on the luminescence. Similar investigations on ion balance in other invertebrates are also described. H. G.

Adaptation of tadpoles to the chemico-physical conditions of their surroundings. A. CLEMENTI. *Atti accad. Lincei* 38, II, 427-30(1924); *Physiol. Abstracts* 10, 143.—Tadpoles die out if kept in hypertonic solns. of saccharose, while they survive in hypertonic solns. of urea or Ringer's fluid of the same mol. concn. In establishing the conditions under which tadpoles may live in solns. of crystalloids, besides the osmotic pressure, the chem. properties of the substances dissolved in the medium should also be taken into account. The present observations have an analogy with those of Overton on the neuro-muscular prepn., and of Baglioni on the isolated central nervous system of amphibia, the excitability of which disappears sooner in isoosmotic solns. of glucose or saccharose than in isoosmotic solns. of NaCl. H. G.

The oxygen requirement of certain aquatic animals and its bearing upon the source of their food supply. W. J. DAKIN AND C. M. G. DAKIN. *Brit. J. Exptl. Biol.* 2, 293-322(1925); *Physiol. Abstracts* 10, 231.—Expts. on goldfish did not support Putter's well-known hypothesis that fish under approx. natural conditions can and do obtain $1/2$ or more of their food requirements by the absorption of dissolved org. matter in the external medium. Addn. of asparagine and glycerol to tap water did not make any difference to the duration of life of goldfish deprived of particulate food, nor was the O consumption (detd. by Winkler's method) affected. Similar expts. were performed

on fresh-water mussels and axolotls. Putter's hypothesis of the nutrition of marine animals is criticized. H. G.

Studies on the comparative physiology of digestion. III. Secretion, digestion and assimilation in the intestine of *Ciona*. C. M. YONGE. *Brit. J. Exptl. Biol.* 2, 373-88(1925); *Physiol. Abstracts* 10, 221.—The histology of the alimentary tract in the tunicate *Ciona* is described in detail. Exts. digest starch, glycogen and sucrose, but not raffinose, cellulose, lactose or maltose. The optimum temp. of the amylolytic enzyme is between 42° and 43°, and it is destroyed at 64°. A lipolytic enzyme, and an enzyme which digests salicin and amygdalin, are present. Proteolytic digestion was only obtained in alk. and neutral medium with formation of albumoses, and no trace of amino acids was obtained after 14 days' digestion. Absorption mainly occurs in the mid intestine. Fat and glycogen are the principal storage products. H. G.

Temperature of heart rate in *Pterotrachea* and *Tiedemannia*. O. GLASER. *J. Gen. Physiol.* 9, 269-84(1925).—The thermal increment (μ) for intermediate temps. was 11,200 μ for *P. coronata* and 16,200 μ for *T. neapolitana*. At high temps., the values were 7300 and 7400, resp., whereas at lower temps. they were 22,000 and 23,000, resp. The theoretical application of the exptl. facts is discussed. C. H. R.

Variations in the internal p_H of the sea urchin egg during fertilization and division. P. REISS. *Compt. rend.* 181, 936-8(1925); cf. *C. A.* 19, 862.—The egg was crushed in a soln. of bromocresol purple while under view with the microscope. Tests with the unfertilized egg of *Paracentrotus lividus* Lk. showed an increase in the acidity from p_H 5.57 to 5.4. Upon fertilization the acidity diminished in a rhythmic manner, the max. points of acidity coinciding with the 1st, 2nd, 3rd and 4th divisions. L. W. RIGGS

Biologic action of X-rays of different wave lengths. A. DAUVILLIER. *Compt. rend.* 181, 1130-2(1925).—A criticism is made of Dognon's paper (cf. *C. A.* 19, 3326) particularly the method of measurement of the rays. L. W. RIGGS

The genesis of urates in the cells of orthopteracridians. CH. HOLLANDE. *Compt. rend.* 181, 1175-6(1925).—It was shown in 1914 that the urates in the adipose cells of Lepidoptera at the time of metamorphosis form around the nucleus and are not in the blood of the insect. The urates in Orthoptera are found in the protoplasm of cells specifically called *urate cells*, which are in intimate relation to the adipose cells. Injection of Na or NH_4 urate into the blood of the insect does not increase the urates in the urate cells, from which it is concluded that like the Lepidoptera, Orthoptera does not deposit urates from the blood, but that the urates are elaborated within the cell. L. W. RIGGS

Action of aqueous extracts and salts of eggs of the species on the spermatozooids of the russet frog (*Rana fusca*). H. BARTHÉLÉMY. *Compt. rend.* 181, 1183-6(1925). In no case was the presence of lysine or other substance of female origin found harmful to the male elements. Except in the cases in which the excess of NaCl, of salts or of KCN and the gang manifested their action, the exts. of the eggs were clearly favorable to the activity of the spermatozooids and to the prolongation of their life. The concn. in mineral and org. materials in the perivitellin liquid is the cause of the monospermia of normal eggs of the russet frog. L. W. RIGGS

Salinity of inshore oceanic waters of Australia, in relation to fishes. W. J. PHILLIPS AND F. J. T. GRIGG. *Proc. Linn. Soc. N. S. Wales* 50, 432-7(1925).—Analyses for the chloride content of samples of sea water from the shores of Australia and of New Zealand are given. Fresh water from rivers or rain destroys or retards the growth of certain marine organisms which help to form the ultimate food of fishes. The percentage of fishes which enter brackish water from choice is very small. The largest fishing grounds are away from the mouths of large rivers. L. W. RIGGS

Present pigmentary problems. II. Relation of pigmentation to digestion. Interpretation of cases of homochromia. JEAN VERNE. *Rev. gen. sci.* 36, 705-11(1925). cf. *C. A.* 20, 928.—A review of the work of others and some exptl. results of V. on various lower organisms are given. L. W. RIGGS

Action of dyes used in paper making on the animal life of streams (HAEMPEL) 14.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Food Investigation Board, report for the year 1924. *Dept. Sci. Ind. Research* 1925.—The titles and authors of the principal studies of the year 1924 are given in this abstract. A few of the papers have appeared in scientific journals and many of them refer to in-

completed research work. The theory of freezing: I. Effect of the rate of cooling and thawing upon the final distribution of water in a gelatin gel. T. MORAN AND H. P. HALE. 5-12. II. The velocity of ice crystallization through supercooled gelatin gels. F. H. CALLOW. 12-4. III. Changes of state in white and yolk of hens' eggs which have been frozen, and the effect of temperature upon the life of the egg. T. MORAN. 14-5. IV. Osmotic pressure of solution of protein. G. ADAIR. 16. Preservation of eggs and meat. I. The preservation of eggs. T. MORAN AND J. PIQUE. 16. III. The lactic acid production in muscle. D. L. FOSTER. 16-7. IV. Succinic acid in muscle. D. M. NEEDHAM. 17-9. V. Conditions governing the growth of *Staphylococcus aureus*. G. S. GRAHAM-SMITH AND F. W. FOREMAN. 20-5. The preservation of fruit and vegetables. Research work. I. The course of respiratory activity throughout the life of an apple. F. KIDD AND C. WEST. 27-32. II. Chemical changes in cold-stored apples and their relation to respiratory activity and the onset of internal breakdown. F. KIDD, C. WEST, D. HAYNES AND MISSES JUDD AND ARCHBOLD. 33-4. III. The rate of loss of acidity during senescence of the apple in storage. D. HAYNES. 34-5. IV. The nitrogen content of stored apples. H. ARCHBOLD. 35. V. A correlation between acidity and nitrogen content in samples of apples from different localities. D. HAYNES AND H. ARCHBOLD. 35. VI. A correlation between amount of protoplasmic nitrogen and respiratory activity. F. KIDD, C. WEST AND H. ARCHBOLD. 35-6. VII. The presence of an undetermined volatile substance in the apple, which decreased in amount during senescence in storage. H. ARCHBOLD. 36-7. VIII. The presence of glycerol in apple tissues during senescence. H. M. JUDD. 37. IX. Changes in the pectic constituents of apples during senescence in storage. M. H. CARRÉ. 37-8. X. Microchemical studies of the senescent tissue of the apple. M. H. CARRÉ AND A. S. HORNE. 38-9. XI. Changes in the pentose-sugar content of the juice of apples during senescence in storage. H. M. JUDD. 39-40. XII. Volatile products of metabolism in the apple other than carbon dioxide. M. THOMAS. 40-2. XIII. Fungal invasion in relation to senescence. M. N. KIDD. 43. XIV. The mortality curve in a population of apples. M. N. KIDD. 43-6. XV. Factors affecting the internal resistance of apple tissues to fungal attack. A. S. HORNE. 46-8. XVI. Chemical factors responsible for the internal resistance of apple tissues to fungal attack. A. S. HORNE. 49-51. L. W. RIGGS

The problems of flour milling chemistry. R. J. CLARK. *Northwestern Miller* 145, 572(1926).—It is necessary that the successful mill chemist have exact knowledge of his raw material, its conversion into flour, and the proper way to handle the flour to produce the max. results. The wheat kernel contains starch, fat, potash, soda, lime, magnesia, proteins, moisture, enzymes, vitamins, various acids, cellulose, sugars and lecithin. Any one of these subjects offers a topic for research, also a chemist must test commodities used by the mill such as lubricating oil, soap, paint, water and coal. Upon flour the chemist tests for moisture, ash, protein and frequently viscosity and hydrogen-ion determinations are also made. Some quick test is needed to furnish information on the quality of wheat before it is milled. L. H. BAILEY

Irrigation as a factor in modifying the composition of grain. J. E. GREAVES. *Northwestern Miller* 145, 658(1926).—Expts. conducted at the Utah Agr. Expt. Station show that wheat, oats and barley grown on irrigated land contain less protein than those grown on non-irrigated, but the ash content is the reverse. The P, K, Ca and Mg contents of grains grown on the irrigated lands are increased. Considering the extent to which irrigation water has modified the mineral elements in these grains, it is easy to see how a ration of irrigated grain would carry sufficient Ca and P if fed to swine to produce strong normal bones, which is not the case with corn alone. L. H. BAILEY

Effect of fine grinding upon flour. C. L. ALSBERG AND E. P. GRIFFING. *Cereal Chemistry* 2, 325-44(1925).—Over-fine grinding of flour reduces the baking quality. The authors sought an explanation of this by detg. the effect on cold water ext. of the flour, the rate of diastatic conversion of starch in flour, the effect on quantity and quality of gluten washed from flour, and the extent to which overgrinding injured the baking strength. They found that overgrinding injures the starch granules so that a part of the starch swells and disperses when the flour is doughed. Cold H₂O ext. is increased because of the dispersed starch. There is increased diastatic starch inversion and consequently an increased initial rate of fermentation follows. Severe overgrinding injures flour for baking purposes despite increased absorption due to swelling of starch granules. Evidence is presented that it also injures the gluten. Moderate overgrinding may injure the starch granules without much affecting the gluten. In 1 flour examd., absorption was appreciably increased without a material effect upon the baking strength. RUTH BUCHANAN

Correlation of test weight per bushel of hard spring wheat with flour yield and other factors of quality. C. E. MANGELS AND T. SANDERSON. *Cereal Chemistry* 2, 365-9(1925).—The use of the test wt. per bushel as a grading factor is justified by its relation to flour yield and to a lesser extent by the relation of test wt. to color of flour or bread. Test wt. and flour yield show a high positive correlation. Test wt. and color of bread show a positive correlation. But the coeff. varies with different crops. No significant correlation is found between test wt. and loaf vol. on water absorption of flour and test wt.

RUTH BUCHANAN

Comments on the use of calcium acid phosphate as an improver of soft wheat biscuit flour. G. L. ALEXANDER. *Cereal Chemistry* 2, 370-9(1925).—Four flours were divided into 4 portions and stored for 3 months. In 1 portion of each flour was incorporated 0.5% of CaHPO_4 and in the other 3 portions of each flour were incorporated resp., 1.00% and 1.50% acid phosphate and a standard leavening formula. Portions of the plain flours were used as controls. At the end of 3 months it was found that in the bleached flours contg., resp., 1.0% and 1.5% of added phosphate, a slight disagreeable odor prevailed. The unbleached flours contg. 1.5% added phosphate had a slight odor. All other samples were sweet. Tests indicate that sound flours under normal conditions of storage will not deteriorate in a reasonable time if treated with not over 1.0% of CaHPO_4 . Unbleached flours can carry the action of somewhat more added phosphate than bleached flours. Baking tests with flours contg. 0.5% added phosphate and 1% added phosphate were found to improve the dough quality, biscuit vol., crumb texture and color. One % added phosphate showed more improvement than 5% but principally on crumb color. Lactic acid was found to improve biscuits also. Lactic acid does not increase the adsorption of dough as phosphate. Effect of phosphate is believed to be due to increase of H-ion concn.

RUTH BUCHANAN

Wheat and flour studies. V. Plasticity of simple flour in water suspensions. P. F. SHARP. *Cereal Chemistry* 3, 40-55(1926).—An app. much more simple and less costly than the usual app. for detg. plasticity is described. A particular flour-in-water suspension was found to be plastic when it contained 9% or more of flour by weight on the dry basis. A bibliography is given.

RUTH BUCHANAN

Detection of minute amounts of naphthalene in flour. A. K. EPSTEIN AND B. R. HARRIS. *Cereal Chemistry* 3, 60-2(1926).—A reliable method is described for the detection of naphthalene in flour in concn. as low as 1.5 to 1.0 parts of naphthalene per 100,000 parts of flour. This is based on a 50-g. sample of flour. By using larger sample, smaller quantities of naphthalene might be detected.

RUTH BUCHANAN

(Flour) ash. H. L. THOMPSON. *Am. Miller* 54, 160(1926).—The ash of a patent flour contains approx. P_2O_5 50, K_2O 35, CaO 7, MgO 7, Na_2O $\frac{3}{4}$ and Fe_2O_3 $\frac{1}{2}$ %. The Mg increases in the lower grades while the Ca decreases. The other constituents remain almost const. The percentage of ash is only indicative of flour grade. Usually a flour with high ash content is low in grade. There is no close correlation between the ash content and baking quality. Ash detn. is of great value in the control of the operation of a mill. Ash content of flour depends on (1) the ash content of the wheat (2) the cleaning of the wheat, (3) tempering, (4) grinding, (5) bolting or sifting, (6) operation of the purifiers, (7) proper sepn. and blending of the mill streams. A method is given for making an ash detn. of flour.

L. H. BAILEY

(Flour) ash—its determination and significance. C. O. SWANSON. *Am. Miller* 54, 70-1(1926).—There is an annual variation in the ash content of wheat. Light test weight wheat has more ash than heavy. As wheat ripens the kernel fills out decreasing the proportion of bran to endosperm, and since this has less than one-tenth as much ash as the bran, the percentage as a whole decreases. High ash in flour may be traced to two sources: first, the bran specks which are made fine enough to pass the flour bolting cloth; and second, the fine invisible material high in ash. This latter does not seem to affect the color value, while the former does. The effect on color is no doubt the greatest objection to high ash. A high-ash flour is dark colored compared with a low-ash flour. The dark specks or dark color are associated with lack of purity in flour. Proper humidity control maintains toughness in the bran and prevents its pulverization, and hence produces a flour with low ash content. The same mineral elements present in wheat are present in flour only in smaller amts. Wheat is deficient in Ca, one of the important mineral elements needed by the body.

L. H. BAILEY

Determination of the ash content of flour. A. GOSKE. *Z. Nahr. Genussm.* 50, 428-9(1925); cf. *C. A.* 19, 3327.—1.5 g. of finely powd. pumice is calcined in a small Pt dish, cooled, and 0.8-1.0 g. flour is added. After moistening and stirring, the mixt is heated over a low flame, then over a stronger flame and finally in a muffle furnace. The dish is cooled, weighed, and may be used for a second detn.

W. J. H.

The nutritional deficiencies of whole wheat flour. E. M. NELSON AND W. H. STROWD. *Northwestern Miller* 145, 896(1926).—Authorities are quoted showing that wheat and other seeds are deficient in Ca, P, Na and Cl as well as vitamins. It is scarcely practicable for a man to eat enough leafy foods to enable him to succeed with a strictly vegetable diet. Lack of sufficient Ca is one of the most important deficiencies in such a diet, and a great abundance of leaf is necessary to supply this element in adequate amounts. Self-rising flour contains approx. 9 times as much Ca and 2.25 times as much P as entire wheat flour. Foods prepd. from self-rising flour will help eliminate deficiencies in the American diet.

L. H. BAILEY

Some factors influencing the strength of wheat and flour. J. S. REMINGTON. *Ind. Chemist* 2, 35-8(1926).—The writer's methods for detg. wet and dry gluten and method of testing stretch of gluten are given. Method of testing the flour by making a dough of flour, H₂O and yeast is described.

RUTH BUCHANAN

The nutritive value of Philippine cereals. I. The vitamin B content of glutinous rice, dead rice and adlay. F. O. SANTOS AND E. G. COLLADO. *Philippine Agr.* 14, 473-7(1926).—The compn. of the dead rice, glutinous rice and adlay was H₂O 13.65, 13.27 and 12.92; ether ext. 0.60, 0.33 and 1.46; ash 0.91, 0.30 and 1.15; protein 9.34, 5.66 and 10.46; crude fiber 0.38, 0.20 and 0.51; and carbohydrates 75.14, 80.24 and 73.50 %, resp. Glutinous rice and adlay supplied sufficient vitamin B for the growth of rats and dead rice did not. Six citations are appended.

A. L. MEHRING

Residual sugar of bread. C. B. MORISON. *Baking Tech.* 4, 328-30; *Cereal Chemistry* 2, 315-7(1925).

RUTH BUCHANAN

Some variable factors of bread production. C. G. HARREL. *Cereal Chemistry* 3, 1-18(1926).—Trouble in bread making is due not to the flour but to certain variables not properly controlled. Absorption, correct panning, time and speed of mixing and temp. of the finished dough are factors to be watched carefully. Fermentation is the most important single factor in bread production. Factors affecting fermentation vary according to whether there is a straight or sponge dough. A scientific discussion of fermentation of both doughs is given. The action of acids in the dough is of great importance. From a bread-producing standpoint this necessitates a classification of the dough ingredients into (1) factors resisting an increase in acid formation, the buffer value of the dough; (2) forces tending to overcome this buffer value, chiefly the yeast and acid accelerating salts. Measurements of these factors are given.

RUTH BUCHANAN

Organic acids in doughs. A. H. JOHNSON. *Cereal Chemistry* 2, 345-64(1925).—The factors involved in the increase of the acidity of flour-water suspensions, cracker sponges, and bread doughs fermented with yeast are (1) CO₂ produced by yeast, (2) acid phosphate salts produced by phytase-phytin phenomena, and (3) org. acids produced by the yeast or other organisms present in the media. CO₂ produced by yeast and acid phosphate salts resulting from phytase acidity have very slight effect on the final acidity of flour-water suspensions and cracker sponges fermented with yeast. CO₂ present in a bread dough is the most important single factor affecting its H-ion concn. and titratable acidity. Lactic and acetic acids are the only org. acids found in flour preps. fermented with yeast. Lactic acid occurring in the flour-water suspensions represents 70-96% of the org. acid present, the remainder being acetic acid. The proportion of acetic acid appears to increase with increase of fermentation period. Lactic acid varies from 78 to 95% of the org. acid of a cracker sponge and acetic acid constitutes the remainder. A bibliography is given.

RUTH BUCHANAN

A study of the determination of the neutralizing value of monocalcium phosphate. HOWARD ADLER AND G. E. BARBER. *Cereal Chemistry* 2, 380-90(1925).—The present methods of detg. the neutralizing value of monocalcium phosphate have been studied with a view to estg. their merit in calcg. the proportions of phosphate and carbonate to be used in baking. Titration methods can be used for these requirements. The method which involves the detn. of the ion concn. of the baking powder residue does not give applicable results and further does not take into consideration the nature of the reacting substances. Exptl. evidence has been advanced to show that the reaction between monocalcium phosphate and soda does not stop at a p_{H} of 7.0 nor at the dicalcium stage. It is shown that dicalcium phosphate can be used as a baking acid, giving satisfactory products when constituting up to 25% of the baking powder. Within the limits of baking practice residual CO₂ does not indicate undecomposed soda and is not directly related to the p_{H} of the residue. Residual CO₂ is present to a large extent in an insol. form.

RUTH BUCHANAN

Method for a graphic record of texture, volume and contour of cakes. ALICE M. CHILD AND DAISY I. PURDY. *Cereal Chemistry* 3, 57-60(1926).—Mix together thoroughly.

equal parts of mimeograph ink, glycerol and H_2O . Cut a piece of blotting paper slightly larger than the piece of cake of which a print is to be made. Allow the blotter to absorb all the ink mixt. Place this, ink side up, on a board and work the ink into the blotter with a camel's hair brush. By means of thumb tacks stretch tightly a piece of thin, soft, smooth, even-textured cloth over this. Allow it to stand 5 or 10 min. to absorb ink. All excess ink should be wiped off. Cut a piece of cake, $\frac{1}{2}$ to $\frac{3}{4}$ in. in thickness, with a clean cut surface. Using the slice of cake as a stamp and the blotter as a pad press lightly with the tips of fingers over the whole surface in order that every cell may have a film of ink. Transfer the cake to the paper on which the print is to be made. Illustrations are given.

RUTH BUCHANAN

The standardization of the methylene blue test for milk control work. E. G. HASTINGS. *13th Ann. Rept. Intern. Assoc. Dairy Inspectors 1924*, 268-75.—H. compares foreign and American tablets. H. recommends tablets of $\frac{1}{2}$ and $\frac{1}{4}$ strength of foreign to prevent loss by spoilage of soln. H. classifies milk according to time of reduction

GEORGE R. GREENBANK

The use of eosin methylene blue culture medium in milk examination. MRS. EDITH L. MOORE. *13th Ann. Rept. Intern. Assoc. Dairy Inspectors 1924*, 186-8.—M finds this medium differentiates the colon bacillus from lactis aerogenes. The colon bacillus gives a fluorescence around colonies and the lactis aerogenes brownish centers

GEORGE R. GREENBANK

A critical investigation into the thermal death point of *Bacillus tuberculosis* in milk with special reference to pasteurization. F. W. C. BROWN. *13th Ann. Rept. Intern. Assoc. Dairy Inspectors 1924*, 67-73.—No difference was found in the thermal death point of human and bovine strains. 60° for 20 min. was sufficient to kill most all strains. Twenty-five different strains were studied.

GEORGE R. GREENBANK

Copper in milk and its relation to vitamin potency. *13th Ann. Rept. Intern. Dairy Inspectors 1924*, 37-51.—Following the work of Hess and Weinstock the comm. finds that the Cu in milk averages 2.5 parts per million. This is not sufficient to cause alarm, but should be a warning against equipment in poor condition. Several biologists report only the usual effects of heavy metals but not Cu as specific.

G. R. G.

The practicability of the Coolidge p_H test in the improvement of city milk supply. H. R. ESTES. *13th Ann. Rept. Intern. Assoc. Dairy Inspectors 1924*, 212-4.—E. detcs. the p_H developed by using a neutral broth contg. bromothymol, adds 1 cc. milk and incubates for 8 hrs., then compares it with standards. This method is more rapid than bacterial count.

GEORGE R. GREENBANK

Interpretation of certain empirical standards in their application to Irish butter. G. BROWNLEE. *Sci. Proc. Roy. Dublin Soc.* **18**, 49-58(1925).—Examn. of 127 samples of butter confirmed B.'s earlier contention that a Reichert-Wollny value of 24 is too high to be taken as the limit below which it is to be assumed that the butter has been adulterated. It is suggested that the general adoption of the practice of winter dairying would prevent the occurrence of abnormal Reichert-Wollny figures for pure Irish butter, for the effect of advancing lactation in causing depression of the Reichert-Wollny value can, to some extent, be counteracted by liberal treatment of the cows as regards feeding and shelter. No other tests (e. g., Polenske value, Koettstorfer test, Avelle-Lallemand test, or Zeiss butyrefractometer reading) could be considered as giving any more reliable information than the Reichert-Wollny value.

B. C. A.

Phytin content of foodstuffs. H. P. AVERILL and C. G. KING. *J. Am. Chem. Soc.* **48**, 724-8(1926).—The phytin contents of 57 samples of foodstuffs have been estd by the method of Heubner and Stadler (*C. A.* **8**, 3569). It was found preferable to use 2% HCl for extrn. Heating, soaking and steaming brought about a very perceptible decrease in the amt. of phytin as estd. by titration. The course of purification of phytin when sepd. by Anderson's method was studied to show the effect of the various steps on the loss and purity of the different fractions.

C. J. WEST

Variations in the mineral content of cabbage and sauerkraut. W. H. PETERSON, C. A. ELVEHEJEM and L. A. JAMISON. *Soil Science* **20**, 451-7(1925).—Eighteen samples of cabbage from New York, Ohio, Illinois and Wisconsin showed the following variation in compn., Ca 0.029-0.056, P 0.017-0.057, Fe 0.00017-0.00059, sugar 2.91-4.20 and N 0.15-0.24%. Samples high in Ca were also high in Fe. No relationship was found between the variation in these elements and P. Early samples contained more sugar and less N than the late samples. Sauerkraut made from this cabbage showed similar variations in compn. The kraut juice contained approx. the same percentage of food constituents as the kraut itself. The loss in minerals in making kraut ranged from 10 to 20%.

R. BRADFIELD

Relationship of incubation temperature to viability, rate of growth and toxin produc-

tion of *Cl. botulinum* in different vegetables. W. B. STARIN. *J. Infectious Diseases* 38, 106-14(1926).—Temps. of 20° and 25° are equally suitable for the growth of *Cl. botulinum* and for the production of toxin in such vegetables as corn, string beans, peas and spinach. The rate of development is somewhat more rapid at 25° than at 20°, although in each case the toxicity eventually reaches the same level. A temp. of 10-12° is not suitable for growth of *Cl. botulinum* nor for the production of a potent toxin, even when incubation is extended to 5 mos. Death of the organism does not occur at any temp. used, even after 3 mos. incubation. Even in those media in which no evidence of growth or toxin production could be detected, transplants to a suitable medium, such as beef heart, resulted in abundant growth of the organism with normal toxin production. Disintegration of the medium parallels the production of toxin, although in some instances lethal doses of toxin may be present with practically no changes in the gross appearance or in the odor. The 4 vegetables used rank as follows in the rate of toxin production, and in the quantity of toxin produced: corn peas, string beans, spinach. The high initial acidity of the beans and spinach may be the responsible factor for the slight growth and toxin production in these media.

JULIAN H. LEWIS

Toxin production by *Clostridium botulinum* in canned foods. LUTHER THOMPSON WITH F. W. TANNER. *J. Infectious Diseases* 37, 344-52(1925).—By testing the growth of *Clostridium botulinum* in various canned foods it was hoped to indicate those foods that are potentially dangerous, although some of them might never have been reported as the cause of food poisoning. Those foods found to be regularly toxic after inoculation with all strains of the organism were: red kidney beans, lima beans, hominy, peas, sweet potato, salmon and shrimp. Those irregularly toxic were: asparagus, beets, pumpkin and spinach. The acid fruits and the very acid vegetable products, such as sauerkraut and dill pickles, never became toxic. The irregularity of toxin production in asparagus, beets, pumpkin and spinach is probably explained by their reaction. The reaction in certain canned vegetables is greatly affected by the quality of the material put in the cans. Expts. with spinach show that a small amt. of rotted material will reduce the acidity to a point where *Clostridium botulinum* can grow and develop a toxin.

JULIAN H. LEWIS

Vanilla and vanillin. P. MARTELL. *Z. Nahr. Genussm.* 50, 415-20(1925).—A general review.

WILLIAM J. HUSA

Effect of lime-sulfur spray in canned cherries. A. E. STEVENSON. *Canning Age, Convention Digest* 1926, 248-50.—This paper reports an investigation with an exptl. pack of cherries subjected to the lime-sulfur spray. The results show how to guard against any danger of hydrogen springers.

T. MARKOVITS

Fermenting citron of commerce. LUCIA McCULLOUGH. *Fruit Products J. and Am. Vinegar Ind.* 5, No. 6, 8(1926).—McC. briefly considers methods of production.

J. A. KENNEDY

Investigation of commercial apple juices and pectin preparations. HANNS ECKART. *Z. Nahr. Genussm.* 50, 405-15(1925).—A discussion of the compn. of com. pectin preps., with tabulated analyses of several such preps.

WILLIAM J. HUSA

Fish meals. II. Changes occurring in the water-soluble nitrogen and in the amount of water-soluble phosphorus with different methods of treatment and storage. W. L. DAVIES. *J. Soc. Chem. Ind.* 45, 25-9T(1926); cf. *C. A.* 20, 462.—Samples of 5 types of fish meal were stored (a) in bags, in open vessels, and a dry warm state for 7 months, and (b) in a cold and a warm wet state for 3 weeks. Aq. exts. of these meals were examd. for initial acidity, water-sol. N, sol. P, etc. Acidity was increased by (b) and by mold growth in (a). Water-sol. N was generally increased by (b), except with meals B and E, and tended to diminish with (a), except with meal C. In every case more of the total N appeared in the alc. solns. obtained from the aq. exts., and this fraction was also a larger fraction of the H₂O-extractable N. Some decarboxylation occurred with cold wet storage and some deamination during warm dry storage. (b) increased the amt. of volatile base in the water-sol. fraction. (a) caused a loss of volatile base. Warm dry treatment caused the greatest increase in the amt. of sol. P. Mold growth caused a decrease in sol. P. and an increase in initial acidity. (b) caused all the meals to become unwholesome; neither open vessel nor warm dry treatment caused any fetid odor in spite of mold growth in some cases. Bag storage caused oily meals to become rancid and some white meals to become fetid.

M. W. MCPHERSON

The tryptophan content of proteins of foodstuffs (TILLMANS, ALT) 11B. Effect of electric current on microorganisms—electrical food conservation (KLEIBER) 11C. Mildew in cotton goods (MORRIS) 25.

BAILEY, C. H.: **The Chemistry of Wheat Flour.** Am. Chem. Soc. Monograph Series. New York: The Chem. Catalog Co., Inc. 324 pp. Reviewed in *Cereal Chemistry* 2, 398-9; *Baking Tech.* 4, 382(1925).

GERHARD, ALBERT F.: **Handbook for Bakers.** Century Vocational Series. New York: Century Publishing Co. 484 pp. Reviewed in *Cereal Chemistry* 3, 63-4(1926).

LECOQ, RAOUL: **Cacao, poudres de cacao et farines composées alimentaires avec et sans cacao.** Paris: Vigot. 176 pp. 15 francs. Reviewed in *Rev. prod. chim.* 29, 9(1926).

LECOQ, RAOUL: **Quand, pourquoi et comment malter les aliments.** Paris: Vigot frères. 5 francs. Reviewed in *Rev. prod. chim.* 29, 8(1926).

Food from cheese and yeast. H. HEUSER. U. S. 1,572,533, Feb. 9. Live-cell fermentation yeast is mixed with about 5-10 times its wt. of milk curd, the moisture content of the mixt. is reduced to about 30-45% by pressing and the mixt. is ripened while excluding air.

Dried food material from potatoes or the like. H. M. HEIMERDINGER. U. S. 1,571,945, Feb. 9. A special method is described for drying potatoes to produce a product adapted for use in bread, "breakfast food," etc., which contains a considerable proportion of yeast-food substances and about 5-8% H₂O.

Apparatus for pasteurization of cream, milk, etc. J. O'CONNELL and H. H. KERR U. S. 1,572,031, Feb. 9.

Preserving fresh fruits and vegetables. II. R. FULTON and J. J. BOWMAN. U. S. 1,571,938, Feb. 9. Citrous or other fresh fruits or vegetables are superficially treated with a soln. formed of borax 5, Na₂CO₃ 1.39 and H₂O 100 parts to prevent the development of organisms causing stem-end rot, blue-mold rot or similar forms of decay. Cf. *C. A.* 20, 79.

Sterilizing and clarifying fruit juices, milk, or similar liquids. W. McCOMB and W. A. HEYMAN. U. S. 1,573,177, Feb. 16. The liquid is forced through a zone heated to at least about 63° under a pressure of at least 200 lbs. per sq. in. and then admitted into a zone heated to not over about 22° under a pressure of not over 25 lbs. per sq. in. and finally is passed to a zone having a temp. not over about 2° where the pressure is reduced to atm. pressure.

Yoghurt. A. AXELROD. Brit. 242,147, March 18, 1925. An app. for prep'g yoghurt comprises a receptacle for milk to which yoghurt ferment is added, this being surrounded by an annular vessel which is filled with hot H₂O and by an outer heat-insulating jacket.

Apparatus for curing tea-leaves. A. H. VAN NOOTEN. Brit. 236,902, July 10, 1924.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Basic principles of evaporation, distillation and drying. W. H. McADAMS. *J. Chem. Education* 3, 157-65(1926).—Elementary. W. L. McCABE

Distillation and rectification. L. GAY. *Chimie et industrie* 15, 3-13(1926); cf. *C. A.* 18, 558.—A detailed mathematical and graphical treatment of the sepn. of a mixt. of more than 3 constituents into its constituents in a practically pure condition A. PAPINEAU-COUTURE

Economic side of evaporator scale formation. W. L. McCABE. *Chem. Met. Eng.* 33, 86-7(1926).—Equations for max. production and min. cost for evaporators handling scale-forming soln. are derived and illustrated by an example. The formulas are an extension of the work of Badger and Othmer, *C. A.* 19, 2888. W. L. McCABE

Heat transfer from moving gases to tubes. H. REIHER. *Z. Ver. deut. Ing.* 70, 47-52(1925); *Mitt. Forschungsarbeiten* No. 269.—Air was blown through a heater, then through a diffuser, then across H₂O-cooled pipes at right angles to the line of flow. Gas temps. before and after these pipes were measured with Pt resistance thermometer grids, tube wall temps. were measured with thermocouples. Radiation from air to tubes was calcd. and allowed for. Tubes of 4.6-28 mm. outside diam. were used. For one row of tubes $\alpha = C(\lambda_m/d)(W_m d \rho_m / \mu_m)$ 0.56 Cal. per sq. m. per °C. per hr., where λ_m and μ_m are thermal conductivity and viscosity of the air in metric units at mean film temps., ρ_m is density in kg. per cu. m., d is pipe diam. in meters, and W_m is mean gas velocity in m. per sec. For this case $C = 0.35$. For

successive rows of tubes in line the exponent is 0.654 and $C = 0.122$ for 2 rows, 0.126 for 3 rows, 0.129 for 4 rows, and 0.131 for 5 rows. For successive rows of pipes staggered the exponent is 0.69 and $C = 0.100$ for 2 rows, 0.133 for 3 rows, 0.123 for 4 rows, and 0.131 for 5 rows.

W. L. BADGER

The absorption of chemical mist. H. REMY. *Z. angew. Chem.* 39, 147-50 (1926).—The ease of absorption of chemical mists is a function of their vapor pressures. A distinction must be made between "dry" and "damp" mists, as they act in very different ways. Particles of "dry" mists are generally of the same magnitude as colloid particles; they may be called "colloid dust." The most efficient means for removing mist is by the use of high-tension electricity. Exptl. results show that absorption bottles with H_2O , KOH soln., gas mask charcoal, etc., are less effective absorbents for moist NH_4Cl than filter paper, absorbent cotton and layers of asbestos in Gooch crucibles. This is accounted for on the assumption that these inert particles carried along in a gas stream do not come into contact with the absorbent as frequently as do gaseous mols. The particles of mist within a bubble passing through a liquid may not come into contact with the liquid at all. Confirmatory tests are reported for expts. with dry and damp SO_2 passing through various absorbents. The smaller the size of the particle, the more easily is it absorbed. Passed through filter paper damp mists are held back better than dry. Most important is it that intimate contact between mist and absorbent be effected.

W. C. EBAUGH

Engineering problems in refrigeration. EZER GRIFFITHS, J. H. AWBERY AND A. SNOW. *Food Investigation Board, report for the year 1924. Dept. Sci. Ind. Research* 1925, 68-80.—The topics studied were the inflammability test on heat-insulating materials, phys. properties of substances used as refrigerants, hygrometry, industrial forms of app. for the detn. of the CO_2 content of the atm. in a refrigerated enclosure, "air-conditioning" app., instruments for indicating the rate of flow of NH_3 or brine in a refrigerating plant circuit, and app. for demonstrating the circulation of air currents among stacked boxes in a cooled enclosure.

L. W. RIGGS

English-German conversion of technical units of measure. TH. HOFFMANN. *Chem. App.* 13, 30-1 (1926).—A table.

J. H. MOORE

Literature of carbon monoxide poisoning. R. R. SAYERS AND SARA J. DAVENPORT. *U. S. Public Health Bull.* 150, 54 pp. (1925).—A review under the headings: historical statement, occurrence, symptoms, pathology, percentage of CO dangerous to breathe, methods of detecting CO in blood and in air, treatment, prevention, and bibliography (141 references).

C. M. SALLS

Prophylaxis in industrial lead poisoning. DAVID MCKAIL. *J. Ind. Hyg.* 8, 74-7 (1926).—Although inhalation of fumes or dust is the main channel of entrance, absorption of Pb takes place mainly through the alimentary tract. Pb dust from the upper respiratory passages is swallowed and dissolved by the HCl of the gastric juice. Prophylaxis lies in removal of dust at point of origin; avoidance of raising or inhaling dust; scrupulous cleanliness of hands, face, teeth and clothing; mouth-washing; an albuminous meal before starting work; and a sol. sulfate cathartic once or twice a week. The sulfate soln. forms physiologically inert $PbSO_4$.

C. M. SALLS

Four cases of poisoning by mononitrochlorobenzene and one by acetanilide, occurring in a chemical works—explanation of the toxic symptoms produced. ARNOLD RENSIAW AND G. V. ASHCROFT. *J. Ind. Hyg.* 8, 67-73 (1926).—Poisoning followed exposure of only a few days to fumes rising from crystg. trays contg. *o*- and *p*- $C_6H_4ClNO_2$ made by nitration of $PhCl$. Apparently $C_6H_4ClNO_2$ is a cumulative blood poison causing cyanosis and collapse, probably due to reduction in the blood to the highly toxic and very reactive $C_6H_4ClNH_2$. Users of alc. apparently suffer most. One case from the crushing of acetanilide for *p*-nitroaniline manuf. was probably due to 0.1 to 0.2% $PhNH_2$ impurity. Local ventilation and covering of the crystg. trays with tightly fitting covers is recommended.

C. M. SALLS

The action of water containing NH_3 on pipes and boiler plates (TILGNER) 9.

BARBAUDY, JEAN: Contribution à l'étude de la distillation des mélanges ternaires hétérogènes: Paris: Hermann. Reviewed in *Rev. métal.* 23, 62 (1926).

BERG, FRITZ: Die patentierte Erfindung in neuer Darstellung und Beanspruchung. Mannheim: J. Bensheimer Verlag. 91 pp. R. M. 5.

KOPACZEWSKI, W.: L'état colloïdal et l'industrie. I. Industrie des colloïdes. Paris and Liège, 1925: Ch. Béranger. 324 pp. Reviewed in *Rev. prod. chim.* 29, 9 (1926).

MARILLER, CH: *Distillation et rectification des liquides industriels*. Paris: Dunod. 731 pp. 95 francs. Reviewed in *Rev. prod. chim.* 29, 10(1926).

MÜCKENBERGER, RUDOLF: *Handbuch der chemischen Industrie der ausser-deutschen Länder*. 6th ed. Berlin: R. Mückenberger. R. M. 60.

MOLDENHAUER, WILHELM: *Chemisch-technisches Praktikum*. Uebungsbeispiele aus d. chem.-techn. Analyse f. Studierende an techn. Hochschulen und Universitäten. 2nd ed. revised and enlarged. Berlin: Gebr. Borntraeger. 264 pp. R. M. 14.25.

Evaporating and distilling liquids. SOC. GENERALE D'EVAPORATION PROCÉDÉS PRACHE ET BOUILLON. Brit. 242,259, Oct. 31, 1924. Air or gas is passed through heated liquid to be evapd. and through a condenser the condensate from which is used to preheat the liquid. An app. is described.

Heat-exchange system for fractional condensation of oil vapors, etc. J. E. BELL. U. S. 1,573,129, Feb. 16.

Heating glass, metals, etc., to render them workable. J. W. VAN METTER. U. S. 1,572,975, Feb. 16. Heat is generated in a non-oxidizing atm. by the chem. reaction of Cl on Zn, Fe, Pb or As, etc., which may be placed within a glass tube or other article to be heated.

Electric insulation. E. B. WEDMORE, W. S. FLIGHT AND BRITISH ELECTRICAL & ALLIED INDUSTRIES RESEARCH ASSOCIATION. Brit. 236,619, April 3, 1924. Tangled filaments of glass, slag-wool or fused SiO_2 are arranged in layers and impregnated with a phenol-formaldehyde resin, and compressed.

Electric insulation. E. HAEFFELY ET CIE ART.-GES. Brit. 236,937, July 12, 1924. Wood is satd. with synthetic resin, forced into the pores of the wood under pressure while in liquid condition, and the resin is then hardened by heat and pressure.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Chlorination of water. L. H. ENSLOW. *Pub. Health Eng. Abstracts* Jan. 30, (1926).—The modern application of Cl to the destruction of bacterial life, algae prevention, oxidation of S gases and Fe, and in taste and odor prevention is discussed.

MARTIN E. FLENTJE

Determination of chloride in water. H. W. VAN URK. *Z. anal. Chem.* 67, 281-8 (1925).—Mohr's well-known titration method is discussed critically on the basis of the mass-action law and as a result of the mathematical study certain improvements in technic are suggested. The concn. of the CrO_4^{--} should lie between 0.7 and 1.5 millimoles per l. The p_H value of the water titrated should lie between 7 and 11. If the water is alk. toward tropeolin O or acid toward rosolic acid, it should be neutralized. The most suitable p_H value is 9, at which point phenolphthalein is barely pink. MgO is unsuitable as a neutralizing agent but NaHCO_3 soln. is advantageous. Water satd. with Mg(OH)_2 has a p_H value of about 11. W. T. H.

Comparative study of the oxidation number of water by the Kubel-Tiemann test and of its chlorination number. KARL KREISER. *Gas u. Wasserfach* 69, 42-3, 65-9 (1926).—The detn. of org. matter in H_2O free from aluminous decompn. products may be made by KMnO_4 oxidation (Kubel method) or by chlorination (Froboese method), but if the water is contaminated by sewage the chlorination method must be used for exact results. Comparisons of the 2 methods are given, for various types of contaminated waters, by 15 tables. In certain cases the chlorination of the raw water increases its filterability by the change in the colloidal nature of its org. matter.

W. B. PLUMMER

Chemical relation of salt dome waters. H. E. MINOR. *Bull. Am. Assoc. Petroleum Geol.* 9, 38-41(1925).—The Cl content of ground waters from Texas and Louisiana salt domes has been found useful in identifying the source of the waters and in correlation of water-bearing sands. The amt. of Cl is lowest in the near-surface water and increases downward, reaching satn. near the salt of shallow cores but in domes of the deep-seated type rising gradually at a rather uniform rate below the 2000-foot level. In several cases structure of the rocks is clearly suggested by Cl concn. in ground waters.

C. L. C.

Occurrence of sulfur waters in the Gulf Coast of Texas and Louisiana, and their significance in locating new domes. F. F. HENNIGER. *Bull. Am. Assoc. Petroleum Geol.* 9, 35-7(1925).—The occurrence of comparatively shallow waters showing varying

concns. of sulfates and H_2S throughout the salt dome belt of Texas and Louisiana, is more or less general. Geological examns. of a no. of localities where high concns. were found over small areas show the mineralization to be due in most instances to surface conditions and not to buried domes. Actual drilling has practically condemned several of the most promising areas, emphasizing the fact that new salt domes are not readily located on the evidence of S water alone. That it becomes increasingly difficult to find additional domes is apparent when one considers that of the 40 known domes in the Gulf Coast area, 37 were found from 1901 to 1913. Cf the other three, two were found in 1917 and the other in 1922. Since the discovery in 1917 of the Hager-Martin dome in sec. 28, T. 9 S., R. 7 E., St. Martin Parish, Louisiana, approx. 675 wildcat wells have been drilled in search of new domes on the coast, involving an expense estd. at \$20,000,000, exclusive of the cost of leases and overhead expenses. Yet only 1 new dome has been found during this period and it has not yet proved profitable commercially as a source of oil. C. L. C.

Santa Fe Springs Field, California (water problems). R. R. TEMPLETON AND C. R. MCCALLON. *Bull. Am. Assoc. Petroleum Geol.* **8**, 190-2(1924).—Surface waters are typical alkaline waters, with total solid content of 500-1000 parts per million. An av. sample contains total solids 691.5, Na 138.7, Ca and Mg 118.1, SO_4 106.1, Cl 65.0, HCO_3 and CO_3 263.6. Waters of Foix and Bell zones are mixts. of altered connate and meteoric waters; that of the Meyer zone is an altered connate water with little or no meteoric water. Foix water is distinguished from Bell water by higher content of Ca and Mg. Foix water has an av. alk. earth content of 2.5 to 4.0%, while Bell zone water averages 1.5 to 2.0%. The alk. Bell zone water is characterized by low primary salinity, 44%, with correspondingly high carbonate-chloride ratio. Is distinguished from Foix water by lower primary salinity, higher primary alky., lower alk. earth content, higher carbonate-chloride ratio and usually higher concn. It is easily distinguished from Meyer water by lower concn., lower primary salinity, higher primary alky. and higher carbonate-chloride ratio. It is distinguished from other Bell waters by lower primary salinity, higher primary alky. and higher carbonate-chloride ratio. Saline Bell zone water closely resembles the Meyer water, and is distinguished from the Foix water by higher concn., lower alk. earth content and higher primary salinity. It is distinguished from other Bell waters by higher concn., higher primary salinity, and lower carbonate-chloride ratio. It differs from Meyer water by lower concn., lower primary salinity, and higher carbonate-chloride ratio. Meyer water is an altered connate water with the highest dissolved salts concn. in the field. C. L. C.

Maintenance and operation of water supply works. W. H. DITTOE, *et al.* *Am. J. Pub. Health* **16**, 136-9(1926).—The reduction of typhoid fever and the pollution of surface streams are making a demand for greater efficiencies in water purification. More careful control by technical service and by state labs. is advocated. K. C. B.

Isolation of the colon group in water. N. J. HOWARD AND R. E. THOMPSON. *Eng. Contr.* **64**, 597-606(1925).—See C. A. **19**, 2541. C. C. RUCHHOFF

Antimicrobial properties of various river or sea waters. Bacteriophage power. F. ARLOING, SEMPE AND CHAVANNE. *Bull. Acad. Med.* **43**, 7(French); *Pub. Health Eng. Abstracts*, Jan. 30, 1926.—Evidences of anti-microbial action of certain river or sea waters have been found. The lytic action of these waters is attributed to the presence of multivalent bacteriophage, rather than to nonspecific causes. M. E. F.

The action of dyes used in paper making on the animal life of streams. O. HANMPEL. *Z. Nahr. Genussm.* **50**, 423-6(1925); cf. C. A. **6**, 781.—Fish and other lower water animals were kept for 1-10 days in solns. contg. various dyes in concns. of 1:100,000-1:1,000,000. Cotton red 4B, orange II, new fuchsin 90, safranin OF and naphthamine RON proved harmless; auramine conc. and canary-yellow 40 were slightly poisonous; methyl violet 34B80 was poisonous; Victoria blue B extra, brilliant green cryst. and benzol green EO were very poisonous. WILLIAM J. HUSA

Purification of boiler feed water. WM. E. SMITH. *Facts about Sugar* **20**, 1168-9(1925).—Proper cylinder lubrication and efficiency of various types of equipment for removing oil are discussed. T. MARKOVITS

Prevention of scale and rust. DE GRAHL. *Gesundh. Ing.* **49**, 45-6(1926).—The pptn. of normal carbonates is prevented by the addn. of a sol. chloride to the water, sufficient being added to change part of the Ca content to $CaCl_2$. This method is recommended for household installations. MARTIN E. FLENTJE

Loss of nitrogen in the purification of effluent waters by means of activated sludges. LUCIEN CAVEL. *Compt. rend.* **181**, 1101-3(1925); cf. C. A. **19**, 1020.—To emphasize the loss and to enable the N to be detd. with greater precision, $(NH_4)_2SO_4$ was added to

effluent water contg. 20% of activated sludge. The total N in the original water-sludge mixt. 189.28 mg. per l., N added as $(\text{NH}_4)_2\text{SO}_4$ 119.5, total 308.78. After bubbling air through the mixt. until the passed air gave no further Nessler test, there was found org. N 95.20, N as nitrates and nitrites 74.60, N as NH_4 8.0 mg., total 177.80, showing a loss of 42.4% of the N.

L. W. RIGGS

Treatment of packing-house sewage. W. C. MOOR AND W. P. WAYNE. *Ind. Eng. Chem.* **18**, 239-42(1926).—Several attempts have been made to dispose of heavy wastes from the packing-houses of Armour and Swift and of the stock yards at Ft Worth, Texas. By the scheme adopted the sewage from the 3 contributors is passed through vertical bar screens, $3\frac{1}{2}$ in. apart, and then through North screens with 8 in. mesh. Two screens of Monel metal are proving better than 2 screens of brass. The liquid is passed through Dorr clarifiers and then to the city sewer. 74% of the suspended matter is removed. Screenings and settlings are blown by ejectors to waste land near the plant. Grease is removed by live steam from the screens and by skimmer from the tanks. It has thus far been wasted. The effluent passes to the city sewer and the city disposal plant, which contains screens, grit chambers, Imhoff tanks, sprinkling filters, and Dorr clarifiers. The packing-house effluent increases both the org. and inorg. content of the sewage to above the av. of domestic sewage. The plant is rated to handle 7,000,000 gallons of domestic sewage and can handle about 5,000,000 gallons of the mixt. An addn. to the plant will be necessary.

EDWARD BARTOW

Treatment of sewage at Manchester. E. ARDERN. *Annual Report, Manchester Rivers Dept.* **1925**, 465; *Pub. Health Eng. Abstracts*, Feb. 6, 1926.—Conditioning sludge with alum gave good results in filtration. Sludge in good condition when leaving the aeration plant could economically be conditioned by the combined use of acid and alum. Trade wastes, especially oily and tarry matter, cause operation difficulties.

M. E. F.

Activated sludge. Jamshedpur sewage-disposal works with special reference to the activated-sludge plant. F. C. TEMPLE AND V. N. SARANGDIAR. *Abstr. J. o' Eng. Inst. of Canada* **8**, 28(1925); *Pub. Health Eng. Abstrs.*, Dec. 26, 1925.—The activated-sludge system is remarkably well adapted to Indian conditions—both for sewage purification and for the production of fertilizer.

MARTIN E. FLENTJE

Laboratory apparatus for activated-sludge experiments. F. SIERP. *Gesundh. Ing.* **49**, 46(1926).—A description is given with illustrations and drawings, of an app. for exptl. studies of the activated-sludge method of sewage disposal.

M. E. F.

Soil acidity and survival of hookworm larvae. A critical commentary. L. FABIAN HIRST. *Indian Med. Gazette* **61**, 14-7(1926).—A criticism of the paper by Chandler, cf. *C. A.* **20**, 256. H. believes that ordinary acidity such as is found in agricultural soils increases the mortality of hookworm larvae. **Soil acidity and survival of hookworm larvae.** A. C. CHANDLER. *Ibid* 17-8.—A reply to Hirst's criticism.

L. W. RIGGS

Chlorine treatment of contaminated oysters. CHARLES KRUMWIEDE AND WM. H. PARK, et al. *Am. J. Pub. Health* **16**, 142-52(1926).—Sterilization of reasonably clean oysters contaminated with feces contg. *B. typhosus* was not successful. The treatment reduces the no. of *B. typhosus* present, but safe oysters can be obtained only from uncontaminated waters.

K. C. BEESON

The action of water containing NH_3 on pipes and boiler plates (TILGNER) **9**. Filter bed for water (U. S. pat. 1,572,398) **1**.

MORGENSTERN, EMIL: *Die Mineralquellen und Kurmittel des Iodbades Tölz mit bes. Berücks. ihrer Anwendungsweise.* 5th ed. revised and enlarged. Bad Salzungen: L. Scheermesser. 91 pp. R. M. 1.50.

Softening feed water for boilers. M. F. NEWMAN. U. S. 1,572,944, Feb. 16. After treatment of H_2O with reagents such as lime and Na_2CO_3 for neutralizing acids and pptg. hardening substances, it is further treated with NaHSO_4 or other acid sulfate to reduce its alky.

Treating boiler water to prevent incrustation. S. W. KOWALSKI. *Brit.* **242,276**. Oct. 30, 1924. An elec. treatment of H_2O is described for prep. H_2O for use in boilers or for brewing, dyeing, bleaching, ice-making, etc.

Apparatus for filtering water. W. PATTERSON. U. S. 1,572,076, Feb. 9.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Review of German literature on plant nutrition and soil science for 1924. E. A. MITSCHERLICH. *Soil Science* 20, 353-62(1925).—A series of abstracts arranged under the following headings: (1) Nitrogen as a growth factor; (2) phosphoric acid as a growth factor; (3) potassium as a growth factor; (4) lime as a soil factor; (5) soil reaction; (6) soil physics; (7) influence of CO₂ of atm. and of soil on plant growth; (8) further soil studies.

R. BRADFIELD

A movable lysimeter for soil studies. F. L. DULEY. *Soil Science* 20, 465-71 (1925).—The lysimeter and method of using it are described in detail. The chief advantages are: (1) It permits the use of natural soil column. (2) Its portability makes it possible to bring soils having different profiles to one place where they are subjected to similar environment.

R. BRADFIELD

A new soil core sampler. E. B. POWELL. *Soil Science* 21, 53-7(1926).—A sampler is described by means of which a cylinder of soil 6 in. in diam. and 12 in. long can be obtained in an undisturbed, natural condition. It consists of 2 concentric, tightly fitting, brass cylinders. The outer one is equipped with cutting knives which upon rotation by means of the heavy handle cut a rim 1½ inches wide around the outside of the sample desired. The inner cylinder does not rotate but as the sampler is drawn into the ground by its auger-like rotation, it slips over the soil core and protects it. Upon the removal of the sampler from the soil the core remains inside the inner cylinder. It is forced out by means of a plunger, the soil core is wrapped in screen wire and then dipped into melted paraffin. Samples thus protected may be transported to the lab. without any appreciable change in their natural structure.

R. BRADFIELD

The acetone method of extracting sulfur from soil. R. H. SIMON AND C. J. SCHOLLENBERGER. *Soil Science* 20, 393-6(1925).—The detn. of the residual S instead of the H₂O-sol. sulfates is recommended for studies of the rate of oxidation of elemental S in the soil. A modification of the acetone extn. method proposed by Pearson (C. A. 15, 960) and Dyer (C. A. 16, 3557) was found satisfactory. Twenty g. of air-dry soil is placed in the thimble of the extn. app. and compacted so that the acetone percolates through it slowly and uniformly. Fifty cc. of acetone is placed in the flask and kept at a temp. of about 56°. Sufficient heat is supplied to keep the acetone condensate percolating with 2-3 cm. pressure for 3-4 hrs. The acetone contg. the dissolved S is slowly distd. and recovered. The residual S is oxidized to sulfate with KMnO₄, the oxidized residue dissolved in 5 cc. concd. HCl for each g. of KMnO₄ used, the excess acid evapd., and residue taken up in a few drops HCl, dild. to 100 cc. and the S detd. by pptn. with BaCl₂.

R. BRADFIELD

Nitrification in soils. H. N. BATHAM. *Soil Science* 20, 337-51(1925).—Monomino-amino monocarboxylic acids are nitrified at about the same rate in Indian soils. Samples of each of the following amino acids containing 15 mg. of N were added to 100 g. of soil + 0.5 g. CaCO₃ at optimum moisture and the % nitrate detd. after 30 and 40 days incubation at room temp. The av. nitrification was: tryptophan 51.49%, phenylalanine 47.08%, α-alanine 45.46%, leucine 44.80%, tyrosine 39.70%, cystine 37.96%, (NH₄)₂SO₄ 67.46%. No correlation was found between rate of nitrification of these pure org. compds. and their N:C ratio. The presence of S in cystine seems responsible for its depressive influence on nitrification. The nitrate content of natural soils fluctuates widely but regularly at different periods of the year. The nitrifying organisms remained active in stock soil for over a year.

R. BRADFIELD

The relationship between soluble iron and colloids in certain residual clays. G. R. MACCARTHY. *Soil Science* 20, 473-5(1925).—A fair correlation was observed between the colloid content of 4 highly weathered soils as detd. by the ratio method and the content of Fe sol. in dil. HCl. Discordant results were obtained with 2 soils contg. large amts. of undecomposed mineral grains. The wide variation in the SiO₂:(Al₂O₃ + Fe₂O₃) ratio in soil colloids was not taken into consideration.

R. BRADFIELD

The influence of hydration on the stability of colloidal solutions of soils. L. C. WHEETING. *Soil Science* 20, 363-6(1925).—The relative hydration of different soil colloids in contact with different salt treatments was estd. by measuring 2 cc. of a concd. colloid sludge + 1 cc. of the salt treatments into a dilatometer and measuring the expansion on freezing at -4°. The values obtained with the check indicated the presence of from 3.11 to 3.40 cc. of free H₂O although only 2 cc. of sludge and 1 cc. of H₂O were added. The extra vol. is considered due to the liberation of water of hydration by the freezing process. The use of 1 cc. of 0.2 N Na₂CO₃ decreased the amt.

of H_2O liberated while the same quantities of $\text{Pb}(\text{NO}_3)_2$ and $\text{Al}_2(\text{SO}_4)_3$ increased it slightly. Flocculation resulted with the two latter salts and peptization with the Na_2CO_3 . W. concludes, therefore, that the stability of soil colloids is governed by the quantity of H_2O of hydration held by the particles. The elec. charge on the particle is not considered.

R. BRADFIELD

The influence of the amount and nature of the replaceable base upon the heat of wetting of soils and soil colloids. W. W. PATE. *Soil Science* 20, 329-35(1925).—Soils were satd. with different bases by leaching with normal solns. of the chlorides and the heats of wetting detd. after the excess Cl was leached out and the soil dried at 110° . In every case the soils satd. with univalent bases gave lower values than those satd. with bivalent bases. With extd. colloids values ranging from 6.50 to 10.24 cal. per g. were obtained with the NH_4 -satd. series and 7.72-14.40 cal. per g. for the Ca-satd. series. Untreated soils in general were very similar to the soils satd. with bivalent bases. A fair correlation was found between heat of wetting, exchangeable-base content, and colloid content detd. by the ratio method. Variations in heat of wetting and replaceable-base content in different soils were correlated with the $\text{SiO}_2:(\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3)$ ratio; soils having the higher ratio of SiO_2 in their colloidal complex, have in general, higher content of replaceable bases and give a greater heat of wetting.

R. BRADFIELD

Two unusual colloidal soils. C. F. SHAW. *Soil Science* 20, 419-23(1925).—Two colloidal soils, one from the island of Hawaii, the other from the recently exposed bed of Lower Klamath Lake on the Cal.-Ore. line, are described. Both are gelatinous when wet and horny when dry. The H_2O content under field conditions is 133-540% without seepage. H_2O equiv. 348-380% vol. wt. of field soils (wet basis) 1.105; dry soil floats on H_2O ; loss on ignition 31-54%. The Klamath Lake soil has the following compn.: SiO_2 39.89, Al_2O_3 4.66, Fe_2O_3 1.23, SO_4 0.67, Ca 3.00, Mg 0.62, K 0.33, Na 0.62 and volatile matter 47.41%. The Hawaiian soil is formed by residual weathering of basic lavas under high temp. and rainfall. Crop growth is poor. The Klamath soil is composed largely of remains of diatoms. It has only recently been exposed and is wholly unaltered by weathering. Its agricultural value is probably very low.

R. BRADFIELD

A critical p_{H} for the formation of hardpan in acid clay soils. J. R. SKREEN. *Soil Science* 20, 307-11(1925).—A correlation was found between the p_{H} value of the soil and the occurrence of hardpan. This critical value was on the av. about 4.8. The cementation in these pans was due largely to pptd. Fe and Al. The low p_{H} values in the region studied are probably due to the leaching of the soils with the SO_2 produced in large quantities in the industrial section of Philadelphia. Some expts. on synthetic pans made in the lab. are described.

R. BRADFIELD

Nitrate accumulation under the straw mulch. W. A. ALBRECHT AND R. E. UHLAND. *Soil Science* 20, 253-67(1925); cf. C. A. 17, 2339.— NH_3 was found in greater quantities in the mulched plots. Aerating the mulched soil increased nitrate accumulation. The mulch increased the H_2O content of the soil and caused a marked change in soil structure. When used as inoculum the soil from the mulched plots was inferior to the check for converting NH_3 to NO_3 . Removal of the mulch gave a marked increase in nitrates after 2 mos. The ill effects seem to be due to a retardation of the evaporation rate which results in a higher H_2O content, lower temp. and prevents normal aeration.

R. BRADFIELD

Relation of biological processes to cation concentration in soils. J. S. BURD. *Soil Science* 20, 269-83(1925).—Analyses were made of the compn. of the soil soln obtained by the displacement method after various treatments. Some samples were displaced continuously, others were subjected to different temps., degrees of aeration, etc., after the first displacement then subjected to as many as four successive displacements at different time intervals. Under biol. oxidizing conditions nitrates increased, bicarbonates decreased and cations in general increased slightly in concn. The reverse was true under biol. reducing conditions; nitrates almost disappeared, bicarbonates increased markedly and the concn. of most cations decreased slightly. The variations in cation concn. were not as great as in the case of the different anions, because of the reciprocal relation between NO_3 and HCO_3 and SO_4 . The results emphasize the importance of biol. over direct soln. processes in the soil soln.

R. B.

The hydrogen-ion concentration of soils as affected by carbonic acid and the soil-water ratio, and the nature of soil acidity as revealed by these studies. W. H. PIERRE. *Soil Science* 20, 285-305(1925).—The colorimetric method of detg. the p_{H} value was found to be more reliable than the H-electrode for the very slightly buffered H_2O exts. of soils and of displaced soil solns. In order to obtain reliable results with the colori-

metric method it was necessary to use very clear exts. The filtration method, with the colloidal clay as an ultrafilter, developed by Truog was most satisfactory. With the soils studied, filtered exts., soil suspensions, and displaced solns. gave the same H-ion concn. Bubbling CO_2 through a soil suspension increased its acidity as measured with the H-electrode. Growing crops had no appreciable effect on the p_{H} value of the displaced solns. of the soils in which they were growing. The passage of CO_2 through a soil column had no detectable effect upon the soln. displaced immediately after the treatment. The p_{H} value of the ext. of some soils changed with the soil- H_2O ratio used. If the sol. salts and acids were removed by washing, the exts. yielded the same p_{H} value regardless of the soil- H_2O ratio. In this study the p_{H} value of the washed soil was not detd.

R. BRADFELD

Base exchange in relation to alkali soils. W. P. KELLY AND S. M. BROWN. *Soil Science* 20, 477-95(1925).—A careful study was made of all the more important types of alkali soils found in the U. S. They fall into 3 classes: (1) Soils whose replaceable Ca and Mg have been substituted mainly by Na. Such soils have a high content of H_2O -sol. Na salts, but little Ca and Mg and become extremely impermeable on leaching out the sol. salts. (2) Soils in which the substitution of Na has taken place to but a limited extent. They may contain considerable sol. Na but also contain Ca. They are less impervious than those in group (1). (3) Soils low in replaceable Na and high in Ca and Mg salts. Na salts may be fairly high but in the presence of large amts. of Ca and Mg they do not enter the exchange complex. These soils do not become impermeable on leaching out the Na salts. In the practical reclamation of these soils group (1) will require special treatment in large amts., preferably Ca salts. Group (2) may be benefited by such special treatments but the application need not be so large. Group (3) may be improved by mere flooding and drainage. The ultimate objective in alkali soil reclamation is to restore the normal proportion of replaceable Ca in addn. to the removal of the sol. salts. Elemental S is a promising treatment for soils contg. large amts. of CaCO_3 . All treatments will give only temporary improvement unless the H_2O table is kept low enough to prevent the rise of sol. salts by capillarity. The results reported are in complete accord with the findings of European workers.

R. BRADFELD

The soils of the experimental fields in Dolgoprudnoe. N. REMESOV. *Trans. Inst. Fertiliz. (Russian)* 1925, No. 30, 8-46.—A detailed description of the relief, geology, rocks of the region, the morphology of the soil, topography, physical and chem. properties of the soil, with a complete description of methods used in analyzing the various fractions.

J. S. JOFFE

Soil survey of Nyasaland. A. J. W. HORNBY. *Nyasaland Dept. Agr. Bull.* 2, 4 pp.(1924); *Expt. Sta. Record* 53, 115.—Data on the mech. and chem. compn. and the fertility requirements of the prevailing soil types of Nyasaland are briefly presented and discussed.

H. G.

Suction force of soils: A note on the application of this principle in the study of the soil-plant system. J. S. JOFFE AND H. C. MCLEAN. *Science* 62, 548-50(1925).—Besides serving as an index of the colloidal content of soils, the suction force principle has several other applications. It is the force which must be overcome by plants in imbibing water, when the water concn. is below satn., and it reaches a critical pt. at about half satn. Thus it may be linked with the wilting pt. of plants. The equil. between the suction force and the pulling power of the plant will be shifted by factors such as low or high evapn. intensity, reducing the problem to a study of these 2 factors. Another application is in the study of the moisture movement in soil profiles, involving the suction force of layers. The principle may further be utilized in irrigation problems.

P. R. DAWSON

The rate of oxidation of different forms of elemental sulfur. R. H. SIMON AND C. J. SCHOLLENBERGER. *Soil Science* 20, 443-9(1925).—Four commercial forms of elemental S were incorporated in the Wooster silt loam at the rate of 500 lb. per acre and the changes in p_{H} value and SO_4 content detd. at intervals for 8 wks. The rate of oxidation was influenced more by the fineness of grinding than any other factor. With one exception the oxidation process continued throughout the test period and at the end of 8 wks. 187-465 lb. of the added S had been oxidized. The original soil was about neutral and the lowest p_{H} value obtained during the expt. was only 6.1. A close correlation existed between the amt. of S oxidized and the lowering of the p_{H} value.

R. BRADFELD

The action of an application of lime on clay soils. D. J. HISSINC. *Onderdruk uit het Landbouwkundig. Tijdschr., Maandblad van het Nederl. Genootschap. voor Landbouwwetenschap.* 37, No. 442, 443, 444, 20 pp. (1925).—Limed heavy clay soils were

richer in CaCO_3 than the unlimed ones. They also showed a higher content of exchangeable Ca in the clay-humus portion. The excess of lime in 3 limed soils was correlated with the application of lime made. The percentages of exchangeable CaO in the clay and in the humus are estd. The max. value for the clay of Netherlands soils was found to be 1.1 and for the humus 5.2. There is a correlation between the p_H and the exchangeable Ca value of humus. It is assumed that the CaO combines with the humus at a definite p_H and that by difference the amt. combined with the clay may be obtained. With these values and the highest exchange values observed in humus and clay, the amt. of CaO with which the soils are able to combine is calcd. The term "efficiency coeff." is used to express the percentage difference between the actual amt. of CaO fixed and the calcd. amt. which the clay and humus are capable of fixing. Factors found to control this "efficiency coeff" are (a) the satn. of the clay-humus substances in bases, (b) the excess of CaO applied, and (c) the mixing of the CaO with the soil, the duration of the action, and the condition (finess, etc.) of the liming material.

R. M. BARNETTE

The results of the investigation of several clay soils from the province of Groningen (Netherlands). D. J. HISSINK AND J. VAN DER SPEK. *Overdruk uit het Groningen Landbouwwblad* 1925, Dec. 12 and 19, 16 pp.—Several samples of heavy clay soils from the province of Groningen were analyzed for CaCO_3 , humus, clay, exchangeable CaO, p_H and P_2O_5 . From the calcn. of the values for exchangeable CaO in the clay and the humus of these soils, it is concluded that most of the soils are capable of fixing more CaO. The quantity of CaO which the soils may fix to reach max. exchange values is calcd. (cf. preceding abstract). The influence of the CaO on the structure of the heavy clay soils is emphasized. The form of CaO best suited to improving a bad phys. condition is discussed. $\text{Ca}(\text{OH})_2$ is given preference over the less sol. forms.

R. M. BARNETTE

The action of an application of lime on a "roodoorn" soil. D. J. HISSINK. *Overdruk uit het Landbouwkund. Tijdschr. Maandblad. van het Nederl. Genootschap voor Landbouwwetenschap*. 37, No. 445, 392-8 (1925).—"Roodoorn" soils are unsatd. strongly acid clay soils contg. large percentages of humus. Samples taken of a soil limed with 20,000 kg. per ha. of beet residue contg. 53% CaCO_3 and an unlimed portion of the same field were investigated as to reaction (p_H), humus content, clay content, sand content, exchangeable CaO, P_2O_5 , and N. The lime was found to be completely fixed by the clay and humus, there being no CaCO_3 in the limed sample. The clay-humus-substances of the unlimed soil were found to be unsatd. with respect to lime and to have low Ca exchange values. After liming the exchangeable Ca values for humus and clay were higher. The additional amt. of CaO with which the clay-humus substances could combine over that which they contained was calcd. by using as a basis the highest Ca exchange values which have been encountered in Netherlands soils (cf. 2nd abstract above). The soils were found to be well supplied with P_2O_5 and with org. N. The adequacy of this common application of lime is questioned because of the unsatd. condition of the soil after liming.

R. M. BARNETTE

Liming and soil nitrates. N. REMESOV. *Trans. Inst. Fertilizers (Russia)* 1925, No. 30, 105-18.—This is a study of the influence of liming on nitrate formation and accumulation in soils. The results were conflicting and no conclusions could be drawn.

J. S. JOFFE

Influence of lime on the decomposition of organic matter in soils. A. F. TYULIN. *Trans. Inst. Fertilizers (Russia)* 1923, No. 14, 3-12.—Lime applications tend to speed up the decompn. of the org. matter. Together with the decrease in the org. matter goes on a quant. regrouping of the kinds of humus substances; the fraction which is subject to high dispersion, the so-called crenates and apocrenates, is increased, the stable humus is decreased.

J. S. JOFFE

The injurious effect of excessive lime applications. A. F. TYULIN. *Trans. Inst. Fertilizers (Russia)* 1923, No. 18, 3-15.—Excessive liming brings about an alk. reaction, an increased amt. of sol. Ca salts and as a result nitrites appear and at times NH_3 in the early stages. Either factor by itself is not of great importance in soil reactions, but the disturbance in nitrification and activation of denitrifiers is important.

J. S. JOFFE

The disintegration of limestone and dolomite separates as influenced by zone of incorporation. W. H. MACINTIRE AND W. M. SHAW. *Soil Science* 20, 403-17 (1925). An analysis is presented of data obtained in a 4-yr. lysimeter study on: (1) the effect of fineness of grinding and (2) the zone of incorporation, upon the rate of disintegration of limestone and dolomite in a Cumberland loam soil having an initial p_H value of 6.38. Four separates, 10-20, 20-40, 40-80, and 80-200-mesh, resp., of both limestone and

dolomite were thoroughly incorporated with the surface soil subsoil in a second series and the degrees of disintegration after an analysis of the soil for residual carbonates.

Liming and phosphate applications on the experiment of Krukovo and Volokolamsk. S. SHCHERBA. *Trans. Inst. Fertilizers* (Russian), 1925, 85.—On heavy soils liming has only a slight influence on oats but the effects on clover and vetch were good. There is a discussion of the relative amounts of CaCO_3 to be used.

Some residual effects on neutral salt treatments on the soil reaction. C. H. SPURWAY AND R. H. AUSTIN. *Soil Science* 21, 71-4 (1926).—Samples of soil from the 1, 1₁, A₂, B and C horizons of 4 soils were treated with 2 N neutral solns. of CaCl_2 , MgCl_2 , KCl and NaCl and after frequent stirring for 1 hr. the samples were thrown on a filter and washed with H_2O until chlorides were removed. The pH value of the residual soil was then detd. electrometrically. The reaction of the soil was not appreciably changed by the CaCl_2 treatment, a slight increase in pH value was obtained with MgCl_2 and a marked increase with both KCl and NaCl.

Effect of the concentration of potassium salts in soil media upon the carbohydrate metabolism of plants. The diastatic activity of the nasturtium. D. T. ENGLIS AND H. A. LUNT. *Soil Science* 20, 459-63 (1925).—Nasturtium plants were grown in the greenhouse in pots of sand and peat treated with different amts. of KCl. The plants were harvested at the appearance of the first bloom, dried at 45-50° for 5 days, weighed, then ground fine and stored for analysis. The diastatic activity was detd. by a modification of the method of Brown and Morris. The activity decreased with increase in K in the case of sand. With peat it increased with small applications but decreased with the higher concns. The results suggest a correlation of diastatic activity with favorable growing conditions rather than with the presence or absence of K. The lowest application of KCl to sand was 49 lbs. per acre, the peat received none.

Action exercised by alkali chlorides on plants and soils. C. DUPONT. *Ann. Sci. agron.* 41 (1924); *Expt. Sta. Record* 53, 21.—Lab. studies of the action of the chlorides of Na and Ca on wheat, flax, vetch, buckwheat, white lupines and mustard on siliceous soil well supplied with org. matter are reported, the purpose being to det. the conditions governing the best use of these chlorides as fertilizers. A comparison was also made of the carbonate and the chloride of K on buckwheat in garden soil. The results showed that the addn. of chlorides to the soil increased the Cl content of the crops, but this increase varied widely with different crops and there was no relation between the quantity of Cl absorbed and its toxic action. When used on soils well supplied with alkalis, alk. chlorides tended to decrease the alky. of the sol. part of crop ashes, but where the soils were deficient in potash, resulting in a reduced alky. of the crop ashes, the use of KCl increased in the alky. of the sol. ashes. Studies of the influence of chlorides on the soil showed that the transformation of KCl into CaCl_2 in soil depended upon the absorbing power of the soil. It was almost complete in clay soils, but was feeble in siliceous soils deficient in colloidal elements. NaCl underwent such transformation to a less extent than KCl indicating that the power of soils to absorb Na is less than that for K. Dissolved lime salts had little action on the absorption of potash. On the contrary, they retarded the absorption of Na and consequently decreased the formation of CaCl_2 at the expense of NaCl. When NaCl and KCl were applied to soil, as when sylvinit was used, the CaCl_2 formed at the expense of the KCl prevented the transformation of the NaCl and decreased lime losses.

H. G.

Alkali studies. III. Tolerance of barley for alkali in Idaho soil. R. E. NEDRIG AND H. P. MAGNUSON. *Soil Science* 20, 367-91 (1925), cf. *C. A.* 19, 2100.—Four crops of barley were grown on Idaho soil treated with various concns. of Na_2CO_3 , NaCl and Na_2SO_4 and 2 and 3 salt combinations of these salts. In general the first crop was injured most. The majority of the treatments increased the second crop of barley. The 4th crop approached the normal in yield. NaCl when present in a combination that did not exceed the toxic limit produced the greatest stimulation in yield. The toxicity of Na_2SO_4 did not become very acute until very high concns. over 15% were used. The results differ widely from studies reported on other soils and indicate the necessity of considering the alkali tolerance of the soil as well as that of the crop. **IV. Tolerance of oats for alkali in Idaho soil.** *Ibid* 425-41.—In a series of pot studies similar to the above except oats were grown instead of barley. The general response of the two crops was similar. 0.4% added Na_2CO_3 which gave 0.15% recoverable carbonates was toxic, NaCl was toxic in concns. of 0.2-0.3% added salt or 0.17-0.20% recoverable salt. Na_2SO_4 in concns. as high as 1.5 was toxic only to the first crop. Low addns.

of NaCl and Na₂SO₄ to a basic treatment of 0.2-0.4% Na₂CO₃ usually increased the yields over the single basic treatment indicating some sort of ion antagonism. R. B.

Potassium ferrocyanide and ferric ferrocyanide as sources of iron for plants. C. G. DEUBER. *Soil Science* 21, 23-6(1926).—Soy beans and *Spirodela polyrrhiza* made fair growth in solns. contg. 0.033-0.066 p. p. m. of Fe in the form of K₄Fe(CN)₆. Higher concns. proved toxic. Merck's Fe₄(Fe(CN)₆)₃ was a satisfactory source of Fe for soy-bean plants when the soln. had a reaction of p_H 5.0. When used in a series of buffer mixts. this salt gave min. growth at p_H 6.4. This reaction corresponds to the isoelec. point of the soy-bean root tips as detd. by Robbins and Scott. R. B.

May Chile saltpeter be replaced by other nitrogenous fertilizers? A. BIEDERBECK. *Z. Zuckerind. czechoslov. Rep.* 50, 177-81(1925).—Reply to Stoklasa, C. *A.* 20, 258. There is no evidence that the I content of Chile saltpeter has a favorable influence on the growth of beets, and that it may be replaced by an equiv. amt. of any nitrogenous fertilizer. W. L. BADGER

Comparative study of the "six types" of nutrient solutions in relation to the growth of potato plants in sand cultures. F. S. JOHNSON. *Soil Science* 20, 397-401(1925); cf. *C. A.* 19, 2721.—The av. relative dry wt. of Irish Cobbler potatoes, grown in sand cultures with the "6 types" of salt combinations recommended by the Div. of Biol. and Agr. of the Natl. Research Council were: 1.23, 1.18, 0.92, 0.84, 0.95, 0.88 for types I-IV, resp. Best growth was associated with the high N content of the solns. except when it was supplied as Mg(NO₃)₂, the high concn. of Mg apparently being toxic. Ca(NO₃)₂ was the best carrier of N. The superiority of I over II is attributed to its more favorable reaction; p_H 4.6 as compared with 3.7. R. BRADFELD

Residual effects of forty years' continuous fertilizer treatments. II. Effect of caustic lime on soil treated with barnyard manure. J. W. WHITE AND F. J. HOLBEN. *Soil Science* 20, 313-27(1925); cf. *C. A.* 19, 1469.—An analysis is made of plots which had received 120 tons manure in 40 yrs. with and without applications of CaO, 2 tons every 4 yrs., total 20 tons. The manure + lime plots produced 13,120 lbs. more dry matter than manure alone. At the end of 40 yrs. the CaO + manure soil contained 64,179 lbs. org. matter and 3168 lbs. N per acre compared to 63,374 and 2990 lbs., resp., in the unlimed manure series. Lime stimulated azofication, 294 lbs. more N being fixed. 90% of the manure added was decomposed on the limed and 84% on the unlimed plots. It is estd. that 93% of the org. matter of the limed and 88% of the unlimed has been derived from crop residues. Lime applied to the manured soil stimulated the decay of 2900 lbs. of org. matter in excess of the manure without lime, but crops were increased sufficiently to cause an accumulation of 4245 lbs. of crop residues, resulting in a net balance of 1345 lbs. org. matter in favor of the limed plot. Liming decreased the amt. of alkali-sol. humus. The N:C ratio of the sol. humus was approx. the same as for the soil as a whole. The amt. of humus extd. with alkali depended upon length of the extn. period. The org. C or N content of a soil is considered a better index to fertility than the alk. humus method. R. BRADFELD

The assimilation of peat nitrogen by plants. P. COOPREENOK. *Trans. Inst. Fertilizers (Russia)* 1923, No. 19, 1-19.—A series of expts. with various kinds of peat as a source of N in the soil has shown that moss peat has increased the yield 178%; swamp meadow peat increased it 56% and transition-state swamp peat increased it 14%. Addition of lime greatly increased efficiency of peat as a N source. Inoculation with animal manure, especially urine, stimulates utilization of N. The use of peat has also increased the % of N in crop. J. S. JOFFE

The value of the organic nitrogen of koufri, marog and tafla. V. N. MOSSÉRI. *Bull. inst. Egypte* 6, 1-8(1924).—Expts. demonstrated that a considerable fraction of the org. N of koufri is assimilable. In 1.5 mos. 4-11% is nitrified and in 2 mos. 8-21%. The process is more or less slow, depending upon a no. of factors, such as the nature of the org. matter, that of the soil and its reaction, the quantity of koufri applied, duration of plant growth, climatic conditions, etc. Likewise the quantity, nature and proportion of the sol. salts of the soil or the koufri play an important role. Compared with dried blood under identical conditions, the org. N of koufri may be assigned a value of 5-10% that of the N of NaNO₃. Tafla and marog contain in general insignificant concns. of such assimilable N. P. R. DAWSON

Effects of various methods of applying fertilizers on crops and on certain soil conditions. D. G. COE. *Soil Science* 21, 7-21(1926).—A thorough study was made of the effect of the method of applying different fertilizers in various amts. upon the germination, top growth and root development of crops and upon the movement of the fertilizers. Phosphatic fertilizers were the least toxic to plants but when applied in direct contact with the seed even it was toxic when used at the rate of 300 lbs. per acre. NaNO₃

and KCl at the rate of 25 lbs. per acre retarded germination. Placing the fertilizer 1 inch to the side of the row of seed gave better returns than applications a similar distance above or below the seed because of the fact that the lateral diffusion of salts is much slower than the vertical diffusion. The side application is recommended for all localized fertilizer treatments.

R. BRADFIELD

The availability of nitrogen in garbage tankage and in urea in comparison with standard materials. A. L. PRINCE AND H. W. WINSOR. *Soil Science* 21, 59-69 (1926).—Vegetative expts. with barley, rape and sorghum in sand cultures gave the following relative availabilities for different N carriers based on NaNO_3 as 100%: Urea 98%, $(\text{NH}_4)_2\text{SO}_4$ 88.2%, standard tankage 53.4%, fish 49.2%, and garbage tankage 14.2%. The chief value of garbage tankage is probably for a fertilizer filler. Urea was a very desirable source of N, in a few cases superior to NaNO_3 and in every case superior to $(\text{NH}_4)_2\text{SO}_4$. Chem. availability tests by 3 methods failed to correlate except in a very general way with the vegetative expts. The rates of decompn. of urea in sand, $1/2$ sand + $1/2$ soil, and soil in 5 days were 3, 67 and 90% resp. In the soil 50% of the urea was converted into NH_3 in 3 days. Eleven days was required for 50% decompn. in the case of an acid soil. This rate was raised by CaCO_3 applications.

R. B.

The new artificial manure. F. M. LAWRENCE. *Canning Age* 1926, 129.—In making manure artificially, a substitute for animal matter, such as vegetable wastes, roughages of various kinds, corn stover, pea vines, dried leaves, wild grasses, ferns, sugar-cane wastes, banana leaves (almost any kind of non-woody vegetable material), is worked by a special process into a matter acceptable to the growth of certain bacteria.

T. MARKOVITS

Fertilizer trade developments. OTTO WILSON. *Ind. Eng. Chem.* 18, 401-4 (1926).

E. J. C.

Experiments with sulgin. A. F. TRAAEN. *Meldinger Norges Landbrukshoeiskole* 4, 194-200 (1924).—Sulgin is a soil disinfectant, for which stimulating action on the N fixation and the growth of plants has been claimed. The chief constituents are CaS about 30%, lime 50%, bone meal 10% or less and some K_2O . It was studied in regard to its influence upon the microbiological activities in 3 different soils, clay, silt and compost. In no case did sulgin show any power of stimulating the N fixation of the soils. Sulgin appeared to check the intensity of nitrification more or less, according to the nature of the soil.

C. A. ROBARK

Restoring the strength of mercurial solutions employed for treating grain. J. KRAUSS. *Z. angew. Chem.* 38, 1088-91 (1925).—German governmental publications direct that Hg-contg. preps. that have been used for treating grain are to be brought up to strength by adding a "new soln. whose concn. is twice as great as the prescribed soln." By studying the Hg content of spent solns. and the Hg absorbed by treated grain, it was found that the time of treatment had a great influence upon the amt. of Hg taken up, but that in general the above directions are satisfactory.

W. C. E.

Composition and action of cupric sprays. G. VILLEDIEU AND MME. VILLEDIEU. *Rev. vit.* 64, 67-70 (1926).—Good protection, equal in all respects to Bordeaux mixt., was obtained in collaborative field expts. with a spray of the following compn.: 3 kg. of a sulfate mixt., consisting of 10-20% CuSO_4 , 10-20% MgSO_4 and 80-60% 200-mesh hydrated CaSO_4 ; 3 kg of quicklime; and 1 hectoliter of water.

P. R. DAWSON

Potash in relation to plant and animal diseases. J. C. WILLIAMS. *Fertilizer, Feeding-Stocks and Farm Supplies J.* 10, 791-4 (1925).—A correlation of published data on the use of potash in the prevention of plant and animal diseases.

K. D. JACOB

Irrigation as a factor in modifying the composition of grain (GREAVES) 12.

Fertilizer. H. SANDERSON. U. S. 1,571,970, Feb. 9. Comminuted shells of cacao beans are used as a fertilizer ingredient together with dried humus, sand, lime, loam or other materials.

Fertilizer. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norw. 42,237, Dec. 21, 1925. The mixed crystals of K Al nitrate obtained from a potash-contg. Al nitrate liquor are mixed with a raw material the plant nutrients of which are converted in an assimilable form by the acid of the Al nitrate.

"Attractant" for insects. L. B. SMITH, E. A. RICHMOND AND P. A. VAN DER MEULEN. U. S. 1,572,568, Feb. 9. Geraniol is used for attracting the Japanese beetle or other insects and may be incorporated with inert material and insecticides.

Insecticide and fungicide. N. A. ALEXANDERSON. Swed. 60,110, Jan. 12, 1926. An aq. soln. of Ca cresolate is especially fit for killing the flea-beetle on root plants.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The separation of the enzymes of malt. W. WINDISCH. *Wochschr. Brau.* **43**, 18-20(1926); cf. Pringsheim, Genin and Perewasky (*C. A.* **20**, 924).—In addn. to diastase malt contains 2 other polyases: lichenase which forms cellobiase from lichenase, and mannanase which converts mannanase to mannobiose. Malt also contains 2 disaccharases, cellobiase and mannobiose, and sometimes a maltase. After 18 days at p_H 3-4 mannanase and cellobiase were inactive, and amylase was slightly active. At p_H 6-7 all enzymes were more resistant. At p_H 3 in the presence of kaolin adsorption of enzymes was almost quant. At p_H 5 medium adsorption occurred, and at p_H 8 and by the addn. of alc. the mannobiose and part of the cellobiase were adsorbed, whereas the mannanase and lichenase remained in soln. $Al(OH)_3$ gave similar results. By repeated treatment with phosphate buffers at varying p_H the amylase remained in the filtrate mixed with maltase. By decreasing the kaolin and by washing with increasing amts. of alc., the 2 enzymes were sepd. Maltase and amylase can be sepd. not only from each other but from reducing substances found in the presence of malt enzymes.

C. N. FREY

A rare nectar yeast. J. GRÜSS. *Wochschr. Brau.* **43**, 57-61(1926).—This yeast, named *Amphiernia rubra*, produces no CO_2 or alc. It forms glycogen and fat from glucose. No fat is formed if S is added and the H_2 removed as H_2S . The H_2 is probably formed from glucose: $C_6H_{12}O_6 + 2O \rightarrow COOH(CHOH)_4COOH + H_2$. The O is probably derived from $3C_6H_{12}O_6 \rightarrow C_{18}H_{34}O_2 + H_2O + 15O$. The O attacks more sugar: $7C_6H_{12}O_6 + 14O \rightarrow 7COOH(CHOH)_4COOH + 14H$, $3C_6H_{12}O_6 + 12H \rightarrow 6C_3H_8O_3$. An oxidase is present in active cells and can be demonstrated by the use of violamin soln. Reductase is also present in the cells.

C. N. FREY

Vertical driers. PETER HETZEL. *Wochschr. Brau.* **43**, 61-6(1926).—The relative merits of vertical and horizontal driers are discussed. Expts. are given showing the results obtained by the use of vertical driers in drying malt.

C. N. FREY

Reaction of the mashing liquor in relation to extract yield and soluble non-coagulable nitrogen. A. C. CHAPMAN AND C. W. MCHUGO. *J. Inst. Brewing* **31**, 306-11(1925).—Exptl. mashers were made with samples of malt of diastatic power ranging from 21° to 150° Lintner, with mashing liquors of varying H-ion concns. With distd. water, p_H 5.0 and with London supply water acidified with lactic acid to p_H 4.2 and 3.4, the differences of ext. yield were very small, and only a slight increase of non-coagulable N was obtained with increasing H-ion concns. The H-ion concns. of the worts were lower than those of the corresponding mashing liquors by about p_H 1.0 with the more acid liquor and about p_H 0.6 with distd. water. Mashers made with London well water, p_H 7.9, and London supply water, p_H 7.8, gave an ext. yield of about 2 lbs. per quarter lower than with distd. water and also a smaller percentage of non-coagulable N. The H-ion concns. of the worts of the alk. mashers were increased to about p_H 6.3-6.6.

B. C. A

Hypocras. J. PRITZKER AND R. JUNGKUNZ. *Schweiz. Apoth. Ztg.* **63**, 361-1, 380-4(1925); cf. *C. A.* **19**, 2257.—Further historical notes by correspondents. S. W.

Temperature conditions of the vinegar generator and their influence on production. FR. SCHRANK. *Deut. Essigind.* **30**, 61-2(1926).—A discussion of the factors involved.

W. O. E

Yeast. R. L. CORBY and RUTH GLASGOW. U. S. 1,571,932, Feb. 9. A yeast nutrient soln. is prepd. consisting essentially of molasses, cereal material and yeast nourishing salts and in which an acidity is produced somewhat in excess of that preferable for yeast propagation. The acidity is then properly reduced and the amt. of assimilable N for yeast growth in the soln. raised by the addn. of an alk. compl. contg. yeast-assimilable N, e. g., NH_4OH .

Apparatus for separating yeast from associated liquid in vats. W. SCOTT. Brit 242,114, Jan. 5, 1925.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

How varied conditions affect some essential oils. R. A. KONNERTH. *Am. Perfumer* 20, 695(1926).—In an effort to det. to what extent the factors of temp. variation, exposure to light, air or oxidation, contact with container, etc., might be responsible for deterioration, a series of expts. was conducted on anise, lemon, lemon (terpeneless), orange, peppermint and eugenol oils with the following results: the oils examd. undergo the least deterioration if stored in bottles under N. Keeping the oil in tins at room temp. causes rapid deterioration in odor and darkening in color. At low temp. the development of a darker color and impairment of odor are somewhat retarded. Lemon oil keeps fairly well in tins if under N. The terpeneless product retains its fragrance, though darkening in color to a deep yellow, if stored in amber glass bottles under N. Oxidation and exposure to diffused daylight cause a dark orange-yellow color and a very disagreeable odor. No complete data are available on tin-can storage, since these were lost after 6 months' observation. Indications were, however, to the effect that this oil does keep fairly well in tins. Orange oil keeps better at room temp. than in the refrigerator. It also keeps fairly well in tins under N. Light hastens the darkening of color. Peppermint oil is more stable than the other oils, but is subject to a decided color change when in contact with tin. Protection from light retards the development of color and impairment of odor. Eugenol is rapidly affected by oxidation, passing from colorless to dark reddish orange. Storage in tins causes rapid deterioration in both odor and color. Reduced temp. retards the development of color.

W. O. E.

Medicaments derived from saccharin and its secondary products. WALTHER HERZOG. *Pharm. Zentralhalle* 67, 81-6(1926).—An enumeration and discussion of certain Au and Hg compds. of saccharin, and derivs. of *p*-toluenesulfonic acid and *p*-aminobenzoic acid used medicinally.

W. O. E.

Scientific pharmacy. RAPP. *Pharm. Ztg.* 71, 88-90, 214-7(1926). I. **Decoctions and infusions.** II. **Pills.**—A plea backed by exptl. data for a return to the earlier methods for prep. decoctions and infusions and pills in the apothecary, instead of having recourse to com. brands of possibly questionable potency.

W. O. E.

Determining the effectiveness of trade disinfectants. H. IJERS AND FRANZ WEINFURTER. *Wochschr. Brau.* 43, 25-9, 35-9, 45-9(1926).—The following disinfectants were tried out experimentally and their phenol coeffs. detd.: antiformin, chloramine, pantosept, "Magnocid," CaOCl_2 , SO_2 , H_2SiF_6 , NH_4F , $\text{CH}_3\text{OHHSO}_3$, HClHO , $\text{C}_6\text{H}_5\text{OH}$, HCOOH , $\text{C}_6\text{H}_5\text{COOH}$, Cl , HgCl_2 , cyclotelluridimethylpentane, $\text{C}_6\text{H}_4\text{OIHCOOH}$ and "Pyritzit" (BF_3Na).

C. N. FREY

Studies in the genus *Mentha*. VIII. **The aldehydes of peppermint oil.** R. E. KREMERS. *Am. J. Pharm.* 98, 86-91(1926); cf. *C. A.* 20, 92.—The aldehydes and reactive ketones have been isolated from a large quantity of crude peppermint oil. The aldehydes obtained had the phys. characters of the aliphatic series and the predominating fractions were within the distg. range of the valeric group. 3-Methylbutanal (isovaleraldehyde) was quantitatively the most important constituent and was definitely identified through conversion into isoleucine. The presence of a *d*-2-methyl-2-butanal, suggested by the optical activity of the valeric fractions, was not confirmed. No compd. was identified in the high-boiling fractions.

W. G. GAESSLER

Solution of magnesium citrate U. S. P. X. J. W. ENGLAND. *Am. J. Pharm.* 98, 91-4(1926).—The formula of the U. S. P. IX is too acid to be palatable (*C. A.* 18, 3449); that of the U. S. P. X is even more acid. The increased acidity has been made to insure greater stability and prevent pptn. but it is secured at the expense of acceptability. The soln. of the problem is in a return to the official formula of 1870 of 13 g. carbonate and 26 g. of acid, or rounded off, metrically 12.5 g. of the former and 25 g. of the latter. If a wholly acid-salt soln. be found necessary it could be had by adding more acid, but even with this, the acidity would be much less than that of the present soln. The U. S. P. for many years required the use of KHCO_3 only. In the new revision (as in the U. S. P. IX) either KHCO_3 or NaHCO_3 is permitted. It is not generally recognized that a part—and it is no small part—of the therapeutic value of soln. of Mg citrate is due to the diuretic and diaphoretic action of its alkali citrate—that elimination is to be secured not only by purgation, but also by diuresis and diaphoresis. Therapeutically the use of KHCO_3 for carbonating soln. of Mg citrate is indicated, not NaHCO_3 , and charging the soln. with CO_2 as a substitute for the alkali

bicarbonate is to be condemned because CO_2 does not have the therapeutic properties of the alkali citrate.

Second international conference on the unification of formulas of heroic remedies. *Am. J. Pharm.* **98**, 94-108(1926).—General recommendations as to nomenclature and methods of standardization are discussed. Cooperation with the Committee on Hygiene of the League of Nations is recommended.

The presence of sugar in saliva. HELEN UPDEGRAFF. *Dental Cosmos* **68**, 237-9 (1926).—"While the elimination of sugar in the saliva is a rare phenomenon, even in cases of severe diabetes, nevertheless it may occur in some advanced cases." In 68 samples of human saliva from normal individuals, the presence of sugar could not be detected, sugar was also absent from the saliva of 3 normal individuals 1 hr. after ingestion of from 100 to 300 g. of dextrose. A bibliography is appended. J. S. H.

Tutocaine in dentistry: a new anesthetic. BORIS LEVITT. *Dental Cosmos* **68**, 240-1(1926).—Tutocaine has value as a local anesthetic for conduction anesthesia.

Gordin's method for the determination of alkaloids. H. M. FERREIRA. *Arch. med. legal* **1**, 325-6(1925).—Gordin's method (titration with HCl and phenolphthalein) gave exact results for most alkaloids including colchicine. Berberine, meconine, cantharidine and narceine did not dissolve in 0.05 N HCl even after 24 hrs. contact. Results obtained with Mayer's and Bouchardot's reagents are given.

Determination of filicin in the ether extract of male fern. ELISA MOSSO. *Gior. farm. chim.* **75**, 8-13(1926).—Schmidt's method is the most rapid and exact. The filicin content of fern collected in March was 18.46%, i. e., higher than in the season usually recommended for collection. The yield in the prepn. of pharmacopoeial ext was 6.84%.

Some medicinal plants growing in the Himalayas. R. N. CHOPRA and N. N. GHOSH. *Indian J. Med. Research* **13**, 533-7(1926).—A description of belladonna roots contg. 0.81% of active principles (B. P. S. and U. S. P. S. 0.45%), belladonna folia contg. 0.5% (B. P. S. and U. S. P. S. 0.30%), hyocyanus leaves and flowering tops contg. 0.03% (U. S. P. S. 0.065%) of *Valeriana wallichii* and flowering tops contg. 0.31% of essential oils, of *Podophyllum emodi* and flowering tops contg. 10.02% of resin (U. S. P. S. 3.0%), and of *Artemisia brevifolia* Wallichii and flowering tops contg. 0.5 to 2.0% of santonin. Digitalis, although not a natural plant, can be cultivated. The use of this in prepg. fresh tinctures insures a decided advance since imported digitalis is affected by the climate.

Crystalline alkaloids from the inflated lobelia. H. IESTRA. *Bull. sci. pharm.* **33**, 16-20(1926).—Several procedures are described for extg. the alkaloids from lobelia. The total alkaloidal content was about 0.4%, and the alkaloids obtained in the crystal form under the most favorable conditions were about 0.002%. The crystal. alkaloid is exceedingly active.

Certain errors in collecting and certain substitutions in commerce of medicinal plants. E. MARTIN-SANS. *Bull. sci. pharmacol.* **33**, 21-7(1926).—Ten common drug plants are discussed.

Shortening the time of percolation of ipecac and aconite roots. M. BRIDEL and M. G. BAREL. *J. pharm. chim.* [8], **2**, 49-58(1925).—In the prepn. of tinctures and exts. of ipecac and aconite roots, not only may the time of maceration be reduced from 24 hrs (Codex) to 2 hrs. (cf. R. A. Hatcher and Miss Lichtmann, *Am. J. Pharm.* 1921, 534), but a 6.5 days' percolation (Codex) may also be reduced to 24 hrs., with the same yield in active alkaloids. For ext. of ipecac, 10 parts, not 6 parts of 70% alc. (Codex) should be used for complete extn. in both cases. In the prepn. of exts. of ipecac and aconite, filtration of the liquid left after distg. off the alc., should be omitted, as it involves large losses of alkaloids.

Shortening the time of percolation of hydrastis rhizome, and the barks of yellow and red cinchona. (M. G.) G. BAREL. *J. pharm. chim.* [8], **2**, 476-84(1925); cf. preceding abstr.—Extn. of the hydrastis rhizome by the method of the Codex (1908) and by the 24-hr. method yields fluid exts. of the same alkaloidal content, although in both cases extn. of the alkaloids is incomplete, unless more alc. be used. Again, in the prepn. of soft ext., filtering after distg. off the alc. removes about 50% of the alkaloid. Very similar results are obtained with the 2 cinchona barks.

The oils, fats and waxes of the Codex. RICHARD. *J. pharm. chim.* [8], **2**, 76-87, 243-57, 443-53, 495-501(1925).—Report of the 4th Sub-Commission.

Gauzes for wound dressings. R. BERNIER. *J. pharm. chim.* [8], **2**, 120-3(1925).—Report of the 15th Sub-Commission of the Codex.

Analysis of nitrates of bismuth. PICON. *J. pharm. chim.* [8], **2**, 132-40(1925).

cf. C. A. 20, 559.—The Bi subnitrate of the Codex 1908, (A) prepd from the neutral salt with cold and very dil. HNO_3 , has the compn. $\text{N}_2\text{O}_5 \cdot \text{Bi}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$, contg. 76.31% Bi_2O_3 , basicity ratio $\text{Bi}_2\text{O}_3/\text{N}_2\text{O}_5$ 4.29. A slight excess of HNO_3 evaps. upon drying at 50° . The subnitrate of the Codex 1884, (B) prepd. from the neutral salt with good yield by boiling with H_2O , has approx. the compn. $9 \text{ N}_2\text{O}_5 \cdot 10 \text{ Bi}_2\text{O}_3 \cdot 7\text{H}_2\text{O}$ (Rutten, 1902), contg. 80.86% Bi_2O_3 , ratio $\text{Bi}_2\text{O}_3/\text{N}_2\text{O}_5$ 4.77, is well crystd. and when washed and dried, does not give off nitrous vapors when in contact with org. substances. Salts crystg. from the mother liquors approach the compn. $5\text{N}_2\text{O}_5 \cdot 6\text{Bi}_2\text{O}_3 \cdot 8\text{H}_2\text{O}$, (Rutten), ratio 5.15. Replacement of salt A by B in the new Codex is recommended, also omit detn. of H_2O , detg. only Bi_2O_3 , N_2O_5 and their ratio, this not to exceed 5.2. Cf. Corfield and Short, C. A. 18, 3617.

S. WALDBOTT

Antiseptic chlorinated liquids prepared from industrial products. M. VARDIN. *J. pharm. chim.* [8], 2, 141–2 (1925).—In com. Javel soln. det. active Cl as usual, and alky. by titrating 5–10 cc. (dild. with 10 vols. H_2O) with 5% AcOH , using litmus paper as outside indicator, and calc. quantity of AcOH for 1 l. Then mix sufficient Javel soln. for 4.5 g. Cl per l. with the calcd. quantity of 5% AcOH , 5 g. of NaCl , and enough H_2O to bring to 1 l.

S. WALDBOTT

Preparation of chlorinated antiseptic solutions. P. BRETEAU. *J. pharm. chim.* [8], 2, 142–3 (1925).—Detn. of active Cl and of alky. in Javel soln. must be made on the dild. liquid, since losses are caused by dildn. (C. A. 10, 654). Boric acid which was first used in neutralizing alky., set free HClO causing rapid decompn. "Dakin soln." as now frequently used, contains, per l. NaHCO_3 10–15 g., Javel soln. 4–5 g. active Cl and 0.25 g. KMnO_4 for greater stability of Cl content (cf. B., *J. pharm. chim.* [7], 21, 139 (1920), and C. A. 16, 2198).

S. WALDBOTT

Poisoning by white hellebore (*Veratrum album* L.); confusion with asparagus root (*Asparagus officinalis* L.). J. MAHEU AND P. CHERAMY. *J. pharm. chim.* [8], 2, 185–95 (1925).—A (non-fatal) case of poisoning led to a detailed differentiation of the macroscopic and anatomical characters of the rhizomes and roots of the 2 plants. Drawings of microscopic sections are given. The microchem. behavior of the material c. g., towards the Dragendorff-Goris reagent for *Veratrum album* confirmed the findings.

S. WALDBOTT

The need of an assay method for absorbent cotton in the codex. M. FRANÇOIS AND F. RICHARD. *J. pharm. chim.* [8], 2, 273–80 (1925); cf. Picon, C. A. 19, 2389.—A review of several standard methods, e. g., that of the U. S. P. A well-defined immersion test should be given in the Codex, allowing a mix. of 10 sec. for the time of complete wetting. The fat content, to be detd. by extn. with Et_2O , should not exceed 0.20 g. per 100 g. of cotton, and tests for ash and neutrality should be given. S. WALDBOTT

Second international conference for the unification of the formulas of potent drugs. Brussels, 1925. *J. pharm. chim.* [8], 2, 406–15 (1925).—The official final protocol. Also in *Schweiz. Apoth. Ztg.* 63, 751–60 (1925).

S. WALDBOTT

Notes on the Brussels conference. L. GRIMBERT. *J. pharm. chim.* [8], 2, 369–75 (1925); cf. preceding abstr.—A crit. discussion on the Latin titles for "Sirop diacode" and other official prepsns. and chemicals, notably NaCl , in various pharmacopeias.

S. WALDBOTT

The arsenobenzenes, their composition, toxicity, nature of the side chain, value of the D. M. index. F. DE MYTENAERE. *J. pharm. chim.* [8], 2, 417–27 (1925); cf. C. A. 17, 2471.—In answer to criticisms (cf. C. A. 19, 2103), the value of the D. M. index as of definite chem. significance, and having an evident relation to toxicity, is maintained. Valeur and Launoy (C. A. 19, 1756) failed to adhere to the given method of detn., notably as to the temp. of pptn. by H_2S . For the purpose of official control of these prepsns., det. As content (19–21%), the ratio As/N (5 to 5.6), the nature of the side chain (whether methylene sulfoxylate or methylene bisulfite), and the index D. M., whose value should not exceed 12.

S. WALDBOTT

Physiological assay of hypophyseal preparations. Technic of the assay of extracts of the posterior lobe on the uterus of the guinea pig. H. PÉNAU AND H. SIMONNET. *J. pharm. chim.* [8], 2, 513–25 (1925).—The method used is practically that of Burn and Dale (C. A. 17, 2474), Smith and MacCloskey (C. A. 18, 3227) and C. Heymans (C. A. 19, 2107). Stress is laid on obtaining trustworthy results through the use of special exact app. which is sketched and described in detail. By mounting 2 similar uteri in the same app., parallel records are obtainable for each reacting fluid. A physiol. soln. of the Locke-Tyrode type, and Voegtlin's standard soln. for comparison with the com. hypophyseal prepsns. are employed. Minute directions for procedure are given.

S. WALDBOTT

Atropine and tropine; the silicotungstate of tropine. R. HAZARD. *J. pharm.*

chim. [8], 3, 5-9(1926); cf. *C. A.* 19, 3323, 20, 71.—Tropine (*A*) may be sepd. from atropine (*B*) by the relative soly. of its silicotungstate (0.01 g. *A*:16 + cc. liquid). To a mixt. (1:1 cc.) of 1% soln. of H_2SO_4 -*B* and 1% HCl -*A* add sufficient 2% HCl to make 20 cc., then 5 cc. of Bertrand's reagent (10% aq. soln. of silicotungstic acid); after 12 hrs filter the ppt., contg. the total of *B*, evap. the filtrate contg. *A*. The ppt. in HNO_3 soln. shows Vitali's test; with the evapd. filtrate the test is neg. A method of quant. sepn. of *A* and *B* is in prepn. S. WALDBOTT

Opium and its preparations. L. DÉBOURDEAUX. *J. pharm. chim.* [8], 3, 10-2 (1926).—Recorded losses of total and sol. morphine in powd. opium (*C. A.* 7, 680) have increased further on 10 yrs.' keeping, probably caused by oxidation; the products preventing soln. of the pptd. insol. morphine (*C. A.* 5, 1660). Tincture of opium and Rousseau's laudanum of the French Codex (*C. A.* 8, 206) showed no loss of morphine at any time, while laudanum of Sydenham (*ibid*) steadily pptd. within 6 months, and afterwards, involving loss of morphine in the filtrate. When left in contact with the ppt., the original prepn. after 10 yrs. did not show loss, indicating re-soln. of the morphine, perhaps through the action of some starch-like substance. The cause of the initial decompn. is ascribed to the sol. products of *saffron*, which, therefore, should be omitted from the compn. of Sydenham's laudanum. S. WALDBOTT

Ultra-violet absorption spectra of narcotine and its decomposition products (STEINER) 3.

ARMY, HENRY V.: **The Principles of Pharmacy.** 3rd Ed. revised. Philadelphia and London: W. B. Saunders Co. 1078 pp. Cloth \$8.00. Reviewed in *Am. J. Pharm.* 98, 130(1926).

MARTINDALE, W. H. and WESTCOTT, W. WYNN: **The Extra Pharmacopoeia.** Vol. 2. 18th ed. revised. London: H. K. Lewis. 770 pp. 20s.

SNOW, CLYDE M.: **The Arithmetic of Pharmacy.** London: Henry Kimpton 6s. 6d.

ZÖRNIG, HEINRICH: **Tabelle zur mikroskopischen Bestimmung der officinellen Drogenpulver.** 2nd ed. revised and enlarged. Berlin: J. Springer. 59 pp. R. M. 3.60.

Basic ethers of quinolines. J. CALLEN. U. S. 1,572,768, Feb. 9. By the reaction of quinoline compds. with amino alcs., basic ethers of quinolines are obtained which are useful in the treatment of diseases of the heart. They are generally colorless to yellowish oils sol. in the usual org. solvents but insol. in H_2O and form 2 series of salts with HCl which retain the therapeutic properties of the free bases. α -Hydroxyepi-dimethylaminoethyl ether b_{10} 175-8° and forms 2 series of salts with HCl ; α -hydroxy- γ -methylquinoline piperidylethyl ether (obtained from α -chloroepi-dimethylaminoethyl ether) b_{17} 232-4°; α -methyl- γ -hydroxyquinoline dimethylaminoethyl ether b_{10} 190°.

Packaging medicinal and anesthetic substances. A. E. SMITH. U. S. 1,572,322 Feb. 9. Liquid and non-liquid substances such as H_2O and cocaine or like substances are enclosed in an ampule of glass or other suitable material and are sepd. from each other by a partition of paraffin or other material, which may be fused to permit intermixture of the substances. U. S. 1,572,323 also specifies packaging local anesthetics and H_2O , etc. (or other substances which are used to form unstable compns. by admixt.) in glass ampules with a sepg. partition of paraffin or other material m. 45-100°. U. S. 1,572,324 specifies similarly packaging sepd. liquids such as ingredients of local anesthetic solns. which are to be mixed at the time of use.

Compositions opaque to X-rays (for internal administration). T. THORNE-BAKTER. Brit. 241,968, June 23, 1924. A prepn. to be taken internally by a patient before radiographic examn. comprises a heavy metal salt opaque to X-rays, e. g., a jelly in which is pptd. $BaSO_4$ (formed from $BaCl_2$ and an excess of $(NH_4)_2SO_4$ and a small quantity of H_2SO_4).

Removing nicotine from tobacco. T. SCHLOESING. Brit. 234,845, May 30, 1924. Tobacco is treated with a mixt. of steam and NH_3 , the latter being continuously introduced into the app. used to maintain an appreciable pressure. Condensate is treated with "petrol" or other solvent of nicotine from which the nicotine is subsequently recovered. Brit. 242,225 specifies freeing the nicotine solvent of NH_3 by passing the solvent upwardly through H_2O which may be satd. with $NaCl$, or by bringing it into intimate contact with air.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Recovery of copper from pyrite residues in the manufacture of sulfuric acid. N. F. YUSHKEVICH. *J. Chem. Ind. Russia* 1, 5-11 (Nov.-Dec., 1924).—Pyrite contg. some Cu is used in Russia for the manuf. of H_2SO_4 by the chamber process. As by-product a cinder is obtained which contains 6.27% of Cu in the form of sulfides and sulfates. Y. investigated the best method of effecting the recovery of the Cu in the form of CuSO_4 . The methods of extg. the cinder by either H_2O or $\text{H}_2\text{O} + \text{H}_2\text{SO}_4$ gave unsatisfactory results. Y. recommends submitting the cinder to a preliminary treatment by wetting it with H_2SO_4 (8 parts by wt. of chamber H_2SO_4 to 100 parts of cinder) and furnacing at temps. between 500° and 600° to convert all the Cu into CuSO_4 and transform the Fe sulfides and sulfates into Fe_2O_3 and SO_2 . During this treatment SO_2 is formed in abundance. After this, the residue is treated first with boiling H_2O , then with boiling H_2O contg. 4% of H_2SO_4 . By this method the Cu extd. reaches 97%.
BERNARD NELSON

Means for reducing the absorption of ammonia in gas holders. KALTENBACH. *Mem. poud.* 21, 144-51 (1924).— NH_3 , stored in gas holders, is absorbed slowly by the H_2O through the interspersed layer of oil. When the absorbed NH_3 has made the H_2O specifically light enough, the NH_3 soln. rises above the oil or emulsifies with it and causes trouble. Warm NH_3 gas, satd. with H_2O , if cooled in the gas holder, deposits drops of satd. NH_3 soln. If 600 cu. m. pass per hr., and if the gas is cooled from 20° to 15° , then 108 l. condense in 24 hrs., if from 25° to 15° , then 275 l. Remedies are previous cooling of the gas, introduction of fresh H_2O at the bottom, and frequent removal of the strongly ammoniacal layer directly beneath the oil, before it has time to diffuse into the mass of H_2O .
TENNEY L. DAVIS

Manufacture of sodium chromate. N. F. YUSHKEVICH. *Trans. Inst. Econ. Mineralogy and Petrography* (Russia) 1925, No. 13, 1-29.—The influence of temp. on the velocity of the formation of chromates was studied by roasting in an elec. furnace chrome iron ore 37.85% (contg. 44.6% Cr_2O_3) with Na_2CO_3 24.3% (98.5% pure) and CaO 37.85% (90% pure). The formation of chromates at 700° is rather slow. At 1160° , 30 min. roasting is sufficient to convert 95% of Cr_2O_3 into chromates. Any diminution of soda required theoretically as indicated in the equation: $4\text{FeO} \cdot \text{Cr}_2\text{O}_3 + 8\text{Na}_2\text{CO}_3 + 7\text{O}_2 = 8\text{Na}_2\text{CrO}_4 + 2\text{Fe}_2\text{O}_3 + 8\text{CO}_2$ influences the yield of the sol. chromate. The type of furnace for the best results must maintain the following conditions: (1) The mixt. must heat rapidly to 1160° . (2) The mixt. must be constantly stirred. (3) The temp. of the heating gas must not exceed 1260° .
J. S. JOFFE

Production of sodium cyanide from atmospheric nitrogen, sodium carbonate and carbon. E. BERL AND A. BRAUNE. *Fortschritte Chem.* 18, 203-34 (1925).—The production of NaCN in accordance with the equation, $\text{Na}_2\text{CO}_3 + 4\text{C} + \text{N}_2 \rightleftharpoons 2\text{NaCN} + 3\text{CO}$, proceeds rapidly and almost quantitatively if gas diffusion is not hindered, and the CO pressure is sufficiently low. C must be present in excess; Fe or Fe oxide must be present as catalyst; and gaseous diffusion must be aided by stirring the mixt. during the process. Fusion of the material must be avoided, as it causes reversal of the reaction. The best results are obtained by using a mixt. of equal parts of Na_2CO_3 , C and Fe. Considerable quantities of Na are produced if the N is supplied at too great a rate, and the formation of Na is considered to be a necessary stage in the process. A temp. of 950 – 1000° is most suitable for the process. Ferrocyanides are formed during the process, the quantity apparently depending upon the proportion of Fe in the mixt. NaCN is converted quantitatively into NH_3 and Na formate by treatment in autoclaves with steam at 150° .
B. C. A.

Removal of sulfite and sulfate from sodium thiosulfate by crystallization. LOTHAR WÖHLER AND J. DIERKSON. *Z. angew. Chem.* 39, 33-6 (1926).—In the prepn. of $\text{Na}_2\text{S}_2\text{O}_3$, Na_2SO_3 and Na_2SO_4 are generally present as impurities in the crude liquor. The authors have studied the soly. isotherms of the 3 binary systems at 23° , 40° , 60° and 80° , together with the ternary system, equil. diagrams being shown. From the data given it is possible to start with any mixt. of the 3 salts, and obtain pure $\text{Na}_2\text{S}_2\text{O}_3$ by evapn. and crystn. at the proper temp. Soly. curves of the 3 salts taken separately are also shown.
H. STROBTZ

Deterioration of commercially packed chlorinated lime. C. C. McDONNELL AND LESLIE HART. *U. S. Dept. Agr. Bull.* 1389, 1-19 (1926).—The available Cl in samples of bleaching powder packed in containers of the usual com. type as a rule decreases fairly regularly during storage on account of the conversion of the Cl into CaCl_2 . No

marked difference was noted in the rate of deterioration between samples manufactured and packed in winter, and in summer, but the loss of available Cl was greater in warm than in cold weather, the av. loss for the hottest months of the year being 1.44% per month and for the coldest months 0.61%. A comparison of samples stored in glass bottles in the light with those stored in the dark indicates that light rays slightly accelerate the loss of available Cl.

W. H. ROSS

Factors governing lime-kiln capacity and fuel economy. V. J. AZBE. *Nat. Lime Assoc. Tech. Papers and Addresses* 1925, 37-58.—An attempt to establish a standard of comparison and an outline of the basis for these standards. The principal points cover higher fuel efficiency, higher kiln capacity, longer kiln running periods and better lime. Min. fuel cost should be the chief aim. "Too large amts. of excess air used for burning of fuel are responsible to a great extent for inefficiency of lime kilns." Heat loss by radiation and the bearing of kiln gas analysis on kiln efficiency are pointed out. The methods of firing, kiln running periods and kiln refractories are discussed. Few kilns, if any, show 50% thermal efficiency.

W. H. BOYNTON

Measurement of kiln performance. W. K. LEWIS AND A. H. RADASCH. *Chem. Met. Eng.* 33, 76-8(1926).—Calcns. are given for keeping a quant. check on a lime kiln during its operation through gas analysis and other detns. Comparison is made between kilns with and without the Eldred-Dougherty recirculation system. Higher quality and uniformity of product are the advantages of this system rather than lower cost of operation.

H. F. K.

The use and revivification of decolorizing carbon. BERTHOLD BLOCK. *Chem. App.* 12, 222-4, 242-4(1925); 13, 4-6, 27-30(1926).—A general description with many references to Ger. patents, and 15 cuts of app. and plant.

J. H. MOORE

Anti-freezing solutions for motor radiators. C. E. MULLIN. *Textile World* 69, 81, 119(1926); *Textile Recorder* 43, No. 513, 95(1925).—The use of alc., glycerol, honey glucose, CaCl_2 and kerosene are discussed.

CHAS. E. MULLIN

The structure of casein plastics. K. HAUPT AND M. WAECHEER. *Kunststoffe* 15, 129-31(1925); *Plastics* 2, 45-6, 58(1926).—By optical examn. of thin pieces of extruded casein plastic the stresses set up are studied. By the use of modern macerating and mixing machinery a uniform product is secured. Drying should be slow enough to allow a uniform rate of shrinkage. The main problem is in connection with the stresses set up by the selective tanning action of formaldehyde in the various concentric layers of the plastic rods.

W. H. BOYNTON

Thermal decomposition of sulfates (MARCHAL) 2. Natural and artificial pearls (BOUTAN) III. Apparatus for evaporating brine (Brit. pat. 242,018) 1.

BRAIDY, H.: *La fabrication de l'acide sulfurique par le procédé de contact.* Paris: H. Mounier. 302 + xi pp. 15 francs. Reviewed in *Chimie et industrie* 15, 160(1925).

PARRISH, P.: *Sulphuric Acid Reaction Chambers.* London: Ernest Benn Brothers. 159 pp. 6s.

Purifying hydrocyanic acid. M. WALKER. U. S. 1,571,982, Feb. 9. Liquid HCN contg. H_2S is treated with SO_2 .

Scrubber or absorber for nitrous fumes evolved in nitric acid manufacture, etc. CHEMISCHE WERKE LOTHRINGEN GES. Brit. 236,918, July 10, 1924.

Absorption of nitrous gases in water. OLAF JENSEN. Norw. 42,212, Dec. 7, 1925. The gases are absorbed by thin films of water applied on cooled surface by which the heat of absorption is removed from the soln. as quickly as possible and without any evapn. of water. The temp. of the soln. is kept between 0° and 10° .

Ammonia. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norw. 42,179, Nov. 23, 1925. The process described in Norw. 40,640 (C. A. 19, 1329) is carried out under increased pressure.

Borax and sodium bicarbonate from lake brines. M. V. LOWRY. U. S. 1,573,259, Feb. 16. A brine, previously concd. by evapn., is carbonated and cooled so that crystal borax and NaHCO_3 are pptd. as a sludge. The sludge is mixed with colemanite and heated to about the b. p. to dissolve borax from the sludge.

Purifying zinc sulfate solutions. R. B. ELDRIDGE. U. S. 1,573,233, Feb. 16. Impure ZnSO_4 solns. are treated with Zn hyposulfite or other sol. hyposulfite to ppt. impurities such as Co, Ni, Mn, Fe, Cu, Hg, Cd, As, Sb, Ag, Au, Pb, Bi, Tl, Se or Te.

Drying calcium hypochlorite compounds. G. PISTOR. U. S. 1,572,952, Feb. 16. Preliminary drying is effected by heating and the material, still contg. a small pro-

portion of H_2O , is then mixed with a hygroscopic substance such as CaO or calcined gypsum which does not decompose the hypochlorite.

Mining sulfur. W. C. AVERILL, JR. U. S. 1,573,026, Feb. 16. Sand is caused to flow from an overlying stratum to fill channels and cavities in a S-bearing stratum and retard the escape of hot H_2O from the vicinity of a well.

Creosote from corn cob distillation. F. C. ATKINSON. U. S. 1,572,510, Feb. 9. Crushed corn cobs are extd. with steam under pressure, dried and then destructively distd. in a closed retort at high temp. The oily portion is sepd. from the rest of the collected distillate and is redistd.

Silica gel. CHEMISCHE FABRIK AUF ACTIEN (VORM. F. SCHERING). Brit. 242,234, Nov. 3, 1924. Silica gel is washed until it contains about 2% of salt (calcd. on the wt of the dried product) and the washing is then discontinued without removing the residual electrolyte.

Coloring granular mineral substances. H. C. FISHER. U. S. 1,572,425, Feb. 9. Granulated slate or other granular mineral material is mixed dry with ultramarine blue or other pigment insol. in H_2O ; H_2O and a sol. silicate are then added and the agitated mixt. is dried by heat.

Wood for sound amplifying horns, etc. POLYPHONWERKE AKT.-GES. AND H. WÜNSCH. Brit. 242,117, Jan. 7, 1925. Compressed air or CO_2 is used for spraying and impregnating horns or similar articles of wood, with a compn. of port. cement 1, lime 4, plaster 4, $NaCl$ 1 and "sol. glass" 1 part, or with similar compns.

Hard molded articles from calcined magnesia. O. FROSELL. U. S. 1,572,714, Feb. 9. Imitation marble or other articles are formed of calcined magnesia which is set by hydration with H_2O under the simultaneous action of heat and compacting pressure.

Solid composition for absorbing and purifying waste combustion gases. J. C. TATE. U. S. 1,573,284, Feb. 16. A hard porous mass formed of lime bonded with burned gypsum is used for treating gases such as those from the combustion of animal or vegetable materials.

Dust-laying composition. R. GILBERT. Brit. 236,731, July 15, 1924. A mineral oil of 6.89 sp. gr. at 15° , close flash point about 175° and Redwood viscosity of 182 sec. at 20° and 50 sec. at 60° , is mixed with about 5% of com. cresols.

Molding aircraft fuselages, boats or similar articles, of phenolic condensation products. R. KEMP. U. S. 1,572,936, Feb. 16. Pressure-exerting members of molding app. are formed in part of Bi, Sn, Pb alloy or other material of relatively low m. p. and in part of another material of higher m. p.

Diaphragms for sound reproduction. J. GRAHAM. Brit. 236,699, May 17, 1924. Two or more layers of dressed pig skin (between which Fe filings may be placed) are joined by lignum-vitae gum or other adhesive.

Vertical shaft lime kiln. H. MISCAMBELL. U. S. 1,572,156, Feb. 9.

Mixture for protecting the skin from dirt, oil, grease, etc. D. R. KELLOGG. Brit. 236,069, Aug. 26, 1924. Bentonite 17, soap $4\frac{1}{2}$ and H_2O 78 $\frac{1}{2}$ %.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

The South's possibilities for glass and portland cement industries. G. R. SHELTON. *Manufacturers Record* 89, 55(1926). F. G. J.

Glasses and glazes in ancient Assyria. ANON. *Pottery Gaz. Glass Trade Rev.* 51, 87-9(1926).—The information given is taken from Assyrian cuneiform tablets which have recently been deciphered by R. C. Thompson. Approx. formulas, source of materials and methods of prepn. are given. R. E. G.

Plan for reclaiming 12% waste gases from glass tank. R. R. MEYER. *Ceramic Industry* 6, 148-53(1926).—A suggested system to reclaim 100 to 150 h. p. per ton of coal used in melting of glass, from waste heat. In most factories this heat could be used to good advantage in making steam for gas producers. R. E. G.

Ceramics and road materials. Ceramic industry. HOWELLS FRÉCHETTE. Can. Dept. Mines, *Mines Branch* No. 645, 1-7(1925).—A review is given of the ceramic industry in 5 of the Canadian provinces. Lab. tests of various clays best suited for ceramic purposes are reported. Cost of burning brick and tile. L. P. COLLIN. *Ibid* 8-17.—Data taken from 16 burnings in 14 plants showed that the cost of setting ranged

per ton from \$0.13 to 0.44, firing \$0.05 to 0.58, unloading \$0.12 to 0.54, fuel \$0.50 to 1.90, total cost \$1.07 to 2.44. These figures indicate that much improvement may be made in lowering the cost especially in the matter of fuel. Samples of clay from 43 localities were tested. Road materials in New Brunswick and Nova Scotia. R. H. PICHER. *Ibid* 18-45.—Granulometric analyses and phys. tests of 66 samples of road gravels are reported. Forty-two samples of bed rock in this region and in Quebec were tested for their fitness for road material. L. W. RIGGS

The constitutional changes occurring in clays on heating. THE RESEARCH STAFF OF THE GENERAL ELECTRIC CO. *Trans. Ceram. Soc. (Eng.)* 24, 402-6(1924-25).—The data presented resulted from an attempt to follow, by X-ray methods, the 500° and 900° changes in kaolinite, and to obtain information upon the stable compds. formed in fired clay. The facts established by the X-ray study of the constitutional changes in clay are: kaolinite completely breaks down at about 600°, forming a silicate which is stable to about 900°. This silicate is presumably $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$. At the higher temps. mullite is formed; the X-ray patterns of natural sillimanite and of mullite prepd. by heating andalusite at 1550° for 5 hrs. are different. The pattern of the mullite agrees with those obtained from fired clay mats. The mineral formed in clays at about 1000° is mullite and not sillimanite. The formation of mullite occurs in all the clays examd. by heating for 5 hrs. at 1050°. The temp. at which complete stability is reached—i. e., the point at which there exists only transformed quartz and mullite in the fired clay—varies according to the nature of the clay. R. F. S

Chemical transformations of kaolinite at high temperatures. P. A. ZHEMYAT CHENSKII. *Ann. Inst. Anal. Phys.-Chim. Leningrad* 2, 499-500(1924).—On the basis of the behavior of kaolin towards 5% Na_2CO_3 soln., which indicates absence of free silicic acid, Z. concludes that the kaolin mol. remains undecomposed at the temp. of complete dehydration, namely, 600-700°. B. C. A.

Behavior of kaolin at a high temperature. V. I. ISKUL. *Ann. Inst. Anal. Phys.-Chim. Leningrad* 2, 498-9(1924).—A sample of kaolin contg. 44.16% SiO_2 , 38.24% Al_2O_3 , 13.35% H_2O , and small proportions of various other oxides, lost its H_2O at a dull red heat and was then readily decomposed by 2% HCl soln., but the anhyd $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$ did not decompose. At 1000-1100°, this residue was decomposed into a substance of the compn. of sillimanite, $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$, and SiO_2 , which could be dissolved by 10% KOH soln. A second sample of kaolin, contg. 48.44% SiO_2 and 34.68% Al_2O_3 , and thus more SiO_2 than corresponds with the formula, $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$, exhibited no free SiO_2 in the form of granules of quartz; after dehydration this sample behaved towards reagents similarly to the previous one, but when heated to a higher temp. and then treated with 10% KOH soln., it left a residue having approx. the compn. of the aluminosilicate, $2\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$. The basis of this kaolin is, therefore, probably not kaolinite, but either another aluminosilicate or a mixt. of aluminosilicates. B. C. A.

Note on a new method for the determination of porosity. P. B. ROBINSON. *J. Soc. Chem. Ind.* 45, 33-4T(1926).—The usual porosity detn. of prolonged boiling in H_2O or soaking under reduced pressure was found to be incomplete even after 72 hrs with brick of about 30% porosity. The method suggested is based on the difference between the bulk sp. gr. of the brick when coated with a thin layer of plasticine and the true sp. gr. of the powd. material. Porosity = $100 [1 - (\text{bulk sp. gr. brick} \div \text{true sp. gr. powd.})] \%$. H. F. K

The application and grinding of engobes. P. JÜRGEI. *Keram. Rundschau* 34, 17-9(1926).—Engobes are white or colored slips which are applied to leather-hard bodies to conceal the more undesirable color of the body. Many natural clays are used as engobes. The engobe should have the same shrinkage as the body. If white engobes have a cream tinge, 0.01-0.02% CoO may be added. The addn. of ZnO to the slip may greatly whiten the color but is too expensive for ordinary work. The slip is usually applied by pouring it in a leather-hard vessel and emptying out the excess. A common defect is pinholing, which comes chiefly from applying the slip to ware which is too dry. Dry ware is more or less porous and when the H_2O is absorbed by the ware gases are forced through the slip causing pinholes. Another source of pinholes is fermentation of the engobe. This often originates from old wooden containers which have started to decay. If dark clays are used in the engobe they often contain pyrites which may cause pinholing during firing since gases are given off. Grinding the clay and hence the pyrites finer will tend to overcome this trouble. Typical compns. of some engobes are given. To produce engobes of different colors, oxides may be added as follows: For brown, Fe or Mn oxides; for blue, CoO ; for green, Cu or Cr oxides; for yellow, small quantities of Fe_2O_3 or TiO_2 ; for black, a mixt. of Fe, Cr and Co oxides. About 2-6%

of these oxides usually give the desired colors. Many effects may be produced by using 2 or more colored engobes. Glazes as a rule are applied over the engobes but if 30–50% of the glaze is added direct to the engobe mat finishes are produced which do not require a glaze.

H. G. SCHURECHT

The selection of refractory materials used in industrial chemistry. A. B. SEARLE. *Ind. Chemist* 2, 51–3 (1926).

E. H.

The use of silica refractories. P. B. ROBINSON. *J. Soc. Chem. Ind.* 45, 29–33T (1926).—A general discussion of the use of silica brick is given, the inversion changes which are commonly observed being followed with precautions to prevent phys. failure due to buckling of walls and spalling of the brick. New data are given to show the greater heat cond. of silica brick at all temps. over fireclay brick. The effect of exposure and wetting is studied, showing that soln. of some of the bond as well as phys. effects weaken silica brick, especially those underburnt.

H. F. K.

Carborundum refractories. IAN STEWART. *Chem. Eng. Mining Rev.* 18, 151–4 (Jan. 1926); cf. C. A. 20, 712.—The most important type of carborundum refractory contains over 90% pure cryst. and infusible SiC, bonded by the addition of a small amt. of highly refractory but fusible materials. Carborundum is infusible but decomposes at approx. 2300°. Its thermal cond. is 8–10 times that of fireclay or silica. A new type of radiating combustion chamber is described, in which liquid, gaseous, or pulverized fuels are burned in a flue of small cross section but considerable length, composed of SiC tile less than 2 in. thick. With this type it is possible to burn liquid and gaseous fuel at a rate equal to 375,000 B. t. u. per cu. ft. of combustion space per hr., and pulverized coal at the rate of 225,000 B. t. u. per cu. ft. per hr. Finely divided sponge Fe was produced on a commercial basis, and a decrease in fuel consumption of 25 to 35% with an increased production has been effected in the porcelain enameling industry. There is also a large field for SiC in the steel industry, despite its high cost.

H. STROETZ

Preparation and constitution of German insulator bodies. E. THIESS. *Ceramic Industry* 6, 191–2 (1926).—The German and Bohemian high-tension porcelain consists of 47–50% kaolin and white-burning clays, 30–25% feldspar (Sweden) and 23–25% quartz sand or rock quartz (Norway). About 90% of the German bodies are prepd. by grinding in ball mills. Most factories age the clay for long periods of time before working. Most of the ware is fired to cone 14 or higher.

R. E. G.

Porcelain for high tension insulators. K. H. REICHAU. *Trans. Ceram. Soc. (Eng.)* 24, 279–99 (1924–5).—Phys. properties are discussed.

R. F. S.

Refractory materials in carbonizing practice (MIDDLETON) 21. Mat varnish effects on glass (Brit. pat. 236,709) 26. Heating glass to render it workable (U. S. pat. 1,572,975) 13.

A Bibliography of Magnesite Refractories. Compiled by Members of the Refractory Division of Am. Ceramic Soc. Columbus, Ohio: The Society.

A Bibliography of Silica Refractories. Compiled by Members of Refractories Division of Am. Ceramic Soc. Columbus, Ohio: The Society.

Glass. W. C. TAYLOR. U. S. 1,572,625, Feb. 9. A halogen compd. is added to modify the colors due to metallic salts in borate glass, e. g., 3% of KCl may be added to a glass contg. SiO₂, B₂O₃, Co oxide and alkali in order to change the color toward the blue end of the spectrum.

Annealing plate glass. M. BICHEROUX. Brit. 236,924, July 10, 1924. Mech. features.

Annealing and cooling sheet glass by gas streams of regulated temperature. F. L. BISHOP. U. S. 1,573,033, Feb. 16.

Clay for pottery. J. E. TAMS. Brit. 242,089, Nov. 22, 1924. A "semi-porcelain" compn. for making pottery comprises ball clay, china clay, ground flint and MgO or other suitable Mg compd. (excepting hydrated Mg silicate), all blunged together. Cf. C. A. 19, 2732.

Clay mixture for pottery. J. E. TAMS. Brit. 242,091, Nov. 24, 1924. Bone 10¹/₄, china clay 5¹/₂, and hydrated Mg silicate 1¹/₂ parts are blunged together. Cf. C. A. 19, 2732.

Apparatus for removing air from pottery clay, etc., by vacuum treatment. BULLERS, LTD., F. R. PENNELL and E. J. HACKLEY. Brit. 236,687, April 28, 1924.

Fused silica articles. QUARTZ ET SILICE. Brit. 242,214, Oct. 30, 1924. Elec.

insulators, measures, etc., formed of fused SiO_2 , are superficially worked with a grinding wheel or like device having a hardness of not less than 7 on Mohr's scale. This removes the porous skin from the article and avoids the need of superficial remelting.

Kiln for drying and burning bricks. A. HABLA. Brit. 242,051, Oct. 8, 1924.

Tunnel kiln adapted for drying brick, etc. H. R. STRAIGHT. U. S. 1,572,326, Feb. 9.

Continuous tunnel kiln adapted for burning brick, tile, etc. H. R. STRAIGHT. U. S. 1,572,327, Feb. 9.

Abrasive. M. L. HARTMANN. U. S. 1,573,061, Feb. 16. Abrasive articles which may be formed mainly of SiC_2 , Al_2O_3 or similar materials have their voids filled with a lubricant such as graphite or talc which does not fuse by the heat normally created by abrasive action. A binder such as dextrin is also used with the lubricant.

Refractory ceramic material. F. M. LOCKE and F. J. LOCKE. U. S. 1,572,730, Feb. 9. A batch for making elec. insulators or other refractory articles comprises clay mixed with about 1-15% of MnO_2 or similar Mn compd. which serves to produce a product resistant to high voltages even when heated.

Refractory lining for crucibles, etc. F. C. FRARY. U. S. 1,572,475, Feb. 9. A steel shell is lined with fine particles of Al_2O_3 bound together by Na silicate.

Refractory walls for safes, etc. SOC. BOURNISIEN, BEAU, ET CIE. Brit. 242,267, Oct. 29, 1925. Zircon or similar material (which may be agglomerated by magnesia cement) is embodied in the walls of safes, etc., to resist attack by oxy- C_2H_2 blowpipe flame.

20---CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Use of sulfur in rendering cement drain tile resistant to the attack of alkali. F. H. BATES. *Ind. Eng. Chem.* **18**, 309(1926).—Impregnating drain tile with molten S greatly increased the tensile strength and reduced absorption. Impregnated tile, placed in a western alkali soil, completely disintegrated in 2 years. No satisfactory explanation of this rapid disintegration was found; but free S reacted readily with solns of lime water from concrete.

Determination of the quality of concrete. ROBERT STUMPER. *Bull. soc. chim. Belg.* **34**, 296-303(1925).—The quality of concrete being defined by the ratio of cement, sand in the mixt., formulas are derived for the calcn. of this ratio from the SiO_2 or CaO content of the cement, sand, and concrete.

Testing the materials to be used for the building of the Aaensire dam. N. HAA VARDSHOLM. *Teknisk Ukeblad* **72**, 457-60, 467-70, 477-80(1925).—The effect of the addn. of certain cheaper hydraulic materials, for instance artificial trass, or finely ground coal slags and brick waste to the mortar was studied. The mixed mortars showed a marked superiority in crushing strength and resistance to water penetration. Especially the addn. of 0.6 parts of powd. slag from coal or coke to 1 part of cement gave an excellent concrete for dam constructions.

The South's possibilities for glass and port. cement industries (SHELTON) **19**. Bituminous emulsions for use in road-making (Brit. pat. 236,641) **22**. Gas-fired shaft furnace for burning cement (Brit. pat. 236,776) **1**.

MAY, PETER. *Praktische Winke für Zement und Beton*. Berlin: W. ERNST & SOHN. 122 pp. R. M. 6.

Cement mixtures. J. U. A. OHLSEN. Brit. 236,827, Jan. 16, 1925. Infusorial earth, moler or the like are impregnated with bituminous or resinous substances and used as aggregate with Sorel cement or other cements, with or without asbestos, slag wool or other fillers, and the mixt. is molded under pressure.

Refractory cement and concrete. P. J. F. KESTNER. U. S. 1,573,072, Feb. 16. See Brit. 231,141 (C. A. **19**, 3576).

Plaster. V. LEFEBURE. Brit. 236,695, May 8, 1924. Salts such as Na_2SO_4 , K_2SO_4 , Na_2CO_3 , K_2CO_3 or alum are added to ground anhydrite in the proportion of 0.125-2.0%.

"Substitute for lumber" from bagasse. J. K. SHAW. U. S. 1,572,565, Feb. 9. Bagasse fibers are cooked together with their natural pith and with the addn. of alkali

to loosen encrusting substances (but insufficiently for paper-making) and a "lumber substitute" is formed from the fibers by H_2O deposition.

Impregnating wood. O. V. STEWART. U. S. 1,572,905, Feb. 16. Wood elec. insulators or wood in other forms is impregnated with paraffin in its inner portions and is then superficially impregnated with asphalt.

Bituminous expansion joints (for concrete, etc.) containing corncob fiber. A. C. FISCHER. U. S. 1,571,874, Feb. 2.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Fuels and combustion. ANON. *Power* 63, 8-12(1926). --A review. D. B. D.

Principles of modern heat economy. CURT WEISSBACH. *Apparatebau* 38, 30-2 (1926); 6 cuts. J. H. MOORE

A rational utilization of low-grade combustibles. GAETANO CASTELLI. *Russ. min. mel. chim.* 64, 10-2(1926).—Various methods are described which have been developed in different countries for utilizing low-grade fuels in the most economical manner. The prepn. of fuels by some of these methods, particularly flotation and low-temp. carbonization, would result in considerable saving in certain Italian industries, such as cement and glass manu. C. C. DAVIS

Motor fuels. A. PIRLOT. *Bull. fed. ind. chim. Belg.* 4, 387-402, 463-71(1925).

A general discussion with special reference to the production of EtOH for motor fuel and its utilization in admixt. with C_6H_6 , tetralin, etc. W. B. PLUMMER

Value of liquid fuels (in internal-combustion engines). P. DUMANOIS. *Compt. rend.* 181, 26-8(1925).—The fuel consumption of a motor engine over long distances averaged 22 l. per 100 km. with MeOH; 11.6 l. with a mixt. of 50% of gasoline and 50% of EtOH, 12.7 l. with a mixt. of 80% of gasoline and 20% of kerosene contg. 0.2% of lead tetraethyl, and 11.7 l. with a mixt. of 70% of gasoline and 30% of kerosene contg. 0.2% of lead tetraethyl. The corresponding max. speeds obtainable were 80, 85, 93 and 90 km. per hr. Although the consumption of MeOH is twice that of gasoline the equiv. calorific power is less. The addn. of 5% of water to the MeOH prevents back-firing, which frequently occurs, without detonation, however, with the pure alc. B. C. A.

The calculation of constants (index numbers) for benzine, benzene and similar substances. WA. OSTWALD. *Z. angew. Chem.* 39, 98-9(1926).—The differences between boiling curves, as given by various types of standard app. and procedures, and the impossibility of comparing directly the results from one kind with those of another accurately, have led to the use of a const. obtained by a rough integration (adding the temps. of 5, 15, etc., vol. % and dividing the sum by 10) of the b. p. curves themselves. Such a method is not applicable when different kinds of liquids are present in a sample, as in "benzene spirit." The following const. are proposed: 96-104°, BV motor benzene; 112-120°, high test benzenes for automobile fuel; 120-130°, (especially 126-128°) av. benzene for automobile fuel; and 140°, U. S. Navy quality. In detg. the possible uses of benzenes and benzenes the form of the boiling curve is not as helpful as is the const. described above. The const. makes possible a grading of such fuels with respect to their behavior upon boiling, and also enables calcs. concerning mixts. of fuels to be made. Also in *Petroleum Z.* 21, 1323-8(1925). W. C. EBAUGH

Flammable liquid fuels and the methods of rendering them industrially safe. A. RIEDLER. *Oesterr. Chem.-Ztg.* 27, 91-5, 100-6(1924).—Polemical. An answer to Strache (*C. A.* 18, 1572). R. defends the Martini Huneke system of protecting flammable liquids by excluding air from them at all times with inert gas, CO_2 or flue gases, as the only safe system and attacks Strache's method of avoiding explosive mixts. by satg. the air over the liquid with the vapor of the liquid itself, showing that it does not give protection except within a certain range of temps. for a given flammable liquid, outside which explosive mixts. are formed by bubbling air through them, particularly when the liquids are cold, and the time of mixing is short. The point is supported by tables and curves of vapor pressure vs. explosive limits for various flammable liquids, and by a practical test on supposedly satd. air-vapor mixts. from gasoline tanks protected by the "saturation method." The practical test indicated that time of mixing is the most important factor in detg. the efficacy of this method. The satn. method fails fully to protect empty tanks from explosion hazard, while the Martini-Huneke system protects empty tanks as well as full ones, by maintaining at all times an inert atm. The balance of the paper is mostly polemical against Strache, with more det.

tailed comparison of the Martini-Hunke system, and the "saturation method" as installed by Dabeg (Dampfapparatebau Gesellschaft in Wien). C. L. JONES

Complete utilization of coal and the motor fuel supply. A. C. FIELDNER AND R. L. BROWN. *Refr. & Nat. Gasoline Mfr.* 4, No. II, 83(1925); *Blast Furnace & Steel Plant* 14, 138-40, 148(1926).—Diesel type engines using heavier oils, gas producers, using coke and semi-coke, and even compressed gas engines may be used in the future, especially on trucks. The most promising solution of the motor fuel problem is production by synthesis from coal gas and water gas. M. BETH HART

Economical coal buying. H. B. STANTON. *Power* 63, 140-3(1926).—The short comings of purchasing coal on a heat unit basis are pointed out. Practical suggestions are offered for selecting coal on a performance basis. D. B. DILL

Pulverized coal. K. C. BARRELL. *Proc. Inst. Mech. Eng.* 1926, 37-50.—Prepn and uses are described. E. H.

Rapid determination of sulfur in coal. A. KOMAROVSKII AND A. KOGON. *Lehrkanzeln wiss. Forsch. Odessa* 1925, [4], 5 pp.—Coal (0.5 g.) mixed with 5 g. of a mixt. of equal parts of Na carbonate and KMnO_4 , and covered with 5 g. of the same mixt. in a metal crucible of 150-170 cc. capacity, is heated below redness for 30 min., and then to incandescence for 20 min., the mixt. being stirred with an Fe rod during the heating. The product is extd. with water, and sulfate detd. by the usual method. Results differ from those obtained by Eschka's method by -0.11% to $+0.07\%$. B. C. A.

Coal and oxygen. S. W. PARR AND F. B. HOBART. *Trans. Am. Inst. Mining Met. Eng.* 71, 216-26(1925).—Cf. C. A. 19, 1339. W. B. PLUMMER

Modern views of the chemistry of coals of different ranks as conglomerates. A. C. FIELDNER AND J. D. DAVIS. *Trans. Am. Inst. Mining Met. Eng.* 71, 227-45(1925).—A bibliographical review and discussion of coal classification, its microscopic examination, the action of solvents, of chem. reagents, of O under pressure, of reducing agents, and of destructive distn. W. B. PLUMMER

Resolution of coal by oxidation. W. FRANCIS AND R. V. WHEELER. *Trans. Am. Inst. Mining Met. Eng.* 71, 165-75(1925).—Cf. C. A. 19, 1484. W. B. P.

Constitution of coal. F. V. TIDESWELL AND R. V. WHEELER. *Trans. Am. Inst. Mining Met. Eng.* 71, 176-83(1925).—A general discussion (cf. C. A. 19, 1483) in particular emphasizing the humic nature of vitrain and its constitutional similarity to dopplerite (the latter "pure" humin occasionally found as jelly-like inclusions in peat). W. B. PLUMMER

Selective combustion in coal. F. S. SINNATT. *Trans. Am. Inst. Mining Met. Eng.* 71, 189-210(1925).—Mainly a review of the work of S. and associates (cf. C. A. 19, 161) on the propagation of a partial combustion zone through powd. coal. W. B. P.

Heat value of coal. W. F. SCHAPHORST. *Can. Chem. Met.* 10, 40(1926).—A chart is given graphically representing Dulong's formula for the calcn. of the heating value of coal from its compn. W. B. PLUMMER

Nitrogenous constituents of coal. J. W. COBB. *Trans. Am. Inst. Mining Met. Eng.* 71, 211-5(1925).—A brief but quite thoroughly bibliographical review of the literature on the forms and reactions of N in coal. W. B. PLUMMER

The elimination of explosives in coal mines by the use of sulfur dioxide. J. A. S. RITSON AND J. CROSSLAND. *Colliery Guardian* 131, 253-4(1926).—It was considered possible that SO_2 could be made to attack the carbonates of coal partings and the resulting disintegration eliminate the necessity of blasting. Expts. under various conditions, however, in which SO_2 was passed into the seams, indicate that its use is impracticable. The quantity of SO_2 per hr. was limited by the natural characteristics of the coal and the max. which could be used was about 0.25 lb. per bore hole per hr. The cohesion of the coal seams was not reduced and even if SO_2 did render the coal easier to mine, the cost would probably be prohibitive. The escape of CH_4 through the boreholes in fact rendered the coal more difficult to mine. C. C. DAVIS

The chemical composition of durain. N. SIMPKIN. *Colliery Guardian* 131, 198(1926).—The ash of durain from Lancashire seams varied from 1.16 to 28%, and in some cases was less than that from the remainder of the seams. The ash usually varied from white to pale brown in color. It was highly refractory, with a m. p. over 1400° , even when the coal from which it was obtained had a readily fusible ash. The volatile varied considerably, even when allowance was made for differences in H_2O and ash. Coke prepd. at 900° was barely coherent, but in some cases was very hard, the agglutinating value in each case being lower than that of the remainder of the coal. In all cases the % S was far lower than that in the remainder of the coal, usually 0.5-0.7%, but reaching in 1 case about 2%. The calorific value compared favorably with the

whole seams. The yields of gas were usually lower and those of liquor higher from the durain than from the remainder of the coal.

C. C. DAVIS

A proposed standard method for the determination of the agglutinating value of coal. M. BARASH. *Colliery Guardian* 131, 197-8(1926).—A coal may be regarded as composed of 2 parts: (1) a smaller fusible portion which gives on distn. a cellular, vitreous mass, and (2) a larger infusible, "inert" portion. There is at present no method for detg. the amt. of the first portion, for no method could be found in which this portion was not increased or diminished during attempts to sep. it from the infusible portion. The inert portion exerts a remarkable and hitherto unrecognized influence on the agglutinating properties of the fusible portions, and the nature of this infusible portion is perhaps the most important factor in the quality of the coke. During carbonization the fusible portion is partially absorbed by capillary action into the pores of the infusible portion. The relative porosity of the latter thus det. the amt. of the fusible portion left available for binding together the coke mass. This absorptive property is influenced by the method of treating the coal. Different methods of heating, chem. treatment or even weathering change the porosity of the infusible portion, thus changing in turn the agglutinating value of the coal. The most economical method of controlling the latter property is by blending different coals.

C. C. DAVIS

The liquefaction of coal. F. BERGIUS. *Petroleum Z.* 22, 76(1926).—Carefully conducted expts. showed that the reactions of coal liquefaction are largely exothermic. Org. material which is not sol. in benzene always remains. The amt. of this decreases with the first rise in temp. but later increases. Its min. value is characteristic for every coal, being less than 1% for lignite and about 10% for gas coal (cf. C. A. 20, 654).

M. BETH HART

Liquefaction of coal. J. RUBINFELD. *Allgem. oesterr. chem. tech.-Ztg.* 43, 151 (1925).—There are 4 methods by which motor fuel can be produced: (1) by low- and high-temp. carbonization of coal; (2) F. Fischer's Synthol process, (3) the Bergius process; (4) the process of the Badische Anilin u. Soda Fabrik. The Bergius process is slow to develop because of the high cost of the app. and the special type of coal necessary for the process.

M. BETH HART

Effect of briquetting of sub-bituminous coal. H. K. BENSON, J. N. BORGLIN AND R. K. ROURKE. *Ind. Eng. Chem.* 18, 116-7(1926).—A low-grade non-caking Washington coal with 15.5% water and 33.5% volatile (air dry) yielded a firm coke on carbonization at 700-950° after the addn. of 3% S and 8% California asphalt. The effect of S addn. is briefly discussed.

H. L. OLIN

Analysis of Alabama coals—analyses of mine samples. A. C. FIELDNER, H. M. COOPER AND F. D. OSGOOD. *Bur. of Mines, Tech. Paper* 347, 12-45(1925).—Proximate and ultimate analyses and results of calorific value and ash softening tests of a large no. of samples of Alabama coals—the sixth of a series of reports by states. Analyses of delivered coal. N. H. SNYDER. *Ibid* 100-7.

H. L. OLIN

Coal ash and clean coal. I. The formation and constitution of coal. R. LESSING. *Colliery Guardian* 131, 194-5(1926).—A discussion of the economic significance of the mineral components of coal, the influence of inorg. compds. on its formation, inorg. plant components, mineral matter after the formation of the coal and its distribution in the coal, chem. changes during incineration, analysis of the ash, the phys. structure of the mineral components and X-ray examn. II. Mineral matter and production. *Ibid* 255-6.—A discussion of chem. methods of mining coal, spontaneous combustion, prepn. for the market, flotation processes, drying, dry-cleaning, the control of washing and cleaning and sampling. Also in *J. Roy. Soc. Arts* 74, 182-97, 205-18(1926).

C. C. DAVIS

Steam and boiler coal consumptions, and the determination of costs, in drying brown coal. K. DEIMLER. *Braunkohle* 24, 933-41(1926).—A continuation of previous discussion (C. A. 19, 2401), extensive charts and tables for the detn. of fuel consumptions for varying per cents of H₂O in the raw coal and varying sp. heats of the dry coal, etc.

W. B. P.

Briquetting sawdust and wood waste. J. PETITPAS. *Bull. soc. d'encour.* 124, 399-408(1925).—The sawdust is treated with a dil. aq. soln. contg. glue and starchy materials, the quantity of water or soln. required being detd. graphically from the absorptive capacity of the sawdust. In order to obtain an even penetration the glue soln. is made alk. and the sawdust brought to a standard moisture content. The jelly-like mass is subjected to pressure, the presence of the alkali increasing the effect on the sawdust. A hard and durable, readily combustible briquet is thereby produced.

B. C. A.

Elimination and recovery of phenols from crude ammonia liquors. R. M. CRAW-

FORD. *Ind. Eng. Chem.* **18**, 313-5; *Blast Furnace & Steel Plant* **14**, 112-4, 154 (1926).—Description of plants built (3 installations) by the Foundation Oven Co. for removing phenols by scrubbing with C_6H_6 . Two extn. towers are used, having a downwards flow of NH_3 liquor and an upwards "spray" of C_6H_6 , 2 more towers serving to ext. the phenols from the C_6H_6 by NaOH soln. from which they are liberated by CO_2 or H_2SO_4 . With NH_3 liquor contg. 2 g./l. of phenols, consumptions and yields per 1000 gals. liquor treated are NaOH 14 lbs., C_6H_6 (loss) 5 lbs., com. concd. H_2SO_4 17 lbs or CO_2 9 lbs., phenols obtained (crude) 16.6 lbs., Na_2CO_3 obtained (if CO_2 is used) 18 lbs. The crude phenols are 12% H_2O , 51% PhOH, 26% cresols (mainly *o*-), and 11% higher acids and residue.

W. B. PLUMMER

Low-temperature coking benefits coal. R. DAWSON HALL. *Coal Age* **29**, 112-4 (1925).—A review of the present status of the Trent amalgam, McEwen-Runge and other methods for processing coal.

H. L. OLIN

Refractory materials in carbonizing practice. A. H. MIDDLETON. *Colliery Guardian* **131**, 160-1 (1926).—A general discussion of various materials. Data show that the coking time of coal is reduced almost to 0.5 when semi-silica walls are replaced by silica walls, in consequence of the superior heat cond. of the latter and the higher temp. obtainable. Measurements of the thermal expansion of silica in ovens showed that expansion is almost complete at 600°. On the other hand silica is more sensitive to heat at lower temps. than fireclay or semi-silica, and it is imperative that the rate of heating be slow below 600° and that an even temp. be maintained throughout. When properly used, ground ganister is a satisfactory jointing material for silica constructions.

C. C. DAVIS

Low-temperature carbonization. A. GUISELIN. *Matières grasses* **16**, 6941-6 (1924).—Crit. analysis of Sainte-Claire Deville's work (*C. A.* **20**, 490).

A. P. C.

Successful purification of natural gas at Fort Alma, Ontario. VICTOR LAURISTON. *Can. Chem. Met.* **10**, 30 (1926).—A brief description of a plant (Union Natural Gas Co.) using the Seaboard liquid purification process to remove H_2S from natural gas.

W. B. PLUMMER

Carbonization of Canadian fuels. I. Application of the principles of high- and low-temperature carbonization to wood, peat, and different classes of Canadian fuels. R. E. GILMORE. *Can. Chem. Met.* **10**, 31-4 (1926).—A general review and economic discussion.

W. B. PLUMMER

Carbonization of coal. F. SCHÜTZ AND W. BUSCHMANN. *Stahl u. Eisen* **45**, 1232-42 (1925).—A comprehensive survey of the field for low-temp. carbonization and the com. possibilities of the products obtained, based on a three-years' operation of a rotary retort of the "Fellner & Ziegler" type. The types of fuel suitable for low-temp. carbonization are described, and the yields and characters of the various products discussed in detail. The heavier gaseous hydrocarbons and the light oils are recovered from the gas by a compression method similar to that used in the U. S. A. for gasoline recovery from natural gas. By compressing to about 50 atm. and then expanding to atm. pressure a light spirit ("Gasol") is recovered, a sample of which contained 53.3% of paraffin hydrocarbons (ethane to pentane), 12.2% of ethylene, 16.5% of propylene, 12.2% of butylene, 2.2% of butadiene, 1.5% of amylene, and 2.1% of pentadiene.

B. C. A.

Bituminous coal in water-gas making. W. C. SMYTHIE. *Am. Gas J.* **124**, 90 (1926).—A brief discussion of the method of caleb. the most economical % of blow run in the cycle, as detd. by the economic balance between increasing oil consumption and decreasing fuel/M with increasing length of blow run. In the given case a 14-sec. blow run (4% of the cycle) was most economical.

W. B. PLUMMER

Progressive regional carbonization of coals. DAVID WHITE. *Trans. Am. Inst. Mining Met. Eng.* **71**, 253-81 (1925).—A detailed discussion of the mechanism of the evolution of coals by carbonization (bituminization) and of the factors causing and controlling such changes. Characteristics of the various North American coal fields are discussed and their relation to the general geological history of the various parts of the continent is shown.

W. B. PLUMMER

Desulfurization of large quantities of gas. A. THAU. *Gas u. Wasserfach* **69**, 125-8 (1926).—A discussion of the (German) costs of various types of large-scale installations.

W. B. PLUMMER

Determination of the cubical expansion coefficients of pitches and asphalts. H. MALLISON, F. JACOBSON AND K. SARRE. *Z. angew. Chem.* **39**, 164 (1926).—The coeff. of cubical expansion, 15-60° range, of coal tar pitch (m. 75°, Krämer and Sarnow method) and of a petroleum asphalt (m. 81°, same method) have been pycnometrically detd. as 0.00045 and 0.00062, resp. As a check on the exptl. procedure the coeff.

(20–60° range) for Hg was detd. as 0.000176 as compared to the accepted value of 0.000182.

W. B. PLUMMER

Distinction between lignite- and coal-tar oil. ANON. *Mill. Materialprüfungsamt* **42**, 67(1924).—Valenta's test for distinguishing between lignite- and coal-tar oils, in which the oil is shaken with $1\frac{1}{2}$ times its vol. of dimethyl sulfate, coal-tar oil being completely sol. and lignite-tar oil usually only slightly sol. in this solvent, is not always satisfactory, as creosote oil derived from lignite tar dissolves to the extent of about 80%. Other values, especially the d. and I value, must, therefore, be taken into consideration in judging the source of tar oils.

B. C. A.

Continuous distillation of coal tar. ANON. *Ind. Chemist* **2**, 65–74(1926).—The plant and process at the Silvertown Works of Messrs. Burt Boulton & Haywood, Ltd. are described.

E. H.

Tar-distilling plant at a steel works. ANON. *Engineer* **141**, 68–9; 72(1926).—An illustrated account is given of a plant for distg. tar. One of its outstanding modern features is a continuous tar still unit which shows little signs of requiring renewal after 8 months' operation.

D. B. DILL

Preliminary decomposition of fuels and utilization of the resultant semi-coke. EDMOND MARCOTTE. *Rev. sci.* **63**, 684–9(1925).—Discussion of the possibility of using semi-coke for the production of lean gas in gas producers on motor vehicles.

A. P. C.

Use of metallurgical coke for domestic heating. J. DE THY. *Rev. ind. minérale* **1926**, 69–73.—Proper manipulation of a coke not too high in S will insure uniform and satisfactory heating with an economy of heating 25% greater than with English or Belgian anthracite. Difficulties such as a tendency of the coke to corrode the grate and linings and to form a fusible ash apply only to cokes which are unusually high in S.

C. C. DAVIS

The production of Durham coke, with special reference to the Becker oven. H. W. SMITH AND D. RIDER. *Colliery Guardian* **131**, 443–4(1926).—A review and discussion of the carbonization of Durham coal in the Becker oven, including the characteristics of the latter and its present status both in English and American practice.

C. C. DAVIS

What is "coke combustibility"? R. H. SWEETSER. *Iron Age* **117**, 477–8(1926).—Reviews various work on, and discussions of, coke combustibility and emphasizes the lack of any basis for comparison between lab. tests and blast furnace results.

W. B. PLUMMER

Coal in relation to coke. E. C. JEFFREY. *Trans. Am. Inst. Mining Met. Eng.* **71**, 149–64(1925); cf. *C. A.* **18**, 458.—A discussion, with 13 macro- and microphotographs, intended to show that the coking power of coal is contingent upon a high content of modified wood (Anthraxylon).

W. B. PLUMMER

Ignition point and reactivity of coke products. KARL BUNTE. *Z. anorg. Chem.* **39**, 132–8(1926).—A review of B.'s work on ignition temps. and reactivity of coke with O or CO₂ (cf. *C. A.* **17**, 335, 3915, **18**, 3109), with tables and curves presenting data in some detail. The interrelation of these properties is shown by the fact that if for various cokes the temp. required to give various concns. of CO (in the standard test with CO₂) be plotted against the ignition temp. of the cokes, lines drawn through points of equal CO percentages form a family of parallel curves.

W. B. PLUMMER

Effect of over-heating on the reactivity of coke. C. HOLTHAUS. *Stahl u. Eisen* **45**, 1131–3(1925).—The reactivity of fully carbonized coke is not affected by further heating, but in a semi-coke from which the volatile matter has not been completely expelled, further heating lowers the combustibility and raises the ignition point. Expts. in which semi-coke was heated showed that at the point where the total gas evolution becomes a max., the sp. gr. and ignition point of the coke reach a max., and the combustibility a min.; further heating has no effect, and this point therefore marks the period of effective carbonization.

B. C. A.

Determination of water in hydrocarbon oils, shales and lignite (WOOD, NEALE) 22. Bituminous emulsions for use in fuel briquets (*Brit.* **236**, 641) **22**. Conversion of lignified plant matter into coal. **III.** Sugar formation as an intermediate stage of coal formation (SCHWALBE, SCHEPP) **10**.

ENGEL, W.: *Die Separation von Feuerungsrückständen und ihre Wirtschaftlichkeit, einschliesslich der Briquetierung und Schlackensteinherstellung*. Berlin: Julius Springer. M. 8.10. Reviewed in *Engineering* **121**, 133(1926).

FÜRTH, ARTHUR: *Die Leuchtgasindustrie*. Berlin: de Gruyter & Co. 132 pp. R. M. 1.25.

Fuel mixture. U. VON PORTEN. U. S. 1,572,909, Feb. 16. A fuel for household use comprises manure, garbage or other animal or vegetable refuse 75, a hydrocarbon distillate such as kerosene 2, a combustible binder, *e. g.*, tar oil and pitch 18 and clay 5%.

Fuel briquets. P. E. WELTON. U. S. 1,572,629, Feb. 9. Coal culm is mixed with a binder such as waste sulfite liquor in plastic form and then with a water-proofing material such as asphalt in granular form, shaped and then heated to drive off moisture and liquefy the waterproofing material so that it serves also as a binder.

Fuel briquets. W. PRESCOTT and D. F. WORGER. Brit. 236,636, April 8, 1924. See U. S. 1,554,462 (C. A. 19, 3582).

Fuel for internal-combustion engines. B. H. MORGAN. U. S. 1,572,750, Feb. 9. Gasoline is mixed with about an equal quantity of a mixt. formed of alc. 60-80 and ether 30-60 parts.

Fuels for internal-combustion engines. D. BALACHOWSKY and P. CAIRE. Brit. 236,914, July 12, 1924. Heavy fuels are passed alone or mixed with air over or through heated catalytic or absorbent substances. An app. is described, also adapted for enriching poor or producer gas.

Fuel oil for explosion engines. F. L. DIETZ. U. S. 1,573,307, Feb. 16. A fuel adapted for use in internal-combustion engines comprises low-temp. tar mixed with substances such as EtOH and C_6H_6 to prevent solidification of the tar. U. S. 1,573,307 specifies a fuel for explosion engines consisting of crude tar obtained by the distn. of coal at temps. up to 600° mixed with about 1-3 times its quantity of alc.

Apparatus for carbonizing and compressing bituminous fuels in a rotatable annular series of cells. A. BESTA. U. S. 1,571,927, Feb. 9.

Continuous drying of wooden chips, peat, etc. O. NORDSTROEM and A. MOERCH. Swed. 60,146, Jan. 19, 1926. Mech. features of app.

Gasifying coal. JACKSON RESEARCH CORPORATION. Brit. 236,780, Oct. 13, 1924. In gasifying coal in a vertical retort, the upper part of the retort is heated sufficiently to drive off volatiles and the lower part is heated to incandescence. Gas is withdrawn from the lower end of the retort and returned to the top and passed downwardly through the charge to carry the volatiles into the hotter zone where they are cracked.

Gas from oil and coke. J. RUDE. Brit. 242,029, Sept. 15, 1924. Oil is introduced into coke at the bottom of an externally heated retort and the oil gas produced is removed directly as formed from a point close to the zone of its formation. An app. is described.

Coke and water gas production. KOPPERS CO. Brit. 241,991, July 30, 1924. Steam is diffused into and caused to penetrate the coked sides of the charge without penetrating the uncoked inner portion.

Carburetted water gas. HUMPHREYS AND GLASGOW, LTD. Brit. 242,237, Oct. 31, 1924. In order to obtain a more uniform temp. in a water gas carburetor, steam is not allowed to ext. heat from it, and the down-run gas is led directly to the holder. During the up-run, gas is passed through the carburetor and fixer.

Water gas producer and associated valve-operating devices. HUMPHREYS AND GLASGOW, LTD. Brit. 242,226, Oct. 30, 1924.

Purifying gas house liquor. E. W. KEITH. U. S. 1,573,169, Feb. 16. In purifying gas house liquor for hydrometallurgical use, this solvent menstruum is charged with ZnO in sufficient quantity to react with the NH_4 sulfide present, forming free NH_3 and ZnS and the ZnS ppt. is sepd.

Purifying crude ammoniacal liquor. A. WEINDEL. U. S. 1,571,986, Feb. 9. The liquor is subjected to the action of a solid adsorbent such as Al_2O_3 , $CaCO_3$, sawdust or charcoal for some time to adsorb finely divided particles of tar, and, after removing the adsorbed mass the liquor is treated with a solvent, *e. g.*, C_6H_6 , for recovering the phenols in soln.

Gas producer. K. KOLLER. Brit. 236,725, July 4, 1924.

Gas producers with rotating bodies and ash pans. J. F. ROGERS. U. S. 1,572,040-41, Feb. 9.

Furnace for purifying producer-gas, etc. H. T. GRAFTON, C. W. WEESNER and F. J. HOFFMAN. U. S. 1,572,599, Feb. 9.

Apparatus for cleansing, cooling and mixing producer gas and air for use in internal-combustion engines. R. I. DENHAM and N. C. JONES. Brit. 236,743, Aug. 1, 1924.

Gas calorimeter. R. G. GRISWOLD. U. S. 1,572,283, Feb. 9. Gas is burned in heat-interchanging relation to H_2O proportionate in vol. to the vol. of gas burned.

The gas to be burned is continuously fed by displacing it from a container with the H_2O being heated, and the rise in temp. of the H_2O due to the gas combustion is registered in units indicating the heat value of the gas.

Testing the coking properties of coal. W. J. KLAIBER. U. S. 1,572,391, Feb. 9. See Brit. 221,778 (C. A. 19, 888).

Vertical coke retorts. P. H. DOUGLAS and I. D. THOMAS. U. S. 1,573,145, Feb. 16.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Barnsdall an outstanding name in sixty-five years of history of oil. JAMES MCINTYRE. *Oil & Gas J.* 24, No. 35, 102-3(1926).—Historical. M. BETH HART

Micrographic analysis of mineral oils subjected to certain oxidation tests. VANGHELOVITCH. *Bul. soc. chim. România* 7, 93-9(1925).—Hoblyn's results (*J. Petrol. Tech.* No. 48(1925); cf. C. A. 19, 1048, 1493) are confirmed. In the course of the heat test (heating to 250° till pptn. of asphalt occurs) hard asphalt is first formed, then soft asphalt, and lastly carbene. The heat test can be replaced by a shorter oxidation test, consisting essentially in detg. the min. concn. of a powerful oxidizing agent, e. g., HNO_3 , which will cause sepn. of asphalt, visible under the microscope. The lower the strength of the HNO_3 , the poorer the quality of the oil as a crank-case lubricant.

A. PAPINEAU-COUTURE

A method for the estimation of water in hydrocarbon oils, shales and lignites. C. E. WOOD and A. E. T. NEALE. *J. Inst. Petr. Techn.* 11, 471(1925).—The method is accurate for oils contg. only a small percentage of water. A sufficient quantity of oil to give less than 0.5 cc. of H_2O is distd. with toluene or xylene and 20 cc. of distillate are collected in a graduate tube. Aniline is run into the distillate from a buret until a critical soln. obtained at 20°. The cc. of aniline used corresponds to the amt. of H_2O in the distillate, which may be read off from detd. graphs. M. BETH HART

Cracking heavy petroleum oils at ordinary pressures. L. DAL PRATO. *Bull. fed. ind. chim. Belg.* 4, 16-20, 80-3(1925).—A discussion of the author's (patented) process for vapor-phase cracking at 550-600° over bauxite, Fe_2O_3 , etc., as catalyst. It is claimed that C_6H_6 and cyclohexane and their homologs are present in the gasoline thus produced, and that their presence makes the gasoline miscible (emulsifiable) in com. 95% EtOH for motor fuel. W. B. PLUMMER

The utilization of the aromatic hydrocarbons of petroleum. DAN RADULESCU. *Mon. pétrole Roumain* 24, 1821(1925).—During the World War aromatic hydrocarbons were obtained from Arbanasi petroleum by the following method: The naphtha contg. over 2% hydrocarbons was subjected to a slow rectification. The fraction up to 73° was used as aviation gasoline. The fraction 73-85° contained benzene (95%). The fraction 80-105° contained no aromatic hydrocarbons and the fraction 105-116° contained 23% of toluene. The benzene and toluene fractions were nitrated directly or after further rectification. M. BETH HART

The study of petroleum deposits by means of gas analysis. DOBRESCO. *Mon. pétrole Roumain* 24, 1910(1925).—Analysis of the gas of various wells in Morein showed that a relation exists between the compn. of the gas and the oil bed from which it comes. Gas from the Dacian formation has a high percentage of CO_2 and the corresponding crude is heavy and poor in gasoline. The Metoc formation, however, contains gas with practically no CO_2 and crude rich in gasoline which has a relatively small percentage of paraffin wax. M. BETH HART

Method of calculating energy contained in petroleum gas. S. F. SHAW. *Oil & Gas J.* 24, No. 35, 78(1926).—The ratio between dissolved gas and the quantity theoretically required to raise a gal. of oil is given for several fields. M. BETH HART

Apparatus for the determination of the cold-point of mineral oils by the ether method. ANON. *Chem.-Zig.* 50, 86(1926); 1 cut.—A 3-walled Dewar vessel is closed with a 3-hole stopper. A 15-mm. test tube with thermometer and the oil sample is inserted into the Et_2O bath through the central hole and air is drawn through the Et_2O through tubes in the other holes. A temp. of -35° is easily reached, and 50 cc. Et_2O is enough for 3 detns. J. H. MOORE

The oil shale of Holzheim and the oil produced from it. K. NEUBRONNER. *Petroleum Z.* 22, 57-61(1926).—Carbonization in Al app. gives: carbonization water 5-12,

shale oil 6-7.5, residue 76.8-82%, gas 20-40 l. per kg. The crude oil contains 0.5% org. bases and 1.3% phenols. The yield is very low. Possible utilization of the shale would consist in using the carbonization residue as raw material for cement manu-

M. BETH HART

Oil shale deposits of Salzburg (Germany). EMIL SPORN. *Teer* 24, 86-8(1926).—A stratum has been discovered, about 2.5 m. thick and of considerable extent, the shale contg. 21% bitumen. In an exptl. retort yields were 4-5% (wt.) gases, 9-12% oil, the residue contg. about 6% bitumen.

W. B. PLUMMER

Possibilities of oil shale in event of petroleum shortage. B. MILLS. *Oil Weekly* 39, No. 10, 43(1925).—N and S will be the chief by-products from oil shales. The quantity of oil extd. varies from one gal. to 60 gals. per ton of oil shale. Theoretically it will be possible to recover 25,000,000,000 bbls. of oil from the oil shales of Utah

M. BETH HART

Fire protection and prevention in petroleum industry practice. C. H. HAUPT. *Oil & Gas J.* 24, No. 35, 87-8(1926).—A general discussion. Fire fighting facilities around a refinery include: (a) high-pressure water, (b) steam smothering lines, (c) foam systems, (d) portable extinguishers. Such equipment constitutes an investment of 3 to 5% of the total plant valuation.

M. BETH HART

Paraffin wax content of Grosny petroleum. A. SACHANOV AND N. WASSILJEV. *Neftjanoe i slancevoe Khozjstvo* 8, 44-51(1925).—In detg. the paraffin wax content by Holde's method (cf. Engler and Hofer, "Das Erdöl," IV., 18), a certain quantity of the wax is decomposed during the distn. of the oil or masut, and the decompn. is only inappreciable when the wax content is less than 2%. The distd. portion of masut contg. 13.04% of wax, contains only 8.35%. The rate of distn. has a marked influence upon the extent of the decompn.; thus, with rapid distn., results are 30-50% higher than with slow distn., and as it is very difficult to regulate the rate, the method gives erratic as well as inaccurate results. Pptn. of the wax by the addn. of alc.-ether or alc.-amyl alc. mixts., without previous distn., gives results up to 400% too high, even if resinous constituents are adsorbed by silica gel before pptn. In contrast to Holde's method, however, the method yields more accurate results when the wax content is high. More accurate results are obtained by pptg. the wax with an alc.-amyl alc. mixt. and subsequently re-pptg. it with an alc.-ether mixt. The m. p. of the wax is affected to only a slight extent by impurities, and consequently is of little value in judging the purity; thus, 10% of cylinder oil lowers the m. p. from 57.2° to 56.1°, 9.6% of machine oil to 56.0°, and 50% of oil to 48.6-49.5°. The solidifying temps. of samples of masut from Grosny petroleum contg. 0.1-0.7%, 1.5-2.5% and above 3% of wax, were below -10°, 5° to 20°, and about 30°, resp.

B. C. A.

Control of pressure to increase recovery. H. L. DOHERTY. *Oil & Gas J.* 24, No. 35, 90, 138-40(1926).—Oil underground in an undisturbed pool is in a different condition from the oil after it is placed in tanks. Surface tension and viscosity of the oil are lowered by the gas dissolved in it and render the oil underground more fluid. Data given show the amt. of probable gas pressure at different levels and the method of calcn.

M. BETH HART

Expander increases yield of Pure Oil Plant. R. MUNSELL. *Refiner and Natural Gasoline Mfr.* 4, No. 12, 17(1925).—The output of the compression gasoline was increased 25% by subjecting the compressed gas to a temp. of 28° to 30° F. The low temp. is obtained by the use of an expander-compressor, which operates on the pressure of the dry gas leaving the pressure accumulating tanks at approx. 250 lbs.

M. BETH HART

An electrical apparatus for locating the source of water in oil wells. R. L. KEYES. *Summary of Operations in Calif. Oil Fields.* 10, No. 12, 5(1925).—An app. is described which is used to det. the point of entry of water into an oil well by means of elec. resistance measurements. The fluid in the hole is first entirely displaced with surface water having a relatively low salt content and, therefore, a high resistance. Some of the water is then removed by bailing, thereby reducing the hydrostatic head and allowing the formation fluids to enter the well. The sp. resistance of the fluid is measured at various depths. A marked decrease in the resistance of the fluid is observed opposite the point at which salt water is entering the well. Oil entering, will be indicated by an increase in resistance.

M. BETH HART

Refineries with cracking. C. O. WILSON. *Oil & Gas J.* 24, No. 28, 68(1925).—Refineries with cracking equipment handle 75% of the crude oil.

M. BETH HART

Mechanical entrainment in refining equipment and its elimination. G. M. KIRKPATRICK. *Oil Trade* 17, No. 1, 21(1926).—The use of vapor-pressure tanks and oil and gas separators prevents the entrainment of mist. By this all of the oil is conserved

and also the lighter ends are held back. As a result, the oil tests at the highest possible gravity.

The refinery factor for approximating refinery yields. J. M. EVANS. *Petr. World* 10, No. 10, 52(1925).—A method for detn. is described. Examples are given.

M. BETH HART

Sulfurous acid as a refining agent. ISMAR GINSBERG. *Refr. & Nat. Gasoline Mfr.* 4, No. 11, 16(1925).—Although SO_2 dissolves a greater part of the aromatic compds. of light oil, it is best to subject the oil that is to be refined to further treatment with a small quantity of H_2SO_4 and oleum. When SO_2 is not used, a large amt. of H_2SO_4 is necessary with products which contain a high proportion of S because the acid must first combine with the aromatic and unsaturated compds. in the distillates before it reacts with the sulfur impurities.

M. BETH HART

Refinery gasoline reclaiming plant pays for itself three times in a year. J. C. CHATFIELD. *Nat. Petr. News* 17, No. 48, 27(1925).—The small oil absorption plant of the Johnson Oil and Refining Co. is described. Uncondensed still vapors and vapors from the Dubbs cracking plant are reclaimed.

M. BETH HART

Gasoline recovered in one operation. GEORGE W. H. REID. *Oil & Gas J.* 24, No. 35, 125, 127(1926).

M. BETH HART

Economic aspect of cracked gasoline. R. B. DAY. *Oil & Gas J.* 24, No. 27, 66(1925).—A general discussion which emphasizes the need for max. recovery of motor fuel oil and suggests the importance of chem. research.

M. BETH HART

Training school at gasoline plant. T. N. S. HILL. *Oil & Gas J.* 24, No. 25, 149(1925).—Description of training school at the Pacific Gasoline Plant

M. B. H.

Some of the potential public health hazards from the use of ethyl gasoline. F. B. FLINN. *J. Ind. Hyg.* 8, 51–66(1926).—Careful physiol. expts. with rabbits, guinea pigs, rats, goats, pigeons and monkeys to det. the possible hazard due to contact with coned. PbEt_4 , splashing with Et gasoline, and inhalation of Et gasoline fumes prove that storage of Pb takes place under sufficient exposure, and this storage of Pb in the body constitutes potential Pb poisoning. The rate of excretion did not equal the rate of absorption in these expts. Absorption through the skin was proven by application of 0.1% PbEt_4 in gasoline in repeated doses of 0.3 cc. to rabbits, 0.1 cc. to guinea pigs, and 2 cc. to goats. Absorption of Pb from Et gasoline fumes was proven by causing the animals to inhale air contg. about 0.04 mg. Pb per cu. ft. (1.4 mg. Pb per cu. m.); and by exposure to fumes rising from the natural evapn. of Et gasoline. When 0.01 cc. coned. PbEt_4 was applied daily to 5 rabbits, death ensued in 13 to 19 days. C. M. S.

Lubricating oils. W. C. LUCKOW. *Baking Tech.* 5, 40–2(1926).—Routine tests for oils are given and the analytical results of over 50 oils are tabulated. Most of the oils tested were for automobile use.

RUTH BUCHANAN

Evaluating lubricating oils. ISMAR GINSBERG. *Refiner and Natural Gasoline Mfr.* 4, No. 12, 19(1925).—A good lubricating oil must have a certain amt. of "oiliness" or lubricating power. It must be stable from a phys. and chem. standpoint. It must possess a certain degree of viscosity. Oiliness is connected with the static friction. The change of viscosity with the temp., the volatility and the solidification point det. the physical behavior of the oil. The Conradson coking test and the oxidation or sludging test are characteristic of chem. behavior.

M. BETH HART

Contact filtering of lubricating oil successful at Ohio refinery. P. TRUESDELL. *Nat. Petr. News* 17, No. 47, 78(1925).—Lubricating oil is filtered through fuller's earth of 200 mesh, untreated and unroasted. The charge consists of 125 bbls. of oil and 1400 lbs. of earth.

M. BETH HART

Effect of moisture and temperature on the power factor of transformer oil. J. E. SHRADER. *J. Frank. Inst.* 199, 513–38(1925); *Science Abstracts* 28B, 337.—Four methods usually employed in making dielec.-loss measurements are described. The fact that there is a decreased absorption of moisture at the higher temp. for reheated oil would suggest that the oil had undergone some chem. change such that its water soly. was different at the higher temp. The results show that the power factor shows a min. value with voltage and the increase in power factor on the upper range of voltage is not very marked for oil in good condition; moisture mechanically mixed with oil settles out from the oil as shown by the decrease in losses and power factor; moisture is driven from oil by heating.

H. C.

Charcoal. HILDING BERGSTROEM AND SVEN LUNDIN. *Jernkontorets Annaler* 109, 625–38(1925).—Results are given of investigations regarding the influence of the final carbonization temp. on the yield of charcoal, the compn. of the product, the yield of distillate and uncondensable gas, and the compn. of the latter, with several tables curves and illustrations of the app. used. The investigations include also the increase

in wt. of charcoal in H_2O -sadt. air and the activation of charcoal for decolorizing purposes by means of heating in H_2O -vapor. C. A. ROBAX

The composition of rosin oils from Bukowina pines. OSCAR CZERNY. *Bul. soc. chim. România* 7, 91-2(1925).—Resinic acids extd. from pine oil by means of Na_2CO_3 , and pptd. with H_2SO_4 , recrystd. from EtOH give rhombohedral plates of abietic acid, m. 156° . The purified oil gives the Storch-Norawski reaction (violet color with C_6H_6 , Ac_2O and a few drops of $SnCl_4$). Pine oil treated with KOH at $50-60^\circ$ for 24 hrs., washed and dried, gave a clear, yellow, odorless oil, free from fluorescence, with practically no acidity or sapon. no., and I no. 47.5. Most of it distd. (in the presence of Na) at $250-350^\circ$, and no solids could be sepd. by cooling the distillate, in a mixt. of CO_2 -snow and Me_2CO . Fractional distn. under a pressure of 9 mm. gave the following fractions: (1) $195-8^\circ$, colorless oil without fluorescence, d_{15} 0.9647, with compn. corresponding to octahydrotene, $C_{18}H_{36}$, identified by production of trimellitic acid, $C_6H_6O_6$, m. $225-6^\circ$, by oxidizing with $HNO_3-H_2SO_4$ on the water bath for 24 hrs. followed by sapon. with KOH. (2) $240-65^\circ$, colorless, odorless oil, free from fluorescence, d_{15} 0.960, with compn. corresponding to styrene, C_8H_8 , identified by its dibromide, m. 74.5° . (3) $310-40^\circ$, slightly bluish oil, most of which distils at $310-5^\circ$, with compn. corresponding approx. to C_6H_4 . (4) $340-8^\circ$, greenish oil with aromatic odor, d_{15} 0.9686, from which concd. H_2SO_4 exts. a colorless oil, d_{15} 0.9686, with compn. corresponding to diterphenyl, $C_{20}H_{20}$, identified by its yellow nitrate, $C_{20}H_{17}(NO_2)_3$; the residue from the H_2SO_4 extn. on heating *via* Renard gave an oil m. $392-3.4^\circ$, with compn. corresponding to retene, $C_{18}H_{18}$, identified by its picrate, m. 125° . A. PAPINEAU-COUTURE

Relation of oil shale to petroleum (VAN TUYL, BLACKBURN) 8. $CaCl_2$ waters from certain oil fields in California (HUDSON, TALIAFERRO) 8. Kerogen and its relation to the origin of oil (FRAGER) 8. Analyses of Wyoming oil-field waters (ESTABROOK) 8. Water analyses in oil production and some analyses from Poison Spider, Wyoming (PARKS) 8. Heat-exchange system for fractional condensation of oil vapors (U. S. pat. 1,573,129) 13.

BUNBURY, H. M.: Die trockene Destillation des Holzes. Translated by Wilhelm Elsner. Berlin: J. Springer. 340 pp. R. M. 24.

HICKS, J. H.: The Laboratory Book of Mineral Oil Testing. 4th Ed. revised by A. W. Cox. London: Chocless Griffin & Co., Ltd. 128 pp. Cloth 5s. Reviewed in *Chem. News* 132, 61(1926).

PATEK, FRANZ: Holz-Lexikon. Ein Hilfsb. f. d. Holzfachmann. Berlin: C. A. Schwetschke & Sohn. R. M. 10.

Distilling petroleum oils. J. M. WADSWORTH. U. S. 1,572,584, Feb. 9. Crude petroleum or other oil is subjected to repeated vaporizing operations, fractions of similar b. p. are combined and condensed to form primary distillates of varying volatility, and these primary distillates are continuously redistd. as sep. substances, and the residue from the substances of lighter distillates are added in series to the substances of heavier distillates.

Cracking hydrocarbon oils. H. WOLF. Brit. 242,223, Nov. 3, 1924. After cracking oil by heating under pressure to above 390° (e. g., in a heated coil or metal bath), the products are cooled below 250° (preferably to $100-150^\circ$) immediately on expansion by admixt. with cooled residual products, reflux condensate or crude oil. The cracked product may, for this purpose, issue into a vessel contg. oil and Raschig rings.

"Constructive conversion" of liquid hydrocarbon oils. H. R. BERRY. U. S. 1,571,994, Feb. 9. Hot H-contg. gas, e. g., water gas, and liquid hydrocarbon material such as a petroleum oil are caused to counter-flow in intimate contact, e. g., in an app somewhat like a column still, so that the liquid hydrocarbons are constantly subjected to an increasing temp. and the H-contg. gas is constantly subjected to a decreasing temp. The conditions of heat and pressure are regulated so that part of the liquid hydrocarbon combines with the H-contg. gas and liquid of lower and gas of heavier gravity are produced. An app. is described.

Demulsifying mineral oils. W. D. LEEPER. U. S. 1,573,321, Feb. 16. The oil is first washed by passing it in finely divided state through hot H_2O , and live steam is then passed through the washed oil.

Oil and other products from bituminous materials. PATENTAKTIEBOLAGET GROEN-DAHL-RAMÉN. Swed. 60,119, Jan. 19, 1926. Mech. features of app.

Internally heated annular cellular retort for transforming and distilling hydrocarbon oils. A. A. F. M. SIEGLE. U. S. 1,572,691, Feb. 9.

Still, dephlegmator, separator, etc., for distilling and refining petroleum oils. W. C. AVERILL, JR. U. S. 1,573,025, Feb. 16.

Condensing vapors from oil pressure stills. E. W. ISOM and J. E. BELL. U. S. 1,573,167, Feb. 16. A stream of condensate is circulated to and from a relatively large body of the condensate and vapors from a pressure still are injected into this circulating stream between a cooler through which it passes and the large body of condensate.

Fractionating column and other apparatus for producing gasoline. F. TINKER. U. S. 1,572,626, Feb. 9.

Separating wax from mineral oil distillates. S. H. HALL and C. H. HAPGOOD. U. S. 1,571,943, Feb. 9. A wax distillate soln. is refrigerated to throw the wax out of soln. in cryst. form and the mixt. is centrifuged while feeding H_2O at a temp. sufficient to melt the wax to the periphery of the mixt. undergoing centrifugation to facilitate sepn.

Reconditioning used lubricating oils. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 242,272, Oct. 29, 1924. Oils such as those from internal-combustion engines, which contain suspended solids, are treated with an alkali silicate or other weakly basic agglomerating substance sol. in H_2O , sludge is sepd. with H_2O and volatile impurities are distd. An app. is described.

Hydrocarbon lubricating oils. J. C. BLACK. U. S. 1,572,465, Feb. 9. After treating hydrocarbon oil with H_2SO_4 and sepn. of the pptd. acid products, the oil is treated with neutralizing and decolorizing material, heated, and sepd. from the added purifying and decolorizing substances.

Bituminous emulsions for use in road-making or in fuel briquets, for coating stone, roofing, etc. H. A. MACKAY. Brit. 236,641, April 8, 1924. Sulfonated fatty oils are used in prepg. emulsions of Mexican asphalt, pitch or other bituminous substances. Cf. C. A. 20, 663, 811.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Reply to the remarks of K. Hess on the depolymerization of cellulose. F. HEUSER AND N. HIEMER. Z. *Elektrochem.* 32, 47-50(1926); cf. C. A. 18, 1384; 20, 110.—In reply to Hess (C. A. 20, 663) the authors maintain that the Cu values 6.8-8.5 obtained for hydrocellulose indicate a pure product. Impurities are further reduced by methylation. After prepn. of a hydrocellulose from viscose fibers, the product was found to have a Cu value of 10.4 by Schwalbe's method, but only 6.97 by the method of Weltzien and Nakamura. The ash-free substance was methylated, washed, and filtrate and wash water were examd. for impurities. The latter proved to be simple sugars; hence it is safe to assume that degradation products are removed in washing. The mean mol. wt. of the methylated product is 2200. Whether mol. wts. of methylated celluloses may be detd. accurately by f. p. methods, was investigated by making the detn. on a pure hydrocellulose, Cu value 0.45 (1.84 by Schwalbe's method). The value found was 1900, which shows that accurate results can be obtained by taking great care in the readings. So detd., the mol. wt. represents the size of the phys. mol. in colloidal soln.

Bleaching pulp in vacuum with hypochlorite. RAFFAELE SANSONE. *Papeterie* 48, 21-5(1926).—Brief description of an app. allowing of bleaching in vacuum, with an outline of its operation and advantages.

Increasing the combustibility of cigaret paper. ANON. *Papeterie* 48, 18, 21 (1926).—It is suggested that a small quantity of cellulose chlorate or nitrate be added to the stock in the beater, a short time before dropping. A method of prepn. of these esters is described.

The combustibility of cigaret papers. H. FREYDIER. *Industrie papetière* 5, 19 (1926).—Brief outline of the methods which can be used to impart the desired degree of combustibility to cigaret papers.

Paper fillers. M. B. SHAW AND G. W. BICKING. *Bur. Standards, Tech. Paper* 301, 733-48(1925); *Pulp Paper Mag. Can.* 24, 153-9(1926); *Paper Trade J.* 82, No. 3, 46(1926); cf. C. A. 19, 576.—Runs of book paper using 10-20% of different fillers were made, and the product was examd. as to retention, color, strength, opacity, etc. Asbestine and talc have approx. the same paper-making properties and are comparable to the better clays. Crown filler and gypsum have relatively low retentive qualities when the usual machine water system is employed, and the fillers are added in the usual amts. The comparatively small quantities of filler in finished paper are not

sufficient to produce variations attributable to the color characteristics of the fillers employed, unless pronounced differences in color are evident in the filling materials. Sizing and other paper-making operations were not adversely affected by any of the materials. Differences in opacity, finish, strength and degree of sizing were due chiefly to differences in retention of the fillers. Bibliography of 25 references. A. P.-C.

Wood from the Ivory Coast. F. HEIM DE BALSAC, M. CERCELET, G. S. DAGANI AND R. HEIM DE BALSAC. *Bull. agence gén. colonies* 18, 520(1925); *Bull. Imp. Inst.* 23, 482(1925); cf. C. A. 20, 285.—"Avodiré" wood (*Turroeanthus africana*, F. Pelligrini) having ash 4.56, fats and waxes 0.80, cellulose 62.15, lignone 32.49% (all on the dry basis), on digestion with NaOH at 5% concn. for 8 hrs. under 3 kg. pressure, gave a light brownish yellow pulp, which bleached easily, yielding 37% of bleached pulp. On microscopical examn it was found to consist almost entirely of cylindrical fibers which tapered regularly and had a wide lumen and thin walls; a few cells and fragments of vessels were also present. The fiber length was 1-2 mm. (av. 1.5), and the diam. 0.015-0.025 mm. (av. 0.020). The pulp furnishes paper which is comparable in all respects with that obtained from the ordinary com. wood pulps. A. P.-C.

The composition of lignin. L. P. ZHEREBOV. *Bumazhnaia Promyshlennost* 3, 495-506, 686-709(1921); *Paper Trade J.* 81, No. 27, 47-58(1925). A crit. review. A. PAPINEAU-COUTURE

Production of paper and cardboard from peat. A. LAMIRETTE. *Papeterie* 47, 809-13, 901-5, 950-5, 990-4, 1052-5, 1090-4, 1134-8(1925).—More particulars are given concerning L.'s previously published work (C. A. 17, 2503), more particularly as regards differences in treatment necessitated by considerable variations in the properties of peat of different origins. L. considers that some of the results obtained might justify com. operations, but this has not yet been realized as the processes can hardly be worked successfully under present economic conditions. A. PAPINEAU-COUTURE

Reddening of sulfite pulp. ANON. *Mon. papeterie belge* 6, 97, 99(1926).—The reddening of sulfite is attributed to formation of free S towards the end of the cook, which, under the action of traces of H_2S , forms a white or yellowish compd. with the lignin in the pulp; and this compd. under the action of oxidizing agents, gives a red coloration. A. PAPINEAU-COUTURE

Treatment of straw and of resinous woods with sodium sulfite and ammonium sulfite. M. V. BROT AND M. HIRSCHL. *Papier* 29, 75-80(1926); cf. Brot and Men, C. A. 19, 1052.—Tests were carried out in the same app. and under the same conditions as those previously reported. Comparative expts. with NaOH and Na_2SO_3 gave the following results:

Wt. of chemical per 100 g. dry straw	10	20	30	40
Yield obtained with NaOH	54.1	44.3	41.0	39.2
Yield obtained with Na_2SO_3	61.0	57.5	54.0	52.5

The color of the Na_2SO_3 pulp was much whiter than that of the NaOH pulp. Similar results were obtained with $(NH_4)_2SO_3$. On treating Bordeaux pine contg. 6-8% resin with 60% of $(NH_4)_2SO_3$ (on the wt. of dry wood), at 180-5°, delignification takes place suddenly between the 3rd and 5th hrs. of cooking. The pulp obtained in 4 hrs. bleaches easily. Under the microscope it has a normal appearance, but still contains an appreciable amt. of resin. The advantages of such a process over the soda and sulfate processes are discussed, and the problem of waste liquor recovery is also discussed as regards both the Na and NH_4 sulfite treatments. A. PAPINEAU-COUTURE

Fresh digester filler. W. G. MACNAUGHTON. *Paper Trade J.* 82, No. 5, 61(1926).—The equipment consists of a fan which circulates air with considerable velocity through the digester while it is being filled with chips. Tests at the Robertsfors mill (Sweden) showed an increase in yield from 78 to 108 kg. of air-dry (90%) pulp per cu. m. of digester space. A. PAPINEAU-COUTURE

Heat problems in the sulfate mill. K. M. THORSEN. *Paper Trade J.* 82, No. 5, 62-5(1926).—Comparison of the usual recovery system in sulfate mills with the Sandberg-Sundblad system, showing the advantages of the latter. A. P. C.

Mechanical pulp and its physical property of wetness. J. H. MOWAT. *World's Paper Trade Rev.* 84, 1988-96(1925); *Paper Maker & Brit. Paper Trade J.* 71, 59-62(1926).—Discussion of the importance of wetness (or freeness) of groundwood in the manuf. of news print, and of the characteristics of the pulp according to its process of manuf. and condition on reaching the paper mill. A. PAPINEAU-COUTURE

The freeness test for sulfite and groundwood pulp. FREDERICK BARNES. *Pulp Paper Mag. Can.* 24, 105-7, 123(1926).—Efforts were made to develop a freeness tester (of the Schopper-Riegler type) of the highest accuracy and widest range possible, the

time-sedimentation tester ("slowness" tester) being used as a comparative standard. Results obtained indicate that a depth of stock increased by 50% would give the Green tester considerably closer side-drainage figures and an improved range. Interesting results were obtained by applying a strong suction to the whole base of the freeness tester, giving an even curve when plotted against the time-sedimentation test. When groundwood contains a large no. of fiber-aggregates, the freeness tester may give results which are misleading as to the quality of the stock, and the slowness tester is preferable in that case.

The testing, analytical and research laboratories of the French School of Paper Making. ANON. *Industrie papetière* 4, 374-6(1925); 5, 15-9(1926).—Description of the labs. and their equipment, with a list of the principal researches carried out from 1907 to 1925.

Electric oven for determining the moisture content of pulp, designed at the French School of Paper Making, Grenoble. M. ARIERT AND M. FALLOT. *Papier* 28, 1303-5 (1925).—The oven can hold 50 or more samples in perforated Al baskets. The balance pan is inside the oven, and the samples can be weighed without having to open the oven.

Control of operations in the pulp mill. R. DIECKMANN. *Papier Ind.* 7, 1606-7 (1926).—See C. A. 19, 2563.

Paper drying. R. MARX. *Tech. Sect. Papermakers' Assoc.* 5, 146-63(1925).
B. C. A.

The action of dyes used in paper making on the animal life of streams (HÄMPFEL)
14.

SIEBER, RUDOLF Ueber das Harz der Nadelholzer und die Entharzungen von Zellstoffen. 2nd ed. Berlin Carl Hofmann. 164 pp. M. S. Reviewed in *Pulp Paper Mag. Can.* 24, 14(1926). *Paper Trade J.* 82, No. 3, 47(1926).

SIEBER, RUDOLF Ueber das wärmetechnische Verhalten des Sulfitzellstoff-Kochprozesses. Biberach-Riss, Württemberg: Gfintter-Staib Verlag. M. 6.50. Reviewed in *Pulp Paper Mag. Can.* 24, 162(1926).

Drying newly formed traveling webs of paper. E. A. BRINER and H. J. GUILD. U. S. 1,573,297, Feb. 16. Mech. features of regulating the constraint under which the web is held during different successive stages of drying.

Transparent paper. C. E. SWETT. U. S. 1,571,976, Feb. 9. Glassine paper is treated with a soln. of tannic acid in alc. or other non-aq. solvent, to render it transparent. Terpinol hydrate also may be added. Cf. C. A. 20, 823.

Reclaiming used paper. G. HAMMOND. U. S. 1,572,478, Feb. 9. Paper carrying pigment is heated at a temp. somewhat below 43°, beaten and treated with caustic alkali during the beating. An alkali acid sulfite such as NaHSO₃ is then mixed with the pulp at substantially room temp. and further beaten.

Deinking paper. G. HAMMOND. U. S. 1,572,479, Feb. 9. A compn. for deinking paper is formed of H₂O, glucose and "naphtha" soap.

Paper-making apparatus. G. F. McCCLAY and H. V. HAIGHT. U. S. 1,572,498, Feb. 9.

Blended color wall paper. J. J. WARREN. U. S. 1,573,208, Feb. 16. A color soln. is applied to a blended pulp stock as it flows over an inclined apron.

Pulp from bagasse and similar material. E. C. LATHROP and T. B. MUNROE. U. S. 1,572,539, Feb. 9. Bagasse or similar fibrous material is fermented to soften and heat the material and is piled in masses which will retain heat on their interior sufficiently to lessen their moisture contents and effect substantial sterilization. U. S. 1,572,540 specifies preserving green bagasse and similar material from injurious fermentation during storage by substantially satg. a mass of the material with moisture and keeping the mass sufficiently wet to maintain a fermentation by lactic and similar bacteria while inhibiting other fermentations until a sufficient proportion of the parenchymatous matter is destroyed.

Pulp from wood chips or similar material. L. BRADLEY and E. P. McKEEFE. U. S. 1,572,840, Feb. 9. A cooking liquor is used contg. Na₂S₂O₃ and a quantity of NaOH in excess of that required to decompose silicates and aluminates in the material treated.

Apparatus for cooking wood chips to form pulp. J. T. JAEGER. U. S. 1,572,723, Feb. 9.

Cellulose acetate films. S. J. CARROLL. U. S. 1,572,232, Feb. 9. Transparent cellulose acetate films contain sufficient tributyrin (usually about 10-35%) to maintain flexibility even after prolonged heating at 65°. Cf. C. A. 20, 111.

Cellulose ester lacquers. R. A. BEAUSEJOUR. U. S. 1,572,461, Feb. 9. A layer of cellulose ester lacquer is floated on an aq. NaCl soln. or other liquid of greater d. with which the lacquer is substantially immiscible. A wood panel or other article to be lacquered is then dipped through the floating layer of lacquer.

Filaments and films from cellulose xanthates. H. HAWLIK. Brit. 242,240, Oct. 29, 1924. Insol. water-proofing compds. are formed in filaments or films during the spinning or like operation, by chem. reaction; e. g., a sol. salt of Al, Ba, Ca, Sr, Sn or Zn may be incorporated with the viscose soln. and a higher fatty acid with the "spinning bath" or pptg. soln. Brit. 242,242 specifies the addn. of sol. sulfides (or formation of sulfides from oxides) in making films, filaments, etc., from viscose.

Reducing viscosity characteristics of nitrocellulose. L. E. BRANCHEN. U. S. 1,572,266, Feb. 9. Nitrocellulose is first softened with MeOH (contg. H₂O) or other penetrant liquid and is then separately treated with an aq. soln. of an alkali, e. g., a 2% Na₂CO₃ soln. contg. Cl (for 1-3 days at room temp.).

Reducing viscosity characteristics of nitrocellulose. S. E. SHEPPARD and L. W. EBERLIN. U. S. 1,572,248, Feb. 9. Nitrocellulose is treated with a substantially non-nitrating gaseous mixt. contg. higher oxides of N, e. g., NO and NO₂. U. S. 1,572,249 specifies treating nitrocellulose with a bath of H₂O₂ or other peroxide, for the same purpose.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

The manufacture of nitrocellulose. A. B. NIXON. *Hercules Mixer* 8, 55-7 (1926).—A description of the manuf. of cellulose nitrates from cotton linters based on practical experience, and giving detailed information on cutting and grading linters, and the factory control.

CHARLES E. MUNROE

Experimental researches on the explosive and the shock waves. P. LAFFITTE. *Ann. phys.* 4, 587-694 (1925).—This is a detailed review of the results of L.'s previous work on detonating gaseous mixts. (cf. C. A. 18, 1910; 19, 1776) with additional matter dealing with the formation and propagation of plane detonation waves, special attention being given to the influence of the diam. of the tube in which the explosion phenomena are propagated on the length over which the combustion wave, which precedes the birth of the detonation wave, extends. This was found to be a function of the increasing diam. of the tube. Where there is an abrupt change in the diams. of the tubes the duration of the period of combustion which succeeds the explosion wave is found to be an increasing function of the relation between the diams. of the tubes. Observations on tubes down to those 0.1 mm. in thickness show that the velocity of the explosion wave is independent of the thickness of the wall of the tube. Studies of the influence of initial temps. up to nearly the temp. of inflammation of detonating mixts. show that the velocity is a slowly decreasing function of the temp. When inflammation is provoked in an explosive gaseous mixt. by a sufficiently powerful detonator a spherical explosion wave is formed and propagated. The development of shock or compression waves by detonating solid explosives has been further studied and while this shock wave has been found initially to have a higher velocity than the detonation wave in the explosive, and to propagate itself to a considerable distance beyond the explosive, its rate falls off very rapidly. The propagation of the shock wave in combustible and incombustible gases, and through solids also was studied as were the spectra of mixed gases in a state of combustion and of these and solid explosives while detonating. L. urges the use of Berthelot's "explosive" wave in place of Dixon's "explosion" wave but he makes "explosive wave" synonymous with detonation wave. C. E. M.

The explosion at 9 Kirchstrasse (Berlin). K. A. HOFMANN. *Gas u. Wasserfach* 69, 154-7 (1926).—This explosion, of unknown origin, was of great violence, tearing out the side and front of the house from the street floor to the roof (four stories). It is presumed that O from CaOCl₂ stored on the first floor formed an explosive mixt. of high brisance with C₂H₄ vapors or C₂H₂ from some source. There was no evidence of leaks of illuminating gas. W. B. PLUMMER

Warning against the customary process of making cooling baths from inflammable compounds and liquid air. H. STAUDINGER. *Z. angew. Chem.* 39, 98 (1926).—From 2 to 2½ cc. of liquid O (old liquid air) placed in a thin dish and mixed with 1 cc. of ether

(added through a tube at least 1 m. long), and then ignited by a spark from wires placed 1 cm. above the liquid, explode with about the force developed by 3 l. of detonating gas or 4 g. of nitroglycerine. Such mixts. are also sensitive to friction and concussion. Diln. with N, or mixt. in other than the optimum concns., diminishes the severity of the explosion. The danger inherent in such mixts., when used for low temp. work, is apparent.

Generation of electricity in fuel pipes. BRUNO MÜLLER. *Apparatebau* 38, 29-30 (1926).—Expts. showed that tensions of 100-1200 v. resulted from forcing benzine through a nozzle.

W. C. EBAUGH

J. H. MOORE

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Mordant dyes. G. T. MORGAN. *J. Soc. Dyers Colourists* 43, 54-8(1926).—A lecture.

L. W. RIGGS

Fastness of dyes to the influence of light. R. E. ROSE. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 68-9; *Am. Dyestuff Rept.* 15, 90-1.—The important variables which influence fastness are: the compn. of the dye, the intensity of the dyeing, the quantity of the radiation, the wave length of the radiation, the quality of the substrate, temp., and humidity.

L. W. RIGGS

The S. R. A. dyes for celanese brand yarns, fabrics and garments. R. G. DORT. *Chemicals* 24, No. 19, 19-22; No. 23, 19-23(1925); 25, No. 1, 22-6, 39; No. 5, 21-3(1926).—The properties and application of the S. R. A. dyes on celanese are discussed.

CHAS. E. MULLIN

Preparing cotton piece goods for jig dyeing. H. C. ROBERTS. *Textile World* 69, 581-3(1926).—The various methods of desizing cotton piece goods are discussed.

CHAS. E. MULLIN

Use of zinc dust in dyeing synthetic indigo. JACOB RICHTER. *Chemicals* 25, No. 5, 19-20(1926).—Various formulas for prepg. indigo vats are discussed.

CHAS. E. MULLIN

Calico printing—some white discharges. WM. B. NANSON. *Textile Am.* 45, No. 2, 25-7(1926).—Several formulas.

CHAS. E. MULLIN

Basic dyes on acetate silk. C. E. MULLIN. *Canadian Colorist & Textile Processor* 6, 4, 12-6(1926); cf. *C. A.* 19, 2748.—The methods of application, use of dyeing assistants such as celloxan, acetane, Zn salts, etc., properties of the resulting colors, and patents are discussed.

CHAS. E. MULLIN

Dyeing of artificial silks or rayons. L. A. OLNEY. *Am. Dyestuff Rept.* 15, 109-14 (1926).—An address.

L. W. RIGGS

Dyeing of natural silk hose containing cotton. H. D. MUDFORD. *J. Soc. Dyers Colourists* 43, 44-6(1926).—A lecture.

L. W. RIGGS

Throwing as related to piece dye silks. L. C. LEWIS. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 72-5; *Am. Dyestuff Rept.* 15, 120-3.—An address with discussion by members.

L. W. RIGGS

Dyeing and finishing silk from the consumer's standpoint. P. V. BOUTERSE. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 77-85; *Am. Dyestuff Rept.* 15, 125-33.—An address with discussion by members.

L. W. RIGGS

Application of nitrobenzyl cellulose ethers to the dyeing of cotton. D. H. PEACOCK. *J. Soc. Dyers Colourists* 43, 53(1926).—Leucotrope (phenylbenzylidimethylammonium chloride) is a reagent capable of producing benzyl ethers of cellulose. When nitrobenzyl ethers are produced they can be reduced to amino compds., which may then be diazotized and coupled.

L. W. RIGGS

The dyeing of wool in fast shades. C. P. BEAN. *Ind. Chemist* 2, 57-9(1926).

E. H.

Effective ventilation in dyehouses. A. S. CAPWELL. *Canadian Colorist & Textile Processor* 6, 76-9, 85(1926).

CHAS. E. MULLIN

Corrosion from cotton dyeing and finishing. W. W. CHASE. *Textile World* 69, 1513-5(1926).—The corrosion of buildings and app. by the various textile chemicals is considered and suitable resistance materials are suggested.

CHAS. E. MULLIN

Viscose as a filler. WM. B. NANSON. *Textile World* 69, 585-7(1926).—Cotton piece goods may be filled by printing with a suitable viscose soln., in an ordinary single-color printing machine equipped with a steel finishing roll, instead of wood. The filled cloth is dried and passed through an aniline black aging box at 95-7°. The dried cloth may be softened by means of soap or sol. oil in the dye bath.

CHAS. E. MULLIN

Warp streaks in silks. JAMES CHITTICK. *Textile Am.* 45, No. 2, 47-8(1926).—Causcs. CHAS. E. MULLIN

Tests to distinguish between viscose and cuprammonium artificial silks. O. S. RHODES. *J. Textile Inst.* 17, 75-6T(1926).—A soln. contg. 1% AgNO_3 , 4% $\text{Na}_2\text{S}_2\text{O}_3$ and 4% NaOH is prepd. by dissolving the AgNO_3 and $\text{Na}_2\text{S}_2\text{O}_3$ separately and mixing, the NaOH is then added and the whole brought to the boil and filtered. The 2 silks are separately immersed for 1 min. in the prepd. reagent at boiling, when the cuprammonium silk remains white and the viscose silk turns brown. Nitrate silk also gives a brown coloration with this reagent, but a blue coloration with diphenylamine sulfate. L. W. RIGGS

The chemical analysis of cotton. The ash content and ash alkalinity of typical cottons. R. G. FARGHER AND M. E. PROBERT. *J. Textile Inst.* 17, 46-52T(1926). The mineral matter in the principal cottons of the world varies between 1 and 1.3%. Certain American outside growths and native Indian types show slightly higher figures, while the Sea Island varieties are apt to be lower in mineral matter. The alkyl. per g of ash is a fairly const. factor and is approx. proportional to the ash content, so without much error the ash may be calcd. from the ash alkyl. L. W. RIGGS

Progress in the knowledge of fibrous materials. O. HERZOG. *Ledertech. Rundschau* 18, 30-2(1926); *Z. angew. Chem.* 39, 297-302. I. D. C.

Nature of the proteins of wool. S. R. TROTMAN, E. R. TROTMAN AND R. W. SUTTON. *J. Soc. Chem. Ind.* 45, 20-4T(1926).—Woolen fabric was extd. in a large hot Soxhlet app. successively with light petroleum ether, CCl_4 , CS_2 and alc. when no loss of S occurred. The expts. of Allworden (cf. *C. A.* 10, 1436) were repeated but his results were not confirmed. Cold N or 0.2 N NaOH removed 50% of the S in 12 hrs.; 0.01 N NaOH removed no S. When cold dil. NaOH acts on wool the cortex appears to be attacked more readily than the epithelium. This suggests the presence of 2 proteins. Two proteins were sep'd. from wool by treatment with concd. HCl at 70°, filtering, reprecip. and purifying. The first protein (A) gave ash 0.40%, S 362, N 12.50. The filtrate after removing (A) contained another protein (B) which gave ash 0.10%, S 1.49, N 12.68. A considerable proportion of the S is present in firm combination, but it may be removed without destroying the protein-like structure. (A) and (B) gave humin N 2.55 and 2.45%, amide N 1.20 and 3.90, diamino N 12.00 and 34.30, mono amino N 86.25 and 59.35, resp. L. W. RIGGS

Specific gravity of wool and its relation to swelling and sorption in water and other liquids. A. T. KING. *J. Textile Inst.* 17, 53-67T(1926).—This paper is for the most part purely scientific in character and does not deal directly with mfg. procedure. The topics considered are the effect of sorption on the actual detn. of sp. gr., penetration by solvents and oils, influence of salts on swelling and sorption, and density methods of detg. regain and of estg. wool-cotton mixts. L. W. RIGGS

The moisture relations of cotton. The absorption of water by cottons of various origins. A. R. URQUHART AND A. M. WILLIAMS. *J. Textile Inst.* 17, 38-45T(1926) cf. *C. A.* 19, 2749.—The differences which are observed among raw cottons with reference to water absorption are considerably reduced by the partial purification effected by boiling with water. It is probable that the pure celluloses of these various cottons are only slightly variable, the observed differences being largely attributable to the non-cellulosic impurities. The removal of the non-cellulosic materials is accompanied by a reduction in hygroscopicity. Dyed materials exhibit a further reduction which can not be wholly explained in terms of loading the cotton with non-hygroscopic substances. L. W. RIGGS

Comparison of the effects of oxidation before and after the mercerization of the cotton fiber. EDMUND KNECHT AND E. F. MULLER. *J. Soc. Dyers Colourists* 43, 46-53(1926).—Mercerized yarns are more susceptible to oxidation than plain cotton. The Cu nos. of the products are greater than that of plain oxidized cotton, even when the oxidation has been the same in each case. This increase in Cu nos., after deducting the resp. amts. caused by mercerization, is the same for yarns mercerized with NaOH and HNO_3 at their resp. optimum mercerizing strengths. Mercerizing of oxidized yarn with NaOH produces a tendering and decrease in Cu no., but for degrees of oxidation below "0.0064 atom of O/mol." the effect of mercerization is to increase the strength and raise the Cu no. of the yarn. Yarns mercerized with NaOH and oxidized in a vacuum have a Cu no. identical with that of ordinary cotton oxidized in a vacuum. The aggregate totals of a series of Cu-no. detns. conducted on the same piece of oxidized yarn give an approx. identical value for plain and mercerized cotton. Cotton yarns mercerized by varying strengths of NaOH and then subsequently oxidized, show a decrease in Cu no. which varies with the diminishing strength of the NaOH. There is a pro-

nounced rise in temp. during mercerization with both NaOH and HNO₃. A definite strength of mercerizing soln. is necessary to obtain a completely mercerized yarn. The percentage of moisture retained by a completely mercerized yarn corresponds to the mol. proportion of 2 mols. of cellulose to 1 mol. of water. A semimercerized yarn contains a lower percentage of moisture and possesses less affinity for O than a fully mercerized product. The heat of reaction also is less. These results appear to indicate that moisture-free mercerized yarn loses its affinity for O and that yarn kept moist by phys. methods shows no increased affinity for O. Dyed mercerized yarns fade more readily than ordinary dyed cotton. Yarns mercerized with NaOH show this property to a greater extent than those mercerized with HNO₃. L. W. RIGGS

Mildew in cotton goods. The growth of mold fungi on sizing and finishing materials. I. E. MORRIS. *J. Textile Inst.* 17, 1-22T (1926). Seven species of fungi, all obtained from cotton goods which had mildewed under ordinary trade conditions, were cultivated on size pastes and agar jellies. From these expts. the rate of growth of each fungus was detd. on different sizing and finishing substances, thus giving a basis for classification of these substances according to their degree of liability to mildew. The dextrins and wheat, rice and cassava flours permit the most rapid growth and production of spores. Growth on dextrins tend to fall behind that on flours. An intermediate group is formed by wheat and maize starches, gum tragacanth, and sol. starch. On tapioca flour, sago and farina fungi grew slowly and produced few spores. The greater growth on flours than on starches is attributed to their greater sugar and N content. **Mildew in cotton goods.** The growth of mold fungi on steeped wheat flour. *Ibid* 23-37T.—A period of fermentation decreases the liability of a flour to develop mildew so far as the growth of *Clasosporium* and *Fusarium* are concerned, but has slight effect upon the growth of *Aspergillus* and *Penicillium*. The addn. of 6% ZnCl₂ decreases, in varying degrees according to the species, the liability to mildew. The addn. of NaOH to the steep until it is neutral to litmus increases the liability, which is unaffected by the length of the steeping period. If the steeped flour is washed free of acids the liability is increased, but to a less extent than by neutralization. The effect of adding ZnCl₂ to the steep is removed by washing. L. W. RIGGS

Banana fiber. R. O. BISHOP. *Malayan Agr. J.* 13, 376 81 (1925).—Fiber was prepd. by stripping the stems of *Musa malaccensis*, Ridl., *M. violascens*, Ridl., and cultivated banana, the yield from the latter being smaller, but in quality the fiber resembles the medium grades of "partially cleaned" Manila hemp. Analysis of the fiber gave the following results for the 3 varieties, all on the dry basis except H₂O: H₂O 10.4-12.29, ash 1.47-2.6, water-washing loss 1.8-6.9, acid-washing loss 3.03-9.5, hydrolysis "A" loss 17.7-21.0, hydrolysis "B" loss 25.0-29.3, cellulose 30.7-34.62%; fiber length 0.9-6.30 mm., av. 4.15 mm., mean fiber diam. 0.025 mm. With ZnCl₂ and I the fiber is stained a deep blue, after a transient claret in some parts of the slide; with I it gives a brown color, and with H₂SO₄ and glycerol it gives no color. A. PAPINEAU-COUTURE

Weighting and the dyeing of weighted silk piece goods. C. A. PULLER. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 75-7; *Am. Dyestuff Rept.* 15, 123-5.—An address. L. W. RIGGS

Moth-proofing compounds—their composition and patents. C. E. MULLIN. *Textile Colorist* 48, 89-91 (1926).—A discussion of the various patents upon this subject with particular reference to those covering *Eulan F. Extra* and *BL*, and *Larvex*. CHAS. E. MULLIN

Naphthophenothiazines (Brit. pat. 236,795) 10.

TROTMAN, S. R., AND TROTMAN, F. R.: **The Bleaching, Dyeing, and Chemical Technology of Textile Fibers.** London: C. Griffin & Co., Ltd. 610 pp. 30s.

Dyes. BRITISH DYESTUFFS CORPORATION, LTD., K. H. SAUNDERS and H. GOODWIN. Brit. 242,061, Oct. 22, 1924. 1-Amino-2-hydroxy-3-carboxynaphthalene-6-sulfonic acid is prepd. by sulfonating β -naphthoic acid, coupling the sulfonic acid obtained with a diazo compd. and reducing the azo compd. Monoazo dyes, giving fast pink to bluish red shades when chrome-printed on cotton, are made by coupling this sulfonic acid with 3'-carboxy-1-phenyl-3-methyl (or carboxy)-5-pyrazolone, 3'-hydroxaminophenyl-3-methyl-5-pyrazolone or similar compds. The 3'-hydroxaminophenyl-3-methyl-5-pyrazolone may be made by condensing the hydrazine obtained from the diazo compd. of *m*-HONHC₆H₄NH₂ with Et acetoacetate.

Dyes. W. P. BATES. U. S. 1,572,417, Feb. 9. Intermediates which give orange

to brown dyes are formed by adding a diazonium compd., e. g., diazotized aniline, to *m*-phenylenediamine or other aromatic amine in the presence of H_2O while maintaining the reaction mixt. hot.

Azo dyes containing zinc. F. STRAUB and H. SCHNEIDER. U. S. 1,572,573, Feb. 9. Dyes obtained by coupling the nitrated diazo compd. of 1-amino-2-hydroxynaphthalene-4-sulfonic acid with α - or β -naphthol and reducing the nitro group are further treated with substances yielding Zn such as $Zn(OH)_2$ and its compds. with alkalis and NH_3 . The resulting dyes form dark powders dissolving readily in H_2O with violet coloration which changes to bluish red on addn. of caustic alkalis. They dye wool violet to brownish black tints which become gray to black by after-chroming.

Dyeing. BADISCHE ANILIN & SODA FABRIK. Brit. 242,233, Oct. 30, 1924. In dyeing either animal or vegetable fibers or piece goods, propylated or butylated aromatic sulfonic acids or their salts, e. g., Na isopropyl (or butyl) naphthalene sulfonate, are added to the dye bath or used for preliminarily treating the material, to produce dyeings of good fastness to rubbing.

Dyeing animal fibers. S. W. WILKINSON. Brit. 242,027, June 25, 1925. Fibers and fabrics such as wool, fur, bristles, silk, leather and feathers are treated with NH_3 and ozonized air to improve their power of absorbing dyes so that in some instances mordants are unnecessary.

Dyeing furs or other animal fibers. H. STEIN, W. E. AUSTIN and I. LIEBOWITZ. U. S. 1,573, 200, Feb. 16. Previous to dyeing, the material is treated with a bleaching soln. of H_2O_2 in the presence of a fiber-protective agent comprising $FeSO_4$ and NH_4Cl .

Dyeing textile materials with sulfur dyes. B. K. THURS. Brit. 236,617, April 3, 1924. Mech. features of froth dyeing.

Dyeing apparatus. SMITH, DRUM & Co. Brit. 236,728, July 8, 1924.

Steaming and aging apparatus for use in dyeing fabrics or warps. MATHER & PLATT, LTD., and J. LEONTIEFF. Brit. 236,620, April 4, 1924.

Apparatus for dyeing or other fluid treatment of skeins of textile fibers. J. BRAND WOOD. U. S. 1,572,637, Feb. 9.

Dyehouse ventilation system for eliminating vapors and preventing condensation. C. J. HEUSER. U. S. 1,572,288, Feb. 9.

Apparatus for "dry-spinning" of artificial filaments from cellulose acetate solutions or similar substances. E. PRINCE. U. S. 1,572,955, Feb. 16.

Apparatus for making filaments of artificial silk. SIEMENS-SCHUCKERTWERKE GES. Brit. 241,948, Oct. 24, 1924.

Spinning viscose. J. C. HARTOGS. U. S. 1,573,062, Feb. 16. $Fe_2(SO_4)_3$ or other ferric salt is added to an acid spinning bath to prevent evolution of H_2S .

Transparent, wool-like and other finishes on cellulosic fabrics. KNOW MILL PRINTING CO., LTD. and R. J. HANNAY. Brit. 236,643, April 9, 1924. Natural or artificial cellulosic yarns, fibers or fabrics are treated with H_2SO_4 together with sulfonic acids of the benzene or naphthalene groups or their compds. substituted with OH. The treatment may be preceded or followed by mercerizing, calendering, embossing or other finishing processes.

Pressure kier for treating cloth or yarn. W. C. FOULDS. U. S. 1,573,310, Feb. 16.

Impregnating composition for bags. NORSK HYDRO-ELEKTRISK KVAELSTOF-AKTIESELSKAP. Norw. 42, 235, Dec. 21, 1925. A compn. especially suitable for impregnating bag fabric is produced by heating a mixt. of unsatd. oils, sulfur and asphaltic bitumen.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

True colloidal paints. SAMUEL CABOT. *Paint Oil Chem. Rev.* 81, No. 9, 10(1926) --- A brief review of the causes of chalking, peeling and spotting in paints. These characteristics are largely avoided by prepg. the pigments of colloidal size by means of "direct disruptive force" and a protective agent. These particles are negatively charged and show Brownian movement. There is practically no tendency for pigment and vehicle to sep. Tinting power and brilliance of color are increased. Priming qualities are improved as a result of the capillary action of surface pores on the fine particles.

ROBERT J. MOORE

Problems in paint and varnish technology. The need for experimental investigation. H. H. MORGAN. *J. Roy. Soc. Arts* 74, 271-86(1926). E. H.

Laboratory and test fence. W. T. PEARCE. *Paint, Oil Chem. Rev.* 81, No. 8, 10-11 (Feb., 1926).—This is a discussion of the relative merits of paint and varnish test in the lab. and on the test fence. P. outlines some of the questions needing investigation, and takes up the problems of exposure testing, such as the structure and moisture content of the wood painted, the direction and angle of exposure, and the method of inspecting the tests.

H. STORRTZ

Preservative coatings for structural materials. *Rept. of Comm. D-1, Am. Soc. Testing Materials* 44, 67 pp. (preprint) (June, 1925).—Exposure tests have been carried out on white paints to det. the relative dirt collection of paints of low and high pigment. White lead alone, and mixts. of ZnO with titanox, lithopone and white lead, resp., were reduced with various proportions of raw linseed oil, turpentine, liquid drier and heat-treated tung oil. After exposure for 3 months, the majority of expts. showed a compd. pigment consisting of ZnO 30%, and titanox 70%, to be the cleanest. The tests seem to indicate that the most rapid deterioration of paint occurs where it has been applied over a badly rusted surface; sand blasting or pickling of the steel seems preferable to hand cleaning. From the results of tests on 21 anticorrosive and anti-fouling paints coated on panels and submerged in the sea for 4 months, the following tentative specifications are given: Anti-fouling paints to contain in each U. S. gallon, both Cu and Hg in not less than the following amts.: for general service, for Northern temperate waters, for Southern temperate waters, and for tropical waters, Cu 14 oz., 25 oz., 20 oz., and 14 oz., Hg 7 oz., 1.5 oz., 5 oz., and 14 oz., resp., the Cu and Hg to be present as compds. sol. in distd. water at 20° to not more than 1 part in 15,000 by weight, and so finely divided that not more than 2% is retained on a No. 325 U. S. standard sieve. Fouling and corrosion appear as much dependent on variations in the vehicle as on the pigment. Proposals for the standardization of service tests of exterior varnishes, including a standard black undercoat, are minutely described. Full details are given of tentative methods for routine analysis of white linseed oil paints, and for testing shellac varnish; also specifications for dry bleached shellac, lithopone, lampblack, bone black, chrome yellow, pure chrome green, and reduced chrome green; requirements for sampling tung oil, and a definition of the term "screen" or "sieve."

B. C. A.

Toxic compositions to prevent fouling of steel ships and to preserve wood bottoms. H. A. GARDNER. *Paint Manufs. Assoc. of U. S., Circ. No. 259, 232-71* (1926).—A résumé of results of 4 yrs'. research on materials to prevent the fouling of metal by barnacles, hydroids, ascidians and bryozoa, and on materials to prevent the destruction of submerged wood by *Teredo* or *Limnoria*. On running ships from salt into fresh water death of the barnacles occurs, apparently as a result of osmosis, but the mantels remain attached. Smoothing or polishing the surface does not prevent fouling. Expts. on various colors showed that the comparative freedom from fouling on white and light tints is probably due to zinc oxide. Hundreds of anti-corrosive and anti-fouling compns. were tested, including animal and vegetable oils, metallic soaps, rubber, finely divided metal powders, org. Hg compds., org. acids, resins and alkaloids. A combination of coal tar, rosin and certain soaps proved to be valuable in preventing barnacle attachment. Copper soaps are particularly efficient. Of hundreds of hot-application paints investigated, only a few proved valuable. Ester gum incorporated in the paint makes the film too insol. The best results are obtained when the film is of a sol. or soft nature. Pine oil incorporated in the thinners gave much better results than mineral spirits, turpentine and other high-boiling ingredients. Phenol-formaldehyde resins dissolved in alc. or C_6H_6 gave very good results. Nitrocellulose coatings failed quickly. Tung-oil fatty acids gave excellent results. The claim that special steel plate, such as is used in the passenger ship "Leviathan," would not foul if left unpainted did not prove true. Zn and Cd coatings sprayed over metal and wood, while non-corroding, fouled rapidly. A formula which gave excellent results as a copper paint for wood bottoms, as well as being efficient as a general anti-fouling paint, is: rosin 164 lbs., coal tar 49.5 lbs., coal-tar naphtha 451 lbs., beeswax $3\frac{3}{4}$ lbs., Mn linoleate 145 lbs., Venetian red, dry, 105 lbs., ZnO, dry, 210 lbs. There are included 68 formulas representative of hundreds exposed, and photographs of tests.

ROBERT J. MOORE

Notes from the practice. II. A white lead substitute. J. PRESCHER AND R. CLAUS. *Z. Nahr. Genussm.* 50, 430 (1925).—The pigment freed from oil consisted of lithopone (35.3% ZnS and 64.7% $BaSO_4$).

WILLIAM J. HUSA

α - and β -Eleostearin. Liquid and solid granular light-induced products from tung oil. H. A. GARDNER AND H. C. PARKS. *Paint Manufs. Assoc. of U. S., Circ. No. 256, 207-15* (1925).— β -Eleostearin formed in light-struck tung oil does not render the oil unsuitable for varnish making. The crystals sepd. from the oil by washing with cold Me_2CO gave a shorter heat test than the original oil. Dissolved in C_6H_6 and poured on

glass, the crystals dried slightly faster than the liquid residue so dissolved and poured.

ROBERT J. MOORE

Machinery for hulling and crushing tung seed. With notes on constants of abnormal oils. H. A. GARDNER. Paint Manufrs. Assoc. of U. S., *Circ.* No. 255, 199-206 (1925).—Detailed analyses are tabulated of oils made by different methods of hot and cold pressing seeds imported from China, compared with commercial Chinese tung oil and Florida-grown tung oil.

ROBERT J. MOORE

Perilla and chia culture experiments of 1925. With results on chia crushing experiments. H. A. GARDNER. Paint Manufrs. Assoc. of U. S., *Circ.* No. 257, 216-27 (1926).—Economics of production, planting time and methods, weather conditions, and results are given for the growing of perilla seed in Georgia and Florida. Florida plantings were unsuccessful because of unprecedented drought. Perilla seed culture probably will not be taken up rapidly in America because of relatively low yields and difficulty in harvesting. Data are given on crushing and hot and cold pressing of chia seed obtained from Mexico. Consts. for hot-pressed and cold-pressed, resp., are: $d_{15.5}$ 0.9333, 0.9332; n_D 1.4796, 1.4796; I value 190.6, 191.4; sapon. value 195, 196; nonsapon. matter 1.16, 0.87; acid value 3.32, 1.80.

ROBERT J. MOORE

Notes on alfalfa seed oil, hempseed oil and safflower seed oil. H. A. GARDNER. Paint Manufrs. Assoc. of U. S., *Circ.* No. 258, 228-31 (1926).—Attention is called to the possible use of these oils in white paints to reduce the yellowing shown by linseed oil. Alfalfa seed yielded only 11.2% oily substances. The oil had an I value of 165 and an acid value of 2.5. Safflower seed oil may be refined to a very light color. Compared with linseed oil in paints, it shows very little yellowing. Hempseed oil, I value 155-160, is almost equal to linseed in drying. It yellows less than linseed.

R J M

The constitution of ultramarine blue. I. S. REMINGTON. *Ind. Chemist* 2, 79-84 (1926).

E H

Chemistry and manufacture of writing and printing inks. WM B. GAMBLE. *Introduction*, by H. M. LYDENBERG. N. Y. Public Library, *Separate* 1926, 105 pp.—A list of references in the N. Y. Public Library.

E. J. C

Airplane dopes. MAURICE DESCHIENS. *Chimie et industrie* 15, 18-27 (1926)—Review. A. PAPINEAU-COUTURE

The seeds of *Mercurialis* species (GILLOR) 11D. Oil sampler for tank-car shipment (GNAEDINGER) 27. Cellulose ester lacquers (U. S. pat. 1,572,461) 23.

Preparing cement surfaces for painting. A. HARRIS. Brit. 241,976, July 24, 1924. A mixt. formed from HOAc, H₂SO₄, turpentine and H₂O is applied to cement work before painting it.

Coloring waxes, rubber, shellac, etc. BADISCHE ANILIN- & SODA-FABRIK. Brit. 242,274, Nov. 3, 1924. Coloring substances which are practically insol. in the usual solvents are "nearly colloiddally dispersed" in the plastic materials. Shellac colored with lithol-fast scarlet R in borax soln. may be used as an ink.

Protecting metal surfaces from acids, etc. A. C. HOLZAPFEL. Brit. 241,970, July 1, 1924. Cleaned metal surfaces are coated with a mixt. comprising rubber, resin and ground asbestos or other acid-resisting pigment, and then provided with an overlying coating of a cellulose ester varnish or paint.

Tung oil. TAUBMANS, LTD. Brit. 236,928, July 10, 1924. Tung oil for use in paint or varnish, etc., is treated to delay polymerization and prevent gelatinization when heated, by heating the oil with one of the B-contg. acids to a temp. of about 260° and allowing it to cool until the desired viscosity is reached.

Mat varnish effects on glass. R. K. HEARN. Brit. 236,709, May 30, 1924. Naphtha or other "suitable adulterant" is added to varnish for attaching silk sheets to glass; or the silk may be backed with crinkled Sn foil.

Composition for removing baked enamel. G. W. BLAIR. U. S. 1,572,839, Feb. 9. Shellac is mixed with smaller quantities of lacquer and paraffin and with a still smaller proportion of NH₄OH.

"Turpentine substitute." C. C. MONGER. U. S. 1,572,902, Feb. 16. An acidulated mixt. of resin and naphtha is distd. after a preliminary heating below the temp. of distn.

Furniture polish. J. JOHANSEN. U. S. 1,572,021, Feb. 9. Linseed oil 6 oz., kerosene 4 oz., vinegar 4 oz., turpentine 2 oz. and spirits of camphor 1 dram.

Printing inks. SHUCK, MACLEAN & CO., LTD., and W. P. PRICE. Brit. 236,611, March 13, 1924. Printing ink is mixed with an emulsion of the oil-in-H₂O type compris

ing a deliquescent salt such as CaCl_2 and which may also contain NH_4Cl or borax and petroleum jelly. The emulsion is preferably mixed with lithographic varnish and then incorporated in the ink; its use avoids the need of damping-app. in lithographic or printing processes.

Resinous coating composition containing chlorinated rubber. N. BOEHMER. U. S. 1,572,065, Feb. 9. A compn. suitable for coating concrete, etc., comprises chlorinated rubber and at least an equal quantity of cumarone resin, together with a solvent such as C_6H_6 or solvent naphtha.

Distilling natural resinous substances. J. M. A. CHEVALIER, P. BOURCET and H. REGNAULT. U. S. 1,572,766, Feb. 9. A natural resinous material such as gum of the pine, Canada balsam or Peruvian balsam is mixed with 1-5% of H_3PO_4 and the mixt. is distd. at a temp. which is progressively raised until the temp. of the vapors reaches about 310° , in order to obtain rapid distn. of a *turpentine substitute* in good yield.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The chemistry of oils and fats. I. The synthesis of the higher unsaturated acids. R. ROBINSON AND G. M. ROBINSON. *Food Investigation Board, Report for the year 1924 Dept. Sci. Ind. Research* 1925, 62-3 —The Na deriv. of a monoalkylated acetoacetic ester was condensed with the ester chloride derived from a dibasic acid and the product was hydrolyzed. The acetoacetic ester contributes only a methylene group to the final product. Thus any ketone of the form $\text{R}.\text{CH}_2.\text{CO}.\text{R}$ can be synthesized.

I. W. RIGGS

Oil sampler for tank-car shipment. R. J. GNAEDINGER. *Paint Manufacturers Assoc. of U. S., Circ. No. 254*, 195-8(1925).—The sampler tube is divided into small cells of varying cross-sectional areas, so that the amt. of oil taken from different layers in the tank is proportional to the total vol. of that layer.

ROBERT J. MOORE

Notes from the practice. I. Testing of cacao fat for alkalies and alkaline earths. J. PRESCHER AND R. CLAUS. *Z. Nahr. Genussm.* 50, 429-30(1925)

W. J. H.

Detection and determination of coconut oil and milk fat in cacao fat. J. KUHLMANN AND J. GROSSFELD. *Z. angew. Chem.* 39, 24-6(1926). —In the analysis of mixed fats it has been found advantageous to det. *A* the fatty acids whose Mg salts are sol. in water but whose Ag salts are insol. and *B* the volatile fatty acids with sol. Ag salts. Both values are expressed in cc. of 0.1 *N* soln. The *A* no. for coconut oil is about 27.7 but for butter fat it is 6.7. The *B* no. for the former is 2.75 and for the latter 33.4. The *A* no. for pure cacao butter is about 0.1. Detailed directions for detg. these 2 values are given and it is shown how to interpret the results

W. T. H.

Oil-producing palms. PÉLICIEN MICHOTTE. *Matières grasses* 15, 6354-8, 6415-8, 6509-10, 6528-30, 6547-50 (1923); 16, 6709-12(1924); 17, 7034 5, 7062-3, 7308-11, 7335-7, 7363-5(1925); 18, 7419-21(1926).—A monograph. The production, compn. and uses of the various products of the different kinds of palms are covered

A. PAPINEAU-COUTURE

Safflower seed oil. FRANK RABAK. *Paint, Oil Chem. Rev.* 81, No. 7, 10-2 (Feb. 1926).—The oil from the safflower seed (*Carthamus tinctorius* L.) promises to be of value in the industries using drying oils. The seed somewhat resembles sunflower seed and yields 20 to 30% oil, which shows the following properties: for a Virginia oil: sp. gr. at 15.5° —0.9263; refraction at 24° —1.473; acid no.—12.7; sapon. no.—204.9; I no. (Hanus)—143.5; loss on heating at $108-110^\circ$ —0.18%; unsaponifiable matter—1.02%. A South Dakota oil showed an acid no. of only 1.1, this oil coming from a better crop of seed. Safflower oil absorbs its max. content of O in 7 days, but the film is more tacky than that from linseed oil. The flash point was found to be 266° by the "open test" at method. Oil bodied by heating for 2 hrs. at 305° to 315.5° tested as follows: sp. gr. at 15.5° —0.9632; acid no.—5.28; sapon. no.—199.7; and Hanus no.—90.6. Co resinate and linoleate are the most satisfactory driers, giving a dry non-tacky film in 22-28 hrs., as against 46-94 hrs. with Pb and Mn driers. Exposure tests with white lead as pigment showed good results.

H. STOERTZ

Grape seed oil. P. VIALA. *Rev. vit.* 64, 121-3(1926).—Grape seed oil closely resembles castor oil in its phys. properties, and it should find its chief value as a substitute for the latter, in lubrication. Proper precautions in handling the raw material prevent the development of an acidity of over 2%.

P. R. DAWSON

Disturbances in the production of lye-glycerol. ANON. *Seifensieder-Ztg.* 53,

41(1926).—A sudden darkening of lye-glycerol during concn. was traced to the presence of 1.0–1.5% NaClO_3 , probably a constituent of electrolytic NaOH used in sapon.

P. ESCHER

Analyses of soap solutions of phenols. F. DI STEFANO. *Ann. chim. applicata* 15, 573–80(1925).—Though numerous methods have been proposed for analyzing soap solns. of phenols (Creolin, Seifenöl, etc.), they are almost without exception (cf. Bohrisch, *C. A.* 16, 790) limited to detg. the amts. of phenols, soap and free alkali. Since the oil or fat from which the soap is prepd. influences the phys. properties of the final soln., a method was developed for identifying the oil or fat used. Dissolve 20 g. of soln. in 60 cc. of H_2O , acidify with H_2SO_4 , steam-distil to remove the phenols, cool, sep. the fatty acids from the supernatant H_2O , dissolve them in aq. NaOH , filter, add excess dil. H_2SO_4 , filter, wash free of H_2SO_4 with hot water, dissolve the acids in Et_2O , distil off the Et_2O , dry at 100° , and det. the m. p., I no. and acetyl no. Application of this method to com. soap-cresol solns., supposedly prepd. from castor oil, which contained the required amt. of cresol and soap, but which were not sol. enough in H_2O , showed fatty acids corresponding to olein and not castor oil. The results obtained with the method emphasize the influence of the nature of the soap on the soly. of the cresol and, therefore, on the properties of the final product.

C. C. DAVIS

Durable shaving soaps. C. BAIER. *Am. Perfumer* 20, 731–2(1926).—A discussion and comparison of an American vs. a German shaving soap. The American soap is preferred to the German because its compn. is more advantageous; it consists of 90% stearin, 10% coconut oil and large amt. of potash, while the German soap was made from 75% tallow, 10% lard, 15% coconut oil and less potash. The former has less unsatd. glycerides and will, therefore, be the more durable.

E. SCHERUBEL

The Burnus of after-war-time and the Wermil (Zegil). P. HEERMANN. *Seifensieder-Ztg.* 53, 59–60, 80(1926).—H. reports on the effectiveness of Burnus and Wermil as cleansing agents. Burnus is a prepn. contg. the tryptic enzyme of the pancreas and its effectiveness is due to the digestion of albuminous matter during the pre-soaking period of dirty wash; the fiber is not attacked. Wermil or Zegil is a new cleansing mixt. contg. 12.5% fatty acids, 0.07% active O_2 and 49% Na_2CO_3 ; ferments and enzymes are absent. The tests were made by preliminary soaking of soiled test pieces, each lot separately, followed by a washing of all lots in the same soapsuds; the conditions of concn., temp., etc., were so selected as to obtain a cleansing effect just short of satisfactory for the best agent and thus show the greatest difference between good and bad compds. Burnus is a good cleansing aid; Wermil is not. Its small soap content is lost in hard H_2O .

P. ESCHER

Calculation of rosin in a kettle-charge. C. BERGELL AND C. WILMS. *Seifensieder-Ztg.* 52, 1003–4(1925).—Lab. expts. showed that 97% of water-white rosin went into soap and 3% into the lye, while only 92% of the J grade of rosin went into soap and 8% into the lye.

P. ESCHER

The seeds of *Mercurialis* species (GILLOT) 11D. Coloring waxes (Brit. pat. 242,271) 26.

STEINER, O.: *Industrie der Fette und Seifen*. Dresden and Leipzig, 1925: Theodor Steinkopff. viii + 83 pp. Reviewed in *Rev. chim. ind.* 35, 25(1926).

Albuminous and fatty products by autolysis of animal and vegetable substances. M. KAHN. U. S. 1,572,933, Feb. 16. About 0.1% each of toluene and CHCl_3 are added to substances such as fish which are subjected to autolysis.

Treating nut kernels to prevent rancidity. M. A. JULIEN AND D. G. GOONERWAR DENE. Brit. 236,713, June 11, 1924. A protecting layer is formed on the surface of coconut kernels or other oil-bearing kernels by the use of coagulants such as alum. formaldehyde or $\text{K}_2\text{Cr}_2\text{O}_7$; oxidizing agent such as Cl , HNO_3 or Na or K permanganates, or mild disinfectants such as borax or H_3BO_3 .

Detergent. W. SCHNEIDERMAN. U. S. 1,572,814, Feb. 9. A compn. for cleaning grease from the hands, etc., comprises soap cream and turpentine in about equal quantities, a larger quantity of petrolatum and a small proportion of CCl_4 .

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The sugar industry in Cuba. ANON. *Intern. Sugar J.* 27, 593-9(1925).—An economic survey. W. L. OWEN

The influence of lime upon the velocity of crystallization of sucrose. I. A. KUCHARENKO AND B. G. SAVINOFF. *Sucr. Belge* 45, 205-8(1925).—The presence of CaO in a sucrose soln. has a retarding effect upon the velocity of crystn. The retarding effect brought forth by CaO upon the velocity of crystn. in a sugar soln. is increased with the increase of the amt. of CaO in the mother liquor. T. MARKOVITS

Spray system of juice screening. H. F. HADFIELD. *Facts about Sugar* 21, 210 1 (1925).—A juice screen for purifying sugar juices is described. Illustrated. T. MARKOVITS

Thick-juice densities at the pressure evaporator station and juice concentrators. K. SÁZAVSKÝ. *Z. Zuckerind. czechoslov. Rep.* 50, 60-4(1925); *Listy Cucrov.* 43, 87ff. (1925).—If the density of thin juice varies, a pressure evaporator does not give corresponding variations in thick juice concn., because with denser thin juice less steam is used for heating; hence less evapn. must be done in the pressure evaporator. Increased d. of thick juice can only be obtained by using a concentrating evaporator in connection with the pans, or blowing off steam from the pressure evaporator. S. carries out several calcs. showing that this concentrating evaporator does not affect the heat balance of the mill or the operation of the pressure evaporators. It is to be considered a part of the pan station, not the evaporator station. W. L. BADGER

The theory of evaporation with especial reference to sugar factory operation. BOHUMÍR PRÁČEK. *Z. Zuckerind. czechoslov. Rep.* 50, 161-7, 169-73(1926); *Listy Cucrov.* 43, 373 (1924-5); cf. *C. A.* 18, 3122; 19, 3610.—Mathematical W. L. BADGER

Evaporator bodies with or without juice circulation. K. SÁZAVSKÝ. *Z. Zuckerind. czechoslov. Rep.* 50, 71-2(1925).—A discussion of special juice circulating devices such as used in the Vincik-Turek evaporator. It is shown mathematically that such constructions increase the capacity of an evaporator as compared to the usual construction in which the whole body is filled with juice of the final density. W. L. B.

The influence of filter material on the quality of the work of the filter station. JAROSLAV HRUDA. *Z. Zuckerind. czechoslov. Rep.* 50, 75-80, 81-7, 89-93, 113-8, 121-8 (1925).—Elaborate tests of 4 kinds of filter cloth. Exptl. data are given in full. The cloths are described only by trade names, so that the conclusions are not of general significance. W. L. BADGER

Vallez filters in France. ANON. *J. fabr. suc.* 67, 1(Feb. 6, 1926).—A description is given of the Vallez filters in a sugar factory in France. Detailed observations are included on the time required for various operations. The working of the filters is considered satisfactory, and it is concluded that their cost is amortized in 2 or 3 years by economies in labor and filter cloths. T. MARKOVITS

Experiments on the clarification of cane juice using the "streamline" filter. C. F. ARMSTRONG. *Intern. Sugar J.* 27, 424-6(1925).—Expts. carried out in Guatemala on the filtration of cane juices with the "stream line" filter showed that the best results are obtained when the filter packs are cleaned with compressed air just as they are emerging from the juice. Increasing the distance between the leaves increased the rate of filtration. A max. of 15 gals. of juice per sq. ft. per hr. was obtained. The filtration can best be applied in cane sugar factories, to the juice in the early stages of clarification, after defecation. The filtering area required for a plant grinding 1000 tons of cane daily will be 1092 sq. ft. This is small in comparison with a carbonation factory in which the filtering area required was 5184 sq. ft. for a grinding capacity of only 450 tons per day, or a sulfitation sugar factory in Argentina where 40 presses with a combined filtering area of 18,000 sq. ft. were required for a 1300 tons milling capacity, all the juice being filtered. W. L. OWEN

Deterioration of cane mill juices from the aspect of acidity increase. W. L. McCLEERY. *Intern. Sugar J.* 27, 543-6(1925).—It is becoming more and more evident that there is considerable loss of sucrose in juice during milling as the result of bacterial activities. The difficulty has been to det. these losses, because of the inadequacy of present methods of detg. accurately the sucrose entering the factory. That such losses in sucrose do occur is very strikingly indicated in the purity differences between first expressed juice and mixed juice in factories operating under the usual conditions and the lessened difference in the purities when steps are taken to keep the plants in sanitary condition. Another evidence of the deterioration of cane juice during milling is the

increased acidity of the mixed juice over the freshly extd. juice. The increase in acidity from the first to the last mill is especially marked during the latter part of the week, indicating that it resulted from an increasing accumulation of infection around the mills. By keeping a careful record on the increase in acidity, and including these data in the control sheets of the lab. it is possible to keep acidity at a min. at all times. The test is by titration against $N/2.8$ NaOH and sensitive neutral litmus paper. Each cc. of the alkali represents 0.01% acidity in terms of minus CaO. The acidity is expressed as parts per 100 Brix. If it can be assumed that the acidity increase is due to AcOH formed at the expense of sucrose, the difference in the 1923 and 1924 acidities would represent a saving of 1.75% for the latter year. Correlative data to show that this is correct are lacking.

The chief losses in the manufacture of sugar from Java cane. W. L. OWEN. *Rev. ind. agr. Tucuman* 16, 46-50 (1925).—Owing to sucrose inversion [the commonly cultivated Java cane varieties P. O. J. 36 and 213 suffer considerable and rapidly increasing losses when stored before milling. The loss is actually much greater than the decrease in sucrose content because of difficulties in defecation, filtration and crystal Damping and protection from air may partly inhibit deterioration. P. O. J. 2725, P. O. J. 228, D. 1135 and the purple, or striped creole cane do not markedly deteriorate after being cut. P. O. J. 2725 is most suitable for the majority of soils. M. J.

Chemical control in cane sugar factories. H. A. COOK. *Facts about Sugar* 20, 1234-6; *Intern. Sugar J.* 27, 602 7 (1925).—C. emphasizes the necessity of a complete equipment for chem. control and points to the fact that in Hawaii a large amt. of investigational work on clarification problems has been conducted. Work on liming of juices for the best results in clarification gave positive evidence that there is a point in reaction at which the best results are secured. The P_2O_5 content of the juices is a vital factor in clarification. The max. increase in purity for this method of clarification was obtained at approx. the same reaction, *viz.*, neutral or slightly alk. to phenolphthalein, as that at which the optimum clarification was secured. At the time of these investigations an instrument or other material for the detns. of p_H values was not available. It has since been demonstrated that a definite relation existed between this reaction and the H ion concn. to which the juice is limed. Available potentiometric methods are not adaptable to use in plantation labs. This is due not only to the cost of such equipment and to the skill and care required for their use but also to the inherent characteristics of the H electrode when used in org. solns. There remained the choice of some colorimetric method or the adaptation thereof. The method of Clark and Lubs using comparator tubes with buffer solns. or the spot test method did not seem to possess suitable characteristics for general use, mainly because these buffer solns. could not be counted upon to retain their values for any length of time. The alternative remained to produce color charts of standard color values. The prepn. of these charts was undertaken and the indicators proposed by Clark and Lubs were found most suitable. Inasmuch as buffer solns. are eliminated and the color charts are made the basis of the values, a certain personal element enters into the detn. Even in view of such limitations as may be inherent in the method, however, it is a big step in the right direction, and results can be secured that are very close to those secured by the use of the potentiometer. T M

Fuel economy in the cane sugar factory. G. H. W. BARNHART. *Intern. Sugar J.* 27, 428-33 (1925).—The general rule for power requirements of mill engines is 15 indicated h. p. per ton of fiber ground per hr. for a 2-roll crusher, 30 per ton of fiber in a 3-roll crusher, and 30 additional for each 3-roller mill in the train. The ideal arrangement for a mill power plant where much outside power is supplied is a non-condensing turbo-generator, running in parallel with a condensing unit, the power to be controlled by a back pressure regulator which controls the load. Standard practice indicates a boiling heating surface of 450 sq. ft. of fire tube boilers for each ton of cane ground, per hr., which corresponds to 375 sq. ft. in water tube boilers. If the percentage of CO_2 in the flue gases is 12-14, and flue gas temp. does not exceed $600^\circ F.$, then the bagasse may be said to be burned efficiently. In practice there is a tendency to use too much air on the furnaces in an effort to keep the CO within the prescribed limits with a resulting loss of efficiency as evidenced by excessive flue gas temp. Measurement of piping in sugar factories has shown that for each ton of cane ground per hr. there are 287 sq. ft. of radiating surfaces of pipes in the factory. Evapn. from bare pipe would be equal to 12.64% of total bagasse, which loss could be reduced to 1.61% with a 1" layer of MgO insulation, and to 1.46% with a 1.5" layer. Four factors have contributed to the gradual increase in heating surface required in pans, evaporators, and heaters in cane sugar factories. These are an increase in the grinding rate, an increase in power requirement due to the introduction of the Messchaert groove, a decrease in operating pressure due to lap seam

boilers, the introduction of the calandria type of vacuum pan permitting faster boiling.

Soil hygiene in relation to cane "diseases." MAURICE BIRD. *Intern. Sugar J.* 27, 423-4, 536-7 (1925).—Extended study of the pathological condition of sugar cane, as induced by soil conditions, has shown that it is due to a high MgO-CaO ratio. The phenomenon usually follows a period of very rapid growth on the part of the cane. The first evidence of it is a withering at the tip, the cessation of growth, and finally the plant dies. Analyses of the soil in which this pathological condition manifests itself shows it to be normal in every respect, except perhaps for its low P_2O_5 content. Analyses of the ash of the cane and the soil adhering to its roots show that the MgO-CaO ratio is much higher in the diseased cane than in the sound cane, and the same applies to the dirt from the roots of the canes for the 2 sources. Analyses of the roots, stalks and leaves of the sound and diseased canes show also that the MgO-CaO ratio is much higher in the latter than in the former, and the same relationship exists as regards the soils on which the 2 types are produced. This pathological condition is more pronounced upon stiff clay soils, which are lacking in vegetation, and are more impervious to the penetration of H_2O . Conclusion: The chief factor in promoting this condition in the cane is a deficit in lime, caused by the sluggish circulation of soil moisture and the lack of sol. lime at the roots of the plant, and a consequent excessively high MgO-CaO ratio.

W. L. OWEN

A method of handling cane tassels for breeding work. J. A. VERRET, Y. KUT-SUNAI, U. K. DAS, RAYMOND CONANT AND TWIGG SMITH. *Intern. Sugar J.* 27, 412-8 (1925).—In handling cane tassels for breeding purposes, it is difficult to prevent the cut tassels from wilting and dying. It was found, after a very extensive investigation, that a 5% soln. of SO_2 gas, when used in the proportion of 1 100, would preserve the tassels in a state of perfect freshness for a period of 2 weeks. The substances tested included $HgCl_2$, NH_4Cl , $PbCl_2$, $MgCl_2$, $CHCl_3$ and C_2H_5OH . The $HgCl_2$ prevented the formation of the slime, which was thought to be the cause of the deterioration of the tassels but the plants seemed to be injured by it. The SO_2 soln. has to be very carefully prepd. so as to avoid the occurrence of any free H_2SO_4 . It is necessary to place the tassels in the soln. immediately after they are cut. When tassels are to be conveyed for any distance the cut ends are immediately submerged in water and kept there until they are brought to headquarters, when the lower joint of the stem is removed while still submerged, and the tassels are then transferred to the SO_2 soln.

W. L. OWEN

Milling of Uba cane in Natal. R. F. HUTCHESON. *Intern. Sugar J.* 27, 632-7 (1925).—For the efficient milling of Uba cane the following conditions should be maintained: (1) Good feeding at the cane carrier. (2) The cane carrier to be driven by an independent engine or motor with a variable speed. (3) Levelling knives. (4) A double crusher. (5) All rolls provided with large intermeshing grooves. (6) Rolls run as slowly as possible. (7) Trash plates kept low. (8) Heavy maceration.

W. L. O.

The "crusher shredder." ANON. *Intern. Sugar J.* 27, 418 23 (1925).—The cane first passes between a pair of rollers, having very coarse teeth and moving under very heavy pressure. While the crushed cane is still held in the rollers, it comes in contact with a 3rd or shredding roller, which combs the bagasse into shreds. The shredded cane is then thrown forward into an inclosed casing toward the mills, the extd. juice being kept free from the fiber, and reabsorption is thus reduced to a min. The shredder roller is independently driven, and its speed can thus be regulated as desired. In Java practice it has been found that a speed of 400 r. p. m. is ample to obtain the greatest efficiency. The advantages of the "Crusher Shredder" are: (1) the yield of juice is increased; (2) there is no powdered bagasse with which to contend; (3) the power consumption required for shredding is much less than that required with the ordinary type of shredder; (4) there is less expense required in the replacement of parts as there is less wear on the bearings.

W. L. OWEN

Molasses analysis. H. CHARLIER. *Sucre Belge* 45, 208-10 (1925).—C. emphasizes the necessity of a uniform method of detg. the total sugars in molasses and points out the difficulties which exist in detg. the density with the spindle on account of the different Baumé scales.

T. MARKOVITS

Changes in the composition of frozen beets. JIRÍ VONDRÁK. *Z. Zuckerind. cechoslov. Rep.* 50, 130-2 (1925); *Listy Cucrov.* 43, 555ff (1924-5).—The invert sugar content of samples cut from the same beet and (a) frozen at once, (b) frozen, thawed, and frozen again, and (c) heated to 60° for 15 min., and then frozen, were: immediately after freezing, (a) 0.19, (b) 1.15, (c) 1.00%; after 34 days, (a) 0.47, (b) 4.5, (c) 7.8%; after 67 days, (a) 0.81, (b) 6.0, (c) 8.4%. This increase is to be ascribed to the action of invertase normally present in beets.

W. L. BADGER

Active carbons. CHR. MRASEK. *Z. Zuckerind. cecoslov. Rep.* 50, 142-4(1925).—Polemic. W. L. BADGER

The importance and economy of active carbons for filtering thick-juice. P. HONIG. *Z. Zuckerind. cecoslov. Rep.* 50, 118-20(1925).—Reply to Sazavsky (*C. A.* 19, 3610). A few expts. are cited showing the comparisons between carboraffin and norit on the same juices. Percent color removed and viscosity after filtration are about the same for both; alkyl. of filtered juice is less with carboraffin. Nevertheless H. concludes that norit is superior. W. L. BADGER

Efficiency of decolorizing carbons. L. WICKENDEN. *Facts about Sugar* 21, 230-1(1925).—A comment upon the paper of Blowski and Bon (*C. A.* 20, 836). T. M.

Boneblack, carboraffin, norit. FRANZ NOSEK. *Z. Zuckerind. cecoslov. Rep.* 50, 93-6(1925).—Polemic. W. L. BADGER

May Chile saltpeter be replaced by other nitrogenous fertilizers [for beets]? (BINDERBECK) 15.

Sucrose from molasses. H. S. PAINE, C. F. WALTON, JR., and V. BIRCKNER. U. S. 1,572,359, Feb. 9. Invert sugar in cane molasses is removed by a selective fermentation which may be effected by the use of organisms of the "*S. apiculatus* group". Residual sucrose is then pptd. as saccharate by the addn. of lime and the sucrose recovered by decomposing the saccharate, filtering the sucrose soln. and crystg.

29—LEATHER AND GLUE

ALLEN ROGERS

The behavior of sharpened limes in unhairing. I. A microscopical investigation of the unhairing action of caustic alkalis and sodium sulfide. MADGE KAYE AND R. H. MARRIOTT. *J. Intern. Soc. Leather Trades Chem.* 9, 591-8(1925).—The action on pelts of lime, Na_2S , NaOH , NaHS and various mixts. of them was followed under the microscope by continuous observation and by examn. of sections cut at different time intervals. In all cases "the cellular tissue of the hair roots and follicles and the base of the epidermis" is the first structure attacked. II. The unhairing action of sulfide and polysulfides. *Ibid* 599-611. III. The action of caustic alkalis, sulfides, and polysulfides on the hair shaft. *Ibid* 612-9.—M. distinguishes between the action of the reagents named on the hair root (unhairing action) and on the hair shaft. Both sulfides and hydroxides must be present to obtain satisfactory unhairing. This is attributed to the formation of the S ion by the action of the OH ion on the SH ion. The depilatory action of the polysulfides is less than that of sulfides, and is probably due to the S ion. When hair is treated with sulfide, the S ion decreases in the soln., while the total S increases to an approx. equal extent. Previous treatment of the hair with alkali prevents it from reacting with the S ion. It is suggested that the S ion combines with the hair by addn. to the cystine portion of the keratin mol., forming a sol. complex. The action of alkalis is to split off cystine, leaving a residue which cannot react with the S ion.

H. B. MERRILL

The tannin content of the oak. P. PAVLOVICH. *Collegium* 1925, 627-9.—The tannin content of the winter oak, *Quercus sessiliflora*, increases with age of the tree and also is much higher at the top and slightly higher at the root than at breast height.

I. D. C.

Histological leather investigation. LUDWIG JABLONSKI. *Collegium* 1925, 620-3.—Leather fibers can be stained and examd. after extg. with H_2O , with EtOH and then either with 5-7% $\text{Na}_2\text{S}_2\text{O}_4$ or 10-15% alc. H_2O_2 . Fibers were not damaged in 3 weeks by limes sharpened with Na_2S .

I. D. C.

The utilization of marine animals to supply tannery needs. TH. KÖRNER. *Leder-techn. Rundschau* 18, 1-7(1926).—The production and characteristics of oil, leather, etc., from marine animals are described.

I. D. C.

Electroosmotic tanning procedure. SARROT DU BELLAY. *Cuir tech.* 15, 75-8(1926).—A description and discussion of advantages claimed for this method of tanning.

H. B. MERRILL

Investigation of synthetic tanning materials. EDWARD WOLSENSKY. Bur. of Standards, *Tech. Paper* No. 302, 45 pp.(1925).—Soft, pliable and strong leather can be produced by tanning with condensation products of the sulfonic acids of monohydroxy-phenols with CH_2O , but the leather yield is low. Greater yields can be obtained with

sulfonated phenolformaldehyde resins and still greater yields of leather with a sulfonated phenol-acetaldehyde resin. Condensation products of resorcinol or pyrogallol with CH_2O or with $\text{C}_6\text{H}_4\text{O}$ were found to possess greater filling properties than any of the sulfonated products.

The reversal of double refraction of collagen fibers by some vegetable tannins. J. A. WILSON. A. KÜNZEL. *Collegium* 1925, 623-7.—By tanning with sumac, tea, divi-divi, algarobilla, or myrobalans the double refraction of collagen is changed from + to —. Other tannins lessen the + refraction. Syntans, sulfite cellulose, mineral tannins, HCHO or EtOH have no effect. This test may be used to det. the nature of the tanning material in leather.

Mechanical leather testing. LUDWIG JABLONSKI. *Collegium* 1925, 616-20.—Other tests are often more important than the detn. of tensile strength. Simple methods are given for testing H_2O absorption, elasticity and permeability to H_2O and air.

Note on the modified shake method (for tannin analysis). G. BALDRACCO. *Cuir tech.* 15, 99-101(1926); cf. C. A. 19, 3170.—Slight modifications in manipulation are suggested.

Modifications in the (European) official method for quantitative analysis of tanning materials (approved by the Paris conference, Sept. 1925). *Cuir tech.* 18, 97-8(1926).—Text of changes in details of procedure.

Effect of splitting on the tensile strength of leather. J. A. WILSON AND E. J. KERN. *Ind. Eng. Chem.* 18, 312-3(1926).—Charts showing how the strength and stretch of chrome- and vegetable-tanned calf leathers vary with the degree of splitting of the leather.

New leather preservatives in France. H. SCHMIDT. *Ledertech. Rundschau* 18, 18 9(1926).

CHAMBARD, P.: Contribution à l'étude du tannage au chrome. Paris: Dunod. 128 pp. Fr. 15.

Ornamenting leather with colored designs. W. KNOLL. U. S. 1,573,251, Feb. 16. Leather is coated with a background, a pattern is placed on this and the pattern design is applied in a decorative color and a fixing substance such as varnish. U. S. 1,573,252 specifies a similar process including the feature of shading off the design around the pattern.

Pyrroles and pyrocoll. J. MICHELMAN. U. S. 1,572,552, Feb. 9. Collagenous animal waste is subjected to destructive distn. out of contact with air, the distillate is condensed and the oily fraction is treated with a diluent such as toluene and filtered to obtain pyrocoll crystals which sep. The filtrate is fractionally distd. to obtain pyrrole, etc.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The chemistry of rubber and of gutta-percha. H. STAUDINGER. *Kautschuk*, Aug.-Sept. 1926; *Gummi-Ztg.* 40, 1095.—A review and discussion of previous work (C. A. 17, 2974; 18, 3490; 19, 1791). The term *eucolloid* is suggested for colloids such as rubber, in which the mols. constitute the individual colloidal particles (cf. C. A. 18, 3490). Since very long C chains are unstable, it is probable that these rubber macromols. split or dissociate, as a result of which rubber exhibits abnormal viscosity phenomena. In concd. solns. where the largest mols. are present, the viscosity is high, whereas there comes a point in the diln. where the viscosity suddenly decreases greatly because of the formation of smaller mols. Not only can *cyclo-rubber* be obtained by treating rubber hydrohalides with Zn, but it is formed by heating rubber in the absence of air with acids, or by distn. at atm. pressure. The derivs. of natural rubber, of synthetic rubber, of gutta-percha and of balata are identical, in each case the colloid mol. having suffered degradation to such an extent that any differences in the original 4 substances no longer exist. Accordingly the differences in the properties of rubber, gutta-percha and balata are due solely to differences in the constitution of the colloid mols. The rubber mols. are the largest and so rubber solns. have higher viscosities than gutta-percha or balata solns. of the same concn.

C. C. DAVIS

The concentration of latex with the aid of the filtration apparatus of Bechhold-

König. RUDOLF DITMAR. *Caoutchouc & gutta-percha* **23**, 13,010-1 (1926).—Without the use of collodion, the Bechhold-König filtration app. gives excellent results in the concn. of latex (cf. Ditmar, *C. A.* **20**, 311). On the other hand the method of Traube (German Patents 414,210 and 414,930) is uneconomical on a large scale. C. C. D.

Effect of accelerators on the temperature of rubber mixtures. F. KIRCHHOF. *Rubber Age* **18**, 355-7 (1926).—English version of a previous article (*C. A.* **19**, 2424) C. C. DAVIS

Coloring rubber (Brit. pat. 242,274) **26**. Action of N_2O_4 on caoutchouc (Emden) **10**

Rubber compositions. C. PICKSTONE. Brit. 241,993, July 31, 1924. State powder 40-70, rubber (which may be partly reclaimed rubber) 15-25, bitumen 2-10 and vulcanizing and coloring materials 13-25% are mixed in the powd. state, molded, pressed and vulcanized.

Preserving rubber. T. W. K. CLARKE. Brit. 242,096, Dec. 1, 1924. Tires or other rubber articles are coated with a mixt. formed of china clay 30, soft soap 60 and chrome yellow 10 parts, mixed with H_2O to a paste or paint, or with a similar mixt. which excludes actinic light from the rubber.

Repairing rubber articles. W. H. BUSCHELL. U. S. 1,573,039, Feb. 16. A portion of rubber to be repaired, e. g., a cut or blown-out tire, is heated and treated with a reaction product obtained by "natural valence combination" of turpentine and S. The article is then further subjected to the action of heat and pressure.

Treating rubber latex. W. B. WESCOTT. Brit. 236,624, April 7, 1924. Latex is concd. to a thick mass in which the rubber remains uncoagulated by intense centrifuging with as little agitation as possible. An alk. stabilizing substance is preferably added to the concd. latex as it emerges from the app. Details of an app. for this purpose are specified.

Coagulating latex. H. W. HAMMOND. Brit. 236,633, April 8, 1924. A soln. obtained from cane molasses by dilg., clarifying and boiling (or other saccharine soln.) is added to rubber latex, and the mixt. is boiled to effect coagulation.

Thin-walled rubber receptacles, etc., formed from sheets of coagulum or plastic rubber. A. R. VAN DER MARK and H. KREMER. Brit. 236,897, July 11, 1924. Mech. features of molding, etc.

Rubber playing balls. R. RUSSELL and H. BROOMFIELD. U. S. 1,573,093, Feb. 16. A tennis ball or the like composed of sections of vulcanized rubber is provided on at least one side with a film of pptd. latex solids.

CHEMICAL ABSTRACTS

Vol. 20.

MAY 10, 1926

No. 9

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

An improved all-metal mercury-vapor pump. G. W. C. KAYE. *Phil. Mag.* [7] 1, 349-53(1926).—An all-metal single-stage Hg-vapor pump is described with a detail drawing of the pump and an accessory needle-valve to control the inlet of air for a controlled vacuum. The walls are of solid drawn-steel tubing $\frac{1}{16}$ in. thick. The jet is of the annular type $\frac{1}{32}$ in. in width. Either elec. or gas heating may be used up to 600 v. or 12 l. of coal gas per min. A back pressure of 4-5 mm. is allowable and 15 mm. is sufficient to give the highest attainable vacuum. Only 50 cc. of Hg is required and as a result of the low heat capacity, the pump will operate, with gas, in 3 min. from cold. The micrometer needle valve, shown in detail, is a steel needle in a narrow brass seat. S. C. LIND

Foam meter. H. E. WILLIAMS. *Ind. Eng. Chem.* 18, 361-2(1926).—The substance under test is placed in a vertical cylindrical container and agitated at a standard speed for a definite length of time, when a cock in the bottom is opened and the contents are allowed to fill a standard flask, whose vol. is considerably less than that of the liquid taken for the test, the flask then being weighed. Obviously the greater the foaming tendency of the liquid under test the higher will be the proportion of air in the mixt. drained from the app. and the less will be the wt. of the flask and its contents. W. B. PLUMMER

A support for the condensation of sublimates. A. BRALEY. *Bull. soc. franç. mineral.* 48, 92-5(1925).—An apparatus for the analysis of Hg, Se, As and similar materials. C. B. SLAWSON

A device for circulating fluids under high pressure. I. R. MCHAFFIE. *Trans. Faraday Soc.* (advance proof), Feb. 22, 1926.—An electro-magnetically operated pump for circulating gases at high pressures and const. rates. A detailed description and diagram are given. ARTHUR GROLLMAN

Production and measurement of high vacua. H. H. PAINE. *J. Chem. Met. Soc. S. Africa* 25, 341-50(1925).—Complete descriptions are given of the theory and operation of the Gaede mol. pump, the Gaede Hg-vapor diffusion pump, and the Langmuir pump, and of the McLeod and Pirani gages. T. S. CARSWELL

The accuracy of gas-measuring vessels. H. V. RENN. *Ind. Chemist* 2, 54-6(1926); cf. *C. A.* 20, 847.—The article deals with the calibration of cylindrical glass tubes and burets to be used in gas analysis. Because of the difficulty of constructing a tube closed at both ends by stopcocks, so that it will contain exactly 100 cc., it is usual with such instruments to graduate them on the basis of an arbitrary unit, usually $\frac{1}{100}$ of the total vol. When the arbitrary unit method is employed it is a rule of the National Physical Lab. that the value of this unit must be inscribed on the app. R. describes in detail the precise calibration, by means of Hg, of gas tubes, including tables for use in making corrections for the errors due to water and mercury menisci. With H₂O as the confining liquid, R. gives a detailed description of the calibration of similar tubes with the use of a 2-cc. or 5-cc. Ostwald pipet. Lunge's statement (*Technical Gas Anal.*) that "the examn. of app. adjusted for Hg, especially when they are provided with a stopcock, can be performed by means of water, from the tables worked out for volumetrical vessels" is incorrect if dry Hg is to be used. Vessels intended for use with dry Hg cannot be tested with H₂O in the ordinary way, for in so doing a film of H₂O is left on the walls, thus escaping measurement. E. G. R. ARDAGH

An automatic siphonic gas circulator. G. M. GREEN. *J. Chem. Soc.* 1926, 500.—Two concentric glass tubes, about 6 ft. long and 1 in. in diam., one fitting inside the other loosely enough to allow the passage of water, are connected with a siphon tube, and gas outlet and inlet regulated by mercury seals. The inflowing water fills the tubes, forcing

out the enclosed gas. When the tubes are filled with water, the siphon commences to operate and empties them of water, while a new vol. of gas is sucked in. Intermittent circulation of gas is thus maintained. R. J. HAVIGHURST

Spiral springs of quartz. H. D. H. DRANE. *Nature* 116, 315(1925).—A method is described for the production of spiral springs of silica fibers having a diam. of about 10^{-3} cm. (cf. Smith, C. A. 20, 521). B. C. A.

Small constant-humidity testing cabinet. F. T. CARSON. *Paper Trade J.* 82, No. 8, 231-7(1926).—A cabinet is described in which paper can be tested without opening the cabinet to the outside air at any time. Air is taken from the cabinet through a blower at the rate of about 1 cu. ft. a min., is bubbled through H_2SO_4 of proper concn to maintain the desired relative humidity, and is then returned to the cabinet. The tester is placed inside the cabinet, which normally has no communication with the outside air. The specimens are handled and the tester is manipulated by means of flexible sleeves which terminate in rubber gloves into which the hands are placed. The method of operation is described in detail. The difficulties encountered, mainly possibility of variations in the relative humidity due to differences in the temp. of the air in the cabinet and of the H_2SO_4 , are discussed. A. PAPINEAU-COUTURE

The Brown-Duvel moisture tester and how to operate it. D. A. COLEMAN AND E. G. BOENER. U. S. Dept. Agr., *Bull.* 1375, 1-44(1926).—A detailed description of the Brown-Duvel moisture tester and of its application in the detn. of moisture in grain, flour, meal and other materials. W. H. ROSS

New apparatus for the determination of water. H. KREIS. *Ann. chim. anal. chim. appl.* 8, 33-4(1926).—The app. is similar in principle to that of Normann (C. A. 19, 2277). Also in *Schweiz. Apoth. Ztg.* 63, 671-2(1925). W. T. H.

Proper methods of installing electric pyrometers. MAX MOELLER. *Siemens Z.* 6, 65(1926). C. G. F.

Theory and construction of lever manometers. OTTO FRANK. *Z. Biol.* 83, 1-15(1925).—F. discusses the theory and construction of lever manometers. If the vol. elasticity coeff. equals infinity a system which has 2 degrees of freedom is obtained. This system possesses the essential properties of a lever manometer. The chief data may be calcd. to within 1%. FRANCES KRASNOW

Generation of ultra short waves. V. J. SHAROV AND N. A. PETROV. *Elektrichest.* 1926, No. 1, 44-9.—Report of an exptl. investigation of thermionic valves. C. G. F.

Modern refrigerating machines, their manipulation and advantages. CONSTANTIN REDZICH. *Apparatebau* 37, 117-8, 129-31, 141-3, 153-4, 169-70, 184-6, 195-6, 207-9, 229-31, 244-5, 256-7, 275-6, 288-9, 298-9, 312-3, 324-6, 334-5(1925). 28, 1-3, 13-6, 25-7, 37-9(1926); 29 cuts.—Many data on operating costs and capacities are given. J. H. MOORE

BOLAS, BERNARD D.: *A Handbook of Laboratory Glass-Blowing*. New York. E. P. Dutton & Co. \$1.50.

Filter for separating crystals from evaporated solutions, etc. G. J. PEZOLD. U. S. 1,574,409, Feb. 23.

Apparatus for concentrating solutions by freezing. M. O. JOHNSON. U. S. 1,576,136-7, March 9.

Jacketed-tube and conveyor apparatus for effecting crystallization of various substances. M. J. KERMER. U. S. 1,575,584, March 2.

Filter for separating solids from gases. J. J. PREBLE. U. S. 1,576,121, March 9.

Device for mixing gases in determined proportions. A. W. PETERS. U. S. 1,574,107, Feb. 23.

Apparatus for separating oil and water or other liquids of different specific gravity. R. C. KNIGHT AND H. D. SMITH. U. S. 1,574,157, Feb. 23.

Apparatus for effecting temporary intimate contact between oil and sulfuric acid or other immiscible liquids. L. D. JONES. U. S. 1,575,116, March 2. The liquids are centrifugally stratified in concentric layers and caused to flow in contact with each other.

Device for dissolving caustic soda or other substances. E. CZAPKX AND R. WEINGAND. U. S. 1,574,561, Feb. 23.

Apparatus for automatically controlling the specific gravity of sirups or of other solutions. E. F. SALICH. U. S. 1,575,643, March 9.

Evaporating apparatus for concentrating or drying peat pulp, sewage, etc. T. RIGBY. U. S. 1,576,471, March 9.

- Dust collector or filter (of the bag type). R. F. FEIND. U. S. 1,574,422, Feb. 23.
- Apparatus for drying and calcining briquets, etc. J. A. BARR. U. S. 1,573,433, Feb. 16.
- Apparatus (with revoluble tubular retort) for distilling shale, coal, wood or other carbonaceous materials. C. A. GRIFFITHS. U. S. 1,573,824, Feb. 23.
- Dialytic apparatus for recovery of caustic hydroxides from "black liquor," mercerizing solutions or other waste solutions. F. H. GRIFFIN. U. S. 1,573,703, Feb. 16.
- Regenerative retort furnace. H. J. TOOGOOD, W. M. CARR and R. DEMPSTER & SONS, LTD. Brit. 237,311, Feb. 22, 1924.
- Filters for metallurgical and other solutions. H. S. COE. U. S. 1,574,556-7-8, Feb. 23.
- Apparatus for treating roasted ore, grain or other solids with liquids. A. RAMEN. Brit. 237,571, July 23, 1924.
- Lacquering, drying and "blueing" apparatus. BARMER EISEN- UND BLECHWARENFABRIK UND VERZINKEREI W. MAUELER. Brit. 237,581, July 28, 1924.
- Oven (with vertically movable platform) for heat treatment of cores, ceramic articles, etc. C. E. SEARCH. U. S. 1,573,873, Feb. 23.
- Deodorizing hair, feathers, etc., with ozone. A. H. GALLAGHER. U. S. 1,574,617, Feb. 23. U. S. 1,574,618, relates to an app. employing O₃ for this purpose.
- Bomb calorimeter. G. R. SCHOLES. Brit. 236,980, March 19, 1924.
- Thermostat for operating electrical contacts. METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 236,960, July 11, 1924.
- Thermostat for controlling electric contacts. J. G. GOODHUE. U. S. 1,574,346, Feb. 23.
- Thermostatic regulating devices for controlling the temperature of furnaces, boilers, ovens, etc. F. D. SMYSER. U. S. 1,574,132, Feb. 23.
- Thermostat for controlling refrigerating apparatus. E. A. DIFFINGER. U. S. 1,576,180, March 9.
- Thermostat for controlling electric current supply. E. GREBY. Brit. 237,417, July 1, 1924.
- Electric pyrometer. T. W. VARLEY. U. S. reissue 16,270, Feb. 16. Original pat. No. 1,375,872, dated April 26, 1921.
- Thermionic tube electrodes. P. SCHWARZKOPF and DEUTSCHE GLÜHFADENFABRIK R. KURTZ and DR. ING. P. SCHWARZKOPF GES. Brit. 237,270, July 16, 1924. Cathodes for thermionic tubes of the dull emitter type are formed of Mo contg. U or its compds. or contg. both U and Th or their compds. together with other substances that increase their elec. resistance, e. g., oxides of Mg, Ca, Sr and Ba. Details of procedure for forming and working the mixts. are given.
- Electric discharge tubes. SÜDDEUTSCHE TELEFON-APPARATE, KABEL- UND DRAHTWERKE AKT.-GES. Brit. 237,614, July 24, 1924. Paraffin or colophony in powd. form is mixed with electron-emitting substances also in powd. form and the mixt. is fused and applied to a Pt or Pt-Ir filament or tubular cathode.
- X-ray apparatus. R. MANNL. Brit. 236,951, July 11, 1924.
- X-ray tubes with tungsten anti-cathodes. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOBILAMPENFABRIEKEN. Brit. 237,580, July 23, 1924.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

- A half century in chemical education. A chronological record of the scientific contributions of Charles Edward Munroe. J. N. TAYLOR. *Gen. Sci. Quart.* 10, 479-91 (1926).—A biography with portrait. E. H.
- Some relations of early chemistry in America to medicine. C. A. BROWNE. *J. Chem. Education* 3, 267-79 (1926). E. H.
- Achievements of pupils in laboratory instruction. H. R. SMITH. *J. Chem. Education* 3, 307-12 (1926). E. H.
- Separate classes in freshman chemistry for pupils who present high-school credits in chemistry. F. E. BROWN. *J. Chem. Education* 3, 301-6 (1926). E. H.
- An experimental study of the methods for recording laboratory notes in high-school chemistry. M. F. STUBBS. *J. Chem. Education* 3, 296-300 (1926). E. H.
- Final examinations in general chemistry. J. H. HILDEBRAND. *J. Chem. Education* 3, 313-8 (1926). E. H.

Bibliography of antimony, from 1917 to 1924. C. Y. WANG. *J. Assoc. Chinese American Eng.* 6, No. 3, 14-34(1925). W. H. A.

The early use of zinc in China. H. D. DJANG. *Science (China)* 9, 1116-27(1924). cf. *C. A.* 18, 487.—Further evidence from early writers and analyses of ancient coins suggests that the Chinese possessed a knowledge of the use of zinc in alloys previous to its traditional discovery by the Persians. Its use in China certainly did not date later than its use in Egypt and Rome. WM. H. ADOLPH

Ancient Chinese brass. C. WANG. *Science (China)* 10, 495-503(1925).—A study of the compn. and method of manuf. of the famous brass of the Ming dynasty. WM. H. ADOLPH

The analysis of Chou Dynasty alloys. T. LIANG. *Science (China)* 9, 1261-78(1925).—Analyses of alloys from the period 1100 to 300 B. C. verify the ancient records in their compn. WM. H. ADOLPH

The discovery of aluminum. NIELS BJERRUM. *Z. angew. Chem.* 39, 316(1926).—Oersted, in 1825, was the first to prep. Al. E. H.

A device for constructing models of carbon compounds. W. H. DORE. *J. Chem. Education* 3, 319-23(1926). E. H.

The evolution of chemical terminology. IX. Pectization and peptization. J. F. COUCH. *Am. J. Pharm.* 97, 858-61(1924); cf. *C. A.* 19, 339.—The obsolescent *pectization* should be let go and *peptization* limited "to that type of gel-sol transformation in which the addition of an electrolyte is necessary to effect the change." A. M. P.

The use of subscript and superscript exponents in chemistry. E. Q. ADAMS. *J. Am. Chem. Soc.* 48, 708(1926).—A. advocates the use in arithmetic and chemistry (as in logic and higher math.) of subscripts as a means of designation and of superscript to denote repetition. D. S. VILLARS

The non-metallic elements. Connections between their dielectric and other physical properties. II. G. L. ADDENBROOKE. *Phil. Mag.* [7] 1, 225-43(1926). Comparison is made between the dielec. const. and the optical properties in the liquid and gaseous states of the elements H, He, O₂, N₂, Cl₂, Br₂, I₂, P, S, Se and in the solid state for C (diamond). S. C. I.

Determination of Avogadro's constant by means of birefringent solutions of dialyzed iron. L. TIERI. *Nuovo cimento* [N. S.] 2, 351-61(1925).—The solns. used contained ultramicroscopic particles of a single species of granule. Some of the liquids exhibited a piling up of granules at the bottom and hence a greater birefringence for the lower strata than would follow from Laplace's law. This was particularly marked in one case. Values for Avogadro's const. ranged from $N = 66 \times 10^{22}$ to $N = 50 \times 10^{22}$. L. T. FAIRHALL

The crystalline structure of cadmium and nickel hydroxides. G. NATTA. *Atti accad. Lincei* [6] 2, 495-501(1926).—The hydroxides of Zn and Co are known to have a rhombic symmetry and those of Mn, Fe⁺⁺, Mg and Ca are rhombohedral. Nothing is known about the structure of the other hydroxides of bivalent metals. The method of Debye and Scherrer was applied to Ni(OH)₂ and Cd(OH)₂. Both were found to belong to the rhombohedral system. The results for these and 3 other hydroxides found in the literature are tabulated below:

Metal	At. diam. of metallic ion	Vol. of the cell of the hydroxide	<i>a</i>	<i>c</i>	<i>c/a</i>
Ni	2.70	37.6	3.07	4.605	1.50
Mg	2.85	39.8	3.11	4.73	1.52
Mn	2.95	46.5	3.34	4.68	1.40
Cd	3.20	49.0	3.47	4.64	1.355
Ca	3.40	52.95	3.52	4.93	1.40

E. J. WITZEMANN

The molecular weight of soluble starch. AMÉ. PICTET. *Helvetica Chim. Acta* 9, 33-7(1926).—By accepting +189° as the av. *sp. rotatory power* of sol. starch, its mol. wt. is calcd. to be 2975. This calcn. assumes the relation between *rotatory power* and *mol. wt.* of the ultimate depolymerization products of starch to be applicable to as complex a deriv. as sol. starch. The simplest mol. of sol. starch is, therefore, (C₆H₁₀O₅)₁₈, i. e., a condensation of 3 mols. of *hexahexosan*. ARTHUR GROLLMAN

Corrections to my work: Previously unknown characteristics of simple compounds and considerations on the form of the solid state. ERNST FRIDRICH. *Z. Physik* 34, 637(1925); cf. *C. A.* 19, 1644. H. C. UREY

The effect of rolling on the crystal structure of aluminum. E. A. OWEN AND

G. D. PRESTON. *Proc. Phys. Soc. (London)* **38**, 132-47(1926) — Sheets of Al were examd. by the ionization spectrometer and X-ray photographic methods. When a cast specimen of Al contg. large crystals oriented at random is rolled, the crystals break up into a large no. of min. crystals. These small crystals assume a definite orientation, each crystal having a cube diagonal [111] plane in the direction of rolling and a (211) plane in the surface of rolling. Two sets of crystals exist in the material after rolling, one set being the optical image of the other in the plane of rolling. The lattice parameter of the severely worked material does not differ from that of the annealed material by more than 0.5%. These results confirm those of Wever (*C. A.* **19**, 10). R. J. H.

Structure of α quartz. R. E. GIBBS. *Proc. Roy. Soc. (London)* **110A**, 443-55 (1926); cf. *C. A.* **19**, 1644; **20**, 318. — A study of the intensities of reflection of X-rays by the various planes of α quartz has been made with the aid of oscillation, rotation and Laue photographs and ionization spectrometer measurements. The O atoms occupy positions $c/9$ above and below the basal planes which contain Si atoms. The proposed structure assumes the crystal to be non-molecular and requires a shift of the Si atoms of about 0.3 Å U. from the positions occupied by them in β quartz. The tetrahedral arrangement of O atoms around each Si atom, which was found in β quartz, is distorted in α quartz. R. J. HAVIGHURST

Volume variations in the formation of solid inorganic compounds. E. MOLES. *Anales soc. españ. fís. quim.* **23**, 524-39(1925). — With the work of Ephraim (*C. A.* **13**, 1660; **18**, 1770, 2448), and Biltz (*C. A.* **15**, 2025, **16**, 1195) as a starting point the vol. changes during formation of permanganates and chlorides of a large no. of elements were investigated. The vol. variation is expressed by $VM/\Sigma V.A.$, VM being the mol. vol. deduced from the d. by $VM = PM/d$ and $\Sigma V.A. =$ the sum of the at. vols. of the components. For solid compds whose m. p. is far different from ordinary temp. the d. at this temp. was used. For those readily fusible or liquid or gaseous at ordinary temp. the d. was reduced to abs. zero by the R. Lorenz formula. This is justified by recent results by van Laar (*C. A.* **20**, 1008), and Biltz, which permits comparison of mol. vols. under corresponding conditions. A no. of errors made by Zaslavskii (*C. A.* **19**, 3392) were found. Vol. changes, arranged according to electropos elements in the periodic system, show (a) In chlorides showing a vol. contraction the heat of formation per atom of Cl is above 50 cal. In all cases of dilation it is below 50 cal. (b) Chlorides can be divided into 3 groups according to the vol. change, namely those showing a diminution, a dilation and an intermediate group. (c) With chlorides of the first group the contraction increases with the at. wt. of the metal. In the second group dilation increases with the at. wt. of the metal. With chlorides of the transition elements such as group VIII, rare earths and sub-groups Ib and VIIa, const. values are obtained. These laws allow of calcn. of unknown at. vols. as a function of the known mol. vol. and of the variation in the vol. of the chloride. The variations of the permanganates are practically the same as those of the chlorides. The mol. vols. of metal carbonyls give for the mol. vol. of CO values almost normal with Ni and Co. For Fe the value is a little lower, according to the method of decompn. The CO in carbonyls thus follows the law of addn., like NH_3 in amines and H_2O in hydrates. The mol. vols. of a no. of cobalt-amines show that entrance of NH_3 , H_2O and Cl into the nucleus follows the rule of addn. E. M. SYMMES

Molecular volume of water in crystalline hydrates. E. MOLES. *Anales soc. españ. fís. quim.* **23**, 557-85(1925) — Expts. proved the existence of hydrates of cations and anions, as foreseen by the Werner theory. With chlorides, sulfates, nitrates, nitrites and double sulfates whose hydrates have been well studied, the mol. vol. of the H_2O of the cation is 14.6, practically coinciding with the calcd. value of 14.3 for zero. abs. For amines the vol. of the H_2O of hydration is always very near 10. Almost the same value is found for H_2O combining with anhydrides and oxides to form acids and bases. There is only 1 remarkable exception, the phosphoric and phosphorous acids, in which the mol. vol. of the H_2O approaches that of the cations. This, together with exptl. data on these acids and salts, establishes the formula H_3PO_3 . The H_2O mol. is held in

HOH

a labile form by a covalence. In all monohydrate salts the H_2O mol. is found as the hydrate of the anion. In the acids the H-ion can also give hydrates whose index of coordination is a max. of 1. Salts of the rare earths are the only exception to the above rules. The double sulfates and nitrates of these cations give 3 as the max. for hydration of the cation. The vitriols have 7 H_2O mols., 6 belonging to the cation and 1 to the anion. The thermic values are in exact agreement with the above. The probable existence of hydrates of the cation with an index of coordination of 5 for the sulfates

of the vitriolic metals was detd. For tervalent metals of the alums the existence of hydrates with 12 H₂O mols. was detd., agreeing with the Pfeiffer view. E. M. S.

Solid solutions between compounds of elements with different valences. G. BRUNI AND A. FERRARI. *Atti accad. Lincei* [6] 2, 457-62(1925).—The isomorphism of LiF and MgF₂ was studied with X-rays by Bruni and Levi (C. A. 19, 2581) and by Ferrari (C. A. 19, 2890). The system MgCl₂-LiCl of which the miscibility in the solid state was detd. by Tacchini (C. A. 19, 1368) was studied. The results show that anhydrous MgCl₂ gives a photogram by the method of powders corresponding to a cubic lattice coinciding with that of LiCl. The elementary cell contains 2 mols. MgCl₂ and corresponds to that contg. 4 mols. LiCl. The fundamental data of the 2 cells follow: for 4 LiCl and 2 MgCl₂ $a = 5.10$ A. U. and 5.09 A. U., vol. = 132.65 A. U., and 131.87 A. U., calcd. d. 2.12 and 2.47 , observed d. 2.06 and 2.32 , resp. Since anhyd. MgCl₂ is uniaxial birefringent it has a pseudocubic structure belonging to 1 of the tetragonal or hexagonal systems. E. J. WITZEMANN

The allotropy of zinc. DAVID STOCKDALE. *J. Chem. Soc.* 127, 2951-6(1925).—For detecting the presence and the temp. of allotropic change in Zn an electrolytic cell was used which consisted of Zn electrodes in the arms of a hard-glass U-tube filled with a molten electrolyte (m. about 280°) of ZnCl₂, contg. much oxychloride, plus 10% ZnBr₂. One electrode was kept $6-15^\circ$ hotter than the other, thereby giving rise to an e. m. f. between them; and this e. m. f. was recorded continuously while the whole cell was heated or cooled through the suspected temp. of allotropic change. The occurrence of an allotropic change in either Zn electrode was indicated by a break in the e. m. f.—temp. curve of the cell. The expts. indicate fairly convincingly that Zn undergoes an allotropic change at 315° . Miss Bingham (C. A. 14, 3341) found changes in certain properties of Zn at 330° and 310° . R. H. LOMBARD

Transition compounds between those having a saline character and the metallic alloys. M. PADOA. *Gazz. chim. ital.* 55, 975-83(1925).—The modern theory of valence based on electrochem. processes is adequate for all compds. having a saline character but the problem changes when one considers the intermetallic compds. Ordinary valence does not serve to explain the stoichiometric ratios and the characteristics of metallic alloys are not those of saline compds. Some years ago P. and Zanella (C. A. 17, 1564) suggested that compds. between metals are formed through the secondary valences. In extending this work P. has considered that since As has definite amphoteric characters the arsenides ought to be intermediate between saline and intermetallic compds. Some of the metallic sulfides are undoubtedly saline compds. (e. g., Na₂S, K₂S) while others like FeS₂, ZnS and PbS are even metallic in appearance and Trümpler (C. A. 16, 675) says that these contain the metals in the neutral state. P. investigates As₃Sn₂, As₃Sn and As₃Sn₃. He concludes that compds. of elements of the intermediate type with metals have the properties of metallic alloys and of saline compds. at the same time. The existence of an equil. between the saline form (ionized) and the metallic form is to be expected. This equil. is changeable with the temp. so that the existence of a temp. at which the cond. will reach a max. value for each compd. is to be expected. The above arsenides were prepd. in the form of bars and their elec. resistance was measured at various temps. From these detns. it was found that this max. is 25° for As₃Sn, 0° for As₃Sn and -20° for As₃Sn₃. E. J. WITZEMANN

The hydration water of crystalline compounds. A. GH. BERGHMAN. *J. Russ Phys.-Chem. Soc.* 56, 177-232(1925).—The purpose of the paper was to furnish evidence of the analogy between vapor tension and the elec. potential of metals. The theoretical and exptl. aspects of vapor-tension methods as applied to the study of hydrates are discussed. Van Bemmelen's method, being the most reliable and expedient, was used for the study of vapor tensions at 15° of 16 systems (anhyd. salt-water): CuCl₂, Na₂S₂O₈, Na₂PtCl₆, K₃[Co(C₂O₄)₃], K₃[Cr(C₂O₄)₃], Na₃[Cr(C₂O₄)₃], [Co(en)₃]Cl₃, [Co(en)₃]Br₃, [Co(en)₃]I₃, [Co(en)₃][Cr(C₂O₄)₃], [Co(en)₃][Co(C₂O₄)₃], NiCl₂[Co(en)₃]Cl₃, Ca(UO₂)₂(PO₄)₂, Co(UO₂)₂(PO₄)₂, Cu(UO₂)₂(PO₄)₂, Co(UO₂)₂(PO₄)₂. Conclusions: Cryst. hydrates have 2 vapor tensions. The one which is usually observed and detd. represents the vapor tension of the efflorescent crystals. The other is considerably lower ($1/7_{10}$ as great for CdSO₄) and belongs to the intact crystals. The hydration water of [Co(en)₃][Cr(C₂O₄)₃] is subject to rules different from those of the other salts. MARY JACOBSEN

Kinetic theory of the specific heat of solutions. NICOLA DE KOLOSOSKII. *Gazz. chim. ital.* 55, 844-58; *J. chim. phys.* 22, 225-52(1925).—In a series of nine papers (four of which were published in 1925 and five of which were in press) K. developed a general theory of the sp. heat of solns. by following in the steps of van't Hoff and applying to liquid solns. the consequences of the kinetic theory of gases. This paper constitutes a résumé of the essential part of these papers and also contains some new exptl. data

K. considers 5 hypotheses: (1) The sp. heat of a soln. is composed additively of the sp. heats of all the components of the system; (2) the sp. heats of the dissolved mols. and of the ions are equal to what they would be if in the state of gas; (3) the mol. heat of a n -atomic gas may be expressed by the formula $C_p = 2n + 3$; (4) the passage of a part of the solvent into the state of chem. combination with the mols. or the ions of the dissolved substance is accompanied by a certain variation of the sp. heat; (5) when a rise in temp. is brought about in a soln. a certain quantity of heat is spent in accomplishing the work necessary to overcome the viscosity of the medium. These are considered in detail. It is concluded that the sp. heat of a soln. is composed of the heat spent in raising the temp., of that that is transformed into external heat, and finally of that corresponding to the internal work (work of friction or of viscosity). The same conclusions ought to be applicable to the sp. heat of pure compds. The problem is more difficult in this case, upon which K. is now working. E. J. WITZEMANN

Physicochemical properties of hydriodic acid gas. R. MIRAVALLES AND E. MOLES. *Anales soc. españ. fis. quim.* 23, 509–23(1925).—HI was prepd. from the elements and the pressure of its satd. vapor detd. between -56° and -35° . The normal b. p. was found to be -36.0° , the m. p. -50.0° . A Pt thermometer was used, and a paraffin-oil compensator to isolate the manometers from the receiver because HI attacks Hg even when dry. Vapor pressure is represented by $\log p = 7.20833 - 1025.71 \times 1/T$, which is a straight line. The results approached those of Steele and McIntosh (*Z. physik. Chem.* 55, 136(1906)), and Henglein (*C. A.* 18, 186), but were slightly higher. The b. p. is a little lower, the m. p. slightly higher, than the av. of previous results, which indicates that an impure gas had been used previously. Almost all the previous data have been obtained on HI made by hydrolysis of PI_3 , which was found to give an impure gas. From the above data the mol. heat of evapn. was calcd. as 4916 cal. The Nernst formula gave 20.74 and 20.90 for the Trouton const., and HI is therefore a normal substance. The Guye-Guldberg law gives $T_e = 1.73 \times T_c$ as 410 for the crit. temp., agreeing closely with tests. From m. p., b. p., and heat of evapn., in connection with the same consts. for the corresponding noble gas it was found that HI behaves perfectly normally. E. M. SYMMES

The movement of a perfectly compressible fluid (French). A. FRIEDMANN AND B. IZVEKOV. *Bull. acad. sci. Russie* 19, 351–62(1925).—Math. discussion of the equations of Lagrange and Euler in connection with phenomenon of the movement of fluids. J. S. JOFFE

The rule of Duhem-Margulés. N. ZAVARITZKII. *J. Russ. Phys.-Chem. Soc.* 56, 367–71(1925).—The validity of the relation of Duhem-Margulés between partial pressure and compn. of the liquid phase in binary mixts.: $(d \ln p_i)/(d \ln x) = (d \ln p_i)/[d \ln(1 - x)]$ was studied for the systems HCl-H₂O and HBr-H₂O with the aid of the exptl. material of Zavaritzkii *et al.* (*C. A.* 18, 1421). It was found to be valid for systems contg. from 0 to 30% HCl and from 0 to 55% HBr, resp. The higher concns. were not studied because of the lack of reliable exptl. data. MARY JACOBSEN

Molecular mechanics. R. CASARES. *Anales soc. españ. fis. quim.* 23, 551–6(1925).—An intramol. force of attraction inversely proportional to the square of the distance is assumed. Taking into consideration the thermic movement a hyperbolic law is arrived at, expressing the relation between the mol. distance and the temp. of equil. of a liquid and its vapor. In certain cases this law is approx. verified if a proper origin of temp. for each substance is taken. E. M. SYMMES

A method of measuring the relative surface charges on electrolytes. ALLEN GARRISON. *J. Phys. Chem.* 29, 1517–22(1925).—A new method of obtaining the relative magnitude of the charges on the surfaces of solns. to within 0.01 v. is given. The surface of the soln. is made one plate of a condenser. A disk of Cu coated with Pd is held parallel to the surface and forms the second plate. The potential of the Cu disk is adjusted by an accurate potentiometer until motion of the disk with respect to the surface produces no deflection in a quadrant electrometer connected to both disk and soln. The disk is then at the same potential as the surface. Contact between soln. and electrometer is made through a HgCl electrode. The surface charges of a number of electrodes have been measured, pure water being taken as the standard of reference. The first traces of a substance added to water produce the largest effect. Subsequent addns. have small effect, generally reducing the charge and sometimes reversing its sign. The general relations between concn. and surface charge resemble those between concn. and adsorption. R. E. GIBSON

A comparison of methods of measuring the polarity of surfaces. N. K. ADAM, R. S. MORRELL AND R. G. W. NORRISH. *J. Chem. Soc.* 127, 2793–5(1925).—"Polar" and "non-polar," as here used, refer to the tendency of a substance to dissolve in H₂O,

or in hydrocarbon solvents, resp. Varnishes which "bloom" in H_2O ought to be more polar than non-blooming varnishes. The relative polarity of surfaces of glass, blooming and non-blooming varnishes, paraffin wax, and stearic acid was detd. by measuring their catalytic action on dry ethylene + Br_2 , and on moist ethylene + Br_2 ; and by detg. their angle of contact with H_2O , this being a measure of their attraction for H_2O . The varnishes which are more polar by the angle of contact method are also more polar by the catalytic method. The attraction of a varnish for H_2O parallels its veiling properties. If the attraction is more than about 70% of that of H_2O for itself, the varnish veils, if less than 45-50%, it does not veil. There is, however, considerable disagreement between the polarities of surfaces of different kinds as measured by the catalytic method, and by the angle of contact method; e. g., glass has less catalytic power than stearic acid or the veiling varnishes, but much greater attraction for H_2O . This difference may be due to the "surface" of the more catalytic substance having a depth of several mol so that by penetrating to this depth it would be possible for gases to reach a greater no. of polar groups than are to be found on an equal area of glass. R. H. I.

The adsorption of sulfides by colloidal chromium hydroxide. H. N. HOLMELAND M. A. DIETRICH. *J. Am. Chem. Soc.* **48**, 678-82(1926).—Pptn. of certain sulfides by H_2S in 0.5 N HCl soln. contg. $CrCl_3$ may be prevented by adsorption of the sulfide by colloidal $Cr(OH)_3$ formed by hydrolysis. This occurs in freshly pptd. solns. contg. $CrCl_3$ and $HgCl_2$ in excess of the ratio 2:1. Hydrolysis increases markedly on standing. Sufficient concns. of H^+ and of SO_4^{--} retard the hydrolysis. In $Cr_2(SO_4)_3$ solns. hydrolysis is so slight that there is no interference with the pptn. of the sulfides. Solns. in which marked hydrolysis has occurred are reversed by boiling them for 2 min. after making 3 N with HCl. These facts must be considered in connection with *Sneed's method of qual. analysis* for the H_2S group. F. L. BROWNE

The adsorption of gases by activated charcoal at very low pressures. I. At air temperature. H. ROWE. *Phil. Mag.* [7] **1**, 109-31(1926).—A method is described for detg. the quantities adsorbed by activated charcoal at very low pressures. Results have been obtained for N_2 , CO , O_2 and CO_2 at air temps. From a consideration of the adsorption isotherm of these gases, it is shown that this is better represented by $\log \alpha/P = A_0 - A_1\alpha$ than by the more usual equation $\alpha = kP^{1/n}$. At very low pressures the value of A_1 is negligible compared with that of A_0 , and the relationship between α and P is linear. The pressure at which this relationship no longer holds varies with the b. p. of the gas; it decreases as the b. p. increases. S. C. I.

A method for determination of the adsorption of ions on colloidal particles by means of Donnan's membrane equilibrium theory. HERMAN RINDE. *Phil. Mag.* [7] **1**, 32-50(1926).—R. attains a condition of Donnan equil. by rendering one of the electrolytic ions non-dialyzable by adsorbing it on colloidal particles too large to dialyze. Colloidal S was used to adsorb HCl. In this way the same condition was realized and the same formulas were found to apply as if the HCl itself had been non-dialyzable. By means of a quinhydrone electrode, the e. m. f. of the cell was measured, as also the osmotic pressure. The curve for osmotic pressure has the same shape, but instead of approaching zero attains a low const. value which could not be identified as the osmotic pressure of the colloid itself. S. C. I.

The sorption of vapors by alumina. L. A. MUNRO AND F. M. G. JOHNSON. *Phys. Chem.* **30**, 172-88(1926).—M and J have previously shown that alumina takes up a greater amount of H_2O than of any other vapor (*C. A.* **19**, 759). In the present paper the sorption of water vapor by alumina gel at various temps. and pressures is studied. Both Freundlich's and Patrick's equations apply to the sorption isotherms for 60° and 80°, while neither equation applied to the isotherms obtained when the partial pressures approach the vapor pressure of the H_2O at the temp. of the sorbent. Trouton's sorption rule holds approx. over the temp. range studied, i. e., 35.5° to 80°. PER K. FROLICH

Velocity of crystallization of sucrose from pure aqueous solutions at 60°. I. A. KUCHARENKO AND M. I. NACHMANOVICH. *Centr. Zuckerind.* **33**, 1609-10(1925); *Zapiski* **1924**, 173.—The difficulties of crystn. expts. at high temps. are (a) danger of cracking the original crystals during heating, (b) danger of cracking during cooling after the expt., (c) difficulty of removing the adhering film of soln. at the end of the expt., (d) error due to the fact that expts. are short and the time necessary to remove the crystal is a large % of the total, (e) difficulty of completely removing nuclei from the supersatd. soln. K. and N. have overcome these, but the means used are not given. A large no. of expts. detd. a curve, from which the following values are read for rate of crystn. (a) of sucrose, from solns. of known supersatn. (b), at 60°: (a) 340, (b) 1.005, (a) 720, (b) 1.010; (a) 1340, (b) 1.015; (a) 2210, (b) 1.020; (a) 3100, (b) 1.025. W. L. B.

The rate of solution of sucrose in nearly saturated solutions. I. A. KUCHARENKO AND M. I. NACHMANOVICH. *Centr. Zuckerind.* **33**, 1587-8(1925); *Zapiski* **1924**, 180.—The rate of soln. of a crystal may be written $x = \Delta P/St$, where x is the rate of soln., ΔP is loss in wt., S is surface and t is time. This may be written $x = \Delta P/(K\sqrt[3]{P^2t})$, where P is the mean wt. of the crystal during the process. In general K is not known. Expts. with weighed sugar crystals gave a value of xK (in mg. per sq. m. per min. at 20°) of 20,303 in a soln. 98.96% satd.; 35,479 at 98.13% and 59,649 at 97.54%. If perfect crystals were used K could be calcd. from actual measurements; but during soln. the crystal becomes etched so that the surface cannot be calcd. and hence K is uncertain. K. and N. have detd. the rate of crystal growth for sucrose at 20°. Hence if an etched crystal were grown in a sugar soln. of known supersatn. at 20°, its increased surface could be calcd. from its increased rate of growth. The difficulty is that in growing etched crystals, the first growth tends to restore the regular surface before general growth takes place. Seven such expts. with etched crystals growing in a soln. of 1.025 supersatn. at 20° gave a growth of 504, 335 and 448 mg. per sq. m. per min. for the first 70 mins., and 269, 265, 303, 269 mg. per sq. m. per min. for the first 125 mins. This work is to be continued.

W. L. BADGER

Influence of temperature on the reciprocal solubility of the monoalkyl ethers of ethylene glycol and water. H. L. COX AND L. H. CRETCHER. *J. Am. Chem. Soc.* **48**, 451-3(1926).—Complete soly. data are given for BuOCH₂CH₂OH and iso-BuOCH₂CH₂OH and H₂O; these compds. possess completely closed soly. curves. C. J. W.

The preparation of diluted from concentrated solutions. EMIL LÖW. *Mikrokosmos* **19**, 99-101(1926).—A simple computation permits the prepn. of dil. solns. of a definite content when the concn. is given in g. per 100 cc.

EMIL KLARMANN

The activity coefficients of hydrochloric acid in glycerol-water mixtures. W. W. LUCASSE. *J. Am. Chem. Soc.* **48**, 626-31(1926).—The activity coeff. of HCl is calcd. from the e. m. f. of the cell H₂ | HCl(x M) | AgCl | Ag. x varies from 0.001 to 4 and the solvent is a mixt. of glycerol (1 and 5 mol %) in water. This observed activity coeff. agrees well with that calcd. from the Huckel equation (cf. *C. A.* **19**, 1649) for concns between 0.001 and 1.0 M, but not for higher concns.

D. S. VILLARS

The electrode potential of mercury against its ions in aqueous methanol, acetone, and pyridine. J. GHOSH, P. R. CHAUDHURI AND A. SEN. *J. Indian Chem. Soc.* **1**, 189-200; *Science Abstracts* **28A**, 487-8(1924).—Measurements are made of the abs. potential of Hg in different solns. contg. its ions by detg. the max. position of the electrocapillary curve. From the Lippman-Helmholtz original equations the following relation is derived: $\gamma = \gamma_{\max} - \frac{1}{2}CE^2$, where γ is the surface tension of Hg, C the capacity of unit area of the double layer, and E the p. d. at the boundary. Measurements are made with a U-tube capillary electrometer, to which definite potentials are applied, and the Hg meniscus is read with a microscope. The residual currents corresponding to definite polarization voltages are investigated. The tendency of the electrolyte to creep between the glass wall and the Hg column, thus causing a variation of the capacity of the double layer, is checked as far as possible. A considerable influence on electrocapillary effects appears to be exerted by the adsorption of ions by the Hg surface. With an aq. soln. of HNO₃ and HgNO₃ a fairly good parabolic curve, as demanded by the equation, is obtained with a max. at 1.05 v. This detn. agrees with the value of 0.391 found for the e. m. f. of Hg in this electrolyte against a calomel electrode of which the single p. d. is taken as 0.612. Measurements are made in aq. mixts. of MeOH, acetone and pyridine, and a detn. is made of the dielec. const., D . The potentials E fall with diminishing content of water. With MeOH and water mixts. contg. over 50% of the latter an approx. const. value of about 0.93 is obtained for E/D . In aq. acetone an abnormally low value of the potential is given with a 20% acetone mixt., but with this exception the ratio E/D remains const. at about 1.25 up to 40% acetone and thereafter increases. With pyridine-water the ratio E/D is practically const. at about 0.75 within the range 10 to 40% of pyridine. Within a certain range the free energy of the mercurous ion is in the proportional to the dielec. const. Cf. Kruger and Krumreich, *C. A.* **7**, 3896.

H. G.

The activity coefficients of several types of electrolytes calculated from freezing-point data. W. H. RODEBUSH. *J. Am. Chem. Soc.* **48**, 709(1926).—The activity coeffs. of 0.001, 0.005 and 0.01 M solns. are calcd. from the f. p. data of Hovorka (cf. *C. A.* **19**, 2439). They are, resp.: KCl 0.966, 0.928, 0.902; CsNO₃ 0.966, 0.928, 0.902; K₂SO₄ 0.889, 0.781, 0.715; Ba(NO₃)₂ 0.889, 0.778, 0.710; MgSO₄ 0.765, 0.572, 0.471; CuSO₄ 0.762, 0.560, 0.444; La₂(SO₄)₃ 0.477, 0.232, 0.150.

D. S. VILLARS

Heterogeneous kinetics of dissolved gases. I. The elimination of carbon dioxide from an aqueous solution to a stream of bubbles of an indifferent gas streaming through

it. FRIEDRICH POLLAK. *Monatsh.* **45**, 539-68(1924).—An arrangement is described whereby the rate of elimination of CO_2 from an aq. soln. could be continuously detd. during the passage of a const. stream of N bubbles. On the basis of *Henry's law* an expression $dx/dt = K Bw(N - x)$ is derived for the rate of this elimination. B , is the no. of bubbles of surface area w passing through the soln. whose concn. is N , in unit time; K is a const. Lack of precision in the results prevented their exact interpretation.

ARTHUR GROLLMAN

Relative rates of certain ionic reactions. A. W. FRANCIS. *J. Am. Chem. Soc.* **48**, 655-72(1926); cf. *C. A.* **19**, 2814.—The relative rates of oxidation of several inorg. reducing agents by Br-water were estd. by making these reactions compete with certain irreversible org. substitution reactions. About 300 expts. are reported. To get gradual mixing a special app. was used which delivered the Br-water and the mixt. of competitors at equal slow rates into agitated distd. H_2O . The ratios between the rates of the inorg. and the org. reactions are nearly independent of temp. and concn. The reactivity of a solute is increased by a decrease in soly. and, like thermodynamic activity, is max. in satd. soln. This is a partial explanation of the effect of solvent on reaction velocity. The relative velocity consts. of oxidation (compared with K for TiCl_3 , which is about 10^7) are $\text{Na}_2\text{S}_2\text{O}_3$ 15, HI 14, NaHSO_3 8.6, SnCl_2 4.1, NaAsO_2 4.0, $\text{K}_4\text{Fe}(\text{CN})_6$ 2.4, TiCl_3 1.0, FeSO_4 0.3, FeCl_2 0.3, NaNO_2 0.003. A new volumetric analysis of H_3AsO_4 is given. $\text{Na}_2\text{S}_2\text{O}_3$ reacts faster than NaHSO_3 with I_2 (cf. Eggert, *C. A.* **19**, 766).

A. W. FRANCIS

The catalytic synthesis of water vapor in contact with metallic nickel. A. F. BENTON AND P. H. EMMETT. *J. Am. Chem. Soc.* **48**, 632-40(1926).—From a study of the combination of O_2 and H_2 in contact with reduced Ni and consideration of the work of other authors, it is concluded that the catalytic H_2O formation can be largely and perhaps entirely accounted for on the hypothesis of successive oxidation and reduction of the catalyst. Activation of H_2 does not play a prominent part in the reaction.

F. L. BROWNE

Composition and catalytic action of platinum electro-sols. A. DE GREGORIO ROCASOLANO. *Nachr. Ges. Wiss. Göttingen* **1924**, 177-88.—Because the addn. of protecting colloids such as gelatin increases the stability of Pt hydrosols made by elec. dispersion but decreases their effectiveness as catalysts for the decompn. of H_2O_2 , it is concluded that the chem. compn. of the Pt particles is the important factor governing catalytic action rather than phys. properties such as size of particles. Analysis of the gas evolved during prepn. of the Pt sols by elec. dispersion shows it to consist entirely of H_2 . When the coagulum from such sols is heated, O_2 is given off. The particles of colloidal Pt are therefore composed of Pt and an oxide. The particles are assumed to consist of cryst. masses of Pt torn off from the electrodes during prepn. enclosed in a layer of Pt oxide. The shell of oxide adsorbs OH^- from H_2O , giving the particles a negative charge. The catalytic effect on the decompn. of H_2O_2 is presumed to take place through the alternate reduction of the oxide shell to a lower oxide and its subsequent reoxidation. The catalytic power of a given Pt sol is measured by the amt. of O_2 taken up during its formation. In conformity with this conclusion it is found that (1) the catalytic activity is increased by increasing the proportion of O_2 bound (through control of the exptl. conditions during prepn.); (2) a coagulum from a Pt sol loses its activity when heated to redness and then suspended in H_2O again; (3) sols which have been treated with KI in acid soln., whereby I_2 is set free, lose their activity. The amt. of I_2 liberated by reaction with KI may be taken as a measure of the amt. of O_2 bound, although the results do not check with those obtained by direct detn. To account for this it is assumed that the Pt particles combine with O_2 in 2 different ways. The fact that the catalytic activity is not directly proportional to the amt. of O_2 bound indicates that phys. factors also play a part, even if a minor one.

F. L. BROWNE

Equilibrium between two liquid phases. II. Aniline-lactic acid-water. E. ANGELSCU. *Bul. soc. chim. România* **7**, 72-8(1925); cf. *C. A.* **19**, 3055.—The equil. between the 2 liquid phases of the system was studied by detg. the isotherms at 0° and 20° , the partition coeff. at 20° and variations in the equil. with the temp. The soly. curves of this system have an upper crit. soln. temp., which decreases rapidly with increase in the concn. of the mixt. in lactic acid. The difference between the general shapes of these curves and of those obtained with $\text{PhNH}_2\text{-AcOH-H}_2\text{O}$ is attributed to the greater strength of lactic acid, as compared with AcOH , resulting in less hydrolysis of PhNH_2 lactate. III. *o*-Toluidine-acetic acid-water. *Ibid* **79-90**.—The binary system *o*-toluidine- H_2O has an upper crit. soln. temp. of 216° with a concn. of about 50% *o*-toluidine. The ternary system *o*-toluidine- $\text{AcOH-H}_2\text{O}$ gives closed soly. curves

with upper and lower crit. soly. temps. With 24.52% AcOH in the mixt. the 3 constituents are miscible at all temps. and for all proportions of the other 2. A. P.-C.

The behavior of cyanamide in acid and alkaline solutions. G. GRUBE AND G. MORZ. *Z. physik. Chem.* 118, 145-60(1925); cf. *C. A.* 8, 876.—The equil. $2\text{CNNH}_2 \rightleftharpoons (\text{CNNH}_2)_2$ is investigated by the method given previously. In slightly alk. solns. and at low temps. the reaction goes practically entirely to the right. In strongly alk. solns. and at temps. above 50° , an equil. can be reached from both sides, which advances to the left with rising p_H . The basic dissocn. const. $(\text{CNNH}_2\text{OH}) \times (\text{H})/(\text{CNNH}_2 + \text{H}_2\text{O})$ is detd. at 25° by the sapon. of MeOAc to be 2.5×10^{-16} . The hydrolysis $\text{CNNH}_2 + \text{H}_2\text{O} \rightarrow \text{CO}(\text{NH}_2)_2$ is in dil. solns. a reaction of the first order and below $p_H = 1$ approx. proportional to the H-ion concn. Only when the soln. is concd. as to CNNH₂ and dil. as to acid, a reaction of the second order takes place, because some of the catalyzing acid is lost by salt formation with urea. JOHN T. STERN

Statistics of a diatomic gas and its heat capacity. K. N. SHAPOSHNIKOV. *Bull. Inst. Polytech. Ivanovo-Vosneisensk* 7, 132-42(1923).—S. discusses the observed phenomenon of increase in heat capacity of diat. gases with the increase in temp. He discusses the value $5 RT/2$, which according to the kinetic theory is the energy possessed by a g.-mol. of a diat. gas. He analyses the derivation of this formula by the Plank-Einstein function and through a series of calcns. arrives at the following formula for the total energy: $E = 3RT/2 + 2N(\epsilon/e\epsilon/kt - 1 + \epsilon/2)$. J. S. JOFFE

Measurement and production of high temperatures attaining that of the sun. M. PICON. *J. pharm. chim.* [8] 2, 285-98(1925).—An extended review, based on the work of O. Lummer (*C. A.* 9, 143, 2351) and the advances in pyrometry (cf. Weiss, *C. A.* 15, 2227). S. WALDBOTT

The thermal properties of viscous sulfur. P. MONDAIN-MONVAL. *Compt. rend.* 182, 58-60(1926).—Calorimetric expts. with viscous S, sealed in a glass bulb, have given the following values: Heat of transformation of liquid S into viscous S at about 160° , 2.8 ± 0.1 cal./g. (absorbed); sp. heat of orthorhombic S, 0.176; sp. heat of liquid S, 0.220, and of viscous S 0.290; heat of transformation of orthorhombic S into monoclinic at 95° , 2.7 cal. and the heat of fusion of monoclinic S 9.3 cal. A. W. KENNEY

Thermochemistry of beryllium. C. MATIGNON AND G. MARCHAL. *Bull. soc. chim.* 39, 167-90(1926).—See *C. A.* 20, 695. E. H.

Thermoelectric effect and the heat capacity of electrons in metals. E. D. EASTMAN. *J. Am. Chem. Soc.* 48, 552-62(1926).—The apparent heat capacity of electrons, that is to say the excess heat capacity of metal contg. free electrons over the Debye value, is not the same quantity as the partial molal heat capacity of electrons which occurs in the equation for the Thomsen effect. These two quantities may have different signs. The importance of the Soret effect in this connection is pointed out. F. R. BICHOWSKY

Specific heats of hydrocyanic acid. A reply. EDITH H. INGOLD. *J. Am. Chem. Soc.* 129, 26-9(1926).—A reply to criticism by Partington and Carroll (*C. A.* 19, 2160). F. R. BICHOWSKY

The thermal dissociation of sodium cyanide. E. W. GUERNSEY AND M. S. SHERMAN. *J. Am. Chem. Soc.* 48, 695-704(1925).—Pure NaCN can be prepared by pptn. of NaOH by excess HCN in EtOH. The pure NaCN is not stable at temps. of 600 – 1255° . In atm. of He or N₂, it reversibly dissociates into N₂, Na₂C₂, Na and C. At 1050° the partial pressures in mm. Hg are as follows: Na 117, Na₂C₂ 21.0, N₂ 108, NaCN 21. Equil. const. could not be calcd. with great accuracy because of exptl. conditions. F. R. B.

The free energy and heat of formation of iron carbide for the temperature interval 650 – 700° . H. L. MAXWELL AND ANSON HAYES. *J. Am. Chem. Soc.* 48, 584-93(1926).—Equil. const. for the reaction $3\text{Fe}(\alpha) + 2\text{CO} = \text{CO}_2 + \text{Fe}_3\text{C}$ were measured at 1 atm.; a flow method was used and resultant gases were analyzed. The vol. percent CO₂ at equil. was 35.7 ± 0.1 at 650° , 25.25 ± 0.05 at 700° . From data of Rhead and Wheeler for equil. const. of reaction $2\text{CO} = \text{C}(\text{graphite}) + \text{CO}_2$, ΔF for reaction $3\text{Fe}(\alpha) + \text{C} = \text{Fe}_3\text{C}$ is 3138 cal. at 650° and 2281 cal. at 700° . These data give ΔH at $675^\circ = 19,162$ cal. F. R. B.

Influence of elastic tension on the thermoelectrical force. ESTER MAJO. *Rend. accad. sci. Napoli* 29, 159-67(1923).—Tables of the slight but noticeable change of the Peltier effect under elastic deformation of various metals combined with Cu. JOHN T. STERN

The determination of transition points in non-aqueous solutions by the electromotive force method. R. B. MASON AND J. H. MATHEWS. *J. Phys. Chem.* 29, 1507-16(1925).—The e. m. f. method is used for detg. transition pts. of salts in solns. of anhyd.

C_6H_5N . The temp. e. m. f. curves for the cells, $Cu-Hg | CuCl_2 \text{ 2py.} || HgCl_2 \text{ 2py.} | Hg$, and $Cu-Hg | CuCl_2 \text{ 2py.} || CdCl_2 \text{ 2py.} | Cd-Hg$, show breaks at 55° which are evidently due to the transition, $CuCl_2 \text{ 2py.} \rightleftharpoons 3CuCl_2 \text{ 2py.}$ The temp.-cond. curve has a similar break at 56° . The cell, $Cd-Hg | CdCl_2 \text{ 2py.} | \text{satd. soln. } ZnCl_2 | ZnCl_2 \text{ 2py.} | Zn-Hg$ was very satisfactory as regards cond., stability and reproducibility. Sharp breaks in temp.-e. m. f. curves at 9.3° indicated $CdCl_2 \text{ 6py.} \rightleftharpoons CdCl_2 \text{ 2py.}$, which agrees with 9° obtained by the soly. method. The Cd and Pb amalgams change polarity irreversibly when the cell, $Pb-Hg | PbCl_2 \text{ 2py} | \text{satd. soln. } PbCl_2 | CdCl_2 \text{ 2py.} | Cd-Hg$ is heated. There are indications of a transition pt. at 53° . R. E. GIBSON

The electrolysis of acid solutions of copper sulfate. L. V. REDMAN. *J. Phys. Chem.* **29**, 1548-55(1925).—An account of work done in 1910 as a preliminary for further publications on the subject. Siegrist (*Z. anorg. Chem.* **26**, 273(1901)) noted that in the electrolysis of solns. of $CuSO_4$ in H_2SO_4 , when the ratio $[CuSO_4] / \text{current d.}$ falls below a certain value, the deposition of Cu is independent of the current. He assumed that the reaction is really one of chem. reduction and hence depends on $[CuSO_4]$. Rosebrugh and Miller (*C. A.* **5**, 1013) accounted for the phenomenon on the basis of velocity of diffusion at the electrode. R. shows from the results of unequivocal expts. with interrupted current electrolysis that the theory of R. and M. is to be preferred to that of S. Qual. expts. on the voltage-time curve during the first few seconds of an electrolysis also lend support to the diffusion theory. R. E. GIBSON

The problem of hydration. III. Electroendosmosis and electrical transport of water. HEINRICH REMY. *Z. physik. Chem.* **118**, 161-92(1926); cf. *C. A.* **9**, 1869. The transport of H_2O by electrolysis across a membrane may be due to stoichiometrical hydration, electrodynamical transport of solvent or endosmosis. The results of expts. reported upon (*C. A.* **17**, 3826) are presented in tables and curves. All diaphragms are previously tested for their porosity under a pressure of 150 cm. of water. Different diaphragms of the same material show a H_2O transport parallel to their porosity but this does not hold for different materials. In pure H_2O , S powder, clay and Zsigmondy-Bachmann membrane show a very high endosmotic effect. Animal charcoal, gelatin, and parchment paper show a low effect. The same division into 2 groups is found in KCl solns. from 0.001 N to 1 N . Progressing to concns. above 0.02 N , there is a rapid drop of the factor dv/F with the first 3 substances, which is characteristic for endosmosis. For theoretical reasons the *sp. electroendosmosis*, a term which is derived from the formulas of Helmholtz and Smoluchovsky, can only decrease with increasing concn. as far as the ionic adsorption in the membrane is concerned. The curves for *sp. cond.* $\times dv/F$ in relation to $\log 1/n$ show for most membranes (except parchment) with alkali cations an increase above $n = 0.02$. The alk. earths produce a similar decrease (gelatin membrane). JOHN T. STERN

Duplex electrodes of the second type. PHILIPP GROSS and OTTO HALPERN. *Z. physik. Chem.* **118**, 255-6(1925); cf. *C. A.* **19**, 1808, 2446.—Polemical. J. T. S.

Anomalies observed in the magnetism of gases. A. GLASER. *Ann. Physik* **78**, 641-58(1925).—A continuation of investigations, previously described, with improved app. (cf. *C. A.* **19**, 2295). Results for O_2 , CO_2 and CO are given both in detailed tables and graphically. W. W. STIFLER

Magnetic properties of the carbonyl radical. P. PASCAL. *Compt. rend.* **182**, 215-7(1926).—By taking the value of the susceptibility of the CO radical from measurements on aldehydes, values were computed for amides, acids, urea, carbamates, and carbonates which were in good agreement with exptl. results. P. concludes that the increase of diamagnetism produced by N is accentuated when it is replaced by a neg. radical, but is distinctly diminished upon substitution by a pos. radical. This explains the apparent anomalies observed in compds. with doubly bound O . W. W. S.

The optical behavior of alumina fibers. W. KRAUSSE. *Kolloidchem. Beihefte* **21**, 282-304(1926).—The double refraction of alumina fibers is a minimum after imbibition of liquids whose n is 1.53. The residual double refraction is pos. in the direction of growth of the fibers and is attributable either to the difference in dispersion between fiber and imbibed liquid or to the fiber itself. Cetyl alc., cholesterol, narceine, coumarin, *p*-cresol, paraffin and stearin form sub-microscopic crystals in the interstices of such fibers. They are oriented by the structure of the fibers so as to give a summation of refraction, which is pos. with coumarin and *p*-cresol and neg. with the others. Staining of the implanted cetyl alc. and narceine with I gave a *dichroism* which in the direction of growth of the fibers had the same character as that obtained along the long axis of the crystals of the pure substances. Fibers show dichroism when stained with methylene blue, Au , Ag or Hg , but not with Berlin blue. Staining with metals changes the double refraction, which becomes neg. in the direction of growth with Au and Ag . A. G.

- BLOCH, EUGENE: **The Kinetic Theory of Gases**. New York: E. P. Dutton & Co. \$3.00.
- BORN, MAX: **The Constitution of Matter**. Trans. from 2nd revised German Ed. by E. W. Blair and T. S. Wheeler. New York: E. P. Dutton & Co. \$2.50.
- BOURBION, F.: **Thermochemie**. Paris: G. Doin. 363 pp. Fr. 25.
- BRINKLEY, STUART R.: **Principles of General Chemistry**. New York: The Macmillan Co.
- CRESSY, EDWARD: **Discoveries and Inventions of the Twentieth Century**. 2nd Ed. revised. New York: E. P. Dutton & Co. \$5.00.
- EASON, ALEC B.: **Where to Seek for Scientific Facts**. London: S. Rentell & Co., Ltd. 42 pp. 1s. Reviewed in *J. Inst. Met.* 33, 627(1925).
- EINSTEIN, ALBERT: **The Investigation into the Theory of the Brownian Movement**. Trans. by A. D. Cowper. New York: E. P. Dutton & Co.
- ENGELHARD, CHARLES: **The Platinum-Palladium Controversy in Its Relation to the Jewellery Industry**. A Collection of Letters, Addresses, Editorials, Proposed Laws, Resolutions of Various Associations, Scientific, etc. Vol. I. Newark, N. J.: Baker & Co., Inc. 188 pp. Gratis. Reviewed in *J. Inst. Met.* 33, 624(1925).
- FARADAY, MICHAEL: **The Chemical History of a Candle**. Ed. by W. R. Fielding. New York: E. P. Dutton & Co. 158 pp. \$0.60.
- FREUNDLICH, HERBERT: **Colloid Chemistry**. Translated by H. S. Hatfield. New York: E. P. Dutton & Co.
- HUTTON, A. E.: **The Natural History of Crystals**. New York: E. P. Dutton & Co. 274 pp.
- Les actualités de la chimie contemporaine**. Ser. 2. Ed. by A. Haller. Paris: Doin. 310 pp. Fr. 12. Reviewed in *Tech. Book Review Index* 8, No. 3, 341(1924).
- MARTINET, J. and ALEXANDRE, P.: **Couleur et constitution chimique**. Paris: G. Doin. 328 pp. Fr. 25.
- MULLINS, MARY ROSALIE: **Chem Review**. New York: M. R. Mullins. 88 pp.
- OSTWALD, WOLFGANG: **A Manual of Colloid Chemistry**. Trans. by J. N. Kugelman. New York: E. P. Dutton & Co.
- PEPPER, JOHN HENRY: **The Boy's Playbook of Science**. Revised. New York: E. P. Dutton & Co. 680 pp. \$3.
- TILDEN, WILLIAM A.: **Chemical Discovery and Invention in the Twentieth Century**. New York: E. P. Dutton & Co. 487 pp. \$5.00.
- TRAFTON, GILBERT H.: **Science of Home and Community**. Revised Ed. New York: The Macmillan Co.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

- Polarization of radiation excited by electron impact**. A. ELLETT, P. D. FOOTE and F. L. MOHLER. *Phys. Rev.* 27, 31 6(1926). D. C. BARDWELL
- Photo-ionization and relative absorption probabilities of cesium vapor**. F. L. MOHLER, P. D. FOOTE and R. L. CHENAULT. *Phys. Rev.* 27, 37-50(1926). D. C. B.
- Magnitude of the K absorption discontinuity**. F. K. RICHTMYER. *Phys. Rev.* 27, 1-17(1926). D. C. BARDWELL
- Measurement of the refraction of X-rays in a prism, by means of the double X-ray spectrometer**. BERGEN DAVIS and C. M. SLACK. *Phys. Rev.* 27, 18-22(1926). D. C. BARDWELL
- Stripped oxygen (O_{VI}), the PP' group in (O_V), and new aluminum lines in the extreme ultra-violet**. I. S. BOWEN and R. A. MILLIKAN. *Phys. Rev.* 27, 144 9(1926); cf. *C. A.* 20, 17.—A continuation of the study of hot-spark spectra. Ionization potentials of stripped atoms are calcd. D. C. BARDWELL
- The absorption spectrum of tin vapor in the ultra-violet**. R. V. ZUMSTEIN. *Phys. Rev.* 27, 150-6(1926). D. C. BARDWELL
- The universal constant of thermionic emission**. P. W. BRIDGMAN. *Phys. Rev.* 27, 173-80(1926). D. C. BARDWELL
- The electrification of two intersecting planes**. W. B. MORTON. *Phil. Mag.* [7] 1, 537-48(1926). S. C. LIND
- An investigation into the theory of the "three-point" gap**. C. E. WYNN-WILLIAMS. *Phil. Mag.* [7] 1, 353-78(1926). S. C. LIND
- The J phenomenon. III. Notes on the superposition of X-rays and on scattering**.

C. G. BARKLA AND GLADYS I. MACKENZIE. *Phil. Mag.* [7] 1, 542-53(1926); cf. C. A. 20, 146.

The physical nature of the sun's corona. II. WILHELM ANDERSON. *Z. Physik* 34, 453-73(1925).—A. first discusses previous theories in regard to the sun's corona and finds them unsatisfactory. The distribution of a gas in the gravitational field of the sun is used to derive a relation between the temp. of the base of the corona (the upper surface of the chromosphere) and the radii of the base and outer surface of the corona. The temp. of the outer surface is taken as 0° abs. The temp. of the outer surface of the chromosphere is calcd. for different at. wts. of the gas of the corona and it is found that electron gas would have approx. the at. wt. necessary to give the correct temp. of the chromosphere. A. concludes that the corona is probably pure electron gas.

S. C. LIND
H. C. URREY

The origin of the penetrating radiation. MINESABURŌ AKIYAMA. *Japn. J. Astron. Geophysics* 3, 1-6(1925).—A. correlates data on the diurnal and seasonal variation of the penetrating radiation with auroral appearances and advances evidence supporting the assumption that the radiation is caused by the aurora. If auroral light is caused by bombardment of N₂ mols. by α -particles from the sun, this occasionally results in the release of radiation harder than ordinary γ -rays (cf. C. A. 19, 1812). Max. in frequency of auroral appearances as well as in amt. of penetrating radiation occur in the morning and evening and in the months April and Sept. (cf. C. A. 15, 464; 18, 2642; *Z. Physik* 11, 379; 21, 324; *Jahr. Rad. Elekt.* 14, 383). As aurora is apt to follow transit of sun spots and be accompanied by a magnetic storm, these do not cause the radiation but merely accompany it. (Cf. *Compt. rend.* 173, 722.)

D. S. VILLARS

Apparatus for measurement of penetrating radiation. WERNER KOLHÖRSTER. *Physik. Z.* 27, 62-3(1926).

B. J. C. VAN DER HOEVEN

Have radium rays an influence on the potential of the hydrogen electrode? M. TZENTNERSHVER AND M. STRAUMANIS. *Z. physik. Chem.* 118, 240-50(1925).—An attempt is made to calc. the degree of dissocn. of H₂ under normal conditions. For theoretical reasons the potential of a H₂ electrode should become more neg. by 8.4 milliv., if the concn. of at. H in Pt is doubled. Thirty mg. of RaBr₂ near a H₂ electrode fail to produce an effect detectable by an app. with a sensitivity of 10⁻⁶ v. The ionization of the H atm. is detd. by a condenser which is built into the electrode vessel. Expts are made with H₂ + N₂ and H₂ + SO₂.

JOHN T. STERN

Radioactivity and ionization measurements of air at Tuja-Moujoun (Fergana). V. I. BARANOV. *Bull. acad. sci. Russie* 19, 427-48(1925).—The methods for measuring radioactivity and ionization of air have to be independent of the air purity factor. The measurement of the intensity of ion formation may give a value of abs. significance to judge the activity of the given region. The radioactivity measurements of the air may give the general characteristics of a more or less wide area. Local conditions influence ionization more than radioactivity, especially where an exchange with soil air takes place. Caves could be studied for their Rn with the Schmidt app. Ionization of cave air gives no indication of their radioactivity. In the district of Tuja-Moujoun on account of the Ra deposits the radioactivity and ionization of air are increased.

J. S. JOFFE

Absorption of β -rays by matter. (MME.) J.-S. LATTÈS AND GEORGES FOURNIER. *Compt. rend.* 181, 1135-6(1926); cf. C. A. 20, 702.—The linear relation $\mu/\rho = a + bN$ holds for 3 groups of primary β -rays selected from the complex radiation of a tube of Ra accompanied by its disintegration products. The ratio a/b in all cases studied is const. and = 105. The form $\mu/\rho = b(105 + N)$ is, therefore, proposed for the absorption law.

NORRIS F. HALL

The chemical properties of mesothorium 2 and actinium. ELLEN GLEDITSCH AND C. CHAMIE. *Compt. rend.* 182, 380-1(1926).—Five different chem. tests prove that MsTh 2 belongs to the Ce group of rare earths and is especially like La. These results can also be applied to Act, its isotope.

MARIE FARNSWORTH

Uranium X—its extraction and estimation. RAJENDRALAL DE. *J. chim. phys.* 23, 197-204(1926).—See C. A. 20, 1027.

E. H.

Emission of cathode bundles under vacuum. R. MAGINI. *Nuovo cimento* [N. S.] 2, 485-510(1925).—The form of discharge from cathodes of various shapes and under various stages of vacuum was studied. In all the cathodes studied the deflection of the final rays increases on diminution of pressure and with the distances between opposed points in the cathode. In a cylindrical tube with the bases sufficiently close the cathode streams are normal to the base; the ions strike against the walls and there is no production of canal rays. The course of the cathode rays under various exptl. conditions is described and diagrammed in detail.

L. T. FAIRHALL

Kinetic theory of metallic conduction and the scattering of electrons by atoms. E. L. DAVIES AND G. H. LIVENES. *Proc. Cambridge Phil. Soc.* 22, 555-61(1925); *Science Abstracts* 28A, 565.—A mathematical paper. It is concluded that a purely kinetic theory is quite capable of explaining the phenomena of cond. in metals. H. G.

Laws governing the pulling of electrons out of metals by intense electrical fields. R. A. MILLIKAN AND C. F. EYRING. *Phys. Rev.* 27, 51-67(1926).—The electron current pulled from a W filament increases from 10^{-12} to 10^{-8} amp. as the field is increased from 400 to 1100 kv. per cm. In the dark, luminous spots were seen on the anode, indicating that these currents come from a few active surface spots. A study is made of the variation of current with temp. It is suggested that these currents are due to conduction electrons pulled from minute peaks on the surface. D. C. BARDWELL.

The distribution of energy between the modified and the unmodified rays in the Compton effect. Y. H. WOO. *Phys. Rev.* 27, 119-29(1926).—With small tubes of the Compton type and Soller collimators, reliable measurements of the intensity of scattered X-rays were obtained from five radiators: paraffin, wood, C (graphite), Al and S. The increase in the ratio of the modified to the unmodified line with the angle of scattering agrees in general with Jauncey's theory, but the numerical values given by the theory are 20 to 50% too large. The results are discussed in detail. D. C. B.

Low-voltage discharges in helium. W. H. MCCURDY AND P. DALTON. *Phys. Rev.* 27, 163-72(1926).—Measurements of potential distribution, of mean energy and of concn. of electrons were made in the He discharge at pressures from 0.01 to 2.9 mm. The electron concn. is a max. in the negative glow and falls off to a min. near the cathode side of the first striation. D. C. BARDWELL.

The character of the ionization produced by spraying water. P. J. NOLAN. *Phil. Mag.* [7] 1, 417-28(1926).—The object of the investigation was to det. whether the ions produced by spraying water have mobilities varying continuously over a wide range or whether they are concd. in certain groups or bands. The Zeleny method of measuring mobility was used on account of its high resolving power. A no. of current-voltage curves are shown; the breaks indicate that the water-spray ions preferentially take certain sizes, although these are distributed all the way from "small" ions up to the Langevin "large" ions. Whether these groups include these ions only or whether in addn. there is a general back ground of ions of all sizes the expts. were not crit. enough to det. The proofs of low mobilities 0.00033, 0.0012 and 0.0041 cm./sec./volt/cm. were found in every case. S. C. LIND.

The equilibrium of ionization in the atmosphere. J. J. NOLAN, R. K. BOYLAN AND G. P. DE SACHY. *Proc. Roy. Irish Acad.* 37, 1-12(April, 1925); *Science Abstracts* 28A, 561.—Some results are presented from a general investigation of atm. ionization, nucleation and kindred phenomena. It is found that: (1) The large ions in the atm. carry single electronic charges. (2) A const. fraction of the nuclei of the atm. is charged, i. e., is large ions. The ratio of the uncharged nuclei to the large ions of one sign is 1.28 approx. (3) The equil. between large and small ions in the atm. is detd. by the equation $q = \alpha n^2 + 2\eta_2 N n$, where α is the ordinary recombination coeff. for small ions and η_2 is the recombination coeff. between small and large ions of the opposite sign. When large ions are plentiful the relation is $q = 2\eta_2 N n$. The value of η_2 is 9.7×10^{-6} . (4) A close relation exists between the atm. potential gradient and the concn. of nuclei (and therefore of large ions) in the air. Exptl. details with data and curves are included. H. G.

Gas flow and pressure changes in gases under electric discharge. R. G. LUNNON. *Phil. Mag.* [7] 1, 482-91(1926).—Measurements have been made of the mol. and viscous flow of gases in fine capillary tubes at low pressures. The rate of flow is unaffected, to within less than 5%, by an elec. discharge passing through the flowing gas. A theoretical discussion suggests that an effect is to be expected with diatomic gases at very low pressures. Observations have been made of the disappearance and emission of gas in discharge tubes. The change of pressure follows an exponential law when it occurs, and under special circumstances there may be no change. The gases used in the flow expts. were pure N_2 , commercial O_2 , air and a mixt. of 75% A, 25% N_2 and a trace of O_2 . S. C. LIND.

The so-called positive photoelectric emission (inverse effect) and the reality of the subelectron. E. J. LORENZ. *Phil. Mag.* [7] 1, 499-509(1926).—The inverse photoelec. effect is a spurious effect, and is not due to discharge of positive electricity. This has been proved by careful work on oil, glycerol and Hg drops in various gases. Work with Hg drops shows that the drops that yield values of " e " smaller than 4.77×10^{-10} e. s. u. also show an abnormal behavior to ultra-violet light, that is, they are only slightly sensitive or not sensitive at all. The multiple relationship holds for the charges on

these insensitive drops, proving that their charges are electronic, and that it is erroneous to assume their density to be that of Hg. Drops that are known to be pure Hg satisfy Millikan's $e_1^{1/2}$, $1/pa$ relation, and yield 4.77×10^{-10} e. s. u. for the electronic charge, and 0.695 as the value of the correction const., A , in Stokes' law. S. C. LIND

X-ray radiation from hot sparks. ALBERT BJÖRKESON. *Proc. Nat. Acad. Sci.* 11, 413-5(1925).—A vacuum spectrograph of the Siegbahn type was used with Ag, Al, Si, S and Cu as electrodes and a gypsum crystal as a grating. The plates showed all the earlier known characteristic lines in the L-series spectrum of Ag, and the K-series for the other elements including the so-called spark-lines. No new lines nor any shift nor broadening of the old ones was observed. From the plates the conclusion is drawn that the multiple ionization giving rise to the enhanced X-ray lines of the K-series must be due to simultaneous ejection by a single impact. J. F. SCHAIERER

Significance of the discovery of X-ray laws in the field of optics. R. A. MILLIKAN AND I. S. BOWEN. *Proc. Nat. Acad. Sci.* 11, 119-22(1925); *Science Abstracts* 28A, 459.—Series of atoms of elements from Na to Cl and Li to N have been obtained without valence electrons (cf. C. A. 18, 3537). The working out of the corresponding energy levels has shown that the Moseley and irregular doublet laws hold with optical spectra as well as with X-ray spectra. The same seems to hold also for the regular or relativistic doublet law. As this would involve the abandonment of either relativity causes and effects or of Bohr's interpenetration ideas, the data have been again examined. It is concluded from small discrepancies in values of the screening const., that only the doublets of H and He really obey the law, and that those for other elements are not really relativistic doublets, although they very nearly obey the same law. H. G.

The resonance absorption of X-rays. M. V. POSEJAL. *Compt. rend.* 182, 272-4(1926).—It appears from previous investigations that the secondary radiation produced by the photoelec. effect of X-rays does not follow Einstein's law, the emitted amt. of electronic energy being larger and that of electromagnetic energy smaller than calcd. The agreement between theory and expt. may, however, be established by the assumption of a resonance absorption in the first series of the X-ray spectrum. The absorption of the K-series of W by a sheet of the same metal was observed by means of a Seemann spectrograph. While the absorption of the line β_1 is a normal one the absorption values of α_2 and α_1 , were higher than calcd. This phenomenon of an obviously selective absorption is attributed to a resonance absorption taking place in connection with the ionization or excitation of the atom and depending on the no. of electrons in the spheres L_2 and L_1 . ÉMIL KLARMAN

The excitation of soft X-rays. O. W. RICHARDSON AND F. C. CHALKLIN. *Proc. Roy. Soc. (London)* 110A, 247-82(1926).—Soft X-rays have been excited at 40-600 Å from C, Ni, Fe and W, and studied by a photoelec. method. The breaks on the curves between efficiency of X-ray emission and primary voltage correspond to the following voltages: C: 39.5, 81.2, 265.0, 292.8; W: 36.8, 40.3, 44.9, 70.8, 108.2, 127.7, 150.0, 191.0, 245.2, 263.7, 336.0, 395.0, 419.0; Ni: 38.6, 80.0, 88.9, 99.0, 140.3, 245.5, 282.0, 288.0, 316.4, 335.0, 392.4, 433.0, 532.0; Fe: 45.6, 50.6, 63.7, 75.6, 84.8, 95.0, 107.6, 115.1, 137.6, 189.7, 221.5, 240.6, 270.2, 288.3, 498.0. Most of these discontinuities are due to excitation of characteristic radiation, but some are probably due to discontinuities in the general X-radiation, arising from the space distribution of the electrons in atoms. The total X-radiation per electron impact is approx. proportional to the square root of the at. no. of the target element. R. J. HAVIGHURST

The relative intensities of reflection of X-rays from the principal atomic planes of fluorite. D. A. MACINNES AND THEODORE SHEDLOVSKY. *Phys. Rev.* 27, 130-7(1926); cf. C. A. 19, 1817.—The method of Bragg is modified by adding a reference crystal illuminated through the same slit on a line slightly above the other, and a second ionization chamber and Bumstead electroscopes. D. C. BARDWELL

K-series emission spectra for the elements from tantalum to bismuth. B. R. STEPHENSON AND J. M. CORK. *Phys. Rev.* 27, 138-43(1926).—Accurate measurements were made of the K-lines for all elements from Ta to Bi, excepting Hg, the elements being placed in sheets or layers on a thin Cu target. The $\sqrt{\nu/R}$ values plotted against at. no. give practically a straight line, where ν is the frequency and R is Rydberg's const. D. C. BARDWELL

The X-ray spectra of the lower elements. ROBERT THORAEUS. *Phil. Mag.* 41, 1, 312-21(1926).—By using a vacuum spectrograph and reflecting crystals of palmitic and lauric acids the spectra of some of the lighter elements have been extended into the K and L series. New wave-length values are given for F in the K-series and for Rb, Br, Se, As, Zn, Cu, Ni, Co, Fe, Mn and Cr in various members of the L-series. S. C. LIND

The excitation potentials of the band spectra of nitrogen. H. SPONER. *Z. Physik* **34**, 622-33(1925).—The energy diagram for neutral N_2 is derived from data in the literature together with new data on the critical potentials required to excite the positive and negative bands. The second positive bands appear at 13.0 v. and the excitation potentials of the first and fourth positive bands are calcd. to be 9.3 and 14.8 v., resp., from spectroscopic data. The excitation of the negative bands requires 19.6 v. and the ionization of the mol. is then calcd. to be 16.5 v. The origin of the active N and the afterglow is discussed. It is suggested that the active N is at N and that the afterglow is due to light emitted as the atoms recombine. The trace of O_2 necessary to secure the afterglow may act as a poison to the glass walls just as water does in the case of the monatomic H.

H. C. UREY

Intensity measurements of the iron spectrum. I. J. B. VAN MILAAN. *Z. Physik* **34**, 219-23(1925).—The intensities of the $f'_1 - d'_1$ multiplet of iron are measured. The summation rule of Burger and Dorgelo is obeyed for low current in the arc. The intensity formula of Honl, Kronig, Russell and Sommerfeld is not obeyed. H. C. U.

Additions to the series of the lead arc spectrum. H. GIESLER and W. GROTRIAN. *Z. Physik* **34**, 373-88(1925).—The arc spectrum of Pb has been studied in a heated vacuum discharge tube. This was tried with Tl first and some 15 new lines of the subordinate series are recorded. The known series of Pb consisting of transitions between the p_1, p_2, p_3 and P_2 levels and the ms, md_1, md_2 and md_3 levels are extended. New series consisting of transitions between the p_2 and P_2 levels and the mf_3 levels and between the P_0 level and the ms and md_1 levels have been found. A number of unclassified lines are also recorded.

H. C. UREY

Measurements of the intensity of the lines of the many-lined spectrum of hydrogen at different temperatures and pressures. F. GOOS. *Z. Physik* **31**, 229-39(1925); *Science Abstracts* **28A**, 453-4.—A photographic photometric arrangement is fully described, by means of which the relative intensities of the Fulcher triplets and some other lines in the red part of the many-lined spectrum of H are investigated for 3 different temps. and 4 different ds. of the gas, also for 12 different conditions. The results are given in both tabular and graphical form. It is found that, relative to a standard line, a part of the lines are sensitive to temp. as well as pressure, while of the others some are sensitive to d. only and the remainder to temp. only.

H. G.

The critical potential of the K band of neon. F. HOLWECK. *Compt. rend.* **182**, 53-4(1926).—Measurements of the exciting potential of the K-series of Ne gave a value of 862 v.

C. C. KIESS

The ultra-violet absorption spectra of aqueous solutions of sulfur dioxide and some of its derivatives. F. H. GETMAN. *J. Phys. Chem.* **30**, 266-76(1926).—The extinction coeffs. of aq. solns. of SO_2 and some of its derivs. were observed spectrophotometrically. The characteristic absorption band of SO_2 lies at 276μ . Curves illustrating the absorptions of $SO_2, Na_2SO_3, NaHSO_3$ and $K_2S_2O_8$ in H_2O are given. Solns. of $NaHSO_3$ are stable in light provided O or air is absent; but in the presence of these gases, photo-oxidation ensues, and the absorption band of the soln. changes to that of SO_2 . $K_2S_2O_8$ rapidly decomposes in soln., its characteristic absorption band at 263μ disappearing and that of SO_2 appearing. The frequency relationship of Baly connecting the ultra-violet bands with a fundamental infra-red frequency is applicable to the bands 263μ and 276μ .

C. C. KIESS

The line absorption spectra of the alkali metals. A. L. M. SOWERBY and S. BARRATT. *Proc. Roy. Soc. (London)* **110A**, 190-7(1926).—The lines $1s - md$ which, in the absence of an external field, are forbidden by the selection principle have been observed in absorption for the vapors of all the alkali metals. For Cs they are here observed for the first time either as absorption or emission lines and their wave lengths are found to be, $1s - 3d$: 6894.7 and 6848.5 A. U.; $1s - 4d$: 4425.8 and 4417.7 A. U. These values are only approx., but they indicate that the Cs term values are somewhat in error. Comparison of the absorption intensities of $1s - mp$ and $1s - md$ for K and Rb indicates that the probability for the absorption of $1s - mp$ is about 12,000 times that for $1s - md$. The line $1s - 3d$ of K was observed in emission in an intense flame, but could not be detected in a similar test with Na.

C. C. KIESS

The Doppler effect in canal rays of hydrogen, oxygen and nitrogen. H. KREFFT. *Sci. Assoc. Maharajah's Coll.* **2**, 21-40(1925).—See *C. A.* **18**, 3546; **19**, 931. C. C. K.

The interpretation of the spectra emitted by solid nitrogen and by solidified mixtures of nitrogen with inert gases. L. VEGARD. *Compt. rend.* **182**, 211-3(1926).—Several series of bands of simple structure are emitted by solid N when it is bombarded by canal rays or by rapid cathode rays. The series are the same whether the solid N

is pure or mixed with A. The series are all expressible by Deslandres' formula and are regarded as characteristic for Cr^{+} . C. C. KIESS

Displaced series in the spectrum of chromium. C. C. KIESS AND O. LAPORTE. *Science* 63, 234-6(1926).—Analysis of the arc and spark spectra of Cr has yielded sequences of ^1S , ^3S and ^3D terms which, according to Hund's theory (C. A. 20, 18) should converge, resp., to ^4S and ^4D of Cr^{+} . Of these terms, only ^4D was known; but from the series relationships ^4S should lie 12,730 cm^{-1} below it and should combine with ^4P to give a strong triplet of lines in the ultra-violet. A spectrogram of the region showed the triplet in its predicted place with wave lengths 2055.5 A. U., 2060.5 A. U. and 2065.4 A. U. A table describing the normal states of the neutral, ionized and doubly ionized atoms of the first and second long periods is given. C. C. KIESS

Spectrographic investigations of the Compton effect. M. DE BROGLIE AND A. DAUVILLIER. *J. phys. radium* 6, 369-75(1925).—Results confirming the Compton effect (C. A. 18, 2839) are given, following a description of the theory and the app. employed in the expts. C. C. KIESS

Infra-red absorption of the nitrogen-hydrogen bond. E. O. SALANT. *Proc. Nat. Acad. Sci.* 12, 74-80(1926).—Observations were made of the absorption of a series of symmetrical dialkyl- and trialkylamines. The dialkyl compds. have bands from 2.9 to 3.1 μ due to the N-H bond. Of the trialkyl compds. the aliphatic amines have bands from 3.45 to 3.52 μ due to the C-H bond, and the phenylamines and benzylamines show additional bands at 3.2 μ and 3.3 μ , resp. C. C. KIESS

The spectrum of neon in the extreme ultra-violet. T. LYMAN AND F. A. SAUNDERS. *Proc. Nat. Acad. Sci.* 12, 92-6(1926).—In the arc spectrum of Ne 16 lines were photographed with a vacuum grating spectrograph between the limiting wave lengths 743.7 A. U. and 586.4 A. U. in the extreme ultra-violet. All of these lines are assigned to their proper series and are found to be combinations between a low term $1p = 173,930$ and higher s and d terms found by Paschen (C. A. 15, 341). C. C. KIESS

The secondary spectrum of hydrogen at higher pressures. II. IAN SANDEMAN. *Proc. Roy. Soc. (London)* 110A, 326-41(1926); cf. C. A. 20, 15.—The arc spectrum of H_2 , excited at high pressures (C. A. 20, 15), has been studied further, with the result that additional band series have been found. Of these bands the most intense contains a series already given by Richardson and Tanaka (C. A. 19, 1988). The null lines of this band and three others, details for which are tabulated, are represented accurately by a Rydberg formula in which the current no. $n = 6, 7, 8, 9$. With this formula some lines of the Q and R branches of the band for which $n = 10$ have been found. C. C. KIESS

The absorption spectra of the vapors of aluminum, gallium, indium and thallium. J. G. FRAYNE AND ALPHEUS W. SMITH. *Phys. Rev.* 27, 23-30(1926).—The metals were vaporized in a graphite tube heated with an oxy-acetylene torch to temps. as high as 2000°. A W under-water-cooled spark provided a continuous emission spectrum. D. C. BARDWELL

The optical properties of chromatic emulsions. C. M. SOGANI. *Phil. Mag.* [7] 1, 321-33(1926).—The range of wave lengths transmitted by non-homogeneous emulsions is narrow and dependent upon the intensity of the incident light, the thickness of emulsion, the av. particle size, concn. of the disperse phase, and the difference in dispersion form of the two phases. The homogeneous emulsions contg. particles of uniform size are obtained by sedimentation. The light scattered by this does not give a continuous halo but is concd. in sharp diffraction rings. The surface sepg. the sedimented emulsion from the clear liquid above shows sparkling colors on both sides. A spectroscopic study showed this to be due to total reflection, the emulsion as a whole possessing a different dispersive power from that of the liquid. S. C. LIND

The production of some spectra of carbon, oxygen, and nitrogen in the presence of neon. W. H. B. CAMERON. *Phil. Mag.* [7] 1, 405-17(1926).—The effect of the presence of excess of the inert gas He, Ne or A in the various types of spectra of the gases contg. C, N or O produced by elec. discharge is demonstrated and discussed. The effects are strongest for He, weaker for Ne and weakest or absent for A. The various types of discharge dealt with are: comet-tail bands, associated bands, negative C bands, C arc lines, negative N bands, N arc lines, triplet system, ultra-violet O bands, negative O bands, O_1 and O_{II} . The possible causes of the various phenomena are discussed at length. S. C. LIND

The water-spark absorption spectrum of iron. N. K. SUR. *Phil. Mag.* [7] 1, 433-50(1926).—The paper describes exptl. work on the absorption spectrum of Fe, which is obtained when the high-frequency spark produced between two Fe electrodes immersed in distd. water is analyzed by a spectroscope. The exact exptl. conditions

are described in detail, and the results obtained are compared with the recent work of Laporte on the classification of Fe lines. All multiplets having the three highest groups of terms, viz. d^1 , f^1 and occasionally F^1 , as initial orbits, are obtained in absorption. Some weak lines are also obtained in absorption, which are shown to correspond to the transition of the azimuthal quantum no. from k to $k \pm 2$ (violation of Sommerfeld's selection-principle). This method of obtaining absorption spectra is as suitable as the more elaborate method of obtaining it in the furnace. Arguments are advanced in support of the view that Fe may have a term higher than the d -term, which is the highest so far obtained.

S. C. LIND

The absorption spectra of aluminum and cobalt. N. K. SUR AND K. MAJUMDAR. *Phil. Mag.* [7] 1, 451-62(1926).—The paper contains an account of exptl. work on the absorption spectra of Al and Co in the high-temp. furnace. The $2p_1 - 2s$, $2p_2 - 2s$ lines of Al do not come in absorption before a temp. of 1520° is reached. The higher members of ps - and pd -series are obtained in absorption at about 1700° . The absorption spectrum of Co has been photographed from 4500 A. U. to 3000 A. U. at a temp. of 2000° . The lines have been identified by measurement, and tabulated according to the series classification of Catalan and Bechert. It is shown that many lines belonging to f^1 and f^2 , and a few lines belonging to F^1 terms, which are the three successive largest terms, have been obtained in absorption. Only one line, 4190.709, belonging to the group which Catalan and Bechert have suggested for the resonance lines has come out in absorption.

S. C. LIND

Variations in the ozone content of the higher regions of the atmosphere. H. BUISSON AND C. JAUSSEAN. *Compt. rend.* 182, 232-4(1926).—Fabry and B. have shown (*J. phys.* [6] 2, 197(1921)) that the limitation of the solar spectrum in the ultra-violet region must be due to absorption by O_3 in this region of the spectrum, and that the quantity of O_3 present was equiv. to a thickness of 0.30 cm. of pure O_3 at normal pressure. The av. value of 0.30 cm. has been confirmed, and variations of 0.45 mm. were observed between extreme values measured once daily for over 2 months. These variations could not be related in any manner to variations in atm. conditions. A. P.-C.

The decomposition of potassium ferrocyanide in the light. G. ROSSI AND C. BOCCHI. *Gazz. chim. ital.* 55, 876-83(1925).—The earlier knowledge of this decompn. is reviewed. Baudisch and Bass (*C. A.* 16, 4137) found that N_2 solns. of $K_4Fe(CN)_6$ free from air in sealed tubes exposed to the light undergo a reversible color change. It is nearly indefinitely reversible and only after some months is some $Fe(OH)_2$ pptd. and this decompn. is interpreted by B. and B. R. and B. have studied this process in some detail. The decompn. of $K_4Fe(CN)_6$ in aq. soln. reaches an equil. that does not change in a short time. After 30 min. of exposure the max. amt. of KOH is formed in a N soln. The abs. amt. of KOH increases with the increase of the $K_4Fe(CN)_6$ concn. to a certain limit and then tends to decrease. The relative amt. of KOH present first diminishes, then increases and then diminishes again. The presence of KOH in a soln. of $K_4Fe(CN)_6$ favors the decompn. of the salt by means of light and this favorable action reaches a max. When the concn. is increased beyond this limit the favorable action tends to disappear. The reaction is at first perfectly reversible and then reaches a stage when it does not reverse completely in the dark and this tendency increases with the no. of exposures. The quantity of KOH formed increases with the no. of exposures. Fluorescent compds. do not catalyze this reaction. Heat cannot be used instead of light. If the temp. is high and if the duration of the exposure is many hrs. a decompn. of $K_4Fe(CN)_6$ takes place that is different from that due to light. The temp. in the light expts. did not exceed 45° . The latter results clearly indicate that the effect studied was not due to heat arising from the lamp used for illumination.

E. J. WITZEMANN

The variation of the electromotive force of a photoactive cell, containing a fluorescent electrolyte, when the amount of fluorescent material in solution is varied. WM. RILEY. *Phil. Mag.* [7] 1, 532-41(1926).—The photoactive cell consisted of a glass tube 2×20 cm. with a flat Pt spiral electrode at the lower end and a Pt wire at the upper. The electrolyte was in all cases 0.5 g. NaOH in 100 g. H_2O . No e. m. f. was set up by illuminating one electrode when no fluorescent substance was in soln. The concn. of fluorescein was then varied from 1.6 to 5000 mg. per l. The voltage was detd. with a Dolezalek electrometer, the readings of which were measured at successive time intervals. For all concns. the voltage increases rapidly with time. For the diluter soln. the max. voltage attained increases rapidly with concn. of fluorescein up to about 300-400 mg. per l. and then falls off slowly with further increase of concn. Similar results were obtained with eosin in glycerol and water between the limit of 3 to 30,000 mg eosin per l. That the e. m. f. should vary proportionally to the concn. for the lower

ranges is to be expected. The diminution of e. m. f. at the high concns. is discussed from the standpoint of Perrin's "protection" theory (*C. A.* **18**, 2648). S. C. LIND

The relation between metallurgy and atomic structure (FOOTN) 9. Chemical analysis of Capvern water (LORMAND) 14.

BROGLIE, MAURICE DE: **X-Rays**. New York: E. P. Dutton & Co.

LORING, F. H.: **Atomic Theories**. New York: E. P. Dutton & Co. \$5.00.

STOCK, ALFRED: **The Structure of Atoms**. Trans. by S. Sugden. New York: E. P. Dutton & Co. \$2.50.

4—ELECTROCHEMISTRY

COLIN G. FINK

The installation, operating characteristics and economy of Nathusius furnaces. E. BLAU. *Chem.-Ztg.* **50**, 6-7, 26-7 (1926).—B. describes the Nathusius furnace (cf. *C. A.* **6**, 1401, 2207) with the aid of several figures, also the layout of the transformer room and the regulating room, and the scheme for raising and lowering the electrodes. The electrode holders are "free-hanging," there being 3 top and 3 bottom electrodes. An installation consisting of 2 furnaces on a turntable and provided with a single set of electrodes and control equipment is also described. A. D. SPILLMAN

Economic operation of electric furnaces. R. S. KERNS. *Blast Furnace & Steel Plant* **14**, 133-5 (1926).—K. discusses economic operation of the elec. furnace in the acid steel melting practice. Curves showing the relative costs of steel produced in furnaces rated at 500, 1000, 2000, 3000 and 6000 lb. capacity when pouring from 1 to 8 heats per day for 25 days per month are reproduced. The figures used for plotting the curves were based on the averages of 5 standard sizes of well-known furnaces, 3 phase, automatically controlled, made in the U. S. A simple method of arriving at the cost of labor, power, and material per ton when pouring 1 or 8 heats per day is explained. A. D. S.

Electric power for chemical plants. J. L. McK. YARDLEY. *Elec. J.* **23**, 113-24 (1926).—Chem. plants require large quantities of cheap power, or large quantities of steam. Com. processes are classified as to one or the other. Operations in each class are analyzed and individual applications of elec. power are indicated. D. c. and a. c. generation are compared. Points discussed include: the efficiency of a turbogenerator unit, the effect of plant load conditions upon efficiency, the most efficient a. c. generating equipment, large electrochem. plant developments in 1925, methods of detg. efficiency of power-conversion equipment, a classification of efficiency losses, and Hg-arc rectifiers for electrolytic service. W. H. BOYNTON

Present status of the electrochemical and electrometallurgical industries. ROBERT FLUSIN. *Industrie chimique* **12**, 345-8, 393-7, 489-92, 537-40 (1925).—Review of progress during the last few years. A. PAPINEAU-COUTURE

The problem of organizing the aluminum industry in Russia. A. P. KOORDUMOV. *Trans. Inst. Econ. Mineralogy and Petrography* (Moscow) **1923**, No. 6, 1-80.—K. discusses the world's Al production, the Russian requirements and resources, the technical methods and reactions involved starting with (1) bauxite, and (2) clay. J. S. JOFFE

The German aluminum industry during 1925. R. SEVIN. *J. four elec.* **35**, 49-50 (1926). C. G. F.

Bauxite on the Gold Coast. L. T. EMORY. *Eng. Mining J.-Press* **121**, 443-6 (1926). E. H.

Economics of chlorine. D. A. PRITCHARD. *Trans. Am. Electrochem. Soc.* **49**, (preprint) (1926).—A brief chronological sketch of the economics of the Cl industry with its by-products. C. J. BROCKMAN

Chlorine in Japan. SHUICHIRO OCHI. *Trans. Am. Electrochem. Soc.* **49** (preprint) (1926).—The industry is reviewed from the date of its inception to the present. About 40,000 tons of bleaching powder and 25,000 tons of caustic soda per year are manufactured in Japan today. The bleaching powder is all of electrolytic Cl origin; 80% of the caustic soda produced today is electrolytic. C. G. F.

The electrolytic separation of carbon-bearing iron from its complex compounds with carboxylic acids. HEINZ SCHMIDT. *Z. Elektrochem.* **32**, 33-41 (1926).—The separation of C together with Fe from citrate, tartrate, succinate, oxalate, formate, acetate and carbonate solns. is shown to be a simultaneous process and its dependence upon the

cathode potential or the cathodic total current d. and upon the current efficiency for the deposition of the Fe is established. The latter fact is explained by a soln. and pptn. theory which also explains the carbonization of the Fe cathode in the Fe-free solns. The C in the Fe is formed principally from easily decomposable C-contg. gases. No reduction or pptn. of unknown ions (as ionized C) could be detected either by decompn. potential studies or by chem. analyses of the cathode soln. after an electrolysis of long duration.

J. H. PERRY

A simple method for measuring polarization and resistivity. H. E. HARING. *Trans. Am. Electrochem. Soc.* **49** (preprint) (1926).—A simple method for measuring polarization uses the static potential of the metal in the given soln. as the basis of reference. A glass tube with a capillary extension is filled with the same soln. as that undergoing electrolysis. A rod of the metal dips into this tube. The e. m. f. of the cell consisting of the unpolarized metal rod and the electrode under study is equal to the polarization of the latter. The errors due to contact potentials are avoided and the accuracies of the instrument approach that of the elaborate conventional methods. The new method is reliable in Cu-, Ni- and Ag-plating and appears generally applicable in electro-deposition. In these baths the polarization at both anode and cathode for several c. ds. was measured with (a) a calomel half-cell and potentiometer, (b) with the gauzes and potentiometer; and (c) with the gauzes and a voltmeter. Polarization results by (b) and (c) were practically coincident and in fairly close agreement with the half-cell. The possible application of the app. and principle here set forth in pedagogy, research and industrial control is indicated. A new method for the graphic analysis of the voltage used in electrolysis is described.

W. H. BOYNTON

The electrolytic preparation and some properties of metallic yttrium. A. P. THOMPSON, W. B. HOLTON AND H. C. KREMERS. *Trans. Am. Electrochem. Soc.* **49**, (preprint) (1926).—Metallic Yt was produced (after reduction with Na and with C, and the electrolysis of Yt_2O_3 in cryolite had failed) by electrolysis of fused $YtCl_3$ with small quantities of NaCl. Considerable quantities of cryst. Yt powder and 4 g. of coherent metal were obtained. Phys. and chem. properties of the metal are given. The metal is not pyrophoric and its alloys with Fe are brittle and resistant to acids.

W. H. BOYNTON

Charging storage batteries from direct current mains. L. S. LOOMIE. *Elec. World* **87**, 611(1926).—With low-voltage batteries, the simplest method to avoid trouble during the charging period of storage batteries is to disconnect the battery. But the detn. of the grounded side of a circuit is simple by means of either a voltmeter or a test lamp, and the precaution of connecting the proper terminal of a storage battery to the ground will avoid the burning out of the low voltage app., also shocks to operators. The location of charging resistances with respect to supply wires is illus.

W. H. B.

Cadmium in the electrical industry. N. F. BUDGEN. *Electrician* **94**, 271, 276 (1925); *Science Abstracts* **28B**, 336.—Several interesting applications of Cd in the elec. industry are outlined, the importance of which will increase as the cost of Cd is reduced. Edison's Cd/Cu oxide cell fell into disfavor when the Fe/Ni oxide cell was invented. Forseke and Aschenbach have recently described a new process for making spongy Cd plates to be used against Ni electrodes in a soln. of NaOH or KOH. The cost of such cells is about 3 times that of Pb cells of equal amp. hr. capacity. Cd is used together with finely divided Fe in the negative plates of accumulators for miner's lamps, etc., the Cd forms from 50 to 75% of the filling of the negative plates. Reference is made to the use of Hg-Cd alloys in standard cells and to the use of Cd rods in testing separately the conditions of the positive and negative plates in accumulators. Cd oxide finely ground with water, made into a paste, with or without addn. of Zr silicate, and then baked at 800°, can be used in the form of rods, tubes, etc., as a resistor material for elec. furnaces. Other applications are mentioned, and it is pointed out that probably one of the most important elec. uses for Cd will be in the manuf. of conductors for telegraph, telephone and power transmission lines.

H. G.

The photoelectric cell as a smoke detector. S. H. REYNOLDS. *Elec. J.* **23**, 135-6 (1926).

C. G. F.

Frequency variations in thermionic generators. K. F. EDGEWORTH. *Electrician* **96**, 263(1926).—A discussion of various systems of eliminating frequency variations.

C. G. F.

Electrostatic synchronizer on high-tension lines (neon tube). F. A. THEES. *J. Electricity* **56**, 225(1926).—The synchroscope consists of 3 small Ne-filled glass tubes mounted at 3 points of a triangle. The synchroscope was set up between two 60 kilovolt 3-phase buses, one end of tube No. 1 being connected to phase c of bus 1 and the other end to phase c' of bus 2; similarly tube No. 2 was connected to phase b of bus 1

and b' of bus 2; and tube No. 3 to c and a' . Tube 2 across the 2 b phases will be dark at synchronism and tubes 2 and 3 bright. When the 2 lines are out of synchronism there will be apparant rotation of the glowers.

Small high-voltage transformers. G. W. LENTZ. *Gen. Elec. Rev.* **29**, 257 (1926).
C. G. F.
C. G. F.

Snead electric heat-treating and annealing process (WAITE) 9. Distribution of energy (STARKE) **13.** Proper methods of installing electric pyrometers (MOELLER) **1.** The use of Cl in the refining of sugar (OCHI) **28.** Electrical gas purification for the pulp industry (ZOPF) **23.** Protecting gas-absorbing substances from penetration by liquid (U. S. pats. 1,574,844-5) **13.**

ESCARD, JEAN: **Les fours électriques industriels et les fabrication électrothermiques.** 2nd ed. enlarged. Paris: Dunod. 674 pp. Fr. 80. Reviewed in *J. Inst. Met.* **33**, 612 (1925).

FLEMING, J. A.: **Mercury-Arc Rectifiers and Mercury-Vapor Lamps.** London and N. Y.: Isaac Pitman & Sons. 100 pp. \$1.75. Reviewed in *Mech. Eng.* **48**, 295 (1926).

Primary electric battery. M. L. MARTUS, E. H. BECKER and J. G. ROSS. U. S. 1,574,300, Feb. 23. Structural features.

Electric battery container. W. H. DUGGAN. U. S. 1,573,922, Feb. 23. Structural features.

Storage battery. F. E. SUTTON. U. S. 1,575,393, March 2. Structural features.

Storage battery. C. A. THATCHER. U. S. 1,573,462, Feb. 16.

Lead storage batteries. K. KAWAKAMI. U. S. 1,575,167, March 2. Porous plates for battery elements are formed of Pb 97.8, Hg 1.8 and Sb 0.4 parts, alloyed together.

Storage battery separator. R. C. BENNER. U. S. 1,573,369, Feb. 16. Separators are formed of sheets made of sulfite wood fiber and impregnated with gelatinous silicic acid.

Electrodeposition of chromium. E. LIEBREICH. Brit. 237,288, July 21, 1924. An electrolyte for Cr deposition is prepd. by preliminary electrolytic reduction of a solution of chromic acid in H_2O in which the proportion of free H_2SO_4 to Cr oxide is not greater than 1.2%.

Metal sheets formed by electrodeposition. A. Z. PEDERSEN. U. S. 1,574,055, Feb. 23. Separable sheets of an anodically corrosive metal such as Ni or Co are formed by reversing the direction of current flow between successive depositions.

Zirconium carbide. M. L. HARTMANN. U. S. 1,576,275, March 9. Zr silicide ore is fused with ground coke under reducing conditions in an elec. furnace.

Recovery of copper, tin and lead from brass, bronze or other alloys. T. LEWIN. U. S. 1,574,043, Feb. 23. Fe and nonmetallic impurities are removed from an alloy, e. g., by melting and sepn., the remaining metal is cast into anodes and these are electrolyzed to sepn. and deposit Cu. Sn and Pb present are recovered from the electrolytic slime.

Apparatus for electric precipitation of suspended particles from gases. SIEMENS SCHUCKERTWERKE GES. Brit. 237,262, July 16, 1924.

Apparatus for electric precipitation of suspended particles from gases. E. HOPKINSON. U. S. 1,575,165, March 2.

Apparatus for electrical precipitation of suspended particles from gases. H. EDLER. U. S. 1,574,237, Feb. 23.

Electrolytic cell adapted for evolution of gases. E. HEINZE. U. S. 1,575,627, March 9.

Electrolytic cell adapted for making roofing sheets with a copper coating. J. H. GILLIS. U. S. 1,574,385, Feb. 23.

Electrolytic cell operation in production of roofing sheets coated with copper or other metal. T. ROBINSON. U. S. 1,574,446, Feb. 23.

Collector for separating finely divided charged particles suspended in gases. W. H. DICKERSON and W. B. McLAUGHLIN. U. S. 1,573,376, Feb. 16. The app. is adapted for sepg. solids in spray-drying.

Chromium-coated wires as electric apparatus leading-in connections. D. S. GUSTIN. U. S. 1,576,436, March 9.

Electric apparatus for automatically controlling acidity of solutions. F. H. OLDEN. U. S. 1,576,001, March 9.

Electric resistance furnace. F. J. PETERSON. U. S. 1,574,108, Feb. 23. A U-shaped groove in the resistor is adapted to hold a piece of stock to be heated.

Electric resistance furnace. E. L. SMALLEY. U. S. reissue 16,269, Feb. 16. Original pat. No. 1,459,801; C. A. 17, 2838.

Oxide terminal for resistors of electric furnaces. A. D. KEENE. U. S. 1,575,117, March 2.

Electric condenser. W. P. DAVEY. U. S. 1,576,096, March 9. Layers of conducting material are spaced apart with paper or similar material impregnated with linseed oil or like substance contg. a compd. of unsatd. fatty acids.

Protective coating for magnesium. L. J. KEELER. U. S. 1,574,289, Feb. 23. Mg or its alloys are brought into contact with nascent F which may be generated from a fluoride electrolytically in order to prevent tarnishing. U. S. 1,574,290 specifies electrolyzing Mg or its alloys as anode in a soln. of $\text{Na}_2\text{Cr}_2\text{O}_7$ or other alkali metal chromate.

Cooling electrodes of ozonizers. R. GRAEF. U. S. 1,575,049, March 2. Cooling air is passed in 2 independently regulable streams along internal and external electrodes.

5—PHOTOGRAPHY

C. E. K. MEES

Photochemical studies. VI. Mechanical effects on the photographic plate. A. REYCHLER. *Bull. soc. chim. Belg.* 34, 293-5(1925); cf. C. A. 20, 545.—Various different phenomena may be observed by writing on a photographic emulsion with a blunt metal stylus, depending on whether the plate be developed without exposure to light, exposed to diffuse light before or after the moment of writing thereon, etc. These phenomena are discussed and explained.

Professor Kögel's integral photography. A. STEIGMANN. *Camera (Luzern)* 4, 130-3(1925).—Integral photography is based upon the fact that certain substances behave like quinone diazides, which are decompd. by light to hydroquinol or *p*-aminophenol, which in turn, couple with undecomposed quinone diazide to give azo dyes in the presence of alkalis or NH_3 vapor. In its present form, integral photography cannot hope to approach the speed of Ag halide emulsions, since in integral photography there must be sufficient light action to produce the image-forming material of itself, whereas, in photography with Ag halide emulsions, the initial action of the light is amplified by the developing agent, and made to spread from mol. to mol. of the Ag halide. Kögel and Steigmann [*Phot. Ind.* 23, 1141(1925)] have been able to develop latent quinone diazide and dye images and to show the high sensitiveness of these substances.

M. W. SEYMOUR

Reduction of negatives. R. NAMIAS. *Photo-Revue* 5, 39-40(1926); cf. C. A. 19, 2787.—The recommended process consists in bleaching the upper layers of the image to AgBr, removing the lower layers of Ag with a soln. of KMnO_4 and AcOH, and then redeveloping the AgBr image in an ordinary developer. The image is first bleached in $\text{K}_3\text{Fe}(\text{CN})_6$, 20 g.; KBr, 20 g.; H_2O , 1 liter. After washing for 15 min., the residual Ag is removed in KMnO_4 , 5 g.; AcOH 25 cc.; H_2O , 1 l. The image is then treated with a 5% soln. of NaHSO_4 , rinsed and redeveloped in the light. J. I. C.

Effect of washing on desensitized plates. LABORATOIRES DE RECHERCHES PATHÉ CINÉMA. VI* *Congrès internat. photogr.* (Paris) 1925; *Chimie et industrie* 15, 95-6 (1926).—Strips of a given cinematographic film, to which was arbitrarily assigned a sensitiveness of 1000, were desensitized with 0.01% solns. of pinacryptol green, phenosafranine, and a mixt. of sky-blue rhoduline (0.005%) and of acridine yellow (0.015%). The desensitized strips were washed in the dark for periods of 1 min. to 2 hrs., and after drying the sensitiveness was detd. by means of an Eder-Hecht sensitometric screen. With phenosafranine and with the rhoduline-acridine mixt. desensitization was rapidly reduced by washing, and would doubtless be completely eliminated if washing could be prolonged sufficiently without injuring the emulsion. With pinacryptol green desensitization was slightly reduced at the start, and then remained const., showing that this dye is fixed much more strongly than the other dyes and permanently desensitizes the emulsion.

A. PAPINEAU-COUTURE

Emulsions and baryta coating. T. BENTZEN. *Phot. Ind.* 23, 783-5, 4296-8, 1386-7; *Brit. J. Phot.* 73, 59-62(1926).—The conditions are defined which a baryta coating must fulfil for coating photographic papers. Formulas are given and the purpose and effect of each constituent of the baryta coating is discussed. The exptl.

procedure is stated and several emulsion formulas for printing-out papers are recommended. Proof papers are given two coatings of baryta and papers for sep. toning and fixing are usually given 3 or 4 coatings. G. E. MATTHEWS

Light-sensitive photographic materials. S. E. SHEPPARD. U. S. 1,574,943, March 2. A biochem. sensitizing material which increases the general light-sensitiveness of gelatino-Ag-halide emulsions when incorporated with them is prepd. by treating mustard seed, wheat, wheat bran, corn, etc. with alc. or ligroin. U. S. 1,574,944 specifies photographic emulsions comprizing a colloid, particles of photographic Ag salt suspended in the colloid and a sensitizing added compd. such as thiosinamine.

Light-sensitive varnish mixture for photographic use. M. C. BEEBE. U. S. 1,574,356, Feb. 23. A compn. adapted for reproducing designs on metal, glass, etc., comprizes a varnish contg. a light-sensitive oil such as tung oil and an accelerator, e. g., I, which serves to accelerate the selective action of light upon the varnish for photographic purposes. U. S. 1,574,357 (M. C. BEEBE and A. MURRAY) specifies a compn. including a hydrophobic gel-like material such as gelled tung oil sensitive to the action of light, and a catalytic accelerator such as CHI_3 and AlCl_3 . U. S. 1,574,358 (M. C. BEEBE) specifies a process of photographic copying in which compns. of this kind are used. U. S. 1,574,359 (M. C. BEEBE and A. MURRAY) specifies a hydrophobic colloid such as a tung oil compn. and a sensitizer comprizing Pb triethyl iodide.

Color-sensitive photographic emulsions. E. J. WALL and D. F. COMSTOCK. U. S. 1,573,596, Feb. 16. Photographic emulsions are treated with a color-sensitizing dye and an oxidizing agent such as H_2O_2 .

Photographic prints on metal. C. W. CARMAN. U. S. 1,573,478, Feb. 16. A continuous-tone photographic print is applied on the surface of Ag or other metal after the latter has been provided with a series of parallel scratches which serve to reflect light and give added contrast.

Collotype printing plate. W. J. DOBINSON. U. S. 1,574,378, Feb. 23. A base such as glass or metal carries an inner coating of sensitized gelatin insol. in H_2O when unhardened, and an outer adhering coating. The 2 coatings are conditioned by the action of light through a negative and developed by cold H_2O to remove the soft portions of the outer coating and swell (but not remove) the soft portions of the inner coating.

Photographic sensitizer. M. C. BEEBE and A. MURRAY. U. S. 1,575,143, March 2. A sensitizer is formed of a hydrophobic protective colloid such as asphalt in naphtha soln., and a halogen-liberating compd., e. g., Pb triethyl iodide and CHI_3 .

Glass pictures with colored background. W. KIESLING. U. S. 1,574,156, Feb. 23. A transparent plate is coated with a thin layer of chromate glue sol. in the cold and the coated side of the plate is exposed under a reticle negative, the unaltered glue removed from the portions of the plate protected from the light during the exposure and the exposed portions are colored with a dye soln. The entire coated side of the plate is then painted with another color to form a background.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Synopsis of literature concerning the chemical combination of silicon. I. F. PONOMAREV. *Trans. Inst. Exp. Silicates* (Russian) 9, 1-91 (1924).—A comprehensive critical review of the literature pertaining to Si and its compds. for the years 1912 and 1913. J. S. JOFFE

Air oxidation of titanous sulfate solution. Vanadous sulfate, a new and powerful reducing agent. A. S. RUSSELL. *J. Chem. Soc.* 1926, 497-8.—A soln. of titanous sulfate in 4 N H_2SO_4 is not appreciably oxidized during 12 hours' exposure to air. For ordinary purposes, the simplest procedure is to have a soln. of titanous sulfate in 4 N H_2SO_4 and when titanous sulfate is needed, to reduce the vol. required with Zn amalgam. Vanadous sulfate, prepd. in the same way, is a stronger reducing agent, lying between Cd and Sn in its reducing power in 2 N H_2SO_4 . A 0.1 N soln. in 10 N H_2SO_4 is not measurably oxidized by air when kept an hour in a buret. R. J. HAVIGHURST

The oxidation of fixed nitrogen to nitrate at low temperatures and the reduction of nitrate to cyanide. K. A. HOFFMANN, WALTER LINNMANN, HELENE GALOTTI, HERMANN HAGENEST AND ULRICH HOFFMANN. *Ber.* 59, 204-12 (1926).—While the formation of NO at high temps. has been studied exhaustively and applied in industry, little information was available on the formation of nitrites and nitrates at lower temp. and

with the exception of the old expt. of Tuttle (cf. *Ann.* 101, 283(1857)) no chem. reactions are known which could be compared with the formation of nitrate in the soil. The authors found, however, that different compds. contg. N (NH_3 , nitrides, cyanamide, cyanates, cyanides) react with oxidizing agents (KClO_3 , Na_2O_2) in the absence of water, often giving nearly quant. yields of nitrate. The idea is advanced that the oxidation of NH_3 is not a gradual one; the strong affinity of O for N results in the displacement of atoms originally attached to the N atom, e. g., in the formation of KNO_3 from NH_3 and KClO_3 . Since N_2O is an internally satd. compd., its formula being $\text{N}\equiv\text{N}=\text{O}$, no formation of nitrate occurs when it is led over KClO_3 at 360° . (H and CO likewise do not react with hot KClO_3 .) KCNO reacts violently with KClO_3 with formation of KNO_3 , 37.4% N of KCNO having undergone this reaction. Considerable amts. of nitrate are formed on heating urea and Mg nitride with Na_2O_2 or CaCN_2 with BaO_2 . KCNO , NH_3 and CaCN_2 are oxidized by air temps. below 400° in the presence of catalyzers such as Cu or Ni powder, basic Cu carbonate, Ni carbonate, Ag powder or Au (on porous clay), resp. The presence of a small quantity of water vapor in the air promotes the velocity of the reaction. The reduction of nitrate to cyanide is not to be regarded as the inversion of the process of nitrification as explained before, in view of the high temps. required for this process and the great loss of fixed N. The oxidation of NH_3 is carried out on alk. contact masses at low temps. in the presence of suitable catalyzers such as Cu or Ni carbonate, or Ni and Ag powder, resp. The velocity of the reaction increases considerably when the temp. is raised to $380\text{--}400^\circ$. The yield with Ni carbonate is 97%. The presence of impurities (hydrocarbons, sulfides, cyanides, PH_3) does not interfere. Crude CaCN_2 (contg. C and CaO) is oxidized at temps. below 200° when mixed with soda-lime and CuO and exposed to air in a thin layer. At 400° 50% of the N is converted within 3 hrs. Better yields are obtained with Ni carbonate. The amts. of the catalyzers used are rather large, varying from 20 to 50% of the N compd. In all cases nitrite may be found at the beginning of the reaction, proving an intermediate transformation of the tervalent N of NH_3 into the tervalent oxidized N of the nitrite. The subsequent oxidation to the nitrate takes place with considerable velocity.

EMIL KLARMANN

The reaction between sodium sulfit and sulfur. H. J. WATSON AND M. RAJAGOPALAN. *J. Indian Inst. Sci.* 8A, 275-86(1925).—The factors governing the formation of $\text{Na}_2\text{S}_2\text{O}_3$ from S and Na_2SO_3 in aq. soln. were studied. The reaction took place readily above 60° and was appreciably accelerated by rapid stirring. Addn. of an excess of S produced an acceleration approx. proportional to the amt. of S, the reaction being complete in 1 hr. at 80° with 4 mols. S, $22\text{H}_2\text{O}$ and $1\text{Na}_2\text{SO}_3$. Dilm. of the soln. produced a slight increase in the percentage conversion. Addn. of Na_2S in amts. corresponding to 1-4% of the wt. of Na_2SO_3 accelerated the reaction. The velocity of the reaction appeared to depend almost entirely on the rate of soln. of the S and not on the concn. of the Na_2SO_3 . Preliminary treatment of the S with Na_2SO_3 soln. reduced its rate of soln. Flowers of S and roll S were much more efficient than ordinary S. Thionates other than $\text{Na}_2\text{S}_2\text{O}_3$ were not detected in the reaction mixts. The mechanism of the reaction is being investigated further.

K. D. JACOB

The interaction between copper and sulfuric acid. C. W. ROGERS. *J. Chem. Soc.* 1926, 254-69.—Expts. performed at temps. of $16\text{--}270^\circ$ show that there is only one primary reaction, as follows: $5\text{Cu} + 4\text{H}_2\text{SO}_4 = \text{Cu}_2\text{S} + 3\text{CuSO}_4 + 4\text{H}_2\text{O}$. This is followed rapidly (in a few seconds at 270°) by the secondary reactions: $\text{Cu}_2\text{S} + 2\text{H}_2\text{SO}_4 = \text{CuS} + \text{CuSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$; $\text{CuS} + 2\text{H}_2\text{SO}_4 = \text{CuSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2 + \text{S}$; $\text{S} + 2\text{H}_2\text{SO}_4 = 2\text{H}_2\text{O} + 3\text{SO}_2$. The completed reaction at any temp. is represented by the equation: $\text{Cu} + 2\text{H}_2\text{SO}_4 = \text{SO}_2 + \text{CuSO}_4 + 2\text{H}_2\text{O}$. A white cryst. deposit is anhydrous CuSO_4 , which is at least dimorphous.

R. J. HAVIGHURST

The reciprocal salt pair (Na , Ba)-(Cl, NO_3) in aqueous solution at 20° . ALEXANDER FINDLAY AND JAMES CRUCKSHANK. *J. Chem. Soc.* 1926, 316-8.—The compn. of aq. solns. in equil. with one, two and three salts of this reciprocal salt pair has been detd. with a view to ascertaining the best conditions for the prepn. of $\text{Ba}(\text{NO}_3)_2$ by interaction of BaCl_2 and NaNO_3 . It is found advantageous to use a relatively large proportion of NaNO_3 (about 60% in the initial mixt.) so as to secure as complete a utilization as possible of BaCl_2 .

R. J. HAVIGHURST

Hydrides of the metals nickel, cobalt, iron and chromium. THEODOR WEICHSSELWELDER (WITH BRUNO THIEDE). *Ann.* 447, 64-77(1926).— NiH_2 , CoH_2 , FeH_2 , FeH_3 , and CrH_3 were prepd. by shaking dry H with an ethereal soln. of PhMgBr in which the dry chloride of the metal is suspended. The ethereal soln. becomes colored and a black ppt. seps. out which loses H on being dried. Analysis shows the ppt. to be a hydride. The reaction proceeds as follows: $\text{MCl}_2 + 2\text{PhMgBr} = \text{MPH}_2 + \text{MgBr}_2 +$

$MgCl_2$; $MPh_3 + 2H_2 = 2C_6H_6 + MH_3$. M is the metal under investigation. $FeCl_3$, which is sol. in ether, reacts very rapidly with $PhMgBr$ and also takes up H more rapidly than the other substances. $CrCl_3$, although sol. in ether, takes up H very slowly. W has been observed to form a hydride in a similar manner. R. J. H.

Pseudohalides of quadrivalent lead. H. P. KAUFMANN AND F. KÖGLER. *Ber.* 59, 178-86(1926).—The application of $Pb(AcO)_4$ in the prepn. of free $(SCN)_2$ from HSCN (cf. C. A. 20, 50) suggested its use in an attempt to prep. free $(SeCN)_2$. When a soln. of $Pb(OAc)_4$ in chloroform was added to a cooled soln. of $KSeCN$ in dry acetone, $Pb(SeCN)_2$ pptd. and the soln. contained free $(SeCN)_2$, or possibly the compd. $K(SeCN)_2$. On addn. of antipyrine and evapn. of the solvent the *di-antipyrinyl selenide* (*bis-(1-phenyl-2,3-dimethyl-5-pyrazolonyl-4)selenide*) was isolated, colorless crystals from benzene, m. 236° . $(SeCN)_2$ is decomposed by water with the formation of H_2SeO_4 , HCN and $HSeCN$; H_2SO_4 , HCN and HSCN are produced from $(SCN)_2$ and H_2O . When the soln. is not kept neutral or alk., $HSeCN$ decomposes with formation of Se. It is assumed that the decompn. of $(SeCN)_2$ takes place in 2 stages, the intermediate products being $HOSeCN$ and HO_2SeCN . The reaction between I and $HSeCN$ may be used for the detn. of the latter. When a soln. of $(SeCN)_2$ in CS_2 is heated under reflux a rearrangement takes place with formation of $Se_3(CN)_2$ and $Se(CN)_2$, which were first obtained by Verneuil (cf. *Ann. chim. phys.* [6] 9, 353(1883)) and correspond with the analogous S compds. The same compds. are formed when Se_2Br_2 reacts with $AgCN$ in the presence of Et_2O . An attempt was also made to prep. free oxycyanogen, the radical of cyanic acid, by the action of $Pb(OAc)_4$ on $HCNO$ in $CHCl_3$ soln. No production of CNO was observed and the resulting sirupy product is regarded as $Ph(OCN)_4$. EMIL KLARMANN

The system ferrous oxide-phosphoric acid-water and some of its oxidation products. S. R. CARTER AND N. H. HARTSHORNE. *J. Chem. Soc.* 1926, 363-74.—In an atm. of CO_2 , at 70° , the system $FeO-P_2O_5-H_2O$ was studied between the concns. 7.38 and 57.51%, P_2O_5 . Within this range the stable solid phases are the acid salts $FeO \cdot P_2O_5 \cdot 4H_2O$, $2FeO \cdot P_2O_5 \cdot 3H_2O$, and a new compd. $2FeO \cdot P_2O_5 \cdot 5H_2O$. By the oxidation of phases poor in acid, two neutral ferric phosphates, both having the compn. $Fe_2O_3 \cdot P_2O_5 \cdot 4H_2O$, are deposited. The brown β -form exists in contact with liquid phases having high to medium concns. of ferrous iron; at lower concns., the pink α -form becomes stable.

R. J. HAVIGHURST

The two varieties of mercuric oxide and the direct formation of oxychlorides and oxybromides. H. PÉLABON. *Bull. soc. chim.* 39, 201-2(1926).—See C. A. 19, 1105, 2308. E. H.

Synthetic potassium and sodium chromosilicates. (MLLE.) H. KARFIOL. *Roch. ki Chem.* 5, 182-92(1925).—Synthetic chromosilicates of Na and K are prepared by the fusion of mixts. in various proportions of Cr_2O_3 , Na or K chloride and carbonate and silica. The fused mass, after being heated for 10 hrs., is extd. with water. In the case of mixts. with K, the residue thus obtained had so low a K content that most of them appeared to be compds. of Cr_2O_3 and silica in various proportions, the K present being probably an impurity. The only product of this type which appeared definitely to be a chromosilicate had a compn. corresponding with the formula $K_2Cr_2Si_3O_{13}$. The cryst. nature of these substances could not be detd., because of the extremely small size of the particles. The Na chromosilicates obtained are of very complicated compn. and seem to be additive compds. of Na silicate and oxide to chromosilicates of the same type as the known series of aluminosilicates, $R_2Al_2Si_nO_{3n+4}$. All the Na chromosilicates prepd. are isomorphous, in spite of considerable differences in compn., the proportions of Cr_2O_3 to Na metasilicate being as 1:2, 3, 4, 5, 6, 7 and 8. B. C. A.

Monohydrate of borax. M. RAKUZIN AND A. NESMEIANOV. *Mitt. wiss.-tech. Arb. Rep.* (Russia) 13, 52-4(1924).—The monohydrate of Na tetraborate (borax) may be obtained pure by heating the decahydrate at 180° to const. weight. B. C. A.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Some ideas on the future of analytical chemistry. A. LASSIEUR. *Rev. sci.* 63, 613-6(1925).—A plea for more theory and less cook-book procedure in teaching analytical chemistry. A. PAPINEAU-COUTURE

Sources of error in electrolytic analyses. BOEHM. *Chem.-Ztg.* 50, 109(1926).—The possibility of the deposition of Pt on the cathode after it has been dissolved from the anode is pointed out and the danger of deposition of Mn with Ni is suggested.

These errors are particularly noticeable in working in laboratories which are heavy with fumes and in which the current is variable. W. T. H.

Use of hydrazine sulfate in iodometry. E. CATTELAINE. *J. pharm. chim.* [8] 2, 387-91(1925).— $N_2H_4 \cdot H_2SO_4$ may be used as a standard substance in the titration of I solns., on account of the ease of its purification, its stability in solid form or in aq. soln. and its quant. oxidation by I as follows: $N_2H_4 + 2I_2 = 4HI + N_2$. S. W.

The use of certain organometallic complexes in gravimetric analysis. E. CATTELAINE. *J. pharm. chim.* [8] 2, 485-91, 525-35(1925).—A summary of the use of dimethylglyoxime, diphenylglyoxime, dicyanodiamidine, 1-nitroso-2-naphthol, cupferron and K ethylxanthate for the sepn. and detn. of Ni and Co, Ti and Al, etc., with detailed account of the analytical characters of each ppt. Some recently proposed org. reagents for the quant. sepn. of Ni, Co, Al, etc. (*C. A.* 16, 2460, 3826-7; 17, 2251, 2417; 19, 1548, 1833) are as yet untried. S. WALDBOTT

Analysis of tungsten steels. F. FETTWIS. *Stahl u. Eisen* 45, 1109-10(1925).—Addn. of phosphoric or tartaric acids to the H_2SO_4 - HNO_3 mixt. used in dissolving W steel serves to retain the W in soln. After adding H_3PO_4 the soln. is ready for the detn. of Cr by the persulfate process without filtration, but both phosphoric and tartaric acids interfere in the Mn detn. by the persulfate-arsenite method. For the cyanometric detn. of Ni in W steel, tartaric acid is used to keep the tungstic acid in soln., and $Na_2P_2O_7$ is added to render the soln. sufficiently pale-colored when made ammoniacal before titration. The Ni dimethylglyoxime ppt. from such a soln. invariably retains WO_3 , so that the Ni results are 0.05-0.1% too high. B. C. A.

Commercial practice in sampling and assaying copper. A. M. SMOOT. *Eng. Mining J.-Press* 120, 605-11(1925).—This paper is of interest to the mining engineer who has not time to read the extensive literature on the subject and shows in particular how some of the losses of metal shown on the balance sheet may be more or less fictitious. W. T. H.

Method for the determination of vanadium in ferro-vanadium. KINICHI SOMEYA. *Sci. Repts. Tôhoku Imp. Univ.* 14, 577-91(1925); cf. *C. A.* 19, 796.—The H_2SO_4 soln. contg. V is oxidized by $K_2Cr_2O_7$ and then titrated with $FeSO_4$ with diphenylamine as indicator. W. T. H.

The estimation of tin in non-ferrous alloys. H. NORRISON MARR. *Metal Ind.* (London) 27, 77-8(1925).—The method is an adaptation of Beringer's method and consists in oxidizing the alloy with 6 N HNO_3 , evapg. to dryness and taking up the residue in HNO_3 , filtering off SnO_2 and Sb_2O_3 , igniting this residue with very fine Zn and ZnO to reduce the Sn and Sb to the metallic condition, dissolving in HCl, reducing with Ni and titrating with $SbCl_2$. W. T. H.

Method for the detection and determination of mercury by means of aluminum. PAUL DENIS. *Ann. méd. légale* 1, 348-9(1921).—The method is based on the decompn. of H_2O in the cold by Al in the presence of Hg. With fine Al filings weighing about 0.01 mg. each the H liberated adheres to the Al and carries it to the surface, where the H escapes, allowing the Al to sink. The test is extremely delicate and can give positive results with solns. contg. only 10^{-9} $HgCl_2$. The acid radical can be detd. quant. in the soln., and the Hg calcd. therefrom. A. PAPINEAU-COUTURE

The dichromate method for the determination of iron. A. BESOMBE. *Bull. soc. chim. Belg.* 34, 338-41(1925).—A slight improvement in the operating technic is described. W. B. PLUMMER

Analysis of copper-palladium-gold-silver concentrates. C. W. DAVIS. *Bur. Mines. Repts. of Investigations* No. 2731, 5 pp.(1926).—In Alaska a concentrate is produced contg. 40-50% Cu and considerable Pd, Au and Ag. Results obtained by different assayers on Pd, Au and Ag varied so much that the Bureau of Mines was asked to develop a suitable method of analysis. Five procedures were tested and the following proved to be the most satisfactory on the whole. Fuse 0.5 assay ton with 90 g. PbO , 5 g. borax glass and some Na_2CO_3 . For the detn. of Pd, add 10 mg. of Ag per mg. of Pd to the charge. After melting, pour in the usual way. The button is usually too brittle to hammer. Therefore, add Pb and scorify the buttons twice singly and then in pairs, finally scorifying singly and then cupelling. Part the beads as usual with dil. HNO_3 , anneal and weigh the Au. Ppt. the Ag with HCl, filter and wash with hot water. (For the Ag detn. do not add Ag at the start.) Evap. the filtrate with HCl to dryness twice on the water bath, moisten the last residue with 2 drops of HCl, add a little water, filter and ppt. the Pd with a little dimethylglyoxime reagent. *Filter, ignite in H_2 and weigh as Pd. W. T. H.

The entrainment of magnesium by aluminum. A. LASSIEUR. *Compt. rend.* 182, 384-6(1926).—Pariselle and Laude (*C. A.* 19, 2923) have recommended adding a

very large excess of NH_4Cl in order to prevent pptn. of Mg with Al upon adding NH_4OH . It is here pointed out, however, that the pptn. of Al as hydrated oxide takes place preferably in a soln. to which only enough NH_4OH has been added to make the p_{H} equal to 7. Under such conditions it is not necessary to provide as much NH_4Cl as recommended by Pariselle and Laude, who evidently added too much NH_4OH . W. T. H.

Determination of zinc oxide in brass. B. S. EVANS AND H. F. RICHARDS. *J. Inst. Metals* (preprint) 7 pp. (Mar., 1926).—When the attempt is made to det. O in brass by simply heating in H_2 and weighing the H_2O formed, the results are invariably too low; the trouble has been traced to the volatilization of Zn and condensation of ZnO from the vapors. This trouble can be prevented by placing rolls of Cu in the furnace on both sides of the sample and heating not higher than 1000° . W. T. H.

Estimation of oxygen and sulfur in refined copper. W. H. BASSETT AND H. A. BEDWORTH. *Trans. Am. Inst. Mining Met. Eng.* 1926, No. 1526F, 14 pp.—By heating in H_2 , the O is liberated as H_2O and the S as H_2S , both of which products can be absorbed and weighed. It is sometimes more convenient to weigh the residual metal, calling the loss in wt. O and S. Detailed directions are given for carrying out both detns. W. T. H.

Determination of potassium as cobaltinitrate. L. LE BOUCHER. *Anales soc. españ. fis. quim.* 23, 540–50(1925).—Directions are given for obtaining a normal ppt of $\text{NaK}_2\text{Co}(\text{NO}_2)_6 \cdot \text{H}_2\text{O}$. Emphasis is placed on dropwise addn. of the reagent, prolonged stirring while the ppt. is forming, and allowing to stand overnight before filtering. The drying temp. should not exceed 110° . The method is accurate when the Na content of the soln. is not over 15 times that of the K. With more Na it is best to dissolve the ppt. and repeat the pptn.: in such cases an error of 1% is likely. E. M. S.

Analysis of commercial magnesium. R. GUÉRIN. *Ann. chim. anal. chim. appl.* 8, 34–40(1926).—According to the French Commission, Mg obtained by electrolysis of the chloride is classified into metal contg. over 99.7% Mg and metal contg. 99.2–99.7% Mg. For metal of such purity, special precautions are necessary in the analysis so that detailed directions are prescribed for the accurate detn. of Cl, Si, Fe, Mn, Cu, Pb, Al, Zn and Ca. The methods are well chosen. W. T. H.

Determination of rubidium and cesium. W. STRECKER AND F. O. DIAZ. *Z. anal. Chem.* 67, 321–41(1925).—Dissolve the mixt. of KCl, RbCl and CsCl in as little water as possible and add a mixt. of 2 parts alc. and 1 part concd. HCl. This causes pptn. of the greater part of the KCl. Filter, wash the ppt. with abs. alc., dry at 110° and weigh. In the filtrate, ppt. Rb_2SnCl_6 and Cs_2SnCl_6 at the boiling temp. by means of boiling soln. of SnCl_4 in alc. Filter and det. the residual K by the HClO_4 method after evapg. off the alc. Dissolve the Rb-Cs ppt. in tartaric acid soln., ppt. the Sn with H_2S , filter, evap. to dryness and destroy the tartaric acid by igniting. Dissolve the residual salts together with an equal amt. of FeCl_3 or NaCl in the least possible vol. of water. Add 50 cc. of AcOH per g. of the mixt., heat to boiling and add a satd. soln. of SbCl_5 in AcOH . Heat 1 hour on the water bath and then allow to stand overnight. Filter off the ppt. of $\text{Cs}_3\text{Sb}_2\text{Cl}_9$ and wash with a 5–10% soln. of SbCl_5 in AcOH . Dissolve the ppt. with HCl and det. the Cs as CsClO_4 . In the filtrate, remove all Sb as Sb_2S_3 , by dilg. and introducing H_2S , and det. Rb as perchlorate. Tests with this procedure, using approx. 0.5 g. of each chloride, agreed remarkably well considering the difficulties involved. Interesting data are given concerning the accuracy of the detn. of Rb as RbClO_4 , reduction of RbClO_4 by fusion with soda and niter and titration of the chloride thus formed, reduction of RbClO_4 with hydrazine sulfate and titration of the chloride, detn. of Cs as CsClO_4 , reduction of CsClO_4 and titration of the Cl, pptn. of Rb and Cs with cobaltinitrite reagent and the analysis of the ppts. and pptn. of Rb and Cs with SnCl_4 and SbCl_5 . Some 167 expts. are described. W. T. H.

Separation of iron and aluminum from zirconium. RUDOLF LÉSSING. *Z. anal. Chem.* 67, 341–52(1925).—To the soln. of Fe, Al and Zr in dil. HCl or HNO_3 , add dil. NH_4OH until no further pptn. is noticeable; then add a slight excess of NH_4OH , 100 cc. of a cold, satd. soln. of $(\text{NH}_4)_2\text{CO}_3$ and enough water to bring the vol. to approx. 400 cc. In some cases it is well to add about 2 g. of NH_4Cl at the start, to prevent the formation of a colloidal soln. After the addition of the carbonate, heat gradually to $70\text{--}80^\circ$ and maintain this temp. for 5–10 min. Filter, wash with hot water, dissolve in dil. HCl and repeat the above treatment. Upon ignition, the last ppt. yields Fe_2O_3 and Al_2O_3 . In the combined filtrate, the Zr can be pptd. as $\text{Zr}(\text{OH})_4$ by NH_4OH after making slightly acid and evapg. to about 400 cc. It is probable that the solv. of Zr^{++++} in $(\text{NH}_4)_2\text{CO}_3$ soln. is due to the formation of the complex anion $[\text{Zr}(\text{CO}_3)_3]^{--}$. W. T. H.

Determination of nicotine by the method of Ulex. F. MACH AND F. SINDLINGER

Z. anal. Chem. **67**, 369–86(1926).—Tobacco ext. is now used so much as a fungicide* that the detn. of nicotine is a matter of some importance. The various methods which have been used for the detn. of nicotine are outlined and a bibliography of 36 papers on this subject is appended. It has been known for some time that the Ulex method gave higher results than most, if not all, other methods and a careful study of the details shows that there are so many sources of error that no reliance can be placed upon any results obtained with it. Some nicotine is lost during the analytical procedure but in the distn. considerable NH_3 is formed, which is titrated subsequently with the nicotine. The method is so faulty that it shows very appreciable quantities of nicotine present in such substances as hay, cabbage leaves and tomato leaves, which positively do not contain any nicotine. The method of Ulex must be discarded. W. T. H.

Determination of cerium in alloy steel. K. SWOBODA AND R. HORN. *Z. anal. Chem.* **67**, 386–98(1926).—On the basis of some 37 expts. which are here recorded and discussed, the following method is suggested for the detn. of Ce in high-speed steel. Treat 2 g. of sample with 60 cc. of 6 N HCl in a 500-cc. beaker. After the sample has all dissolved, add dropwise sufficient HNO_3 to insure the complete oxidation of the Fe and W. To the hot soln. add at once 60 cc. of 25% tartaric acid soln. and 30–35 cc. of SnCl_2 in HCl. This serves partly to reduce the Fe and W. Add a slight excess of NaOH soln. and transfer to a 500-cc. measuring flask. After the liquid has become cool, add 10 cc. of alc. and make up to the mark. Mix and filter, using a superposed funnel to avoid oxidation as much as possible. The ppt. contains hydroxides of Fe, Mn, Co, Ni and metallic Ta and there are present in the filtrate cerous tartrate, chromic tartrate and the tartrate complexes of the Na salts of WO_3 , MoO_3 , V_2O_5 and W_2O_5 . Take 250 cc. of the alk. filtrate in a 500-cc. beaker and make slightly acid with HCl. Heat to boiling, remove the flame and ppt. the Ce as CeF_4 by adding 2 g. of solid NH_4F . Neutralize the supernatant liquid with NH_4OH , add 1–2 drops of HCl and filter after 1 hour. Wash with hot water contg. 3 g. NH_4Cl per l. Ignite and weigh as CeO_2 . W. T. H.

The iodometric determination of arsenic acid. B. ORMONT. *Z. anal. Chem.* **67**, 417–26(1926).—The principle involved is identical with that of Gooch-Browning so often used in the analysis of commercial Pb arsenate. The As is reduced to the tervalent condition by means of KI in 15–20% H_2SO_4 . The liberated I_2 is expelled, for the most part, by passing a mixt. of CO and CO_2 through the soln., and the last traces by means of H_2SO_3 . Eventually the tervalent As is oxidized by titration with I_2 in the presence of NaHCO_3 . W. T. H.

Determination of nitrogen by the Kjeldahl method. A. C. ANDERSEN AND B. N. JENSEN. *Z. anal. Chem.* **67**, 427–48(1926).—In this paper some 88 expts. are described in the study of the sources of error in the Kjeldahl detn. As a result of this study the conclusion is drawn that if 20 cc. of H_2SO_4 , 10 g. of K_2SO_4 , 1 g. of CuSO_4 crystals and 0.75 g. of HgSO_4 are used, and the digestion is accomplished by very gentle but steady boiling of the liquid—adding a little graphite if necessary to prevent the danger of overheating—and if, moreover, care is taken to avoid loss of H_2SO_4 , then the N of proteins and similar substances can be converted without loss into NH_4HISO_4 . After the liquid has become clear (green), 2–4 hrs.' heating usually suffices; with some difficultly decomposable substances, more prolonged heating is necessary. If the substance to be analyzed contains considerable chloride, it is advisable not to add the HgSO_4 until all the HCl has distd. off. To remove the Hg from soln. it is best to add Na_2S but the excess of sulfide should be pptd. by adding a little Cu soln. If Hg is used as contact substance, glass flasks are better than Cu ones for the distn. A trap is shown which prevents spattering when Zn is not added. Pumice also prevents bumping. The NaOH added to liberate NH_3 must be free from nitrite. W. T. H.

Determination of perchlorate in Chili saltpeter on the basis of precipitation with methylene blue. K. A. HOFMANN, FRIDOLIN HARTMANN AND ULRICH HOFMANN. *Ber.* **58B**, 2748–54(1925).—The proposed method is suitable for the detn. of 0.4–0.8% of KClO_4 in samples of NaNO_3 . By using the so-called "methylene blue B extra" in 0.1% soln., a sensitive reagent is obtained for the pptn. of KClO_4 . An approx. idea of the amt. of KClO_4 present can be obtained by noting the rate of formation of the ppt. on adding the reagent to a 20% or 10% soln. of the nitrate. The actual amt. can be estd. from the color of filter paper that has been moistened with the soln. and methylene blue and then dried, or by colorimetric comparison with known amts. of KClO_4 added to pure NaNO_3 . It is interesting to note that the soly. of the ppt. is less in NaNO_3 soln. than it is in water, because of a salting out effect. The compn. of the ppt. also varies according to the menstruum from which it is pptd. and approaches the ideal compn. of 1 mol. of dyestuff to 1 KClO_4 only in very dil. solns. The most sensitive

test for KClO_4 is by means of a satd. soln. of the methylene blue perchlorate itself with which 0.04% of KClO_4 can be estd. W. T. H.

Analysis of lime. J. C. BAILLAR. *Ind. Eng. Chem.* 18, 389-90(1926).—Three methods are described for the detn. of CaO . (1) Weigh 1 g. of lime into a dry flask and treat with 500 cc. of boiling water. Add an excess of 0.3 N I_2 soln. and titrate the excess with $\text{Na}_2\text{S}_2\text{O}_3$. (2) Weigh 1 g. of lime into a dry flask and hydrate by adding 500 cc. of boiling water. Add 25-50 cc. of NaOH soln. (of strength equiv. to the ZnCl_2 soln.) and 0.5-1 cc. of an indicator made by mixing a 1% soln. of phenolphthalein in alc. with a 0.4% soln. of alizarin-cyanine-green in water. Add standard 2.5% ZnCl_2 soln. until a fairly permanent green color is obtained and then an excess of 10 cc. After 10 min. titrate to a lavender shade with NaOH . (3) Weigh 5 g. lime into a dry flask and add 150 cc. of boiling water. Shake till the CaO is hydrated, add 40 g. of sugar and shake till the lime is dissolved. Use an aliquot part of the filtered soln. for titration with NaOH with phenolphthalein as indicator. W. T. H.

Benzoylmethylglyoxime as a precipitant of palladous salts. J. HANUŠ, A. JILEK AND J. LUKAS. *Chem. News* 131, 401-2(1925); 132, 1-4(1926).—Benzoylmethylglyoxime, in 2% alc. soln., appears to be a sp. reagent for Pd. To 100-200 cc. of boiling HCl -Pd-soln. add the reagent in 40% excess, boil a few min., let stand 12 hrs., filter, wash with dil. HCl and then with water, dry at 105° and weigh. The dry ppt. contains 20.64% Pd. The yellow ppt. is sol. in NH_4OH but insol. in water and dil. HCl . If Pt, Ir, Rh, Os or Au is present add 1-6 cc. of HCl before adding the reagent. If Sb is present add tartaric acid. In the presence of Mo, W and V, add KH_2PO_4 besides HCl . The presence of Bi, Cd, Hg, As, Sn, Fe, Ni, Co and Zn does no harm if HCl is present. The formula of the ppt. is $\text{C}_{20}\text{H}_{18}\text{N}_4\text{O}_6\text{Pd}$. W. T. H.

The reliability of vacuum analysis for solid metallic hydrides. E. J. WEEKS. *Chem. News* 132, 17-8(1926).—Loss of wt. after heating in a vacuum gives better results in the analysis of metal hydrides than does the attempt to measure the H_2 liberated. W. T. H.

Crucible methods of analysis. J. D. MAIN SMITH. *Chem. News* 132, 65-72 (1926).—Instead of using open crucibles, as is the common practice in gravimetric analysis, or crucibles with lids fitting on top of the crucible, the use of "interior-fitting, serrated lids" is advocated for igniting ppts. The lid prevents loss by spattering if the heating is too rapid and the serrations on the sides of the lid permit escape of gases. The advantages of gravimetric over volumetric analysis are pointed out in numerous instances. W. T. H.

Some new, very sensitive methods based on the measurement of gaseous volumes. LOUIS HACKSPILL and GEORGES D'HUART. *Ann. chim.* 5, 95-133(1926).—*I. New volumetric method of elementary analysis.*—In a single sample weighing 20 mg., it is possible to det. C, O and N with remarkable accuracy. The principle of the method consists in heating the org. substance in an evacuated vertical tube. The substance is covered with a column of CuO to insure complete oxidation and on top of this there is a reduced Cu spiral to insure reduction of oxides of N. The evolved gases are chilled to -80° , which causes congelation of H_2O . The residual gas is measured before and after the CO_2 is absorbed by KOH and $\text{K}_2\text{S}_2\text{O}_8$. From the chilled tube, H_2O is allowed to evap. and after contact with CaH_2 the liberated H_2 is measured. *II. Detn. of water in a gas mixture.*—The principle of the method is the same—condensation of the water by evacuating and chilling, contact with CaH_2 and measurement of the liberated H_2 . In order to get accurate results with small samples it is necessary to take special precautions, which are enumerated in detail. *III. New method for determining carbon in steel.*—The steel is dissolved in 6 N HCl , a very strong soln. of CrO_3 is added and the system is evacuated. The gases pass through a condenser, as in the Corleis method then through a tube chilled to -80° , which condenses H_2O and Cl_2 , then through a hot furnace contg. CuO , and finally into a tube chilled to -190° , which condenses the CO . As compared with the Corleis method, the method is not unduly tedious, but it cannot be as rapid as the dry combustion method now in use in most steel labs. W. T. H.

Sensitive and specific reaction for nitrate and for hydroxylamine. JAKOB BLOM BER. 59, 121-5(1926).—*Reagents.*—(1) Water free from nitrate and nitrite, prepd. by boiling tap-water with Zn and H_2SO_4 and distg. from a flask provided with a Hopkins' trap. (2) 10 g. sulfanilic acid dissolved in 1 l. of 30% AcOH . (3) 3 g. of α -naphthylamine boiled with 700 cc. of water, the clear soln. decanted off from the bluish violet residue and treated with 300 cc. of AcOH . (4) 1.3 g. I_2 dissolved in 100 cc. of AcOH . (5) 2.5 g. $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in 100 cc. of water. (6) 0.7 g. NaNO_2 in 100 cc. of water. (7) Nitrate- and nitrite-free Zn dust, prepd. by heating Zn dust for 1 hr. on the water bath with very dil. AcOH cooled, treated with more AcOH , filtered, washed and dried

All these reagents must be tested to make sure that they are free from HNO_2 or HNO_3 . Since mineral acids interfere with the test for nitrite, they must be weakened by adding AcONa . The tests depend upon the formation of HNO_2 , by reduction of a nitrate or by the oxidation of NH_4OH , after the removal of any nitrite that may have been present originally. Treat about 5 cc. of the AcOH soln. to be tested with 1 cc. each of the above reagents (2) and (3). If no red coloration results, there is no nitrite present, and the soln. can be used directly for the test for HNO_3 . Add a small piece of Zn , or a few centigrams of Zn dust, and if nitrate is present a red coloration will result, eventually with pptn. of the azo dyestuff if much nitrate is present. To test for NH_4OH in the absence of HNO_2 , treat the original AcOH soln. with 1–2 cc. of reagent (2) and then 0.5 cc. of (4). Shake well and after 2–3 mins. remove the excess I_2 by dropping in reagent (5), using a slight excess. Add a little of reagent (3) and a red coloration should result if NH_4OH was originally present. If the original soln. gave the test for nitrite, this must be removed and its decompn. is best effected by means of *p*-diazobenzenesulfonic acid, which is formed by diazotization of sulfanilic acid. Other methods are likely to cause trouble with the test for NH_4OH . To the AcOH soln. under examn. add an excess of reagent (2). After a few minutes the diazotization may be regarded as complete. Heat 3–4 minutes on the water bath or over a free flame to decompose the excess of diazobenzenesulfonic acid. If considerable nitrite was present the soln. will be yellow. To make sure that the HNO_2 was all removed, test a little of the soln. with a few drops of reagent (3). Next make sure that an excess of (2) was added by testing with a drop of (6). Then test as above for HNO_2 and NH_4OH . If large quantities of HNO_2 are present and it is desired to test only for nitrate, it is best to remove the greater part of the HNO_2 by heating with $(\text{NH}_4)_2\text{CO}_3$, afterward adding AcOH and treating as above for the removal of the last traces of HNO_2 . W. T. H.

The potentiometric control of diazotization and the determination of amines. ERICH MÜLLER AND ERNST DACHSELT. *Z. Elektrochem.* 31, 662–6(1926).—Expts. were made in diazotizing aniline, *m*-xylydine, tolidine and aminoazobenzenedisulfonate of Na . It was found in all cases that when the end point was reached, a slight excess of NaNO_2 caused a distinct indication with the indicator electrode. With a little more NaNO_2 the test with iodo-starch paper could be obtained. In the expts. the soln. of the amine was placed in a glass beaker, which was provided with a stirrer and a Pt electrode connected with the *N* calomel electrode in the usual Poggenдорff-Ostwald way. Max. points in the plotted e. m. f. curve was obtained in all 4 of the above cases at +0.54–0.59 volt. The curve is so steep that it is feasible to titrate with an indicator electrode corresponding to this e. m. f. and titrate till the galvanometer shows a permanent zero reading. Such an indicator electrode can be prepd. with Pt foil dipping into a soln. of the same acidity as that of the soln. under examn. and to which 1 cc. of 19.2% NaNO_2 is added for each cc. of soln. The method can be used for the detn. of the amine content as well as for the control of technical diazotizing operations. The results are accurate at 20° but attempts to accomplish acceleration by raising the temp. were abortive. W. T. H.

The absorption of carbon monoxide by cuprous chloride. LUDWIG MOSER AND FRANZ HANIKA. *Z. anal. Chem.* 67, 448–56(1926).—As a result of numerous expts. the conclusion is drawn that the most suitable concn. for an acid Cu_2Cl_2 soln. contains the following parts by wt., Cu_2Cl_2 16–18, concd. HCl 24–27, H_2O 60–55. The addition of 0.2–0.3 g. $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$ accelerates the reaction. For an ammoniacal soln. the most favorable concn. is Cu_2Cl_2 11–12, NH_3 13–14, H_2O 76–74. This soln. is unquestionably more efficient, only 11 parts by wt. of Cu_2Cl_2 being required to absorb 30 cc. of CO , and 16 parts Cu_2Cl_2 being required in the presence of HCl . The dispute of nearly 75 years' standing with respect to the relative advantages of the 2 absorbents seems to be settled in favor of the ammoniacal soln. Expts. with $\text{K}_3\text{Fe}(\text{CN})_6$ showed that in the presence of Hg as catalyzer it can be used for absorbing CO but the rate of absorption is too slow. W. T. H.

A simple means of avoiding entrainment in distilling ammonia in the micro-Kjeldahl method. LEO PICK. *Z. Zuckerind. cecoslov. Rep.* 50, 141–2(1925); *Listy Cucrov.* 43, 557(1924–5).—Charcoal (best official basswood charcoal) is boiled with NaOH and ignited. 20 to 100 mg. added to a Kjeldahl flask is ample to prevent entrainment of alkali. W. L. BADGER

The determination of invert sugar in the presence of sucrose. II. R. OFNER. *Z. Zuckerind. cecoslov. Rep.* 50, 65–71(1925); cf. *C. A.* 19, 583, 3445.—O. finds that his soln. reduces 2.6 mg. Cu per mg. invert in a soln. contg. 0.01% invert. This drops to 2.0 mg. Cu at 0.05% invert, 1.8 mg. at 0.1%, 1.5 mg. at 0.2%, and 1.0 mg. at 1.0%. His standard soln. contains 80 g. $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$. A series of solns. was made up

contg. varying amts. of Na_2HPO_4 and Na_3PO_4 . With sucrose alone, the soln. contg. only Na_2HPO_4 ppts. no Cu when boiled according to directions. As Na_2HPO_4 is replaced by Na_3PO_4 the amt. of Cu pptd. by sucrose alone increases, but the net amt. of Cu pptd. by invert increases, and also the amt. of Cu pptd. by invert becomes more nearly const. with changes in invert content. A soln. contg. 40 g. $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ and 40 g. $\text{Na}_3\text{PO}_4 \cdot 10\text{H}_2\text{O}$ ppts. 5.0 mg. of Cu from 10 g. pure sucrose; but ppts. 2.7 mg. Cu per mg. invert at all concns. of invert between 0.01 and 0.5%. If this soln. is to be used on a sample contg. over 50 mg. invert in a 10 g. sample, a smaller sample should be used and made up to 10 g. with refined sucrose. W. L. BADGER

Salt solution as a confining liquid in gas analysis. F. G. HOFFMANN. *Z. angew. Chem.* 39, 23-4(1926).—Concd. NaCl soln. has been used as confining liquid in gas analysis but recently it has been proposed to add a little acid to the NaCl soln. Whereas the use of NaCl soln. is advantageous because most gases are less sol. in brine than in pure water, it is pointed out that there is no advantage gained by adding acid but, on the contrary, the use of acid is likely to cause error. W. T. H.

Analysis of gases from rocks by microchemical methods. NICOLAS METTA *Annuar. Inst. Geol. Romaniei* 10, 85-119(1925). (In French.)—The analysis of gas is made under const. vol., in a volumeter of previously detd. capacity and placed in communication with a MacLeod manometer modified to show 0.001 mm. of pressure. Operating under an initial pressure of 3.5 to 4 mm., detns. may be made with 0.001 of the vol. required by the ordinary methods of gas analysis. The construction and calibration of the app. are described, also the procedure and calcs. in the detn. of gases in several samples of rock. L. W. RIGGS

Spectrographic analyses of residues of mineral water. I. Water of Salsomaggiore. C. PORLEZZA AND A. DONATI. *Ann. chim. applicata* 15, 535-42(1925).—Spectrographic examn. by a modification method of Urbain (C. A. 18, 2862) and chem. analyses of Salsomaggiore water showed the presence of Na, K, Li, Mg, Ca, Sr, Ba, Al, Fe, Mn, Si and B, and no element was found by one method and not by the other. A detn. of Ba was also attempted spectrographically by an improvised method. NaCl was intimately mixed with 1% of BaO and spectrograms were obtained of this mixt. and of mixts. prepd. from this mixt. by dilg. progressively with more and more NaCl. The spectrogram of the water residue was practically identical with the artificial mixt. contg. 0.01% BaO, from which it was calcd. that Salsomaggiore water contained 0.0162 g. of Ba per l. Previous chem. detns. of Ba give no quant. data, only traces being reported. The results in general indicate that spectrographic examn. is as reliable as chem. analysis for identifying the elements present in the residue of a water, but that the examn. must extend from the green to the ultra-violet and must not be confined to the region prescribed by the original method of Urbain. C. C. DAVIS

Determination of quinone with thiosulfate. J. RZYMKOWSKI. *Z. Elektrochem.* 31, 371-82(1925).—Several methods for detg. quinone iodometrically have been proposed. A study of the equil. between quinone + $\text{I}^- + \text{H}^+$ and hydroquinone + I_2 shows that the equil. const. is 2.9×10^{-6} , which explains why somewhat divergent results are obtained under slightly different conditions when it is attempted to reduce quinone by HI. Now it happens that quinone acts directly with thiosulfate, the final reaction being represented by the equation $2\text{C}_6\text{H}_4\text{O}_2 + 4\text{H}^+ + 2\text{S}_2\text{O}_3^{--} \longrightarrow \text{C}_6\text{H}_2(\text{OH})_2(\text{S}_2\text{O}_3\text{H})_2 + \text{C}_6\text{H}_4(\text{OH})_2$. This reaction can be used for the direct titration of quinone. The end point can be based upon the color of the quinone soln. itself or upon the color obtained in a spot test with Wurster's soln. of dimethyl-*p*-phenylenediamine. It is also possible to det. the end point electrometrically. For the titration take about 0.4 g. of quinone, dissolve in 4 cc. of AcOH and dil. to 100-150 cc. W. T. H.

Formol titration of certain amino acids. S. L. JODIDI. *J. Am. Chem. Soc.* 48, 751-3(1926).—Cystine can be detd. accurately by the formol titration method. Titration of hippuric acid with standard alkali yields a result as accurate as that obtained by the formol titration, there being no advantage in the application of the latter method. The formol titration apparently indicates about 87% of tryptophan. C. J. WEST

Analysis of ternary mixtures, particularly of acetone, alcohol and water. ERWIN BENESCH. *Chem.-Ztg.* 50, 98-9(1926).—A general method is explained based on the detn. of the d. and the direct detn. of one of the constituents. Thus in the mixt. of acetone, alc. and water, the acetone is first detd. by the iodometric method of Messinger. Then, with the aid of the d. detn., it is possible to compute the % of alc. and H_2O with reasonable accuracy. W. T. H.

Volumetric determination of alcohol. G. CHABOT. *Bull. soc. chim. Belg.* 34, 328-37(1925).—The method is based on the assumption that if 0.5 cc. of beer is suspended in an open vessel within a tightly stoppered flask contg. 25 cc. of 0.175 N $\text{K}_2\text{Cr}_2\text{O}_7$

and 12 cc. of concd. H_2SO_4 , all of the alc. and no other reducing substance can be made to distil into the dichromate by heating at 80° for 1 hr. Then the unreduced dichromate can be titrated iodometrically. The method gives concordant results, which are, however, higher than those obtained by the usual distn.-densimetric method. W. B. P.

Air oxidation of titanous sulfate solution. Vanadous sulfate, a new and powerful reducing agent (RUSSELL) 6.

Ausgewählte Methoden für Schiedsanalysen und kontradiktorisches Arbeiten bei der Untersuchung von Erzen, Metallen und sonstigen Hüttenprodukten. Part II. Berlin: Gesellschaft Deutscher Metallhütten und Bergleute e V. Rm. 10.

VILLARD, A.: **Tableaux d'analyse qualitative des sels par voie humide.** Paris: Masson. 408 pp. Fr. 25. Reviewed in *Tech. Book Review Index* 8, No. 3, 415

Detecting chlorine or other halogens. H. SIMON, LTD., AND H. J. DENHAM. Brit. 237,330, April 22, 1924. Cl, other halogens or CHCl_3 , $\text{C}_2\text{H}_2\text{Cl}_4$ or similar halogen compds. are detected by a green or blue color imparted to the flame of a miner's safety lamp with a Cu gauze in contact with the flame.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

The time factor in the formation of some artificial minerals. A. B. PECK. *J. Geology* 34, 65-70(1926).—The minerals were formed in a Dressler tunnel kiln having a max. temp. of 1460° after continuous operation for 18 months. Silica glass was formed at 500 – 600° (98% SiO_2), probably as the result of pneumatolytic action due to an oxidation of the linings composed of SiC. Hematite pseudomorphs after magnetite were observed in branching arborescent forms, formed at 840° . Cristobalite lithophysae were noted at a temp. above 1460° produced by the oxidation of SiC. Changes were noted at lower temp. than usually recorded in the literature, due to the longer time element. Also the larger size of crystals showed a very rapidly increasing rate as the temp. increased beyond a certain point. Below this point the time factor seemed negligible.

W. F. HUNT

Quartz pseudomorphs. CHARLES PALACHE AND K. K. LANDES. *Am. Mineral.* 10, 405 11(1925).—Two types of pseudomorphs were found at Greenwood, Maine (1) Quartz replacements of cubes truncated by trapezohedrons and (2) incrustations of drusy quartz upon a monoclinic host which was later removed by soln. In the first type the original mineral was analcite or pollucite and in the second heulandite or bertrandite.

C. B. SLAWSON

Skeleton quartz crystals. G. W. BAIN. *Am. Mineral.* 10, 435-41(1925) The skeleton quartz phenocrysts occurring in the rhyolite at Agate Point, Lake Superior are formed of 3 plates intersecting at 60° . B. concludes that these skeletons are growth rather than resorption effects because of the systematic arrangement of the tongues of glass penetrating the crystal. These tongues of glass are parallel to crystal faces and clear quartz extends from the center to the corners showing that the rate of growth is greatest along the crystallographic axes. The rate of etching by HF confirms this conclusion.

C. B. SLAWSON

Veins with fibrous quartz and chlorite from the vicinity of Providence, R. I. GRAGG RICHARDS. *Am. Mineral.* 10, 429-33(1925).—White quartz and yellowish chlorite in all proportions occur as fine fibers nearly normal to the walls of veins 1 to 60 mm. wide. Replacement of chlorite by quartz in all stages from fiber by fiber to "in mass" may be observed. Analysis of the chlorite, purified by sepn. with heavy solns. and the electromagnet, gives: SiO_2 23.8, Al_2O_3 21.8, Fe_2O_3 2.0, FeO 28.2, MgO 10.9, MnO 0.3, H_2O 10.7%. K and Na not detd.

C. B. SLAWSON

Mineralogy of the chrome ore from Etchison, Montgomery Co., Md. E. V. SHANNON. *Am. Mineral.* 11, 16-20(1926).—The chrome ore consists of dark brown fractured mass with a low metallic luster penetrated with numerous small veins of margarite and serpentine. Margarite represents about 10% and serpentine about 30% of the total mass of the ore, the remainder being chrome spinel. The ore carries only 20.56% Cr_2O_3 , which is too low to make it com. available.

C. B. SLAWSON

Some minerals from the Kensington Mica Mine, Montgomery County, Maryland. E. V. SHANNON. *Am. Mineral.* 11, 35-7(1926).—The pegmatite dikes at this mine are

mineralogically different from the other granite pegmatites in the region. They carry such minerals as autunite, gahnite, cleavelandite, spessartite, apatite and beryl. An analysis of spessartite gave: SiO_2 35.76, Al_2O_3 20.72, Fe_2O_3 0.76, CaO 1.22, MgO 0.50, MnO 34.40, FeO 6.66%, which agrees closely with the accepted garnet ratios.

C. B. SLAWSON

Mica schists with piedmontite in the Valli di Lanzo, Alpi Piemontesi. VIRGINIA GENNARO. *Atti accad. Lincei* [6] 2, 508-10(1925).—A description of the mineralogical association of the rock.

E. J. WITZEMANN

Topaz and associated minerals from the Einstein Silver Mine, Madison County, Mo. C. S. ROSS AND E. P. HENDERSON. *Am. Mineral.* 10, 441-3(1925).—Argentiferous galena is found in veins in the Archean granite. The wall rock has been profoundly altered with complete replacement of the feldspar by muscovite and quartz and the introduction of topaz, fluorite, hübnerite and scheelite. Analysis of the topaz gives: SiO_2 32.65, Al_2O_3 54.67, Fe_2O_3 1.78% F not detd., establishing the identity of this mineral for the first time.

C. B. SLAWSON

Some minerals of the Keweenaw copper deposits: pumpellyite, a new mineral; sericite; saponite. CHARLES PALACHE AND HELEN VASSAR. *Am. Mineral.* 10, 412-8(1925).—Pumpellyite occurs as bluish green fibers or narrow plates in the amygdaloidal ores. Its species rank was determined optically and confirmed chemically and showed that it is most closely related to zoisite. It is orthorhombic, + with 2V large, $\rho < \gamma$ strong, $\alpha = 1.698$, $\beta = 1.700$, $\gamma = 1.708$, α and γ colorless, β green, X nearly normal to a perfect basal cleavage, hardness = 5.5, sp. gr. = 3.2. The av. of the 2 analyses given is: SiO_2 36.85, Al_2O_3 23.81, Fe_2O_3 4.38, FeO 3.62, MgO 3.94, CaO 21.62, MnO 0.14, K_2O and Na_2O 0.80, H_2O 5.00%. Saponite is detd. as monoclinic or orthorhombic, —, 2V moderate to small, $\alpha = 1.479$ -90, $\beta = 1.510$ -25, $\gamma = 1.511$ -27, X normal to cleavage and Z parallel to elongation. Analyses of sericite and saponite are given.

C. B. SLAWSON

Notes on dachiardite. HARRY BERMAN. *Am. Mineral.* 10, 421-8(1925).—Crystallographic and optical data gives this mineral species rank. Dachiardite is monoclinic, +, with 2V = 65°, $\alpha = 1.492$, $\beta = 1.496$, $\gamma = 1.500$, X = b, and $Z/\alpha c = 35^\circ$. The axial ratio is 2.4786:1:1.3663, $\beta = 72^\circ 11'$ and the characteristic habit is mimetic twins on (110). It is readily decomposed by HCl and decrepitates and fuses to a white enamel before the blowpipe.

C. B. SLAWSON

Pectolite in the Khibin tundra. E. E. KOSTUILEVA. *Bull. acad. sci. Russie* 19, 383-404(1925).—A description of pectolite deposits and a discussion of pectolite from the chem. and mineralogical standpoint. It may be divided into 2 series: CaSiO_3 with $(\text{Na}, \text{K}, \text{H})_2\text{SiO}_3$ and MnSiO_3 and CaSiO_3 with $(\text{Na}, \text{K}, \text{H})_2\text{SiO}_3$.

J. S. JOFFE

The identity of ectropite and bementite. E. S. LARSEN. *Am. Mineral.* 10, 418-21(1925).—Optical properties and chem. analyses of ectropite, bementite and serpentine show that the first 2 are identical and that they may represent the MnO end of the serpentine series. Bementite is retained as the species name because of priority.

C. B. SLAWSON

Planchéite and shattuckite. ALFRED SCHOEP. *Bull. soc. chim. Belg.* 34, 315-27(1925).—A review and discussion of the properties of these 2 minerals. The formula of planchéite may be written in the form $2\text{SiO}_2 \cdot 2(\text{Cu}, \text{Ca})\text{O} \cdot \text{H}_2\text{O}$, whereas shattuckite is $2\text{SiO}_2 \cdot 2\text{CuO} \cdot \text{H}_2\text{O}$, their close chem. similarity being thus made evident. W. B. P.

Purple muscovite from New Mexico. W. T. SCHALLER AND E. P. HENDERSON. *Am. Mineral.* 11, 5-16(1926).—A reddish purple muscovite which is strongly pleochroic upon the basal section is found in Taos County, New Mexico. The pleochroism is most intense in specimens with the highest Fe and Mn content. The only other published description of a muscovite with a high Fe content is "baddeckite" which is non-pleochroic. An examn. of baddeckite under the microscope shows that it contains 2 component minerals, one of which has the optical properties of thin scales of hematite while the other resembles a clay. By recalculating the original analysis of baddeckite after assigning all the Fe to Fe_2O_3 , it is shown that the remaining material has the composition of the clay, cimolite.

C. B. SLAWSON

A peculiar manganiferous serpentine from Franklin Furnace. E. V. SHANNON AND E. S. LARSEN. *Am. Mineral.* 11, 28-30(1926).—This serpentine is red-brown in color with hardness = 5.5, and resembles massive garnet. Analysis gave: SiO_2 41.32, Al_2O_3 0.65, FeO 1.57, MnO 7.57, ZnO 0.14, MgO 32.58, CaO 0.96, $\text{H}_2\text{O} + 12.44$, $\text{H}_2\text{O} - 0.94\%$. The mineral is optically — with 2V medium, $\alpha = 1.561$, $\beta = 1.567$, $\gamma = 1.568$.

C. B. SLAWSON

Radiated chrysotile from Franklin Furnace, New Jersey. WM. F. FOSHAG. *Am. Mineral.* 11, 38-9(1926).—Examn. of a no. of Franklin Furnace specimens of "wave"

lite" showed that they were chrysotile. The *ns.* were slightly higher than the accepted values and analysis gave: H_2O —2.31, H_2O + 14.51, SiO_2 41.47, Al_2O_3 0.10, FeO 0.90, CaO 0.83, MgO 38.40, MnO 0.71, alkalis 0.42%.

C. B. SLAWSON

The so-called genthite from Webster, North Carolina. C. S. ROSS AND E. V. SHANNON. *Am. Mineral.* 10, 444–5(1925).—This mineral occurs as films or veinlets in a partly altered dunite. It is in a cryst. metacolloidal state with mean $n = 1.510$, optically +, and probably uniaxial. Analysis gives: SiO_2 43.26, Al_2O_3 + Fe_2O_3 1.20, CaO 0.24, MgO 30.00, NiO 4.20, H_2O + 10.54, H_2O — 9.30%. This indicates that the mineral is a nickelliferous variety of deweylite rather than genthite.

C. B. S.

The identity of "lehnerite" and ludlamite. HARRY BERMAN. *Am. Mineral.* 10, 128–9(1925).—The optical properties of "lehnerite" are $\alpha = 1.650$, $\beta = 1.669$, $\gamma = 1.689$, +, $\rho > v$, 2V large. It has perfect basal cleavage, sp. gr. = 3.19, and hardness = 3.5. These properties agree so closely with those of ludlamite that "lehnerite" is considered as a Mn-Mg variety of ludlamite.

C. B. SLAWSON

The identity of gilpinite and johannite. E. S. LARSEN AND HARRY BERMAN. *Am. Mineral.* 11, 1–5(1926).—Detns. of the optical properties of johannite show that gilpinite is identical with it; johannite is retained as the species name because of priority. The optical constns. are triclinic, negative, 2V about 90° , $\alpha = 1.572$, $\beta = 1.595$, $\gamma = 1.614$, $\rho > v$ strong, strongly pleochroic, greenish yellow to canary yellow. Specimens from different localities show a very close agreement in all optical properties. The suggested formula is: $(Cu, Fe, Na_2)O, UO_3, SO_3 \cdot 4H_2O$.

C. B. SLAWSON

The identity of newtonite and alunite. WM. F. FOSHAG. *Am. Mineral.* 11, 33–5(1926).—Analyses of "newtonite" from the original locality gives: SO_3 34.92, SiO_2 0.96, Al_2O_3 38.56, CaO 0.78, MgO 0.30, K_2O 8.23, Na_2O 0.80, H_2O 15.15%. The mean $n = 1.58$. The chem. compn. and the phys. and optical properties indicate that "newtonite" is not a species but is identical with alunite. The analysis given with the original description of newtonite is similar in all respects to that of halloysite, so must have been founded upon an error in connection with the material analyzed.

C. B. SLAWSON

Mineralization of the Platteville-Decorah contact zone in the Twin City region. C. R. STAUFFER. *Bull. Geol. Soc. Am.* 36, 615–22(1925).—The Platteville-Decorah contact has passed through 4 stages of mineralization. The first was soln. of the highly calcareous shells, then followed dolomitization of the remaining Ca. Fe-bearing solns. next deposited pyrite in the open spaces, and later the pyrite coatings were covered by calcite.

W. F. HUNT

Mines and ore deposits of Southern Norway. STEINAR FOSLIE. *Norges Geol. Undersøkelse* No. 126, 89 pages(1925).—On the map accompanying this paper all the mines and ore deposits of Southern Norway, 1407 in all, are collected for the first time. Their extension, importance and geological characteristics are outlined. Predominating at present are pyrite, Cu and Fe ores and these will probably also dominate the future production. The Mo, Ni, Ti, Zn and Ag ores have been mined or are known in such quantities that they may be said to have national economic importance. Pb, As, Au, Cr, Co, Mn, Bi, U and V have been mined to a less extent, but deposits of real importance are not known yet. W, Sb and Pt have been extracted in minute quantities. Sn and Hg are the only economically important metals which have not been found at all in Norway.

C. A. ROBAK

The genetic relations of the deposits of ore in the Krivoi Rog. P. P. PYATNITZKII. *Trans. Inst. Econ. Mineral. and Petrography* (Moscow) 1924, No. 9, 1–55(1924).—A treatise on the genesis of the Fe-ore deposits, a description of the region, its geology, compn. and structure of the cryst. rocks on the Dnieper. P. compares the formations with those of the U. S. in the Great Lakes region. A complete summary in English is given. II. Ferruginous cherts and jaspilite. *Ibid* 1925, No. 17, 1–42.—A critical study of Fe-ore deposits throughout the world in comparison with those in the Krivoi Rog district. P. takes up the formation of Al silicates, their soly. and deposition in the upper layers of the crust, cementation of sandstones and other rocks, SiO_2 content of river and sea waters, consumers of Al silicates, source of Fe, its soly. and deposition in rocks, Fe content of river and sea waters, consumers of Fe in the ocean waters, thickness of yearly deposition of Al silicates, Fe oxides and $CaCO_3$, the problem of change of quantity of SiO_2 , Fe_2O_3 , $CaCO_3$ brought in by the rivers in early geological times and the geological picture of the formation of pre-huronic ferruginous cherts and jaspilite. A good English summary is given.

J. S. JOFFE

The natural iron pigments, their chemical and mineralogical composition and technical properties. I. KURBATOV. *Trans. Inst. Econ. Mineralogy and Petrography* (Moscow) 1925, No. 14, 3–36.—Chem. and mineralogical analyses are given of the Fe-pigments found in various sections of Russia. The process of formation of ochre and

"mummy" (rouge) is as follows: When Fe ore contg. ferrous Fe on the surface or in the faults in the vicinity, is oxidized, some of the Fe oxide goes into a dispersed phase; red "mummy" is formed under such conditions. When ferric Fe is present this dispersion leads to the formation of native red pigments, rich in Fe oxides. The technical properties, mineralogical compn., quantity of staining pigment depend on the original chem. compn. of the ore or rocks, from which the red pigments are formed *in situ*. When the native red pigments have been weathered still more, combined with hydration and dispersion of the oxides of Fe, yellow pigments (ocher) are formed. In the decompn. of pyrite and marcasite "mummy" is formed first and later also ocher. Enrichment of bauxite with the dispersed Fe oxides brings about the formation of red pigments which contain free Al_2O_3 .

J. S. JOFFE

New deposits of uranium and vanadium in the Minusinsk district, State of Eniseisk. S. M. KURBATOV. *Bull. acad. sci. Russie* 19, 315-22(1925).—The minerals found in the district correspond to allophane; in these, concretions of canary-yellow color were found, contg. 20.62% V_2O_5 and 0.36% U_3O_8 .

J. S. JOFFE

Investigations on the salt mass from the waters of the Sosnevskaia factory, Ivanovo-Vosniesensk. V. I. PASTAGANOV AND V. A. ZAITZEV. *Bull. Inst. Polytech. Ivanovo-Vosniesensk* 7, 120-31(1923).—A report of the compn. of a salt body, its geological history and adaptability as a source for use.

J. S. JOFFE

Phosphate ores of U. S. S. R. A. V. KASAKOV. *Trans. Inst. Fertilizers* (Moscow) No. 24, 1-66(1925).—This is a report of the phosphate deposits of Jegoryevsk, Moscow government. It gives the geology of the region, of the phosphate deposits, the phys and chem. characteristics of the phosphatic ores and of the adjacent layers, the methods used in the investigations and resources.

J. S. JOFFE

Certain clays from the productive series near Moscow. N. N. SMIRNOV. *Trans. State Exptl. Inst. of Silicates* (Russian) 1924, No. 15, 1-12.—A study of the clays in the region near Moscow, their geology, composition, genesis and uses.

J. S. JOFFE

Coal bed in the metamorphic terranes south of Limoges. JEAN GANDILLOT. *Compt. rend.* 182, 274-5(1926).—Analysis of the coal showed fixed C 58.23%, volatile matter 29.20, H_2O 1.82, ash 9.85, S 0.40, heating value 6048 cal. The age of the deposit is uncertain because of the absence of fossils.

L. W. RIGGS

Coal deposits of Albania. ERNST NOWACK. *Montan. Rundschau* 18, 69-84 (1926).—Mainly a geological discussion, with many maps and a few coal analyses.

W. B. PLUMMER

The effect of rock flowage on the kerogen of oil shale. F. M. VAN TUYL AND C. O. BLACKBURN. *Bull. Am. Assoc. Petroleum Geol.* 9, 158-64(1925).—It has frequently been reported that the kerogen of oil shale could be converted to petroleum at elevated pressures. Recent exptl. work by V. and B. on typical shales from Elko, Nevada, and Grand Valley, Colorado, to det. quantitatively the amt. of oil produced when these shales were subjected to rock flowage at ordinary temps. disclosed the fact that no free oil was formed under such conditions. In view of the results obtained there is reason for doubting the common conception that the kerogen of oil shales represents a stage in the transformation of org. material to petroleum.

C. L. C

A proposed classification of igneous rocks. E. T. HODGE. *Univ. of Oregon Publications* 2 (No. 7), 72 pp.(1924).—Previous classifications are described, also an ideal classification which is planned to cover 18 objectives. It is based on modal minerals which are expressed in actual percentages, and uses a diagram consisting of a circle divided into 2 pairs of equal sectors to show the classes, each sector is divided into 19 smaller sectors by radial lines to show the orders. Six concentric circles are equally spaced inside the original circle to show the rangs. By means of this chart a rock classified either chemically or mineralogically will arrive at the same compartment of the chart.

L. W. RIGGS

The specific heats of rocks. TOKIHARU OKAYA. *Japan. J. Astron. Geophysics* 3, 45-80(1925).—A list of the sp. heats and a petrographic description of 73 Japanese rocks belonging to the andesitic, tuffic, metamorphic and granitoid classes is given. The sp. heat varies considerably from sample to sample in the same rock and is rarely greater than 0.30 or less than 0.10. In general, for andesitic rocks of the Na group it lies between 0.28 and 0.24; for rocks of the K group, 0.20 and 0.14. In the tuffic class, that of Na rocks is between 0.27 and 0.23; of K rocks, 0.20 and 0.18; of metalloid rocks, below 0.16. The sp. heat of cryst. limestone is between 0.19 and 0.25; of granite, 0.25 and 0.18; and of saccharoid marble, greater than 0.26.

D. S. VILLARS

Concerning "evidence of liquid immiscibility in a silicate magma, Agate Point, Ontario." N. L. BOWEN. *J. Geology* 34, 71-3(1926).—Globular inclusions differing in color from the main mass do not constitute sufficient evidence for liquid immiscibility.

bility. The same effect might have been produced by hydration and oxidation by permeating solns. W. F. HUNT

Spectrum analysis of the flames from the Santorin volcano. (Eruption of 1925.) G. GEORGALAS and N. LIATSIKAS. *Compt. rend.* 182, 148-50(1926). Orange-colored flames 15 to 20 m. high were observed, also yellowish green, bluish green or blue flames which seldom exceeded 1 m. in height. The spectroscope showed the presence of the blue H-ray ($\lambda = 486.1$), the Na(D) ray, Cl-blue rays ($\lambda = 481, 479.4, 489.7, 490.3$) and the N-blue band. Rays of Fe and O were probably present. From a fumerole there were exhaled H_2O , HCl, CO_2 and small quantities of SO_2 . In the principal cloud of the volcano the SO_2 was in sufficient quantity to make the air irrespirable. L. W. R.

The paragenesis of the granite pegmatites of central Maine. K. K. LANDES. *Am. Mineral.* 10, 355-405(1925).—The pegmatites show 5 successive stages of mineralization: (1) coarse granitic pegmatite formed by mass crystn.; (2) the development of large cavities by the solvent action of hydrothermal solns. and the deposition in these cavities of Si-Na-Cs-Cb-Ta-Sn minerals; (3) the partial soln. of minerals previously formed and the deposition of Li-Mn- PO_4 minerals; (4) hydrothermal activity ceases with a Li-Si phase; (5) the development of secondary minerals by ground-water activity. L. believes that the cavities of the Maine pegmatites are largely due to soln., though they may follow the trend of primary cavities produced in the igneous magma by shrinking or gas bubbles. C. B. SLAWSON

Evolution of the mineralogical composition of the skeletons of organisms. Y. V. SAMOILOV. *Trans. Inst. Econ. Mineralogy and Petrography* (Moscow) 1923, No. 4, 1-16.—The author traces the mechanism of the mineralization of the skeletons of certain lower animals and discusses the question of the role of organisms as geological agents in the formation of mineral substances. The accumulation of different chem. substances by organisms is discussed. J. S. JOFFE

Deposits of silica of organic origin. Y. V. SAMOILOV and E. V. ROZHKOVA. *Trans. Inst. Econ. Mineralogy and Petrography* (Moscow) 1925, No. 18, 1-65.—The theories of the role of organisms in forming siliceous deposits are analyzed. Diatomaceous ooze, from the lake Baikal was subjected to chem., mech. and microscopic examn. The soly. of the frustules of diatoms in 5% soda was considerable (63.6 to 72.8% SiO_2). Spicules from the sponge *Geodia baretii* were analyzed. Chem. and mineralogical investigations were made on tripolite from various localities of Russia. Samples of "gaize" of early Tertiary age were examd., and it was found that there are several types of gaize, varying in chem. compn. and phys. properties. Detailed descriptions with micrographs of these are given. As a result of the relatively high soly. of the hydrogel of silica the gaize gradually alters its characteristics and merges into varieties of chert. The authors consider the origin of these rocks as a result of biochem. processes and regard them as *silicobioliths*. The literature on the subject is thoroughly reviewed and criticized. An English résumé is given. J. S. JOFFE

The occurrence of lower Tertiary gaize in European Russia. A. N. SEMICHATOV. *Trans. Inst. Econ. Mineralogy and Petrography* (Moscow) 1925, No. 18, 68-73.—This article supplements the discussion of Samoilov and Rozhkova (preceding abstr.). J. S. JOFFE

The use of a lead plate for finishing microscopic rock sections. A. SHUBNIKOV. *Trans. Inst. Econ. Mineral. and Petrography* (Moscow) 1924, No. 10, 25-6.—Lead plates have the advantages over glass plates of slower wear, the possibility of using one single grade of emery in finishing a section, the possibility of using higher pressure and safety against casual larger sized grains of emery, which imbed in the lead. J. S. JOFFE

Bibliography of the mineral wealth of China. III. C. Y. WANG. *J. Assoc. Chinese Am. Eng.* 6, No. 5, 37-53(1925).—For the period 1918 to 1924. W. H. A.

Chemical analysis of Feng Huang iron ore (WANG) 9. The loess of China (BARBOUR) 15. A support for the condensation of sublimes (BRALY) 1. Analyses of gases from rocks by microchemical methods (METTA) 7.

GOSSNER, B.: *Lehrbuch der Mineralogie*. Leipzig Brandstetter. 404 pp. Reviewed in *Tech. Book Review Index* 8, No. 3, 336(1924).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, ROBERT S. WILLIAMS

The relation between metallurgy and atomic structure. P. D. FOOTE. *Trans. Am. Inst. of Min. & Met. Eng.* 1926, (advance proof), 29 pp.—An address reviewing the quantum theory of atomic structure as it applies at the present to the solid state and to metallurgy. Bibliography. ALBERT THOMAS FELLOWS

Secondary metals in 1924. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S.* 1924, Part I, 119-39 (preprint No. 12, published Feb. 11, 1926). E. H.

Recording alkalinity or acidity of flotation pulp. D. WELGE. *Eng. Mining J. Press* 121, 409 (1926).—The general arrangement of electrodes and ammeter used in detg. the cond. of a mill pulp is shown. Soda is added periodically to the primary cells to secure the desired flotation results and the correct amt. is checked by detg. the cond. of the soln. The size of the plates, and the distance between them are so adjusted that the ammeter registers at about the center of the ammeter scale. W. H. BOYNTON

Selective flotation at Bauer, Utah. EDWARD HODGES ROBIE. *Eng. Mining J. Press* 121, 405-7 (1926).—Flow sheets for crushing, fine-grinding and classification, and Pb and Zn flotation of Pb-Zn ores are shown. The manner of handling the circulating load in the Pb circuit is impressive. The concentrate from the flotation cell fed with middling, together with Pb tailings, is returned to the ball-mill classifier. 90% of the crushed ore passes a 200-mesh screen. W. H. BOYNTON

Effect of cyanogen compounds on the flotability of pure sulfide minerals. E. L. TUCKER, J. F. GATES and R. E. HEAD. *Mining Met. J.* 126-9 (1926).—A table has been established of normal relative flotability for chalcopyrite, chalcocite, bornite and pyrite in distd. water under standard conditions. Cyanide in conjunction with lime produces a more depressing action on pyrite than lime alone. High lime alky. depresses markedly the flotability of chalcocite necessitating close alky. control for elimination of pyrite. The exptl. results indicate a feasible method for the elimination of pyrite during Cu concn. A microscopic study is made of surface effects produced on pyrite by contact with NaCN or other reagents in a flotation cell. W. H. B.

Classification on the Witwatersrand. B. R. BATES. *Trans. Am. Inst. Mining Met. Eng.* No. 1560-B, 11 pp. (Feb., 1926).—The results of tests with cones, straight type and bowl classifiers are outlined and the importance of quality of feed and classifier speed is pointed out. The use of "corduroy" tables and cyanidation on ore crushed to 5-10% plus 60-mesh with a corresponding total of 75-80% minus 90-mesh results in satisfactory recovery. The use of the bowl type as a concentrator is being considered. W. H. BOYNTON

Precipitation efficiency of zinc dust in cyanide solutions. ROBERT LIPSOE. *Trans. Am. Inst. Mining Eng.* 71, 1061-5 (1925).—The presence of Pb is not of importance. There is a distinct relation between pptn. efficiency and fineness; the effect generally can be estd. by examp. the size of metallic particles. H. C. PARISH

Treatment of the telluride-bearing gold ores of the Wright-Hargreaves Mines, Ltd. W. A. MUELLER, J. E. GRANT and C. L. HEATH. *Trans. Am. Inst. Mining Met. Eng.* No. 1549-D, 12 pp. (Feb., 1926).—Au occurring as tellurides is but slightly acted upon by the ordinary cyanide treatment. Flotation of the tailings from the regular cyanidation process, taken directly from the Oliver filters, results in a good sepn. Flotation is materially aided by finer grinding and cannot replace it. Results are tabulated from tests using as feed the pulp pumped from the Dorr classifiers. Straight cyanide treatment fails on the resulting concentrate. Roasting of the concentrate renders the Au sol. A flow sheet of the present mill practice and one rearranged for treating roasted concentrates in circuit are shown. The bromocyanide process shows rapid action and when uniform grade of flotation concentrate is obtained should give even better results than at present. Exptl. data are included. W. H. BOYNTON

Lead in 1924 (smelter report). C. E. SIEBENTHAL and A. STOLL. U. S. Geol. Survey, *Mineral Resources of U. S.* 1924, Part I, 149-64 (preprint No. 13, published Feb. 26, 1926). E. H.

The Durango lead smelter and sulfating plant. E. H. ROBIE. *Eng. Mining J. Press* 121, 288-90 (1926).—A description of operations. A. BUTTS

High zinc in lead blast-furnace slags. F. E. BEASLEY. *Trans. Am. Inst. Mining Met. Eng.* 71, 919-28 (1925).—The ZnO content of Pb blast-furnace slags was increased from 13.5 to 20.0% and the FeO content reduced from 33.5 to 25.6% by the addition of 10 to 12% granulated slag to the roaster charge and improved conditions of the crushing, mixing and roasting of the constituents of the sinter. H. C. PARISH

A zinc-distillation furnace with vertical. ROTT. *Feuerungstechnik* 14, 85-6(1926).—The furnace is oval, 70 by 150 cm. high. They are charged from above and discharged into a tank beneath; thus they save a great deal of labor. They may be made by machine; the method of condensing in a sort of side-neck and is tapped out at the bottom. The method of heating is described.

The theoretical basis for metallurgical zinc production. ERNST JANECKE. *Metall. u. Erz* 22, 316-21(1925).—A diagrammatic presentation of the relations between C, Zn, ZnO, CO and CO₂ at different temp. during Zn distn.

Redistillation of zinc. KURT STOCK. *Trans. Am. Inst. Met. Eng.* 71, 897-918(1925).—A review of redistn. methods in use since this method of producing pure Zn was put into practice.

The outlook for aluminum. R. J. ANDERSON. *Mining Mag.* 34, 137-47(1926).

Studies in copper slagging. F. FREIH. V. CZEDIK. *Metall. u. Erz* 22, 175-9(1925).—The relation between the Cu content of the reverberatory mat and slag in the Mansfeld process was studied in special tests and over a long period of normal operation. The mat generally ranged from 70 to 74.4% Cu and the slag from 2.2 to 4.0% Cu. The Cu content of the slag may increase greatly if the concn. in the mat exceeds 75%.

Utilization of chlorine in recovery of tin and tin salts from tin-plate scrap. C. L. MANTELL. *Trans. Am. Electrochem. Soc.* 49 (preprint) (1926).—In detinning with Cl all humidity must be excluded, to prevent corrosive action of Cl on the Fe. The scrap must also be free of org. substances, and the process cannot be used for unclean scrap. Provision must be made for keeping the temp. of the reaction chamber below 38°, otherwise the Fe will be attacked. In the Goldschmidt process, the material is placed in baskets in large cylindrical containers, and dry Cl is introduced under a pressure of 3.7 atm. at 0°, or 7.6 atm. at 25°. After the reaction is complete, the gases are drawn off along with any volatilized SnCl₄, and the detinned scrap is washed and dried. In the method of Von Schutz, a dry mixt. of Cl and air is drawn through the scrap by suction. Dubois and Kaufman employ Cl in a solvent such as CCl₄. The Sn salts and solvent are recovered by addn. of H₂O or steam, or the soln. of the Sn salts in CCl₄ may be electrolyzed. Other processes are briefly described. In the Cl process the plant cost will vary from \$15 to \$20 per ton of scrap handled for a yearly capacity of 1500 tons to \$8 to \$10 per ton of scrap for a yearly capacity of 10,000 tons. Cl consumption will be approx. 80-100 lb. per ton of Sn plate of the quality used in the manuf. of Sn cans.

Chemical analysis of Feng Huang iron ore. C. WANG. *Science (China)* 10, 951-7(1925).—Forty analyses of this important deposit av. 47.8% Fe. The S is high; working of this ore is declared impracticable.

Desulfurization of spathic iron ore during roasting. A. WEYEL. *Stahl u. Eisen* 45, 1273-4(1925).—Spathic Fe ore from Siegerland, contg. very variable amts. of S, due to its admixt. with Cu and Fe pyrites, loses most of this S on roasting. Samples of the ore having a S content of 2.56-2.64% were ground to particles less than 2 mm. and roasted in an electrically heated oven at temps. of 700°, 800° and 900°. The amt. of S burnt off (as dioxide and trioxide) depends on the temp. and on the time of roasting, but particularly on the former, 800-900° being found most effective. Roasting for 6 hrs. at 800° reduced the S to 0.44% and for 2 hrs. at 900° to 0.48%. The rate of desulfurization is rapid at first, but falls off with decreasing S content. Because of the varying distribution of temp. and other factors, similar quant. results may not hold for large-scale practice. A smaller degree of desulfurization takes place when the hot roasted ore is quenched with water. This is due to the washing out of MnSO₄ formed during the roasting. Five g. of ore roasted at 840° had its S content reduced from 0.564 to 0.055% on washing with 1200 cc. of hot water. The washings contained no metal except Mn. Complete removal of the residual S in this way would require too much water for large-scale work. MnSO₄, however, is completely decomposed at 900°, and the amt. of S left in well-roasted Siegerland spathic Fe ore may be ignored with reference to the limestone required in the smelting furnace.

[Spathic] ore roasting. N. FLEISSNER. *Stahl u. Eisen* 45, 1373-9(1925).—Spathic Fe ore was heated in streams of various gases, and the amts. of CO₂ given off in a given time were measured as a function of the temp. The temp. necessary for the decompn. of the Fe carbonate fell as the partial pressure of the CO₂ was diminished, the effect depending on the nature of the gas used in the following order—water vapor, air, N, CO₂. Decreasing the grain size of the ore increased the rate of decompn. The quicker

results obtained with finely divided material suggested a modification of roasting furnace design and led F. to suggest that the blast furnace may be superseded. The heat set free by the oxidation of FeO to Fe_2O_3 during the roasting process should be made use of in practice to diminish the external heat applied. The method of roasting described may be applied to ores contg. large quantities of FeO , as this is readily reducible if porous. Moreover, contamination of the ore by the ash of the fuel and local heating and formation of lumps are avoided.

B. C. A.

Blast-furnace practice in Alabama. H. E. MUSSEY. *Trans. Am. Inst. Mining Met. Eng.* **71**, 436-52(1925).—A brief summary of existing practice in this district Southern practice tends to carry higher stove temp. than Northern plants as well as a higher blast vol. for a given size of stack. It is thought that still higher stove temp will be maintained with the more thorough cleaning of the gas and adequate stove capacity. This will result in lower fuel consumption and increased production.

H. C. PARISH

Effect of sulfur on blast-furnace processes. T. L. JOSEPH. *Trans. Am. Inst. Mining Met. Eng.* **71**, 453-69(1925).—In charcoal furnaces, about $\frac{2}{3}$ of the S in the materials comes from the charcoal, and about $\frac{1}{3}$ of the total S charged enters the metals. In coke furnaces about 92% of the S comes from coke, but only about 5% enters the metal. Slag carried off 86.7%. The elimination of S, therefore, in coke furnaces is difficult as the allowable % entering the metal is so small. In 1921 S in coke cost the country's resources 3,000,000 tons of fuel. The possibilities of desulfurization by steam are being studied.

H. C. PARISH

The blowing-in methods with a water-jacketed furnace. V. P. SMIRNOV. *J. Russ. Met. Soc.* **1925**, Pt. I, 297-303.—Expts. on the charging of water-jacketed furnaces so as to give max. efficiency of the blowing-in process are described. The ratios of wood, coke and other materials are worked out.

J. S. JOFFE

Economic significance of cyanide accumulation in the blast furnace. R. FRANCHOT. *Trans. Am. Inst. Mining Met. Eng.*, July, 1925, (advance copy) 14 pp.—The reactions occurring in the blast furnace, particularly those involving the oxidation of C and reduction of Fe oxide, are discussed in relation to furnace efficiency. The 2 to 1 ratio of CO to CO_2 in the gas at the top of the furnace is not necessary, since it has been experimentally demonstrated that FeO can be reduced to Fe with a gas contg. more than 50% CO_2 and less than 50% CO , and that hematite and magnetite are reduced at all furnace temps. to FeO by gases contg. much more than 50% CO_2 . The greatest loss in the furnace is that about $\frac{2}{3}$ of the coke C is not converted from CO to CO_2 . That about twice as much coke is required to produce 1 ton of Fe as indicated by heat-developing and heat-absorbing values is attributed to the heat required to vaporize, as cyanide, accumulated alkalis. About 30% of the coke burned in the hearth appears to be applied to cyanide vaporization. Measurements of cyanide concn. in hearth gases have shown this to reach as much as 4% by vol. or 9 lb. of KCN per 1000 cu. ft.

B. C. A.

Temperature and analysis of gases in the throat of a recently constructed blast furnace. H. LENT. *Stahl u. Eisen* **45**, 1149-52(1925). Continuous records were taken of the temp. and compn. of the gases at the middle and circumference of the throat of a furnace having an av. output of 774 tons per day. The temp. in the downcomer, the temp., pressure and quantity of the blast, and the depth of the charge were also recorded. Particulars are given of the compn. and grading of the charge. Contrary to what is supposed from an examn. of the flames, the temp. was higher in the middle of the throat than at the periphery, especially when "chimneys" tended to form in the middle of the furnace. An unsuitable ratio between the fine ore and lump ore charged, caused the latter to roll to the center, thus forming a path of lower resistance for the gas current. The gases from the middle of the throat were 2-3% lower in CO_2 and 3-4% higher in CO . The changes in the gas analysis during tapping are recorded. At the moment of plugging the tap hole the gases were extraordinarily rich and contained 8-9% of H compared with a normal content of 1.5%. The H was formed by the reaction of chemically combined water or ordinary moisture with CO_2 and CO , and may explain some of the difficulty in keeping furnaces damped. A zone of indirect reduction was present in the upper part of the shaft. Uniformity in size of ore lumps resulted in a smaller coke consumption.

B. C. A.

Desulfurization and reduction in cupola furnaces. A. WAGNER. *Stahl u. Eisen* **45**, 1202-5(1925).—A crit. comparison is made of the results obtained with various manganiferous desulfurizing media in cupola practice. The effect is greater the more reducible the Mn oxide used. To det. the possible degree of reduction W. used ferro-manganese blast-furnace slag, which had a higher S content than pure Mn ore, but this

did not affect its desulfurizing power. Expts. were made in 2 cupolas of 480 mm. and 800 mm. diam., resp., with a charge coke percentage of 8.5–9.0. The S in the Fe was reduced 18–36% by the use of the ferromanganese slag, the favorable effect being due to the easy reduction of its MnO content. The use of a forehearth had no effect on the desulfurizing action and the basicity of the slag, but appeared to favor Mn reduction in the furnace. The Mn reduction was independent of the basicity of the slag and increased with the Mn concn. in the burden. The ferromanganese slag raised the Mn content of the Fe, but the Fe loss was greater. A high Mn content in the cast Fe did not appreciably increase the desulfurization. The higher MnO content of the slag protected the Fe from taking up S from the gases, and exerted a greater desulfurizing effect than limestone on charges with high S content. Desulfurization was, however, more certain when fluorspar was used. B. C. A.

New Wüst furnace for refining high-quality cast iron. T. KLINGENSTEIN. *Stahl u. Eisen* 45, 1476–8(1925).—In the production of high-quality pearlitic cast Fe it is difficult to hold the C low and regular in the cupola furnace. Although the C content can be reduced it is at the expense of the temp. of the molten Fe, and when tapping small quantities the compn. is irregular. The Wüst oil-fired flame cupola furnace is designed to overcome these difficulties. The oil burner is at one end and the charging shaft at the other. The flame licks the bath and meets the bottom end of the charge column. The exhaust gases are used to preheat the blast to 400–600°. The fuel is tar oil; 2% of lime is added to the charge and no coke is used. With an output of 1020–1125 kg. per hr. the total oil consumption was 8–10%, the Fe being tapped at 1500–1600°. The S content is low, and the finely divided graphite is more like temper C. B. C. A.

The calculation of charges of the ore scrap-iron open hearth (Martin) process. C. I. SHARASHKIN. *Trans. Inst. Exp. Silicates (Russian)* 1923, No. 6, 1–31.—This is a discussion of the metallurgical principles involved in the Martin process. Many analytical data on various charges with a diagram of the changes taking place are given. J. S. JOFFE

Making rimmed steel. CARL PIERCE. *Trans. Am. Inst. Mining Met. Eng.*, Feb., 1926, No. 1563-C, 11 pp.—P. deals with the manuf. of rimming steel by the open-hearth process, and with lower-C steels, such as sheet bar, rivet stock, skelp, etc. Materials of known compn. must be used, a satisfactory mix made, and enough pig iron charged to insure heats that will not melt soft. Working and tapping temps., proper shaping of the slag and slow pour are essential. The steel must contain sufficient CO to produce the rimming effect. The finished steel should preferably contain only a trace of Si, and for soft steel 0.08–0.10% C and 0.30–0.35% Mn. W. H. B.

Elimination of metalloids in the basic open-hearth process. J. L. KEATS AND C. H. HERRY, JR. *Trans. Am. Inst. Mining Met. Eng.*, Feb., 1926, No. 1550-C, 28 pp.—Very complete exptl. data obtained in a 100-ton (90,909 kg.) stationary furnace are given. The charge consisted of scrap, pig iron, dolomite, ore and spar. Accurate record was kept of the wts., the temps., sampling of metal and slag, and the rate of elimination of C, Mn, P and S. Wide variations in compn. of the bath, from door to door, occur right after ore addns., while the compn. becomes uniform under finishing conditions. It is probable that the gas given off from the decompn. of the limestone desulfurizes the bath. Erosion of the furnace lining is dependent, for a given amt. of slag, primarily on the SiO₂ content and the fluidity of the slag. The rate of soln. of lime from the limestone into the slag is dependent, under the same conditions, on the fluidity of the slag and on its Fe oxide and SiO₂ content. The rate of elimination of metalloids is mainly controlled by the fluidity of the slag. Numerous tables and curves are included. W. H. BOYNTON

The Krupp nitrogen process for case hardening. AD. FRY. *Krupp Monatsh.* 7, 17(1926).—Detailed description profusely illustrated. C. G. F.

Temper carbon and iron graphite as identical forms of carbon. A. LISSNER AND R. HORNBY. *Stahl u. Eisen* 45, 1297–301(1925).—The chem. behavior of graphite from gray Fe and temper C pptd. during the annealing of white Fe has been compared, and the conclusion is drawn that the 2 forms of C are identical. Both give graphitic acids of the same compn.; neither is attacked by fused Na₂SO₄, and both resist the action of HNO₃ and of a mixt. of HNO₃ and H₂SO₄. Because of its more finely divided condition, temper C ignites at a lower temp. than Fe graphite, but both have the same heat of combustion. B. C. A.

Austenite and austenitic steels. J. A. MATHEWS. *Trans. Am. Inst. Mining Met. Eng.* 71, 568–96(1925).—See C. A. 19, 3457. G. F. C.

Inspecting and testing automobile axles. R. L. ROLF. *Blast Furnace and Steel Plant* 13, 386–91, 418(1925).—A general discussion of the chem., mech., microscopic,

and deep-etching methods of testing axes. The usefulness of the results obtained is emphasized, and the article is well illustrated by photomicrographs and photographs of machines, etc. G. F. C.

Finishing melting temperatures of simple ingot steels. H. D. HIBBARD. *Trans. Am. Inst. Mining Met. Eng.* 71, 476-506 (1925).—The compn., casting temp., and rate of teeming det. the quality of plain C steel. There is an ideal pouring temp. for any given ingot of steel, although a different temp. may give serviceable metal. Casting steel too hot causes concn. of impurities along grain boundaries and cracking during hot-working. The effects of Mn and Si on the fusion temp. are negligible, but the tapping temp. becomes lower as the C content is raised, being 1615° with 0.1% C, and 1475° with 1.5% C, if no alloys are melted in the ladle, and teeming is not delayed. A table of tapping and teeming temps. for steels with various C contents is given. Variations of even 10° affect the quality somewhat. The hottest steel in the ladle is at the top, and is teemed last; hence there is little change of temp. during teeming. Pyrometers are not necessary in steel melting, for skilled melters judge the temp. accurately in other ways. The best casting temp. is generally the lowest possible without leaving too much solid steel in the ladle. Caspersen's results published in 1882 are discussed, but are not applicable to present American practice. Pure killed steel of over 0.1% C may be cast very hot without injury. This is common European practice, using small nozzles. Casting effervescing steel too hot impairs the effervescence, so that some gas, probably H, is not removed and causes skin holes. At lower temp. the steel dissolves less gas, so that when cast the H does not sep. until several in. of sound steel have solidified around the sides of the mold. The failure of very hot steel to effervesce properly may be due to a decompn. of CO by Mn at the abnormally high temp. In discussion, A. Sauveur stated that a high teeming temp. produced coarser dendrites only because the mold became hotter, and did not necessarily injure the steel. H. Stern said no steel should contain blowholes, questioned the presence of H in them, and denied the power of Mn to reduce CO. G. V. Luerssen presented the temp. of skull formation for a series of steels, the values being 9° to 28° below the author's ideal teeming temp. The skull temp. was about 10° above the Fe-C liquidus. Various opinions were expressed regarding the value of optical pyrometers in open-hearth work. L. F. Reinartz defended the use of effervescing steel. H. Le Chatelier stated that the tapping temp. of one heat may vary 50°, but the temp. in the ladle is more uniform and more important. The melting temp. may affect the size of the solid dendrites. W. J. Priestley reported tapping and teeming temps. somewhat lower than the author's but showing the same variation with C content. Molten steel should not be hotter than necessary to flux out the non-metallic inclusions, on account of absorption of gas at higher temp. H. W. Gillett quoted some measurements by Popp of German tapping and teeming temps. that were 30° to 80° higher than the author's. I. A. Billiar reported temps. of 0.48% C and 0.70% C heats that agreed with the author's in tapping, but were lower in teeming. Differences of 28° in casting temp. are negligible, other variations in practice being much more important. W. P. Barba considered that the proper pouring temp. depended on so many factors that no definite value could be fixed. J. Strauss questioned any effect of 10° variations in casting temp., and doubted that casting too hot was ever truly harmless. Hot tapping, cooler teeming and rapid solidification were advocated. H. H. Smith favored the practical test for fluidity. The author in reply emphasized the usefulness of effervescing steel for boiler plate, high-finished sheets, and welded tubes. G. F. C.

An examination into the causes of the failure of steel rails. E. A. DANCSTER. *Ind. Chemist* 1, 441-8 (1925).—A record of the make, years of service and traffic carried has been kept for a number of fractured rails. Photographs of sections deep-etched with H₂SO₄ show most failures are due to flaws from pipes in ingot. When sound rails fail it is nearly always at the first fish-bolt hole at the leading end. The wearing qualities increase about with the square of the C content between 0.30 and 0.55%. Small grained, ductile metal is desirable. E. L. CHAPPELL

Fatigue failures in steel. F. W. ROWE. *Metal Ind. (London)* 28, 157-9, 185-6 (1926); cf. C. A. 20, 1203.—The fatigue strength is independent of the rate of alternation of the stress. Hollow forgings have good fatigue resistance, are readily heat-treated, and are free from axial defects. Several fatigue failures are described and illustrated. A soft steel shaft with too coarse structure and low yield point failed because the bearings were out of line. Its endurance limit was found to be above the yield point in tension. A gear pinion whose teeth broke in service was found to have been badly machined, and not well heat-treated, having a very coarse grain. A Diesel engine shaft failed too soon on account of poor structure, but the design also was at fault.

The periodicity of the vibrations of a shaft should not synchronize with the pulsations of the engine. G. F. C.

Factors other than dissolved oxygen influencing the corrosion of iron pipes. J. R. BAYLIS. *Ind. Eng. Chem.* 18, 370-80(1926).—The max. iron concns. reached in natural waters contg. CO_2 and Ca salts are much less than the theoretical soly. of $\text{Fe}(\text{OH})_3$. Data on the soly. of FeCO_3 in the presence of CaCO_3 are given. Continuation of corrosion under rust layers depends on the diffusion of sol. iron chlorides and sulfates. Pitting occurs under breaks in an impervious rust membrane. Some iron oxides are magnetic and cling to the metal surface. E. L. CHAPPELL

Corrosion of an ancient tin specimen. C. O. BANNISTER. *J. Inst. Metals* 1926, (advance copy), 2 pp.—Ancient tin articles are seldom found, the metal being unstable below 18° . A medieval English scabbard was 99.98 tin covered by 2.5 mm. of adherent stannic and hydrated stannous oxide. There was little loss in wt. on heating, 5.1% water being driven off, and 4.51% O absorbed. E. L. CHAPPELL

Snead electric heat treating and annealing process. C. C. WAITE. *Metal Industry* (N. Y.) 23, 441-3(1925).—A description with photographs of a direct elec. heat treatment method for tubes, rods and strip. The process consists of passing an elec. current through the mass of the work, the resulting heat being due to its own elec. resistance; the temp. is detd. and controlled by expansion. The application to admiralty brass condenser tubes is detailed. W. A. MUDGE

Eutectic patterns in metallic alloys. C. H. GREEN. *Trans. Am. Inst. Mining Met. Eng.* 71, 651-68(1925).—Excellent photomicrographs of 16 eutectics are presented. In most instances some primary crystals were obtained, as a result of segregation or supercooling of the melt. Portevin's classification (cf. C. A. 17, 1940) is quoted and illustrated by examples, which are discussed. A revised classification is suggested, as follows: Type 1, regular crystals. Type 2, dendrites or skeleton crystals, Bi-Pb, Bi-Sn, Pb-Te. Type 3, colonies or complex grains, Cd-Sn, Cd-Zn, Mg-Sn, Pb-Sn, Al-Zn, etc. Type 4, conical arrangement, Sn-Zn, Sb-Te, Bi-Te. In discussion, C. Benedicks explained the structure of the Cd-Zn and white-cast-Fe eutectic as due to the fact that the fine part froze first and quickly, and the liberated heat of solidification made the coarser part freeze more slowly. G. E. Dalbey described a special habbitt of unusually fine and uniform structure. G. F. C.

Etching aluminum and its alloys for macroscopic and microscopic examination. F. B. FLICK. *Trans. Am. Inst. Mining Met. Eng.* 71, 816-27(1925).—Solns. of NaOH or HF are not always satisfactory for showing the grain size of Al alloys, as tarnished surfaces may be obtained. HF in alc., followed by concd. HCl, has given better results. A soln. of 10 cc. concd. HF and 15 cc. concd. HCl in 90 cc. water was very satisfactory. The specimen is first cleaned with alc. Etching takes 30 to 90 sec. If a black coating is formed by Cu in the alloy, it is removed by concd. HNO_3 . Illustrations show excellent results at magnifications up to 10 diam. The reagent is also suitable for microscopic etching. S. Daniels found it satisfactory and very rapid, 5 sec. etching being sufficient for Al contg. 4% Cu, 2% Ni and 1.5% Mg. G. F. C.

The development of the process of thermal improvement of technical alloys of aluminum. P. ASSMANN. *Metall u. Erz* 22, 506-11(1925).—A review, referring especially to the effect of Si, Mg and Li upon Al alloys. C. G. KING

Casting and heat treatment of some aluminum-copper-magnesium alloys. SAMUEL DANIELS, A. J. LYON AND J. B. JOHNSON. *Trans. Am. Inst. Mining Met. Eng.* 71, 864-88(1925); cf. C. A. 19, 1844.—D. Hanson and M. L. V. Gavler in discussion stated that heat-treated sand castings of Al alloys with 4% Cu showed over 5% elongation, instead of 1.5% as found by the authors. The alloy showing the best combination of strength and ductility contained amts. of Cu and Mg_2Si close to the limit of solid soly. at high temp. The alloys should be quenched from the temp. giving max. supersatn. of the solid soln. There is a best aging temp. and time for each alloy. The elongation of duralumin is reduced by aging at 200° for over 2 hrs. The "Y" alloy contg. 4% Cu, 2% Ni, and 1.5% Mg is stable at 167° . Chill castings contg. 4 to 5% Cu are improved in strength and ductility by annealing for 2 days at 500° and cooling in air. Aging at room temp. is largely due to Mg_2Si , and the effect of CuAl_2 is greater at higher temp. G. F. C.

Bronze welding cast iron pipe. H. Y. CARSON. *Acetylene J.* 27, 429-35(1926).—Results of various tests and proper methods of welding are set forth in detail. W. B. PLUMMER

The effect of heat of bronze welding on cast iron pipes. ARTHUR R. LYTLE. *Acetylene J.* 27, 325-37(1926).—A discussion with 35 photomicrographs. W. B. P.

Welding steel tubing and sheet with chromium-molybdenum welding wire. S. T.

SISCO AND H. W. BOULTON. *Acetylene J.* 27, 377-483, 410-4 (1926).—In welding Cr-Mo steel seamless tubing or Cr-V sheet steel, a Cr-Mo welding wire (0.28% C, 0.61% Mn, 1.14% Cr, 0.95% Mo) gives a more uniform and generally desirable weld than plain low-C wire. In welding Cr-Mo tubing to plain steel tubing, plain steel welding wire should be used. Welded Cr-Mo tubing has a soft area about the weld, due to local annealing, which should be removed by heat treatment. Detailed results of strength tests on welded tubes and many photomicrographs of welds are given. The effects of heat treatment after welding are discussed in detail. W. B. PLUMMER

The effect of rolling on the crystal structure of Al (OWEN, PRESTON) 2. Apparatus for treating roasted ore with liquids (Brit. pat. 237,571) 1. Filters for metallurgical solutions (U. S. pat. 1,574,556-7-8) 1. Lacquering, drying and "blueing" apparatus (Brit. pat. 237,581) 1.

GUILLET, L. and PORTEVIN, ALBERT: *Précis de metallographie microscopique et de macrographie*. 2nd Ed. revised. Paris: Dunod. 340 pp. Fr. 65. Reviewed in *J. Inst. Metals* 33, 617 (1925).

MUNDEY, A. H.: *Tin and the Tin Industry*. The Metal History, Character and Application. London: Sir Isaac Pitman & Sons, Ltd. 3s.

Froth flotation separation of ore constituents. R. ELLIS. U. S. reissue 16,270, March 2. See original pat. No. 1,425,186 (*C. A.* 16, 3300).

Filtering and thickening apparatus for treating ore slimes, etc. A. L. GENTLE. U. S. 1,575,907, March 9.

Dry reduction of iron ore. P. FARUP. U. S. 1,574,382, Feb. 23. In dry reduction by means of CO the reduced mass is cooled in an atm. contg. only a relatively small proportion of CO to avoid undue disintegration or dusting.

Dehydrating zinc ore pyrite concentrates or other mineral substances. W. R. WADE. U. S. 1,574,950, March 2. The material is allowed to fall through a furnace flue in contact with hot combustion gases and an air blast.

"Beneficiating" oxidized iron ore. C. P. MCCORMACK. U. S. 1,575,852, March 9. An oxidized Fe ore or metal-bearing product contg. Al is roasted with Na_2CO_3 so that a regulated amt. of the Al present is converted into a H_2O -sol. Na salt, which may be leached out.

Recovering magnesium and aluminum from scrap metal. A. BECK. U. S. 1,576,080, March 9. The metal to be treated is melted, MgCl_2 is added to it together with one or more substances such as MgO and CaF_2 which act as thickening agents on the MgCl_2 , the materials are stirred together and the molten metal is sepd.

Separating copper and nickel. S. GIERTSEN. U. S. 1,575,160, March 2. In order to sep. Cu from solus. contg. both Cu and Ni, they are treated with bessemerized Cu-Ni mat contg. not more than about 10% S.

Metallic gallium. S. BOYER. U. S. 1,576,083, March 9. A film of a halogen compd. is formed on the surface of a charge of metallic gallium to be purified, e. g., by treating the metal with HCl , and the charge is heated *in vacuo* to a temp. at which the film is volatilized (about 500° with chloride). This serves to produce bright clean metal.

Recovery of by-products from metals heated in retorts. H. W. TUTTLE. U. S. 1,574,137, Feb. 23. Gases and fumes such as those given off from smelting Zn ores are passed through a gas filter and passage closed to air, to sep. solids from the gases without oxidation of the latter.

Arsenic and tin. J. A. LAHEY. U. S. 1,575,217, March 2. A soln. obtained by treating scrap metals or ores or other soln. contg. As and Sn in the form of oxysalts is cooled to effect crystn. of As salts while the Sn salts remain in soln. for subsequent recovery. Sb salts may be sepd. from the soln. by sedimentation.

Refining lead. H. HARRIS. U. S. 1,573,830, Feb. 23. Molten Pb, at a temp. not over about 500° , is brought into intimate contact with a molten reagent comprising molten caustic alkali, which also may contain NaCl , and NaNO_3 or other suitable oxidizing agent is then added in such a limited amt. as to produce substantially no Pb oxide or alkali oxysalt of Pb in the resulting melt. This treatment serves to remove As, Sb, etc.

Rotary furnace adapted for metallurgical purposes. A. H. PEHRSON. U. S. 1,574,932, March 2.

Open-hearth furnace. J. D. JONES and E. E. LITZ. U. S. 1,575,000 March 2

Open-hearth furnace. G. L. DANFORTH, JR. U. S. 1,574,797, March 2.

Furnace for roasting ores. H. H. BUBAR. U. S. 1,576,033, March 9.

Apparatus for separation of gold, silver and copper ores, etc., by flotation. S. E. MEYER. U. S. 1,574,403, Feb. 23.

Apparatus for refining or separating molten lead, etc. H. HARRIS. U. S. 1,573,829, Feb. 23.

Metal chip briquets for use in cupola furnaces. G. E. GAIL, JR. U. S. 1,574,878, March 2. Dried compacted briquets are formed of chips of cast-Fe scrap or other metal and a water-glass binder applied to the material in dil. soln. The briquets withstand high temps. without premature disintegration.

Casting silicon-iron. RHEINISCHE EISENGIESSEREI & MASCHINENFABRIK AKT.-GES. Brit. 237,554, July 26, 1924. For casting Fe contg. 10% or more Si, heated molds are used. For Fe with 10% Si, temps. of 350–500° and for 20% Si a temp. of 150° for the molds may be employed.

Cast iron containing nickel and chromium. J. C. HENDERSON. U. S. 1,573,937, Feb. 23. In prepg. metal contg. definite quantities of Ni and Cr, an alloy of Fe, Ni and Cr, high in C and of relatively low m. p. contg. more Ni than Fe and Cr together (e. g., an alloy of Ni 60, Fe 27, C 1 and Cr 12%) is combined with molten Fe in a ladle.

Preventing adhesion of iron, steel or other metal plates. S. T. G. SMITH. U. S. 1,574,131, Feb. 23. Barytes is placed on the surfaces of metal plates when rolled or annealed.

Non-magnetic steel. H. BECKER. U. S. 1,574,782, March 2. A non-magnetic steel having a high yield point and elongation in normal condition comprises Mn 6–15, Ni 17–4 and Cr or metals of similar properties up to 10%.

Rolling hollow steel. E. BUMFORD. U. S. 1,574,551, Feb. 23. A hollow blank is filled with CaC_2 , rolled and the CaC_2 then removed by the action of H_2O .

Pot or crucible for heat treatment of high-speed tool steels. A. E. BELLIS and C. S. COLLINS. U. S. 1,573,535, Feb. 16. A pot or crucible adapted for holding a heat transfer bath such as a salt soln. has a wall formed of ferrous metal contg. not more than 2% each of C, silicates, aluminates or other basic impurities and capable of withstanding a temp. of 980° or higher without releasing impurities from the wall into the bath soln. The soln. is thus maintained inactive with respect to the metal being treated.

Heat-treating iron castings. W. J. DIEDERICHS and A. HAYES. U. S. 1,574,374, Feb. 23. Castings from white cast Fe are heated to above the crit. temp. for 15 min. to 5 hrs. or more but only until the Fe carbide present is practically all absorbed in the solid soln. (the combined C being generally reduced to about 0.9%) The castings are then cooled successively to a lower temp. near the crit. temp. and then to room temp. U. S. 1,574,375 specifies heating above the crit. temp., cooling to a temp. considerably below the original crit. temp., reheating to cause further structural and chem. changes and then cooling slowly at the rate of about 5° per hr. U. S. 1,574,376 specifies a process similar to that of U. S. 1,574,374 with a final cooling at a rate not less than about 7° per hr.

Heat treatment of iron castings. W. J. DIEDERICHS and A. HAYES. U. S. 1,574,377, Feb. 23. Castings of white cast Fe are heated to above the crit. temp., cooled by quenching to a temp. considerably below the original crit. temp., reheated to effect further chem. and structural changes, and then cooled to stop the changes.

Silicon iron (magnetic alloy). V. B. BROWNE. U. S. 1,574,550, Feb. 23. In making Si-Fe contg. sufficient Si to adapt it for use as a magnetic alloy and not over 0.03% C, the C in the refined Fe is reduced by adding Fe ore to the bath until no further reduction of C is obtained by further addn. of ore; sufficient ferro-Si is added to produce the necessary heat to maintain the metal molten during a Bessemer blow, the metal is transferred to a Bessemer converter and over-blown to remove the Si which has been added and substantially all the remaining C, and is then transferred to a ladle and the necessary Si is added. Cf. C. A. 20, 735.

Alloys for bearings. METALLBANK UND METALLURGISCHE GES., AKT.-GES. Brit. 237,583, July 25, 1924. Bearing alloys comprise Pb and alkali metals with or without alk. earth metals. Li 0.1 and 0.5 or less Na may be present. K 0.1% or less and 0.5% of an alk. earth metal may be present as may also small quantities of Cu, Ni, Co, Zn, Mg, Bi, Cd, As, Sb, Sn, Al, Si, Se, P or S.

Treating fumes from smelting copper alloys. L. LO CASCIO and B. BRUZZONE. Brit. 237,232, July 20, 1924. Gases evolved from an externally heated furnace for extg. Cu from its alloys are passed first through a steam generator in which the waste heat is utilized and then through a filter for recovery of ZnO . An app. is described.

Osmium alloy. E. HAAGN. U. S. 1,574,966, March 2. An alloy for pen points

which is non-fibrous and of greater hardness than the natural Os-Ir alloy occurring in Pt ore comprises Os 85 together with Pt 10 and Rh 5%.

Purifying molten metals. F. M. BUCKER. Brit. 237,088, July 9, 1924. An Fe-Cr alloy may be treated with an alloy of Pb 92 and Mg 8%. Other purifying mixts. comprize Mg shavings, Pb shot and powd. Mn-Si, briquetted together; Mn-Si in an alloy of Pb 56 and Mg 17 parts; ferro-Mn in an alloy of Pb 33 and Mg 16 parts; and Mg shavings with Mn-Si.

Dental alloy. C. C. VOGT. U. S. 1,574,714, Feb. 23. An alloy of Ag, Cu and Sn with Cr, W, V, Mn, Mo or Ta is prepd. for forming dental amalgams with Hg.

Salt mixtures for heat treatment of metals. BELLIS HEAT TREATING CO. Brit. 237,337, April 22, 1924. A fused mixt. of NaCl 39 and Na₂CO₃ 61% or other "eutectic" mixt. is used for heat treatment of steel having a C content of 0.4% at a temp. of about 815°. CaCl₂ 71 and NaCl 29% also may be used.

Heat treating of magnetic materials. D. S. O'DONOVAN. U. S. 1,575,178, March 2. Mech. and magnetic features of material handling during heat treatment.

Tempering metals. J. W. VANMETER. U. S. 1,573,784, Feb. 16. Internal-combustion engine cylinders or other articles to be tempered are heated in a non-oxidizing atm., and, while excluding air, are treated under pressure, with products generated from Cl, sawdust, Fe filings, NaCN and C₂H₆ or other hydrocarbon.

Pickling metal. W. C. KRONQUEST. U. S. 1,574,823, March 2. Sheet steel strips or other metal articles are immersed in an aq. soln. of H₂SO₄ or other acid and electrolyzed as anode, with an inert cathode such as Pb.

Apparatus for casehardening small articles. G. A. H. MEKER. U. S. 1,575,633, March 9.

Tin plate. G. M. HARRIS. U. S. 1,576,274, March 9. Plates, after hot rolling, are black annealed, black pickled and swilled, dried at a temp. not substantially over 100°, cold-rolled and then prepd. for tinning and tinned.

Apparatus for annealing the ends of pipe. C. W. BARDEEN. U. S. 1,575,087, March 2.

Soldering aluminum. E. CONTI. Brit. 237,224, July 21, 1924. A solder is formed of Sn 52-66, Zn 23-46 and Cd 2-11% and to a fused mixt. of these metals there is added NaCl, NH₄Cl or alum.

Welding different metals to each other. F. JORDAN. Brit. 237,072, June 20, 1924. Fe and Al bands from sep. spools are heated to about 350°, rolled together and welded by rolling again at 550°. In welding Al and Zn bands together, the Zn is heated to 250° and the Al to 450° and the welding is effected in a single operation.

Attaching labels to aluminum ware. A. M. HAGEMAN. U. S. 1,573,826, Feb. 23. A portion of the surface of the ware is heated to roughen it so that it will retain an adhesive.

Ingot mold. E. GATHMANN. U. S. 1,573,486, Feb. 16.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Pyrogenic acetylene condensations. Cuprene-tar. P. SCHLÄPFER AND O. STADLER. *Helvetica Chim. Acta* 9, 185-99 (1926).—Cuprene (also known technically as Carben), and consisting principally of rather unreactive and insol. solid hydrocarbons, is obtained catalytically by passing technical C₂H₂ over Cu at 300°; it is accompanied by a tarry by-product and satd. and unsatd. gases. The reaction yields 75-80% cuprene, 5.5-7% tar, and 13-17% gases. Cuprene-tar is a greenish blue liquid, d. 0.878-0.910. It is strongly unsatd., neutral and consists almost entirely of aromatic and aliphatic hydrocarbons. The material was fractionated at 12 mm. up to 70°; then at 0.3-0.5 mm. All but 1.6% distd. below 220°. Fractional distn. and treatment with concd. H₂SO₄ and Br show that the tar consists mainly of satd. aromatic hydrocarbons, especially of the C₆H₆ and C₁₀H₈ series, with small quantities of anthracene derivs. The C₆H₆ and C₁₀H₈ nuclei are substituted by one or more Me, Et and seldom Pr groups. Next in importance are olefins and styrenes. Hexylene, heptylene and octylene were identified. Small quantities of paraffin hydrocarbons were found in the lower fractions. The fraction b.p. 85-125° contains a very small quantity of a blue substance, of unsatd. hydrocarbon nature. In washing the cuprene-tar with concd. H₂SO₄, some condensation takes place by addn. of the aromatic hydrocarbons to the olefins. E. H. V.

The alcoholates of magnesium and their application to the synthesis of alcohols.

II. Tests with isobutyl and isoamyl alcohols. M. A. TERENTIER. *Bull. soc. chim.* 37, 1553-7(1925); cf. *C. A.* 19, 633.—By passing the vapors of primary alcs. over Mg, heated to 250–300°, Mg alcoholates are obtained. By passing over these alcoholates alc. vapors at 360–400° there are formed condensed alcs. with double the no. of C atoms in the original alc. (cf. Terentier, *C. A.* 19, 633). The present article has to do with iso-Bu and iso-Am alcs. For a detailed study of iso-AmOH cf. Guerbet, *Bull. soc. chim.* 21, 437, and Nef, *Ann.* 318, 137. Dehydrated iso-BuOH vapors, passed over powd. Mg at 280–300°, yield (iso-BuO)₂Mg as a white, infusible powder. By passing iso-BuOH vapors over this alcoholate, for 3–5 hrs. at 380–410°, a condensation of the alc. with the alcoholate is effected. At a temp. higher than 380°, the b. p. of the alc. falls from 108–9° to 96–7°, in consequence of the formation of iso-PrCHO as an intermediate product. The solid residue from this reaction is largely Mg(OH)₂. The liquid product represents 60–70% of the original alc. and yields, upon rectification, the following substances: (1) A few drops of iso-PrCHO, b. 61°, recognizable by its odor and its color with Schiff's reagent. (2) (iso-Pr)₂CO (probably), b. 124–6°, d_4^{20} 0.8087, and n_D^{20} = 1.4007. (3) A fraction b. 147–50° (about 10% of the original alc.), consisting principally of iso-BuO₂CCHMe₂, b. 149°, d_4^{20} 0.8475 and n_D^{20} 1.4010. (4) A fraction b. 155–70° (about 5% of the original alc.). Its principal fraction, b. 164–70°, n_4^{20} 1.426 and d_4^{20} = 0.8232, corresponds to C₈H₁₈O and is probably diisobutyl alc., Me₂CHCH₂CM₂CH₂OH. (5) Higher fractions, b. 170–205°. One substance has been isolated (about 5% of the original alc.), b. 199–202°, n_D^{20} 1.4208, d_4^{20} 0.8545, corresponding to octyl isobutyrate, Me₂CHCO₂CH₂CM₂CH₂CHMe₂ (I). The Me₂CHCHO formed in the 1st fractions of distillation as an intermediate product, condenses on itself to form Me₂CHCO₂CH₂CHMe₂. Also this aldehyde reacts with Mg(OCH₂CHMe₂)₂ to form octylic aldehyde, which condenses with Me₂CHCHO to form I. This I in turn reacts with Mg(OH)₂, giving the corresponding octyl alc. and the (Me₂CHCO₂)₂Mg and, finally, the latter decmps. to MgCO₃ and (Me₂CH)₂CO. iso-AmOH, similarly treated, reacts normally with Mg, yielding a decylic alc., b. 210–3°, n_D^{20} 1.480, d_4^{20} 0.8322. H. W. GIBSON

Some experiments on the assimilation hypothesis. D. VORLÄNDER. *Ber.* 58B, 2656-8(1925).—V. has attempted to det. whether it is possible to synthesize HCHO from CO₂ and H₂O in the light without the intervention of protoplasm or organized matter by using dimethylhydroresorcinol (I) to detect any HCHO formed and to remove it from the field of action and thus render the reaction irreversible (the compd. which I forms with HCHO is sol. only to the extent of about 0.0005 g. in 100 cc. satd. aq. soln. at 19° and even less in the presence of excess of I). Thus far he has not been able to detect the formation of any HCHO, even after weeks of illumination with the ultra-violet light from a Hg-quartz arc light or after months with sun- and daylight, in satd. solns. of I in a current of CO₂ and contg. various added substances (UO₂SO₄, Ce carbonate or chloride, Ti sulfate, FeSO₄, C₃H₅N, etc.). Both the solid I and its aq. solns. are stable indefinitely when protected from the air, but in the air, more rapidly with H₂O₂ or O₃, the reagent gradually oxidizes to dimethylglutaric and *asym*-dimethylsuccinic acid; with O₃ in Na₂CO₃ is formed a Na₂CO₃-sol. monobasic acid, m. about 142°, forming with PhNHNH₂ a dark red compd. m. around 180°. C. A. R.

Natural oleic acid. A. LAPWORTH, E. N. MOTTRAM AND MRS. L. PEARSON. *Food Investigation Board, Report for the year 1924. Dept. Sci. Ind. Research* 1925, 68; cf. *C. A.* 19, 1851, 1930. L. W. RIGGS

Thermal decomposition of unsymmetrical diacyl peroxides. FR. FICHTER AND HANS ERLÉNMEYER. *Helvetica Chim. Acta* 9, 144–52(1926).—F. and E. aimed to discover the mechanism of the thermal decompn. of diacyl peroxides to give hydrocarbons. They have shown that the decompn. by heat at the explosion temp. is represented by RCOO.OOCR = R.R + 2CO₂ (I). This formation of the hydrocarbon may take place by the intermediate decompn. into CO₂ and the free radicals R, followed by polymerization of the 2 radicals: RCOO.OOCR = R + 2CO₂ + R (II); R + R = R.R (IIa). AcO.OBz, when exploded in a bomb at 200°, without a solvent, gives PhMe, which decmps. further to C₆H₆, Ph₂ and C₆H₅. A mixt. of (AcO)₂ and (BzO)₂, heated similarly, gives no PhMe, but C₆H₆ and much more Ph₂ than AcO.OBz. (AcO)₂ and I when exploded give no MeI. Ph₂ at 500–600° gives C₆H₆ and some Ph₂C₆H₅; the same products are obtained from (BzO)₂. These expts. show that in such thermal decmps. the alkyl or aryl radicals do not become free, but remain in their original spheres of attraction. E. H. VOLWILER

Ethers derived from propylene chlorohydrin. A. DEWAEL. *Bull. soc. chim. Belg.* 34, 343–6(1925).—MeCHClCH₂OMe, from MeCHClCH₂OH (I) and Me₂SO₄,

b_{768} 98–9°, d_{20} 0.9946, n_D^{20} 1.40754, some $\text{CH}_3\cdot\text{CClMe}$ being a by-product of the reaction. $\text{MeCHClCH}_2\text{OEt}$, from **I**, EtOH, and H_2SO_4 , b_{768} 116–7°, d_{20} 0.9828, n_D^{20} 1.41285. $\text{MeCHClCH}_2\text{OPr}$, by mixing **I** with SO_2Cl_2 and addn. of PrOH , b_{768} 139°, d_{20} 0.9399, n_D^{20} 1.41912. $\text{MeCHClCH}_2\text{OCH}_2\text{CH}_3$, from **I**, $\text{CH}_3\cdot\text{CHOH}$, and H_2SO_4 , b_{768} 142–3°, d_{20} 0.9683, n_D^{20} 1.42887. ($\text{MeCHClCH}_2\text{O}$)₂, by heating **I** with SO_2Cl_2 , b_{768} 188°, d_{20} 1.109, n_D^{20} 1.44675. W. B. PLUMMER

Some derivatives of dipropyl ketone. LOUIS MATHUS AND FERNAND GIBON *Bull. soc. chim. Belg.* **34**, 303–13 (1925).—Various compds. have been prepd. during attempts to prep. 3,4-heptanediol (**I**) from Pr_2CO (**II**). Reduction of **II** to Pr_2CHOH (**III**) and dehydration of **III** gave 3-heptene (**IV**), b_{768} 95.8°, d_{20} 0.7016, n_D^{20} 1.40419, all attempts to sep. **IV** into 2 isomers failed. Esterification of **III** gave 4-bromoheptane, b_{11} 55°, b_{760} 159–60°, d_{20} 1.1389, n_D^{20} 1.4472, and 4-chloroheptane, b_{768} 144–5°, d_{20} 0.8619, n_D^{20} 1.4199. From **IV** were prepd. 3,4-dibromoheptane, b_{11} 98–9°, and 3,4-dichloroheptane, b_{760} 179–81°, d_{20} 1.0260, n_D^{20} 1.45036. With HOCl **IV** gave a mixt. of the 2 isomeric chlorohydrins, from which mixt. solid KOH formed 20% of the corresponding oxide $\text{EtCH}\cdot\text{CHPr}\cdot\text{O}$, b , 131–2°, d_{20} 0.8338, n_D^{20} 1.4134, but which could not be con-

verted into **I** by hydrolysis. **I** was, however, obtained in small yields from the foregoing mixt. of chlorohydrins by refluxing with $\text{AcOK} + \text{AcOH}$ and finally sapon. with NaOH , b , 98–9°, b_{761} 212°. Further expts. indicate that the bromoheptanes are subject to isomerization in the sense $4\text{-Br} \rightarrow 3\text{-Br} \rightarrow 2\text{-Br}$. W. B. PLUMMER

Chemistry of the higher fungi. XVIII. Muscarine question. BRUNO GUTH *Monatsh.* **45**, 631–48 (1925).—Choline gives a HCl salt which could not be completely dried; the chloroplatinate (**I**), m . 242°, the chloroaurate (**II**), m . 250° and is stable only when pure. HgI_2 first ppts. an amorphous compd., changing to the cryst. $\text{C}_6\text{H}_{14}\text{NOI}\cdot 2\text{HgI}_2$, light yellow, dissociated by boiling H_2O . In EtOH HgCl_2 gives the salt $\text{C}_6\text{H}_{14}\text{NOCl}\cdot \text{HgCl}_2$, m . 170°; recrystn. from H_2O or dil. EtOH gives a salt with 67% Hg , corresponding approx. to the salt $\text{C}_6\text{H}_{14}\text{NOCl}\cdot 6\text{HgCl}_2$ (Mörner, *Z. physiol. Chem.* **22**, 520 (1896)). Oxidation of **I** with HNO_3 (d 1.52) gives a compd. ($\text{Me}_3\text{NCl}\cdot\text{CH}_2\text{ONO}$)- AuCl_3 (?), m . 133–4°; since this contains an extra N and 1 less Cl , it is of no interest in connection with the muscarine question. Oxidation of **II** gives the known HNO_3 ester of choline. Oxidation of choline sulfate with KMnO_4 gave betaine, identified as the AuCl_3 salt. The sapon. of trimethylammonium acetal gave a product, the PtCl_4 salt of which, on crystn., gave a series of fractions, m . 230°, 227°, 215°, 209°, and 204°; these showed the same compn., ($\text{Me}_3\text{NCl}\cdot\text{CH}_2\text{CHO}$)₂ PtCl_4 , and contained $3\text{H}_2\text{O}$ instead of the reported 2 mols. The m . p. of the various fractions may be due to differences in the H_2O content or to polymorphism or possibly to impurities which do not show in the analytical results. The so-called choline- or pseudomuscarine is to be stricken from the literature, since it is not obtained by the reported directions. A careful fractionation of the bases from fly agaric indicates that these bases consist essentially of choline and that a substance of the compn. of muscarine is not present. C. J. WEST

Ethyl β -hydroxybutyrate. A. DEWAELE. *Bull. soc. chim. Belg.* **34**, 341–2 (1925). $\text{MeCH(OH)CH}_2\text{CO}_2\text{Et}$, b_{768} 184–5°, d_{20} 1.017, n_D^{20} 1.4182, the b . p. previously reported in the literature being lower and apparently that of the α -compd. W. B. P.

Constitution of α -ketogluconic acid. A reply. M. HÖNIG. *Ber.* **58B**, 2644–6 (1925).—Cf. van Niel and 't Hooft, *C. A.* **20**, 360. C. A. R.

The preparation of aspartic acid from asparagine. FR. PACHLOPNIK. *Z. Zuckerind. cecoslov. Rep.* **50**, 139–41 (1925); *Listy Cukrov.* **43**, 348 (1924–5).—Asparagine is hydrolyzed with dil. HNO_3 instead of HCl as called for in most methods. After 3 hrs.' boiling the excess acid is neutralized with NH_3 , the mixt. evapd. to dryness, and extd. with EtOH. The lower soly. of aspartic acid in EtOH results in much higher yields (93%) than previous methods. W. L. BADGER

Attempts to prepare 8-alkylallantoins; also, a consideration of hydroxonic acids and 5-aminohydantoin. HEINRICH BILTZ AND HELMUT HANISCH. *J. prakt. Chem.* **112**, 138–63 (1926).—No allantoin could be obtained by the action of Ac_2O , POCl_3 , SOCl_2 or HCl upon a mixt. of $\text{CO(NH}_2)_2$ and free alloxanic acid; substituted ureas likewise showed no reaction. Attempts to transform hydroxonic acid into its amide (allantoin) or its chloride failed. MeNH_2 gave the methylammonium salt, easily sol. in H_2O . The K salt, $\text{C}_4\text{H}_5\text{O}_4\text{N}_4\text{K}_2\cdot\text{H}_2\text{O}$, leaflets, turns yellow at 280°, decomps. 313°; from H_2O crystals. the mono- K salt. Hydroxonic acid is not changed by heating the free acid or

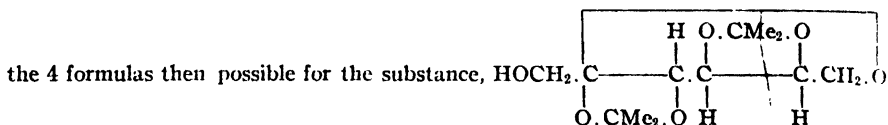
its mixt. with $\text{Ba}(\text{OH})_2$ and thus does not give rise to 5-aminohydantoin. Attempts to reduce allantoxidine also failed as did attempts to condense it with MeNCO . Heating diacetylaminohydantoin with H_2O gives 94% of 5-acetylaminohydantoin (I), sinters 199° , m. $218-9^\circ$; with CH_2N_2 this gives a 3-Me deriv., sinters 186° , m. 210° , which with Ac_2O yields a 1-Ac deriv. (II), sinters 204° , m. $221-2^\circ$. I gives a Na salt, crystg. with H_2O , decomp. about 106° ; Ag salt, crystg. with H_2O , darkens in the light. Numerous attempts to prep. the free 5-aminohydantoin from its HCl salt failed. Uric acid (100 g.) gives 45 g. allantoin, 30 g. 3-methylallantoin, 13-15 g. 3-methylxonic acid (K salt), which is reduced by Na-Hg to 9 g. 3-methylhydroxonic acid, m. $246-7^\circ$; it is decompd. by warm NaOH but is only slightly changed by boiling with 2 N HCl for 15 min.; NH_4 salt, decomp. about 260° ; crysts. with H_2O ; the strength of the acid is indicated by the slight tendency of this salt to hydrolyze in H_2O . K salt, decomp. above 270° ; crysts. with H_2O . Ag salt, turns brown 156° , black 170° , decomp. 192° ; Ba salt, decomp. above 265° ; Pb salt, yellow at $256-8^\circ$, decomp. about 350° . Et ester, m. $172-3^\circ$; Me ester, sinters 199° , m. $210-1^\circ$. Ac_2O gives 25% II; this is also obtained by the action of CH_2N_2 upon 1-acetyl- or 1,3-diacetyl-5-acetylaminohydantoin. Boiled with MeOH satd. with HCl, II gives nearly quant. 3-methyl-5-aminohydantoin as the HCl salt (III), m. $239-42^\circ$, decomp. about 350° ; perchlorate, m. 222° , rhodanate, m. $188-9^\circ$ (decompn.). III and KCNO give 85% of 3-methylallantoin. The free base is obtained from III and MgO as a light brown sirup. With PhCNO this gives a mixt. of phenyl- and diphenylurea.

C. J. WEST

Degradation of some uric acid glycol ethers by alkali. H. BILTZ AND H. KLEIN. *Ber.* 58B, 2740-7 (1925).—It was found (C. A. 16, 2451) that a no. of uric acid glycol ethers are converted by boiling H_2O into the corresponding allantoin but that the 3,7- and 3,9-di-, 1,3,7-tri- and 1,3,7,9-tetra-Me derivs. are resistant towards boiling H_2O . Also, uric acid glycol di-Me ether on solu. in KOH at room temp. and immediate acidification gives allantoin in good yield and it was hoped that the above derivs. which are stable towards H_2O might undergo the same reaction, but this proved to be the case only with the (sym.) Me_4 compd., 1.5 g. of the (di-Me) ether giving 0.04 g. tetramethylallantoin hydrate, m. $86-93^\circ$. The others underwent further and novel degradations. The 1-methyluric acid was prepd. in the usual way from methylvioluric acid, m. $202-3^\circ$, which was obtained in 8.0-8.6 g. yield from 20 g. theobromine oxidized with KClO_3 and HCl, filtered and treated with NH_2OH HCl on the H_2O bath. The 1- and 7-methyluric acid glycol di-Me ethers are strikingly stable towards alkali; 9% KOH hardly attacks them in 2 min. at room temp. and although NH_3 is evolved on longer continued action the reaction is not complete in 2 days; only 20% KOH completely decomp. them in 9 hrs. but no definite products could be isolated. The action of concd. alkalies on 3,7- and 3,9-dimethyluric acid glycol ethers and subsequent acidification results in a new type of degradation in which HNCO is evolved and which is therefore called the "cyanic acid degradation". It seems that for its occurrence there must be only 1 Me group (in position 3) in the pyrimidine nucleus; this is split off as NH_2Me , 1 CO group as CO_2 and the NHCO group as HNCO , while the 4-RO group is hydrolyzed, the products being the hitherto unknown ethers of 1-methyl-5-hydroxyhydantoin (I). The reaction proceeds in steps; with KOH, only a small amt. of NH_2Me is evolved; as acid is slowly added, the odor of NH_2Me becomes perceptible and disappears only when the soln. has become acid and now the CO_2 and HNCO are evolved. In the prepn. of 3,7-dimethylchlorisouric acid by chlorination of theobromine in AcOH (C. A. 8, 3554) the AcOH should contain about 1.7% H_2O (such an acid m. 13.7°). 3,7-Dimethyluric acid glycol di-Et ether is decompd. only about 50% by 30% KOH at room temp. in 15 min., completely by 40% KOH in 1 hr. or in 15 min. by 20% HCO_2H on the H_2O bath; 3 g. allowed to stand 2 days in 30% KOH and then neutralized yielded 0.5 of the Et ether of I, m. $99.5-100.5^\circ$, sol. in about 20 parts boiling AcOEt, 16 of H_2O , 12 of C_6H_6 , 10 of PhMe, reduced by HI to 1-methylhydantoin. Me ether (0.15 g. from 2 g. of the glycol di-Me ether), m. 118° , could not be isolated from the reaction product of the 3,9-dimethylglycol ether. 1,3,7-Trimethyluric acid glycol di-Me ether (II) boiled with 1-1.5% KOH splits off NH_2Me and reduction with HI of the sirup obtained by neutralizing, evapg. and extg. with alc. gives about 20% 1-methylhydantoin; allowed to stand several days in 33% KOH 16 g. of II gives 7.1 g. of a compd. $\text{C}_8\text{H}_{14}\text{O}_4\text{N}_4$, probably 1-methyl-4-dimethylureido-5-methoxy- $\Delta^{3,4}$ -2-glyoxalone, m. $123-4^\circ$, acts towards acids as a weak base, cannot be methylated with CH_2N_2 or Me_2SO_4 , sol. in about 8 parts boiling AcOEt, loses some McNH_2 when heated moist at 85° , is hardly attacked by H_2O_2 ; perchlorate; HCl salt, decomp. 190° . Reduction of the base with concd. HI on the H_2O bath gives 6.7 g. of a polyiodide (80.7% I), prisms with green metallic luster, brown by transmitted light; 11 g. of this, treated with SO_2 ,

then CO_2 , PbCO_3 and H_2S , yielded 0.21 g. of a high red substance, sublimes about 350° and has approx. the compn. $\text{C}_8\text{H}_8\text{O}_7\text{N}_2\text{S}$ (C 41.4, H 3.2, N 20.6, S 21.9). With concd. NH_4OH in sealed tubes at 100° , 3.2 g. II gives 1.2 g. 1-methyl-4-methylimino-5-methoxyhydantoylamide, m. 254° (decompn.), sol. in 8-10 parts hot MeOH and EtOH, sol. in acids, reprecipitated by alkalis, gives off NH_3 with hot concd. HCl; methylamide (1.1 g. from 3 g. II with 33% MeNH $_2$), m. 270° (decompn.), gives the biuret reaction, as does the oily ethylamide. C. A. R.

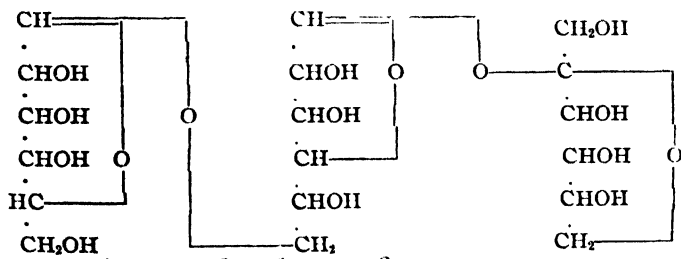
Acetone compounds of the sugars and their derivatives. III. Constitution of β -diacetonfructose. HEINZ OHLB. Ber. 58B, 2577-84 (1925); cf. C. A. 19, 249. The relatively great stability of β -diacetonfructose (I) towards acids indicates that the Me_2CO residue not on the reducing group is attached to 2 sec. carbinol groups. Of



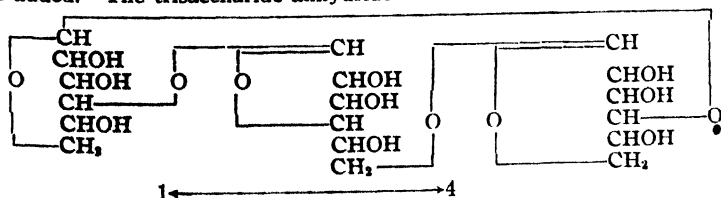
(II) seems, by exclusion, to be the correct one. Its Me ether (III) with dil. acids gives a sirupy methylfructose (IV), which does not crystallize even when seeded with the 3-methylfructose (V) obtained from methyl- α -diacetonfructose according to Irving and Hynd. IV, therefore, cannot have the MeO group on C atom 3. The change in rotation of III on removal of the Me_2CO groups follows the same characteristic course as that of I, i. e., the rotation passes through a negative minimum, showing that in the methylation of I there is no change in structure and that in the removal of the Me_2CO residues the deriv. of an unstable fructose changes into a deriv. of the stable fructose. Again, III with PhNHNH_2 yields red-brown, easily resinified flocks and not 6-methylglucosazone (Helfferich and Becker, C. A. 19, 250) and can therefore not have the MeO group on C atom 6, leaving C atom 1 as the only possible position for the MeO group in III or the free HO group in I. O. attempted to obtain further confirmation of this view by oxidative degradation. I is attacked only exceedingly slowly by neutral KMnO_4 , alkalis accelerate the reaction, which, however, is still far slower than with diaceton-glucose or α -diacetonfructose under the same conditions and almost comes to a standstill when 2 atoms O have been used up. The product, obtained in excellent yield, is the K salt of an acid $\text{C}_{12}\text{H}_{18}\text{O}_7$ (VI), which, if II is the correct formula for I, should give on removal of the Me_2CO groups a 2-ketogluconic acid. The product (VII), however, is isomeric, not identical with either the Botroux-Kiliani or the Hönig and Tempas 2-ketogluconic acid (cf. K. C. A. 20, 1057). This interesting isomerism is being investigated. III, prepd. with Ag_2O and MeI (yield, 11.4 g. from 20 g. I), by Preudenberg and Hixon's method (C. A. 18, 818) (yield no better) or with $\text{Me}_2\text{SO}_4\text{---NaOH}$ (least satisfactory method), m. $48\text{--}9^\circ$, $[\alpha]_D^{20} = -38.26^\circ$ (abs. alc., c 2.07), -29.53° (CHCl_3 , c 5.08); 0.4538 g. in 3 N alc. H_2SO_4 at $38\text{--}40^\circ$ gave $[\alpha]_D^{20} = -30.3^\circ$, -27.55° , -50.69° , -52.4° (const. value) after 10 min., 2, 19 and 24 hrs., resp. Calcd. for IV, the final value is -73.9° ; the isolated sirupy IV has $[\alpha]_D^{20} = -49.82^\circ$ (MeOH, c 2.162). K salt of VI, needles with $1\text{H}_2\text{O}$ (yield, 87%), very hygroscopic when anhyd., $[\alpha]_D^{20} = -31.75^\circ$ (H_2O , c 1.748), decomps. completely above 350° under 15 mm.; PhNH $_2$ salt, $\text{C}_{18}\text{H}_{25}\text{O}_7\text{N}$, m. 120° , $[\alpha]_D^{20} = -31.3^\circ$ (CHCl_3 , c 1.237), begins to decompose in a high vacuum at a bath temp. of 120° , yielding first PhNH $_2$ and then the free VI as a brown, very viscous oil solidifying to a glassy mass, also obtained in 9.5 g. yield from 16.5 g. of the K salt in the calcd. amt. of ice-cold 2 N H_2SO_4 quickly extd. with much Et_2O ; it forms no difficulty sol. salts with heavy metals or alkalis. The K salt (6.6 g.) in 100 cc. N H_2SO_4 at about 40° shows $\alpha_D = -2.1^\circ$, -1.65° , -1.45° , -1.27° , -3.1° , -3.2° , -3.37° , -3.5° (const. value) after 0, 1, 2, 3, 20, 21, 22 and 24 hrs., resp.; calcd. for VII, the final value, $[\alpha]_D^{20}$, is -89.8° . K salt of VIII, microcryst., very hygroscopic powder with $1\text{H}_2\text{O}$, $[\alpha]_D^{20} = -70^\circ$ (c 1.620), -74° (0.1 N HCl, c 1.608), or calcd. for the free VII, -95.35° ; although the solns. were prepd. as rapidly as possible and at 0° , no mutarotation was observed. Hydrolyzed in 100 cc. N HCl at 40° , 9.5 g. VI gave a final rotation of -40° (calcd. for VII, -69.13°); this difference from the results obtained with H_2SO_4 cannot be ascribed to exptl. errors but is to be referred chiefly to a sp. action of the HCl, for a similar difference was observed with III hydrolyzed with HCl; as the HCl was evapd. off *in vacuo* at 30° the soln. became a deeper and deeper brown and the distillate did not become neutral after repeated addns. of fresh portions of H_2O . The metal salts of VII are all easily sol. in H_2O ; brucine salt, $\text{C}_{25}\text{H}_{30}\text{O}_{11}\text{N}_2\cdot 3\text{H}_2\text{O}$, m. 166°

(decompn.). In dil. AcOH with PhNHNH₂ on the H₂O bath VII yields an *osazone phenylhydrazine salt*, C₂₄H₂₈O₈N₄, deep red, m. 102–3°. IV. Constitution of *diacetonegalactose*. HEINZ OHLE AND GERTRUD BEREND. *Ibid* 2585–9; cf. Svanberg, C. A. 19, 3481.—The observation of S. that diacetonegalactose (I) with KMnO₄ gives diacetone-*d*-galacturonic acid (II) has been confirmed. The oxidation cannot be controlled as well as with β-diacetonefructose and diacetone-mannose; even under the mildest conditions a not inconsiderable part of the I is degraded all the way down to (CO₂H)₂. A 50% excess of KMnO₄ gives the best results (50–60% of the K salt of II). O. and B. agree with S. that the end primary CH₂OH group of the galactose is also present in I but not that there is an O bridge between C atoms 1 and 3. I is also formed from galactose and Me₂CO in the presence of CuSO₄, *i. e.*, in the absence of mineral acids, although in very poor yield (0.2 g. from 1 g. galactose) (doubtless owing to the extremely slight soly. of the sugar in Me₂CO), and under these mild conditions there is no shifting of the O bridge, so that the same ring structure must be present in I as in galactose; from the work of Haworth, Ruell and Westgarth, the O bridge is very probably between C atoms 1 and 5 (C. A. 19, 973). I is best prepd (yield, 50–60%) from 20 g. galactose shaken 20 hrs. in 1 l. Me₂CO with 10 cc. concd. H₂SO₄; in C₂H₅N with the calcd. amt. of Ac₂O at 38–40° it gives the *acetate*, m. 108°, [α]_D²⁰ –48.08° (CHCl₃, *c* 4.832). *K salt* of II, needles with 0.5 H₂O, very hygroscopic, decomp. above 200°, [α]_D²⁰ –61.09° (H₂O, *c* 2.046). Free II, m. 157°. *d*-Galacturonic acid (III), from II or its K salt and *N* H₂SO₄ at 38–40°, is isolated as the curdy basic Pb salt or the Ba salt, cryst. powder with 2 H₂O, decomp. about 180°, [α]_D²⁰ 25.1° (H₂O, *c* 1.394); free acid, [α]_D²⁰ 46.7° (Ba salt in the calcd. amt. of HCl, *c* 1.038); no mutarotation was observed although the solns. were rapidly prepd. at 0°. *Brucine salt* of III, C₂₈H₃₆O₁₁N₂·H₂O, m. 189° (decompn.), [α]_D²⁰ –7.5° (H₂O, *c* 1.328). A soln. of III treated dropwise with PhNHNH₂ as long as the base dissolved yielded in a short time a light yellow cryst. crust, probably of the *phenylhydrazone phenylhydrazine salt*, which could not be recovered when dissolved in boiling H₂O; this soln., heated with PhNHNH₂ and dil. AcOH on the H₂O bath, gave the *phenylosazone phenylhydrazine salt*, C₂₄H₂₈O₈N₄, brown, m. 140° (decompn.). C. A. R.

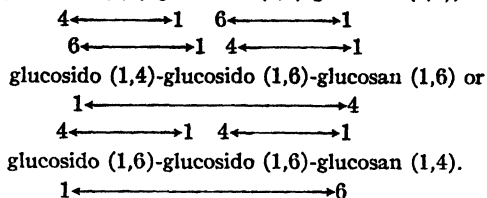
Nomenclature of polysaccharides. M. BERGMANN. *Ber.* 58B, 2547–50(1925).—B. suggests that O bridges between 1 component sugar of a polysaccharide and another component sugar be represented by a double-headed arrow written above or below the name of the polysaccharide and extending to the names of the 2 component sugars united by the O bridge in question; the positions at which the O bridge is attached are to be indicated by nos. before and after the arrow. Thus, raffinose, for which Haworth, Hirst and Ruell give the structure



would be galactosido (1,5)-glucosido (1,4)-fructosido (2,6). If it is desired to take the spatial relationships into account also, the necessary designations (α -, β -, *d*-, *l*-) can easily be added. The trisaccharide anhydride



could be written glucosido (1,6)-glucosido (1,4)-glucosan (1,6),



Naturally, the arrows are to be used only when no clear and intelligible name is possible without them. For trehalose and related compds. the name glucosidoglucoside shows that both sugars are joined through their glucosidic group and sucrose is sufficiently described by the name glucosido(1,4)-fructoside(2,6). The ending "osan" (from ose-anhydride) is suggested for all anhydrides derived from a disaccharide by loss of H_2O involving the carbonyl or lactol group, the term anhydro-sugar being reserved for those derivs. in which this group is still intact.

Action of diazomethane on cellulose. M. NIERENSTEIN. *Ber.* 58B, 2615(1925). N does not agree with Schmid (*C. A.* 20, 743) that cellulose does not react with CH_2N_2 . Geake and N. (*C. A.* 8, 3563) obtained from cotton cellulose and CH_2N_2 products with 1.5-4.2% MeO.

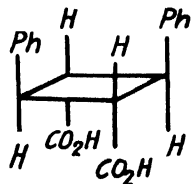
The chemistry of glycogen. JAMES C. IRVINE AND H. GILCHRIST. *Food Investigation Board report for the year 1924. Dept. Sci. Ind. Research* 1925, 63-6. The reactions of glycogen from different sources varied greatly, although no analytical difference could be detected. It is suggested that some of the impurities may be present in solid soln. The study of glycogen free from extraneous substances and consisting exclusively of $\text{C}_6\text{H}_{10}\text{O}_5$ units, can be approached through the acetylation of the polysaccharide, and a method has been devised whereby pure glycogen triacetate can be prepd. The account of this compd. given in the literature has been corrected as it has been shown that unless special methods of purification are adopted 1 mol. of AcOH remains persistently in combination with the triacetate. Acetylation removes N and P completely, but the elimination of the last traces of Fe is difficult. L. W. RIGGS.

Chemistry of the polycyclic structures in relation to their homocyclic unsaturated isomerides. II. Intra-annular tautomerism. III. The simulation of benzenoid properties by the five-carbon intra-annular nucleus. R. F. HUNTER. *Chem. News* 132, 117-22, 133-7(1926); cf. *C. A.* 18, 1651.—Theoretical discussion of various papers from English lab.

Relation between optical rotatory power and structure in polysaccharide chemistry. HANS PRINGSHEIM AND JESAJA LEIBOWITZ. *Ber.* 58B, 2808-14(1925).—The relations between mol. rotation and structure developed with Hudson (*C. A.* 20, 583) for amylobiose (I) and amylotriose (II) have been extended to the hexosans. Assuming that in the formation of di- (III) and trihexosan (IV) from I and II, resp., with cold concd HCl the union ruptured by the HCl is the same in both cases, i. e., that III and IV bear to each other the same relation as I and II, the difference between the mol. rotations of the corresponding pairs of sugars should be the same. The differences actually found are: II — I, 28,100; IV — III, 30,400; and for the Ac derivs., 41,600, 42,800, resp. Calculus made in this way are in harmony with the view that of the 2 formulas suggested for III and IV (*C. A.* 19, 974) the sym. is the correct one. These calcs. may be extended to the polyamyloses; the differences between the mol. rotations of tri- (V) and diamylose (VI) (29,500) and of their acetates (42,600) indicate that in the expansion of the ring of VI to V the same radical is introduced as in the expansion of III to IV. The members of both polyamylose series have almost exactly the same sp. rotation (α -series, 136-9°, β -series, 152-7°). IV ($[\alpha]_D$ 166°) and III (155°) are then apparently not the true elementary substances of amylopectin (196°) and amylose (189°), resp.; P. and L. believe that the 2 hexosans are produced from the true, very labile elementary substances of the starch constituents by an inner rearrangement, but are still closely related to them. Calcs. of the sp. rotation of VI on the basis of the structure suggested by Karrer and Smirnov (*C. A.* 16, 1747), i. e. 2 maltose or 1 maltose and 1 gentiobiose union, give values (216° and 87°, resp.) which, even if the rule of optical superposition holds only approx., are in no agreement at all with the value found exptly. (137°). The elementary substance of cellulose would be expected to be wholly or almost wholly inactive, a condition fulfilled neither by Karrer's "cellosan" formula, nor by Pringsheim's cellobiose anhydride formula if it be assumed that the configuration is sym.; if configurative asymmetry

(i. e. an α - and a β -glucosidic union) is assumed for the P. formula, it cannot be checked by calcn. as 5- α -glucosidoglucose is not yet known.

Configuration and degradation of ϵ -truxillic acid. X. R. STOERMER, JOH. NEUMÄRKER AND RUDOLF SCHMIDT. *Ber.* 58B, 2707-18(1925); cf. *C. A.* 19, 2825.—Since ϵ -truxillic acid (I) is obtained from all of the other truxillic acids by alkali fusion and does not form an anhydride, it was at first supposed to be a *trans*-acid but, for reasons briefly discussed in earlier papers, it is now assigned the *cis*-structure (as shown in the fig.). The efforts to obtain a monomol. anhydride have been renewed and although they failed, it has been possible to obtain the *imide* (II) and *phenylimide* (III). II, obtained in small yield by dry distn. of the NH_4 salt of I (the chief products of the reaction being mostly the diamide (IV) with somewhat less of the *amidic acid* (V)), is obtained much more satisfactorily by heating IV several hrs. with 75% ZnCl_2 in AcOH , while III is prepd. from the *amidic acid* (VI) with hot Ac_2O and NaOAc ; both can be hydrolyzed stepwise, through V and VI, resp., to I. All the theoretically possible *cis*- and *trans*-truxillic acids have therefore now been well characterized. The extraordinary stability of I is undoubtedly related to its perfectly sym. configuration; it is obtained by rearrangement from all of its isomers but cannot itself be rearranged into any of them. Derivs. substituted in only 1 or unsym. in both CO_2H groups tend to assume a sym. structure when heated in dry state or in suitable solvents; thus, V forms II, I and IV at high temps., VI with Ac_2O alone gives I and the dianilide (VII), the *amidine amide* (VIII) with AcOH gives IV and VII. The stability of the anhydrides of the 3 *cis*-acids increases with the no. of Ph groups near the CO_2H groups; that of the *peri*-acid is formed on mere fusion of the acid and is not decompd. by boiling AcOH , that of the γ -acid is obtained from the acid only by heating with Ac_2O and is hydrolyzed by boiling AcOH , while that of I cannot be prepd. even in this way. Likewise II is hydrolyzed, with extreme ease (cold dil. Na_2CO_3) while the amide of the γ -acid requires several hrs'. boiling; even dry NH_3 in anhyd. solvents converts II into IV. V was converted successively into 2,4-diphenyl-3-aminocyclobutane-1-carboxylic acid (IX) (by the Hofmann degradation) and then, with progressively diminishing yields, into the 3-hydroxy- (X) and 3-halogen acids and finally reduced and sapond. The greatest difficulty in this process was the continuous appearance of unsatd. derivs. (presumably of a cyclobutenecarboxylic acid) which stubbornly resisted hydrogenation. The final satd. cyclic acid (XI) was not identical with the distyranic acid (XII), m. 176° . The structure of I was further confirmed by heating I with 3 parts piperidine 4 hrs. at 160° ; this gave mainly ϵ -truxillpiperididic acid (XIII), m. 220° , which is not resolvable into optical antipodes (*Me* ester, m. 91° ; *Et* ester, m. 110°), together with about 20% of the *dipiperidide*, m. 189° , hydrolyzed to XIII by short boiling (up to 20 min.) with concd. alc. KOH, to I by long boiling. The truxillic esters with arylmagnesium halides readily yield tertiary alcs. α -Tetraphenyltruxilldiol (11.5 g. from 15 g. of the di-*Et* ester of the α -acid in C_6H_6 with PhMgBr in Et_2O), m. 262° ; γ isomer, m. 219° ; ϵ -compd., also m. 219° but strongly depresses the m. p. of the γ -diol, forms a *dibenzozate*, m. 169° . ϵ -Tetraethyltruxilldiol, from the ester of I with EtMgBr , m. 201° . The α -diol is not converted into an anhydride by dehydrating agents, while the γ -diol in C_6H_6 with P_2O_5 on the H_2O bath yields a γ -oxide, $\text{C}_{12}\text{H}_{10}\text{O}$, cryst. powder, m. 208° , and 5 g. of the ϵ -diol, gently heated 10 min. at most with ZnCl_2 , gives 4.5 g. of the ϵ -oxide, m. 170° ; hydrolysis back to the ϵ -diol is rendered difficult by the numerous tarry by-products which are formed; it was effected once with hot alc. alkali under pressure and also with AcOH satd. with HBr (the product in this case being the dibromide of the diol) but not with PCl_5 . The ϵ -diol dihalides are obtained almost quant. by gently warming the diol with the calcd. amt. of PCl_5 or PBr_3 0.5-2.0 hrs in CCl_4 ; the *dichloride*, m. $175-6^\circ$, is gradually decompd. by boiling H_2O , while the *dibromide*, m. 126° , is more stable but is also slowly decompd. by hot alc.; the dichloride gives the oxide on mere boiling in AcOH . The following homologs of the above compds. have been prepd. by Lengfeld (*Diss. Rostock, 1925*): ϵ -Tetra-*p*-tolyltruxilldiol, m. 232° ; anhydride, m. 195° ; *dichloride*, m. 155° ; *dibromide*, m. 112° . *o*-Tolyldiol, m. 219° ; anhydride, m. 146° . *p*-Amisylldiol, m. 224° ; anhydride, m. 84° . *o*-Phenetyldiol, m. 174° ; anhydride, m. 92° . II (75% from IV), m. 198° , mol. wt. in boiling Me_2CO 265-8, gives with PhNH_2 at $170-80^\circ$ VIII, m. 222° ; *Na* salt of II; *K* salt, m. 224° . With EtBr in alc. at $160-70^\circ$ these salts are merely converted to the di-*Et* ester of II; the ϵ -ethylimide, m. 144° , was finally obtained by refluxing II in abs. alc. with EtBr , ignited K_2CO_3 , a little KI and a trace of "Naturkupfer." V, m. 213° . *Me* ester, m. 145° ; *Et* ester, m. $140-1^\circ$. VI, m. 239° , is obtained in good yield from I heated 20 min. at



210-220° with 1 mol. PhNH₂; Na salt, gelatinous; Ca salt, crystals more difficultly sol. in hot than in cold H₂O; Me ester, m. 157°. **III** (25% from **VI** with 5 parts Ac₂O and 2 parts NaOAc at 145-50°), m. 252°, mol. wt. in boiling CHCl₃ 372. **IX** (yield, about 80%), rodlets with MeOH of crystn. which is lost in the air or *in vacuo*, m. 188° (decompn.); Me ester, does not cryst.; HCl salt, m. 244° (decompn.). **X**, from the ester of **IX** treated in cold dil. H₂SO₄ with NaNO₂ and sapond. with cold alc. KOH, crystals with 2H₂O (lost *in vacuo* at 30-5°), m., anhyd., 166-7° (decompn.). 2,4-Diphenylcyclobutane-1-carboxylic acid, obtained in very small amt. by treating the Me ester of **X** with hot Et₂O with PCl₅, reducing the product with concd. HI, Zn dust and red P on the H₂O bath and sapon. with cold alc. KOH, m. around 172°, strongly depresses the m. p. of **XII**. **XI**. γ -Truxillic acid. R. STORMER AND FR. FRETWURST. *Ibid* 2718-25. The configuration of γ -truxillic acid (**I**) (*cis*-acid, with both CO₂H and 1 Ph group on the same side of the ring plane) has been further confirmed by the resolution of the amidic acid (**II**) into optical antipodes and regeneration of **I** by cautious hydrolysis of the *d*-**II**. **II** differs in some characteristic respects from the anilidic acids; it is completely hydrolyzed to **I** by long boiling with 15% HCl; aq. KOH also hydrolyzes it but yields chiefly the α -acid (**III**) and as **I** itself shows not the slightest tendency to undergo such a rearrangement under these conditions it must be the **II** which rearranges before being hydrolyzed; with boiling alc. KOH, **II** gives very little **III**, some unchanged **II** and considerable amts. of the α -amidic acid (**V**) while **V** under the same conditions partly rearranges into **II**. The α -diamide (**VI**) with alc. KOH in an autoclave at 120° gives an apparently homogeneous product (**VII**) which, however, can be sepd. into **II** and **V** by tedious fractionation from alc. while in a sealed tube in a bomb oven at the same temp. (in which the pressure and probably the inside temp. are higher) it is completely saponified and rearranges almost wholly into the ϵ -acid; **II** under the same conditions gives only **III**. On fusion, **II** slowly loses H₂O and changes into the *imide* (**VIII**), which is best obtained by long heating of the NH₄ salt of **II** (in this case some **V** is also formed as by-product but no **III** or **VI**; in sealed tubes at 180-200°, a small amt. of **VI** is obtained but still no **III**). With Ac₂O-NaOAc **II** likewise gives some **VIII** but in poor yield together with considerable γ -truxillacetamidic acid (**IX**), which becomes the chief product when the NaOAc is omitted. The ring in **VIII** is ruptured by Na₂CO₃ only on long boiling, by excess of cold alc. KOH in 24 hrs. The ethylamidic acid (**X**) with HNO₂ yields a *NO* deriv. (**XI**) which with hot Na₂CO₃ decomps. completely into N₂CHMe and **I**, a reaction which can be applied to the anilidic acids and permits of the hydrolysis of the substituted amidic acids without any rearrangement. **II**, obtained almost quantitatively from the anhydride and concd. NH₄OH on the H₂O bath, m. 240° (loss of H₂O); Me ester, m. 154°; Et ester, m. 135-8°. The resolution of **II** into its optical antipodes is effected with morphine in alc.; the difficultly sol. *l*-salt, m. 183° (decompn.); *l*-acid, m. 258-9° (loss of H₂O) (mixed m. p. with *dl*-**II**, 247-8°), [α]_D²⁰ -11.05° (0.0706 g. in 10 cc. AcOH) soly. in AcOH at 21° 0.66% (*dl*-acid 1.49%). Salt of *d*-acid, m. 89-90°; free acid, m. 258-9°. Me ester of *l*-acid, m. 153-4° (mixed m. p. with the *d*-ester 139-45°) [α]_D²⁰ 8.55° (0.3764 g. in 10 cc. alc.); Et ester of *d*-acid, m. 168-9°, [α]_D²⁰ -12.78° (0.2031 g. in 10 cc. Me₂CO). **VIII** (75% from the NH₄ salt of **II** at 240-50°), m. 208°. **IX**, m. 185°, hydrolyzed to **II** by boiling 10% alc. KOH, to **I** by hot 15% HCl. K and Na salts of **VIII**, from **VIII** in the least possible amt. of alc. with 1 mol. alc. KOH and much Et₂O, silvery leaflets. Phenylimide of **I**, from **VIII**, PhBr, ignited K₂CO₃, "Naturkupper" and KI in boiling PhNO₂, m. 194°. Ethylimide, m. 142°, hydrolyzed by short boiling with alc. KOH to **X** (also obtained from the anhydride and NH₄Et in alc. on the H₂O bath), m. 217°, converted into the ethylimide by Ac₂O-NaOAc at 160°. **XI**, faintly yellow, m. 172-3° (violent decompn.), deflagrates on dry heating. Nitroso-anilidic acid, suddenly decomps. 129-30°, decompd. by short boiling with concd. HCl into the anilidic acid, by 25% KOH into **I**. C. A. R.

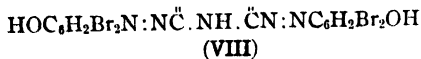
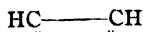
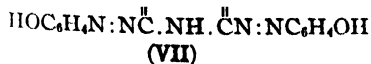
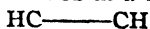
Catalysis and change in form of molecules. N. D. ZELINSKII (WITH MRS I. N. TRTZ). *Ber.* 58B, 2755-63(1925).—As the result on the one hand of his work on hydrogenation and dehydrogenation catalysis and, on the other, of observations made on certain transformations which occur under the influence of contact action (see, e. g., C. A. 19, 2333), Z. is convinced that intermediate chem. compds. are not a *conditio sine qua non* of catalytic processes but (cf. also Mendelyev, *J. Russ. Phys.-Chem. Soc.* 18, 8(1886); Raschig, *Z. angew. Chem.* 19, 2049(1906); Bodenstein, *C. A.* 19, 924) that in such processes are involved changes in the motions of the mols. and atoms resulting from changes in form of the system produced by contact action; in the present paper are given further instances in support of his view. Cyclohexylcyclopentane (**I**) on catalytic dehydrogenation is attacked in both nuclei simultaneously, the product being not the expected phenylcyclopentane (**II**) but a compd. C₁₁H₁₈ (**III**), which, however,

cannot be phenylcyclopentadiene, as it has a completely satd. character; the cyclopentamethylene ring (IV) must, therefore, have suffered a deep-seated deformation during the dehydrogenation. II cannot be dehydrogenated with either palladinized or platinized asbestos, even with the assistance of platinized active charcoal; in order to be capable of undergoing dehydrogenation IV must, therefore, be combined with a hexahydrophenyl (V), not with a Ph residue; as V easily splits off H it forces IV to do the same. In 1-cyclohexyl-3-methylcyclopentane (VI), V, losing some of its H, forces the methylcyclopentyl ring to lose some also but the latter residue at the same time undergoes a deep-seated rearrangement, the sole product being Ph₂. I, obtained by treating cyclopentanone with C₆H₁₁MgBr, boiling the resulting pentanol, b₁₀ 115–8°, with aq. (CO₂H)₂ or treating it with KHSO₄ and reducing the unsatd. hydrocarbon, b. 226–8°, with H and Pd-asbestos at 160°, b. 225–7°, d₄²¹ 0.8813, n_D²¹ 1.4767 (it is also obtained by treating the pentanol with AcOH satd. at 0° with HI and then warming with Zn

dust). III, which is provisionally assigned the structure $\text{PhCH} \begin{array}{c} \diagup \text{CH} \cdot \text{CH} \cdot \\ \diagdown \text{CH} \cdot \text{CH} \end{array}$, is obtained

in 3 g. yield from 8.5 cc. I passed 3 times at the rate of 1 drop per min. through a 7 × 400-mm. tube filled with 30% palladinized asbestos at 300–5°; it m. 69.4°, b. 248–9°, does not react with Br, KMnO₄, picric acid or K in boiling C₆H₆. Phenylcyclopentanol, from cyclopentanone and PhMgBr, b₁₈ 132–3°, d₄¹⁹ 1.0609, n_D¹⁹ 1.5472, gives with HI-AcOH II, b. 215–7°, d₄¹⁹ 0.9503, n_D¹⁹ 1.5305. VI (8 g. from 16 g. of the pentanol, b₁₆ 125°, with HI-AcOH), b. 231–3°, d₄¹⁷ 0.8902, n_D¹⁷ 1.4787. C. A. R.

The tautomeric form of hydroxyphenylazocarboxamide. A. PIERONI, *Gazz. chim. ital.* 55, 793–804 (1925).—In continuation of earlier work (C. A. 17, 1439; 18, 3177, 3188), P. has undertaken the study of *p*-hydroxyphenylazocarboxamide (I). 100 g. pure *p*-HOC₆H₄NH₂ was heated with 100 cc. HCl (d. 1.45) and some pieces of Sn. After a few hrs. the soln. was dild. with H₂O, boiled and filtered. Sn was removed with H₂S and the filtrate was concd. in a stream of H₂S. On cooling white *p*-H₂NC₆H₄OH·HCl (II) seps. 35 g. II in 100 cc. EtOH + 13 cc. concd. H₂SO₄ was diazotized with 20 g. EtONO₂ at 10–1° for 2 hrs. with agitation. The mixt. was then cooled to 0° and 100 cc. 40% KCN was added slowly. Concd. HCl was added drop by drop, keeping the temp. below 0°, and the nitrite (III), HOC₆H₄N:NCN, m. 117° (decompn.), sepd. A satd. Et₂O soln. of dry III treated with HCl gas at 15–6° seps. I. A satd. EtOH soln. of I made alk. with KOH gives a ppt. which treated in H₂O with CO₂ gives I, red, m. 172°. To 14 g. quinone in hot EtOH was added 12 g. H₂NCONHNH₂·HCl. The mixt. solidified. The calcd. amt. of NaOAc necessary to eliminate HCl was added. The ppt. was filtered off and washed with the min. of H₂O. The *p*-quinone semicarbazone (IV) obtained was dissolved in EtOH, pptd. with KOH + Et₂O; the K salt was decompd. with CO₂ as above and gave IV, yellow, which becomes red at 120° and m. 172° (decompn.). In this way unstable IV, O:C₆H₄:NNHCONH₂, gives the more stable HOC₆H₄N:NCNH₂ (I). In glacial AcOH IV is more sol. than I. 6 g. I suspended in a little glacial AcOH with 12 cc. perhydrol and then kept at 40° for several days still contained a little H₂O₂. The AcOH was evapd. in the air and impure phenolazoxycarboxamide (V), HOC₆H₄N(O):NCONH₂, sepd.; from hot H₂O V seps. as yellow needles, m. 153° (decompn.). In aq. alk. soln. V with β-naphthol, like other azoxyamides, gives the corresponding *p*-hydroxybenzenecazonaphthol (VI), m. 194°. VI in glacial AcOH with the calcd. amt. of Br₂, then AcONa to neutralize the HBr and H₂O to ppt. gave *p*-hydroxydibromophenylazoxycarboxamide, red, m. 232°. Both I and its di-Br deriv. react with pyrole in alk. medium, giving VII and VIII, resp., which will be fully described in a later paper.



E. J. WITZEMANN

Coloring substances derived from thiocarbodibenzidine. II. G. ROSSI AND B. CRECHETTI, *Gazz. chim. ital.* 55, 872–5 (1925).—In a preceding paper (C. A. 19, 2657) R. and C. described thiocarbodibenzidine (I), (H₂NC₆H₄C₆H₄NH)₂CS₂. I diazotized with HNO₃ in HCl gives tetrazothiocarbodibenzidine chloride (II) S:C(NHC₆H₄N)₂Cl. The soln. of II was treated with the calcd. amt. of PhONa in NaOH. The brown soln. was neutralized with HCl and gave a ppt. which was sol. in dil. Na₂CO₃.

The [diphenolazo]thiocarbodibenzidine, $S:C(NHC_6H_4C_6H_4N:NC_6H_4OH)_2$, is a direct dye for cotton, silk and wool. The corresponding (*di-β-naphtholazo*) compd., obtained with $C_{10}H_7ONa$, is sol. in xylene, insol. in alkalis and dil. HCl. E. J. W.

Stereoisomers of chloriodoethylene. H. VAN DE WALLER AND A. HENNE. *Bull. soc. chim. Belg.* 34, 399-410(1925).—See C. A. 20, 1050. W. B. PLUMMER

Bromophenols. VII. Bromine substitution products of hydroquinol. MORITZ KOHN AND L. W. GUTTMANN. *Monatsh.* 45, 573-88(1925); cf. C. A. 19, 1700.—Heating Habermann's dibromohydroquinol di-Me ether (*Ber.* 11, 1034) with fuming HBr and AcOH gives 2,5-dibromohydroquinol (I), showing that H.'s ether is 1,4-dimethoxy-2,5-dibromobenzene (II). This was further confirmed by its synthesis through methylation of I. Fuming HNO_3 , acting on II, gives 2,5-dibromoquinone, m. 188-9°. *Tribromohydroquinol di-Me ether*, m. 101-3°; with fuming HNO_3 it gives tetrabromoquinone (bromanil) (III). 2,6-Dibromohydroquinol di-Me ether (IV), m. 56°; nitration with fuming HNO_3 gives the 3,5-dinitro deriv. (V), pale yellow, m. 150-1°. *Crystallographic data* by K. Hlawatsch are given for I-V and for 2,6-dibromohydroquinol. **VIII. Bromo- and bromonitroresorcinols.** MORITZ KOHN AND GEORG LÖFF. *Ibid* 589-95.— $m-C_6H_4(OH)_2$ and Br in CCl_4 give the 4,6- Br_2 deriv., m. 110-2° (Zehenter, *Monatsh.* 8, 296 (1887)), whose di-Me ether (VI), m. 138°, is identical with Hönig's compd. obtained from Br and $m-C_6H_4(OMe)_2$ (*Ber.* 11, 1041(1878)). Further bromination of VI gives the 2,4,6- Br_3 deriv., m. 60-1° (Torrey and Hunter, *C. A.* 5, 1400, give 68-9°); with fuming HBr and AcOH it gives 2,4,6-tribromoresorcinol, m. 111°. Me_2SO_4 and KOH contg. a little NaSH give the di-Me ether, m. 62°, while bromination of $m-MeOC_6H_4OH$ and methylation give an ether, m. 69°. 3-Hydroxy-1-methoxy-2,6-dibromo-4-nitrobenzene, deep yellow, m. 122°, from the 2,4,6- Br_3 deriv. and KNO_3 in AcOH; the K and Na salts are yellow, the Ag salt, red. With HBr and AcOH it gives 2,6-dibromo-4-nitroresorcinol, m. 146°. **IX. Bromo- and bromonitrophenols.** M. KOHN AND SALOMEA STRASSMANN. *Ibid* 597-603.—Soln. of tetrabromoanisole in fuming HNO_3 gives 1-methoxy-2,3,4,6-tetrabromo-5-nitrobenzene, m. 122°, which is demethylated by HBr in AcOH, giving 2,3,4,6,5- $Br_4(O_2N)C_6OH$, m. 162°. Nitration of tetrabromophenyl acetate ($H_2SO_4 + HNO_3$) gives the yellow 2,3,6-tribromo-5-nitroquinone, m. 285°. Tribromoanisole gives 1-methoxy-2,4,6-tribromo-3,5-dinitrobenzene, m. 148°, which is demethylated by HBr, giving 2,4,6-tribromo-3,5-dinitrophenol, m. 196°. The product from the bromination and methylation of $m-BrC_6H_4OH$ is 3,4,6- or 2,3,4-tribromo-6-nitroanisole, m. 67°, which, with fuming HNO_3 , gives 2-nitro-3,4,6-tribromo- or 2,3,4-tribromo-6-nitroanisole, m. 105°. **X. Chloronitro ether and bromonitro ether of hydroquinol and toluhydroquinol and the mobility of the halogen atom in the same.** M. KOHN AND RICHARD MARBERGER. *Ibid* 649-62.—2,6-Dichloro-3,5-dinitrohydroquinol di-Me ether (VII), m. 121-3°, prepd. as V; extensive crystallographic data are given. Boiled with C_6H_5N for about 20 min., there results the mono-Me ether, m. 97° (crystallographic data). 1-Methyl-2,5-dimethoxy-3-bromo-4,6-dinitrobenzene, m. 124-6°; C_6H_5N gives the mono-Me ether, light yellow, m. 86°. 4-Methoxy-3,5-dibromo-2,6-dinitrophenol, S-yellow, m. 135-7°. V, heated with 40 mols. $PhNH_2$ until boiling begins, gives 4-methoxy-2,6-dinitro-3,5-dianilinophenol, dark red, m. 181° (decompn.); it also results from VII and 30 mols. $PhNH_2$. 1-Methyl-6-methoxy-2,4-dinitro-3-hydroxy-5-anilino-benzene, dark red, m. 138-9°. **XI. Bromination of hydroquinol monomethyl ether and of nitrohydroquinol dimethyl ether.** M. KOHN AND SARA GRUN. *Ibid* 663-7.— $p-MeOC_6H_4OH$, rubbed with excess Br, gives 1-methoxy-4-hydroxy-2,3,5-tribromobenzene, m. 145°; also obtained in CCl_4 soln. KNO_3 in AcOH gives a nitrodibromo deriv., m. 170° (decompn.), yields red alk. salts and a dark purple Ag salt. The action of 6 mols. Br upon $O_2NC_6H_4(OMe)_2$ gives tetrabromohydroquinol di-Me ether, m. 190-1°, also obtained by methylating the tetrabromohydroquinol from bromanil. C. J. W.

The alkylmethylglycerols. RAYMOND DELABY AND GEORGES MOREL. *Bull. soc. chim.* 39, 220-30(1926).—See C. A. 19, 2326. E. H.

Monomethyl ether of styphnic acid and a new trinitroguaiacol, 2-hydroxy-1-methoxy-3,4,5-trinitrobenzene. MORITZ KOHN AND GEORG LÖFF. *Monatsh.* 45, 605-15(1925).—1,3,2,4,6-(MeO) $_5C_6H(NO_2)_3$, obtained in 50% yields from 25 g. $m-C_6H_4(OMe)_2$ in 6 vols. concd. H_2SO_4 treated with a mixt. of 150 cc. fuming HNO_3 and 150 cc. concd. H_2SO_4 with cooling, finally adding 50 cc. HNO_3 , gives with C_6H_5N the *N*-methylpyridinium salt of styphnic acid Me ether, yellow, m. 131-2°; the *N*-methylquinolinium salt, yellow, m. 151°. Decompn. of these salts with dil. HCl gives styphnic acid Me ether, pale yellow, m. 80°; C_6H_5N salt, yellow, decomps. about 140-5°; quinoline salt, yellow, decomps. 165-174°; heating with KOH gives the free acid, 1,2,3,4,5-(MeO) $_5C_6H(NO_2)_3$, heated with AcOH-HBr, gives 2-methoxy-4,5,6-trinitrophenol (2-hydroxy-1-methoxy-3,4,5-trinitrobenzene), light yellow, m. 143-9° (some decompn.);

C_6H_5N salt, dark yellow, m. 158° (decomps.); quinoline salt, dark yellow m. 201° (decompn.); Bz deriv., m. 146° ; *N*-methylpyridinium salt, deep red, m. 120° ; *N*-methylquinolinium salt, bright red, m. $161-3^\circ$. C. J. WEST

Mono- and dimethoxypicric acids and their chlorides. H. H. SCHLUBACH AND FRITZ MERGENTHALER. Ber. 58B, 2732-6(1925).—The present incomplete results are published now because of the appearance of the paper of Hodgson and Moore (C. A. 19, 2937). In attempting to explain the mechanism of the Wurtz-Fittig synthesis the possible intermediate formation of free Ph radicals has been suggested (C. A. 17, 1417), but there seems to be very little hope of being able to isolate Ph itself. S. and M. thought, however, that by suitably substituting the H atoms in the Ph group its properties might be so altered that the free radical might be isolated and as the Cl in PhCl is rendered increasingly labile by the successive introduction of NO_2 groups in positions 2, 4 and 6, just as that in MeCl is by the introduction of aryl groups, they tested $(O_2N)_3C_6H_2C_6H_2(NO_2)_3$ (I) for any possible indications of dissociation into radicals but mol. wt. detns. gave no evidence of any such dissociation. The remaining H atoms in picric acid (II) and picryl chloride (III) were then replaced by 1 and 2 MeO groups and the cond. of the 4 resulting compds. compared with that of II and III; the results showed that introduction of the MeO groups does not increase but, in fact, decreases the cond., and, moreover, the 2 MeO-substituted chlorides cannot any longer be converted into the corresponding Ph_2 derivs. by the Ullmann method. Mol. wt. of I (0.4818, 0.7688 and 0.9676 g., resp., in 32 g. boiling $PhNO_2$), 359, 430, 399 (calcd., 424). 5,2,4,6-MeO $(O_2N)_3C_6H_2OH$ (IV), by a modification (acidifying with dry HCl gas instead of aq. acid) of Blanksma's method (Rec. trav. chim. 21, 254(1902)) is obtained in 62% yield and in pure form, m. 87.5° ; it cannot be converted with PCl_5 into 3-chloro-2,4,6-trinitroanisole (methoxypicryl chloride) (V), m. 86° , which was accordingly prepd. (yield, 61.5%) from *m*- ClC_6H_4OH and $HNO_3-H_2SO_4$. 3,5- $(O_2N)_2C_6H_3OMe$ with $AlCl_3$ at 130° gave 80% $(O_2N)_2C_6H_3OH$, m. $123-4^\circ$, which in hot concd. H_2SO_4 with $HNO_3-H_2SO_4$ yielded 52% $(O_2N)_3C_6H_2OH$, and this by B.'s method gave 70% dimethoxypicric acid (VI), S-yellow, m. 76.5° . 1-Chloro-3,5-dimethoxy-2,4-dinitrobenzene (34.7% from $(O_2N)_2C_6H_3Cl$ in C_6H_6 with Na in MeOH), m. 220° , gives in HNO_3 with fuming H_2SO_4 83.6% of 5-chloro-2,4,6-trinitroresorcinol di-Me ether (dimethoxypicryl chloride) (VII), m. 88.5° . Cond. ($K_p \cdot 10^4$) in MeOH for ν 64,000, 128,000, 250,000, resp.: II (at 24.3°) 3.62, 2.37, 1.624; IV (24.52°) 2.71, 1.88, 1.225; VI (24.56°) 1.716, 1.555, 0.77; III (24.3°) 1.007, 0.705, —. C. A. R.

Action of chlorosulfonic acid upon phenols. I. Derivatives of the three cresols and phenol. JAKOB POLLAK, ERICH GEBAUER-FÜLNEGG AND EUGEN RIESZ. Monatsh. 46, 383-97(1926).—At room temp. *o*- MeC_6H_4OH and $ClSO_3H$, either in equiv. amts. or with excess of acid, give 2-hydroxytoluene-3,5-disulfonyl chloride (*o*-cresol-4,6-disulfonyl chloride), m. $85-6^\circ$; $FeCl_3$ gives a violet color. *m*- MeC_6H_4OH gives *m*-cresol-4,6-disulfonyl chloride (?), m. $84-9^\circ$; $FeCl_3$ gives a violet color. If the equiv. amt. of $ClSO_3H$ is added to 5 g. *m*- MeC_6H_4OH , there is formed principally *m*-cresolsulfonic acid, but also 0.2 g. di-*m*-cresyl sulfate, m. 119° ; $FeCl_3$ gives no color. The *p*-cresoldisulfonyl chloride, m. 105° . $PhOH$ (10 g.) gives 3 g. phenol-2,4-disulfonyl chloride, m. 89° , gives a red violet color with $FeCl_3$. Heating 10 g. *o*- MeC_6H_4OH and 100 g. $ClSO_3H$ 3 hrs. at 110° gives 17-8 g. *o*-methylphenylene-*o*-sulfonylide-*p,p'*-disulfonyl chloride, decomps. 280° , is stable in boiling H_2O or EtOH, is saponif. by EtOH-KOH and then gives a deep red-violet color with $FeCl_3$. Heating the 2 reacting compds. 6 hrs. at 150° gives 4 g. of the chloride and the free acid, analyzed as the Ba salt, yellow, which crysts. with 4.5 mols. H_2O . *m*- MeC_6H_4OH (10 g.) and 100 g. $ClSO_3H$ at 110° for 1.25 hrs. give 9 g. of *m*-cresolsulfonylide disulfonyl chloride, decomps. 290° ; heating 6 hrs. at $130-40^\circ$ and pouring into concd. HCl gives 12 g. *m*-cresol-2,4,6-trisulfonyl chloride, m. 151° , saponif. by hot H_2O ; the amide decomps. at 290° ; pouring the above reaction product into H_2O gives the free acid, analyzed as the Pb salt. *p*- MeC_6H_4OH likewise gives a *p*-cresolsulfonylide disulfonyl chloride, decomps. at 280° . $PhOH$ and $ClSO_3H$ give after 4-5 hrs. at $130-40^\circ$ phenol-2,4,6-trisulfonyl chloride, m. 193° ; a sulfonylide was not obtained. C. J. WEST

Dehydration of benzyl alcohol by the xanthate method. S. S. NAMEYKIN AND D. KURSANOV. J. prakt. Chem. 112, 164-8(1926).—Me benzyl xanthate, m. 29° , in 60% yield from 54 g. $PhCH_2OH$ in 35 g. $C_6H_5Me_2$ and the theoretical amt. of Na, 88 g. CS_2 , followed by treatment with Me_2SO_4 ; Et ester, b.p. $170-1^\circ$, does not solidify at -20° . EtOH- NH_3 gives 75% of the amide, m. $61.5-2^\circ$. Heating 23 g. of the Me ester at $180-350^\circ$ gives more than 5 g. stilbene and a compd. $C_{22}H_{20}S$, light yellow, m. $184-5^\circ$, mol. wt. in boiling C_6H_6 , 392, 399. C. J. WEST

The effect of various purification methods on xylene as solvent for catalytic reduc-

tions. FRITZ ZETZSCHE and OLGA ARND. *Helvetica Chim. Acta* 9, 173-7(1926).—The value of various hydrocarbons as solvents in the reduction of acid chlorides to aldehydes varies with their purity. The aldehyde-titer may be used as an index of their value. The impurities may (1) inactivate the catalyst; (2) allow a satisfactory reduction to aldehyde to take place; (3) the reduction goes past the aldehyde stage. To (1) belong most technical toluene, xylene, etc., and to (3) belong mostly the pure manufactured hydrocarbons. The latter class may be controlled by regulators. The reduction of BzCl was studied, the object being to convert a solvent of titer -0 into one of $+0$, and if possible to make the solvent inactive catalytically. Washing solvents, e. g., xylene, with concd. H_2SO_4 20-25 times accomplishes this, but the loss is great. Distn. will not work. Treatment with POCl_3 seems quite satisfactory, although the solvent so obtained is not entirely inactive catalytically. Of a series of other substances with which xylene was treated to render it catalytically neutral (Na-Hg, Cu, $\text{C}_6\text{H}_2(\text{NO}_2)_3\text{OH}$, H_3PO_4 , animal charcoal, HCl , AlCl_3 , and quinoline-S) only anhyd. AlCl_3 was satisfactory. One treatment with this is equiv. to 12 washings with concd. H_2SO_4 . Both POCl_3 and AlCl_3 give solvents for catalytic reductions to aldehydes, which are usually satisfactory. E. H. VOLWILER

Usefulness of various solvents for the catalytic aldehyde synthesis from acid chlorides. FRITZ ZETZSCHE, FLORIAN ENDERLIN, CHRISTIAN FLÜTSCH and ERNEST MENZI. *Helvetica Chim. Acta* 9, 177-81(1926).—The use of aromatic hydrocarbons as solvents for the synthesis of aldehydes from acid chlorides is often limited by the insoly. of the reactants or products, and by the time required for the reduction. The solvent should be readily manipulated, purified, and regulated. BzCl was reduced in a large no. of solvents. The titer was first detd. for the solvent, usually at the b. p., then the solvent distd. and washed, and finally a regulator (quinoline-S) added to give a max. yield of aldehyde. The following were tried:— CHCl_3 , CCl_4 , $\text{C}_6\text{H}_5\text{N}$, quinoline, $\text{C}_2\text{H}_5\text{Cl}$, tetralin, decalin, PhCl , PhBr , PhCCl_3 , AmOAc , hexalin acetate, EtOBz , di-Et phthalate, anisole, phenetole, Ac_2O , turpentine and PhNO_2 . Tetralin, decalin, anisole and turpentine were promising. The 1st two resemble the aromatic hydrocarbons, but need not be so painstakingly purified. Addn. of 3 mg. quinoline-S as a regulator gave 82% of BzH from BzCl in 2 hrs. with tetralin, and 86% with decalin, at 180° . Both solvents had been twice distd. Anisole and turpentine gave similar results. All these solvents gave approx. twice the speed of reduction as with the usual aromatic hydrocarbon solvents. Ac_2O as a solvent gave with BzCl a good yield of Bz_2O , so that this may be used as a method of prepn. of anhydrides. F. H. V.

The action of ultra-violet rays on aldehydes. Hexahydrobenzaldehyde, phenylacetaldehyde and hydrocinnamaldehyde. ADOLF FRANKE and FRIEDRICH SIGMUND. *Monatsh.* 46, 61-74(1925).—Previous expts. show that ultra-violet light decomps. aliphatic aldehydes, RCHO , into CO and RH (cf. *C. A.* 6, 2074; 7, 2543). BzH does not undergo this kind of a decompn. (cf. *C. A.* 5, 2024). R. and S. find that $\text{C}_6\text{H}_7\text{CHO}$ yields CO , whereas PhCH_2CHO and $\text{PhCH}_2\text{CH}_2\text{CHO}$ do not. A partial valence from the unsatd. benzene ring evidently joins to the CHO group and prevents its decompn. Whether the CHO is in the β - or γ -position makes no difference in this inhibition. Decompn. into CO and hydrocarbon does not necessarily accompany polymerization to a trimer, e. g., in PhCH_2CHO . $\text{PhCH}_2\text{C}(\text{CH}_2\text{OH})_3$ was prepd. by condensing PhCH_2CHO with HCHO and alc. KOH . D. S. VILLARS

Chemical isomerism of the three *cis*-cinnamic acids. A reply to Mr. W. K. de Jong. HANS STOBBE. *Ber.* 58B, 2620-6(1925).—Cf. de J., *C. A.* 13, 3149. C. A. R.

Action of organic acids on beryllium carbonate. S. KINHORN. *Bul. soc. chim. Roumanie* 7, 100-1(1925).—Be acetylsalicylate, prepd. by neutralizing hot aq. $o\text{-AcO-C}_6\text{H}_4\text{CO}_2\text{H}$ by gradual addn. of a considerable excess of BeCO_3 with stirring, has a compn. corresponding to $(\text{AcOC}_6\text{H}_4\text{CO}_2\text{Be})_2\text{O}$, showing that it is formed by condensation of 2 mols. of $o\text{-AcOC}_6\text{H}_4\text{CO}_2\text{H}$ with elimination of 1 mol. H_2O . It is insol. in Et_2O , C_6H_6 , C_7H_8 , ligroin, CS_2 , CHCl_3 , NH_4OH , etc. It is sol. in mineral acids only when heated, except HCl , in which it is insol. Aq. solns. of phenylacetic, gallic and tannic acids dissolve only very small quantities of BeCO_3 on boiling, with evolution of CO_2 . Sebatic, mucic and hippuric acids do not attack BeCO_3 . Thioacetic acids and aq. solns. of $o\text{-HSC}_6\text{H}_4\text{CO}_2\text{H}$ dissolve considerable amts. of BeCO_3 , but the corresponding salts could not be isolated; thioacetic acid gives $\text{Be}(\text{OAc})_2$ with evolution of H_2S , and $\text{HSC}_6\text{H}_4\text{CO}_2\text{H}$ gives a thick, gummy, uncrystallizable sirup. A. PAPINEAU-COUTURE

2-Mercapto-5-methylbenzoic acid. F. KROLLPFIEFFER with H. SCHULTZE and E. SOMMERMEYER. *Ber.* 58B, 2698-701(1925).—The compd. (I) obtained by Arndt (*C. A.* 20, 197) by the decompn. of 2,2-dichloro-6-methylthiochromonol with H_2O ,

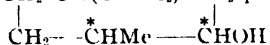
which he believes is 3,6-Me(HS)C₆H₃CO₂H is different from K.'s 5,2-Me(HS)-C₆H₃CO₂H (II), obtained by alk. degradation of 2,6-dimethyl-3-bromothiochromanone (III) (C. A. 20, 202), which in all its properties resembles the unsubstituted 2-HSC₆H₃CO₂H (IV). That I is no homolog of IV was proved in an attempt to oxidize it to the disulfide acid with alk. K₂Fe(CN)₆; no well-defined disulfide acid was obtained but CO was evolved on the addn. of the K₂Fe(CN)₆; furthermore, alkali fusion of I yielded 5-methylthionaphthenequinone. Both observations indicate that I has more C atoms than II, and A. must have been misled by an error in analysis; K., S. and S. find 15.56–15.61% S in I instead of the 19.1% given by A. Whether I is a 2,3,4-triketothiochroman, with which the above S content agrees, is left to A. to det. That the constitution assigned to II is correct has been established by synthesizing it from 5,2-Me(H₂N)C₆H₃CO₂H (V) and by converting it into 5-methyl-3-hydroxythionaphthene (VI). In connection with the statement of A. that dehydration with PCl₅ has hitherto proved to be the "only practicable way" for the prepn. of chromone (VII) from chromanone, attention is called to the work of v. Auwers (C. A. 14, 3633) who describes the prepn. of substituted chromones from the corresponding 3-bromochromanones by boiling with PhNMe₂, and K., S. and S. have prepd. VII itself from 3-bromochromanone by boiling both with PhNMe₂ and with C₆H₅N so that the difference in reactivity of the H atoms in position 2 of 3-bromothiochromanones and 3-bromochromanones alleged by A. does not exist. V (4.2 g.) diazotized in aq. H₂SO₄ with NaNO₂, then treated with SO₂ and with "Naturkuper C," gives 2 g. of the crude SO₂H acid which with Zn dust and HCl in alc. yields II, m. 155°, identical with the product obtained from III. With an excess of ClCH₂CO₂H in an equiv. amt. of aq. Na₂CO₃ II in NaOH gives on the H₂O bath *p*-tolylthioglycolic-o-carboxylic acid, m. 220° (decompn.) (yield, nearly quant.), 0.5 g. of which, with 5 g. NaOH and a little H₂O at 180°, yields 0.1 g. VI, m. 100°. I (1.5 g.) under the same conditions gives with ClCH₂CO₂H 0.5 g. of an acid, m. 226°, which on alk. fusion yields II.

Degradation of 2,2-dichlorothiochromonols. F. ARNDT. *Ber.* 58B, 2702(1925); cf. preceding abstr.—The error in the S detn. of the supposed Me(HS)C₆H₃CO₂H had been detected in A.'s lab., also that 3-bromochromanone can be converted into chromone by boiling with tertiary bases, but whereas long boiling is required to effect the latter conversion, only a few min. is required in the thiochromanone series. C. A. R.

Determination of unsaturated hydrocarbons in the presence of saturated and tricyclic hydrocarbons; the solution of the problem from the point of view of the dehydration of alcohols. S. S. NAMETKIN AND LYDIA BRYSSOVA. *J. prakt. Chem.* 112, 169–76(1926).—The method depends upon the discovery of Prileschaeff (C. A. 6, 2407) that Et₂O or CHCl₃ solns. of unsatd. hydrocarbons react quant. with BzO₂H; the excess BzO₂H reacts with KI and H₂SO₄ and the liberated I is titrated with Na₂S₂O₃. The reaction with menthene, limonene, tricyclene, fenchocyclene, α methylcamphene, bornylene and a mixt. of limonene and menthane is described. C. J. WEST

Isomeric carvomenthols from carvacrol. VINCENZO PAOLINI. *Gazz. chim. ital.* 55, 818–24(1925).—In previous work P. (Atti accad. Lincei 32, II, 134, 731) showed how

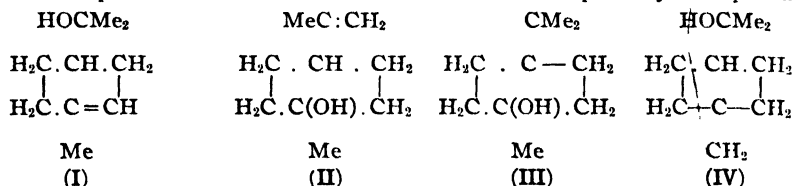
various carvomenthols (I) (menthan-2-ols), CH₂ $\overset{*}{\text{C}}\text{H}(\text{CHMe}_2) \text{CH}_2$ prepd. by various



authors are mixts. of 8 stereoisomers, arising from the 3 asym. C atoms, in unknown proportions. Several preps. of I have been characterized or sepd. by P.'s cold esterification process with C₆H₄(CO)₂O. Another mixt. of I can be obtained by reducing carvacrol (II) according to a modification of Brunel's method. The product contains about 50% of unchanged II. When the mixt. is agitated with 5% NaOH II is dissolved. 20 g. of I (a mixt. of α - and β -carvomenthol) in 500 cc. PhMe was treated with K. After decanting from the excess K the calcd. amt. of C₆H₄(CO)₂O suspended in PhMe was added. After 48 hrs. 700–800 cc. dil. KOH was added. From this soln. β -carvomenthol acid phthalate (III) (a mixt. of at least 2 phthalates) sepd. on adding dil. H₂SO₄. 10 g. III, m. 125°, in abs. EtOH was treated with the calcd. amt. of strychnine. After evapg. the EtOH the strychnine salt was dissolved in CCl₄ and on adding petroleum ether half of the salt sepd.; m. 148°, [α]_D –14.72°. 20 g. of this salt was dissolved in EtOH; excess HCl (d. 1.18) was added and then H₂O; *l*, β -carvomenthol acid phthalate, m. 125°, [α]_D –3.70°, sepd. This sapond. by EtOH-KOH gives *l*, β -carvomenthol, b. 218°, *d*₄ 0.9082, *n*_D¹⁵ 1.4610, [α]_D –1.81°. The liquid, from which the less sol. strychnine salt was sepd., was evapd. and converted with HCl into *d*, β -carvomenthol acid phthalate, m. 125°, [α]_D 3.77°. This sapond. with EtOH-KOH gave *d*, β -carvomenthol, b. 218°, *d*₄ 0.9081, *n*_D¹⁵ 1.461, [α]_D 1.79°. The acid phthalate sol. in cold petroleum

ether was converted into the *Ag salt*, m. 225°, but was recovered in the free state again as an oil. This treated as above gave *l,α-carvomenthol*, $[\alpha]_D -2.70^\circ$, and *α,α-carvomenthol*, $[\alpha]_D 2.20^\circ$. These products were sirupy and purification is probably not complete. From a summary of results obtained so far P. concludes that in the 4 papers published so far 6 of the 8 possible stereoisomers of I have been described. E. J. W.

Isomeric terpineols and the separation of α-terpineol into its optical antipodes. VINCENZO PAOLINI. *Gazz. chim. ital.* 55, 804-11 (1925).—Liquid com. terpineol (formed by the action of H_2SO_4 or dil. H_3PO_4 on terpene hydrate) is a mixt. of at least 3 isomeric alc., of which α-terpineol (I), m. 35°, β-terpineol (II), m. 32°, and γ-terpineol (III), are formed when H_3PO_4 is used (IV is the remaining unknown isomer). Various mixts. of these compds. are obtained and when individuals are sepd. they are optically in-



active. These compds. are so readily isomerized that the usual method of esterifying the alc. with $C_6H_4(CO)_2O$ and subsequent fractionation of the strychnine salt cannot be applied. In 1910 P. (*C. A.* 5, 3404) developed a modification of Haller's method by which he has sepd. the active isomers of tana-cetyl alc., linalool, sabinol, santalol and carvomenthol. The α-terpineol (I) used, b. 218°, m. 35°, and was optically inactive. 10 g. I in 200 cc. PhMe was treated with 4 g. K wire for 10-12 hrs. The soln. of the K alcoholate was decanted from the excess K and treated slowly with 9.6 g. $C_6H_4(CO)_2O$ in much PhMe. After 48 hrs. 400-500 cc. very dil. aq. KOH was added. The phthalic ether was taken up by the H_2O as the K salt; the soln. was acidified with H_2SO_4 and sepd. the acid phthalate. This was washed, dried and dissolved in abs. EtOH. The calcd. amt. of strychnine was then added and enough $CHCl_3$ to give complete soln. Presently the strychnine salt of the *l*-form (VI), $C_{11}H_{18}(CO_2C_{10}H_{17})(CO_2H \cdot C_2H_4N_2O_2)$, sepd.; recrystd. from iso-BuOH this m. 207°, $[\alpha]_D -40.80^\circ$. 50 g. pure VI was treated with $NH_3 \cdot H_2O$ on the H_2O bath; the strychnine was filtered off; the filtrate, acidified with H_2SO_4 , pptd. *l-α-terpineol acid phthalate*. This was sapond. with hot KOH-EtOH; the *l-terpineol*, removed by steam distn., b. 218°, m. 37-8°, $d_{15} 0.935$, $[\alpha]_D -98.20^\circ$. The mother liquor from VI was evaporated spontaneously; strychnine was removed with NH_4OH as above; the filtrate with $AgNO_3$ pptd. the *Ag salt* of *d-α-terpineol acid phthalic acid* (VII). This was washed, dried and decompd. with NaCl soln. and acidified with H_2SO_4 ; VII was pptd., m. 116°, $[\alpha]_D 40.50^\circ$. VII sapond. with KOH-EtOH gave *d-α-terpineol*, $[\alpha]_D 98.50^\circ$. E. J. W.

The isomeric α-terpineols. Active terpineols, from active pinene. VINCENZO PAOLINI. *Gazz. chim. ital.* 55, 812-7 (1925).—In the previous paper (cf. preceding abstr.) the sepn. of the optical isomers of α-terpineol (I) was described. The mechanism of the transformation of pinene into optically active I is reviewed and discussed. By a modification of Flawitzky's method Godlewsky (*J. Russ. Phys.-Chem. Soc.* 31, 203-8, 1899) from *l*-pinene obtained *l-α-terpineol* $[\alpha]_D -95.28^\circ$. P. applied the methods reviewed in the preceding abstr. A fraction, b. 157-8°, $d_{15} 0.80$, $[\alpha]_D -35.5^\circ$, was sepd. from com. turpentine. 150 g. of this pinene with 350 g. 90% EtOH + 150 g. 70% H_2SO_4 were agitated continuously for 10 hrs. The lower layer was then sepd. and poured into ice- H_2O . The lower oily layer was dried well with K_2CO_3 and dissolved in 250 g. PhMe + K in excess. After 48 hrs. this was decanted and treated with $C_6H_4(CO)_2O$ as before and gave a mixt. of ethers, which when sapond. with KOH-EtOH gave terpineol, $[\alpha]_D -57^\circ$. The acid phthalate treated as before with strychnine gave *l-α-terpineol*, $[\alpha]_D -98.32^\circ$, m. 37-8°, $d_{15} 0.935$. The mother liquors from this salt were sapond. and gave I with $[\alpha]_D -27.00^\circ$. The same pinene treated according to Ertschikowsky with glacial AcOH and $ZnCl_2$ gave terphenyl acetate, which on sapon. and treatment as before gave about the same results on sepg. the *l*-form. The results obtained with *l-α-terpineol* here agree with those obtained on sepg. the 2 isomers. E. J. W.

New derivatives of campholcarbinol. H. RUPF AND F. FEHLMANN. *Helvetica Chim. Acta* 9, 80-97 (1926).—Reduction of Et campholate with Na in EtOH gave 55% campholcarbinol (I), purified through the Na campholmethyl phthalate; by-product, *di*[campholmethyl] phthalate, m. 80°. Campholmethyl bromide (II), from I and HBr in AcOH in sealed tubes at 100°, b. 94-5° and is rather unstable; it could not be com-

condensed with $\text{H}_2\text{C}(\text{CO}_2\text{Et})_2$ or $\text{AcCH}_2\text{CO}_2\text{Et}$. Shaken with AgOAc in AcOH , **II** gave a hydrocarbon $\text{C}_{10}\text{H}_{18}$ (**III**), b. 164° . Treated with Mg and the product decomposed with H_2O , **II** gave a mixt. b. $46-8^\circ$, of **III** with a solid hydrocarbon $\text{C}_{10}\text{H}_{20}$, and also a hydrocarbon $\text{C}_{20}\text{H}_{38}$, b. $177-8^\circ$. With PhNH_2 at 150° , **II** gave **III** and campholmethylaniline (**IV**), m. 59° , b. 173° ; HCl salt (from Et_2O), m. 156° (decompn.); nitrosamine. **I** heated with H_3PO_4 also formed **III**, which added HBr to give **II**, identified by conversion to **IV**. Campholmethyl phenylthionocarbamate, from **I** and PhNCS (16 hrs. at 120°), m. 101° . The following esters of **I** were made by warming with the acid chloride and excess $\text{C}_6\text{H}_5\text{N}$: acetate, b. 101° ; propionate, b. 112° ; camphocarboxylate, m. 145° ; phenylacetate, b. 191° ; hydrocinnamate, b. 206° ; cinnamate, b. 217° , b. 148° ; *p*-nitrobenzoate, yellow, m. 95° , yields on reduction the *p*-aminobenzoate, waxy mass, b. $242-3^\circ$, m. 74° ; HCl salt (from Et_2O), m. $140-6^\circ$ (decompn.). Camphol Me ketone (90% yield from campholyl chloride and ZnMe_2) brominated in AcOH , CS_2 or CHCl_3 , gave campholacyl bromide (**V**) (RCOCH_2Br ; cf. "phenacyl"), b. $138-42^\circ$, m. 35° , sensitive to light and air, and campholacyldibromide (**VI**), b. 164° , m. 52° . Campholymethyl acetate, through **V**, b. 146° , gave with MeOH contg. dry HCl , campholylcarbinol (**VII**), b. $123-5^\circ$; benzoate, m. 82° ; phenylacetate, b. 224° , neither **VII** nor its benzoate formed a semicarbazone. Reduction of **VII** with Na - or Al-Hg gave chiefly camphol Me ketone. **VI** heated with KOH in MeOH gave an oil, b. $128-30^\circ$, probably campholglyoxal dimethylacetal, $\text{C}_9\text{H}_{17}\text{COCH}(\text{OMe})_2$, reduces warm Fehling soln.; semicarbazone, m. 181° . Campholacylphthalimide, from **V**, m. $98-9^\circ$; campholacylphthalamidic acid, m. 143° (decompn.); campholacylamine, b. 128° , yields with HNO_2 **VII**, identified as the benzoate; campholacylphenylthiourea, m. 105° (decompn.). **V** and McNH_2 formed campholacylmethylamine, b. 123° ; the distn. residues yielded some *di*[campholacyl]methylamine; HCl salt, m. 199° ; campholacylmethylphenylthiourea, m. 147° ; *di*[campholacyl]aniline, yellow, m. 212° , insol. in acids. Similarly, campholacyltrimethylammonium bromide, m. 230° (decompn.); campholacylpyridinium bromide, m. 214° . Condensation of camphol Me ketone and HCO_2Am with NaOEt in Et_2O yielded 75% of the hydroxymethylene deriv., campholylvinyl alc. (**VIII**), b. $122-3^\circ$, which gives characteristic reactions with Fe and Cu salts, and is reduced by H_2 (Ni catalyst) to campholylethyl alc. (**IX**), b. $146-8^\circ$.

BEN H. NICOLET

Optically active esters of campholylcarbinol and of campholylethyl alcohol. H. RUPP and J. PERRET. *Helvetica Chim. Acta* 9, 97-115 (1926); cf. preceding abstr., to which nos. below **IX** refer. The rotations given are in each case for $\lambda = \text{C, D, E}$ (Hg) and F ; (b) indicates 10% soln. in C_6H_6 : **V** (b), 49.74, 63.77, 76.36, 102.80; **VII**, d_{20} 1.0002, 68.98, 87.16, 103.07, 134.33; acetate of **VII**, d_{20} 1.0256, 50.55, 63.28, 74.34, 95.37; benzoate of **VII** (b), 30.87, 38.33, 44.12, 54.11; propionate of **VII**, b_{11} 157°, d_{20} 1.0155, 49.71, 62.28, 73.16, 93.60; butyrate of **VII**, b_{11} 167.5°, d_{20} 1.0021, 46.48, 58.32, 68.40, 87.34; phenylacetate of **VII**, d_{20} 1.0668, 39.84, 49.90, 58.63, 74.63; hydrocinnamate of **VII**, b_0 136-8°, d_{20} 1.0566, 36.20, 45.27, 52.99, 67.27; camphol glycol (**X**), m. 108° , b. 146° , (b) 38.91, 47.60, 55.45, 70.45; acetate of **I**, d_{20} 0.9433, 36.72, 46.72, 55.04, 71.36; propionate of **I**, d_{20} 0.9341, 36.94, 46.60, 54.91, 71.02; butyrate of **I**, b_{11} 128.5-9°, d_{20} 0.9280, 35.73, 45.04, 53.08, 68.75; phenylacetate of **I**, d_{20} 1.0042, 29.06, 36.62, 43.22, 56.07; hydrocinnamate of **I**, d_{20} 0.9988, 26.80, 33.81, 39.89, 51.69; cinnamate of **I**, d_{20} 1.0167, 32.43, 41.25, 49.06, 64.93; **VIII**, d_{20} 0.9946, 48.03, 59.85, 69.72, 87.56; **IX**, b_{12} 143°, d_{20} 0.9974, 42.76, 52.94, 61.29, 76.03; acetate of **IX**, b_{12} 159°, d_{20} 1.0103, 35.05, 43.35, 51.05, 61.96; propionate of **IX**, b_0 93-4°, d_{20} 1.0006, 34.36, 42.48, 49.18, 61.02; butyrate of **IX**, b_0 104-6°, d_{20} 0.9886, 32.78, 40.64, 47.07, 58.41; campholylethyl bromide, b. $127-35^\circ$, 1.2042, 39.87, 49.77, 57.98, 72.86. Optical anomalies were few and slight. **X** was made in 42% yield by reduction of the acetate of **VII** in dil. alc. with Na-Hg ; it is sol. in alkalis; diacetate of **X**, b. $205-7^\circ$; monobenzoate, b. $198-9^\circ$. HNO_2 oxidizes **X** to **VII**. The prepn. of **VIII** was improved; benzoate of **VIII**, m. 65° ; hydrocinnamate of **VIII**, b. $216-8^\circ$; both esters decomp. on long standing, apparently to form *s*-tri-campholylbenzene, m. 136° , mol. wt. in C_6H_6 519-547, calcd. 534.6, found as a by-product in the prepn. of **VIII**. The Na salt of **VIII** gave with $\text{MeC}_6\text{H}_4\text{NH}_2 \cdot \text{HCl}$ in H_2O , β -campholylvinyl-*p*-toluidine, yellow, m. 80° (decompn.). Campholylethyl phenylthionocarbamate, from **IX** and PhNCS , yellow, m. 154° . Varied attempts to prep. campholylethylene by dehydration of **IX** gave a polymer, white amorphous powder, m. above 250° , mol. wt. in C_6H_6 800-1152.

BEN H. NICOLET

Phytochemical studies. **II**. Amyrin of elemi resin. OTTO DISCHENDORFER. *Monatsh.* 46, 399-408 (1926); cf. *C. A.* 18, 246.—The f.-p. curve of mixts. of α - and β -amyrin shows a eutectic at 181° and 77% of the α -form; in detg. this point, the clearing point of the mixt. is used, since this is fairly sharp, while the m. p. extends over an interval of $5-15^\circ$. α -Amyrin anisate, m. 193° ; Liebermann's cholesterol test gives

a pale red color; the concd. H_2SO_4 soln. is colorless; mol. wt. in camphor, normal; $[\alpha]_D^{20}$ 102.2° (13.347 mg. in 403.57 mg. C_6H_6 , d. 0.8767); 101.5° (25.02 mg. in 727.96 mg. C_6H_6 , d. 0.8805). β -Deriv., m. 250°; Liebermann's test gives a bluish red; $[\alpha]_D^{20}$ 97.36° (32.446 mg. in 517.516 mg. C_6H_6 , d. 0.8863); 98.29° (58.925 mg. in 967.296 mg. C_6H_6 , d. 0.8857); α 1.533, β 1.522, γ 1.671 (calcd.); other crystallographic data are given. These 2 derivs. show no eutectic. α -Amyrin *m*-nitrobenzoate, m. 233°; the Liebermann test gives a pale red color; $[\alpha]_D^{20}$ 97.62° (25.306 mg. in 860.27 mg. C_6H_6 , d. 0.8818), the β -deriv., m. 236°; Liebermann's test gives a bluish red color; $[\alpha]_D^{20}$ 96.74° (20.713 mg. in 853.601 mg. C_6H_6 , d. 0.8802). A mixt. of these 2 derivs. shows very little depression of the f. p. α -Amyrin formate, m. 190°; Liebermann's cholesterol test gives a deep dark violet red color; $[\alpha]_D^{20}$ 80.4° (18.398 mg. in 450.473 mg. C_6H_6 , d. 0.8812); 73.87° (0.8482 g. in 42.294 g. CHCl_3 , d. 1.4734); sapon. gives α -amyrin, indicating that the HCO_2H had caused no rearrangement. β -Deriv., m. 240°; Liebermann's test gives a deep dark bluish violet color; $[\alpha]_D^{20}$ 49.76° (18.569 mg. in 479.114 mg. C_6H_6 , d. 0.8834); 52.36° (0.7381 g. in 38.0778 g. CHCl_3 , d. 1.4713). A mixt. of the formates shows a eutectic at 176° and 71% of the α -form.

C. J. WEST

Some *p*-alkoxybenzohydrylamines. C. TORRÉS Y GONZALÉS. *Bull. soc. chim.* 37, 1591-6(1925).—This article gives methods of prepn. and properties for homologs of the *p*- $\text{ROC}_6\text{H}_4\text{CH}(\text{NH}_2)\text{Ph}$. Certain mono- and dialkoxy *p*-derivs. of Ph_2CHNH_2 having the properties of local anesthetics, have been previously discussed (cf. *J. pharm. chim.* [8] 1, 576). Nearly all of the series, together with the raw materials used in their prepn., are unknown. *Ethoxybenzohydrylamine* (I). For prepn. cf. Gatterman and Eberhardt, *Ber.* 23, 1206; Klages and Allendorff, *Ber.* 31, 1001. $\text{BzC}_6\text{H}_4\text{OEt}$, obtained in 331 g. yield from 280 g. BzCl + 244 g. PhOEt + 400 cc. CS_2 + 270 g. of AlCl_3 , b. 215-25°, b_{25} 245-50°, m. 47-8°. The ketoxime, from the ketone and NH_4OH HCl in 75% yield, m. 135-6°. I, obtained in 24 g. yield from 50 g. of oxime with 2 kg. Na-Hg in AcOH , is a non-distillable oily liquid. Its HCl salt, m. 229°. *Propoxybenzohydrylamine* (II), $\text{BzC}_6\text{H}_4\text{OPr}$, m. 65-6°. The oxime, m. 104-5°. II.HCl (14 g. from 17 g. oxime), m. 220-1°. *Butoxybenzohydrylamine* (III), $\text{BzC}_6\text{H}_4\text{OBu}$, b. 235-45°, m. 38-9°; the oxime m. 94-5°; the III.HCl (13 g. from 17 g. oxime), m. 213-4°. *Isoamloxybenzohydrylamine* (IV). The ketone, b. 225-40°; oxime, m. 93-4°; IV.HCl, m. 224-5°. *Phenoxybenzohydrylamine* (V). The ketone (95% yield), m. 70-4°; oxime, m. 124°; V.HCl, m. 218-9°. *Et benzohydrylamine-p-oxacetate*, $\text{C}_6\text{H}_5\text{CH}(\text{NH}_2)\text{C}_6\text{H}_4\text{OCH}_2\text{CO}_2\text{Et}$ (VI). The ketone is obtained by condensing $\text{PhCOC}_6\text{H}_4\text{OH}$ (cf. Dobner, *Ann.* 210, 224) with $\text{ClCH}_2\text{CO}_2\text{Et}$ in the presence of soda. The VI.HCl, m. 183-4°. The phenylbenzylamines are obtained in a similar manner except that BzCl is replaced by PhCH_2COCl in the prepn. of the ketones. *Diphenylethylamine* $\text{PhCH}_2\text{CH}(\text{NH}_2)\text{Ph}$ (VII). Ketone, m. 57°, b. 320-2°; b_{12} 177°. Oxime, m. 97-8°; VII.HCl, m. 251-2°. *p*-Methoxyphenylbenzylamine, $\text{PhCH}_2\text{CH}(\text{NH}_2)\text{C}_6\text{H}_4\text{OMe}$ (VII). The ketone, m. 77°, and the oxime, m. 114°, are known. VIII.HCl, m. 234-5°. *Ethoxyphenylbenzylamine* (IX). Ketone, m. 105-6°. Oxime, m. 89-90°. IX.HCl, m. 203-4°. Resolution of I into optical isomers is effected by treating 10 g. I.HCl with 1 equiv. of NH_4 bromocamphorsulfonate in 60 cc. abs. alc. and pptg. by 140 g. distd. water, yield 9.98 g., m. 174-5°. The substance is purified by successive recrystns., and the base freed by the calcd. amt. of soda. It is extd. by Et_2O and has $\alpha_D -3.99^\circ$, m. 201-2°. The mother liquors, cooled to 0°, furnish the remainder of this substance and then a new crystn. of *dl*-bromocamphorsulfonate, m. 174°. The mother liquors from these two crystns., treated with soda give a non-cryst. base, α_D 3.37°. HCl salt of *d*-rotatory base, m. 223-4°; of *l*-rotatory base 221-2°; of *dl* base 229-30°.

H. W. GIBSON

Constitution of the so-called diphenylcyclobutane. R. STOKER and CL. THIER (in part with E. LAAGH). *Ber.* 58B, 2607-15(1925); cf. *ibid.* 38, 1965(1905). The supposed 1,3-diphenylcyclobutane obtained, together with $\text{C}_6\text{H}_5\text{Ph}$ and other products, by heating PhCH_2CHO with alc. KOH under pressure has been shown to be really $\text{PhCH}_2\text{CH}:\text{CHPh}$ (I) (Dieckmann and Kammerer, *Ber.* 39, 3048(1906)); it is assumed that the PhCH_2CHO is first converted into the aldol $\text{PhCH}_2\text{CH}(\text{OH})\text{CHPhCHO}$ (II), which, under the influence of the alc. KOH, loses H_2O and the CHO group (as $\text{HC}_2\text{O}_2\text{H}$). Under the altered conditions now used in prepg. the I (heating the PhCH_2CHO with the alc. KOH in open vessels), the mother liquors on acidification no longer yield Na_2CO_3 -sol. but only Na_2CO_3 -insol. products which, however, dissolve, although with difficulty, in hot alkalis. From these were isolated small amts. of 3 compds. $\text{C}_{14}\text{H}_{12}\text{O}_2$, m. 109° (III), 133° (IV) and 165° (V) (apparently lactones), and the dry Na salt of III, heated

with Me_2SO_4 in an attempt to prep. a Me ester, yielded a 4th isomer (VI), m. 135° , which strongly depressed the m. p. of IV. III also exists in a 2nd dimorphous form (VII), m. 122° , and could never be obtained again, as on soln. and seeding it always immediately changed into VII; no further analogous rearrangements could ever be effected. The formation of these compds. may be explained by assuming that the aldol II changes under the influence of the alc. KOH into the unsatd. aldehyde $\text{PhCH}_2\text{CH}:\text{C}(\text{Ph})\text{CHO}$ which adds another mol. of PhCH_2CHO to form the dialdehyde $\text{PhCH}_2\text{CH}(\text{CHPhCHO})\text{CHPhCHO}$; this undergoes a Cannizzaro reaction and the resulting $\text{PhCH}_2\text{CH}(\text{CHPhCH}_2\text{OH})\text{CHPhCO}_2\text{H}$ yields α,γ -diphenyl- β -benzyl- δ -valerolactone, $\text{PhCH}_2\text{CH}(\text{CHPh})\text{CO}_2\text{O}(\text{CH}_2\text{CHPh})$ (VIII). VIII may theoretically exist in 4 isomeric

dl-forms according as the Ph and PhCH_2 groups lie on the same or on different sides of the plane of the lactone ring. I (5.8 g. from 10 g. PhCH_2CHO refluxed 2 hrs. with 5 g. KOH in 35 cc. alc.), b_{14} $178-9^\circ$, m. $15-6^\circ$, mol. wt. in boiling C_6H_6 195.9; dibromide, m. 109° ; pseudonitrosite, m. $142-50^\circ$ (depending on the rate of heating) with effervescence, dissolves in boiling xylene with green color but not without decompn., gives with NH_2Et in hot alc. the nitrodiethylamine, $\text{C}_{18}\text{H}_{24}\text{O}_2\text{N}_2$, yellowish, m. 93° ; nitroschloride, m. 166° (foaming), sol. in C_6H_6 with green color. In boiling alc. with Na or in alc. with H and palladinized CaCO_3 I gives $\text{CH}_2(\text{CH}_2\text{Ph})_2$, b_{16} $166-8^\circ$, b. $301-3^\circ$. With alk. KMnO_4 I gives, together with much unchanged I, only BzH, BzOH and $\text{PhCH}_2\text{CO}_2\text{H}$; with KMnO_4 in Me_2CO and H_2SO_4 is obtained also a compd. (IX), m. $116-7^\circ$, which reduces Fehling soln. and $\text{NH}_3\text{-AgNO}_3$ and forms a semicarbazone, m. 189° and regenerating IX on boiling with 10% H_2SO_4 ; IX has the compn., $\text{C}_{16}\text{H}_{14}\text{O} \cdot \text{H}_2\text{O}$, of an α,β -diphenylpropionaldehyde hydrate, possibly formed by migration of a Ph group in the glycol $\text{PhCH}_2\text{CH}(\text{OH})\text{CH}(\text{OH})\text{Ph}$ resulting from the oxidation of the I. It dissolves in concd. H_2SO_4 with a dark red color destroyed by the addn. of H_2O , forms no oxime and could not be converted into the corresponding acid. Ozonization of I in AcOH gave only BzH, BzOH and $\text{PhCH}_2\text{CO}_2\text{H}$. C. A. R.

1-Phenylnaphthalene and its derivatives. RICHARD WEISS AND KARL WOLDICH. *Monatsh.* **46**, 453-8(1926). -- $1\text{-C}_{10}\text{H}_7\text{Ph}$ (I) (Möhlau and Berger, *Monatsh.* **26**, 1198), b_{17} , 334° , results in 33 g. yield by heating 55 g. 1-phenyldialin (b_{12} $175-7^\circ$; in 28 g. yield from 61.5 g. PhBr, 10 g. Mg and 50 g. 1-tetralone) with S at 250° and in 4 g. yield from 8 g. tetrahydrophenylnaphthalene (b_{760} 332° , m. 36°); in 6 g. yield from 10 g. $\alpha\text{-C}_{10}\text{H}_7\text{Br}$, 1.2 g. Mg and 4.2 g. cyclohexanone) and S-Br deriv., b_{12} $210-20^\circ$, m. 70° ; 7 g. from 10 g. I and 7.5 g. Br. In AcOH, HNO_3 gives from 8 g. I 6 g. of a NO_2 deriv., yellow, m. 132° . The NH_2 deriv. is an oil and was analyzed as the HCl salt, crystg. with 0.5 H_2O and m. 234° (decompn.); *Ac* deriv., m. $169-70^\circ$. *p*-Nitrophenylazo-*p*-aminophenylnaphthalene, green, shimmering needles, m. $220-2^\circ$, from the NH_2 deriv. and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{N}(\text{NO})\text{Na}$. Reduction with SnCl_2 in AcOH-HCl gives *p*-diamino-1-phenylnaphthalene, whose *di-Ac* deriv. m. 278° . *Na* phenylnaphthalenesulfonate, glistening needles. C. J. WEST

A mercuri-organic compound of phenyl- β -naphthylamine. G. ROSSI AND B. CECCHETTI. *Gazz. chim. ital.* **55**, 869-72(1925). -- $\beta\text{-C}_{10}\text{H}_7\text{NHPh}$ in alc. is treated with $\text{Hg}(\text{OAc})_2$ in 50% EtOH slightly acid with AcOH. The soln. is heated on the H₂O-bath about 30 min. and after 12 hrs. a yellow ppt. m. 173° , is filtered off; this is probably mercuriphenylnaphthylamine, $\text{C}_{16}\text{H}_{14}\text{Hg} \cdot \text{C}_{10}\text{H}_6\text{NH} \cdot 2\text{EtOH}$. The presence

of EtOH in this compd. was demonstrated by the CHI_3 test. E. J. WITZEMANN

Acetylene derivatives. V. Phenyl- β -naphthylacetylene. PAUL RUGGLI AND MARC REINERT. *Helvetica Chim. Acta* **9**, 67-79(1926); cf. C. A. **15**, 1369. -- PhCH_2COCl and C_{10}H_8 in CS_2 gave with AlCl_3 , 77% of a mixt. of α - and $\beta\text{-C}_{10}\text{H}_7\text{COCH}_2\text{Ph}$ (I and II), sepd. as the picrates from C_6H_6 ; picrate of II (less sol.), m. $142.5-3.5^\circ$; picrate of I, m. $101-2^\circ$; I, m. $66-7^\circ$; II, m. $99-9.5^\circ$; phenylhydrazones of I, m. $101-1.5^\circ$, decomp. on standing; phenylhydrazone of II, m. $165-7^\circ$; oxime of I, m. $148-52^\circ$ (decompn.); oxime of II, m. $128-9.5^\circ$. Oxidation of I and II with KMnO_4 in dil. $\text{C}_6\text{H}_5\text{N}$ gave chiefly α - and β -naphthylphenylglyoxal, yellow, m. $101.5-2^\circ$ and $86.5-7^\circ$, resp., and giving with $\alpha\text{-C}_6\text{H}_4(\text{NH}_2)_2$ α - and β -naphthylphenylquinoxalines, yellow, m. $137-9^\circ$ and $108-10^\circ$. Heated 0.5 hr. in CHCl_3 with PCl_5 , II evolved HCl and gave 1-phenyl-2- β -naphthyl-2-chloroethylenes, m. $116-7^\circ$, very stable toward hot alc. KOH; boiled 2 hrs. in $\text{C}_6\text{H}_5\text{N}$ with KOH, it gave phenyl β -naphthylacetylene, m. $115-6^\circ$, which, dissolved in concd. H_2SO_4 and let stand some hrs., re-forms II. With PBr_5 in C_6H_6 II yielded 1-phenyl-1-bromo-2- β -naphthyl-2-ketoethane, m. $111-1.5^\circ$, hydrolyzed by KOH in MeOH to 1-phenyl-1-hydroxy-2- β -naphthyl-2-ketoethane, m. $151-2^\circ$. With PCl_5 , I gave 1-phenyl-1,2-dichloro-2- α -naphthylethane, m. 102° (evolution of HCl); on repeated distn. in

vacuum, it formed 1-phenyl-2-chloro-2- α -naphthylethylene, oil, b_{11} 228–33°, loses only 10% of its Cl when boiled 7 hrs. with KOH in C_6H_5N . With PBr_3 I gave, according to the conditions, 1-phenyl-2-bromo-2-[dibromo- α -naphthyl]ethylene, m. 170–1°, or 1-phenyl-1-bromo-2- α -naphthyl-2-ketoethane, m. 63–4°. Hydrolysis of the latter formed 1-phenyl-1-hydroxy-2- α -naphthyl-2-ketoethane, m. 105–5.5°. BEN H. NICOLET

Decahydronaphthalene and its substitution products. I. GYSIN. *Helvetica Chim. Acta* 9, 59–67(1926).—Decalin was sprayed by Cl_2 into a chamber; as catalysts light and 1% I_2 were used (app. described in G.'s, *Diss. Geneva*, 1925). From 270 g. 120 g. chlorodecalin (I) and 60 g. dichlorodecalin (II) were formed. KCN in EtOH or AgCN in AmOH gave with I no cyanodecalin, but some octalin. Attempts to prep. decalindicarboxylic acid from II by the Grignard reaction, and to rearrange decalin carboxamide to the amine, failed. By means of $AlCl_3$, I was condensed with a no. of aromatic substances, yields averaging 50%; the position taken by the $C_{10}H_{17}$ is to be determined later. The following products are described: phenyl, b_{18} 170–80°; tolyl, b_{18} 180–90°; *m*-xylol, b_{18} 182–92°; *cymyl*, b_{18} 192–212°; *anisyl*, b_{18} 185–95°; *m*-dimethoxyphenyl, b_{18} 225–35°; *p*-dimethoxyphenyl, b_{18} 208–25°; naphthyl, b_{18} 240–80°, gave two isomers, m. 62° and 68°. BEN H. NICOLET

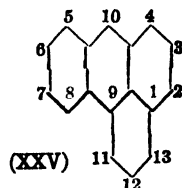
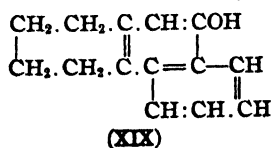
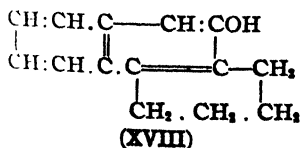
Radical dissociation of arylated succinic acid derivatives. II. Radical dissociation of tetraarylsuccinodinitriles. A. LÖWENBEIN AND R. FÜRST GAGARIN. *Ber.* 58B, 2643–4(1925); cf. *C. A.* 19, 2043.—In view of the appearance of the paper of Blicher (*C. A.* 19, 1858), L. and G. give the exptl. evidence which they have obtained of the dissociation of tetraphenylsuccinodinitrile (I) into free radicals. As I itself begins to dissociate only at about 140° it was sought to lower the temp. limits of the dissociation by the introduction of suitable substituents in the Ph residues. Tetra-*p*-anisylsuccinodinitrile, from $(MeOC_6H_4)_2CHCN$ (II) boiled 0.5 hr. with $K_2Fe(CN)_6$ in 15% NaOH slowly liquefies 220–40°, gradually becoming redder and redder, dissolves in concd. H_2SO_4 with intense blue color; the colorless solns. in $CHCl_3$, EtOH, C_6H_6 or AcOH assume on warming a vivid pink color and a very intense yellow fluorescence which slowly disappear on cooling; the dissociation begins at 60–80°, depending on the solvent. The presence of free *di-p*-anisylcyanomethyl radicals is shown by the fact that on long boiling with $PhNHNH_2$ these solns. take up H with regeneration of the original II. *C. A. R.*

Derivatives of β -methylanthraquinone. VII. Nitro derivatives of 1-hydroxy-3-methylanthraquinone and their reaction products. R. EDER AND O. MANOUKIAN. *Helvetica Chim. Acta* 9, 51–9(1926); cf. *C. A.* 19, 2046.—1-Hydroxy-3-methylanthraquinone (I) and 2 mols. KNO_3 in 4 parts concd. H_2SO_4 , heated 5 hrs. at 100°, gave chiefly the 2,4-dinitro deriv. of I (II), m. 275–6° (decompn.). From the mother liquors the 2-nitro (III), m. 272–3° (decompn.), and 4-nitro deriv. (IV), m. 241–2°, were obtained. Nitration of III or IV gave II, which yielded $C_6H_4(CO)_2O$ on oxidation. II, III and I methyl-2-nitro-4-hydroxyanthraquinone all resisted replacement of the NO_2 by OMe when heated with KOMe (cf. *Ber.* 37, 59(1904)). II, refluxed 15 hrs. with NaOMe, showed much reduction. The crude product, heated 6 hrs. at 190° with AcOH and HCl, finally yielded 15% 3-methylpurpurin, m. 231–2°; *Ba salt*, violet needles. Reduction of II, III and IV with Na_2S gave resp. the 2,4-diamino, violet, m. 259–60°, 2-amino, violet, m. 238° and 4-amino deriv. (V) of I, red-violet, m. 253–4°. V was also made by hydrolysis of 1-bromo-3-methyl-4-aminoanthraquinone with H_2BO_3 in H_2SO_4 . BEN H. NICOLET

Catalytic hydrogenations under pressure in the presence of nickel salts. IX. Anthraquinone, phenanthrenequinone and benzanthrone. JULIUS V. BRAUN AND OTTO BAYER. *Ber.* 58B, 2667–85(1925); cf. *C. A.* 18, 2162; Schroeter, *C. A.* 19, 1271. The guiding thought of this investigation was the observation that in the catalytic hydrogenation of anthracene (I) the 1st point of attack is, in part, at least, the center ring, just as in the other mild reduction processes, followed by the addn. of 2 more H atoms (in 1 of the side rings, naturally) and finally, in a 3rd phase, there is a shifting of the H (or the double bonds), the center ring becoming aromatic. This remarkable intramol. rearrangement has been confirmed by the behavior of dihydroanthranol (II) which yielded, together with di- (III) and tetrahydroanthracene (IV) (formed without doubt from I, which is produced so readily from II), a compd. which could be proved with certainty to be a 2,3-tetramethylene-1-naphthol (V). Whether catalytic hydrogenation of the I complex proceeds primarily exclusively through the *meso*-nucleus or whether it is accompanied by a simultaneous attack on 1 of the side chains cannot be

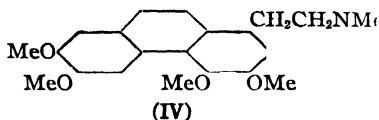
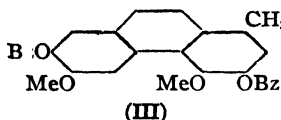
detd. for I itself, but, according to the scheme
$$\begin{array}{c} 4H \\ \text{V} \end{array} \xleftarrow{\text{anthranol (VI)}} \text{II} \xrightarrow{2H} \text{V} + \text{III} + \text{IV}$$
, if only the middle ring is attacked first, the yield of V should, under the same

conditions, not be greater from VI than from II, whereas if there is a simultaneous hydrogenation of a side ring it should be greater. As a matter of fact, II gives only 15% V and almost 80% of III + IV, while with VI these relative yields are reversed. It may be concluded with certainty, therefore, that with VI the addn. of H to a side ring predominates, in fact may be exclusively the primary reaction, and that primary addn. on the *meso*-nucleus occurs only in those mols. in the anthrone form which, under the explt. conditions (at about 200° under high pressures) must certainly be present to a certain extent. It might be objected to the above scheme that V itself may easily be further attacked by H with elimination of the HO group and formation of IV so that the relative yields of V and of III + IV are no true index of the course of the reaction. Such is not the case, however. V can be further hydrogenated, to be sure, but much more difficultly than VI or II and no IV is formed; the aromatic side ring is attacked first and the products are *octahydroanthranol* (VII) and, finally, *octahydroanthracene* (VIII). V and VII, which may be considered as a $C_{10}H_8$ and a C_8H_8 deriv., resp., agree in some of their properties with the known naphthols and phenols but differ in others, probably owing to the loading down of the aromatic rings with cyclic side chains. Both are oxidized to the corresponding quinones (IX and X), are easily brominated in the *p*-position, couple with diazo compds. and can in this way be converted into the *p*-amino phenols (XI and XII) and on alkylation and acylation behave like normal phenols. On the other hand, VII, unlike durenol, is strikingly little sol. in alkalies and XII dissolves in neither alkalies nor acids; V and VII cannot be nitrated, are oxidized by HNO_2 partly to the quinones and partly to the *ditetra*- (XIII) and *dioctahydrodianthranols* (XIV) and form NO derivs. in only small amts. No indications of tautomerism in V and VII have been observed. Unlike hydrogenation with Pt sponge, hydrogenation of anthraquinone with Ni under pressure gives no anthrahydroquinol; the first product which can be isolated is VI, which, under proper conditions, can be obtained practically quant.; further hydrogenation then yields the products described above. The hydrogenation of phenanthrenequinone (XV) proceeds in a manner entirely analogous to that of anthraquinone. There are 3 marked differences in the 2 series, however: (1) With XV it is possible, by moderated reduction, to obtain, along with the 9-phenanthrol (XVI), the *phenanthrenehydroquinol* (XVII), which is therefore certainly the 1st stage in the reduction. (2) Theoretically, 2 *tetrahydrophenanthrols* (XVIII and XIX) are possible, but thus far only 1 form has ever been obtained and it has not been possible to det. whether it is a β - (XVIII) or an α -naphthol (XIX). (3) Probably owing to the greater instability of the hydrogenated derivs. of phenanthrene as compared with those of I, the yields in the former series are not so good and it is more difficult to follow quant. the course of the reactions. Benzanthrone (XX) on catalytic hydrogenation gives a whole series of products different from those hitherto obtained in other ways. No matter how carefully it is hydrogenated, it takes up 4 atoms of H with the formation of *1,9-trimethylene-anthranol* (XXI), which on further reduction apparently follows the left-hand side of the scheme given above, yielding *1,9-trimethylene-5,6,7,8-tetrahydro-anthranol* (XXII) and no trimethylene-anthracene. That in XXI it is the isolated ring which is hydrogenated has not been proved with certainty. Further hydrogenation merely removes the HO group, with formation of *1,9-trimethylene-5,6,7,8-tetrahydro-anthracene* (XXIII); only with Na and alc. can 2 more H atoms be introduced; the product (XXIV), which contains a reactive double bond (adding Br), is assumed, by analogy, to be *1,9-trimethylene-1,4,5,6,7,8-hexahydroanthracene*. It seems impossible to name these new derivs. of XX satisfactorily in accordance with Bally and Scholl's nomenclature (C. A. 5, 3249) and it is suggested that in naming them they be considered as 1,9-trimethylene-anthracene derivs., the positions of the substituents being indicated as shown in the formula XXV. Anthraquinone (XXVI) (100 g.) at 160–70° absorbs 4 atoms H in a few min.: in decalin further hydrogenation occurs readily and,



to obtain VI quant. somewhat less H must be introduced into the autoclave at the end, but in other solvents the reduction often stops at the VI stage so that even this precau-

and yields 1.5 g. *norboldine-HI*, faintly yellowish needles, m. 249–50°, decompd. by boiling H₂O but giving with the calcd. amt. of NaHCO₃ in a CO₂ atm. the free base as a pure white powder which is exceedingly sensitive to O and in alk. soln. at once becomes dark blue in the air. With excess of CH₂N₂ in Et₂O, 10 g. I·CHCl₃ yields 6–7 g. of its *di-Me ether* (II), m. 117–8°, α 108°, insol. in alkalies; *HI salt*, m. 243°. With BzCl in 10% KOH I gives a *tri-Bz deriv.* (III) (the relative positions of the BzO and MeO groups being undetd.), m. 173°, in which the 3rd Bz residue must be on the N; unlike II, it does not react with MeI and is not optically active. Together with III is obtained a small amt. of a *di-Bz deriv.*, m. around 124–7°. *Methiodide* of II, m. 221°, optically active, converted by boiling KOH into the oily optically inactive *methin base* (IV) while with Ag₂O in H₂O is obtained an optically active soln. of the quaternary NH₄ base. *Methiodide* of IV (4.5 g. from 5 g. II·MeI) boiled 10 min. with 20% KOH in MeOH and then treated at 25–30° with an excess of MeI, m. 276–80°; 7 g. of this, shaken with excess of Ag₂O in H₂O, filtered, treated with 10 cc. of 10% KOH and evapd., gives NMe₃ and 3.5 g. 2,3,5,6(?)*-tetramethoxy-8-vinylphenanthrene* (V), m. 143°, which in Me₂CO with aq. KMnO₄ gives 2,3,5,6(?)*-tetramethoxyphenanthrene-8-carboxylic acid*, m. 213–4° and yields on distn. with Zn dust, although in only very small amt., a hydrocarbon having the properties of α-ethylphenanthrene (picrate, m. 134–5°; Pschorr, *Ber.* 39, 3127(1906), gives 138–40°). IV, its methiodide and V with concd. HNO₃ give 1,2,3,4-C₆H₂(CO₂H)₄, m. 237–8°, whose *tetra-Me ester* m. 129°. I with alk. KMnO₄ yields only (CO₂H)₂ and the 2 HO groups are, therefore, probably on different rings. II is probably identical with glaucine (Gadamer, *C. A.* 5, 2641), for which the 2,3,5,6-positions of the MeO groups have been established by synthesis.



C. A. R.

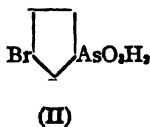
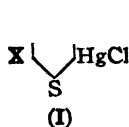
A new dye formed by the action of diethyl oxalate on pyrrolmagnesium bromide. T. N. GODNEV AND N. A. NARYSHKIN. *Ber.* 58B, 2703–5(1925); cf. *Astrachan Mediz. J.* 1922, No. 2–3, 14 pp.—From pyrrolmagnesium bromide (prepd. from 10 g. pyrrole, EtBr and Mg) treated with (CO₂Et)₂ in Et₂O, then decompd. with ice water and NH₄Cl extd. with Et₂O, evapd. and treated with HCl is obtained 4 g. of a dye to which is as-

signed the structure

$$\begin{array}{c} \text{ClH.N:CH.CH:CH.C} \\ \text{NH.CH:CH.CH:C} \end{array} \begin{array}{c} \diagup \\ \diagdown \end{array} \text{C} \quad ; \text{ it is pptd. from CHCl}_3 \text{ at } -10^\circ$$

by ether as an amorphous blue-black powder, insol. or almost insol. in the ordinary solvents except CHCl₃ and C₆H₆N. The free base is obtained by treating the HCl salt with alc. KOH, dilg. with H₂O and extg. with Et₂O. At a concn. of 0.03 g. per l. in a layer 15 mm. thick, the soln. shows complete absorption from λ535 on. C. A. R.

Arsenical derivatives of thiophene. III. C. PINZI. *Gazz. chim. ital.* 55, 824–31 (1925); cf. *C. A.* 10, 1639.—The method of synthesis used for the prepn. of As derivs. of thiophene was used in the prepn. of the halothienylarsonic acids described here. The method consists in the action of AsCl₃ on halogen derivs. of mercurithienyl chloride. 2-Bromo- and 2-iodothiophene treated with HgCl₂ give the corresponding chloro-mercuri derivs. (I) of known constitution (Steinkopf, Bauermeister, *C. A.* 8, 1418). I treated with AsCl₃ and warmed on the H₂O bath gave the corresponding bromo- and iodothienylarsenious chlorides (BrC₄H₂SA₂Cl₂ and IC₄H₂SA₂Cl₂) that could not be



sepd. from the reaction mass but were oxidized in 20% NaOH with 15% H₂O₂ to 5-bromo- (II) and to 5-iodothiophenyl-2-arsenic acid (III), both of which are colorless and infusible. The reaction RAsCl₂ + RHgCl → HgCl₂ + R₂AsCl and the oxidation of

R_2AsCl to R_2AsO_2H takes place to a small extent, giving rise to the bis[halothieryl]-arsinic acids. The prepn. of **II** and **III** was undertaken to aid in establishing the position of the NO_2 group in the nitration product of 2-thienylarsonic acid (C. A. 10, 1641). This NO_2 compd. was reduced with Na-Hg to the corresponding amino acid but attempts to replace this with Br or I after diazotization failed. **III** was easily nitrated with HNO_3 - H_2SO_4 , giving 3(or 4)-nitro-5-iodothieryl-2-arsonic acid, m. 302° , but **II** was recovered unchanged from the nitration mixt. Arsenic compds. contg. a pair of tervalent As atoms united by a double bond $RAs:AsR$ are generally called arseno derivs. and they are prepd. by reduction of primary arylarsonic acids: $RAsO_2H_2 \rightarrow RAsO \rightarrow RAs:AsR$. To the series of reducing agents used for this purpose (H_3PO_3 , $SnCl_2$, Na-Hg, $Na_2S_2O_4$) Bart (C. A. 17, 82) has added H_3PO_2 . This and H_3PO_3 do not act upon the NO_2 group and have enabled F. to obtain 5 new arsenothiophene derivs. To 2 g. thienylarsonic acid in 15 cc. EtOH an excess of cryst. H_3PO_2 was added. The mixt. was heated on the H_2O bath and sepd. 2,2-arsenothiophene, yellow, softens without melting, insol. in common solvents. H_3PO_2 reacts more promptly, giving the same product. 5,5'-Dinitro-2,2'-arsenothiophene (**IV**), greenish yellow, browns at 150° , explodes $170-8^\circ$, detonates violently in the open flame, 5,5'-dibromo-2,2'-arsenothiophene, yellow, softens 130° , m. 170° (decompn.), 5,5'-diiodo-2,2'-arsenothiophene, yellow, softens 135° , m. 175° , and dinitro-5,5'-diiodo-2,2'-arsenothiophene (**V**), yellow, softens 120° , decomps. 140° , were all obtained similarly from the corresponding acids. These arseno derivs. are oxidized back to the corresponding acids with alk. H_2O_2 . The diaminoarseno derivs. corresponding to **IV** and **V**, as well as their pharmacol. action, will be described in another paper. Steinkopf (C. A. 11, 2326) obtained triithienylarsine on fractional distn. *in vacuo* of thiophenearsonic acid derivs. The same compd. is obtained from 2-bromothiophene + $AsCl_3$ in Et_2O when treated with Na thus: $3C_4H_3BrS + AsCl_3 + 6Na \rightarrow 3NaBr + 3NaCl + (C_4H_3S)_3As$.

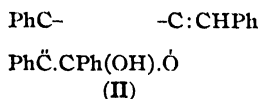
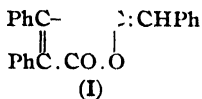
E. J. WITZEMANN

Formation of 2-phenyl-3-arylindones from benzalphthalide, hydrolysis of the latter to a new acid and the preparation of a stereoisomeric benzalphthalide. RICHARD WEISS and ROBERT SAUERMAN. Ber. 58B, 2736 10(1925).—Gabriel's benzalphthalide (**I**), m. 108° , with arylmagnesium bromides gives indones in satisfactory yields. With NH_3 in alc. **I** gives a (non-hydrated) *allo-desoxybenzoic-o-carboxylic acid* (**II**), $C_{15}H_{12}O_3$, isomeric with that obtained by G. and Michael (Ber. 11, 1018(1878)) with boiling alc. KOH; which of the 3 possible forms (keto and 2 *cis-trans* enolic) corresponds to each of the isomers cannot be detd. as yet. Boiling with alc. HCl and pptn. from aq. alk. soln. with concd. HCl converts **II**, with loss of H_2O , into an *allo-benzalphthalide* (**III**), indicating that **II** is an enol. **III** can no longer be hydrolyzed by alkalis and does not react with Grignard reagents. 2,3-Diphenylindone, from **I** in C_6H_6 with $PhMgBr$ in Et_2O , red, m. $153-5^\circ$, sol. in concd. H_2SO_4 with emerald-green color. 2-Phenyl-3-*o*-tolylindone (3.1 g. from 6.5 g. **I** with MeC_6H_4MgBr), orange-yellow, m. $123-5^\circ$, sol. in concd. H_2SO_4 with green color. 3- α -Naphthyl analog (2.2 g. from 4.15 g. **I**), brown, m. $183-5^\circ$, sol. in H_2SO_4 with violet color. **II** (yield, almost quant.), m. 165° , sol. in cold dil. alkalis and not reprecip. by diln. with H_2O . **III** (obtained almost quant.), light yellow, m. $185-7^\circ$, mol. wt. (Rast method) 232.8 6.5; Br deriv., obtained with Br in $CHCl_3$ (0.4 g. from 0.5 g. **III**), m. $211-4^\circ$.

C. A. R.

A synthesis of substituted indones and cyclopentadienones. A. LÖWENBEIN and G. ULLICH. Ber. 58B, 2662-7(1925).—From 10 g. benzaldiphenylmaleide (**I**) in C_6H_6 with $PhMgBr$ in Et_2O is obtained 9 g. of the compd. **II**, m. 210° , insol. in aq. alkalis, sol. in concd. H_2SO_4 with black-violet color, does not react with ketone reagents ($PhNHNH_2$, $NH_2CONHNH_2$), and, although it evolves heat when treated with Grignard reagents, it is recovered unchanged when the reaction mixt. is decompd.; 3 g. boiled a short time with aq. alc. NaOH gives 1.2 g. 2,3,4,5-tetraphenylcyclopenta-2,4-dien-1-one, also obtained in 8 g. yield from 10 g. **II** in hot AcOH treated with HCl gas and in 0.8 g. yield from 1 g. **II** in boiling AcOH with a few drops of concd. H_2SO_4 ; it forms black-violet crystals, m. 218° , whose solns. have a $KMnO_4$ -like color; with $PhCH_2MgCl$ in Et_2O - C_6H_6 it yields 2,3,4,5-tetraphenyl-1-benzylcyclopenta-2,4-dien-1-ol, faintly yellow, m. $155-6^\circ$, 1 g. of which in boiling AcOH with HCl gas yields 0.8 g. 2,3,4,5,6-penta-phenylfulvene, deep red, m. 204° , also obtained in 1.1 g. yield from 1 g. 2,3,4,5-tetraphenylcyclopenta-2,4-diene, BzH and KOMe in boiling MeOH. Benzalphthalide with $PhMgBr$ yields 80% of 2,3-diphenyl-1-indone (**III**), red, m. $150-1^\circ$; in this case no intermediate product analogous to **II** could be isolated but that the **III** is not formed directly by the action of the Grignard reagent is indicated (1) by the fact that even with a large excess of the $PhMgBr$ **III** is the sole product and the yield is even increased, whereas if it were present in the original reaction mixt. it would be expected to react further with the $PhMgBr$ with formation of the colorless triphenylindene; (2) the

reaction mixt. is only faintly yellow and assumes the intensely red indone color only after the hydrolytic decompn. of the soln.



C. A. R.

The action of phenylmagnesium bromide upon the compounds resulting from β -bromoethylphthalimide and γ -bromopropylphthalimide. MORITZ KOHN and ROBERT LAKNER. *Monatsh.* **45**, 617-30 (1925).— $\text{C}_6\text{H}_4(\text{CO})_2\text{NCH}_2\text{CH}_2\text{Br}$ (50.8 g.) and PhMgBr give about 65 g. of 2- β -bromoethyl-3-phenyl-3-hydroxyisoindolin-1-one (I), *m* 189-91°. $\text{C}_6\text{H}_5\text{N}$ gives the salt $\text{C}_{16}\text{H}_{11}\text{O}_2\text{N.C}_6\text{H}_5\text{NBr}$, analyzed as the picrate, $\text{C}_{27}\text{H}_{21}\text{O}_6\text{N}_3$, and chloroaurate, $\text{C}_{21}\text{H}_{19}\text{O}_2\text{N}_2\text{Cl}_4\text{Au}$. $\text{C}_6\text{H}_4(\text{CO})_2\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ and PhMgBr give the 2- γ -bromopropyl deriv. (II), *m* 169-71°; this yields a $\text{C}_6\text{H}_5\text{N}$ salt, analyzed as the chloroaurate. Heated with 20% KOH for 4 hrs, I gives *o*-BzC₆H₄CO₂H; II, after 2 hrs., gives the compd. $\text{C}_{17}\text{H}_{15}\text{O}_2\text{N}$ (III), *m* 126-8°. EtONa and I, boiled 1 hr., give quant. a compd., $\text{C}_{16}\text{H}_{13}\text{O}_2\text{N}$ (IV), *m* 148°; full crystallographic data are given. EtONa and II give the same compd. as obtained by KOH, for which crystallographic data are given. IV and PhMgBr give the compd. $\text{C}_{24}\text{H}_{23}\text{ON}$, *m* 172°, III gives the compd. $\text{C}_{20}\text{H}_{20}\text{ON}$, *m* 194°.

C. J. WEST

The preparation of mercaptobenzothiazole. ERNESTO AZZALIN. *Gazz. chim. ital.* **55**, 895-9 (1925).—Bruni and Romani (*Giorn. chim. ind. e appl.* (1921); cf. *C. A.* **16**, 4093) and Bedford and Scbrell (*C. A.* **16**, 855) found that the vulcanizing action of thiourea and guanidine derivs. is due to the formation of mercaptobenzothiazole (I). P. and R. then found that in the presence of S the Zn salt of I is oxidized, giving the corresponding disulfide and that this is the true vulcanizing agent. A. has studied the formation of I from compds. from which it might be derived most conveniently. NH_4 phenyldithiocarbamate (II) (Freund, Bachrach, *Ann.* **285**, 199) in a sealed tube with 30% of its wt. of S was heated at 250° for 3 hrs. The yellow tar was nearly all sol. in boiling 10% Na_2CO_3 . This when acidified with HCl pptd. impure I, which was purified from Me_2CO . The yield of I was greater when only $\frac{2}{3}$ as much S was used. A mixt. of II with S + PhNH_2 boiled under a condenser 20 hrs. gave anilinobenzothiazole (III), *m* 150-7°. A red soln. of S in $(\text{NH}_4)_2\text{S}$ boiled 20 hrs. with II gave PhNHCSNH_2 , *m* 152°. This same mixt. at 200° for 3 hrs. in a sealed tube gave much S and a little I. S in C_6H_6 boiled 16 hrs. with II gave $\text{CS}(\text{NHPh})_2$ (IV), *m* 149-50°. These results show that the formation of I depends on detd. conditions of temp. and pressure. A mixt. of 5 g. PhNH_2 and 1.73 g. S in 4.1 g. CS_2 heated 3 hrs. at 260° in the sealed tube gives H_2S , a fragile mass of I and a little S + III (an 80% yield of I is obtained). It is thought that IV is formed first and that this decomp., giving PhNH_2 + PhNCS . The latter reacts with S, giving I.

E. J. WITZEMAN

Action of *p*-toluenesulfonazide on malonic ester and alkylated malonic esters. THEODOR CURTIUS and WILFRID KLAVERN. *J. prakt. Chem.* **112**, 65-87 (1926); cf. C. and Ehrhart, *C. A.* **17**, 3876.—*p*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{N}_3$, *m* 22°, and $\text{CH}_2(\text{CO}_2\text{Me})_2$, heated 6 hrs. at 100° and 20 mm. (at ordinary pressures N is split off at 117°, at 14 mm. at 195°) give 85% of 1-toluenesulfon-4-carbomethoxy-5-oxytriazole (I), heavy, yellow oil, which cannot be isolated but changes into the deep yellow 1-toluenesulfon-4-carbomethoxy-5-triazolone (or *Me toluenesulfaminodiazomalonate*) (II), *m* 83°; it may be recrystd. unchanged from hot concd. HCl. II is sol. in EtONa with the formation of the Na salt of I, yellow, decomp. 156° with slight explosion; addn. of acid ppts. the oily I, completely changed into II after 2 hrs. I reddens litmus and is sol. in dil. alkali. I gives a light yellow Ba salt, amorphous; a yellow NH_4 salt, decomp. 154°; a red Fe salt, a green Ni salt, a red Co salt, unstable Ag and bluish green Cu salt, etc.; the yellow piperidine salt, *m* 146° (decompn.). *p*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{N}_3$ and $\text{CH}_2(\text{CO}_2\text{Et})_2$ are condensed by EtONa to 1-toluenesulfon-4-carbethoxy-5-hydroxytriazole, yellow oil, which soon changes to 1-toluenesulfon-4-carbethoxy-5-triazolone, *m* 85° (90% yield); of the enol form there were prepd. the deep yellow Na salt, the amorphous Ph salt, the yellow NH_4 salt, *m* 154° (decompn.) and the piperidine salt, *m* 152° (decompn.). Sapon. with 1:10 NaOH on the H_2O bath gives 80% of 1-toluenesulfon-5-hydroxytriazole-4-carboxylic acid, deep yellow oil, quickly changing to the cryst. *p*-toluenesulfaminodiazomalic acid (III), yellow, *m* 124° (decomp. slowly and after several days, *m* 144°); the Na and NH_4 salts are deep yellow and somewhat unstable as are the metallic salts; the deep yellow Ba salt was analyzed. Hydrolysis of III by heating with 10 parts H_2O on the H_2O bath gives 94% of *p*-toluenesulfaminoglycolic acid, *m* 153°. Heating III in PhMe gives a

yellow compd. m. 192° (decompn.), which may be $C_{10}H_{10}O_4N_2S$ or $C_{10}H_{10}O_4N_2S_2$; the yellow NH_4 salt is hygroscopic; heating in a sealed tube with 20% HCl at 160–70° gives p -MeC₆H₄SO₃H, a compd. m. 230°, with 15.5% N and an oil which was not investigated. With NH_4OH the above esters give 1-toluenesulfon-4-carboxamide-5-hydroxytriazole, yellow oil, changed by heating with EtOH to 4-toluenesulfaminocarboxylic acid-5-hydroxytriazole, anisotropic prisms, decompds. 140° (84% yield). $N_2H_4 \cdot H_2O$ gives 54% of a bis-di- NH_4 salt, m. 212.5°, of 1-amino-4-toluenesulfaminocarboxylic acid-5-hydroxytriazole, slightly anisotropic prisms, m. 164° (decompn.); benzal compd., m. 212° (decompn.); m -nitrobenzal compd., yellow, m. 210° (decompn.); o -hydroxybenzal compd., pale yellow, m. 190° (decompn.). No reaction was observed between p -MeC₆H₄SO₂N₃ and alkylated $CH_2(CO_2R)_2$.

C. J. WEST

Action of benzylsulfonazide on malonic ester. THEODOR CURTIUS and BRUNO JEREMIAS. *J. prakt. Chem.* 112, 88–116 (1926).— $PhCH_2SO_2N_3$ (I) and $CH_2(OEt)_2$ do not react at 110° and 20 mm. When 1 mol. of each is shaken with 2 N NaOH there results 74% of 1-benzylsulfon-4-carbethoxy-5-hydroxytriazole (II), oily, quickly changing into the light yellow *Et* benzylsulfaminodiazomalonalate (III), m. 123°. If the condensation is carried out on the H_2O bath, there results 39% of the *Na* salt, m. 193°, of *Et* benzylsulfonfylmalonalate (IV), anisotropic needles, m. 83°. If the condensation is carried out with EtONa, there results 47% III and 10.5% IV. The *Na* salt of II, pale yellow, m. 184° (decompn.); the NH_4 salt, pale yellow, m. 140° (decompn.); *Ba* salt; Ca, Mn, Zn and Co salts do not give ppts. with the *Na* salt; $FeCl_3$ gives a yellow ppt., $CuSO_4$ a white ppt., while $AgNO_3$, even in the cold, leads to decompn. NaOH (10%) sapon. I to the free acid, smeary mass, which rearranges in a few min. to benzylsulfaminodiazomalonic acid, which is very unstable and is decompd. by H_2O at 70°, giving 68% of benzylsulfaminoglycolic acid, m. 120°; concd. HCl gives $PhCH_2SO_2NH_2$ and $HOCH_2CO_2H$. III and NH_4OH in a sealed tube at 75° for several hrs. give 88.5% of the amide, yellow, m. 148° (decompn.); NH_4 salt, S-yellow, m. 155° (decompn.). $N_2H_4 \cdot H_2O$ gives 63% of the bis-di- NH_4 salt, decomp. 179°, of 1-amino-4-benzylsulfaminocarboxylic acid-5-hydroxy-1,2,3 triazole, anisotropic prisms, decomp. 155°; benzal deriv., pale yellow, decomp. 190°; acetonyl deriv., pale yellow, decomp. 178°; o -hydroxybenzal deriv., yellow, decomp. 187°. IV and $N_2H_4 \cdot H_2O$ in EtOH give 78% of benzylsulfonacetylhydrazide (V), m. 148° and 5.5% of the di- NH_4 salt, m. 232° (decompn.) of the cyclic *sec*-benzylsulfonfylmalonylhydrazide, m. 253° (decompn.). The benzal deriv. of V, m. 179°. V in very dil. HCl, treated with $NaNO_2$, gives benzylsulfonacetyl azide, decomp. 81°; with $PhNH_2$ it gives the anilide, m. 170°, and the *p*-toluidide, m. 151°.

C. J. WEST

Hydrazide and azide of acetylsulfanilic acid and of sulfanilic acid. THEODOR CURTIUS and WILHELM STOLL. *J. prakt. Chem.* 112, 1117–37 (1926).— $AcNHC_6H_4SO_2Cl$ and $N_2H_4 \cdot H_2O$ give acetylsulfanilic hydrazide (I), m. 177–8° (decompn.); *HCl* salt, m. 163–5° (decompn.); dissociated by H_2O ; *Na* salt, decomp. on heating; $AgNO_3$ forms a complex 2 $AgNO_3$, amorphous powder from aq. solns., quickly darkening in the light, leaflets from abs. EtOH, slowly changing in the light. Benzal deriv., m. 182°; acetonyl deriv., m. 174°. I and HNO_2 or $AcNHC_6H_4SO_2Cl$ and NaN_3 give acetylsulfanilic azide (II), m. 107°; it is unchanged by short boiling with concd. HCl. II and $CH_2(CO_2Et)_2$ are condensed by EtONa to the *Na* salt, felt-like needles which decomp. without melting, of acetylsulfanilic-4-carbethoxy-5-hydroxytriazole, yellow oil, changing in a few min. to *Et* acetylsulfanilic acid aminodiazomalonalate, $AcNHC_6H_4SO_2$ -

$NHCO \begin{array}{c} \diagup N \\ || \\ \diagdown N \end{array} \cdot CO_2Et$, pale yellow, m. 146°. Heating I with a little concd. HCl for 5

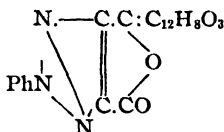
min. gives 75% of sulfanilic hydrazide, $H_2NC_6H_4SO_2NHNH_2$, m. 131°, which reduces Fehling soln. and $NH_4OH \cdot AgNO_3$; di-*HCl* salt, leaflets; benzal deriv., m. 172°; acetonyl deriv., m. 136°. With HNO_2 there results a diazo soln., from which $PhNMe_2$ ppts. the ruby-red *p*-aminobenzenesulfazid-azo-dimethylaniline (III), m. 158° and showing strong pleochroism (violet red-yellow); easily sol. in warm HCl with a bluish red color. II and concd. HCl give sulfanilic azide, pale yellow, m. 36°; the *HCl* salt forms yellow, monoclinic prisms, easily dissociated by H_2O . HNO_2 gives diazoaminobenzenesulfazide, yellow needles which decomp. on heating. The diazo soln. with $PhNMe_2$ gives III; with β -C₁₀H₇OH, *p*-benzenesulfazide-azo- β -naphthol, reddish yellow, m. 161°. $CH_2(CO_2Et)_2$ gives *Et* sulfanilic-aminodiazomalonalate, dirty yellow leaflets; *Na* salt of the enolic form.

C. J. WEST

Triazolic- σ -dicarboxylic acids analogous to phthalic acid. A. BERETTA. *Gazz. chim. ital.* 55, 788–92 (1925).—It is known that the σ -condensed bicyclic and tricyclic systems contg. a pentatomic nucleus show analogy with homogeneous binuclear and trinuclear derivs. Only a brief paper by Pechmann (*Ann.* 262, 308 (1891)) exists on the

analogies of 1,2,3-triazole-4,5-dicarboxylic acid derivs. with those of phthalic acid, 20 g 5-amino-2-phenyl-1,3-benzotriazole (or the equiv. amt. of 6-methyl-5-amino-2-phenyl-1,3-benzotriazole), obtained by oxidizing phenylazo-*m*-phenylenediamine (or phenylazo-*m*-tolylenediamine) with $\text{NH}_4\text{OH} \cdot \text{CuSO}_4$ (Schmidt and Hagenböcker, *C. A.* 16, 1092), were suspended in 50 g. KMnO_4 + 12.5 g. NaOH in 2250 cc. H_2O and heated on the H_2O bath. Gradually the insol. compd. dissolved and NH_3 was evolved. The soln. was decolorized with EtOH and the MnO_2 filtered off. The filtrate was concd. to 200 cc. and acidified with concd. HCl . A mixt. of 2-phenyl-1,2,3-triazole-4,5-dicarboxylic acid (I) and its Na salt were sepd. This was recrystd. from boiling HCl and gave pure I, m. 255° (decompn.). The anhydride (II) formed at the m. p. of I, m. 174° , and resembles $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$. II condensed with resorcinol with ZnCl_2 gave the corre-

sponding triazolefluorescein (III). III with 4 atoms of Br gave

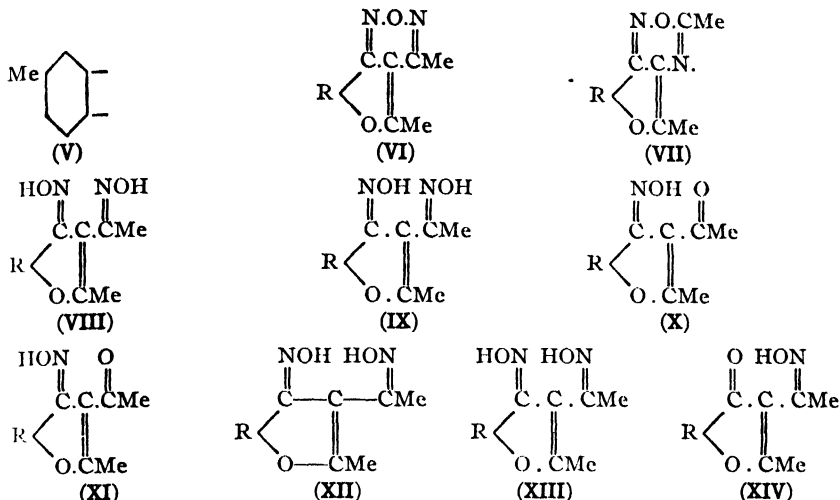


the corresponding triazolic-eosin. II condensed with *m*- $\text{Et}_2\text{NC}_6\text{H}_4\text{OH}$ gave the corresponding rhodamine resembling ordinary rhodamine. A new method of prep. 1-phenyl-1,2,3-triazole-4,5-dicarboxylic acid by oxidation of 5-amino-1-phenylazimino benzene (IV) with alk. KMnO_4 is described. A modification of Zincke's method (*Ann* 313, 262(1900)) of prep. IV is described.

E. J. WITZEMANN

Stereoisomerism of the oximes of 1,3-diketones. I. Action of hydroxylamine on 2,6-dimethyl-3-acetochromone. GEORG WITTIG AND FRITZ BANGERT. *Ber.* 58B, 2627-36(1925).—In detg. the configuration of the oximes described in this paper, W and B. provisionally adopt the conclusions drawn by Meisenheimer from his work on the O_2 cleavage of triphenylisoxazole (*C. A.* 16, 2105). 2,6-Dimethyl-3-acetochromone (I) with NH_2OH in AcOH gives a mixt. sepd. by C_6H_6 into a *mono-oxime* (II) and a *dioxime* (III). Oximation of II in cold NaOH yields a different *dioxime* (IV) which on distn. *in vacuo* forms the *anhydride* VI ($\text{R} = \text{V}$) and with concd. H_2SO_4 , PCl_5 or AcCl undergoes the Beckmann rearrangement in the oximated side-chain, yielding the *oxdiazine* VII; this cannot be oximated and has no basic properties and its formation shows that the oxime group in the side chain of IV must have the configuration represented in formulas VIII or IX, while the formation of VI establishes the γ -configuration (IX) for IV. Concd. HCl converts IV back into II which, since it does not undergo the Beckmann rearrangement with the above reagents, must have the oxime group on the nucleus, a view supported by the impossibility of rupturing the pyrone ring with alkalis or of hydrolyzing off the oxime group even with concd. acids under pressure. Assuming that the conversion of II into IV by alkalis is not accompanied by a stereoisomeric rearrangement which occurs in the reverse direction when the IV is hydrolyzed back to II by acids, II must have the structure X, the configuration of the oxime group being the same as that of the corresponding group in IV; this γ -configuration is further supported by the fact that II is not rearranged by cold NaOH , and only after long boiling with alkalis changes into the α -form (XI), which cannot be converted back into II even by hot concd. acids (under pressure, carbonization occurs), and on further oximation gives III. Oximation of I in AcOH , therefore, gives II and XI, the XI then being further oximated to III. As III is hydrolyzed back to XI by acids and forms no anhydride it must have the α -configuration VIII, which is in harmony with its stability towards alkalis (even fusion with alkalis does not rearrange it). Concd. H_2SO_4 produces no rearrangement in the side chain but splits off the oxime group with formation of XI. With NH_2OH in boiling Na_2CO_3 II gives, together with about 30% of IV, a new *dioxime* which since it is hydrolyzed by acids to II, must have the β -configuration (XII); on vacuum distn. it yields chiefly VI but also some IV, indicating that the XII rearranges into IV which then loses H_2O to form VI; the same rearrangement can be effected by digestion with concd. H_2SO_4 , the product being VII (together with IV if the reaction is interrupted). Long boiling of IV with alkalis gives, together with VI, a 4th δ -*dioxime* (XIII), hydrolysis of which with acids yields a δ -*mono-oxime* (XIV); this with NH_2OH under mild conditions regenerates XIII. II, obtained in 1.1 g. yield, together with 0.8 g. of III, from 2.2 g. I, $\text{NH}_2\text{OH} \cdot \text{HCl}$ and NaOAc in boiling 50% AcOH , yellow, m. $100-0.5^\circ$, sol. in NaOH with yellow color, gives a red-violet color with FeCl_3 . XI (1 g. from 1.4 g. II refluxed 6 hrs. in 2 N Na_2CO_3), m. $157-7.5^\circ$, sol. in Na_2CO_3 , gives no color with FeCl_3 , also obtained in 3 g. yield from 4 g. III in concd. H_2SO_4 on the H_2O bath. XIV (0.1 g. from 0.2 g. XIII with concd. HCl in a sealed tube at 100°), m. $125.5-6.0^\circ$; at the same

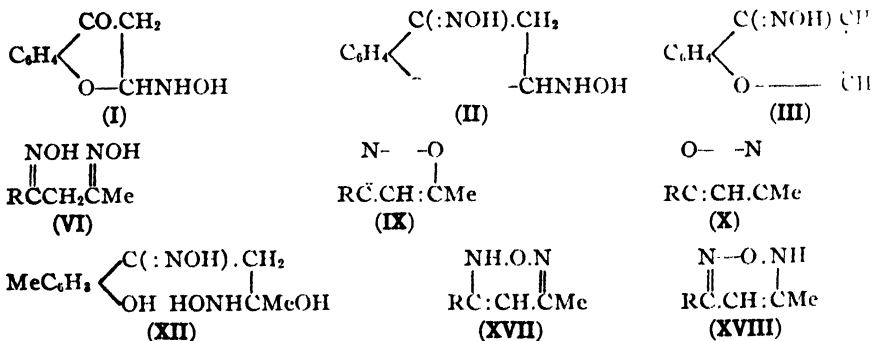
time is obtained 0.03 g. of intensely yellow needles m. 186–7° (whether this is the missing β -mono-oxime has not been detd.). IV (5.1 g. from 5 g. II and $\text{NH}_2\text{OH} \cdot \text{HCl}$ in 2 N



NaOH , m. 159–9.5° on rapid heating, sinters at this temp. on slow heating and finally m. 165–7°, sol. in hot Na_2CO_3 , gives an olive-green color with FeCl_3 , is unchanged by standing 24 hrs. in NaOEt soln., boiling with Na_2CO_3 , heating with H_2O in a sealed tube at 100° or dissolving in concd. H_2SO_4 and reprecip. with H_2O ; 6 hrs. boiling with 50% HCl hydrolyzes it to II and with boiling AcCl it gives the diacetate, m. 131–2° (VII is obtained from the mother liquors on diln. with NaOH), which on soln. in concd. H_2SO_4 and reprecip. regenerates IV and with boiling NaOH gives IV and VI. XII (14.1 g., together with 5.9 g. IV, from 19 g. II refluxed 6 hrs. with $\text{NH}_2\text{OH} \cdot \text{HCl}$ in aq. alc. Na_2CO_3), m. 156–6.5°, depresses the m. p. of IV to 135°, easily sol. in cold Na_2CO_3 , gives no color, when freshly prepd., with FeCl_3 ; diacetate, m. 107–8°. III (1 g. from 1 g. XI with $\text{NH}_2\text{OH} \cdot \text{HCl}$ and NaOAc in boiling AcOH), m. 222–4° (decompn.), mol. wt. in boiling EtOH 217, gives no color with FeCl_3 ; with concd. H_2SO_4 in the ice chest it gives a compd. $\text{C}_{12}\text{H}_{14}\text{O}_3\text{N}_2$, m. 184–4.5°, sol. in NaOH , not attacked by boiling NaOH , resinsified by heating concd. HCl but converted by dil. acid into XI. XIII (3.5 g., together with 8 g. VI, from 30 g. IV refluxed 7 hrs. in 2 N NaOH), m. 194.5–5.0°, gives a dirty green color with FeCl_3 , also obtained from XIV with NH_2OH in very dil. NaOH ; the mother liquors from the XIII yield 4 g. of a compd. $\text{C}_{12}\text{H}_{14}\text{O}_3\text{N}_2$, m. 121–2°, gives an olive color with FeCl_3 , is unchanged by heating 4 hrs. with concd. HCl under pressure at 100°. 3,4-[2',6'-Dimethylchromo]-5-methyl-2,6-oxdiazine-(4) (VI), from IV or XII refluxed in 2 N NaOH or distd. *in vacuo*, m. 88–8.5°, insol. in dil. alkalis and acids, unchanged by concd. H_2SO_4 on the H_2O bath or by concd. HCl at 210°. The isomeric 6-methyl-2,5-oxdiazine-(1) (VII), from IV or XII with concd. H_2SO_4 on the H_2O bath or with PCl_5 in boiling Et_2O , m. 144–4.5°, insol. in dil. acids and alkalis, indifferent towards NH_2OH , boiling alkalis and concd. HCl under pressure at 100°. C. A. R.

Action of hydroxylamine on chromones. GEORG WITTIG AND FRITZ BANGERT. *Ber.* 58B, 2630–42 (1925).—Although the C : O group of chromones reacts with extraordinary sluggishness with ketone reagents it shows a striking reactivity with NH_2OH . From the observations of Harries on analogous compds. (*Ann.* 330, 190 (1904)) it might be expected that NH_2OH first adds at the double bond of the pyrone ring, with formation of a hydroxyaminochromanone (I) whose C : O group can now be oximated with ease, acidification of the product (II) splitting off NH_2OH and yielding the chromone oxime (III). As a matter of fact, NH_2OH in neutral soln. with 2,8-dimethylchromone (IV) and 2,8-dimethyl-4-thiochromone gives the oxime (V) of IV. On the other hand, if IV is oximated in alk. soln. and the still warm reaction mixt. is acidified with a dil. mineral acid, V is again obtained but if AcOH is cautiously added instead of the mineral acid there seps. a compd. $\text{C}_{11}\text{H}_{14}\text{O}_3\text{N}_2$ (VI, R = 3,2-Me(HO)C₆H₃) which is also obtained from 6,2-Me(AcCH₂CO)C₆H₃OH (VII) with NH_2OH , showing that in the oxidation of IV the pyrone ring is ruptured, with formation of the dioxime VI from which hot

mineral acids hydrolyze the oxime group furthest from the C_6H_5 ring with formation of V. With cold acids VI gives, together with V, an alkali-sol. isomer (VIII). V and VIII cannot be converted into each other by concd. alkalis or acids, and VIII, which, unlike V, gives a cornflower-blue color with $FeCl_3$, can also be obtained from VI by the action of alc. NH_3 , *i. e.*, conditions under which chromone formation is impossible VIII can therefore be only the hydroxyphenylisoxazole IX or X. It can also be obtained by heating VI at 160° . Since VI in general shows a tendency to split off the oxime group furthest from the C_6H_5 ring, IX is probably the correct formula for VIII. Alk. oximation of 2,6-dimethylchromone (XI) yields an extremely unstable compd., apparently a hydroxyamino oxime (XII) in which the $NHOH$ group is situated away from the C_6H_5 ring, as with cold acids it readily yields the oxime (XIII) of XI, also obtained with hot mineral acids without the formation of the hydroxyphenylisoxazole (XIV) (X, R = 5,2-Me(HO) C_6H_3), which can be obtained, together with XIII, by fusing the dioxime (XV) of 4,2-Me($AcCH_2CO$) C_6H_3OH (XVI). With alc. NH_3 , XV unexpectedly gave XII, apparently, in the abs. alc. NH_3 added on the oxime group furthest from the C_6H_5 ring, and on acidification was replaced by H_2O ; an analogous NH_3 addn. compd. is probably an intermediate product in the formation of VIII from VI. On long heating with $NaOH$, XV gives an alkali-sol. compd. $C_{11}H_{12}O_2N_2$ which by the Schotten-Baumann method yields a dibenzoate; apparently XV first forms the anhydride (cf. 2,6-dimethyl-3-acetylchromone dioxime, preceding abstr.) in which, under the further action of the alkali, there occurs a shifting of the double bond with formation of the isoxdiazine XVII or XVIII (R = 5,2-Me(HO) C_6H_3); at the same time is formed an isomeric isoxdiazine which with Ac_2O and $NaOAc$ gives a diacetate and which doubtless also has 1 of the structures XVII or XVIII; the soly. in Na_2CO_3 of the 1st isomer and the slight soly. of the latter in $NaOH$ indicate that they are XVIII and XVII, resp. 2-Acetylaceto-6-methylphenol dioxime (VI), obtained in 5.5 g. yield from 5 g. VII or in 75% yield from IV, m. $148-9^\circ$ (slight decompn.), unchanged by heating with H_2O under pressure. V, obtained almost quant. from VI in boiling aq. alc. HCl , in 35% yield from the thiochromone with NH_3OH in aq. alc. and in about 75% yield from IV, m. $145.5-6.0^\circ$. α -[2-Hydroxy-3-methylphenyl]- γ -methylisoxazole (VIII), obtained in 80% yield from VI at $150-60^\circ$, in 30% yield from VI and alc. NH_3 , and in 0.3 g. yield, together with 0.4 g. V, from 1 g. VI in $MeOH$ with cold 0.5 N HCl , m. $90.5-1.0^\circ$. 2-[α -Hydroximinino- γ -hydroximinino- γ -hydroxyacetylaceto]-4-methylphenol (XII), m. $70-3^\circ$, loses H_2O and solidifies and then has the m. p., $122-2.5^\circ$, of 2-acetylaceto-4-methylphenol dioxime (XV); both XII and XV give a blue color with alc. $FeCl_3$. XIII, m. 184.5° . α -[2-Hydroxy-5-methylphenyl]- γ -methylisoxazole (XIV) (yield, 60%), m. $53-4^\circ$. 5-[2'-Hydroxy-5'-methylphenyl]-3-methyl-1,2,6-isoxdiazine (XVIII) (3 g. from 4 g. XV refluxed 6-7 hrs. in excess of 2 N $NaOH$), m. $168-9^\circ$ (slight decompn.), gives an olive-green color with $FeCl_3$; dibenzoate m. $123.5-4.0^\circ$. 3,5-Isomer (XVII) (yield, 0.4 g.), m. $185-7^\circ$ (slight decompn.), gives no color with $FeCl_3$, sol. in hot acids and alkalis and seps. unchanged on cooling, diacetate, m. $155.5-6.0^\circ$.



C. A. R.

Acylation of α -hydroxypyridine. A. E. CHICHIBABIN AND P. G. SZOKOV. *Ber. 58B*, 2650-2(1925).—Meyer believes (*Monatsh.* 26, 1303(1905)) that acylated derivs. of α - and β -pyridones are exceedingly unstable and some, especially the acetates, are not capable of existence at all, but C. and Oparina showed (*C. A.* 19, 3489) that benzoylation of α -pyridone (I) under the most varied conditions always gives the Bz deriv. m. 42° , whose basic properties show that it has beyond doubt the structure

$\text{CH:CH.CH:CH.C(OBz):N}$, and C. and S. have now prepd. the analogous *O-p-nitro-*

benzoate (II) and even the *O-acetate* (III); the latter is characterized by the extraordinary ease with which it is saponified, thus completely excluding the pyridone structure for it. II, from I in a little H_2O treated with 2 parts $p\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$ and then with concd. NaOH to permanent alk., m. $115-6^\circ$, is also obtained by fusing the chloride with 1 equiv. of the Na salt of I, which seps. from alc. in leaflets with $2\text{H}_2\text{O}$. The anhyd. Na salt (in a flask provided with a condenser and connected with an air pump) cautiously treated with the calcd. amt. of AcCl and then heated on the H_2O bath gives III, b_{10} $110-2^\circ$, d_4^{25} 1.1475, stable in the absence of moisture but in the presence of traces of moisture, especially in the light, it becomes blue, then green, and, on distn. after long standing, yields a low boiling fraction smelling of AcOH and a larger residue of higher b. p.; in H_2O it hydrolyzes rapidly, PtCl_4 pptg. the chloroplatinate of I from both the alc. and the aq. solns. The alc. solns. smell of AcOH and even when freshly prepd. give the picrate of I with picric acid.

C. A. R.

Quinoline derivatives. II. Synthesis of $[\beta\text{-}(2\text{-phenyl-4-quinolyl})\text{ethyl}]\text{amine}$ and of $[\beta\text{-}(2\text{-phenyl-6-methoxy-4-quinolyl})\text{ethyl}]\text{amine}$. HANNS JOHN. *Ber.* 58B, 2799-805 (1925); cf. *C. A.* 20, 204, 418.— $\beta\text{-}(2\text{-Phenyl-4-quinolyl})\text{-}\alpha\text{-trichloromethylethanol}$ (I) (24-5 g.) from 15 g. 2-phenyl-4-methylquinoline and chloral refluxed 6 hrs. at $118-20^\circ$, m. 195° ; 6-MeO deriv. (II) (25 g., from 16 g. 2,4,6- $\text{C}_6\text{H}_3\text{NPhMeOMe}$), faintly green, m. 222° ; $\beta\text{-}[2\text{-Phenyl-4-quinolyl}]\text{acrylic acid}$ (III) (6 g. from 10 g. I added in the course of 30 min. to 40 cc. of cold 20% KOH in abs. alc. and heated 1 hr. on the H_2O bath), m. 201° ; *HCl* salt, m. 210° ; sulfate, HgCl_2 gives with the HCl soln. a cryst. ppt., K_2CrO_4 yellow crystals, $\text{K}_4\text{Fe}(\text{CN})_6$ a voluminous blue-green ppt., I-KI with the H_2SO_4 soln. a red-brown, indistinctly cryst. ppt.; picrate, golden yellow; Me ester, m. 123° . 6-MeO deriv. (IV) of III (6.6 g. from 10 g. II), m. 239° , intensely yellow; *HCl* salt, yellow; sulfate; picrate, golden yellow; Me ester, m. 140° . $\beta\text{-}[2\text{-Phenyl-4-quinolyl}]\text{propionic acid}$ (V) (9.4-9.6 g. from 10 g. III in AcOH gently boiled 12 hrs. with colorless HI (d. 2.0) and red P), m. 215° ; *HCl* salt, m. 189° ; III salt, faintly yellow, m. 208° ; sulfate; picrate, yellow; Me ester, m. 63° . 6-HO deriv. (VI) of V (8.5 g. from 10 g. IV), m. 245° , yellow; *HCl* salt, m. 160° ; HI salt, sulfate; picrate, yellow. Me ester of the 6-MeO deriv. of V, m. 100° . Hydrazide (VII) of V (6.8 g. from 7 g. of the Me ester refluxed with $\text{N}_2\text{H}_4\text{-H}_2\text{O}$), m. 158° ; *HCl* salt. 6-MeO deriv. (VIII) of VII (6.5 g. from 7 g. of the ester), faintly yellow, m. 116° . Azide (IX) of V, from VII in 0.5 N HCl at -5° with cold 0.5 N NaNO_2 , brown smeary ppt; 6-MeO deriv. (X). $\beta\text{-}[2\text{-Phenyl-4-quinolyl}]\text{ethylurethane}$ (XI) (6.3 g. from the IX above refluxed 1 hr. in alc.), m. 72° . Bis- $\beta\text{-}[2\text{-phenyl-4-quinolyl}]\text{ethylurea}$ (3.8 g. from 4 g. IX boiled 0.5 hr. with H_2O), m. 175° . 6-MeO deriv. (XII) of XI (7.7 g. from 8 g. X), m. 125° . $\beta\text{-}[2\text{-Phenyl-4-quinolyl}]\text{ethylamine}$ (XIII), obtained as the di-*HCl* salt (5.8 g.), m. 158° , from 6 g. XI refluxed 8 hrs. with concd. HCl ; free base, light brown oil, solidifies 4° , darkens in the air or *in vacuo*; chloroplatinate, yellow, does not m. 270° ; picrate, yellow. 6-MeO deriv. of XIII, m. 54° ; di-*HCl* salt (5.6 g. from 6 g. XII), m. 209° ; sulfate; chloroplatinate, intensely yellow; picrate, golden yellow.

C. A. R.

Synthesis of symmetrical homotetrahydroisoquinoline. JULIUS V. BRAUN AND HANS REICH. *Ber.* 58B, 2765-7 (1925).—The lactam (*C. A.* 20, 391) of $o\text{-H}_2\text{NCH}_2\text{CH}_2\text{-C}_6\text{H}_4\text{CH}_2\text{CO}_2\text{H}$ in somewhat more than 20 parts dry EtOH poured upon 1.5 parts Na yields almost 40% of sym-homotetrahydroisoquinoline (I), $\text{C}_8\text{H}_{11}\text{NCH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2\text{C}_6\text{H}_4$,

b_{11} 115° , d_4^{19} 1.034, has a faintly basic odor, eagerly absorbs CO_2 from the air; *HCl* salt, m. 250° ; chloroplatinate, ochre-yellow powder, becomes discolored 230° , m. 253° (decompn.); picrate, light yellow, m. 220° ; quaternary methiodide, m. 227° ; NO deriv., m. $71-2^\circ$. From the residue from the steam distn. of I is obtained $o\text{-H}_2\text{NCH}_2\text{CH}_2\text{-C}_6\text{H}_4\text{CH}_2\text{CH}_2\text{OH}$, b_{12} 180° , characterized as the di-*p-nitrobenzoate*, yellow, m. 153° .

C. A. R.

Action of formaldehyde and secondary amines on acids with labile hydrogen atoms. C. MANNICH AND LEONHARD STEIN. *Ber.* 58B, 2659-62 (1925); cf. *C. A.* 18, 3360.—The reaction whereby $\beta\text{-NH}_2$ acids are formed from malonic acid derivs. and sec. amines and HCHO does not take place with $\text{PhCH}_2\text{CO}_2\text{H}$ but when the negative character of the Ph group is strengthened by the introduction of NO_2 groups the CH_2 group is sometimes so activated (*p-nitro-* (I) and 2,4-dinitrophenylacetic acid (II) that the reaction does take place. $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}(\text{OH})\text{CO}_2\text{H}$ (III) can also be used, but no success was had with $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CO}_2\text{H}$, *m-* and *p-O}_2\text{NC}_6\text{H}_4\text{CH}(\text{OH})\text{CO}_2\text{H}, $o\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{COCO}_2\text{H}$, $\text{HO}_2\text{SCH}_2\text{CO}_2\text{H}$, $\text{CCl}_3\text{CH}(\text{OH})\text{CO}_2\text{H}$ and *o-* and *p-HOC}_6\text{H}_4\text{CH-}**

PhCO₂H. α -[*p*-Nitrophenyl]- β -piperidinopropionic acid (IV) (16 g. from 16.2 g. I in 5 cc. H₂O neutralized with piperidine and allowed to stand some days at 35–40° with 10.1 cc. of 30% HCHO), decomp. 138–9°, sol. in acids and alkalis; 4 g. refluxed 2 hrs. in H₂O, the soln. being kept permanently approx. neutral by the addn. of HCl, gives piperidine and 1.9 g. α -[*p*-nitrophenyl]acrylic acid, m. 176–7°, sol. in alkalis and reprecipitated by acids, immediately decolorizes Br. With Sn and concd. HCl 2.78 g. IV gives 2.5 g. of the *Nil*₂ acid *di*-HCl salt, m. 213° (decompn.), can be diazotized normally and coupled with 2-C₁₀H₇OH to a blood-red azo dye, but the diazo compd. cannot be converted into the HO acid by boiling. α -[*p*-Nitrophenyl]- β -dimethylaminopropionic acid (1.4 g. from 1.8 g. I), m. 167–8°. β -Methylamino homolog (1.6 g. from 5.4 g. I), decomp. about 177°, sol. in mineral acids and alkalis; HCl salt, decomp. 170°; phenylacetyl derivative, prepd. with PhCH₂COCl in NaOH, m. 175°. 1,3-Dipiperidino-2-[2',4'-dinitrophenyl]propane (1.55 g. from 2.3 g. II, piperidine and HCHO, CO₂ being evolved in the reaction), golden yellow, m. 133–4°; *di*-HCl salt, decomp. 144°. 1,3-Bisdimethylamino analog, yellow, m. 85–6°. 1,3-Bisdiethylamino compd., yellow-brown oil; the HCl salt also does not cryst.; picrate, decomp. 165–6°. α -[*o*-Nitrophenyl]- α -hydroxy- β -piperidinopropionic acid (2.2 g. from 1.97 g. III), crystals with 1 H₂O, decomp. 109°, has a neutral reaction and dissolves in HCl and alkalis.

Some degradation products of digitogenin. A. WINDAUS AND S. V. SHAH. *Z. physiol. Chem.* 151, 86–97 (1926).—Oxidation of digitonic acid with 5 parts of fuming HNO₃ gives 20% of an acid C₂₂H₃₁O₁₀N (I), which decomp. 242° and is probably the HNO₃ ester of a lactol. Its *di*-Me ester, m. 194–5° (decompn.) was prepd. by treatment with CH₃N₂. This splits out HNO₂ when warmed with KOH in MeOH and is converted thereby into resinous products. Oxidation of I with alk. KMnO₄ gives an acid C₂₂H₃₁O₁₁, m. 113°, then solidifies and m. 172°. Treatment of oxydigitogenic acid with HNO₃ gives 30% of an acid C₂₁H₃₁O₁₁N, m. 218–20° (decompn.), which also loses HNO₂ when warmed with alc. KOH. The *tri*-Me ester, m. 171°; when heated in a high vacuum at 250° it splits off HNO₂ with formation of a cryst. ester C₂₄H₃₅O₉, m. 142°, and this on sapon. yields a tribasic acid C₂₁H₃₁O₉, m. 215–6°. The ester C₂₅H₄₀O₉ (II), previously obtained from the mother liquor in the prepn. of digitogenic acid, when refluxed with AcOH and H₂SO₄ gave 25% of an acid *di*-Me ester C₂₈H₄₀O₉.H₂O, m. 125°. Sapon of II with AcOH and HCl gave the *mono*-Me ester, m. 201°. By refluxing II with AcOH and HI an impure product (III) contg. I and m. 240–50° was obtained; its *tri*-Me ester C₂₉H₄₀O₉ is dimorphous, m. 122° and 105°. Removal of I from III by Zn dust gave a tribasic acid C₂₆H₃₅O₈, m. 273–4°; Me ester, m. 125–6°. A. W. DOW.

Infra-red absorption of the N-H bond (SALANT) 3. Polysaccharides (XXXIII). Enzymic decomposition of artificial silk and of native cellulose (KARRER, *et al.*) 11A. Influence of temperature on the reciprocal solubility of the monoalkyl ethers of ethylene glycol and water (COX, CRETCHER) 2.

BÖRSEKEN, J.: **The Configuration of the Saccharides.** Pts. I and II Trans. by Samuel Coffey. Leyden: A. W. Sijthoff's Pub. Co. 129 pp. Reviewed in *Nature* 117, 227 (1926).

HOLLEMAN, A. F.: **A Laboratory Manual of Organic Chemistry for Beginners.** Ed. by A. Jamieson Walker. Revised. New York: John Wiley & Sons, Inc., 76 pp. \$1.25.

KÜRSCHNER, K.: **Zur Chemie der Ligninkörper.** Stuttgart: Verlag Ferdinand Enke. 116 pp. Price G. M. 4.50. Reviewed in *Wochbl. Papierfabr.* 57, 26 (1926).

KARRER, P.: **Einführung in die Chemie der polymeren Kohlenhydrate.** Leipzig: Akademische Verlagsgesellschaft. Price, bound, \$4.00.

Organic Synthesis. Vol. 5. New York: J. Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 110 pp. 7s. 6d.

Methanol, etc. BADISCHE ANILIN & SODA FABRIK. Brit. 237,030, April 28, 1924. Catalysts for producing MeOH and other products by reaction of C oxides with H at elevated temps. under pressure comprise a mixt. of 2 or more metals, the oxides of which can be reduced to the metal by H or CO at ordinary pressure and at a temp. below 550°. Fe, Co and Ni are excluded as are also mixts. with metals of the 4th to 7th periodic groups or B. Cu, Ag, Pb, Zn and Cd are suitable metals; carriers and addns. such as K₂CO₃ may be present. MeOH may be formed under 150 atm. pressure.

Separating butyl alcohol and water. A. STEVENS. U. S. reissue 16,267, Feb. 16, 1926. See original pat. No. 1,394,232 (C. A. 16, 423).

1-Nitro-2-methylantraquinone. H. E. FIERZ. Brit. 237,100, July 28, 1924. See U. S. 1,540,467 (C. A. 19, 2210).

Acetylsalicylic acid. KEROL Co. Brit. 237,574, July 22, 1924. Salicylic acid is dissolved in an inert solvent such as dry Et_2O and ketene passed into it until the soln. is satd. On evap. the ether, needle-like crystals of acetylsalicylic acid are obtained.

Ketenes. KEROL Co. Brit. 237,573, July 22, 1924. Ketenes are produced by thermal decompn. of acetone, Ac_2O or similar compds. in the presence of metallic sulfates, preferably those which are not decomposed by heating to 700° such as the sulfates of Cr, Mn, Al, Ca, Ba, Sr, Mg and Ag. A temp. of about 635° may serve for the decompn.

Acetic anhydride. BRITISH CELANESE, LTD., and W. BADER. Brit. 237,302, Jan. 24, 1924. Acetone is caused to react on CO_2 in excess, preferably under pressure. In the presence of H_2O HOAc is formed. Temps. of 250 – 450° may be used and there may be present substances such as oxides and carbonates of Li, Ca, Ba, Sr, Mg, Th, Zr, Ti, Ce and Sn, charcoal, SiO_2 , port. cement or metallic Cu.

Acetic anhydride. KEROL Co. Brit. 237,575, July 22, 1924. Ketene is passed into HOAc to produce Ac_2O without secondary products. By additional supply of ketene a soln. of ketene in the anhydride is obtained. Glacial HOAc is used.

Barbituric acid pyrazolone compounds. F. HOFFMAN-LA ROCHE & Co., AKT.-GES. Brit. 237,590, July 23, 1924. Mol compds. of dialkyl- or arylalkylbarbituric acid and 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone are produced by intimate mixing. Compds. from dipropyl-, diethyl- and phenylethylbarbituric acids are described.

Barbituric acid derivatives. L. THORP. U. S. 1,576,014, March 9. Malonic esters are condensed with urea in abs. alc. soln. by means of Na, by distg. the alc. out of the mass without preliminary refluxing. This serves to produce high yields without decompn. of the product.

Formamide. BADISCHE ANILIN & SODA FABRIK. Brit. 237,528, March 14, 1925. The vapor of NH_4 formate or formic acid together with free NH_3 , with or without H_2O , is passed over a contact mass (preferably a dehydrating material such as bauxite) at temps. of 100 – 200° .

Sodium formate. M. HENDERLI. U. S. 1,574,875, March 2. CO is caused to react upon dil. Na_2SO_4 solns. in the presence of $\text{Ca}(\text{OH})_2$ or other alk. earth metal hydroxide and further Na_2SO_4 is added to maintain a const. low concn. which may be about 5–6%. Cf. C. A. 19, 3490.

Methylene chloride. E. R. BRODTON. U. S. 1,575,967, March 9. A fluid consisting mainly of methylene chloride is prepd. by redistn. of crude products to obtain a product which is non-inflammable, non-corrosive of brass, Cu, Al and Fe and which may be used for driving engines, extinguishing fires, etc.

"Fixing" of ethylene by sulfuric acid. A. A. L. J. DAMIENS, M. C. J. E. DE LOISY and O. J. G. PIERRE. U. S. 1,574,796, March 2. In rapid fixing of C_2H_4 for production of ethylsulfuric acid and Et_2SO_4 , there is added to H_2SO_4 of about 66° Bé. as catalyzer, a cuprous compd. such as Cu_2O and a gas contg. C_2H_4 is passed through this acid at a temp. of 0 – 50° , the catalyzer is sepd. from the acid, and the acid is dild. The Et_2SO_4 which floats on the surface of the acid is collected and the ethylsulfuric acid remains in soln.

Phenolphthalein. E. B. PUTT. U. S. 1,574,934, March 2. A bulky, substantially white, amorphous phenolphthalein is obtained by dissolving pure cryst. phenolphthalein in aq. NaOH soln., pptg. with HOAc and HCl and drying.

Organic derivatives of tin. C. OEGHSLIN. U. S. 1,573,738, Feb. 16. Ethylene chlorohydrin or other chlorohydrin is treated with SnCl_2 in the presence of NaOH or other alkali metal hydroxide, to produce $\text{HO} \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{SnO}_2 \cdot \text{Na}$ which may be isolated as a S deriv. by use of BaCl_2 and H_2S .

Clarifying saccharin liquors. I. H. MORSE. U. S. 1,573,733, Feb. 16. A soln. or suspension of a reagent such as lime is continuously sprayed into a film of the liquor, which is maintained in thin annular form by being given a swirling motion as it ascends in a cylindrical column.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Enzyme dialysis. O. WALTER. *Bull. acad. sci. Russie* [6] 1917, 1075-88. Collodion bags of any desired degree of permeability and diminished pressure in the outer soln. are utilized. By using tryptase from yeast, a slight lowering of the activity of the soln. (which might be caused by absorption) was found after dialysis. The whole of the N capable of reacting with formaldehyde and 98.5% of the total N were removed. B. C. A

Effect of X-rays on cholesterol content, hydrogen-ion concentration, freezing-point depression, and surface tension of blood. F. KONRICH AND E. SCHELLER. *Strahlenther.* 18, 263(1924).—The cholesterol content and the H-ion concn. of pathological human blood are not affected by X-radiation, the surface tension of the blood is practically unaltered; but the f.-p. depression of the serum is increased. X-radiation of animals lowers the H-ion concn. and the surface tension, but has no effect on the cholesterol content of the blood. B. C. A

Deposition, separation, and reabsorption of hemoglobin in the organism and their relation to the deposition of iron pigment. K. SHIMURA. *Virchow's Arch.* 24, 464 (1924).—Hemoglobin, given to dogs intravenously, was rapidly excreted. The sepsis is brought about by the kidneys, liver, gall-ducts and suprarenals; in the remaining organs the hemoglobin is stored up and decomposed into iron pigment. B. C. A

The alcoholic splitting of protein. I. CH. GRANACHER. *Helvetica Chim. Acta* 8, 784-91(1925).—Emil Fischer's conception that proteins are built up from amino acids is doubted in the light of recent work. There is the possibility that they are labile heterocyclic ring systems. 200 g. goose feathers autoclaved for 2 hrs. at 170-75° with 1 l. 95% C₂H₅OH yield (NH₄)₂CO₃ or NH₄CO₂NH₂ and NH₃(1.5-1.8% of total feather mass) on distn. and 173 g. of solid after heating on a water bath in a vacuum. Analysis of solid: Total N 14.95%, amino N 0.75%. About 2/3 dissolves in 5 times its mass of water. The soln. gives no ninhydrin reaction and only indistinct brown with CuSO₄ or NaOH. An ether ext. of the aq. soln. of solid from 500 g. feathers divides into 3 parts: (a) a solid which seps directly, 2.5 g., and contains diketopiperazine; (b) an ether soln. yielding 14 g. of sirup from which more crystals sep. on standing; (c) 30 g. of sirup sol. with difficulty in ether; it fractionated at 5 mm. pressure. The total distillate weighs 15 g. Fraction 130-40°: viscous oil sol. in H₂O; no color with either Cu(OH)₂ or ninhydrin; forms oily picrate with picric acid; analysis C 77.9, H 8.9, N 11.5%. After boiling with concd. HCl it gives an intensely positive ninhydrin reaction and a deep blue on boiling with CuCO₃. Fraction 180-200°: semi-solid in the cold; analysis total N 12.53, amino N 0.50%. Polypeptides of the acid amide type do not dissolve after autoclaving with alc. at 170-80° for 10 hrs. Benzoyl-diglycylglycine yielded no split products on heating for 4 hrs. at 175-85° with 1% alc. NH₄. Diglycylglycine yields an amorphous mass (probably a higher condensation product) and a cryst. substance which appears to be glycine anhydride on heating for 5 hrs. with 1% H₂S. M. BEBER

Polysaccharides. XXXIII. The enzymic decomposition of artificial silk and of native cellulose. P. KARRER, P. SCHUBERT AND W. WEHRLI. *Helvetica Chim. Acta* 8, 797-810(1925); cf. C. A. 19, 3278.—Differences in resistance to enzyme action are due to differences in phys. structure or in arrangement of micellae and thus of active surfaces. Velocity of hydrolysis depends on concn. of the enzyme as well as on the abn. amt. For comparable measurements relation of cellulose to vol. of mixt. must be kept const. To hydrolyze cellulose preps. that hydrolyze with difficulty within a reasonable time use the enzyme in the highest possible concn. At first the hydrolysis follows the same course as the decompn. of lichenin; next, it approaches a monomol. isotherm, and later (up to 50% decompn.) it follows Schütz's rule. Cotton and com. copper silks are easily acted on by cellulase from snail. Native cellulose hydrolyzed with difficulty and then only with high concns. of enzyme. The unit for cellulase varies, depending on whether it acts on pptd. or native cellulose and "small cellulase unit," used for pptd. cellulose, defined as amt. of cellulase which in 50 cc. at pH 5.28 and temp. 36° will bring about 20% hydrolysis of 1 g. of fibrous copper silk ("Zellwag") in 96 hrs. The enzyme is adsorbed by various aluminiferous earth preps. but not by kaolin. Considerable quantities are lost in dialysis because of adsorption by the membrane. Temp. begins

to inactivate the enzyme at 45–50°; considerable is lost at 55° and the inactivation is almost complete at 60°.

N. BEBER

The relation of human native serum to whole blood serum. II. The reality of refraction differences. W. STARLINGER AND U. STRASSER. *Biochem. Z.* **160**, 417–25 (1925); cf. *C. A.* **19**, 2231.—The differences in refractive index between native serum (that sepg. from plasma) and whole blood serum (that sepg. from whole blood) are very small.

F. A. CAJORI

Various inhibition phenomena in the enzymic cleavage of sucrose. HANS V. EULER AND KARL JOSEPHSON. *Z. physiol. Chem.* **152**, 31–54 (1926).—The view that enzyme reactions occur through the intermediate stage of enzyme-substrate compds., whose equilibria are controlled by the law of mass action, allows a classification of various inhibition phenomena which result from the addn. of other substances. Assuming that the velocity of an enzymic reaction is detd. partly by the concn. of enzyme-substrate compd. and partly by the decompn. velocity of such a compd., the inhibitions may be attributed to alteration of the concn. or to alteration of the decompn. velocity of the complex. Alteration of the concn. may be due to the affinity of the added substance, either for the enzyme portion or for the substrate portion of the complex. By changing the substrate concn., a change then occurs in the relative inhibition by the added substance. In the case of sucrase the effect would vary also according to whether the inhibitory substance is coupled to the glucose- or to the fructose-binding group of the enzyme. It should be possible by displacement of the substrate from the complex in such a way as to inhibit the enzyme action, to det. which of the two affinity positions was occupied by the inhibitor. Galactose, zymophosphate, and AcH alter the inhibition by glucose, but not that by fructose. The aldehyde sugar galactose is, therefore, bound to the same affinity group of the enzyme as glucose, notwithstanding the difference between the two sugars with respect to groupings around the 4th C and the location of the O bridge. The same holds true also for AcH and zymophosphate. Partial inactivation of sucrase by $m\text{-ClC}_6\text{H}_4\text{NH}_2$, followed by addn. of glucose or fructose, showed that sugars can react with amines, the reaction capacity being greater for aldoses than for fructose. In this case the addn. of glucose may bring about an activation by displacing part of the amine from the enzyme complex, up to the point where the sp. inhibitory effect of the glucose itself predominates. Fructose inhibits sucrase somewhat more than glucose. A mixt. of glucose and fructose, however, is more inhibitory than the mol. equiv. of fructose alone. Galactose diminishes the inhibition by glucose but not that by fructose. Na zymophosphate and glucose together show a smaller inhibition than glucose alone, while the reverse is true with respect to fructose inhibition. This indicates that the esterified hexose has more of a glucose- than a fructose-like constitution. Simultaneous inhibition by AcH and fructose is greater than that by AcH and glucose. After partial inhibition by $m\text{-ClC}_6\text{H}_4\text{NH}_2$, the activity of sucrase may be appreciably restored by glucose, whereas it is further diminished by fructose. When the glucose and the amine solns. were mixed 15 hrs. before the test, the enzyme showed greater activity than when the freshly prepd. mixt. was tested. Allowing for the inhibitory action of glucose, the reactivation in this case amounted to 50%. Maltose also has the property of reactivating sucrase after partial inactivation by the amine.

A. W. DOX

The muscle pigment and MacMunn's myohematin. II. O. SCHUMM. *Z. physiol. Chem.* **152**, 55–65 (1926).—Immediately after death the heart muscle of mice and rats shows a distinct content of the pigment or pigment mixt. which MacMunn designated as myohematin. Spectroscopically it is identical, or nearly so, with Keilin's cytochrome of yeast. Myochrome and hemoglobin probably contain the same porphyratin. MacMunn's myohematin, which is probably a mixt. of several porphyratin carriers, contains, predominantly at least, a porphyratin which is not identical with the Fe complex of coproporphyrin.

A. W. DOX

The affinity relations of sucrase. VII. Influence of preliminary treatment of yeast on the affinity constant of sucrase. 1. HANS V. EULER AND KARL JOSEPHSON. *Z. physiol. Chem.* **152**, 66–87 (1926).—Assuming that a transition from a precursory form into active enzyme occurs under the influence of fermenting sugar, it follows that the development of active sp. groupings necessary for enzyme action is such as to meet sp. requirements. It should, therefore, be possible, by the application of various substrates in a preliminary treatment, to obtain sucraes of different specificity. Thus a preliminary treatment by sucrose (fructose plus α -glucose) should exert a somewhat different influence on the constitution and configuration of the newly formed sp. substrate-binding groups of the enzyme than a similar treatment with either glucose (α - or β -form) or fructose alone. After preliminary treatment with sucrose or α -glucose

the affinity of the sucrase for α -glucose increases, whereas the affinity for β -glucose or fructose shows no such increase. While the sucrase from untreated yeast showed only a slight affinity for α -glucose as compared to that for fructose, a preliminary treatment with α -glucose yielded a sucrase with even stronger affinity for α - than for β -glucose and nearly the same affinity for fructose. Along with the increased affinity between sucrase and α -glucose a slight but definite increase in affinity between enzyme and sucrose seems to occur. The fact that yeast when cultivated on different sugars develops sucrase with more or less pronounced sp. affinities supports the possibility of the existence of various sucraes with varying inverting capacities. In explanation of the varying affinity consts. for fructose or glucose, two assumptions are valid: (1) at each affinity grouping the preliminary treatment alters the sp. attraction; (2) the relative number of fructose- or glucose-binding affinity groupings of the enzyme are altered. It is probable that in the living cell a quant. relationship exists between the sugar on the one hand and the affinity groups of the plasma on the other hand. Preliminary treatment affects the different enzymes of the organism to a very unequal degree, as shown by a comparison of inversion velocity with fermentation velocity. It cannot be assumed, however, that sucrase presents an exception in the sense that its two affinity consts. are altered to unequal extents by the preliminary treatment, but rather that the enzyme being adjusted to an equil. mixt. can undergo a change in its affinities through the influence of altered concns. of the substrate components.

A. W. DOX

The kinetics of ester cleavage by liver lipase. NOGAKI. *Z. physiol. Chem.* 152, 101-18(1926).—Lipase combines with the ester as well as with the cleavage products. In the sapon. of esters the amt. hydrolyzed is only approx. proportional to the time. The course of the reaction is not the same for all esters. After an initial steep drop or a slight rise the reaction velocity decreases to the end of the reaction. This decrease is due not to successive destruction of several enzymes of different resistance, but to a binding of the cleavage products; at alk. reaction by the alc., at acid reaction by alc. and acid. Since the binding velocity of alcohol-enzyme is less than that of ester-enzyme, the extent of the inhibition is dependent on the enzyme concn. as well as on the reaction temp. The more slowly the reaction proceeds, the more pronounced is the inhibition. The form of the reaction curve is therefore dependent, not only on the affinity of lipase for the ester and its cleavage products, but also on the velocity at which the sapon. proceeds, and this in turn on the enzyme concn. and temp.

A. W. DOX

Synthesis and fermentation of glycogen by maltase-free yeast. ALFRED GOTTSCHALK. *Z. physiol. Chem.* 152, 132-5(1926).—The yeast *Saccharomyces Ludwigii*, which contains no maltase, synthesizes as well as ferments glycogen. Cultivated on a glucose-salt medium, it builds up glycogen which again breaks down during autolysis. Hence, maltase is not in this case an intermediate product in the fermentative degradation of glycogen. The fact that by combined action of α - and β -amylase from one and the same maltase-free organism the glucoside linkages in the glycogen mol. are bound and broken points to the absence of maltose linkages in this polysaccharide.

A. W. DOX

Biochemical synthesis of fumaric acid from pyruvic acid. ALFRED GOTTSCHALK. *Z. physiol. Chem.* 152, 136-43(1926).—The mold *Rhizopus nigricans* when cultivated on a synthetic medium contg. pyruvic acid as the sole source of C produced in two months 32% of the theoretically possible amt. of fumaric acid, assuming that two mols. of AcCO_2H yield 1 mol. of fumaric. AcOH was also formed. The mechanism of the synthesis is believed to be $\text{AcCO}_2\text{H} \rightarrow \text{AcH} + \text{CO}_2 \rightarrow \text{AcOH} \rightarrow (\text{CH}_2\text{CO}_2\text{H})_2 \rightarrow \text{fumaric acid}$. Pyruvic acid is probably an intermediate stage in the fermentation of carbohydrate to fumaric acid.

A. W. DOX

Remark on paper III on coproporphyrin synthesis by yeast. HANS FISCHER. *Z. physiol. Chem.* 152, 144-5(1926); cf. *C. A.* 20, 769.—*Saccharomyces ananensis*, like com. yeast, produces hemin and traces of coproporphyrin when grown on beer wort. The cytochrome content is not altered by vigorous growth on media free from blood pigment and porphyrin. It is probable that the substance is synthesized directly from the sugar and inorg. salts of the medium. The hemochromogen spectrum in the pyridine ext. from plants, especially yeast and beans, was corroborated.

A. W. D.

The question of zymase formation and co-enzyme action. A. LEBEDEV. *Z. physiol. Chem.* 152, 146(1926).—Polemical with Euler and Nilsson (*C. A.* 20, 211).

A. W. DOX

The rennet-like action of pepsin. RYOICHI AKIBA. *Keio Ig., Tokyo* 2, 1387-91 (1922); *Japn. J. Med. Sci.* 2, 24.—The rennet-like action of pepsin on milk may be caused by the autocatalysis of pepsin itself. At the time when pepsin coagulates

milk, one can find a rennet-like enzyme of

The chemical constituents of tears. IV. 1922, 551-62; *Japn. J. Med. Sci.* 2, 15.—It is nearly 3 times that in serum and about half is nearly equal to that in serum and slightly more and Mg content in tears are lower than those in s

Enzymic splitting of dipeptides. I. H. v. EULER AND KARL JOSEPHSON. *Ber.* 59B, 226-33(1926).—*Erepsin* was prepd. by extn. of the intestinal mucosa of the pig with glycerol for 2 days and pptn. of the filtered ext. with alc. The reaction coeff for the splitting of *glycylglycine* was directly proportional to the amt. of enzyme used. The max. activity is at pH 8.0. Previous theoretical considerations (*C. A.* 17, 3034) are substantiated. ARTHUR GROLLMAN

Activity and iron content of highly active catalase preparations. S. HENNICHES. *Ber.* 59B, 218-25(1926).—The liberation of O from H_2O_2 by liver catalase prepd. by the method of *C. A.* 19, 84 was detd. The O liberated by preps. of different activity is not proportional to their Fe content. The oxidation of *alanine* in the presence of blood charcoal gave an activity per mg. of Fe content much lower than that obtained with liver catalase. The degree of poisoning of the catalase by *HCN* in varying concns. was detd. The view that the mechanism of this poisoning involves an adsorption of the catalytically active Fe is not supported. ARTHUR GROLLMAN

Pancreatic function. I. The determination of pancreatic enzymes. EDWARD HOLLANDER AND J. M. MARCUS. *Arch. Internal Med.* 36, 585-91(1925).—The linear relation between enzyme concn. and velocity of hydrolysis, on which clinical detns. are based, obtains only for *amylpsin*, for which the reversibility of the hydrolytic process is negligible. A linear relation may be obtained for *trypsin* and *steapsin* by applying Hedin's "time law." The time required to neutralize the same quantity of 0.1 N NaOH (phenolphthalein) in a certain quantity of substrate contg. varying amts of the enzyme is inversely proportional to the enzyme concn. The NaOH concn. is so chosen as not to inhibit the enzyme action. MARY JACOBSEN

The preparation of yeast glycogen. TAKEO YOKOYAMA. *Beitr. Physiol.* 3, 95-110(1925).—Yeast prepd. by killing fresh brewer's yeast rapidly and drying *in vacuo* at 100° is refluxed 30 hrs. with a 50% KOH until the I reaction of the residue almost disappears. The glycogen obtained by pptn. with 96% alc. is freed from gum substances with Na-free Fehling soln. and, if necessary, from proteins with Brücke's soln. It is further purified by repeated pptn. with 60% alc. from a slightly acid (HCl) soln. and finally pptd. with 96% alc. and washed with 66% alc. contg. a few drops of AcOH. Analysis: C 44.32%, H 6.65%, ash 0.261%, $[\alpha]_D$ 192. Inversion (Allihn): 97.2 to 98%. MARY JACOBSEN

The blood pigment and a few complex ferro salts. W. KÜSTER. *Chemie der Zelle u. Gewebe* 12, 1-21(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 672. MARY JACOBSEN

Are myelins present in the normal subcutaneous fat of man and in lipomas? ARIBERTO D'ARGENIO. *Folia med.* 10, 809-30(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 512-3(1925).—The subcutaneous fat of man and cow is free from myelin substances, if contamination with blood, never or connective tissue is avoided. Myelin substances were found in lipomas, partly decomposed with cholesterol formation in the case of CH_2O preps. The hydrolysis of the ether ext. led to a product which reduced Fehling soln. but could not be identified as protagon. The extn. method is more reliable for the detection of myelins than the histological staining methods. M. J.

The influence of medicaments on the sedimentation velocity of erythrocytes. S. HARA. *J. Orient. Med.* 2, 191-4(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 279(1925).—The tabulated results show that the sedimentation velocity is diminished by digifolin, digalen, spartein sulfate and $BaCl_2$ and not influenced by caffeine. MARY JACOBSEN

Occurrence and detection of organic skeleton substances in animals. GEORG KUNKE. *Z. vergl. Physiol.* 2, 233-53(1925); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 824.—Chitin, spongin, cornein, conchin and cellulose are discussed. MARY JACOBSEN

Vital staining in the liver of different classes of vertebrates. J. KRAFT. *Z. Zellen u. Gewebelehre* 1, 517-22(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 370.—Study of trypan blue fixation after repeated introduction of small doses into the abdominal cavity. In fishes the capillary epithelium did not store the dye, although the doses were larger than those given to mammals and the dye has been undoubtedly supplied to the liver. The interstitial tissue of the kidneys showed a considerable fixation of the dye followed

by staining of epithelial granula. Frogs, birds and, among mammals, the mouse show fixation of trypan blue in the liver cells.

MARY JACOBSEN

Diffraction in biologic structures. A. PIJPER. *S. African Med. Record* 23, 453(1925); *J. Am. Med. Assoc.* 86, 154.—The principles underlying the use of bacillary surface growths as diffraction gratings are discussed. The technic of measuring the diam. of bacilli by means of their diffraction spectra is indicated. The av. diam. of bacilli of a given strain is an unvarying biologic character. Changes in the diam. of the red blood cells can be measured by this method.

I. W. RIGGS

Isoelectric points of various proteins. FRANK A. CSONKA, JOSEPH C. MURPHY AND D. BREESE JONES. *J. Am. Chem. Soc.* 48, 763-8(1926).—The isoelec. points of a large no. of proteins have been detd. by shaking buffers having a p_H range from 4 to 6.8, with an excess of the protein investigated and pptg. the dissolved protein in the clear filtrate with tungstic acid. The Sørensen value of the buffer filtrate in which was produced the least turbidity is taken as the isoelec. point of the protein. The results show that those proteins having the greater soly. in H_2O have the lower isoelec. points and that a correlation exists between the isoelec. points of proteins of the same group. The isoelec. points of albumins were found to range between p_H 4 and p_H 5, those of globulins from 5 to 5.5 and those of prolamines from 6 to 6.5. Proteins requiring the greater quantity of $(NH_4)_2SO_4$ for their pptn. from saline solns. have lower isoelec. points than proteins which require less. Thus the β -globulins have lower isoelec. points than the α -globulins. Albumins were found to be more sol. in the buffers used, on the alk. side of their isoelec. points, while globulins showed greater soly. on the acid side.

C. J. WEST

The chemistry of glycogen (IRVINE, GILCHRIST) 10.

CUSHNY, ARTHUR: **The Biological Relations of Optically Isomeric Substances.** Baltimore, Md.: The Williams & Wilkins Co. 100 pp. \$2.00.

JOËL, ERNEST: **Klinische Kolloidchemie.** Dresden: Steinkopff. 124 pp. Reviewed in *Tech. Book Review Index* 8, No. 2, 205(1924).

STIEGLITZ, JULIUS: **Chemistry and Recent Progress in Medicine.** Baltimore, Md. The Williams & Wilkins Co. 70 pp. \$1.50.

SUCHARIPA, RUDOLPH: **Die Pektinstoffe.** Braunschweig: Dr. Serger & Hempel. 188 pp. M. 6.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Fairhall (chromate) method for minimal amounts of lead in fecal specimens. ANON. *Ind. Eng. Chem.* 18, 431-2(1926).—In the study of the hazards involved in the distribution and use of gasoline treated with Pb tetraethyl, great care was taken in the detn. of traces of Pb in the feces. The method used was a modification of the Fairhall method; it consisted in drying the feces, ashing, extg. with 6 *N* HCl, filtering, ashing the residue with tartaric acid and HCl, filtering, combining the 2 filtrates, pptg. with H_2S in barely acid medium, dissolving the ppt. and repptg. twice with H_2S , dissolving the third ppt. in HNO_3 , evapg., filtering off any S, pptg. as $PbCrO_4$ in very dil. $AcOH$, and titrating iodometrically the $PbCrO_4$ ppt.

W. T. H.

Buffered water for the Romanowsky-Giemsa stain. MICHAEL BALINT. *Klin. Wochschr.* 5, 147-8(1926).—The stains are dild. with a $M/50$ – $M/400$ phosphate buffer of p_H 6.8-7.0. This p_H gives the sharpest differentiation.

MILTON HANKE

Histological demonstrations of calcium by the method of Rabl. E. FREUDENBERG. *Klin. Wochschr.* 5, 64-6(1926).—Rabl claims to be able to differentiate 2 kinds of Ca in tissue by immersing the tissue in a neutral soln. of $(NH_4)_2C_2O_4$. Insol. bone Ca, present as $Ca_3(PO_4)_2$ and $CaCO_3$, is said to remain unchanged; sol. Ca becomes fixed as CaC_2O_4 . This is theoretically improbable and can be shown by expt. to be untrue. Bones immersed in neutral $(NH_4)_2C_2O_4$ show a conversion of at least 33% of their insol. Ca into CaC_2O_4 . It is, therefore, impossible to differentiate sol. from insol. Ca by the method of Rabl. See also Böhming (*C. A.* 20, 234).

MILTON HANKE

Histological demonstration of soluble calcium compounds. C. R. H. RAHL. *Klin. Wochschr.* 5, 365(1926).—An unconvincing answer to the criticism of Freudenberg (preceding abstract).

MILTON HANKE

The detection and occurrence of chitin. PAUL SCHULZE. *Z. Morphol. Ökol. d. Tiere* 2, 643-66(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 208(1925).—A detailed description of the microchem. detection of chitin.

MARY JACOBSEN

Spectroscopic methods for the detection of blood in feces. SNAPPER. *Arch.*

maladies appar. dig. nutrit. 14, 677-704(1924); *Ber. ges. Physiol. expil. Pharmacol.* 30, 429(1925).

MARY JACOBSEN

New methods of silver impregnation of nerve fibers as applied to series section in paraffin. WALTER FREEMAN. *Riv. patol. nerv. ment.* 29, 89-92(1924); *Ber. ges. Physiol. expil. Pharmacol.* 30, 779(1925).

MARY JACOBSEN

The sulfosalicylic acid method in the determination of pepsin action. R. W. SEUFFERT AND E. MOHR. *Beitr. Physiol.* 2, 275-82(1924); *Ber. ges. Physiol. expil. Pharmacol.* 30, 800(1925).—The time required for the decoloration of sulfosalicylic acid-serum depends on the age of the substrate. It increases inversely with the enzyme content but at a much higher rate and depends on the HCl content. A pepsin soln. neutralized by CaCO_3 does not regain its activity by addition of HCl. Numerous control expts. are necessary.

MARY JACOBSEN

Manometric determination of cellular metabolism in serum. OTTO WARBURG. *Biochem. Z.* 164, 480-503(1925).—Modifications of the original method (C. A. 19, 1720) are described which adapt it to the study of cellular metabolism where the glycolysis is small as compared to the respiration. When m mg. tissue (dry substance) develop in t hrs. x cu. mm. O_2 , CO_2 or lactic acid, the following quotients are obtained: $Q_{\text{O}_2} = x_{\text{O}_2}/mt$; $Q_{\text{CO}_2} = x_{\text{CO}_2}/mt$; $Q_M = x_M/mt$; $Q_S = x_M + x_{\text{CO}_2}/mt$, where M is lactic acid and S serum. From these quotients are calcd. in % by wt.; oxygen consumption: $Q_{\text{O}_2}(32/22,400) 100 = Q_{\text{O}_2} \times 1.43 \times 10^{-3} \times 100$; CO_2 production: $Q_{\text{CO}_2}(44/22,400) 100 = Q_{\text{CO}_2} \times 1.96 \times 10^{-3} \times 100$; lactic acid formed: $Q_M(90/22,400) 100 = Q_M \times 4.02 \times 10^{-3} \times 100$.

S. MORGULIS

Contribution to the p_H determination in blood. A new hydrogen electrode. G. ETIENNE, M. VERAINE AND M. BOURGUAUD. *Compt. rend. soc. biol.* 93, 765-6(1925).—The object of this instrument is to secure a const. and low value for Michaelis' factor $a = \text{vol. H}_2/\text{vol. serum}$. A pipet provided with a glass stopcock has a capacity of exactly 7.5 cc. The vol. 0.05 cc., i. e., $1/150$ of the vol. of the pipet, below the stopcock is marked by a line on the stem. Between this line and the stopcock a Pt wire is fused through the stem and bent so the end inside reaches 1 mm. below the line. Plasma is obtained with the usual precautions practiced in the p_H detn., and the bulb and its connecting tubes are completely filled with this plasma. The pipet is then attached to a H generator and H is slowly run in until the plasma reaches the mark below the stopcock (0.05 cc). The stopcock is then closed and the free end likewise closed with the finger and the contents are thoroughly mixed. The pipet is plunged together with a N or 0.1 N calomel electrode into the connecting vessel kept in a thermostat at 37° and the p_H measured by the c. m. f. as usual.

S. MORGULIS

C—BACTERIOLOGY

A. K. BALLS

Rapid method of preparation of silica-gel for bacteriological cultures. M. SOUL-REYRE. *Ann. Brass. et Dist.* 23, 371-2(1925); *J. Inst. Brewing* 31, 471-2; *Analyst* 50, 629-30.—The principle employed is the elimination of the K contained in the silicate used as the slightly sol. bitartrate, this salt being removed by filtration. One hundred cc. of a soln. of K silicate (sp. gr. 1.057) are poured rapidly into a mixt. contg. 40 cc. of 20% tartaric acid soln., 1 cc. of 84% phosphoric acid soln. and 1 cc. of H_2SO_4 dild. with an equal vol. of water. After 5 mins. pptn. is accelerated by stirring, the ppt. allowed to settle, and the supernatant liquid filtered, the filtrate being designated A . A second soln., B , is prepd. by mixing 2 vols. of K silicate soln. (sp. gr. 1.085) with 1 vol. of 5% KOH soln. For the culture of yeasts a suitable medium is obtained by sterilizing separately at 115° for 10 min. After cooling in a stream of water, liquids (a), (b) and (c) are mixed in the following order: (a) 100 cc. of soln. A and 50 cc. of beer wort; (b) 100 cc. of sugar soln. or other nutritive medium; (c) 50 cc. of soln. B ; and they are then transferred immediately to sterile Petri dishes or test tubes. Modifications of this medium are described for use in the culture of bacteria and N-fixing organisms.

H. G.

Bacteriological examination of material containing *B. proteus*. ALBRECHT SCHUPACK. *Klin. Wochschr.* 5, 67-8(1926).—Prep. an immune serum by injecting guinea pigs with several strains of *B. proteus*. It should have a titer of approx. 1:6000. Preserve by mixing with an equal vol. of 0.5% phenol. Mix 0.2-0.3 cc. of this serum with 10 cc. of liquefied agar medium and slant as usual. This medium is then inoculated with the material to be investigated. *B. proteus* is agglutinated; the other bacteria develop normally. In this way an overgrowth by *B. proteus* is avoided.

M. H.

Bacteriology of the duodenum. J. OLIVET. *Klin. Wochschr.* 5, 307-10(1926).—

The duodenum is usually sterile. It is always sterile when the concn. of gastric HCl is normal or above normal. The duodenum becomes infected in diseases that are associated with hypoacidity or anacidity. The invading organisms, chiefly colon bacilli, are not usually classed as pathogenic; but they may become so if they invade the bile duct, cystic duct or gall bladder.

MILTON HANKE

The behavior of bacteria to nuclear staining. K. VORR. *Z. ges. exper. Med.* 47, 183-92(1925).—Nuclear staining depends on the ability of nucleic acids of the type of thymonucleic acids to stain with acid fuchsin after partial hydrolysis, but not without hydrolysis. By the use of this method, nucleic acid of the type of thymonucleic acid may be demonstrated in various bacteria and in the nuclei of trypanosomes.

HARRIET F. HOLMES

The chemical composition of *Spirocheta pallida*. JOSEF SCHUMACHER. *Dermatol. Wochschr.* 79, 1494-7(1924); *Ber. ges. Physiol. exper. Pharmacol.* 30, 322(1925).—The O content of *Spirocheta pallida* is very low because of the absence of nucleic acids. The main constituent is a Gram-negative lipoprotein.

MARY JACOBSEN

Gum formation by bacteria. FERNBACH. *Sucre Belge* 44, 639(1925).—*Leuconostoc dextranicus* attacks only dextrose giving dextran, which upon hydrolysis regenerates dextrose. This dextran has no reducing power. *Leuconostoc* produces gums only from dextrose which it previously derives from saccharose. It forms no gum in the presence of sugar previously inverted, nor from glucose or levulose. The yield of dextran is at most 10% while the yield of levulosan may reach 50%. It has also been confirmed that the levulosan-producing bacterium produces no gum except from nascent levulose. Sucrose is incapable of yield gum directly.

T. M.

The influence of lipid solvents on spore formation in aerobic bacteria. S. MICHALOWSKY. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 17-25(1925).—Cultures of aerobic spore formers including *B. subtilis*, *B. megatherium*, *B. mesentericus*, *B. anthracis* and *B. chauwei* were grown on agar at 32 to 34° and exposed sealed to the fumes of a long list of substances including various alcs., ethers, aldehydes, acids, ketones, benzene, toluene, etc. In most instances lipid solvents increased spore formation and other substances did not.

JOHN T. MYERS

Conditions affecting aerobiosis and anaerobiosis of bacteria. E. HOEN. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 25-31(1925).—The amt. of free O required by a given bacterial species increases with the amt. of available food material.

J. T. M.

The action of vertebrate hormones on bacterial growth. K. FUJITA. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 31-8(1925).—The effect of various hormones on the rate of growth of *B. coli* was studied. Adrenaline and weak thyroid ext. inhibited growth, pituitrin and parathyroid stimulated it, and thymus and insulin had no demonstrable effect.

JOHN T. MYERS

The relationship of urea bacteria to organic compounds. L. RUBENTSCHIK. *Centr. Bakt. Parasitenk., II Abt.,* 65, 1-15(1925).—The urea bacteria of Chadjibeylinus will grow and ferment urea in protein-free media, with urea as the only source of N and various N-free compds. such as starch and dextrin as the source of C. The growth energy was low in protein-free media. There is a parallelism between the energy of growth and that of urea fermentation. Urea can serve as a source of N but not of C. Each species of urea bacteria has an optimum org. compd. as a source of N. This suggests the possibility of a number of different species.

JOHN T. MYERS

The dependence of the rate of denitrification on the reaction of the medium. T. M. SACHOROWA. *Centr. Bakt. Parasitenk., II Abt.,* 65, 15-35(1925).—Denitrification by the bacteria of Iterson and by *Bacterium stutzeri* is dependent on the reaction of the medium. The optimum for the bacteria of Iterson is p_H 7 to 8.2, for *B. stutzeri*, 7.6. The acid limit for the reduction of HNO_3 is p_H 5.2 and the alk. limit, 9.8. The same conditions apply to the reduction of nitrites. The presence of NO_3 slows NO_2 reduction. Reduction of HNO_3 is more vigorous in the presence of $Sr(NO_3)_2$ than in that of KNO_3 because CO_2 from the destruction of cellulose is pptd. as water insol. compds. by $Sr.$ and not by $K.$ Hence the medium does not grow rapidly alk. in the presence of $Sr.$

JOHN T. MYERS

Bacterial sulfur oxidation in pond soils and its practical value. H. FISCHER. *Centr. Bakt. Parasitenk., II Abt.,* 65, 35-42(1925).—Sulfate formation in pond soils is analogous to nitrification. The process depends on the p_H of the water and soil and on the nature of the org. compds. present. The buffer action of soil carbonates and the adgn. of S or H_2S has a marked effect in such soils. The formation of SO_4 ions brings into soln. considerable amts. of soil phosphates so necessary to fish life.

JOHN T. MYERS

A green bacterium. J. SACK. *Centr. Bakt. Parasitenk., II Abt.,* 65, 113-6(1925).

A spore-forming bacterium was found in soils. It produced a blue green pigment which was a mixt. of yellow and blue. The blue pigment crystallizes in plates. It can use N but not C from inorg. compds.

Sphaerotilus natans. J. SACK. *Centr. Bakt. Parasitenk., II Abt.*, 65, 116-8(1925).—These bacteria cannot assimilate free N. They fail to grow in cond. water contg. K_2HPO_4 and glucose. There is almost no growth with KNO_3 , $NaNO_2$, $(NH_4)_2SO_4$, asparagine, tyrosine, or glycocoll as a source of N. They depend on protein for N. NH_3 but not free N is produced.

The influence of bacterial fluorescein on protozoa. H. ZIKES. *Centr. Bakt. Parasitenk., II Abt.*, 65, 128-30(1925).—The fluorescent substances produced by bacteria have an inhibiting photodynamic effect on certain protozoa.

Chalk bacteria and other chalk-precipitating fungi. H. MOLISCH. *Centr. Bakt. Parasitenk., II Abt.*, 65, 130-9(1925).—There are marine bacteria which can ppt. cryst. $CaCO_3$, the crystals being spherical or hourglass in shape. The pptn. is so marked that agar or gelatin colonies become turbid with a definite corona around them. Sea water in a medium will serve as a source of Ca, but the addn. of Ca in any form as chloride or acetate hastens the pptn. They produce NH_3 from org. matter which combines with CO_2 and then reacts with Ca. Many strains of these bacteria were isolated from sea water and pond and lake soils, and also an actinomycete from the air. They probably play an important part in nature. Some species produce oxalic acid which ppts Ca as the oxalate.

The utilization of non-protein sources of nitrogen by the micrococci. G. J. HUCKER AND L. F. RETTGER. *Centr. Bakt. Parasitenk., II Abt.*, 65, 273-7(1925).—The micrococci, while they produce luxuriant growth on complex substances, also have the power to utilize more simple forms of N. However, they have become either too specialized to use chem. pure amino acids or have lost the power to produce enzymes which would enable them to utilize such forms of N. They thus differ from the more saprophytic colon typhoid group, which in many cases grows abundantly on pure amino acids as the only source of N. With NH_4 phosphate as the only source of N, distinctly saprophytic strains cloud the medium, while the parasitic ones do not.

The germination of the conidia of Botrytis cinerea in solutions of various substances. K. STARITZSKY. *Centr. Bakt. Parasitenk., II Abt.*, 65, 291-7(1925).—Germination was studied in a variety of org. and inorg. substances. Solns. just strong enough to prevent sprouting swelled the spores so that the diam. was twice that of fresh conidia. In the presence of concd. solns. of many org. acids as citric, tartaric or lactic, abnormally thick irregular sprouts formed. Similar forms appeared with Na_2CO_3 , Na_2SO_4 and $ZnSO_4$. In dye solns. the sprouts remained uncolored.

A contribution to the dynamics of toxicity and the theory of disinfection. I. S. FALK AND C. E. A. WINSLOW. *J. Bact.* 11, 1-25(1926).—The mortality of *B. coli* in solns. of NaCl and $CaCl_2$ and in distd. water of varying p_H follows a generally logarithmic course and may be roughly described by the unimol. chem. equation. This relationship is not close or exact. Where disinfection does not follow a logarithmic course and is not described by the unimol. equation, the course may be sometimes described by the di-, tri-, or higher multimolecular reaction. When used in sufficiently low concn., NaCl and $CaCl_2$ may not only be non-toxic for *B. coli* but may stimulate growth and reproduction. The reaction between disinfectant and cell or cell constituents is probably highly complex.

The multiplication of yeasts and yeast-like fungi in synthetic nutrient solutions. E. W. TANNER, E. D. DEVEREUX AND F. M. HIGGINS. *J. Bact.* 11, 45-64(1926).—Fifty pure species of yeasts and 22 strains of yeast-like fungi multiplied rapidly in Fulmer and Nelson's medium F. over a period of 11 months. Growth was less in Ferml's medium and least in Nageli's. These organisms can develop in pure synthetic media if heavy inoculations are used, but growth is more rapid if "bios" or org. matter is present. Growth depends on a number of factors such as temp., acclimatization to a certain medium, purity of ingredients, chem. constitution of the medium, aeration and p_H . Absence of growth may be explained by variation in these factors. Postulation of "bios" or other hypothetical substance is not necessary.

Nitrification in the sea. B. ISSATCHENKO. *Compt. rend.* 182, 185-6(1926).—The conditions for bacterial nitrification in the Azov and Black Seas are discussed.

The interconvertibility of "rough" and "smooth" bacterial types. E. O. JORDAN. *J. Am. Med. Assoc.* 86, 177-8(1926).—The existence in certain bacterial stock cultures of 2 types of cells, characterized, resp., by the formation on agar plates of "rough" (R) and "smooth" (S) colonies, has been demonstrated for a no. of bacterial groups. Under

ordinary conditions, transfers from the *R* and *S* colonies breed true. The importance of the 2 types of colony formation is shown by the correlation of characters: subcultures from *S* colonies form stable suspensions in salt soln., while the cells from *R* colonies tend to agglutinate spontaneously. The acid agglutination optimum is higher for the *S* than for the *R* type; the *S* type is more virulent than the *R*, and there are significant serologic differences. Single cell strains of paratyphoid bacilli of the *R* and *S* type can more or less regularly be made to yield cells of the opposite type by appropriate treatment. A nonvirulent strain can at will be converted into a virulent, and the virulent strain so produced possesses certain correlated characters, such as agglutinability and colony type formation, which distinguish it from the parent type.

L. W. RIGGS

Bacteria in muscular tissues and blood of apparently normal animals. A preliminary report. A. F. REITH. *J. Am. Med. Assoc.* **96**, 325-6(1926).—Cultures of muscular tissues of slaughtered hogs showed the presence of bacteria in 77% of 216 samples examd.; 57% of the samples contained anaerobes. Cultures of the muscular tissues of healthy live hogs, rabbits and guinea pigs show the presence of bacteria in 83% of 108 samples examd.; 49% of these samples contained anaerobes. In the blood of these animals the figures were 67% in 18 samples, and 44% of these samples contained anaerobes.

L. W. RIGGS

Does bacteriophage respire? J. BRONFENBRENNER. *Science* **63**, 51-2(1926). A large no. of expts. with different types of bacteriophage were made in a specially constructed respirometer, and in no case was there any indication of the production of CO₂ or of other phenomena to indicate respiration.

L. W. RIGGS

The use of quinic acid in the differentiation of the colon-aerogenes groups (BUTCHER: 14.

THOM, CHARLES AND CHURCH, MARGARET B.: **The Aspergilli.** Baltimore, Md The Williams & Wilkins Co. 250 pp. \$5.00.

D-BOTANY

B. M. DUGGAR

Dynamics of assimilation of potassium [by plants] from mineral silicates. J. M. DOBRESCU-CLUY. *Chem. Erde* **2**, 83-102(1925).—Applying the methods and formulae worked out by Mitscherlich to studies of the relative availability to plants of the K in various mineral silicates, it was found that the use of water satd. with CO₂ as a solvent gave figures which were in direct disagreement with the results of pot expts. with the same minerals. When, however, dil. HCl was used as the solvent the figures obtained agreed well with the vegetation expts. The 4 minerals—biotite, phonolith, muscovite and orthoclase—are in the order named in regard both to the soly. of the K present in HCl and to its availability to plants, the difference in these respects between biotite and orthoclase being very marked. The more weathered the mineral the greater is the facility with which the K can be assimilated. Water, satd. with CO₂, is very suitable for work on the availability of phosphoric acid but is not equally applicable to the study of other plant nutrients.

B. C. A.

Activity of the proteolytic and related enzymes of certain Hymenomycetae, in the association known as Mycorrhiza. E. MELIN AND K. HELLEBERG. *Biochem. Z.* **157**, 146-55(1925).—The activity of these enzymes has been studied in view of the likelihood that certain mycorrhiza which are associated with the roots of the larch, the pine and the birch render more readily available for the tree some of the N of the humus. The proteolytic activity of an ext. of the young fructifications of these fungi and also the activity of their deaminase vary very much from 1 species to another. A nuclease is present in small quantities in all the species examd. In virtue of these enzymes the mycorrhiza probably assist the tree by providing simpler nitrogenous food material for it from the more complicated compds. of the humus.

B. C. A.

Penetration into Valonia of oxidation-reduction indicators; estimation of the reduction-potential of the sap. MATILDA M. BROOKS. *Proc. Soc. Exptl. Biol. Med.* **23**, 265-6(1926).—The penetration of 3',5'-dibromindophenol into the sap of *Valonia* follows the course of a bimolecular reaction curve and the amt. of dye in the sap at equil. is proportional to the amt. of undissocd. dye in the external soln. At higher temps. and lower concns., the curves are similar in shape to those for two consecutive unimolecular reactions. The dye is found in the sap only in a reduced form. Methylene blue, however, is found in the sap only in an oxidized form; the amt. found in the sap was const. at all external and internal changes in p_H from 5 to 9, at which

p_H values methylene blue is completely dissoed. Other indigo dyes are discussed. The electrode potential of protoplasm was tentatively found. The r_H of the sap was found to be between 16 and 18.

M. M. B.

A study of wheat oil. C. D. BALL. *Cereal Chemistry* 3, 19-39(1926).—Chem. and phys. const. were obtained on oils extd. from wheat embryo and wheat patent flour by ether extn. and also some const. on that obtained from wheat embryo by pressure. Wheat embryo oil differs from wheat flour oil in that it has a higher sapon. no., a higher I no., contains more unsaponifiable matter, and has a lower sp. gr. Embryo oil extd. by pressure has a slightly higher I no. than that extd. by ether. A material seps. out from the flour oil which is not found in the embryo oil. It contains no N, S, or halogens. It m. 96-97°. It gives some of the sterol reactions but is not an alc. In prolonged sapon. it yields a substance with the same m. p. as sitosterol and also gives all the sterol color reactions. It is probably a sitosterol ester. R. B.

The chemical composition of the separative membranes of lemons. ANTONINO FICHERA. *Ann. chim. applicata* 15, 568-72(1925).—Ripe lemons (*Citrus limonum*) were quartered and both the external and the internal fibrous membranes removed and thoroughly washed and dried. The 2 products were then each treated in 2 ways: (1) with HNO_3 (d. 1.15) and (2) with boiling 4% H_2SO_4 . *External membrane.* The dry wt. was 27% of the fresh membrane. On treatment with HNO_3 it yielded mucic acid (corresponding to 1.5% by wt. of galactose in the fresh membrane). Hydrolyzed with boiling H_2SO_4 it yielded galactose (1.37% by wt. of the fresh membrane), glucose and traces of rhamnose. A non-hydrolyzed residue remained (40% by wt. of the dried or 10% of the fresh membrane). *Internal membrane.* The dry wt. was 20% of the original. Oxidation with HNO_3 gave no mucic acid, indicating the absence of galactose, but hydrolysis yielded glucose (4% by wt. of the fresh membranes). No crystallizable sugar could be recovered. The results show that the membranes are composed of complex polysaccharides, including cellulose (the portion not hydrolyzed by hot dil. mineral acids) and hemicellulose (the portion yielding monosaccharides on hydrolysis). The external membranes are composed of cellulose, galactosan and glucosan, the internal vesicular membranes of cellulose and glucosan. C. C. DAVIS

Röntgen-spectrographic comparison of lichenin and cellulose. R. O. HERZOG. *Z. physiol. Chem.* 152, 119-24(1926).—The Röntgen diagrams of β -cellulose (cellulose hydrate) and lichenin are very similar, but by no means identical. This applies especially to the intensities of the interferences. It may be assumed that lichenin and β -cellulose are chem. related, but probably not individual substances, and that the main cryst. component may be identical in both preps. The progressive alteration of the cellulose lattice with repeated reppn. of the substance would indicate that native cellulose is not a primary but a secondary product of the organism. In the reppn. the particles become smaller, and, to a certain extent, amorphous. When moistened, the crystallites give off smaller particles and residual affinities result which take up H_2O . When the H_2O evaps., these affinities cause an aggregation which may not be resolved again by H_2O , so that only the larger gaps take up H_2O adsorptively. The velocity with which the particles arrange into a lattice then becomes zero. The primary particles give rise to amorphous secondary particles. A. W. DOX

Hydration of mosses with water vapor. A. MAYER AND I. PLANTEFOL. *Ann. physiol. physico-chim. biol.* 1, 64-84(1925); *Physiol. Abstracts* 10, 142. —When a living cell is placed in water, exchange is complicated by the passage of other substances than water. By using mosses in vapors of which the tension can be measured, information of a new order is obtained showing variable affinity according to previous content in water temp., etc. H. G.

Some protein properties of plant protoplasm. W. H. PEARSALL AND J. EWING. *Brit. J. Exptl. Biol.* 2, 347-56(1925); *Physiol. Abstracts* 10, 252. —There is a general tendency for the proteins of the higher plant to be isoelec. at about p_H 4.0 to 4.5. Aggregation and pptn. of the particles of the protoplasm of wheat take place at about p_H 4.1. Typical uniform tissues like potato tubers and bean cotyledons stain more strongly with basic dyes between p_H 5 and 7, and with acid dyes at p_H 3 to 4. In acid solns. a marked depression in the swelling curve for potato occurs at about p_H 4.5. Heat coagulation of *Spirogyra* is effected more easily in presence of dil. acids than in pure water or in presence of alkalis, while in potato and beetroot heat coagulation is produced most rapidly at p_H 4.4. Plant protoplasm thus shows properties that are also those of the proteins extd. from the tissues. H. G.

Variations in the permeability of leaf cells. H. H. DIXON. *Sci. Proc. Roy. Dublin Soc.* 17, 349-56(1924); *Physiol. Abstracts* 10, 253. —The elec. resistance of the leaf was measured in *Syringa vulgaris* and *Hedera helix*. The resistance falls considerably

as temp. increases from 0° to 50°. The av. temp. coeff. was 1.334. The resistance of the leaf appears to increase with age, probably on account of the increase in the intercellular space system. The living leaf possessed a resistance 6 to 22 times that of the leaf killed by exposure to CHCl_3 or CS_2 . H. G.

Influence of light on the absorption of nutrients by young [rye] plants. H. WIESSMANN. *Z. Pflanzenernähr. Düngung* **B4**, 153-5(1925).—Three lots of plants were grown in sand, treated with a complete fertilizer, and exposed to light in the open, light from a northern window, and light from a southern window, resp. The dry weights of green matter and roots and the total potash and P_2O_5 contents were all considerably higher for the plants exposed to the southern light than for those exposed to the northern light. The plants grown in the open had higher values for all detns. than had either of the other 2. H. G.

The role of the chloroplasts in protein formation in green plants. [HERMANN ULLRICH. *Z. Botanik* **16**, 513-62(1924); *Ber. ges. Physiol. expll. Pharmacol.* **29**, 229(1925)]. The size of the chloroplasts increases with N supply and protein formation and is reduced by N hunger and by digestion of the proteins with pepsin-HCl. Parallel to the protein decrease is a change of the color to yellow. Regeneration by N supply is possible only when the protein loss does not exceed a certain value. MARY JACOBSEN

The action of stimulants on the growth of plants. H. BEHN. *Angew. Botanik* **6**, 201-24(1924); *Ber. ges. Physiol. expll. Pharmacol.* **29**, 233(1925).—Trypaflavine, 3,6-diaminoacridine nitrate and sulfate, MgSO_4 - MnSO_4 , NH_4NO_3 -K phosphates and a no. of stimulants of unknown compn. were studied. The effect on growth was but slight and depended on the nature of both plant and soil. MARY JACOBSEN

The formation of resins in conifers. I. The formation of resin in *Pinus cembra*. GH. V. PIGHULEVSKII AND V. V. VLADIMIROVA. *J. Russ. Phys. Chem. Soc.* **56**, 325-34(1925); cf. *C. A.* **19**, 2222.—The needles of *Pinus cembra* contain 10% resin. The accumulation of resins begins when the buds open and continues during the development of the needle. The periods of max. production of dry matter and resin are coincident. The formation of essential oils lags behind that of resin and reaches its max. only after the accumulation of dry matter has ceased. The resin content increases in the 2nd and 3rd years at the expense of the high-boiling constituents of the essential oils. Complicated ethers and acids are among the constituents of the resin. The acid content is lower in the early stage of the development than in the somewhat older needles and decreases again in the 1st and 2nd years. II. **Study of the formation of resin in *Pinus cembra*.** GH. V. PIGHULEVSKII. *Ibid* 335-48.—During severe frosts resinous secretion is forced out of cut twig ends owing to the compression of the resin ducts by cold. The essential oil content of this secretion was 33%. Once secreted the resin is not regenerated during the following period of growth. III. **The formation of resin in *Abies sibirica*.** GH. V. PIGHULEVSKII AND V. F. GRIGORIEVA. *Ibid* 349-58, cf. *C. A.* **19**, 2223.—*Abies sibirica* contains 14% resin. The time of its formation in relation to growth and to other constituents is discussed. The compn. in the various periods of vegetation is similar to that of *Pinus cembra*. The essential oil content of the secretion is 27.6%. IV. **The formation and transformation of the essential oil in *Pinus strobus*.** GH. V. PIGHULEVSKII AND V. V. VLADIMIROVA. *Ibid* 359-66.—The essential oil content of *Pinus strobus* is 1% of the dry matter. Essential oil is formed during the entire period of growth and reaches its max. after the accumulation of dry matter has ceased. Gradually the high-boiling constituents of the essential oil disappear, possibly to form resin as in *Pinus cembra*. The resin, amounting to 6%, contains acids and complicated ethers. The essential oil content of the secretion is 15.9%. MARY JACOBSEN

The action of dressings pathological to plants. HENRIK LUNDEGARDH. *Bot. Zentr.* **44**, 465-87(1924).—The absorption of Cu ions by wheat is localized chiefly in the outer coverings to which the pathogens adhere. This reaction occurs periodically and recalls the Liesegang phenomenon. The Cu absorption is influenced by salts in proportion to the lyotropic properties. The "germination-energy" of the seeds varies periodically with the increase in the amt. of absorbed Cu ions. Very small amts. inhibit, larger amts. do not interfere, still larger amts. inhibit again, etc. Treatment of the seeds with 0.01 N HgCl_2 calls forth similar periodical response. The action of various concns. (0.000001 to 0.001 N) for a definite period gives results similar to those obtained when the concn. is kept const. and the time interval varied. F. K.

The period of maximum oxygen intake. M. G. STRÅLFELT. *Biol. Zentr.* **46**, 1-11(1926).—The period of max. O_2 intake by young plants (*Sinapis alba*) is established. In the germinal layers there is a very sharply marked period of max. O_2 intake—the highest point being reached the 4th day of germination. During the growth of the root

and the stem the intake of O_2 decreases rapidly. The maxima for different parts of the plant are different and the duration of these maxima varies. In general, the O_2 intake for the germinating portion is many times that used by the root and stem together.

FRANCES KRASNOW

The permeability to oxygen of the wounded and intact embryo of *Sinapis alba*. M. G. STÄLFELT. *Biol. Zentr.* 46, 11-23(1926).—The O_2 which germinating seeds of *Sinapis alba* take from the air is significantly lower than the amt. they can convert. With an increase in the partial O_2 pressure of 20 to 50%, the O_2 intake increases. The intake is greater for the germ than for the root as long as the germ is enclosed by the seed covering. If the root is cut close to the germ, the O_2 intake decreases; this may mean that the O_2 permeability was decreased. The decrease may be overcome by an increase in the partial pressure or removal of the seed shell. At a pressure of 0.2 atmosphere, the O_2 intake of the root is not interfered with after one or two cross-section cuts. A decrease in permeability does not hinder the diffusion of O_2 . Interference sets in only after abundant destruction.

FRANCES KRASNOW

The rate of reproduction of *Lemna major* as a function of intensity and duration of light. N. A. CLARK. *J. Phys. Chem.* 29, 935-41(1925).—The rate of reproduction of *Lemna major* under elec. light from Mazda lamps with av. intensities of 400 and 900 foot candles at the surface of the solns. increased with increased length of day up to continuous light. Plants under 900 foot candles at all lengths of day reproduced more rapidly than those under 400 foot candles. With continuous light of 900 foot candles and a 12-hr. change of soln. the rate of reproduction was increased and the health of the plants maintained. It is possible that the failure of some investigators to get reproduction with certain plants under 24 hrs. light may be due to the fact that the environment of the plant, with regard to food, reaction, etc., is not suited to the rapid growth attained with continuous illumination.

H. R. KRAYBILL

Review of the relationship between parasitic plants and the respective host. A. ZIMMERMANN. *Centr. Bakt. Parasitenk., II Abt.* 65, 311-8(1925).—There is a mass of botanical data. Also some chem. data are given concerning the effect of antiseptics on germination.

JOHN T. MYERS

Occurrence and disappearance of starch in lichens. FR. TOBLER. *Ber. botan. Ges.* 41, 406-9(1923).—Starch is present in numerous species of lichens exterior to the walls of the algae, in greatest amounts in autumn and least in spring. The hyphae of the fungus excrete an enzyme capable of hydrolyzing this starch and "in vitro" rice starch. The starch exterior to the algae is the first to disappear when the lichens are placed in the dark.

W. NEWTON

Metachromatic staining of plant cell walls with substantive dyes. I. II. FRANK SCHWARZ. *Ber. botan. Ges.* 42, 21-8, 28-38(1924).—Staining with substantive dyes is recommended because the dispersion varies with the nature of the tissue and consequently the same dye gives distinct colors with each specific tissue. The color differentiation is more marked in the cell wall than in other plant tissues. Color reactions of individual dyes upon different types of cell wall tissue are described, and dye groups are arranged according to their value in the differentiation of specific tissue. A description is given of the staining technic for this class of dyes.

W. NEWTON

Silicon metabolism of diatoms. F. BRIEGER. *Ber. botan. Ges.* 42, 347-55(1924).—In the nutrition of diatoms an optimum concn. of $K_2Si_2O_5$ between 0.031 and 0.063% is found for *Fragilaria*, *Navicula* and *Nitzschia*. There is a distinct optimum for each species. The harmful effects of higher concn. are due to the OH ion. Sol. silicates appear to be necessary, for only one species decomposed SiO_2 . Absorbed Si is deposited in the shell as an org. complex. The mature shell can be neither distended nor dissolved by the diatoms.

W. NEWTON

Depletion of the endosperm in *Zea* mais. FRIEDA BESSENICH. *Jahrb. wiss. Botanik* 63, 231-72(1924).—Conversion of starch to dextrose is observed in excised endosperms in the presence of water. The rate is decreased by the addn. of $CaSO_4$.

$PO_4 + Na_2HPO_4$ buffers at pH 5 slightly accelerate the rate of depletion, but at pH 0-4 marked inhibition obtains. The inhibition through the addn. of NaOH increases with the OH-ion concn.

W. NEWTON

Effect of salts on the depletion of the endosperm in *Zea* mais. PAUL DAHM. *Jahrb. wiss. Botanik* 63, 273-320(1924).—Starch hydrolysis is depressed by chlorides in the order, $Na, NH_4, Mg, Ca, Sr < K < Ba < Li$ and by sodium salts in the order, $SO_4, NO_3, Cl, H_2PO_4 < SCN, C_2H_3O_4 < Br < B_4O_7 < CO_3, HPO_4, OAC$. The optimum rate of hydrolysis takes place at pH 6 under low saline conditions. Diastase is generated

in the aleurone but not in the inner endosperm or scutellum. The activity of the diastase within the cells is not affected by the same factors as those which affect the enzyme diffusing out.

W. NEWTON

The effect of the hydrogen-ion concentration on the availability of iron for *Chlorella* sp. E. F. HOPKINS AND F. B. WANN. *J. Gen. Physiol.* 9, 205-10(1925).—Unless precautions are taken to keep the Fe sol in the culture soln., the results obtained by varying the H-ion concn. will not represent the effect of H ion upon growth. Fe is pptd. at the lower H-ion concns., and Fe in some salts more readily than in others. Fe citrate is the most favorable source of Fe for plant culture media. Fe may be removed from culture solns. by adsorption on amorphous ppts. like Ca phosphate. By omitting Ca, Fe may be kept in soln. at alk. reactions by adding Na citrate. When working with varying H-ion concns. in these media strongly buffered solns. should be used.

C. H. R.

X-ray diffraction patterns from plant tissues. O. L. SPONSLER. *J. Gen. Physiol.* 9, 221-33; *Science* 62, 547-8(1925).—The structural units in the wall of the fiber form a space lattice, the elementary cell of which is an orthorhombic structure. The units are probably composed of a group of atoms more or less closely packed together.

C. H. R.

Accumulation of brilliant cresyl blue in the sap of living cells of *Nitella* in the presence of ammonia. M. IRWIN. *J. Gen. Physiol.* 9, 235-53(1925); cf. C. A. 20, 221.—"When the living cells of *Nitella* are placed in a soln. of brilliant cresyl blue contg. NH_4Cl , the rate of accumulation of the dye in the sap is found to be lower than when the cells are placed in a soln. of the dye contg. no NH_4Cl and this may occur without any increase in the pH value of the cell sap. This decrease is found to be primarily due to the presence of NH_3 in the sap and seems not to exist where NH_3 is present only in the external soln. at the concn. used."

C. H. R.

The penetration of carbon dioxide into living protoplasm. W. J. V. OSTERHOUT AND M. J. DORCAS. *J. Gen. Physiol.* 9, 255-67(1925).—Little or no CO_2 enters normal cells of *Valonia macrophysa* except as undissocd. mols. When the interior of the cell is more acid than the surrounding medium, the internal concn. of total CO_2 at equil is less than the external. Methods are given.

C. H. R.

Suspension of the life of seeds in a vacuum at a temperature of liquid helium. PAUL BECQUEREL. *Compt. rend.* 181, 805-7(1925); cf. C. A. 3, 1761.—Seeds of rampion, tobacco, clover, amaranth, toadflax, rocket, snap-dragon and eschscholtzia were desiccated in a vacuum at 40° and were divided into 3 series for germination tests as follows: (1) Control, in which the seeds after desiccation were kept in the dark. (2) The seeds were kept in a vacuum for 4 months after desiccation. (3) The sealed tubes contg. the seeds in a vacuum were immersed in liquid He at -269.2° for 10.5 hrs. The 3 series of seeds were then allowed to germinate at 28° , when it was found that neither deprivation of air nor exposure to a temp. of -269.2° for 10.5 hrs. lessened the germinating vitality of the seeds.

L. W. RIGGS

Localization of bromine in a floridian alga (*Antithamnionella sarniensis* Lyle). C. SAUVAGEAU. *Compt. rend.* 181, 841-3(1925).—Cells of the plant when placed in ammoniacal fluorescein indicate the presence of Br, either free or in very loose combination.

L. W. RIGGS

Bromides of the *Antithamnion* Naeg. C. SAUVAGEAU. *Compt. rend.* 181, 1041-3(1925); cf. preceding abstr.—Br was found in dried specimens of various species of *Antithamnion* which had been preserved for more than 20 years. These specimens were collected in different European countries and in America.

L. W. RIGGS

The enzymes produced from the seeds of various species of *Rhamnus*, or "Rhamnodiaestase." M. BRIDEL AND C. CHARAUX. *Compt. rend.* 181, 925-6(1925).—Fresh seeds of *Rhamnus utilis* Dene are ground and sifted to remove the outer inactive portions and the meal is extd. with Et_2O to remove the fat. The meal is then allowed to macerate in 3 times its wt. of distd. water contg. some thymol. After expression the clear liquid is treated with 4 vols. of 95% alc. and the resulting ppt. is washed and dried. Yield 6.8%. By a more thorough procedure the yield may be raised to 10.7%. The rhamnodiaestase thus prepd. is a source of several enzymes which show particular behavior with certain glucosides (cf. following abstract). Also in *Bull. soc. chim. biol.* 8, 35-9(1926).

L. W. RIGGS

Methods of biochemical study in plants of the glucosides hydrolyzable by "rhamnodiaestase." M. BRIDEL AND C. CHARAUX. *Compt. rend.* 181, 1167-8(1925); cf. C. A. 19, 2108; 20, 220 and preceding abstract.—Rhamnodiaestase hydrolyzes only partially various glucosides, that is, the resulting mols. of glucose remain combined as glucidic complexes, rutinose, primeverose, rhaminose, etc. The action of rhamnodiaestase is

less sp. than that of emulsin. The biochem. method with rhamnodistase as with emulsin should be a point of departure for work upon glucosides as yet unknown. Rhamnodistase may be utilized in plant physiology, to det. the variations in the glucosidic content of plants during their growth. Also in *Bull. soc. chim. biol.* **8**, 40-9 (1926).

L. W. RIGGS

Equilibrium of cellular constituents and intensity of oxidations in the cell. Imbibition and oxidations. Case of seeds. RAYMOND JACQUOT AND ANDRÉ MAYER. *Compt. rend.* **181**, 931-3 (1925).—Seeds of bean, corn and peanut were subjected to conditions of varying humidity and the CO_2 evolved per hr. under the different conditions was measured. Increased imbibition of water by the seed results in increased oxidation up to a limit of imbibition which differed with the species. Beyond this limit additional imbibition of water is accompanied by a sharp fall in the oxidation.

L. W. RIGGS

Influence of the electrolytes in the medium upon the gaseous exchange of mosses. ANDRÉ MAYER AND L. PLANTEFOL. *Compt. rend.* **181**, 1094-5 (1925); cf. *C. A.* **18**, 2361.—Mosses were immersed in solns. of NaCl , NaNO_3 , Na_2SO_4 , Na_2SiO_3 , Na_2PO_4 and NaAcO , resp. in mixts. of NaCl , KCl and CaCl_2 , and in mixts of Na_2SO_4 , $\text{Al}_2(\text{SO}_4)_3$ and $\text{La}_2(\text{SO}_4)_3$ in concns. ranging from 0.001 N to N ; also in acetic, butyric, citric and picric acids in concns. ranging from 0.00005 N to 0.1 N . The O consumed and the CO_2 evolved were measured. The results show that the concn. of the medium in electrolytes has a very definite action upon the nature and intensity of the respiratory exchanges of mosses. The variations produced by different salts at various concns. are too many to be formulated in a general statement.

L. W. RIGGS

Variations of the p_H in certain Sphagnum peat bogs in central and western France. P. ALLORGE. *Compt. rend.* **181**, 1154-6 (1925).—Two types of vegetation are recognized according to elevation and are illustrated by that of the Margeride mountains with an altitude of 1400 m. (arctic type) and the Atlantic type in the Maine province, altitude 545 m. The flora of the bogs studied is cataloged, and the p_H of the peat varies somewhat according to the character of the vegetation covering the bog. *Sphagnum* bogs have an acidity ranging from p_H 3.9 to 4.6. In other bogs the range is 4 to 6.8.

L. W. RIGGS

Chemical characters of green, yellow and red leaves. H. COLIN AND A. GRANDSIRE. *Compt. rend.* **181**, 1168-70 (1925).—The reducing sugars, sucrose, water, ash, alkyl. of ash, Ca content, lowering of f. p. and elec. cond. were detd. The last two detns. were made on 3 g. of fresh leaves finely ground and suspended in 25 cc. of water. Compared with normal green leaves, red leaves of autumn are richer in sugars and free organic acids, but not in acid salts. Red leaves are less mineralized and are partially decalcified. Yellow leaves are poor in sugar but rich in minerals.

L. W. RIGGS

Influence of light on the formation of tannins. MICHEL-DURAND. *Compt. rend.* **181**, 1171-3 (1925); cf. *C. A.* **18**, 1516; **19**, 1585.—Young plants of oak and chestnut were grown in light and in darkness and the tannins of the entire plants, roots, stems and leaves were detd. by extn. with acetone and with water. Plants grown in darkness from seeds contg. only traces of tannin in their cotyledons actively elaborate the tannins in all of their parts. The tannin content may represent 14% of the wt. of the stems and 23% of the leaves. It is necessary that the plants have at their disposal abundant nutritive reserves. In general plants in darkness produce less tannin than those in light. This action of light is particularly strong in its effect upon the tannin content of the roots. In darkness the tannins tend to accumulate in the stems and leaves. These conclusions are verified with seeds the cotyledons of which contain much tannin.

L. W. RIGGS

Age of seedlings as a factor in the resistance of maize to sodium chloride. G. J. HARRISON AND C. J. KING. *J. Agr. Research* **31**, 633-40 (1925).—Corn seedlings in water cultures show extreme variation of tolerance to NaCl depending on the size. Young seedlings with short radicles and undeveloped plumules are most susceptible to NaCl , older plants with 2 seed leaves follow next in susceptibility and the intermediate stages are the most resistant. Artificial excision of the radicles increases the resistance of the seedlings to a marked degree causing a prompt and comparatively rapid development of permanent roots and plumule even while exposed to a strong salt soln. The resistance of seedlings are apparently influenced greatly by changes in weather conditions and it was therefore not found possible to obtain consistent results when comparing behavior of seedlings subjected to salt solns. on different dates.

W. H. ROSS

Sulfate content of the leaf-tissue fluids of Egyptian and Upland cotton. J. A. HARRIS, CLARA T. HOFFMAN AND W. F. HOFFMAN. *J. Agr. Research* **31**, 653-61 (1925);

cf. *C. A.* 18, 2022.—The sulfate content of the leaf-tissue fluids of Meade and Lone Star Upland cotton is higher than in that of Pima Egyptian cotton. The differences range from 3 to 4 g. per l. of leaf-tissue fluids, or from 18 to 28% of the sulfate in the fluids of the Upland variety. These results as compared with those of the earlier study (*C. A.* 19, 844) of chloride content show that, as far as the varieties investigated are concerned, the behavior of these 2 types of cotton with respect to the absorption of chlorides and sulfates is quite different, the Egyptian type taking up larger quantities of chlorides and the Upland types absorbing larger quantities of sulfates. W. H. R.

The transport of sugar by plants. ADOLF MAYER. *Landw. Vers. Sta.* 104, 103-8 (1925).—A discussion. F. M. SCHERTZ

Leaf cytoplasmic proteins. A. C. CHIBNALL. *J. Am. Chem. Soc.* 48, 728-32 (1926).—An examn. of the physicochem. properties of cytoplasm may help to explain the mechanism of cell permeability. The analysis of spinach leaf cytoplasm gave. EtOH-sol., 12.7; ash, 15.1; protein, 64.6%; amide N (% of "free" protein), 6.93; humin N in acid, 0.76; humin N in lime, 1.46; humin N in C_2H_5OH , 0.25; cystine, 1.27; arginine, 13.80; histidine, 3.89; lysine, 9.63; amino N in filtrate, 58.09; non-amino N in filtrate, 2.58. The isoelec. point of the cytoplasmic proteins and the H-ion concn of the contents of the leaf cells were, resp., spinach, 5.0-4.0, 6.57; hogweed 5.0-4.3, 6.19; broad bean, 5.1-4.3, 5.69; cabbage, 4.7-4.0, 5.60; rhubarb, 3.5, 4.00; *Vitis vinifera*, 4.8-4.4, 3.02. C. J. WEST

The N and mineral requirements of the plantain (NORRIS, AYYAR) 15.

E—NUTRITION

PHILIP B. HAWK

Effect of ultra-violet light on protein metabolism. S. YOSHINE. *Strahlenther.* 18, 201-11(1924).—The positive N balance of irradiated dogs showed a slight rise when the exposure was short, changing to a negative balance on longer exposure. With increase in the positive balance, the excretion of amino acids in the urine diminished somewhat. Longer periods of irradiation led to disturbance in the assimilation of nitrogenous substances in the intestine and to refusal of food. B. C. A.

Sex differences in the requirements of certain food factors. G. A. HARTWELL. *Brit. J. Exptl. Biol.* 2, 323-30(1925); *Physiol. Abstracts* 10, 224.—From the fact that on specified diets the male rat grows at about the same rate as the female and does not exhibit the more rapid growth characteristic of the male of the species it is inferred that the growing male requires relatively more vitamin B, and is also more susceptible to the quality of the protein components of its food. H. G.

The isolation of vitamin B. SOGEN TSUKIE. *Jikken Ig. Z., Tokyo* 5, 539-74 (1922); *Japn. J. Med. Sci.* 2, 13.—Treat the alc. ext. of rice bran with ether to ext. fatty substances and then with phosphotungstic acid. Sep. the ppt. formed and decompose with BaO. Filter off the Ba phosphotungstate. To the filtrate, after it is acidified with HNO_3 , add $AgNO_3$. Here hypoxanthine and xanthine appear. Filter. On neutralizing the filtrate with BaO a ppt. is produced. Dissolve this again with HNO_3 - $AgNO_3$ soln. and ppt. with NH_4 - $AgNO_3$ soln. Treat this ppt. with alc. and then with ether, and pulverize. The yield is 0.3-0.5 g. from 4 kg. of rice bran. 0.005-0.05 g. of this substance is able to prevent the outbreak of neuritis of fowls fed exclusively with polished rice. H. G.

The acidity of the blood serum of fowls suffering from polished-rice disease. RYUICHI AKIBA. *Keio Ig. Tokyo* 2, 142-8(1922); *Japn. J. Med. Sci.* 2, 15.—Fowls suffering from polished rice disease showed an increase of acidity and accordingly a decrease of acid-neutralizing capacity of the blood serum, when the several symptoms became manifest. These changes in the blood serum, however, disappeared, when the fowls recovered after they had been fed with ext. of rice bran. H. G.

The occurrence and significance of the vitamin A group. GEORG VON WENDEL. *Klin. Wochschr.* 4, 2389-90(1925).—The vitamin A content of food diminishes during the winter months. Vitamin A is slowly oxidized when foods are stored. Cattle fodder, such as hay and carrots, becomes markedly deficient as sources of A as the winter progresses; hence milk and the other dairy products also are deficient in A. This vitamin deficiency of winter foods leads to a decreased rate of growth in children during the winter months. Statistical figures are given. MILTON HANKE

The relation between scurvy and tuberculosis in guinea pigs. BRUNO HEYMANN. *Klin. Wochschr.* 5, 59-62(1926).—Tuberculous guinea pigs, fed on a vitamin-C-deficient diet, die much sooner than those fed on a normal diet. MILTON HANKE

The influence of avitaminosis on the healing of bone fractures. ARTHUR ISRAEL AND ROBERT FRANKEL. *Klin. Wochschr.* 5, 94-7(1926).—A broken femur, in a properly nourished guinea pig, shows a rounding of the broken edges in 8 days, periosteal callus in 14 days and complete consolidation in 5-6 weeks. The broken femur shows no signs of repair in 3-4 weeks in an animal that is kept on a diet free from vitamin C. Normal repair can be started at any time by adding vitamin C to the diet. A condition resembling pseudoarthrosis in man can be developed in guinea pigs, with broken femurs, that are kept in a state of chronic scurvy by feeding small amts. of lemon juice as the only source of vitamin C. The fracture becomes covered with a loose callus; but the broken bones are not cemented together. A series of animals, with broken femurs, were allowed to repair on a normal diet for 14 days. Vitamin C was then removed from the diet. The repair process proceeded normally for 4 weeks. At this time the animals were at the point of death from scurvy. They were revived by feeding small amts. of carrots. The animals were then kept in a chronic scurvy state. The newly formed callus gradually atrophies and becomes decalcified until it consists of an easily broken shell.

MILTON HANKE

New observations on fat-soluble growth factors. H. V. EULER. *Arkiv. Kemi. Mineral. Geol.* 9, No. 28, 6 pp. (1925); cf. *C. A.* 19, 3104; 20, 222.—The growth-promoting power of irradiated solns. of cholesterol in ivory-nut oil was not proportional to the cholesterol content. Irradiated solns. of cholesterol acetate in peanut oil showed no growth-promoting or antirachitic power; negative results were also obtained with cholesterol palmitate. In expts. on irradiated sitosterol and benzene exts. of wheat embryo and of yeast the growth-promoting power was proportional to the sterol content, but the antirachitic power was not parallel, being remarkably high in the exts. Irradiated β -amyrin and betulin were inactive as growth-promoters; betulin showed antirachitic action.

WILLIAM J. HUSA

Butter, fresh beef and yeast as pellagra preventives, with consideration of the relation of factor P-P of pellagra (and black-tongue of dogs) to vitamin B. JOSEPH GOLDBERGER, G. A. WHEELER, R. D. LILLIE AND L. M. ROGERS. *U. S. Pub. Health Repts.* 41, 297-318(1926); cf. *C. A.* 19, 2693, 3118.—Black-tongue of dogs is analogous to pellagra in man; both diseases are interpreted as due to deficiency of a pellagra-preventive factor (factor P-P). Butter is poor in factor P-P. A daily allowance of 200 g. of lean beef, or 15 g. of a com. dried aq. ext. of yeast, in the diet of adult persons, is adequate for prevention of pellagra, but not fully adequate for prevention of beriberi. Factor P-P is distinct from the antineuritic factor of water-sol. B, but may be identical with the growth-promoting factor; this means that it may possibly be identical with Wildiers' bios. The factor P-P is thermostable. From the evidence presented, it is pointed out that the so-called growth-promoting factor of water-sol. B may be inactive by itself, and active only in combination with the antineuritic factor.

W. J. H.

Renal injuries by amino acids. L. H. NEWBURGH AND P. L. MARSH. *Arch. Internal Med.* 36, 682-711(1925); cf. *C. A.* 18, 2739; 19, 3296.—The investigation was suggested by the renal injuries following high-protein diets. Intravenous injections of amino acids into dogs and rabbits demonstrated the marked toxicity to the kidney of lysine, histidine, tyrosine, tryptophan and cystine. Arginine and aspartic acid are mildly nephrotoxic, while alanine, leucine, glycine, phenylalanine and glutamic acid even in doses of 2 mg. per kg. did not affect the kidney. Cumulative effects from repeated small doses were observed. Cystine also produced toxic effects when introduced through the portal vein of dogs or added to a standard diet of rats.

M. J.

The premortal nitrogen increase and its relation to the thyroid. ALFONS SCHÖN. *Beitr. Physiol.* 3, 165-87(1925).—S. found in contrast to Mansfeld and Hamburger that the premortal N increase in starvation was the same in 2 normal A and 2 thyroidectomized B dogs. The O intake per sq. m. was the same in both A and in one B, while the other B showed an increase of 17%. There was no rise in metabolism. A considerable improvement in the condition of the extremely emaciated animals could be produced by the administration of glucose, citric acid and egg in water.

M. J.

Metabolism on pure carbohydrate and pure meat diet. FRANZ SCHRÖTER. *Beitr. Physiol.* 2, 263-6(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 893(1925).—In three-day expts., the respiratory quotient was detd.

MARY JACOBSEN

The energetic value of woman's milk and the growth of the infant. LUIGI POLLINI. *Osp. magg.* 12, 182-9(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 60.—The caloric value of 1 l. milk is 600-1000. There are considerable individual variations, smaller in healthy women. The value calcd. from analysis is usually lower than that directly detd. for the total milk. Individual constituents show marked variations, e. g., 1 g. fat 8.5-9.9 cal. A low d. is often combined with a high caloric value. The growth

of the infant usually depends on the no. of calories, but good growth was observed with a low cal. no. With equal cal. nos. milk of a higher concn. gives better results.

Changes in the hypophysis in chronic hunger. S. K. SEDLEZKY. *Z. Konstitutionslehre* 10, 356-66(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 769(1925).—In persons of any age who died from starvation the hypophysis shows a slight decrease in weight, an increase in secretion and change of secretion (basophilia). Basophilic cells and granula are prevalent.

Metabolism of cold-blooded animals. I. KAI HSÜ. *Z. Biol.* 83, 45-52(1925).—It is shown that frogs can be kept in N equil. for a short time only. The meal worms constituting the diet are incompletely digested.

Formation of vitamin A during the germination of seeds. WILHELM STEPP. *Z. Biol.* 83, 94-8(1925).—The vitamin A produced during germination of wheat is sufficient to prevent keratomalacia but not to increase the wt. of the animal.

The effect of changes in regime upon the urinary alkaline tides in a normal individual. M. MUSCHIAT. *J. Clin. Invest.* 2, 245-53(1926).—The pH of the urine was detd. every 2 hrs. during the day for 27 days, on 20 of which the subject had 2 meals a day (morning and evening), on 3, only one meal (at 1 p. m.), on 3, three meals, on 1 day breakfast, followed by rest in bed until noon. Under all these conditions 2 alk. tides were observed, one at a max. about noon, and the second about 8 p. m.

The vitamin content of foodstuffs. W. H. EDDY. *Am. J. Pub. Health* 16, 109-15(1926).—The importance of standardized diets in expts. designed to test comparative vitamin content of food is emphasized. In the case of foods low in certain vitamins, the possibility arises that the large consumption of the food tested may reduce the consumption of the basal diet, so as to introduce other dietary deficiencies. By the use of Sherman's standard diets and methods, the minimum protective dose against scurvy per guinea pig per day of ripe bananas was 5-8 g. 0.4-0.5 g. bananas furnish sufficient vitamin A to produce an av. gain of 25 g. per rat in 8 weeks, while more than 7 g. of bananas are required to furnish vitamin B for a gain of 20 g. per rat in 8 weeks.

The prevention of rickets. H. C. SHERMAN, E. L. FISK, I. GREENWALD, T. P. B. JONES AND C. E. A. WINSLOW. *Am. J. Pub. Health* 16, 139-41(1926).—Report of the Committee on Nutritional Problems of the Am. Pub. Health Assoc.

Vitamins in canned foods. V. Peaches. E. F. KOHMAN, W. H. EDDY, VICTORIA CARLSSON AND NELLY HALLIDAY. *Ind. Eng. Chem.* 18, 302-4(1926).—The min. protective dose of raw peaches against scurvy was 5 g. daily per guinea pig. The equiv. of 5 g. of raw peaches canned and fed after 6-12 months gave results comparable to 5 g. of raw peaches. In contrast to the canning of apples (*C. A.* 19, 543), the elimination of O from the fruit previous to canning did not favorably influence the vitamin C content of the canned product. Commercially canned peaches contained 4-5 times as much vitamin C as kettle-cooked peaches. On the dry basis, canned peaches were about $\frac{1}{3}$ as potent in their content of vitamin A as butter fat, while the content of vitamin B was so low that the large quantities necessary for protection of rats resulted in disturbances of general nutrition.

The maintenance requirement of cattle for protein as indicated by the fasting catabolism of dry cows. E. B. FORBES, J. A. FRIES AND M. KRISS. *J. Dairy Sci.* 9, 15-27(1926).—Urine and fecal analyses (N, crude fiber and dry matter) are reported for fasts of 3-9 days duration by dry dairy cows. The bulk of the residual feed present in the alimentary canal was eliminated in the first 2 or 3 days of the fast, but the elimination of the same was incomplete even after 9 days of fasting. The av. daily excretions per 1000 lbs. in the last 4 days of the 9-day fast were 46.5 and 43.6 g., resp., for 2 animals, equiv. to 0.62 and 0.58 lb. of body protein. This figure which is considered to represent the protein catabolism of fasting is identical with Armsby's estimation of the digestible crude protein maintenance requirement of cattle.

The role of the antiscorbutic vitamin in the nutrition of calves. L. M. THURSTON, C. H. ECKLES AND L. S. PALMER. *J. Dairy Sci.* 9, 37-49(1926).—Calves do not require vitamin C in quantities which can be measured by the present method of testing food materials for antiscorbutic potency (*i. e.*, development of scurvy in guinea pigs).

A study of calcium and phosphorus balances with dairy cattle. R. C. MILLER. *J. Dairy Sci.* 9, 78-92(1926).—The substitution of clover hay for timothy as part of a ration which included silage and grain mixt. resulted in a slightly improved assimilation of Ca. Some evidence of the independence of Ca and P assimilation was obtained. The assimilation of P was increased when more P was present in the grain mixt.

variation in the Ca and P content of the milk was observed, although the % of P in the milk seemed to increase slightly in response to an increased supply in the feed.

H. B. L.

Observations on vitamin B and metabolism. R. H. A. PLIMMER, J. L. ROSEDALE AND W. H. RAYMOND. *J. State Med.* **34**, 117-21 (1926).—Expts. with pigeons showed that vitamin B must be increased as the total caloric requirements of the bird increased if normal nutrition and rearing of the young are to be obtained. Studies to det. the amt. of various cereals necessary to supplement polished rice or white flour and furnish vitamin B demonstrated the superior value of wheat germ, yeast and yeast ext. The value of bran and middlings was greater than that of flour, due largely to the wheat germ present. Shortage of vitamin B in human dietaries may be associated with the origin of common gastro-intestinal disorders.

H. B. LEWIS

Some nutrition experiments with brewer's yeast, with especial reference to its value in supplementing certain deficiencies in experimental rations. M. I. SMITH AND E. G. HENDRICK. *U. S. Pub. Health Repts.* **41**, 201-7 (1926).—Dried brewer's yeast contains a factor essential in nutrition other than vitamin B. This factor is not present in coagulated yeast protein, is still active after autoclaving at 15 lbs. pressure for 6 hrs., and can adequately supplement a ration in which the oat kernel is the sole source of protein and vitamin B. A synthetic ration with casein as the sole source of protein and contg. Seidell's purified vitamin B picrate must be supplemented with this unrecognized factor present in yeast in order to make it adequate. If properly supplemented, oat protein appears to be as satisfactory in the nutrition of the rat as is casein.

H. B. LEWIS

Vitamin studies. XI. Inorganic blood phosphorus and bone ash in rats fed on normal, rachitic, and irradiated rachitic diets. R. A. DUTCHER, MATTIE CREIGHTON AND H. A. ROTHROCK. *J. Biol. Chem.* **66**, 401-7 (1925).—"In normal rats, weighing between 35 and 40 g., the inorg. P was 10 mg. per 100 cc. of serum and during an 8-week feeding period, the tendency was to maintain this level, falling slowly to 8 mg. at the end of 8 weeks. The % of ash in the dry extd. femurs of the same normal rats was 40 at the beginning of the expt. and increased steadily during the 8-week period, to 62%. When rats received Steenbock's rachitic ration, inorg. blood P dropped from 10 to 1.6 mg. in a period of 3 weeks. After that it rose slowly as the result of fasting. The ash of the femurs of the rachitic rats fell from 40 to 26.5% in 3 weeks and finally fell as low as 24%. When Steenbock's rachitic ration was irradiated with ultra-violet light the inorg. blood P and the % of bone ash fell midway between the normal and rachitic groups. It would appear that the rat does not possess the ability to store the antirachitic factor in significant amts. for the reason that Ca and P deposition is hampered from the very beginning of the exptl. feeding period. The method offers an opportunity to make a quant. study of the antirachitic properties of food materials, by using as a standard the least amt. of any food which will prevent fall in the % of bone ash below that possessed by the young animals at the beginning of the expt. or the min. quantity of food required to bring about optimal deposition of mineral matter." Conditions under which the method may be applied in the study of the antirachitic properties of foods are being investigated.

A. P. LOTHIROP

Dietary factors influencing calcium assimilation. VI. The antirachitic properties of hays as related to climatic conditions with some observations on the effect of irradiation with ultra-violet light. H. STEENBOCK, E. B. HART, C. A. ELVEHJEM AND S. W. F. KLETZGEN. *J. Biol. Chem.* **66**, 425-40 (1925); cf. *C. A.* **16**, 3937.—"The antirachitic properties of hays are related to their exposure to sunlight. Clover hay made with exposure to sunlight showed considerable calcifying power, while clover hay made in the dark was inactive. Clover hay excessively weathered was reduced in antirachitic action as compared with hay less exposed to dew and rain. The antirachitic action of clover hay excessively weathered was readily increased by irradiating it with a quartz Hg-vapor light. It is not clear whether this was due to an activation of constituents formerly inactive or to a reactivation. Direct irradiation of a milking goat brought about a positive Ca balance even when the animal was receiving the weathered clover which by itself has no beneficial effect. The antirachitic potency of sun-cured hays was too feeble to act as a preventative of rickets in growing chicks even when the H₂O exts. were fed as equiv. to a high concn. of the hay in the ration. It is suggested that the antirachitic requirements of the chicken and the lactating goat are far greater than those of the rat as used in these expts. On account of the prominent rôle played by the element Ca in animal physiology, it appears urgently necessary that the factors operative in producing hay of max. antirachitic potency be thoroughly understood. This is especially necessary because Ca deficiency in feeds is a common occurrence and

with that there is a proportionate increased demand of the animal for the antirachitic factor. These studies are of value directly as well as indirectly in their relation to processes in human physiology." A. P. LOTHROP

Fat-soluble vitamin. XXVI. The antirachitic property of milk and its increase by direct irradiation and by irradiation of the animal. H. STEENBOCK, E. B. HART, C. A. HOPPERT AND ARCHIE BLACK. *J. Biol. Chem.* 66, 441-9(1925).—The antirachitic properties of cow milk can be increased more than 8 times by exposure to radiations of a quartz Hg-vapor lamp and that of goat milk 24 times. This increase can also be rather promptly induced, though to a lesser degree, by direct irradiation of the animal. "Attention is called to the beneficial results to be expected by the dairyman. For man in general the indirect benefits are obvious." A. P. LOTHROP

Studies on cholesterol. I. Synthesis of cholesterol in the animal body. F. S. RANGLES AND ARTHUR KNUDSON. *J. Biol. Chem.* 66, 459-66(1925).—Young rats were placed on a diet free from cholesterol and all other sterols which respond to the Liebermann-Burchard test. They were allowed to reproduce and their young were continued on a cholesterol-free diet. Vitamin A was furnished by alfalfa from which all sterols were removed by prolonged extn. with cold Et_2O (72 hrs.). The amt. of cholesterol found in the tissues of the rats on the cholesterol-free diet did not vary greatly from the normal. The cholesterol content of the adult rat born and raised on a cholesterol-free diet was many times as great as at birth and "the only explanation available at present is that the cholesterol was built up by the animal organism from substances other than sterols in the diet." Cf. Channon, C. A. 19, 3105. A. P. L.

A study of the retention of uric acid during fasting. WM. G. LENNOX. *J. Biol. Chem.* 66, 521-72(1925); cf. C. A. 18, 1700.—"Measurements of uric acid in blood and urine during 21 fasting periods were made. The observed high concns. of uric acid in blood were due to decrease in uric acid excretion. The usual diurnal and hourly variations in excretion were abolished. Although concn. of uric acid in urine was very low (sometimes less than in blood plasma), the kidneys were able to conc. uric acid to a normal extent. Decreased urine vols. seemed to be associated with increased uric acid output. Study of quant. relationships showed that retention was evident first in the plasma; with rising concns. in the plasma an increasing proportion of retained uric acid (up to about 80%) was found within the cells; at the higher levels there was apparent equil. between concn. within and without the cells; the increase of concn. in tissue H_2O , at its peak, was 30% of the increase in plasma; approx. 60% of the uric acid retained during fasting was recovered in the postfasting period, the unrecovered fraction being either retained in the tissues or destroyed. During some of the 24 hr. periods there was considerable shifting of uric acid from blood to tissues and *vice versa*. During fasting a smaller proportion than normal of uric acid injected intravenously was recovered in the urine. Feeding of fat did not relieve retention, whereas, feeding of carbohydrate, thyroid ext., amino acids and protein did. Following ingestion of small quantities of food, there was increased elimination of uric acid without lowering the renal threshold. Following ingestion of atophan, in doses of 4-5 g., there was a lowering of the renal threshold with drainage of uric acid first from the blood and then from the tissues. From the foregoing data it seems evident that variations in excretion of uric acid following the use of various purine-free diets do not mean variations in production, but variations in the amts. of uric acid contained in blood and tissues. The observations suggest the use of a low-fat diet in the treatment of gout. Disturbance in kidney function and in metabolism of the body both played a part in the retention. Of the various possible factors examd., the attending ketosis seemed the most const. It is possible that various interrelated disturbances in oxidation and in the base-acid equil. of the blood and body tissues are involved." A. P. LOTHROP

The effect of vitamin A deficiency upon the character of nitrogen metabolism. AGNES F. MORGAN AND DOROTHY F. OSBURN. *J. Biol. Chem.* 66, 573-94(1925) When young rats are fed a diet adequate in all respects, the % recovery of total N in the form of urea, NH_3 , allantoin, uric acid and creatinine varied between 45 and 61. The relative amts. of allantoin decreased with gain in body wt. and increased with loss in body wt. The av. amt. of N excreted as uric acid was 0.58% and of creatinine 2.87. Upon diets adequate in all respects except as to vitamin A the % recovery of total N ranged between 46 and 59. The relative amts. of allantoin increased with gain, or in most cases lessened loss, in body wt., and decreased with increased loss in wt. The av. amt. of N excreted as uric acid was 0.73% and as creatinine 2.37. With adult rats on an adequate diet the % recovery varied from 51 to 81, amts. definitely larger than were obtained with either group of young animals. The relative amt. of allantoin excreted varied inversely with gain in wt. as with the young rats. The av. amt. of

N excreted as uric acid was 0.61% and as creatinine 3.45. "A theory is advanced to account for these differences between the excretion of allantoin and uric acid in normal and vitamin-A-deficient animals. It is suggested that in the absence of vitamin A the animal organism fails to produce purine-contg. compds. from the ordinary sources, perhaps arginine and histidine, but continues to utilize over again such portions of discarded purine-ring-contg. substances as are ordinarily excreted in the form of allantoin. The portions of these compds. which are oxidized only to uric acid are apparently no longer usable and continue to be excreted in proportion to the amt. of destruction of cellular material in vitamin-A-deficient as in normal animals." Cf. C. A. 20, 936.

A. P. LOTHROP

The relation between the amount of ultra-violet light received by hens and the amount of antirachitic vitamin in the eggs produced. J. S. HUGHES, L. F. PAYNE, R. W. TITUS AND J. M. MOORE. *J. Biol. Chem.* 66, 595-600(1925).—The amt of ultra-violet light which a hen receives is an important factor in detg. the antirachitic vitamin content of the eggs produced when the feed is low in antirachitic vitamin. Thirty min. ultra-violet treatment daily is not sufficient to enable hens to store sufficient antirachitic vitamin in their eggs entirely to prevent rickets in chicks fed rations contg. these eggs, although the severity of the rickets is materially reduced. Eggs from hens receiving sunlight through glass contain practically no antirachitic vitamin. Eggs of low antirachitic vitamin content do not have as high a hatchability as those with high vitamin content, other factors influencing hatchability being const. Cf. C. A. 20, 936.

A. P. LOTHROP

A study of the effect of excessive calcium ingestion on the calcium content of tissues with and without the application of ultra-violet light. W. DENIS AND R. C. CORLEY. *J. Biol. Chem.* 66, 609-17(1925).—The Ca content of the tissues of rabbits receiving daily doses of CaCl_2 or Ca lactate (equiv. to 0.18 g. of Ca) contain no more Ca than those of control animals. The Ca content of the tissues and serum of normal rabbits is not affected by daily exposure to ultra-violet light.

A. P. LOTHROP

The relation of leg weakness in chickens to mammalian rickets. A. M. PAPPENHEIMER AND L. C. DUNN. *J. Biol. Chem.* 66, 717-29(1925).—"Radiographic and histologic study of a series of young growing chicks with experimentally produced leg weakness showed no rachitic changes. The bone lesions found were arrest of osteogenesis, osteoporosis and fibromyxomatous transformation of the marrow. Administration of the active antirachitic concentrate of the non-saponifiable fraction of cod-liver oil did not prevent the onset of leg weakness nor modify the character of the bone lesions. The addn. of whole cod-liver oil prevented leg weakness and brought about normal bone structure. The diet (white corn 97, CaCO_3 2, NaCl 1, skim milk *ad libitum*) which produced typical leg weakness in chickens was fed to young rats for 4 weeks but did not produce rachitic changes in their bones." Withdrawal of the skim milk from the diet of the rats produced pronounced and typical rachitic lesions so that the leg weakness diet is antirachitic with milk and rachitic without.

A. P. LOTHROP

The nutritional requirements of the chicken. VI. Does the chicken require vitamin C? E. B. HART, H. STEENBOCK, J. G. HALPIN AND S. LEPKOVSKY. *J. Biol. Chem.* 66, 813-8(1925); cf. C. A. 16, 2713; 20, 224.—Scurvy does not develop in chicks fed a ration of grains and heated skim milk, presumably free or at least very low in its vitamin C content. Their livers, however, contained an abundant amt. of vitamin C as guinea pigs were cured of scurvy when fed liver from these chicks at a level of 3 g. daily. Similar results were obtained when the ration consisted of purified food materials—dextrin, casein, salts, etc. "Apparently the chicken, like the rat, does not need vitamin C preformed in the diet in the same sense as does the guinea pig; but its presence in large amts. in the livers of chickens even on synthetic diets indicates that it plays some role in its metabolism. Whether the chicken synthesizes this vitamin from an inactive precursor or from some other org. complex cannot at present be stated." A. P. L.

The effect of orange juice on the calcium, phosphorus, magnesium and nitrogen retention and urinary organic acids of growing children. MARGARET S. CHANEY AND KATHERINE BLUNT. *J. Biol. Chem.* 66, 829-45(1925).—A basal diet consisting of oatmeal, rice, flour, bread, potato sugar, oleomargarine fat, lean beef and whole milk powder was ingested by 2 growing girls, 10 and 11 yrs. old, for a preliminary adjustment period and a 3-day collection period. Then 600-700 cc. of orange juice was added to the diet daily and another adjustment and collection period followed. The expt. was repeated after a 2½ month interval. There was an increased Ca retention which was considerably greater than the amt. of Ca added in the oranges and than might be expected from a stimulus to retention caused by a larger Ca intake. More than 3 times as much P was assimilated after addn. of the orange juice, this increase being much more

marked than that in Ca. Mg retention was also increased but to a lesser extent. N assimilation was greater even though the intake was not altered. There were increases in urinary p_H and org. acids and a decrease in NH_3 . The increase in org. acids amounted to approx. 7% of the citric acid of the ingested juice. A gain in body wt. occurred which was 3-4 times as much daily as in the period when oranges were not included in the diet

A. P. LOTHROP

Maintenance values for the proteins of milk, meat, bread and milk, and soy bean curd. MARY S. ROSE AND GRACE MACLEOD. *J. Biol. Chem.* **66**, 847-67(1925); cf. *C. A.* **19**, 1727.—The relative efficiency of milk, meat, bread and milk, and soy bean curd in maintaining N equil. in the adult human subject has been tested in 8 expts. of 12-15 days duration conducted on 4 young women. The same basal ration was used throughout; the energy yield was adjusted to maintain body wt.; and the protein intake was approx. 0.5 g. per kg. of body wt. although the protein intake was 15-20% less than the av. for maintenance on a mixed diet as detd. by Sherman, in no case was there a negative N balance. The food under investigation in each case furnished 97-98% of the total protein of the diet. Changing from meat to milk and then to bread and milk resulted in av. daily storage of 0.06 g. of protein on meat, of 0.55 g. on milk and of 0.1 g. on bread and milk (1.4, 13.3 and 9.7% of the total intake, resp.). Changing from milk to meat made no practical difference as compared; with changing from meat to milk. Fecal N comprized 11-12% of the total intake in all cases except on the soy bean diet in which case it amounted to 24% of the intake. The urinary N averaged 0.06 g. per kg. on all except the meat diet which caused a higher excretion, averaging 0.07 g. Studies of the urinary acidity and NH_3 indicated no great differences in the acid-base balance of the diet. The NH_3 in the urine was somewhat higher on the meat than on the milk diet (16 and 21% in 2 cases). The constancy of the creatinine excretion indicated that there was no essential difference in the metabolism of the different periods. The high fecal N on the soy bean diet may be interpreted to mean a lower biol. value although the soy bean must be regarded as very efficient inasmuch as equil. was maintained on a very low intake; this point will be further investigated

A. P. LOTHROP

The V factor, an injurious substance in the serum of animals with avitaminosis, measured by its biological effect on the growth of the influenza bacillus. W. KALLATH AND B. LEICHTANTRITT. *Centr. Bakt. Parasitenk. I Abt., Orig.* **97**, 65-80(1925). Blood was mixed with agar, heated 1 min. in boiling water, and poured into plates. Blood from normal guinea pigs gave a luxuriant growth of *B. influenzae*. Blood from pigs with mild scurvy gave weaker growth with some involution forms. That from pigs with marked scurvy gave a scant growth with many involution forms. When a pig recovered from scurvy the deleterious effects of the blood disappeared. The addn. of potato water (vitamins?) reactivated the scorbutic blood. Blood from starved pigs had no bad effects. Blood of beriberi pigeons did not weaken growth. It is probable that there is a bacterial growth-stimulating substance not identical with vitamin A or B

JOHN T. MYERS

Effect of salts of zirconium, titanium and manganese on nutrition. CHARLES RICHET, GARDNER AND GOODBODY. *Compt. rend.* **181**, 1105-6(1925).—Three series of 4 dogs each were given the citrates of Zr, Ti and Mn, resp., in doses of 1 g., which for these animals averaged about 0.1 g. per kg. Of the 4 dogs in each series one received the drug every day, the second once in 2 days, the third once in 3 days, and the fourth once in 4 days. The period of trial was from June 14 to Nov. 10. Three additional dogs served as controls. No toxic action was observed. Favorable or unfavorable action was estd. by gain or loss in wt. In general Ti and more especially Zr showed a slightly favorable action on the nutrition. The action of Mn was peculiar in that it had an unfavorable action when administered every day or once in 2 days, but a decidedly favorable action when administered once in 3 or 4 days.

L. W. RIGGS

The influence of the addition of ternary foods to milk upon the retention of nitrogen during growth. E. F. TERROINE AND (Mlle.) ANNE-MARIE MENDLER. *Compt. rend.* **181**, 1176-9(1925).—Young pigs were fed (1) skimmed milk, (2) whole milk, (3) whole milk with cream added, and (4) whole milk with cassava starch added, and the amt. of N retained detd. The figures showed that the retention of N during growth is strongly influenced by the amt. of ternary foods (fats and carbohydrates) in the ration. This suggests that the construction of albumins is a more complex process than the simple modification of the amino acids resulting from the degradation of the ingested proteins, and that the ternary groups carried by fats and carbohydrates play an important role. Whole milk as a ration during growth is decidedly improved by the addn. of cream or starch up to the limit of digestive tolerance.

L. W. RIGGS

Glycogenic reserves and arterial glucose (effective and proteinic) in the course of experimental scurvy. (MME.) L. RABOIN AND J. M. MACHAUX. *Compt. rend.* 181, 1179-81 (1925).—Three series of guinea pigs consisting of 26, 26 and 30 animals each, were fed, resp., a natural ration, a complete artificial ration, and a complete artificial ration deprived of vitamin C for a period of 32 days. At intervals of about 5 days, 3 or 4 animals were killed and the following detus. were made: free blood sugar, proteinic blood sugar, glycogen in the liver and glycogen in the muscles. In the course of scurvy the glycogenic reserves are somewhat less than those of the normal animal. The alimentary disequilibrium, resulting from the total absence of vitamin C from the ration does not appear to prevent the acquisition of the glycogen reserves, nor does it affect appreciably the blood sugar or the proteinic blood sugar. L. W. RIGGS

The water-soluble vitamin content of the velvet bean. W. D. SALMON AND E. R. MILLER. *J. Agr. Research* 31, 793-9 (1925).—Polyneuritic pigeons were restored to apparently normal health by raw and by alc. and AcOH exts. of velvet beans; and pigeons receiving a diet of polished rice were protected against the onset of polyneuritis by 2 g. of raw velvet beans per day. Beans that had been thoroughly extd. with alc. had no protective action when fed in doses of 2-4 g. per day. While small amts. of velvet beans had a protective action, large amts. were harmful and this effect was not entirely overcome by cooking the beans 1.5 hrs. on a water bath, or by autoclaving them for 2 hrs. at 15 lbs. pressure. W. H. ROSS

Irradiation of foodstuffs with ultra-violet light. H. M. M. MACKAY AND H. F. SHAW. *Lancet* 1926, I, 8-11; cf. C. A. 20, 222.—A clinical investigation of the curative value of irradiated food in rickets. F. B. SEIBERT

Ultra-violet irradiation in the activation of cholesterol and foods. A. F. HESS AND M. WEINSTOCK. *Lancet* 1926, I, 12-4.—Vegetable oils, cotton seed oil, growing wheat, green and yellow lettuce leaves could be activated by irradiation. Chlorophyll, hemoglobin, cream, phosphatide of yolk of egg, glycerol and gelatin could not be activated. Refined wheat flour, dried milk and cholesterol were activated, but the latter readily lost its activity if kept in a dry state or suspended in H₂O, but not if dissolved in oil. F. B. SEIBERT

New facts concerning the fat-soluble vitamins. J. C. DRUMMOND. *Lancet* 1926, I, 272-3.—The history of the discovery of the fat-sol. vitamins is briefly outlined. Of these fat-sol. vitamins, vitamin A is responsible for growth, D for antirachitic effect, and E is extremely important in reproduction. They are not identical. Of cod-liver oil, 99% consists of true fats, i. e., glycerides and 1% of unsaponifiable matter. This latter fraction, if prepd. with care so as to prevent secondary changes, such as oxidation, contains all the vitamins. In an attempt to isolate vitamin A by chem. fractionation, 10 kg. cod-liver oil yielded 100 g. active unsapon. matter; pptn. of this with digitonin gave 50 g. inactive cholesterol and 50 g. active material, which on distn. under 1-2 mm. pressure gave 5 g. inactive, b. 180°; 10-15 g. active (with traces of spinacene), b. 180-200°; 15-20 g. inactive (mainly spinacene and batyl alc.), b. 220-80°; at 300° an inactive residue. Vitamin D has proved to be associated closely with cholesterol. If cholesterol is acted upon by ultra-violet light, a substance, so far unidentified chemically, is produced which has antirachitic activity. The vitamin A may be a higher unsaturated alc., since the active fractions contain only C, H and O in this form.

Effect of ultra-violet light on avitaminoses. II. Beriberi in pigeons. Direct irradiation of the skin after removal of the feathers. JAROSLAV KRÍŽENECKÝ. *Arch. grs. Physiol.* (Pflüger's) 211, 663-5 (1926).—The development of beriberi in pigeons and the manifestations of the disturbance are not modified by the direct irradiation of skin with ultra-violet rays. G. H. S.

FUNK, CASIMIR: The Vitamines. Baltimore, Md.: The Williams & Wilkins Co. 220 pp. \$5.50.

HUDDLESON, MARY P.: Food for the Diabetic. 2nd ed. revised. New York: The Macmillan Co. \$1.25.

PETERS, LULU HUNT: Diet and Health with Key to the Calories. Chicago: The Reilly and Lee Co. 127 pp. \$1.00. Reviewed in *Baking Technology* 5, 62 (1926).

F—PHYSIOLOGY

ANDREW HUNTER

Distribution of nitrogen in urine of ruminants. F. ROGOZINSKI AND M. STARZEVSKA. *Bull. Inter. Acad. Polonaise, B*, 1924, 77-83; cf. C. A. 18, 2363.—When rations rich in protein are given to sheep, the increase in the N content of the urine is

chiefly in the carbamide fraction, and to a less extent in the hippuric acid fraction. The excretion of other nitrogenous substances, in particular uric acid and creatinine, is scarcely affected by increase in the protein intake. B. C. A.

Studies on the adrenaline content of the suprarenal gland. KIICHI TAKAHASHI. *Hoku-Etsu Ig. Kw. Z. Niigata* 37, 257-81(1922); *Japn. J. Med. Sci.* 2, 17.—The adrenaline content of the suprarenal gland of the rabbit is about 0.0825 mg. per kg. of body weight, being equal on both sides and in either sex. After bleeding it decreases, as shown by the lowered blood pressure, and returns to the normal state 48 hrs. later. Elec. stimulation of the splanchnic nerves brings about the increase of adrenaline content in the gland, but that of the vagus has no such effect. Nicotine stimulates the adrenaline secretion for awhile, but atropine has no influence on the adrenaline content and secretion of the suprarenal gland. H. G.

The calcium content of the blood serum. TAKEO INOUE. *Ij. Shb. Tokyo* 1922, 723-35; *Japn. J. Med. Sci.* 2, 17.—By means of I.'s method, a modification of De Waard's method, the Ca content of human blood serum can be measured quantitatively. The Ca content of healthy Japanese adults averages 10.14 mg. in man and 9.83 in woman per 100 mg. blood serum. Its content in the serum of beriberi patients does not indicate any deviation from the normal. H. G.

Intracellular enzymes of the liver, particularly in phosphorus poisoning. STAEMMLER. *Klin. Wochschr.* 5, 134-6(1926).—The oxidase and diastase activity of normal liver cells is markedly inhibited by P *in vitro*. Livers from animals that have suffered with slow P poisoning contain more oxidase than normal livers. The increased oxidase activity is always associated with fatty degeneration. Large doses of P kill before the fatty degeneration has occurred; and in this case the oxidase content of the liver is normal. The diastase content of livers from phosphorized animals is normal. Liver lipase is not sensitive to P. Of particular note is the fact that the results obtained *in vivo* and *in vitro* for oxidase and diastase are exactly opposed. MILTON HANKE

The intestinal wall as assistant regulator of the hydrogen-ion concentration in the organism. W. LÖFFLER. *Klin. Wochschr.* 5, 179-81(1926).—The feces are normally alk.; p_H 7.66-8.04. Ingestion of acid, either NaH_2PO_4 or HCl, gives rise to an acid stool. The p_H may drop to 5.2. The feces becomes acid long before the ingested acid could have traveled to the colon by the intestinal route. The acid is evidently absorbed and then excreted into the colon from the blood. Ingestion of alkali leads to feces that are abnormally alk. Here again the alkali must be absorbed and then be excreted into the colon. MILTON HANKE

Albuminuria of infants. ERNST FAERBER. *Klin. Wochschr.* 5, 181-2(1926). Infants ingest very little fluid during the first few days. Albuminuria is present at birth and continues until the water intake is 9-10% of the infant's body wt. The albuminuria of infants resembles the dehydration albuminurias of adults. M. H.

Is the surface tension of blood serum of constant value? K. BECKMANN. *Klin. Wochschr.* 5, 215-6(1926).—The static surface tension of blood serum is not constant. It changes during the period of food resorption and varies, from the normal range in edema. MILTON HANKE

Alkali reserve in athletes. FULL AND HERXHEIMER. *Klin. Wochschr.* 5, 2-8 (1926).—The alkali reserve of the blood (Van Slyke method) is above normal in well trained athletes. The normal figure is 65. The av. of the values on 13 athletes was 72. Diet is not mentioned. MILTON HANKE

Inner secretion of the sex glands. ESKIL KYLIN. *Klin. Wochschr.* 5, 367(1926).—Aic. exts. of ovary and testicle were prepd. Injection into rabbits of the same sex, e. g., ovarian ext. into females, produces a fall in blood sugar in normal and in diabetic animals. Ovarian ext. produces a rise in blood pressure when injected into castrated males. The exts. lower the blood pressure when injected into man. Boiling for 5 min., cooling for 1 hr. or storing for 2 months at room temps. destroys the active substance in the ext. MILTON HANKE

Fat and the action of the thyroid gland. J. ABRILIN. *Klin. Wochschr.* 5, 367(1926).—Fat seems, in a way, to be antagonistic to the action of the thyroid gland because a high metabolic rate, due to excessive thyroid activity, can be markedly reduced by feeding fat. The thyroid hormone also increases the specific dynamic action of foods. Fat is also antagonistic to the thyroid hormone in this respect. MILTON HANKE

Renal function in persons having only one kidney. NELLIS B. FOSTER. *Arch. Internal Med.* 36, 884-8(1925).—Of the tests performed: concn. test, water and urea excretion tests and the ratio urine urea/blood urea after urea administration only the last revealed consistently a limitation of renal function. MARY JACOBSEN

Intestinal chemistry. III. Salivary digestion in the human stomach and intestines. OLAF BERGHEIM. *Arch. Internal Med.* 37, 110-7(1926); cf. C. A. 1, 2138, 2143; 16, 2894; L. Strauss, *Arch. Verdauungs-krankh.* 33, 163(1924).—Expts. were carried out in persons with normal digestion; the retention stomach tube was used. $\text{Fe}(\text{OH})_3$ was added to the food as a digestion control. Being insol. it always remained with undigested starch. Within 15 to 20 min. after the meal 76% of the starch of mashed potatoes and 59% of bread were converted to maltose and an additional percentage was converted to dextrins. Active amylase disappears as soon as free HCl appears. It was found in contrast to other authors that amylase is inactivated by small quantities of HCl in the presence of starch or of products of its hydrolysis and cannot be reactivated by neutralization. Nor can saliva inactivated by boiling be reactivated by the addn. of small quantities of amylase.

MARY JACOBSEN

Additivity in sugar mobilization. R. W. SEUFFERT AND C. KRÜGER. *Beitr. Physiol.* 3, 85-91(1925).—The expts. on dogs confirmed that *acetamide* (I) and *urethan* (II) have only a mobilizing, not a glycogenetic, effect. The combined action of I, II and *adrenaline* is stronger than the action of I alone but no quant. data regarding the additivity could be obtained. In drawing this conclusion it was assumed that no noticeable sugar formation from fat occurs.

MARY JACOBSEN

The influence of the adrenal function on the ovary. P. G. DAL COLLO. *Folia med.* 10, 609-15(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 121.—The ovaries of mature dogs showed broadening of the *zona germinativa*, increase of the no. of follicles, of which only a few were ripe, and a partial degeneration of follicles as a result of adrenalectomy as well as of intraperitoneal injections of adrenal ext. in increasing doses. In the latter case there was besides that a reduction of interstitial tissue and a thickening of the vascular walls, particularly of the adventitia, but not of the intima.

M. J.

Stomach reaction and chemistry. HANS SCHMIDT. *Arch. klin. Chir.* 130, 307-22(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 274.—A detailed account of the influence of the various stomach operations on gastric acidity.

MARY JACOBSEN

The glucose content of the erythrocytes. PLINIO ATZENI TEDESCO. *Folia med.* 10, 561-71(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 287(1925).—Erythrocytes are permeable to glucose, but contain less glucose than the serum. The method of prepn. and deproteinization applied (details of which are given) precludes injury to the cells.

MARY JACOBSEN

A study in vivo of the interrelation between blood and spinal fluid, and a method of its quantitative evaluation in man. W. SCHÖNFELD. *Dermatol. Z.* 40, 193-200; *Ber. ges. Physiol. exptl. Pharmacol.* 30, 290(1925).—In 17 cases of syphilis *uramin*, a fluorescent dye, appeared in the spinal fluid with a max. intensity 8 to 12 hrs. after the injection of 20 cc. of an 8% soln. Injection of 1% *aesculin* gave a positive result in 5, an ambiguous one in 2 cases out of 15. *Phenolsulfonephthalein* (3 mg.) introduced into the spinal fluid appeared in the urine in 6 to 30 min., with a max. after 1 to 2 hrs. The punctures repeated in rapid succession caused an increase in cell count and protein content of the spinal fluid.

MARY JACOBSEN

The quantitative analysis of woman's colostrum. MASASHI NAKAMURA. *Mitt. med. Fak. Kais. Univ. Tokyo* 32, 235-50(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 367.—The fat content is higher, the lactose content lower (5%) than in permanent milk. The high protein (6-7%) and residual N (over 7%) of the first 2 days reach the normal level on the 2nd to 4th day.

MARY JACOBSEN

Biochemical and serological examination of chicken eggs during hatching. SENJO IZUMI. *Mitt. med. Fak. Kais. Univ. Tokyo.* 32, 197-216(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 383.—Residual and amino N increases, while the total N remains unchanged. Sugar falls regularly until the 10th day, rises from that time on and falls rapidly after hatching. Glycogen increases after the 8th day and decreases after hatching out. The const. diminution of fat which continues after hatching is noteworthy. There is an increase in antitryptic substances, amylase and Forssman antigen. The proteins of the unhatched egg differ antigenically from chicken serum, but they approach it biologically during the incubation period.

MARY JACOBSEN

The p_H of normal horse urine. C. REINHARDT AND F. HUMMELET. *Arch. wiss. prakt. Tierheilk.* 51, 517-24(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 455.—The p_H of normal urine is between 6.8 and 8.4 and is represented by a variation curve, with a max. at 7.6, the ascending and descending branch of which rests on the above 2 values. Work shifts the curve to the acid side, complete rest to the alk.

MARY JACOBSEN

Utilization of acetamide in man. R. W. SEUFFERT AND J. HINZ. *Beitr. Physiol.* 2, 289-94(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 723(1925).—The amt. of volatile

acids in urine increased with the acetamide dose. The increase may be partly due to cleavage processes in the gastro-intestinal tract.

MARY JACOBSEN

Adrenalinemia and arterial pressure. G. MANISCALCO. *Ann. clin. med. e med. sper.* 14, 351-82(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 761.—Destruction of both adrenals by cauterization reduced the arterial pressure of the rabbit from 50 to 25 mm. Normal pressure was reestablished by 0.01 to 0.005 mg. adrenaline. Cauterization of liver, spleen and kidneys reduced the blood pressure only by 7 mm.

MARY JACOBSEN

Thyroid action and products of organ catabolism. J. ABELIN AND R. SATO. *Schweiz. Wochschr.* 55, 45-50(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 770(1925).—Thyroid feeding caused in the rabbit and in the sheep decrease of blood viscosity and of serum proteins, in the beginning also often a fall of sedimentation velocity. The changes occur in phases (decrease, increase, decrease). Discontinuation of thyroid feeding is also attended by blood changes. Since these phenomena appear in all cases of increased catabolism the conclusion is justified that the degradation products participate in the process.

MARY JACOBSEN

The mechanism of production of digestion leucocytosis. V. Action of hydrochloric acid on the behavior of the hematopoietic tissues. C. CIACCIO. *Haematol.* 5, 287-93(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 905(1925).—The effect on the hematopoietic organs of HCl administration is the same as the effect of protein ingestion. It is concluded that the increased HCl secretion after food intake is the cause of alimentary leucocytosis, and that the phenomenon is independent of the digested protein

MARY JACOBSEN

Diuresis. W. NONNENBRUCH. *Erg. inn. Med. Kinderheilk.* 26, 119-206(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 919.—An exhaustive review.

MARY JACOBSEN

Renal and tissue diuresis. A. MUGGIA. *Rif. med.* 40, 1153-6(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 920.—A summary of the work of M. and others. The view is advanced that there is renal and tissue diuresis. Only the essential oil diuresis is considered as purely renal. The extrarenal action of purine derivs. is demonstrated by perspiration and rapidly ensuing diuresis after coffee; the extrarenal loss of water after Hg preps. follows from the decrease of ascites. Combination of diuretics of 2 groups enhances diuresis (euphylline-hypertonic NaCl). Hg preps.-hypertonic NaCl form an exception.

MARY JACOBSEN

The female sexual hormone. III. The effect of the cyclic hormone when administered by mouth. S. LOEWE, F. LANGE AND W. FAURE. *Deut. med. Wochschr.* 52, 310-3(1926).—With mice the authors were able to obtain the typical specific effects of the sexual hormone when the oral method was used; the dose required was 20 times the subcutaneous dose. Fractional doses under certain conditions produce an additive effect.

LOUIS LEITER

The function of the plasma proteins. P. E. HOWE. *Physiol. Rev.* 5, 439-76(1925).—Review with extensive bibliography. The plasma proteins, other than fibrinogen, are stabilizing in their effect on water balance and in their function of a suspending agent for the formed elements. They are probably not to be considered as transition products from food to body proteins, but act as an indirect source of food trephones through the action of leucocytes. It is generally stated that globulins are the carriers of antibodies. This is true as a general statement, but the conditions are complicated.

E. R. LONG

Action of temperature on respiration in vitro of the tissues of homeotherms and of poecilotheims. JEAN ROCHE. *Compt. rend.* 182, 91-3(1926); cf. *C. A.* 19, 2227. Following the technic of Terroine and Roche the consumption of O in vitro per g of fresh tissue per hr. was detd. for the pectoral muscle of the pigeon, and the ischiatic muscle of the frog at different temps. and between the limits of 10° and 30°; the pigeon muscle consumed approx. twice as much O as the frog muscle. The O consumption may be represented mathematically as an exponential function of the temp. These findings are discussed with reference to their bearing on the heat-regulating mechanism of these animals.

L. W. RIGGS

Cholesterogenic function of the spleen; influence of the internal splenic secretion upon the cholesterogenesis in the muscles. J. E. ABELOUS AND L. C. SOULA. *Compt. rend.* 182, 98-100(1926); cf. *C. A.* 18, 2549.—Expts. with dogs indicated that a functional assocn. exists between the spleen and the muscles, and that the spleen plays a role of first importance in the formation of cholesterol. Grigaut and Dejacé (cf. *C. A.* 19, 3303) proved that there is a diminution of the cholesterogenesis in enervated muscles, but an increase in tetanized muscles.

L. W. RIGGS

Test of liver function. I. The Widal hemoclasia. TORU OKA. *Tôhoku J.*

Exptl. Med. 6, 459-87(1925).—Alimentary leucopenia occurs in Eck dogs through the absorption of milk, casein and peptone, and in dogs with the pancreas extirpated through the absorption of sugar, more readily than in normal dogs. Leucocytosis in man and in dogs is provoked by carbohydrates and fats as well as by protein. The so-called Widal hemoclasia is only the alimentary leucopenia. **Test of liver function.** II. **Biliary coloring matter.** *Ibid* 489-521.—A positive reaction for serum bilirubin points to disturbed liver function. If the latter is slight, biliary obstruction does not always occur, but the proportion of urobilin in urine and feces always increases and thus becomes a reliable indicator of disturbed liver function, and also distinguishes between the latter and physiol. hyperbilirubinemia. Dild. bilirubin of herbivora gives a delayed reaction, that of carnivora a prompt reaction whether dild. or not. Bilirubin with prompt reaction may by the addn. of acid be transformed in part into bilirubin with delayed reaction.

L. W. RIGGS

Urea-nitrogen concentration of the blood. I. **Physiological variations of the blood urea-nitrogen and the influence of fixation and anesthesia upon it.** KASANO TASHIRO. *Tôhoku J. Exptl. Med.* 6, 601-29(1925).—The urea-N concn in the blood is equally distributed in the corpuscles and plasma. In case of prolonged fasting the blood urea-N concn. decreases to the min. on the 3rd or 4th day of starvation, after which it increased gradually until death. In the well-fed rabbit the blood urea-N does not appear to change throughout 24 hrs. With 82 normal animals the blood urea-N had a higher value in the warmer months of the year. When the rabbit is anesthetized with Et₂O its blood urea-N concn. is increased. The increase fails to occur when the vagi are previously cut. With Et₂O and with paraldehyde anesthesia the blood urea-N increase does not take place during the pre-narcotic stage. Paraldehyde by the stomach in doses of 1 cc. per kg. does not increase the blood urea-N concn., but in doses of 2 cc. per kg. it causes a marked increase. The increase under anesthesia is attributed to the increase of the central parasymphathetic tonicity. When a normal rabbit is bound, its blood urea-N concn. increases. This increase begins during the binding and if bound for 30 min. it reaches a max. in 30 to 60 min., after release from binding, then falling to normal in several hrs. A binding of 3 to 5 hrs. may double the blood urea-N. This phenomenon is given the provisional name *fixation-hypercarbamidemia*, and is attributed to the central stimulation of the vagus. II. **Effect of caffeine.** *Ibid* 630-43.—A dose of 0.05 g. of caffeine increases the blood urea-N concn. in the rabbit. This increase is arrested and even turned to a decrease by the administration of paraldehyde. The blood urea-N content is not increased but rather lessened by caffeine in atropinized or vagotomized rabbits. Caffeine-hypercarbamidemia is caused by the stimulation of the vagus centers. A large dosage of caffeine causes a decrease of the blood urea-N concn.

L. W. RIGGS

The basal metabolic rate. H. F. MOORE. *Lancet* 1925, I, 219-24.—The theory of "basal metabolic rate" is discussed, especially in its relation to thyroid disease. The *direct* and *indirect* methods for detg. it are given, the various app. are described, and tables of basal heat production standards and calens. are given. The limitations of the method are outlined and it is recommended to be of especial diagnostic value for estg. the degree of thyroid deficiency, of thyrotoxicosis and the results of treatment. It is also useful in differentiating between mild and doubtful cases suspected to have hyper- or hypothyroidism. It is not of great value in diagnosis of frank cases of hyperthyroidism, myxedema or cretinism.

J. B. SEIBERT

The formation of vegetative stimulating substances in active muscle. KENMATSU SHIMIDZU. *Arch. ges. Physiol.* (Pflüger's) 211, 403-13(1926).—Tests made with the perfusion fluid from a resting muscle stimulated indirectly electrically showed that in the fluid obtained at the termination of muscular activity a substance is present possessing properties similar to those of acetylcholine when applied to intestinal and heart preps. In the fluid from the active muscle there is also a substance which stimulates both intestine and heart and whose activity is not modified by either atropine or ergotamine.

G. H. S.

Effect of definite hormones on metabolic physiology. I. **Effects of adrenaline during hunger.** P. JUNKERSDORF AND P. TÖRÖK. *Arch. ges. Physiol.* (Pflüger's) 211, 414-32(1926).—During hunger the administration of adrenaline causes first a marked hyperglucemia, followed by a return to normal with a subsequent hyperglucemia. The time at which the hyperglucemia becomes manifest after the administration of adrenaline varies, apparently being detd. by the nutritional condition, since poorly nourished animals react most promptly. The degree of hyperglucemia is not related to nutritional condition, although the latter does have some effect on its duration. Within limits the amt. of adrenaline administered is without effect upon the time of appearance,

the degree or the duration of the hyperglucemia. As a rule the hyperglucemia is paralleled by a glucosuria. The total N of the blood and the urine N are usually increased during the adrenaline period. The water content of the blood is reduced. Diuresis increases. Changes in the relative wt. of the liver vary with the interval elapsing after the last treatment with adrenaline; after 7 hrs. the wt. is increased (the increase being related to the size of the dose of adrenaline) while after 72 hrs. the relative wt. is diminished. A fatty infiltration of the liver invariably occurs. Seven hrs. after the last dose of adrenaline the glycogen content of the liver is diminished; after 72 hrs. the liver is practically glycogen-free. With large doses of adrenaline the water content of the liver is reduced. Muscle glycogen is reduced. Other organs show no marked deviations from normal. II. Choline during hunger. P. JUNKERSDORF AND ARNO KOHL. *Ibid* 612-35.—Controlled somewhat by the nutritional state of the animal a more or less prompt and intensive hypoglucemia follows the administration of choline. The time of appearance, the degree and the duration of the hypoglucemia are not detd. by the mode of administration. Accompanying the hypoglucemia are changes in total N and water content of the blood; the urine shows an increased excretion of N; and body temp. falls. The wt. of the liver is reduced far below its normal value but its glycogen content is high. The slight reduction in fat may be ascribed to the deprivation of food. The hypoglucemia due to choline is interpreted as essentially an insulin hypoglucemia. G. H. S.

Hyperthyroidization experiments on dogs. III. Thyroid and carbohydrate tolerance. R. E. MARK. *Arch. ges. Physiol.* (Pflüger's) 211, 523-47(1926); cf. C. A. 20, 443.—Alimentary hyperglucemia in normal dogs consequent to the administration of up to 10 g. of sugar per kg. of body wt. usually disappears within 4 hrs., with an administration of between 10 and 20 g. per kg. after 5-7 hrs. Artificially hyperthyroidized animals present a definitely stronger alimentary hyperglucemia; in dogs deprived of thyroid the alimentary hyperglucemia disappears at a definitely slower rate than in normal animals. G. H. S.

Behavior of the lactic acid in the artificially perfused frog muscle. MASAYAKI OKAGAWA. *Arch. ges. Physiol.* (Pflüger's) 211, 577-96(1926).—The amt. of lactic acid appearing from hr. to hr. in the perfusion fluid satd. with O passing through the resting muscle (leg) of the frog shows a continuous decrease. When the muscle is subjected to a rhythmic stimulation the abs. value for the first hr. is increased, but with continued activity the values fall to the same levels as those of resting muscle. If the perfusion fluid contains KCN (0.001 N) in the absence of O (the oxidative processes being completely inhibited) the lactic acid output is markedly increased and remains high just as long as there are any lactic-acid-producing substances remaining within the muscle. The lactacidogen content of the muscle is reduced only by extreme stimulation, and then but slightly. But with long-continued non-exhausting stimulation it tends to increase. The lactic acid content of the muscle increases during activity in case it leads to exhaustion, but continuous activity which does not exhaust the muscle, with continuous and protracted perfusion, leads to a diminished lactic acid content. Repeated perfusion with small quantities of Ringer soln. does not result in any considerable decrease in the lactic acid content of the fluid. G. H. S.

Fatigue of gastric secretion. R. K. S. LIM AND A. C. LIU. *Arch. ges. Physiol.* (Pflüger's) 211, 647-62(1926).—Prolonged treatment with histamine fails to exhaust either the acid or the pepsin secretion of the stomach. In some cases secretory activity slackens; this is due rather to a disturbance in the extracellular secretion mechanism than to a primary damage to the cells. All parts of the stomach respond to the stimulation in the same way. When the acid secretion app. is stimulated the amplitude of the secretion (concn. of HCl) is const. and entirely independent of the strength of the stimulus, but the degree of secretion (amt. of HCl) is variable, being detd. by the intensity of the stimulation. Under physiol. conditions the capacity to secrete acid cannot be exhausted. Stimulation usually increases the amt. of pepsin secreted, but with continued stimulation both the amt. and concn. are reduced. When such a change occurs the concn. is first modified, the amt. being reduced only after a period of some 12 hrs. or more. It is likewise impossible to exhaust pepsin secretion, although the secretory process can be retarded by milder stimulation than is effective upon secretion of acid. G. H. S.

Function of water-soluble nutritional substances in the metabolism of aquatic animals. • VI. Permeability of the skin in fish for solutions of organic food substances (glucose, saccharose, peptone). GRIGORIY CHOMKOVICH. *Arch. ges. Physiol.* (Pflüger's) 211, 666-81(1926).—Expts. with the surviving isolated skin of several varieties of fish showed that the skin of these animals in their normal physiol. activity is able to

absorb sugars and peptone from water. This finding confirms the observation that the absorption capacity of the skin for aq. solns. of foodstuffs, like that of the intestinal epithelium, differs from the usual osmotic processes in that it is associated with a vital function of the skin elements. G. H. S.

A note on the chemical composition and biological activity of liquor folliculi. F. W. HEYL, M. C. HART AND W. B. PAYNE. *J. Am. Pharm. Assoc.* 14, 210-5(1925).—From 230 cc. of follicular fluid from the sow 6% of protein was obtained by pptn. with EtOH: N 14.43 and P 0.095%. The filtrate gave 0.28% more of crude protein by further treatment. The non-protein fractions were tested for certain constituents and the values calcd. to the original fluid: N 0.015, urea 0.01, creatinine 0.005 and phosphatides 0.027%. By subcutaneous injection in an oil base the fat fraction of the fluid gave only a slight prolongation of the estrous cycle of guinea pigs.

L. E. WARREN

TERROINE, EMILIE F. and ZUNZ, EDGARD: *Basal Metabolism*. Paris: Les Presses Universitaires de France. 187 pp. Reviewed in *Physiol. Abstracts* 10, 312(1925).

G—PATHOLOGY

H. GIDEON WELLS

The utilization of fat in diabetes. W. R. BLOOR AND E. M. GILLETTE. *Proc. Soc. Exptl. Biol. Med.* 22, 251-3(1925).—Ninety percent removal of the pancreas in dogs caused a great accumulation and slow removal of fat from the plasma. The effect was observed 1 month after operation. Digestion and absorption were unaffected, as were also the other lipid blood constituents and the corpuscle lipoids. C. V. B.

Some reactions in sensitized guinea pigs to the filtrate of scarlatinal streptococcus. A. R. DOCHEZ AND L. SHERMAN. *Proc. Soc. Exptl. Biol. Med.* 22, 282(1925).—Guinea pigs were given injections of filtrate of scarlatinal streptococcus culture. Skin tests of the filtrate were positive in 7 days and reached a max. in 1 month. No reaction was present in controls. Sensitization was also induced by the subcutaneous injection of living or dead cultures. Sensitized animals gave no reaction following the intracutaneous injection of equal parts of filtrate and antitoxin which had been incubated for 1 hr. C. V. B.

The role of accompanying material in the immunization with invertase preparations. A. BACH, W. ENGELHARDT AND A. SAMISSLOV. *Biochem. Z.* 160, 261-8(1925).—Rabbits were immunized with invertase preps. extd. from yeast. Invertase action was diminished in the presence of the serum of animals so immunized. The purer the invertase preps. the less its immunizing power, and some immunity could be induced by invertase inactivated by heat; so immunity by invertase is not produced by the enzyme mol. but by impurities that ordinarily accompany it. F. A. CAJORI

Lactic acid formation during growth. OTTO WARBURG. *Biochem. Z.* 160, 307-11(1925).— δ -Lactic acid was isolated as its Zn salt from Jensen rat sarcoma, growing in Ringer solns. at 38°. The lactic acid produced in 2 hrs. was equal to 15.4% of the initial wt. of the tumor. The Rous hen sarcoma produces lactic acid at about 8% of its wt. per hr. F. A. CAJORI

Analytical studies on the antihemolytic action of volatile chemicals especially benzene. K. IWAI. *Tokyo Ig. Kw. Z.* 36, 8-9(1922); *Japanese J. Med. Sci.* 2, 115(1924).—The hemolytic action of serum can be diminished or completely prevented by the addn. of C_6H_6 , $C_6H_5CH_3$, $C_6H_5(CH_3)_2$, $CHCl_3$ and benzine. If the volatile chemical is removed, in benzine by centrifuging, the hemolytic power of the serum is restored. Benzene causes a deviation of complement and on its removal the complement is again able to take its part in the hemolysis phenomenon. F. A. CAJORI

A program of research on the action of light on living matter, with especial reference to application in methods of therapy. BRIAN O'BRIEN. *Am. Rev. Tuberculosis* 11, 486-91(1925).—An outlined plan of study is given in which is considered the known radiation spectrum from X-radiation through visible to extreme infra red in its effect upon elementary forms (bacteria, protozoa, nemathelminthes, arthropoda and amphibia), mammalian forms (normal and pathologic) and the local action of light on vertebrate tissues (intact and *in vitro*). H. J. CORPER

Tuberculo-complement-fixation and inhibitive tests. A. H. W. CAULFIELD. *Am. Rev. Tuberculosis* 11, 508-38(1925). H. J. CORPER

The excretion of specific substances of tubercle bacilli in the urine. L. DIENES AND J. FREUND. *Am. Rev. Tuberculosis* 12, 35-40(1925).—All attempts to demonstrate the presence of substances possessing a tuberculin effect on tuberculous guinea pigs, either in the urine of patients with extensive tuberculosis or those receiving during sp.

therapy considerable amts. of sp. substances, were negative. No demonstrable amts. of the sp. substances were present in the blood serum and urine of tuberculous guinea pigs killed by the injection of aq. ext. of tubercle bacilli, while in the urine of normal guinea pigs similarly injected the sp. substances were present. H. J. CORPER

The potency of the watery extract of saprophytic acid-fast bacilli as tuberculins and as antigens in complement fixation. L. D. SCHEFF. *Am. Rev. Tuberculosis* 12, 45-8 (1925).—There exists a close quant. parallelism in the effectiveness of watery exts. of saprophytic acid-fast strains of tubercle bacilli in the complement-fixation test with that of the ext. of the tubercle bacillus, and a marked quant. discrepancy in the tuberculin effect, the exts. of the saprophytic strains having little tuberculin effect only. The skin sensitiveness of guinea pigs treated with killed bacillary material indicates that the material substrate giving the reaction with exts. of saprophytes as compared to tubercle bacilli are not the same and are probably due to different immunological effective groups of protein substances. H. J. CORPER

The agglutination of tubercle bacilli. J. FREUND. *Am. Rev. Tuberculosis* 12, 124-41 (1925).—Suspensions of whole tubercle bacilli agglutinate by electrolytes when their potential is below —13.0 millivolts. NaCl and CaCl₂ cause no agglutination even below this. Some suspensions of one strain studied were agglutinated by CaCl₂ and MgCl₂ at a concn. $\frac{1}{16}$, $\frac{1}{32}$ and $\frac{1}{64}$ mol. Defatted tubercle bacilli acted similarly. Agglutination of lipid suspensions by electrolytes occurs when the potential of the particles is reduced below 15 millivolts, with the above 3 salts. With immune serum sensitized tubercle bacilli are agglutinated whenever the potential is below 13 millivolts, with the 3 salts. Defatted tubercle bacilli sensitized with immune serum act similarly. Normal and immune sera decrease the actual potential of lipid particles. Both agglutinate the lipid particles and normal serum decreases the critical potential for agglutination to 7 millivolts. With immune serum, sensitized lipid particles are agglutinated by NaCl at concns. above $\frac{1}{1000}$ mol., by CaCl₂ above $\frac{1}{4000}$ mol. and by CuSO₄ above $\frac{1}{16,000}$ mol. The isoelec. points of the strains were found between p_H 2.8 and p_H 3; of the defatted bacilli close to 2.8; of lipid particles prepd. from an alc. ext. near 1.5; and particles from ether ext. near 1. The detns. were made by cataphoresis. These observations support the assumption of a protein surface of the bacilli. H. J. CORPER

Complement fixation in tuberculosis. III. Studies on the nature of the antigen. MAX. PINNER. *Am. Rev. Tuberculosis* 12, 142-55 (1925); cf. *C. A.* 19, 2979.—The main complement-fixing substances derived from tubercle bacilli are associated with the fraction practically insol. in acetone, ether and CHCl₃, and sol. in alc. No proof is given that the alc.-sol. substances contain the only antigenic principle, but no ext. from which these substances have been removed contains a sufficient amt. of antigenic power to serve as antigen in complement fixation. Evidence is presented that the degree of dispersion plays an important role in the antigenic value of lipoidal tuberculosis antigen. The protein substances exert an inhibiting influence on the lipoids in complement fixation. No evidence was found that certain sera from tuberculosis patients react only with protein and others only with lipoidal antigen. **IV. Studies on the nature of the antibody.** *Ibid* 233-41.—Sera of tuberculosis patients with positive complement fixation, digested with trypsin and dialyzed until free from protein and protein-split products, still contain complement-fixing antibodies. The complement-fixing antibodies are, therefore, not of the nature of globulins but are either lipoids or proteins (with the CO-NH linkage) not broken up by the action of trypsin. Complement-fixing antibodies have no quant. or qual. relation to the ethylbutyrases ("lipases"). True lipases with a sp. action on tubercle bacillus lipoids were not detected in sera with complement-fixing qualities. The phenomenon, that sera of tuberculosis patients, which are neg. 24 hrs. after the withdrawal of the blood and become pos. after a week or more, is not specific for tuberculous serum, the same occurring, although in smaller percentage, in sera of undoubted non-tuberculous patients. Complement-fixing antibodies may readily be destroyed by ether which excludes the use of ether for extn. in any exams. for complement-fixing antibodies. H. J. CORPER

The effect of the oral administration of calcium lactate and thyroid extract on the calcium content of the blood serum in pulmonary tuberculosis. M. M. TEMITZ. *Am. Rev. Tuberculosis* 12, 222-7 (1925).—Ca lactate and thyroid ext. administration have no effect upon the serum Ca figures in pulmonary tuberculosis. The markedly active toxic cases of pulmonary tuberculosis showed a marked drop below the normal serum Ca figure, averaging about 25%. This apparently indicates that there is a decided loss of Ca from the blood in the terminal stages of pulmonary tuberculosis. H. J. C.

Oxidation and reduction at the site of a tuberculous lesion. WM. C. WHITE, M. L.

SMITH AND M. X. SULLIVAN. *Am. Rev. Tuberculosis* 13, 77-83(1926).—A series of observations is recorded in support of the suggestion that, since, in the conjunction of the tubercle bacillus and the monocyte in their commensal existence, there are operating 2 different oxidation and reduction mechanisms—the monocyte in common with other body cells contg. glutathione, the tubercle bacillus contg. no glutathione. There is a possibility, in the competition of these 2 mechanisms for available labile H, of explaining the observed alteration in the structure of both organisms.

H. J. CORPER
Treatment of tuberculous pyopneumothorax with Pregl's iodine solution. U. WINKLER. *Beitr. Klin. Tuberk.* 59, 218-27(1924).—Favorable action of I soln. upon purulent pleuritis is due to the high CO₂ content of the pyopneumothorax. CO₂ in lab. tests markedly activates the Pregl soln. (C. A. 16, 2691) (aq. soln. contg. 0.035 to 0.04 % free I, with Na ions, I ions, hypoiodite and iodate ions) but not so other I solns. A reinforcing of the I action of the Pregl soln. by introducing CO₂ into the pleural space is superfluous since any excess is rapidly absorbed. The I in Pregl soln. is quickly combined by the tissues and, therefore, posture is used to have the entire diseased pleura come in contact with the soln. immediately after injection. I action persists for 2 to 3 days.

H. J. CORPER
Liver changes and liver function in chronic pulmonary tuberculosis especially with reference to uribilinuria. WALTER LANDAU. *Beitr. Klin. Tuberk.* 61, 29-54 (1925).—The liver in cases of chronic pulmonary tuberculosis shows manifold changes which bear no definite relation to the form of the disease. While the levulose test and chromocholoscropy give no information of diagnostic value in pulmonary tuberculosis regarding liver function disturbances, the urobilinuria is considered the most valuable liver function index. Only a quant. urobilin study possesses value. On account of the impossibility of establishing a pure urobilin scale the term "urobilin unit" is utilized as indicating the amt. of urine divided by the diln. figure. The significance of uribilinuria in pulmonary tuberculosis cannot be detd. from later postmortem findings but rather by means of clinical comparison since it is a labile reversible symptom dependent upon circumstances of stasis. Prognostic conclusions cannot be drawn from the presence of uribilinuria.

H. J. CORPER
The tuberculin problem. VII. Tuberculin reaction and the blood protein picture. A. V. V. FRISCH AND S. BAUMGARTNER. *Beitr. Klin. Tuberk.* 60, 163-71(1924).—The total protein content of the blood varies following tuberculin injection without visible individuality. In almost all cases changes in the blood protein occur after doses which occasion neither general, focal nor local reaction. Likewise, under the same conditions the fibrinogen content changes. In the course of changes of the blood protein picture in one and the same individual there are quant. differences, but qual. the reaction is the same. A parallelism between the pyrexia and fibrinogen curve does not occur in the same individual. To answer satisfactorily the question of the relation of the blood protein reaction to special forms of pulmonary disease there are required many more examns., although it appears that in general active processes cause an earlier increase of the fibrinogen content after tuberculin injection, while in latent or stationary processes the increase is less and more gradual.

H. J. CORPER
The action of tuberculin on the protein decomposition of the liver. R. BIELING AND S. ISAAC. *Beitr. Klin. Tuberk.* 60, 271-5(1925).—The total N, residual (non-coagulable) N and percent relation between the 2 was studied in the liver of normal and tuberculous guinea pigs, untreated and treated with tuberculin. The tuberculin injections in the tuberculous animal caused a splitting of the proteins of the liver as indicated by the N detns. while in normal animals this did not occur.

H. J. C.
Specificity of the tuberculin reaction. H. SELTER AND TANCRE. *Beitr. Klin. Tuberk.* 60, 439-48(1925).—Non-specific bacterial proteins and tubercle bacillus preps. were tested comparatively in tuberculous infected individuals. Of the non-sp. bacterial proteins those from the colon bacillus proved most active, less so were those from chelonin bacilli and still weaker from acid-fast milk bacilli. Between the reactions of the tubercle bacillus protoplasm and the colon bacillus protoplasm first examns. seemed to show no differences, but clinically there was a different course of the reaction in that the tubercle bacillus reaction developed slower. The non-sp. bacteria resulted in a height of the reaction occurring in 24 hrs. which then rapidly subsided. After subcutaneous injection of old tuberculin in active cases of tuberculosis old inflammatory lesions caused by the tubercle bacillus as well as by the colon and other bacilli again flared up. This flare up did not occur after the subcutaneous injection of colon or chelonin bacillus protoplasm, but even these caused marked general reactions. Histological examns. of the excised reaction sites showed no differences, resembling in all cases the structure of the tubercle.

H. J. CORPER

Blood uric acid metabolism in pulmonary tuberculosis. GEORG KELEMEN AND CLARA SANDOR. *Beitr. Klin. Tuberk.* 60, 488-92(1925).—In 20 male tuberculous patients studied in various stages of the disease, but in all of whom there were severe destructive processes, it was found that the blood uric acid in $\frac{2}{3}$ of the cases was only slightly above the lower values of the normal. In a third of the cases even with the full diet the figures were below the normal. The duration and stage of the disease, as well as the pyrexia, seemed to be without influence upon the uric acid. H. J. CORPER

Blood determinations in tuberculosis. E. BRIEGER. *Beitr. Klin. Tuberk.* 61, 2-8(1925).—The total blood vol. was detd. by the Congo red method of Griesbach, the erythrocyte vol. in hirudin blood by means of the Bönninger tubes, and the serum protein refractometrically. In chronic pulmonary tuberculosis there was no increased concn. of the blood as a result of water loss. In advanced cases with increased serum protein values the diminution in the erythrocyte vol. indicates an increase of the plasma vol. The plasma and total blood vol. did not diminish correspondingly to the loss of body weight. The polyglobia in tuberculosis must be considered a genuine erythrocytosis. H. J. CORPER

Sodium chloride and water content of the tuberculous organism. E. BRIEGER. *Beitr. Klin. Tuberk.* 61, 9-18(1925).—The H_2O and NaCl of the tissues of the tuberculous organism are probably diminished, while the blood is not diminished in water or NaCl. The binding of water and NaCl in the tissues of the tuberculous organism is altered. In spite of the higher concn. of the formed elements and the serum proteins, the blood is not dild. The concn. of the blood is the result of a genuine hyperproteinemia in which the normal total blood vol. remains unaltered. An increased administration of water and NaCl alone cannot alter this condition since they will not occasion a normal binding of the water and NaCl in the tissues. J. H. CORPER

Basal metabolism in tuberculosis. W. LANZ. *Beitr. Klin. Tuberk.* 61, 97-121(1925).—The studies were performed with the Krogh-Libesny app. Early tuberculosis gave normal respiratory values. Clinical healed cases of tuberculosis revealed a few with increased metabolism, probably explicable on the existing thyreotoxic condition. Productive acinous nodose forms showed marked gaseous metabolism increase, with the highest values being found in exudative nodose forms. In collapse therapy the metabolism correlated with the clinical findings. After the operation the gas metabolism gradually diminishes. It was significant that at times in early cases, in which physical methods were negative but an active tuberculosis was being dealt with, there was an increased metabolism. H. J. CORPER

The action of tuberculin preparations upon reduction by bacteria. R. BIELING. *Beitr. Klin. Tuberk.* 61, 183-6(1925).—Living bacteria and cells from warm-blooded animals transform aromatic nitro combinations (nitroanthraquinone) into amino combinations (red aminoanthraquinone). These reduction processes can be favored by small amts. of old fluid nutrient media. These enhancing substances are elaborated by various bacteria including the tubercle bacillus. Since tuberculin in the body of tuberculous animals can cause marked dissimilatory changes in the proteins, the question was raised whether the active substances are identical. The reduction-enhancing substances were found not identical with tuberculin, but are non-sp. substances. The reduction method, therefore, is suitable for the detn. of the purity of tuberculin. H. J. CORPER

Secretin. VI. Its influence on the antibodies of the blood: agglutinin. A. W. DOWNS AND N. B. EDDY. *Am. J. Physiol.* 71, 40-3(1924); *Physiol. Abstracts* 10, 212. Rabbits injected daily with a secretin prepn. (15 mg. per kg. in warm normal saline) develop more agglutinins to *B. typhosus* than controls injected with the killed culture only. The difference between the agglutinating powers of the 2 groups is greatest at the end of the first week. VII. Complement. A. W. DOWNS, N. B. EDDY AND R. M. SHAW. *Ibid* 44-5.—The complement from the sera of the same rabbits was estd. by its hemolytic action on washed sheep's red corpuscles. There was no increase in the amt. of complement in the serum of the rabbits receiving the secretin injections nor in that from the controls. VIII. Hemolytic amboceptor. *Ibid* 46-8.—The rabbits used in these expts. received an injection of washed sheep's corpuscles; and half of them were also injected daily with the secretin prepn. The hemolytic power of the serum against sheep's corpuscles increase 800 times in the controls, and 100 times in those animals receiving the secretin injections. H. G.

The adsorption of hemolysins. A. H. ROFFO AND B. BARBARA. *Bol. inst. med. expil.* 1, 280-5(1925); *Physiol. Abstracts* 10, 191.—Hemolysins for sheep's erythrocytes are quantitatively adsorbed from rabbit serum by animal charcoal. H. G.

Surface tension in the Wassermann test and in flocculation reactions. G. PARRINO

AND F. BRANCATO. *Boll. ist.sieroterapico Milanese* 4, 27-33(1925); *Abstracts Bacteriol.* 9, 178.—In a Wassermann system during the course of the reaction there is a lowering of surface tension which is greater in positive than in negative systems. In flocculation reactions there is an increase of surface tension in both positive and negative systems, due to evapn. of alc., but the increase is less in the positive systems, since in these, flocculation tends to lower the tension. The amt. of variation in tension in flocculation reactions is greatest in the Meinicke test, less in the Sachs test and least in the Dold test, depending apparently on the evapn. of the balsam and alc. H. G.

Post-operative acidosis in children. P. C. JEANS AND K. H. TALLERMAN. *Brit. J. Diseases Children* 21, 268-75(1924); *Physiol. Abstracts* 10, 212.—Analysis of blood and of urine before and after operations of various kinds showed that the lowering of alkali reserve is due only in small measure to acetone bodies or to lactic acid. There was an increased phosphate excretion with a lowered blood phosphate, and an increased excretion of org. acids. Conclusion: The lowered alkali reserve is due to some unidentified factor. H. G.

Action of dog serum on human blood. E. RAMIREZ. *Rev. Mexicana Biol.* 5, 253-8 (1925); *Physiol. Abstracts* 10, 149.—Dog serum agglutinates human erythrocytes even in a 1.5% soln. H. G.

The effect of thyroparathyroidectomy on body activities. O. O. STOLAND AND H. L. BRYANT. *Univ. of Oklahoma Bull.* 5 [N. S.] No. 330, 51-8(1926).—The total N, urea N, uric acid and sugar content after thyroparathyroidectomy were normal. The O content and capacity of the blood and the metabolism increased. *Alkalosis* did not always accompany tetany. The subnormal blood pressure following thyroparathyroidectomy may rise after several hrs. of tetany. A meat diet and the oral administration of Ca lactate proved most efficacious in preventing tetany and prolonging life. ARTHUR GROLLMAN

The peroral application of tuberculin. A. REBAY. *Klin. Wochschr.* 5, 69(1926).—A report of one case in which tuberculin was unquestionably active when given by mouth. MILTON HANKE

Metabolism pathology of pyloric spasm. H. VOLLMER AND J. SEREBRIJSKI. *Klin. Wochschr.* 5, 70(1926).—Ten cases of pyloric spasm were studied. The urine was usually alk. The p_H was usually above 7.4 and was, not infrequently, 8.0. The alky. was due to fixed alkalies; NH_4^+ was usually absent. Chlorides were usually absent or present only in traces. The alkali reserve of the blood was abnormally high, values of 100 being not uncommon: p_H normal. Blood chlorides were markedly reduced. Blood Ca, K and P were normal, residual nitrogen was subnormal. Tetanic symptoms were always absent. The acidity of the gastric juice was subnormal. The cases were treated with human milk that had been acidified with HCl until the buffers had been completely neutralized. None of the cases was lost. In this case the pyloric spasm was reduced by administering acid. HCl is known to reduce the contractions of the pylorus and the movements of the stomach in animals. MILTON HANKE

Blood volume determinations, by the dye method, in leucemia and other splenomegalias. ENRICO GREPPI. *Klin. Wochschr.* 5, 110-11(1926).—The total blood vol. detd. by the Congo red method is 7-8% of the body wt. In leucemia, this method gives a value of 12-14%, which would indicate a tremendous hydremia. The refractive index and the erythrocyte count show that a hydremia does not exist. In leucemia, and in other conditions in which the spleen is enlarged, Congo red must be removed from the circulation very rapidly, perhaps by the enlarged spleen. MILTON HANKE

Characteristic blood sugar reaction in cases of ulcus ventriculi. W. SCHARPFF. *Klin. Wochschr.* 5, 138-9(1926).—Ingestion of 80 g. levulose in 300 cc. H_2O by a normal individual does not lead to hyperglucemia. Similar treatment always leads to hyperglucemia in patients afflicted with gastric or duodenal ulcer. M. H.

Occurrence of free phenol in the blood in cases of renal insufficiency. ERWIN BECKER AND STILLFRIED LITZNER. *Klin. Wochschr.* 5, 147(1925).—Phenol can be demonstrated in the blood in cases of renal insufficiency long before the uremic stage has been reached. The circulating phenol, together with other poisons of intestinal origin, may be the causative agents in uremia. MILTON HANKE

The cause of diabetic coma. J. ST. LORANT. *Klin. Wochschr.* 5, 216-21(1926).—Of the theories as to the cause of diabetic coma, the most prevalent are those of Stadelmann and of v. Noorden. S. ascribes the coma to a supreme acidosis, the H ion being the toxic agent, while N. believes that the ketone bodies, particularly β -hydroxybutyric acid, are inherently poisonous. Still, it is a well-recognized fact that administration of alkali does not cure coma. That the ketone bodies are not the causative agents is most conclusively proved by the fact that coma may occur without ketosis. The con-

version of glycogen into CO_2 , H_2O and energy occurs predominantly in the muscle tissue. Diabetes is associated with an imperfect functioning of muscle tissue. The most vital body functions, *e. g.*, blood circulation, vascular tonus and respiration, are carried on by muscle tissue. It is not surprising, then, that coma and death should occur when the muscle tissue ceases to function properly. Anything that tends to increase muscular tonus, *e. g.*, agents that elevate blood pressure, will temporarily arouse diabetics from the state of coma. The relation of glucose to health and disease can be expressed algebraically as follows: $GO \div GI = F$ (oxidation, glycogen synthesis) $\div F_1$ (food carbohydrate, glycogen catabolism, protein carbohydrate) = 1. O = outflow, I = influx, G = glucose and F = function. Any change in the normal balance, such as the intake of carbohydrate, will have to be associated with other changes, as represented in the formula, to keep $GO/GI = 1$. In diabetes both items in the numerator are greatly reduced. The balance is upset. The high blood sugar value is maintained in an effort to increase the possibility of oxidation and glycogen synthesis. MILTON HANKE

The polyphase action of hormones. V. M. KOGAN, M. J. KAMENNEW AND N. B. MANTZ. *Klin. Wochschr.* 5, 221-4(1926).—The salivary secretion in dogs, under the influence of K, Ca, adrenaline and insulin, was investigated. The substances were injected in, possibly, every conceivable combination and in different quantities so that the number of expts. are large. They all affect salivary secretion and the effect of each is modified by the presence of any of the others. The reaction obtained depends upon the time interval that elapses between the injection of any two or three of the substances. A short summary is hardly possible. MILTON HANKE

The relation of the balance between cholesterol and cholesterol esters, in the blood and serum, to liver function. S. J. THIANNHAUSER AND HANS SCHABER. *Klin. Wochschr.* 5, 252-3(1926).—Blood normally contains cholesterol and cholesterol esters. In hepatopathies, the total cholesterol is usually not changed; but the amt. of cholesterol esters is greatly reduced and may even be *nil*. MILTON HANKE

The source of oxalic acid in oxaluria. F. PICCININNI AND E. LOMBARDI. *Klin. Wochschr.* 5, 260-3(1926).—See C. A. 20, 69. MILTON HANKE

The diagnostic value of the sero reaction of Meinicke. ANT. FABIAN. *Bratislavské Lekárske Listy* 4, 87-92(1924).—F. examd. 1571 cases simultaneously by the Bordet-Wassermann and the Meinicke tests. In 75.24% of the cases the results were negative by both reactions and in 21.70% both gave positive tests. In 3.06% of the cases the results were opposite. WILLIAM J. HUSA

Changes in the tissues and in lipoids of mice and rabbits produced by feeding fat, cholesterol and scarlet red. F. KLINGE AND L. WACHER. *Krankheitsforschung* 1, 257-85(1925).—Mice fed with fat, cholesterol, and scarlet red show a deposit of neutral fat, and of cholesterol esters in the fat tissues and in the liver, while the reticulo-endothelial cells and Kupfer's star cells contain lipid pigments. In rabbits the lipid pigments are found especially in the liver cells. Mice excrete scarlet red in the bile, through the kidneys and through the skin; cholesterol in the bile and as ester through the sebaceous glands. Rabbits suffer from cholesterolemia because of their inability to eliminate cholesterol rapidly enough. There are pathological changes in the liver when mice are fed on cholesterol and scarlet red; in herbivorous animals like rabbits these changes occur with cholesterol alone. P. Y. JACKSON

Acidosis in the newborn. The role of the various blood constituents (hemoglobin, blood cells, carbon dioxide, salts) in the regulation of the blood reaction. ARVO YLPPÖ. *Acta paediatr.* 3, 235-60(1924); *Ber. ges. Physiol. expil. Pharmacol.* 30, 742-3(1925). The p_{H} of blood cells and of CO_2 -free blood serum from the cord are lower than the corresponding values in the newborn a few hrs. or days after birth or in the mother. The alky. of CO_2 -free serum is reduced by the addition of erythrocytes. Cells hemolyzed by saponin have a lower p_{H} than intact ones, the lowest values being again encountered in cord blood cells. The p_{H} differences are smaller in the CO_2 -free bloods, because of the buffer action of hemoglobin. Y. concludes that the new born has a tendency toward acidosis, the latent source of which is the erythrocytes. MARY JACOBSEN

The stability of blood suspensions in the course of experimental acidosis. G. DI MACCO. *Ann. clin. med. e. med. sperim.* 14, 303-10(1924); *Ber. ges. Physiol. expil. Pharmacol.* 30, 741(1925).—Injection of 0.28 to 1.5 g. Na butyrate or isobutyrate causes decrease of sedimentation velocity. The contrary effect is produced *in vitro*. MARY JACOBSEN

The calcium content of the blood in various diseases of the skin, based on an analysis of 100 cases. H. J. SCHWARTZ AND O. L. LEVIN. *Arch. Dermatol. Syphilol.* 10, 544-50(1924); *Ber. ges. Physiol. expil. Pharmacol.* 30, 442(1925).—The blood Ca

was low in acne, eczema, furunculosis and folliculities, and, against expectation, normal in urticaria and similar diseases. An intimate relationship does not seem to exist.

MARY JACOBSEN

The lipid partition in blood in health and disease. B. L. OSER AND W. G. KARR. *Arch. Internal Med.* 36, 507-15(1925).—In normal persons an av. of 68% of the total blood cholesterol (I) is present in the plasma. In 2 cases it was very low. The concn. of lipid P (II) in cells varies within narrower limits than in the plasma and is 1.5 to 2 times as high as in the plasma. The cell II amounts to 50 to 60% of the total II of the blood. The ratio I/II is about 6.1 in the cells, about 17.8 in the plasma and less const. in the latter. In normal whole blood it is quite const. around 11.3. These data are different from those of other authors and do not permit a conclusion as to a const. cholesterol-lecithin relation and an antagonism based on it. In diseases with lipemia, such as uremia, pernicious anemia, jaundice, cholelithiasis and diabetes the cell II showed considerable variations especially in cases with a low blood cell count.

M. J.

Diseases of the liver. IV. Functional tests in cases of carcinoma of the liver and biliary tract. C. H. GREENE, C. S. McVICAR, WALTMAN WALTERS AND L. G. ROWN-TREE. *Arch. Internal Med.* 36, 542-60(1925); cf. C. A. 19, 3110. —The serum bilirubin detn. and the phenoltetrachlorophthalein test, especially the latter, permit an early diagnosis of carcinoma of the liver and biliary tract and are valuable in absence of clinical evidence. In cases with jaundice the tests, particularly the bilirubin test, do not afford a differential diagnosis. They are not always positive in malignant liver involvement.

MARY JACOBSEN

Nutritional changes in exophthalmic goiter. The effect of Lugol's solution. C. C. STURGIS AND J. A. GREENE. *Arch. Internal Med.* 36, 561-78(1925).—It was found in accordance with previous investigations that in order to maintain body weight in a patient with exophthalmic goiter and increased metabolism the food intake must be 75 to 100% above the basal metabolism. Lugol's soln. given before the operation decreased the metabolism and reduced the postoperative loss of weight from 5.2 to 2%. In 18% of cases there was even a gain in weight.

MARY JACOBSEN

Lipemia and the reticulo-endothelial apparatus. B. S. OPPENHEIMER AND A. M. FISHBURG. *Arch. Internal Med.* 36, 667-81(1925).—In exptl. lipid feeding and in diseases with increased lipemia (obstructive jaundice, diabetes, nephrosis), lipoids are stored in the reticuloendothelial cells. Xanthomas, or lesions consisting of aggregates of "foam cells" (large clear cells filled with lipoids) appear in various organs, spleen, liver, skin and arterial walls. The lipoids stored are neutral fats, cholesterol and phosphatides. Lipemia may or may not be associated with xanthosis, the yellowish discoloration of palms and soles, which is caused by the increase of the lipochrome (carotin, xanthophyll) content in the blood. Gaucher's disease is also characterized by lesions consisting of foam cells. The disturbance of the lipid metabolism is here, however, primary and constitutional. The lipoids stored are cerebroside and other complex lipoids not detectable by staining.

MARY JACOBSEN

The non-specific protein reaction. FLORENCE B. SEIBERT. *Arch. Internal Med.* 36, 747-8(1925); cf. C. A. 19, 2221, 2849.—A criticism of Ling's work.

M. J.

The antigenic property of pollens. H. L. HUBER AND K. L. KOESSLER. *Arch. Internal Med.* 36, 751-61(1925).—"If suitable procedures are followed the antigenic property of pollens can be demonstrated in specifically sensitized animals by: production of characteristic anaphylactic phenomena; positive uterine strip reaction; positive bronchoconstrictions; and production of sp. antibodies giving precipitin, complement fixation and passive sensitization reactions. The response of sensitized uterine strips to *Ambrosia trifida* and *Ambrosia elatior* and to *Helianthus annuus* is sp." The antigenic property of pollens makes the anaphylactic nature of pollen disease probable. *Zea mays* pollen contains an oxytocic principle.

MARY JACOBSEN

The effect on parametria of blood serum, especially from patients with carcinoma. GENEVA A. DALAND. *Arch. Internal Med.* 36, 762-9(1925).—Parametria form vesicles when mixed with blood serum; the rate of formation is an index of toxicity. Menstrual blood serum is slightly more toxic than normal. In diseases the toxicity is equal to (carcinoma) or higher or lower than that of normal serum. Diln., presence of hemoglobin, irradiation by ultra-violet or Röntgen rays diminish the toxicity.

M. J.

Non-specific desensitization therapy in allergic asthma. The eosinophilic index as a guide to intramuscular injection of venom protein, with case report. R. H. SPANGLER. *Arch. Internal Med.* 36, 779-87(1925).

MARY JACOBSEN

The value of the icterus index in differentiating anemia. A. V. ST. GEORGE AND A. LINCOLN BROWN. *Arch. Internal Med.* 36, 847-56(1925).—The normal range of icterus index detd. by a modification of the Meulengracht method was 3.5 to 5.5 with an av.

of 4.4 for 120 cases. The index is above normal in hemolytic anemia, 8 to 12.5 in pernicious anemia, and below normal in secondary anemias. Besides these sp. diseases the index is increased in pneumonia, cardiac insufficiency and chronic sepsis especially in the biliary system and lowered in hemorrhage, especially slow const. bleeding. The index may serve as a prognostic in anemias and a guide for transfusions. M. J.

The concentration of the blood and the urine in diabetic toxemia. H. A. BULGER AND J. P. PETERS. *Arch. Internal Med.* 36, 857-73(1925).—The Na and Cl concn. of the urine is extremely low in diabetic toxemia with blood dehydration and increases rapidly on treatment along with the diln. of the blood. "There is no relationship between the changes in the blood and in the urine and none of the changes appears to be significantly affected by the presence or degree of hyperglucemia or glucosuria." The administration of large amts. of fluid and carbohydrates is recommended, the latter as a means of reducing not only ketosis but also toxic destruction of proteins.

MARY JACOBSEN
Hyperglucemia. I. The relative blood volumes in diabetes mellitus. L. E. FOSHAY. *Arch. Internal Med.* 36, 889-96(1925).—Young patients respond to hyperglucemia with tissue dehydration and anhydremia; old ones, especially those with advanced arteriosclerosis, exhibit blood diln. on account of the absence or only slight degree of polyuria. In severe acidosis there is always anhydremia. The severity of both conditions depends on the degree of hyperglucemia and the rate of onset. Insulin and diet tend to restore the normal water balance, while relapses are always attended by a return to the blood condition which has preceded treatment. II. Physical and chemical studies of human blood from cases of diabetes mellitus. *Ibid* 37, 18-31(1926); cf. *C. A.* 16, 2521; 17, 2139; 19, 2530, 3319.—In young patients hyperglucemia is attended by acidosis and increased erythrocyte vol.; in old arteriosclerotic diabetics these changes occur only in coma. The cond. chloride discrepancy of both types is present. The type with a higher cond. than that corresponding to the Cl concn. is permanent; the reverse type is transient. Most of the glucose is found in the serum, but with retreating hyperglucemia the concn. in the corpuscles may be greater on account of a lag in diffusion. The ratio of serum and corpuscle glucose is difficult to det. as it is easily upset by changes in concn. and distribution caused by insulin. The Cl concn. in the erythrocytes is not affected by their vol. increase. There is a loss of Cl in hyperglucemia, higher in the corpuscle than in the serum. In the dehydration of severe acidosis the corpuscular Cl may increase because of water transference and retention of Cl. There is no consistent relation between hyperglucemia and corpuscular Cl. M. J.

Liver injury in thyrotoxicosis as evidenced by decreased functional activity. I. B. YOUNG AND L. M. WARFIELD. *Arch. Internal Med.* 37, 1-17(1926).—Impairment of liver function was demonstrated by the usual tests in 21 out of 44 patients, decreased glucose tolerance in 21 out of 27. There was no apparent relation between liver function and any of the other features of the disease except the loss of wt. M. J.

Water metabolism. EDMUND ANDREWS. *Arch. Internal Med.* 37, 82-7(1926), cf. Fischer, *C. A.* 15, 1931.—The amt. of glucose soln. required to produce diuresis in the so-called dehydration fevers of dogs varies with the alk. reserve. Below an alkali reserve of 45 no water is excreted; above this value the water reserve which amts. to from 0 to 72 g./kg. increases about 10 cc. for each cc. of CO₂-combining power of the blood plasma. Various clinical phenomena find an explanation in the influence of the water reserve on water absorption and excretion.

MARY JACOBSEN
Glucose utilization in renal glucosuria. J. E. PAULLIN. *Arch. Internal Med.* 37, 88-91(1926).—It is concluded from the respiratory quotient and basal metabolism of a patient that metabolism and storage of carbohydrate in renal glucosuria are the same as in normal health.

MARY JACOBSEN
Blood-sugar curves in epidemic encephalitis. J. KASANIN AND G. P. GARFIELD. *Arch. Internal Med.* 37, 102-9(1926).—In 17 cases of encephalitis or postencephalitic conditions the sugar curves showed mostly deviation from normal, high curves being prevalent in adults, flat curves in children.

MARY JACOBSEN
The refractometric and viscometric indexes of cerebrospinal fluid. A. LEVINSON AND A. M. SERBY. *Arch. Internal Med.* 37, 144-50(1926).—The indexes, of which a no are given, betray only a marked increase in the protein content. Such a marked increase is usually indicative of a pathologic process of the nervous system such as meningitis, obstructive hydrocephalus and compression myelitis. Normal readings, however, do not exclude pathol. conditions. The readings do not change with the age of the fluid.

MARY JACOBSEN
The relation of albuminuria to protein requirements in nephritis. J. P. PETERS AND H. A. BULGER. *Arch. Internal Med.* 37, 153-85(1926).—Patients with acute and

chronic parenchymatous nephritis usually show evidence of previous protein deficiency which may be partly caused by faulty diet and to a large part probably by N wastage of the disease itself. "The N catabolism of these patients can be estd. from the non-protein N after proper allowance has been made for changes in blood tissue and non-protein N and variations in body weight due to diuresis and edema." Large amts. of fat and carbohydrate are able to reduce the N catabolism to from 0.5 to 0.7 g./kg. a day. N wastage may be prevented by administration of sufficient protein to cover not only the requirements of N catabolism but also the albumin loss in urine. Excess protein may be stored by patients to repair previous N deficiency. An abnormally high non-protein N in the blood occurred only in relatively high N catabolism and was restored to normal when the latter decreased.

MARY JACOBSEN

Gastric secretion in experimental beriberi in the dog. MARTHA BELLE FARNUM. *Arch. Internal Med.* 37, 212-6(1926).—The vol. and the free and total acidity of the gastric secretion of the dog and the response to *histamine*-HCl injection decreases gradually and substantially under a beriberi-producing diet. The gastric response to *gastrin* is hardly affected. The harmful effect of alkali in autoclaving food is due to the destruction of the antineuritic vitamin. The latter is not a gastric secretagog.

MARY JACOBSEN

The inorganic phosphorus and calcium of the blood in nephritis. H. W. SCHMITZ, E. L. ROHDENBURG AND V. C. MYERS. *Arch. Internal Med.* 37, 233-43(1926).—A blood serum Ca below 7 mg./100 cc. was found in relatively many cases of chronic interstitial nephritis with muscular twitchings and convulsions. No uniform reciprocal relation was found between inorg. P and Ca in different cases, although it may be observed in individual cases. As a rule high inorg. P is accompanied by low CO₂ capacity of the plasma. A few p_H detns. showed the acidosis to be of the uncompensated variety. Inorg. P retention is a reliable prognostic sign, but the creatinine is equally reliable and appears somewhat sooner.

MARY JACOBSEN

Intradermal salt solution test in cardiac diseases in children. H. C. OLMSTED. *Arch. Internal Med.* 37, 281-90(1926).—The disappearance time is shortened in the edematous regions in decompensated heart diseases, but not constantly enough to serve as a prognostic sign. In toxic cases without decompensation a shortened time of disappearance gives an unfavorable prognosis. Equal time of disappearance in life and after death was found in 2 cases, showing that circulation is not necessarily involved in the phenomenon.

MARY JACOBSEN

Excretion of phenolsulfonephthalein in obstructive jaundice. H. A. ABRAMSON. *Arch. Internal Med.* 37, 291-6(1926).—In 15 cases of uncomplicated obstructive jaundice the excretion of phenolsulfonephthalein was normal. Since the convoluted tubules are chiefly affected in jaundice, while the glomeruli are not influenced, this finding supports the view that excretion takes place through the glomeruli. Cases with an apparently normal kidney function in which jaundice causes uremia suggest the presence of a latent kidney lesion increased beyond the breaking point by the additional injury of jaundice. The mode of action of the latter is still obscure.

MARY JACOBSEN

Guanidine poisoning and the tetany of pregnancy. LUIGI DI FAZIO. *Arch. ostetr. ginecol.* 11, 337-48(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 30, 814(1925).—Gravid guinea pigs died after the smallest dose of guanidine (injected), which is possibly the cause of tetany of pregnancy. Obduction showed no difference between pregnant and non-pregnant animals.

MARY JACOBSEN

Glycolytic properties of cancer cells. N. WATERMAN. *Bull. assoc. franç. pour l'étude de cancer* 13, 396-409(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 29, 384(1925); cf. C. A. 19, 1737.—Warburg's and Minami's results are confirmed. There is an antagonism between O consumption and glycolysis in normal as well as in cancer cells. The kidney has the highest O consumption and the lowest glycolytic power. The latter is reduced by Ca. Hexosephosphoric acid is attacked by the kidney with lactic acid formation. The presence of insulin in cancer tissue could not be ascertained. Tumor tissues often, although not constantly, yielded an ext. which, without having any glycolytic effect itself, increased the glycolytic action of the kidney.

M. J.

Influence of temperature on the production of experimental tar carcinoma in the mouse. E. DEROM. *Bull. assoc. franç. cancer* 13, 422-62(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 30, 863(1925).—Heating the tar to 70° and repeated short application of metal plates heated to 50° previous to painting with tar of 70° promoted formation of cancer. It was retarded if the temp. of the plates was 60-70°. Neither the above heat application alone nor tincture of I produced carcinoma. The malignant skin carcinomas were partly of the spindle-cell type and showed infiltrative growth and ulceration, partly metastase formation in the lymph glands.

MARY JACOBSEN

Phlorhizin glucosuria. C. ALEXANDRESCU-DERSCA, V. CIOLTEAU AND L. ADLERSBERG. *Bull. mém. soc. méd. hôp. Bucarest* 6, 147-52(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 29, 619-20.—Tests in 30 cases with intact kidneys and exactly known condition of the liver partly support Teissier's hepatic theory of phlorhizin action. Although always modified in diffuse lesions of the liver the test does not permit a prognosis. The abnormal urinary urea quotient seems to be the only reliable indication of diffuse liver lesions. Hay's test is also characteristic although not always positive in liver diseases. The urobilin content cannot serve as a diagnostic means.

MARY JACOBSEN

Inorganic metabolism in tetany. J. G. F. DE GEUS. *Dissertation*, Leiden, 1924; *Ber. ges. Physiol. exptl. Pharmacol.* 30, 895(1925).—Tetany is not caused by alkalosis as such, nor is it influenced by the PO_4 ion. It always occurs, when Ca is lower than 8 mg./100 cc.; above this Ca level it occurs only in the presence of a Na excess.

M. J.

The determination of urobilin in urine and feces and the role of the liver in urobilin secretion. J. G. F. VAN SPENGLER. *Dissertation*, Leiden, 1924; *Ber. ges. Physiol. exptl. Pharmacol.* 29, 625.—Schlesinger's method was modified. Adler's method was used for the detn. of urobilin in urine and a modification of it for the feces. *Conclusions*—The higher urobilin content of the portal blood of young calves and rabbits as compared with other areas is in favor of intestinal urobilin formation. It may, however, be also formed elsewhere. Theoretically any abnormally high urobilin content in the urine must be considered as a sign of hepatic disease or insufficiency. Normally the urobilin content of urine (I) is 3 mg./24 hrs., that of the feces (II) 100 to 150 mg., I/II never over 0.02. In hemolytic processes (pernicious anemia, hemolytic icterus) both I and II are increased and I/II often remains unchanged. The urobilinuria of cardiac obstruction and hepatic cirrhosis must also often be considered as a symptom of relative liver insufficiency.

MARY JACOBSEN

Glucolysis. P. B. VAN STEENIS. *Dissertation*, Utrecht, 1924; *Ber. ges. Physiol. exptl. Pharmacol.* 30, 910(1925).—A study of glucolysis in normal and diabetic blood *in vitro*.

MARY JACOBSEN

The action of bile and its chief components on the contraction of uterine muscle fiber. GIUSEPPE DELLEPIANE. *Folia gynaecol.* 19, 217-39(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 29, 457.—In view of the tendency of icteric women to abortion and atonic hemorrhages the effect of bile and its constituents was tested by the Magnus-Kehrer method on the surviving isolated muscle fibers of gravid and non-gravid uterus of rabbits, cats and guinea pigs. *Na glyco- and taurocholate* and *taurine* had in small doses a stimulating, in large doses a depressing, effect on the tonus and the individual contractions. *Cholesterol* and *glycocholic acid* had a depressing effect. The action of whole bile of the same as well as of another species varied greatly, apparently because of the varying proportions of the individual constituents. Large doses of bile (1.5% of the Ringer-Locke solu.) always paralyzed uterine contractions.

M. J.

Certain histological changes in the ovary as a result of lipid feeding. DOMENICO FERACCIU. *Folia gynaecol.* 19, 241-8(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 152.—Ten injections of 0.3 to 0.35 g. *cholesterol* produced in the ovaries of rabbits the same changes as placenta exts. or gravidity: increase of interstitial tissue and diminished no. of follicles.

MARY JACOBSEN

The mechanism of phlorhizin glucosuria. H. SHIOYA. *Hokkaido Igaku Zasshi* 3, 49-66(1925).—Phlorhizin does not cause hyperglucemia. Unlike normal animals, venous and arterial blood have the same glucose content. Diuresis is produced in spite of the reduced quantity of circulating blood. More sugar is excreted than is split off by the ingested phlorhizin. Phlorhizin does not influence the respiratory exchange, but it considerably increases the gas metabolism of the kidneys. This increase is apparently not a secondary effect of glucosuria or diuresis, since glucose glucosuria and ovalbumin albuminuria do not affect the metabolism of the kidneys. The conclusion is reached that the permeability of the kidneys to glucose is increased as a result of the augmented metabolism and that an unknown metabolite causes glucosuria.

M. J.

Abderhalden's reaction and its dependence on digestive enzymes. F. VENULET. *Medycyna doswiadczalna* 2, 350-7(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 29, 465.—Only the micro-Kjeldahl gives exact results. In the rabbit degradation of muscle and kidney tissue during the periodic action of the digestive glands was established. It is therefore always necessary to consider the physiol. condition of the digestive glands, especially of the pancreas. Expts. on rabbits with ligated kidney vessels demonstrated the occurrence of isolated degradation of kidney tissue.

MARY JACOBSEN

The hemolysins in the colostrum of woman. MASASHI NAKAMURA. *Mitt. med.*

Fak. Kais. Univ. Tokyo 32, 317-34(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 325.—Colostrum hemolyzes only after the addn. of complement. The hemolytic effect is subject to individual variations. It is more pronounced in early colostrum and somewhat lessened by inactivation. Addn. of hemolytic immune serum reveals the presence of a hemolytic complement, the quantity of which is also subject to individual and daily variations.

MARY JACOBSEN

The distribution of bilirubin in the various vascular areas and its relation to the pathogenesis of icterus. CARLO GAMNA AND ATTILIO OMODEI. *Pathologica* 16, 121-4 (1924); *Ber. ges. Physiol. exptl. Pharmacol.* 29, 248.—The role of the liver is by no means established. In heart diseases, in 30% of infectious diseases and in atrophic cirrhosis the bilirubinemia was more pronounced in the liver venous blood than in other areas. In the liver diseases studied (cirrhosis without icterus, CHCl_3 poisoning, acute yellow atrophy) no significant differences were observed. In chronic infectious diseases, in tumors outside the bile ducts and in endocrine disturbances bilirubinemia was often absent.

MARY JACOBSEN

The sedimentation velocity of erythrocytes and the diagnosis of latent or active tuberculosis. FILIPPO D'ASARO. *Pediatria (Riv.)* 34, 57-70(1926).—In tuberculous children in the 1st and 2nd stage, free from other infections, the sedimentation velocity is not influenced by the Pirquet test or by the subcutaneous injection of foreign protein, but changes from 5 to 30 mm. after the subcutaneous injection of 1 mg. Koch tuberculin. The degree of the increase and the rate at which the normal velocity is reestablished afford a conclusion as to the latency or impending activity of the process. M. J.

Agglutinins in the blood following typhoid vaccination in children. LUIGI AURICCHIO. *Pediatria (Riv.)* 34, 113-8(1926).—Typhoid vaccination with the therapeutic dose of Wright vaccine causes appearance of sp. agglutinins in the circulation and may therefore lead to diagnostic errors when the agglutinin reaction is used. The "lysed" serum of Caronia and Cristina and Ceutanni's stomosines do not cause this reaction.

MARY JACOBSEN

The increase of the diastatic power of urine as a diagnostic means in acute diseases of the pancreas. CARL PERMIN. *Rev. chirurg.* 43, 341-55(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 114.—In a case of pancreatic suppuration and in exptl. lesions in dogs and rabbits a marked increase in the diastatic power of the urine was observed.

MARY JACOBSEN

Cholesterol in blood and duodenal fluid during pregnancy. DOMENICO FERRACCIU. *Riv. ital. ginecol.* 3, 5-16(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 416(1925).—In normal women the mean cholesterol content of blood is 0.151% (Grigaut), that of duodenal fluid (linhorn tube) is 0.072. In 13 pregnant women in the last 3 months the former was 0.220%, the bile cholesterol 0.062%. The latter rose mostly, although not always, during the puerperium.

MARY JACOBSEN

Protein concentration in puerperal serum. II. GIOVANNI ALBANO. *Riv. ital. ginecol.* 3, 35-63(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 438(1925).—In 81 pregnant women the protein content (n) of the blood serum, esp. of retroplacental blood, was found to be lowered. It rose during delivery and returned to normal rapidly during the puerperium. The serum protein of fetus and newborn is much lower than the maternal. Anemias have the same effect, while extragenital tuberculosis causes a rise in serum proteins. Syphilis has no effect.

MARY JACOBSEN

Lipolytic enzymes in the serum of pregnant women. FIORENZO CLAUSER. *Riv. ital. ginecol.* 3, 83-105(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 436(1925).—The lipase is strongly reduced in content, but more resistant to atoxyl than that of normal serum. This suggests diffusion of considerable quantities of liver lipase into the blood. The presence of kidney lipase is excluded by its sensitiveness to poisons, that of placental lipase by its selective action on various substrates. No conclusion is afforded as to a possible liver injury, since no liver lipase was found in the serum in a case of eclampsia. The reduced lipolytic power may be caused by hypercholesterolemia.

MARY JACOBSEN

Experimental production of Röntgen carcinoma in the rabbit. General remarks on the origin of experimental carcinoma. BR. BLOCH. *Schweiz. med. Wochschr.* 54, 857-65(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 859(1925).—B. succeeded in producing a true, malignant metastasizing carcinoma on the ear of the rabbit by frequent irradiations over a long period of time.

MARY JACOBSEN

Local acidosis in primarily healing wounds. S. GIRGOLAFF. *Z. Chirurg.* 51, 2297-300(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 30, 30.—The p_H in noninfected, primarily healing wounds is lower than in normal tissue. The min. 6.32 is reached in 24 hrs.

MARY JACOBSEN

Indicanuria as a symptom of fistula gastrocolica. HERMANN STEINITZ. *Arch. Verdauungs-krankh.* 36, 29-33(1926).—Discussion. FRANCES KRASNOW

The occurrence of paralysis after treatment with antirabic vaccine. J. W. CORNWALL AND W. A. BEER. *Indian J. Med. Research* 13, 67-74(1926).—"The fresh normal nerve substance is toxic to both rabbits and men when injected subcutaneously. The toxic dose varies widely with the individual, some showing paralysis after less than 20 mg. per kg. body wt., others tolerating over 1 g. per kg. without inconvenience. The action of the phenol renders the nerve substance slightly less toxic. In antirabic treatment it is desirable to be able to increase the dose of the antigen. This could be done either by sepg. the antigen from its toxic vehicle (nerve tissue) or by neutralizing the toxicity of the vehicle. The latter alternative seems the more practicable." F. K.

The rate of multiplication of rabies fixed-virus in rabbits. J. W. CORNWALL AND W. A. BEER. *Indian J. Med. Research* 13, 475-82(1926).—"The strain of fixed-virus in use at the Pasteur Inst. Coonoor is in its 940th passage. If this virus be subpassaged in rabbits, each subpassage animal being killed on the 3rd day, the series cannot be continued beyond the 2nd subpassage. If each subpassage animal be killed on the 4th day or later, the series can be continued indefinitely with no increase in the length of the incubation period. The rabies fixed-virus, therefore, does not multiply at such a rate that 0.01 g. of brain substance can carry a lethal dose of it after 2 subpassages performed on the 3rd day, but 0.01 g. will always contain a lethal dose if the subpassages be made on the 4th day or later." FRANCES KRASNOW

Relation between different modes of sterilization of vaccine and protective power. K. R. K. IYENGAR. *Indian J. Med. Research* 13, 547-54(1926).—"Vaccines sterilized by heat at 40° and 60° for 1/2 hr. with subsequent addn. of 0.5% carbolic acid protected as efficiently as the vaccines sterilized by carbolic acid only. The no. of survivals were 26 out of 40 pigeons prophylactically treated with each of the vaccines. Vaccines heated at 80° for 1/2 hr. with subsequent addn. of 0.5% carbolic acid showed considerable loss of protective power. The no. of survivals were 8 out of 40 pigeons prophylactically treated. There is no direct correlation between agglutinins and protection." FRANCES KRASNOW

Anthrax aggressin. C. F. SALSBERY. *J. Am. Vet. Med. Assoc.* 68, 755-72(1926). Aggressin produces active immunity. Anti-aggressive serum may be produced by the gradual immunization with aggressins. This antiaggressive immunity may be passively transferred. FRANCES KRASNOW

The nature of the change of the blood in syphilis and its demonstration by means of alcoholic extracts of the spirochetes. F. KLOPSTOCK. *Deut. med. Wochschr.* 52, 226-9(1926).—Alc. exts. of the spirochetes of syphilis gave high sp. complement-fixation reactions with syphilitic sera; they paralleled the Wassermann test but were more sensitive. Aq. exts. with lecithin added were much less reliable as antigen. No useful results were obtained with exts. freed from their lipid content, for which lecithin was substituted. The various methods tried in prepg. the ext. are discussed. Exts. of *Spirocheta dentium* gave equally as good antigen as the *Treponema pallidum*. Injection of rabbits with suspensions of heat-killed spirochetes led to a rapid development of antibodies that reacted both with the Wassermann antigen and the alc. spirochetal exts. The latter antigen has the advantage of not reacting with normal rabbit serum in complement fixation. The Wassermann reaction is considered to be a true immune reaction, being an extension of antibody formation from spirochetal lipoids to organ lipoids. LOUIS LEITER

Total acid-base equilibrium of plasma in health and disease. VII. Factors causing acidosis in chronic nephritis. H. A. BULGER, J. P. PETERS, A. J. EISENMANN AND C. LEE. *J. Clin. Invest.* 2, 213-26(1926).—"The acidosis of chronic nephritis is caused chiefly by a reduction of total base and an increase of undetd. acids, phosphate being less important. Low plasma chloride helps to prevent reduction of plasma bicarbonate and counteracts acidosis. LOUIS LEITER

The excretion of ammonia and titratable acid in nephritis. D. D. VAN SLAKE, G. C. LINDER, A. HILLER, L. LEITER AND J. F. MCINTOSH. *J. Clin. Invest.* 2, 255-88(1926).—"In 11 normal subjects the NH_4 /acid ratio averaged between 1.0 and 2.0, with considerable variation from the mean. The mean ratios were 1.0-2.9 in nephrosis (6 cases), 0.8-1.6 in benign nephrosclerosis (5 cases), 0.6-1.5 in acute glomerulonephritis (8 cases), 0.4-0.9 in mild cases of chronic glomerulonephritis and below 0.5 in cases of chronic glomerulonephritis and malignant nephrosclerosis where renal function was considerably impaired. The ratio in the last group showed fixation as contrasted with normal variability. The low ratios were due to diminished NH_4 excretion. The danger of acidosis is increased when acid-producing diuretics are used in patients with a

diminished NH_3 excretion. Blood NH_3 N varied between 0 and 0.09 mg. per 100 cc. in nephritic patients, including the terminal stages, indicating no retention of NH_3 in the blood. The NH_3 /acid ratio does not regularly parallel the urea concg. power.

LOUIS LEITER

Antigenic properties of certain glucoproteins. KENNETH GOODNER. *J. Infectious Diseases* 37, 285-90(1925).—Glucoproteins from beef submaxillary glands, hog stomach linings, beef nasal septums, beef tendons and egg-white (ovomucoid and ovoglobulin) were compared by means of the precipitin test as to their immunological relationship. Although these substances proved to be poor antigens as far as the production of precipitins is concerned, results are presented to show that there is no antigenic action in common with each other or with serum (beef) except with ovomucoid and ovoglobulin which do show a certain amt. of relationship.

JULIAN H. LEWIS

Toxic products of Bacterium enteritidis and of related microorganisms. SARAH E. BRANHAM. *J. Infectious Diseases* 37, 291-308(1925).—These expts. were designed to det. the nature of the substance responsible for the toxic action of the filtrate of cultures of organisms of the paratyphoid group, with *B. enteritidis* as a representative. These filtrates are toxic for rabbits and mice, but not for guinea pigs, when injected intravenously but are apparently harmless when given by other routes. Symptoms appear within 40 to 45 min. and last from $\frac{1}{2}$ to 1 hr. after which there is death or slow recovery. Toxicity of the cultures appears after the no. of living cells has reached its max. and has begun to decrease. The toxic properties are demonstrable not only in filtrates of fluid cultures, but in autolysates, and with dead and living cells. The results appear to indicate the poison demonstrated in these expts. is within the bacterial cells, is set free on cell disintegration and is thermostable, although it is able to produce an antiserum in rabbits when injected in dilns. in which no protein could be demonstrated.

JULIAN H. LEWIS

The protective substance in antipneumococcus serum. II. Effect of certain chemical manipulations on the stability of the protective substance in Type 1 antipneumococcus serum. L. D. FELTON. *J. Infectious Diseases* 37, 309-20(1925).—The protective H_2O -insol. globulin contained in type 1 antipneumococcus serum loses its protective power when the process of dissolving in NaCl and pptg. by diln. in H_2O in alternation is often repeated. There is a loss in N content of the pptd. globulin and this bears some relation to the loss in protective power. There is an almost complete loss of P, but as the P-free globulin has some protective power it is assumed that the protective substance has no or an extremely small P content. When the protective globulin is dissolved and repptd., resp., by dil. HCl and by NaOH it maintains its protective power for at least 10 pptns. provided it does not become insol. in neutral salts. Fractional pptn. at various H-ion concns. in HCl-NaOH mixts. yields variable results, probably due in part to long-continued shaking at room temp., but in the main the greater part of the protective substance is pptd. at a H-ion concn. of between p_{H} 6 and 7.

JULIAN H. LEWIS

Quantitative relations between antigen and antibody in the precipitin reaction. H. W. CROMWELL. *J. Infectious Diseases* 37, 321-8(1925).—When 2 or more sp. pptg. serums are tested against the same lot of antigen, they all react with the same diln. of the antigen regardless of the strength of the serums, provided a simple antigen is used. The detn. of the point of disappearance of a recognizable ppt. on increasing the diln. of the antigen does not, therefore, give direct evidence as to the strength of the antiserum. The point of max. pptn. when a single diln. of the antiserum is tested against the various antigen dilns. represents an approx. equal no. of units of antigen and antibody. On the basis of this fact one can calc. the antibody content of the serum with considerable accuracy when, by test, the antigen titer and point of max. pptn. have been detd. with 1 diln. of the serum. These exact quant. relations do not obtain when a complex antigen-like serum is used. The antigen titer is not const. but varies in a general way with the antibody titer of the serum. The max. ppt. occupies a whole zone in which it is often impossible to pick out 1 tube showing heavier flocculation than the others. It is not possible, therefore, to make calcs. that would agree even approx. with exptl. results. The neutralization of antigen by its sp. antibody in the precipitin reaction seems, like the toxin-antitoxin reaction, to follow the law of multiple proportion. J. H. L.

Standardization of tuberculin. Assay on the basis of the spermatocyte reaction. E. R. LONG. *J. Infectious Diseases* 37, 368-84(1925).—A review of the literature points out the unsatisfactory features of the heretofore used methods for standardization of tuberculin which can be grouped under 2 heads, those based on the interaction of tuberculin and serum antibodies in the serum of tuberculous animals and those based on the action of tuberculin on the hypersensitive tuberculous animal. L. proposes a new

method based on his observations of the spermatocidal action of tuberculin when injected into the testicles of tuberculous guinea pigs. The chief advantages of this method are the abs. specificity of the reaction, the great delicacy of the reaction, the sharp picture presented by the positive reaction, the constancy of the reaction (as compared, *e. g.*, with the variable skin reaction), and the ease with which a permanent record of the reaction may be preserved. The chief disadvantages are the length of time desirable before reading the reaction (3-4 weeks) and the necessity of cutting, staining and examining the section.

JULIAN H. LEWIS

Relationship of enteritidis-paratyphoid B infections to hyperglucemia in rabbits. MAUD L. MENTEN AND HELEN M. MANNING. *J. Infectious Diseases* 37, 400-10(1925)

Rabbits subjected to adverse environmental conditions develop hyperglucemia. Coincident with a marked hyperglucemia, cultures of organisms of the enteritidis-paratyphoid B group may be recovered from organs of rabbits, which likewise show characteristic morphologic changes. Similar pathologic conditions can be produced by the injection of killed or living organisms of this group. When the hyperglucemia is of long standing hydropic degeneration of the islets of Langerhans is present.

JULIAN H. LEWIS

Effects of diphtheria toxin on the myocardium of guinea pigs. C. W. APPELBACH. *J. Infectious Diseases* 37, 443-8(1925).—The changes in the myocardium of guinea pigs after injection of diphtheria toxin subcutaneously resemble the changes described in the myocardium in human diphtheria, but they are in general not as extensive. By direct injection of the myocardium, extensive degenerative and inflammatory changes can be produced in the guinea pig equal in intensity to those found in human diphtheria. The outstanding changes are retrogressive (cloudy, swelling, fatty change and necrosis). Infiltration of leucocytes with degenerative changes occur, but in the myocardium of guinea pigs degeneration, proliferation and exudation were not commonly observed together in the same regions. The degenerative changes in the skeletal muscles, liver and kidneys, as represented by the amt. of fat that can be stained with Sudan III, are less than those in the myocardium.

JULIAN H. LEWIS

The isolation of substances with immune properties. ARTHUR LOCKE AND E. F. HIRSCH. *J. Infectious Diseases* 37, 449-64(1925).—A method is given for the prepn of a highly purified hemolysin. Hemolysin is sepd. from amboceptor serum by selective absorption on homologous erythrocytes. It is recovered through a destruction of the combining capacity of the erythrocyte for the bound hemolysin. This is accomplished by means of ether extn. This procedure permits hemolysin to be obtained in good yield and of a purity such that but 0.000,125 to 0.000,18 mg. of protein are associated with each hemolytic unit. It is demonstrated that the failure of certain reported preps. of hemolysin to give a positive chem. test for the presence of protein is due to the lack of a sufficient delicacy in the tests employed. Qual. tests are proposed which, under restricted conditions, permit the detection of protein in concns. as low as 0.006 to 0.035 mg. per cc. The stroma-hemolysin combination is loosened and made easily dissociable when the lipins of the stroma are partially removed by ether extn. This behavior is correlated with the shifting of the isoelec. point of the stroma from p_H 5 to p_H 7, approx., when the lipins are so removed. It is suggested that while lipin free stroma protein may be antigenic in the production of hemagglutinin, the antigenic entity in the production of hemolysin is probably the entire lipoprotein complex. When erythrocytes are added to an homologous immune serum, the hemolysin of the serum becomes redistributed between the added cells and some component of the serum. This component is not present in normal serum. It is probably derived from the disintegration of the erythrocytes used in immunization. It is suggested that the appearance of antibodies in the blood plasma follows the disintegration, by lysis and phagocytosis, of antigen already satd. with antibody by a primary process.

J. H. LEWIS

Studies on respiratory diseases. XXI. Electrophoretic potential and virulence of pneumococci (Types 1, 2, 3, and 4). I. S. FALK, H. A. GUSSIN AND M. A. JACOBSON. *J. Infectious Diseases* 37, 481-94(1925).—A specially constructed app. was used to measure the electrophoretic potential of 76 strains of the 4 types of pneumococci isolated from cases of lobar pneumonia. The results of the measurements are expressed in electrophoretic velocities (μ /sec.) of the migrating bacteria. These velocities can be converted into potentials in millivolts by multiplying by 1.3. It appears that the electrophoretic potentials are different from the several types, the highest being 11 μ /sec., uniformly found on type 3 organisms which is 2 or 3 times as high as those found on organisms of the other types. The potentials on types 1, 2 and 4 are not as sharply marked off as those on type 3. The most probable sequence of decreasing potential is types 3, 1, 2, 4. The sequence of decreasing virulence of these organisms is identical with the sequence of decreasing electrophoretic potential. This finding is discussed.

especially in the light of anticipations that this would be found, anticipations based on the commonly found parallelisms (direct or inverse) between virulence, agglutinability and other characteristics of bacteria and on considerations of the role of the electrophoretic potential in the phenomenon of agglutination. **XXII. Some relations between fatality in lobar pneumonia and electrophoretic potentials on pneumococci.** I. S. FALK, M. A. JACOBSON AND H. A. GUSSIN. *Ibid* 495 8.—Just as the sequence of decreasing virulence is the same as the sequence of decreasing electrophoretic virulence (types 3, 1, 2 and 4) so is also the sequence of decreasing fatality rate in lobar pneumonia with these organisms. As was anticipated, organisms from fatal cases of pneumonia show larger potentials than organisms from non-fatal cases, a fact which might be used to determine the prognosis in lobar pneumonia. **XXIII. Electrophoretic potential and virulence of variants of type 1 pneumococci.** *Ibid* 499–506.—The electrophoretic potentials of 2 variant strains (B and C) derived from a parent strain of type 1 pneumococcus (A) parallel the virulence of these organisms, the sequence of decreasing virulence as well as for decreasing potential being strains A, B, C. An addendum gives the measurements of the relative viscosities of the cultures of pneumococci A, B and C in order to determine whether or not the velocities which are given in the tables and which are treated as linear functions of electrophoretic potentials are due to different alterations in viscosity produced by the different strains. The values found are practically identical and indicate that viscosity variations do not explain the electrophoretic potential differences. **XXIV. Electrophoretic potential, virulence and serum agglutination with single cell cultures of variants of type 1 pneumococci.** I. S. FALK AND M. A. JACOBSON *Ibid* 507–13.—Of a total of 15 single cell strains isolated from Blake and Trask's A, B and C cultures of pneumococci (A = type 1; B and C are variant strains obtained from A by growth in the presence of homologous antiserum) one (A1) showed evidences of contamination. Expts. with the remaining 14 (5 from A, 5 from B, 4 from C) and with the parent strains demonstrate that each of the single cell strains is indistinguishable from the parent strain from which it was derived with respect to electrophoretic potential, virulence for white mice and serum agglutination. The parent strains have been carried in stock on blood agar slants through a large no. of generations and up to the present time there have been no evidences of spontaneous changes or in the single cell strains. So far as concerns the characteristics studied, each breeds true. **XXV. The influence of certain electrolytes and nonelectrolytes on the bile solubility of pneumococci.** I. S. FALK AND S. Y. YANG. *Ibid* 38, 1–7 (1926).—An analysis of the mechanism of the action of bile on pneumococci is made. As pneumococci washed with H_2O are no longer sol. in bile a study of the influence of salts on their soly. was made. Chlorides with monovalent cations (Na, K, NH_4 , Li) in relatively low concns. inhibit soln. of washed pneumococci in bile. In higher concns. these chlorides do not inhibit and may accelerate the dissolution of the bacteria. Chlorides with bivalent cations (Ca, Ba) behave differently. They inhibit bile soln. of pneumococci more effectively in high than in low concns. Of the anion series tested, NaOH and Na_3PO_4 are cytolytic to pneumococci; Na_2HPO_4 , NaH_2PO_4 , Na_2SO_4 and $NaNO_3$ are not cytolytic. Cytolysis by NaOH and Na_3PO_4 appears to be a function of OH-ion concn. Peptone, gelatin and ovalbumin appear to inhibit cytotoxicity by bile in the same manner as $CaCl_2$ and $BaCl_2$. The inhibitory action increases with concn. **XXVI. The lysis of pneumococci by sodium oleate.** *Ibid* 8–13. Since bile is a substance of complex and inconstant composition a more simple compd. was tested which has the property of lowering surface tension. As Na oleate has been previously used for differentiating pneumococci its action was compared with that of bile. In concns. of 1.25% and higher, pure solns. of Na oleate in H_2O are bacteriolytic to washed suspensions of pneumococci of types 1, 2 and 3. It dissolves pneumococci only of those strains which are dissolved by bile. NaCl soln. and broth culture fluid inhibit bacteriolysis of pneumococci by Na oleate and by bile. Saponin in concns. up to 10% do not dissolve pneumococci. The bacteriolysis of pneumococci by NaOH, Na_3PO_4 (reported above) and Na oleate is as sp. as bile soly., in that they do not dissolve bile-insol. pneumococci and other strains of bacteria. **XXVII. Electrophoretic potential, acid and serum agglutination of pneumococci.** I. S. FALK AND M. A. JACOBSON. *Ibid* 182–7.—For pneumococci, as has already been found for other bacteria, with increasing acidity the p. d. between bacteria and menstruum declines from negative values to an isoelec. point, then to an increasing positive value and, near p_H 0, to a 2nd isopotential point. The isoelec. points of the pneumococci of types 1, 2, 3 and 4 and of variants (B and C) of type 1 (A) are near p_H 3 and are not significantly type sp. The p. d. for pneumococci is correlated with the inagglutinability by acid. In general, it is found that the higher the p. d. at p_H 6.5, the lower the p_H necessary to cause spontaneous agglutination. The p. d. values for the variant types can be changed relatively by wash-

ing the bacteria. An inversion of the relative potentials on variants A, B and C accompanied by an inversion in their agglutinability by acid. Type-sp., homologous and heterologous antipneumococcus serum reduces the negative p. d.; the greater effectiveness of the homologous serum in this regard parallels its greater effectiveness in agglutinating the bacteria. The correlation between potential and inagglutinability is further evidenced by the inversion of the relative stability of suspensions (A, B, C) when tested with agglutinating serum after they have been washed sufficiently to invert the relative magnitudes of the potentials. Studies on respiratory diseases. XXVIII. The electrophoretic potentials, the dissolution and the serum agglutination of pneumococci in the presence of sodium oleate. *Ibid* 188-92.—Bile is practically without effect on electrophoretic potential. Na oleate effects significant increases in the potentials on pneumococci. From this finding it was anticipated that Na oleate would increase the stability of pneumococcus suspensions and would reduce the titers for serum agglutinations. These anticipations were confirmed by expt. These results provide a further confirmation of the view that the agglutinability of pneumococci is correlated with the electrophoretic potential. The finding that the variant strains of pneumococci (A, B and C) which show marked differences in virulence for mice are equally sol. in bile or Na oleate soln. is contradictory to the usual statement that virulence and soly. are parallel characteristics.

JULIAN H. LEWIS

The effect of hydrogen-ion concentration on certain antigenic properties of *Clostridium botulinum*. I. S. FALK AND F. POWDERMAKER. *J. Infectious Diseases* 37, 514-9(1925).—The antigenic properties of a pure protein can be modified by effecting reversible changes in such of its physicochem. properties as are functions of the p_H of the protein solns. (C. A. 7, 3712). The present paper attempts to extend these observations to *Cl. botulinum* as an antigen. The addn. of acid (to p_H 2) or of alkali (to p_H 10) to a suspension of these organisms before injection into rabbits or the sep. injection into the peritoneal cavity of an equiv. quantity of acid or alkali causes an increase in the agglutinating titer of an anti-A serum for type A organisms, a reduction in the titer of an anti-B serum for type B organisms and a reduction in the titer of an anti-A or an anti-B serum for the heterologous type of organism.

JULIAN H. LEWIS

Detoxication of bacterial vaccines by formaldehyde. W. B. WHERRY AND J. A. BOWEN. *J. Infectious Diseases* 37, 520-2(1925).—The treatment of *B. dysenteriae*, Shiga and typhoid bacilli for 1 week with solns. contg. 0.04% CH_2O detoxicates the organisms without affecting their antigenic properties.

JULIAN H. LEWIS

Separation of a soluble specific substance from hemolytic streptococci. E. F. HIRSCH. *J. Infectious Diseases* 37, 523-7(1925).—A sol. sp. substance was extd. from hemolytic streptococci with dil. alkali. The chem. reactions of this substance, apparently a nucleoprotein, resembled those of similar substances prepd. from many bacteria by other investigators. Solns. of this substance give precipitin reaction in high diln. with antistreptococcus serums, and with the serum of rabbits injected with the substance.

JULIAN H. LEWIS

Nature of the toxic substances produced by *Bacillus suispestifer*. E. E. ECKER AND M. L. RICHARDSON. *J. Infectious Diseases* 37, 538-45(1925).—Young culture of *B. suispestifer* grown in 2% Witte peptone broth p_H 7, on solid media, and in a simple synthetic medium, produce a poison of unknown nature, which upon intravenous injection into rabbits causes a characteristic series of acute changes after a definite incubation period of at least 40 min. This substance appears to have some antigenic properties, but comparatively large doses of immune serum (5 cc.) are necessary to afford protection to rabbits. When the serum is given immediately (in 10-15 min.) prior to the dose of the poison itself, protection is afforded.

JULIAN H. LEWIS

Production of toxic substances in young cultures of single cell strains of *B. paratyphosus* B. E. E. ECKER AND EMERSON MAGRAIL. *J. Infectious Diseases* 37, 545-8(1925).—It was previously shown that filtrates of young cultures of *B. paratyphosus* were inconstant in their toxicity. The present expts. show that filtrates of young single cell cultures of *B. paratyphosus* B were just as toxic as the original parent cultures, but that boiling for 3 min. did not reduce the toxicity of the single cell cultures but did reduce the toxicity of the original cultures. No differences in cultural characteristics were noted between the single cell and parent strains.

JULIAN H. LEWIS

Antibody response to large and small doses of multiple and of single antigens, and restimulation of specific antibody formation by heterologous antigens. MARION CORRIGAN. *J. Infectious Diseases* 37, 549-58(1925).—A review of the literature disclosed a disagreement as to the most effective method for inducing the highest titer with bacterial antigens. The present expts. show that polyvalent bacillary antigens in large or in small doses induced practically as high an agglutinin titer for each of their

constituent organisms as did monovalent bacillary antigens. Polyvalent streptococcic antigens produced a lower titer than did monovalent streptococcic antigens. It was observed that small doses of polyvalent streptococcic antigen were more effective than large doses in the production of agglutinins. The reinjection into formerly immunized animals retaining no antibodies in the blood caused a slight recurrence of antibodies for the original antigen accompanied by a normal production of antibodies for the bacteria used in the reinjection. The recurrence of antibodies seemed to be independent of the variety of bacteria subsequently injected. The results of the reinjection into animals retaining antibodies in the blood varied. Reinjection in some cases caused a rise in the titer of the original antibodies, and on 1 occasion did not hinder the normal decreases of the original antibodies. Again, the reformation of the original antibodies did not depend on the variety of bacteria subsequently injected. The titer of the antibodies for the organism used in reinjection was comparable to that induced by injection into normal rabbits.

JULIAN H. LEWIS

An atypical Weil-Felix reaction. RUTH GILBERT AND MARION COLEMAN. *J. Infectious Diseases* 37, 559-62(1925).—A case is described in which no definite diagnosis was made, the following diseases being, in turn, considered and rejected: grippe, typhoid, Brill's disease, tick-bite fever, Rocky Mountain fever. Both before and after inactivation by heating at 62° the patient's serum agglutinated *B. proteus* × 19 in dilns. up to 1:1600, whereas serum from cases known to be typhus fever lost the agglutinins for *B. proteus* × 19 at a point between 54° and 56°. In immune rabbit serum the agglutinins were not destroyed until between 70° and 75° was reached. These results indicate the desirability of detg. the relative thermostability of the agglutinins in serum from suspected cases of typhus fever.

JULIAN H. LEWIS

Further studies on a diplococcus from measles. Prevention of measles by immune goat serum. RUTH TUNNICLIFF AND A. L. HOYNE. *J. Infectious Diseases* 38, 48-53 (1926).—As a further step in studying the etiologic significance of the organisms isolated from measles by Tunncliffe (*J. Infectious Diseases* 37, 193(1925)) the production of an immune serum was attempted. The goat was used in order to prevent in children sensitization to horse serum, and because of the reported nontoxicity of goat serum. Immune goat serum obtained by injecting the living green-producing measles diplococcus protected rabbits against a subsequent injection of infective material from measles. The rabbits injected with normal goat serum and those untreated showed some or all of the characteristics of measles in rabbits, *i. e.*, a rise of temp., Koplik spots and an eruption. Immune goat serum protected human beings against measles as effectively as convalescent human measles serum when injected on the 1st and 2nd days after exposure to measles. By intracutaneous tests in normal rabbits, the serum of goats injected with diplococci from measles, as well as convalescent human measles serum, were shown to neutralize the action of killed measles diplococci, while serum of normal goats had no such effect. The serum of 1 immune goat was found toxic to nearly all persons injected with it, but after 8 months preservation it appears to have lost its toxic effect. While these expts. do not furnish conclusive evidence of the protective value of immune goat serum, they warrant further investigation.

JULIAN H. LEWIS

Biologic significance of the soluble specific substances of pneumococci. L. D. FELTON AND G. HOWARD BAILEY. *J. Infectious Diseases* 38, 131-44(1926).—The sol. sp. substance from type 2 pneumococci when injected in extremely small doses along with attenuated type organisms produces an antagonistic effect on the defense of the animals, or an actual increase in the virulence of the microorganisms from 10 to 100 fold. The sp. sol. substance has no toxic action of itself. It is able also to neutralize both *in vivo* and *in vitro* the protective substance of antipneumococcus serum. It seems probable that this substance is similar or the same as the so-called "aggressin" and "virulin" of other authors.

JULIAN H. LEWIS

The specific precipitates obtained from antipneumococcus serum and antibody titration by the soluble specific substances of pneumococci. L. D. FELTON AND G.

...sol. in 3% NaCl, and very sol. in dil. acid and alkali when the salt content is low. The H-ion concn. of min. soly. of the 1 sample tested was p_H 6.6. Assuming that the protein of the protective substance has the p_H mol. wt. as pseudoglobulin, the combining ratio per wt. of sol. sp. substance to protein is 1:15, the mol. wt. of the sol. sp. substance being of the order of 5300 and the total mol. wt. of the resulting combination 85,300. Na_2CO_3 in concn. of 0.01 *M* is the best of the dissociating agents used. Dissocn. takes place readily in dil. acid and alkali solns. (HCl and NaOH) as judged by the free sol. sp. sub-

stance, but the resulting solns. have no demonstrable protective value. If, however, to the acid soln. is added NaCl to make 25% satn., a ppt. is thrown down contg. the protective substance. Also when a sample of ppt. is dissociated by heat in the presence of Na_2CO_3 , Na_2HPO_4 , saccharose, or NaCl, and to the clear soln. Na_2SO_4 is added to make 18% practically all the protective substance is pptd. However, this fraction insol. in 18% Na_2SO_4 still contains a small quantity of material antagonistic to defense, as well as highly protective substance.

JULIAN H. LEWIS

Influence of some anaerobic species on toxin of *Cl. botulinum* with special reference to *Cl. sporogenes*. G. M. DACK. *J. Infectious Diseases* 38, 165-73 (1926).—The filtered toxin of *Cl. botulinum* added to beef heart medium is gradually destroyed by the growth of *Cl. sporogenes* in it. The power to destroy botulinum toxin is also possessed by several other anaerobic species with proteolytic and nonproteolytic properties. The destruction of the toxin is not due to changes in H-ion concn. *Cl. botulinum* type A grew scantily in a filtrate of *Cl. sporogenes*. Growth was more vigorous in a filtrate which had been boiled but still was invisible macroscopically. Toxin was demonstrated in all the tubes but was stronger in the tubes contg. the filtrate which had been heated. *Cl. botulinum* type B did not grow in the unheated *sporogenes* filtrate nor did it produce toxin. No reduction in potency of the toxin of *Cl. botulinum* type A was noted when an equal amt of *sporogenes* filtrate was added to it. No visible growth (macroscopically) of *Cl. sporogenes* occurred in a filtrate of *Cl. botulinum* after 7 days incubation at 37°.

JULIAN H. LEWIS

Behavior of botulinum toxin in the alimentary tract of rats and guinea pigs. G. M. DACK. *J. Infectious Diseases* 38, 174-81 (1926).—Botulinum toxin when mixed with stomach tissue and abdominal wall tissue from guinea pigs and mice *in vitro* and incubated at 35° for 1 hr. was not reduced in potency except in 2 cases in which mouse stomachs were used. The reduction, however, was slight in these cases. Botulinum toxin was not completely destroyed in the stomachs and small intestines of rats and guinea pigs receiving injections of the toxin directly into the stomach. Its presence was definitely demonstrated after 12 hrs. in guinea pigs and after 3 hrs. in rats. In 2 cases out of 7 toxin was demonstrated in the blood of guinea pigs fed with botulinum toxin. No toxin was found in the blood of rats fed with large doses of botulinum toxin. Toxin was found in the blood of rats and guinea pigs 3 hrs. after intravenous injections and intraportal injections of the toxin. These expts. do not disclose the cause of the difference between rats, guinea pigs and mice in their susceptibility to botulinum toxin given orally.

JULIAN H. LEWIS

Edema as a problem in physiological regulation. F. C. McLEAN. *Physiol. Rev.* 5, 618-40 (1925).—Review. Edema is not an entity of itself, but a symptom. The fundamental problem is that of physiol. regulation of the vol. of the internal environment, including the blood and tissue fluids.

E. R. LONG

Antibodies which load microorganisms with blood platelets (thrombocyto-barins). I. L. KRICHEVSKII AND R. S. CHERIKOVER. *Z. Immunitats.* 42, 131-49 (1925).—The blood platelets of the immune animal serve as an indicator of the presence of thrombocyto-barins in the blood. These play only a passive role and can be replaced by the blood platelets of a normal horse. Serum obtained from ordinary blood coagulation contains none. Thrombocyto-barins are thermostable. After $\frac{1}{2}$ hr. at 56° serum loses its capacity to induce the loading phenomenon, but on adding to the inactivated serum the serum or plasma of a normal mouse or guinea pig, the inactivated serum is able to incite the loading phenomenon. Thrombocyto-barins are adsorbed by the corresponding antigen, with the fixation of complement. The fact that only the platelets out of all the formed elements of the blood are concerned in this reaction, speaks for the independent origin of the platelets.

E. R. LONG

Further investigation of thrombocyto-barins. I. L. KRICHEVSKII AND R. S. CHERIKOVER. *Z. Immunitats.* 45, 530-44 (1926); cf. preceding abstract.—Thrombocyto-barins result not only from infection but also from immunization of the organism artificially. Thrombocyto-barins are not identical with the lysins, and probably not with other antibodies.

E. R. LONG

Animal calorimetry. XXX. The metabolism of glycerol in phlorhizin diabetes. W. H. CHAMBERS AND H. J. DEUEL, JR. *J. Biol. Chem.* 65, 21-9 (1925); cf. C. A. 19, 3534.—A complete conversion of glycerol to glucose may occur in phlorhizinized dogs but there is sometimes a difference in individual animals. There is no general oxidation of the ingested glycerol or of the glucose into which it is converted and the observed reduction in the respiratory quotient from 0.703 to 0.678 may be exactly accounted for by the oxidation of the 2 H atoms liberated in the reaction of glycerol $\rightarrow \frac{1}{2}$ glucose

The action of glycerol in rate of excretion and the sparing of protein metabolism are similar to those of the monosaccharides.

A. P. LOTHROP

The fate of invertase in normal and immune organisms. A. SAMISSLOV. *Biochem. Z.* **164**, 110-6(1925).—When invertase is injected into normal rabbits or into animals previously immunized to yeast autolyzate, it disappears from the blood stream. The rate of its disappearance has been studied during the entire immunization process. Mixed with blood from normal or immunized animals *in vitro* the activity of invertase diminishes very slightly even after 6 hrs. It was also found that the intravenously injected invertase is not adsorbed by the blood cells. However, the invertase disappearing from the blood can be found in the organs of the exptl. animals. In immunized rabbits the liver adsorbs 50-60% of the enzyme injected, whereas in non-immunized animals only 20-30% is adsorbed. The disappearance of the invertase is that not due to an actual destruction. It is suggested that the site of greatest antibody formation is also the place of greatest adsorption of antigen.

S. MORGULIS

The precipitin reaction in the study of animal relationships. ALAN A. BOYDEN. *Biol. Bull. Marine Biol. Lab.* **50**, 73-105(1926).—The titer of an antiserum is directly proportional to the concn. of antigen within its limits of reaction. Total N detns. should be made on all antigens in order to obtain comparable results. The specificity of the reaction of an antiserum decreases with time. The H-ion concn. of antigen solns. affects the reaction, therefore buffered salt solns. should be used. Increase of salt concn. from 0.85 to 2.25% decreases the titer of chicken antisera and tends to increase their specificity. Filtration of antisera through Berkfeld filters usually does not decrease the titer nor change the specificity. There is a variation in response of different animals of the same species to the same protein. There was a general agreement in the group reactions obtained in the majority of cases. This correspondence was independent of the strength of the antisera used and occurred in antisera produced in such different animals as rabbits and fowls. There is an inhibition of the response of rabbit antisera to other rodent bloods which is absent in the fowl. The principle of reciprocal relationships can be used to test the agreement of the values obtained. The ring test is quant. sp. for no heterologous reaction ever exceeded the homologous reactions of the same antiserum. The ring test when properly performed may give information of value to the student of animal relationships.

L. W. RIGGS

Pollen therapy with protein-free extracts. J. H. BLACK AND MARGARET C. MOORE. *J. Am. Med. Assoc.* **86**, 324-5(1926).—The results of treatment of ragweed-sensitive persons with a ragweed ext. contg. no protein justify the statement that the active substance in pollen is not protein in character.

L. W. RIGGS

The sedimentation velocity of the red blood corpuscles in leprosy. H. P. LIE. *Medicinsk Revue* **42**, 133-50(1925).—Lie has examd. the blood in 33 patients suffering from various forms of leprosy by means of the method and app. described by A. Westergreen (Die Senkungsreaktion, *Ergebnisse der inneren Medizin und Kinderheilkunde*, **26**). The results differ widely, but when due regard is taken of the clinical symptoms and the phase of development of the disease a certain correspondence may be seen, and the method may be a valuable aid in judging the momentary state of each case.

C. A. ROBAK

The glycolysis of bacilli-containing rat tumors and normal rat tissues. A. LASNITZKI. *Z. Krebsforschung* **22**, 536-9(1925).—Glycolysis of tumor tissue contg. bacteria and of normal tissue was detd. by Warburg's manometric method, which was carried out under anaerobic conditions. In this method the CO_2 was measured which was released when lactic acid, formed through glycolysis, acted upon the NaHCO_3 of the Ringer soln. The amt. of glycolysis by normal tissue is about half as great as that by tumor tissue.

F. B. SEIBERT

Utilization of glucosone by the diabetic organism. S. J. THANNHAUSER AND M. JENKE. *Arch. exptl. Path. Pharmacol.* **110**, 300 16(1926).—In almost all of the cases of diabetes which received glucosone the urine became both sugar-free and acetone-free.

G. H. S.

Experimental pathological changes in the ultramicroscopic picture of blood coagulation. MAKOTO WATANABE. *Arch. exptl. Path. Pharmacol.* **110**, 335-41(1926).—Ultra-microscopic observation of fibrin formation in plasma obtained by centrifuging fresh rabbit blood showed that during As poisoning as in complete deprivation of water the deviations from the normal form of blood coagulation were as had been previously noted by Masuda in rabbits with an infectious enteritis.

G. H. S.

Parathyreoprival tetany and guanidine intoxication. PAUL NOETHER. *Arch. exptl. Path. Pharmacol.* **111**, 38-41(1926).—In parathyreoprival tetany of cats the amt. of

detectable guanidine present is but very slightly increased over the normal content. This would indicate that parathyreoprival tetany is not a guanidine intoxication.

G. H. S.

H—PHARMACOLOGY

ALFRED N. RICHARDS

The effect of pituitrin on blood and on lymph and urine production. E. C. BAYLEY, J. C. DAVIS, W. WHITMAN AND F. H. SCOTT. *Proc. Soc. Exptl. Biol. Med.* 22, 312-4 (1925).—Twenty dogs were given injections of 2-3 cc. of obstetrical pituitrin (Park Davis Co.); 16 of these showed no change in the concn. of hemoglobin in the blood. 1 showed a decrease; and 3 showed a considerable increase in concn. Pituitrin caused a marked slowing of the flow of lymph from the thoracic duct and a temporary decrease in the excretion of urine; this was followed by diuresis when the blood pressure increased. Pituitrin decreases the permeability of capillary cells. C. V. B.

Action of sugars on gastric secretion investigated by means of Pavlov's small stomach. A. CIMINATA. *Arch. farm. sper.* 39, 49-83 (1925).—Subcutaneous injection of sucrose had no effect on gastric secretion, which differs in this respect from other secretions which are increased or diminished according to the amt. of sugar injected.

A. W. DOX

The action of calcium and potassium ions upon the cardiac fibers of the vagus in the frog. J. TEN CATE. *Pavlov's Jubilee Vol.* 1925, 55-9; *Physiol. Abstracts* 10, 152. After perfusion of the frog heart with 3.28% glucose soln. free from K and Ca, stimulation of the vagus nerve ceases to cause arrest of the heart. C. believes this effect to be due to depletion of the heart of its K and Ca, and not to a change in the $(K + Na)/Ca$ ratio. This latter is regarded as important only in detg. the activity of the cardiac muscle itself, but without influence on the vagus. H. G.

The influence of calcium on the power of the heart. M. J. E. M. STREYNS. *Onderzoek. Physiol. Lab. Utrecht* 5, 189-211 (1925); *Physiol. Abstracts* 10, 154.—Ca enables the heart to exert power proportional to its dosage in the perfusing fluid. At the same time the capability of the heart to stretch decreases as the Ca dose increases. This decrease is one of the factors which enables the heart to exert power. To measure power accurately, the perfusing fluid must have its K replaced by Ra emanation, because K, besides its effect on automatism, has a tonolytic and in big doses a negative inotropic action which is not possessed by emanation. In the series Be, Mg, Ca, Sr, Ba, the only metal which can replace Ca to any extent is Sr. H. G.

Calcium and myogenic heart properties. A. v. D. WILLIGEN. *Onderzoek. Physiol. Lab. Utrecht* 5, 170-88 (1925); *Physiol. Abstracts* 10, 154.—Ca exerts hardly any influence on the automatism of the frog's heart; it has no effect on the cond. and irritability, but decreasing the Ca in the perfusing fluid causes a great diminution in the height on contraction on elec. stimulation of the heart-point. Removal also causes disappearance of tonus, both "plastic" and elastic. H. G.

The influence of potassium on the intestinal movements. E. H. JANNINK. *Onderzoek. Physiol. Lab. Utrecht* 5, 13-27 (1925); *Physiol. Abstracts* 10, 160. An app. is described for obtaining continuous perfusion of the intestine and removing all substances made by the tissues. The small intestine carries out in perfusion expts. automatic movements dependent on temp., O₂, balancing of Ringer and Tyrode soln., the presence of choline and of a radioactive ion. Complete removal of K by prolonged perfusion with K-free Ringer causes stoppage of contractions. Removal of choline does likewise. If U is added to the perfusion fluid it is only absorbed into the cells in the presence of fluorescein, which apparently acts as a sensitizer. The first effect of the uranyl ion is to antagonize the K automaticity; increasing the dosage causes automatic movements based on U. Choline is necessary probably because it sensitizes the intestine to the action of K. H. G.

The influence of insulin on metabolic processes. A. KROGH AND P. BRANDT-REHBERG. *Pavlov's Jubilee Vol.* 1925, 91-103; *Physiol. Abstracts* 10, 171.—Expts. are described on the gaseous metabolism and blood sugar of urethanized and curarized rabbits after a dose of insulin. In animals under urethan or curare, the blood sugar can be brought down below the convulsive level without convulsions. The total metabolism remains on the whole unaffected by insulin, at least in doses which are not excessive. The respiratory quotient rises shortly after injection of insulin, and reaches a max. in 1 to 3 hrs. It never rises above unity, and only rarely reaches 0.95. The mechanism of the rise is discussed, and reasons are given for the conclusion that it is mainly due to an increased combustion of carbohydrate. Insulin is considered as part of the mechanism

for regulating the distribution of the metabolism between the different oxidizable substances available. Many original protocols are given. H. G.

The intervention of excitoperistaltic substances in the action of opium alkaloids on the intestine. J. LA BARRE. *Arch. intern. pharmacodynamie* 29, 179-303(1924); *Physiol. Abstracts* 10, 186.—An extensive study of the action of the various alkaloids, singly and in combination, with doses varying in size. The results depend to a certain extent on the choline content of the intestine. No abs. correlation between chem. constitution and action of the substances could be established. The opium preps. best calcd. to set the intestine at rest would appear to be "opon" (a mixt. of hydrochloride of the various alkaloids *without* morphine) and Straub's narcophine. H. G.

The point of action of certain drugs acting in the periphery. III. The action of pilocarpine upon the smooth muscle of the blood vessels. E. E. NELSON AND G. F. KEIPER, JR. *Arch. intern. pharmacodynamie* 29, 11-7(1924); *Physiol. Abstracts* 10, 187.—On intravascular administration of pilocarpine, clear effects on the blood vessels were observed. Dilatation, apparently by an action on the arterioles, occurred in the hind-limb vessels of the frog and also in the cat. Large doses of the alkaloid cause contraction of vascular smooth muscle. The generalization that "pilocarpine stimulates smooth muscle" is unjustifiable. H. G.

Effects of iodine on blood pressure. D. BOUDREAU. *J. méd. Bordeaux* 7, 279-80 (1925); *Physiol. Abstracts* 10, 188.—The effects of I on the blood, heart, muscle and vascular walls may either reduce blood pressure when high or raise it when low. H. G.

Emanation as a potassium substitute. H. ZWAARDEMAKER. *Pavlov's Jubilee Vol* 1925, 61-8; *Physiol. Abstracts* 10, 190.—K ions may be replaced by other sources of microradioactivity. The most suitable source of radioactivity is Rn in doses from $1/300$ to several microcurie per l. Rn can replace K only temporarily. After a certain time the effects of the absence of the chem. properties of K assert themselves, and these cannot be supplied by Rn. Rn becomes very readily adherent to cellular surfaces and can be removed by washing only with difficulty. The action of Rn is augmented by the presence of Ca ions. In order to maintain a regular rhythm of the heart the ratio of the concn. of ions should be K/Ca, Pb/Ca, U/Ca, Th/Ca = const.; but for Rn the concn. should be $Rn \times Ca = \text{const.} = 2 \times 4.10^{-10}$ (Rn in curie, Ca in mol.). The minimal concn. for Rn is $1/300$ microcurie and for Ca about 0.5×10^{-4} mol. H. G.

The effect of choline on the intestine of the rabbit. K. J. KRIEGER AND G. NOAH. *Z. ges. expil. Med.* 43, 661(1924); *Physiol. Abstracts* 10, 222.—The oscillations and the peristalsis of the small intestine increase. H. G.

Antagonistic action of insulin and pituitary extracts. G. JOACHIMOGLU AND A. MERZ. *Deut. med. Wochschr.* 50, 1787(1924); *Physiol. Abstracts* 10, 228.—Different exts. of the pituitary body vary in the power of inhibiting the action of insulin on the blood sugar content and on the uterus of the guinea pig. Insulin antagonizes the action of pituitary ext. on the guinea-pig uterus if the 2 gland exts. are mixed together before addn. H. G.

Diabetes treated by insulin. CARLES AND CLARAC. *J. méd. Bordeaux* 102, 384 (1925); *Physiol. Abstracts* 10, 229.—A contrast of 2 examples of marked glucosuria differently affected by insulin. In one, with little or no wasting, but considerable trophic disturbance and high sugar loss, a rapid improvement was effected. In the other, presenting a much wasted condition and similar degree of glucosuria, scarcely a check was put to the downward course of the illness. H. G.

The relation between hypoglycemia and convulsions after insulin. F. LAQUEUR, A. GREVENSTUK AND S. F. DE JONGH. *Deut. med. Wochschr.* 51, 178(1925); *Physiol. Abstracts* 10, 228.—From a series of 3000 expts. on the standardizaion of insulin by injection into rabbits the authors conclude that a low blood sugar content in itself is not necessarily the causative agent in the production of convulsions, but that the low blood sugar gives rise to substances which excite these. Insulin, therefore, should not be standardized by its power of producing convulsions, but by its effect upon the blood sugar. H. G.

Influence of colloids on the action of drugs. W. STORM VAN LEEUWEN, A. V. SZENT-GYÖRGYI AND L. JENDRASSIK. *Arch. neerland. physiol.* 9, 442 8(1924). **Biological significance of some lipoids.** A. V. SZENT-GYÖRGYI. *Ibid* 448-9. **Pharmacological action of decomposition products of cephalin.** L. JENDRASSIK. *Ibid* 449-53; *Physiol. Abstracts* 10, 243-4.—Cephalin injected intravenously produces a fall of blood pressure; it also improves the action of the hypodynamic heart. Lecithin has no effect on blood pressure; it reinforces the hemolytic action of silicic acid and cobra venom; it forms a combination with peptone; and it is pptd. at pH 5.5. The reinforcement of

the action of pilocarpine, atropine, etc., upon the isolated cat's small intestine by a previous dose of rabbit serum has been traced to the activity of the lipoids, etc., of the serum. Cephalin enhances the action of pilocarpine and atropine, lecithin that of histamine, and antagonizes the action of cephalin. The action appears to be due to some unidentified decompn. product of cephalin. Among other substances examd., soap have the same property; Na oleate possesses it to a very marked degree. The same or a similar decompn. product also enhances the anesthetic action of novocaine on motor and sensory nerves, in the frog and mammals, resp. Rabbit serum forms a combination with pilocarpine or atropine; peptone and the general anesthetics prevent this; it is probable that the combination is an adsorption compd. Cf. *C. A.* 15, 1945; 17, 437.

H. G.

Choline and the gastrointestinal system. R. MAGNUS. *Münch. med. Wochschr.* 72, 249(1925); *Physiol. Abstracts* 10, 246.—Choline is the physiol. stimulant for Auerbach's plexus; atropine paralyzes it. This explains the conflicting reports on the action of atropine on the intestinal movements; when there is little choline atropine stimulates the plexus. Choline produces only normal movements, not spasms. It is effectual in exptl. paralysis of the bowel in animals (peritonitic, CHCl_3 anesthesia) in doses of 10 mg. per kg.; 35 mg. of choline-HCl is fatal if injected rapidly.

H. G.

The action of potassium ions on the blood sugar picture. F. KYLIN AND A. ENGI. *Klin. Wochschr.* 4, 653(1925).—KCl, injected intravenously, lowers the blood sugar.

MILTON HANKE.

Antagonistic action of insulin and atropine on the vagus nerve in blood pressure experiments. ERNST FREY. *Klin. Wochschr.* 4, 501-2(1925).—Stimulation of the vagus nerve leading to an isolated frog heart leads to a reduction in the pulse rate. Insulin does not stimulate the vagus because it produces, if anything, an accelerated pulse rate. Atropine is without effect in the latter case. Atropine reduces the pulse rate of a rabbit heart because of its action on the vagus. Insulin counteracts the action of atropine; the pulse rate increases and becomes normal. Insulin displaces atropine from the nerve fiber.

MILTON HANKE.

The action of ephylline diuresis on normal and disturbed water balance. W. KEMP MANN AND H. MENSCHEL. *Klin. Wochschr.* 4, 308-10(1925).—Ephylline is a diuretic. Ingested KOAc or KCl and injected CaCl_2 are not diuretic in the concns. employed in the expts. Normal persons that have been treated for 8 days with K or Ca salts are in a state of disturbed water balance. Treatment with ephyllin now leads to a profound diuresis associated with a loss in body weight, concn. of the blood and a subsequent water retention. The loss in H_2O via the lungs and skin is, not infrequently, also greatly increased.

MILTON HANKE.

The supposed erythrocyte-generating action of germanium dioxide. WERNER KEIL. *Klin. Wochschr.* 5, 62-3(1926).—Injection of K_2GeO_3 into rabbits (10 mg GeO_2 per kg. body wt. on alternate days) has no effect upon the erythrocyte count nor upon the hemoglobin.

MILTON HANKE.

The detoxicating effect of glucose in guanidine poisoning. JOSEF BAKUCZ. *Klin. Wochschr.* 5, 70-1(1925).—Guanidine poisoning, in animals, is associated with hypoglycemia. The fall in blood sugar begins with tetany and parallels the severity of the symptoms. Administration of glucose, intravenous or peroral, has no effect upon the tetany; glucose does not function as a detoxicator in this case.

MILTON HANKE.

Increased resorption due to the action of insulin. OSKAR KOREF AND HANS MAUTNER. *Klin. Wochschr.* 5, 191(1926).—Curare is not poisonous, when ingested, because it is not absorbed from the intestinal tract. Insulin poisoning is associated with an increased absorption rate if, indeed, not with qual. changes in absorability because, in insulin-treated animals, curare is absorbed from the intestinal tract and leads to death with typical symptoms. The toxicity of curare, given perorally, is directly proportional to the intensity of the insulin poisoning as measured by the degree of hypoglycemia. Other expts. indicate that milk and an 8% soln. of MgSO_4 are absorbed from the intestinal lumen under the action of insulin.

MILTON HANKE.

Chemotherapeutic studies with gold. ADOLF FELDT. *Klin. Wochschr.* 5, 299-301(1926).—Inorg. gold salts are bactericidal, but poisonous. The therapeutic index is about 1:1, i. e., the dose required to kill the host is about equal to that required to destroy the invader. Org. gold compds. have the general formula R-S-Au. It has been possible to prep. org. gold compds. with a therapeutic index of 1:10 (staphylococci and *Spirochaeta febris recurrens*). Such compds. are harmless because only one tenth of a lethal dose, for the host, will destroy the invader. The expts., so far, have been limited to animals. The possibility of using gold salts in the treatment of tuberculosis is mentioned. Hg is, on the whole, a poor element for chemotherapy because bactericidal

action and toxicity, to the host, are parallel functions in the majority of compds.; in short, the therapeutic index of most Hg compds. is 1:1. MILTON HANKE

Disappearance from the blood plasma of intravenously injected dyes. ANNELEISE WITTGENSTEIN AND H. A. KREBS. *Klin. Wochschr.* 5, 320(1926).—Basic dyes, such as fuchsin, safranin, brilliant cresol blue, methylene green, neutral red and methylene blue, disappear from the circulation to the extent of 99% in 1 min. The remaining 1% disappears within 1 to 2 hrs. Acid dyes such as uranine, patent blue V, echtgelb, orange G, eriocyanin, chrysolin, acid fuchsin, light green SF, Congo red, trypan blue and water blue disappear from the circulation to the extent of 20-90% in 1 min. The remaining dye can be demonstrated for 5 hrs (uranine) to 2 months (water blue). The disappearance of the acid dyes is a function of their degree of dispersion. The colloidal dyes (trypan blue, water blue VI B and Congo red) disappear more slowly than the crystalloidal dyes. The degree of dispersion is not the only factor. Congo red and water blue are equally dispersed; but Congo red circulates for 3 days and water blue for 2 months. Those triphenylmethane dyes that circulate as colorless carbinols (acid fuchsin, light green and water blue) leave the circulation more slowly than other dyes of equal dispersion. Basic dyes are far more toxic than acid dyes. The conditions in the body are such that basic dyes are readily adsorbed by the cellular colloids. Acid dyes are poorly adsorbed. This explains the greater toxicity and speed of migration of the basic dyes. MILTON HANKE

Action of pyridone on the musculature of the intestine. H. JANUSCHKE AND F. LASCH. *Klin. Wochschr.* 5, 321(1926).—Pyridone, in a concn. of 1:10,000, relaxes the tonus of the isolated guinea-pig intestine. It promptly removes the spasm produced by BaCl₂ or pilocarpine. Pyridone is also spasmolytic in the intact animal. MILTON HANKE

Influence of calcium on elevated blood pressure. WILFRIED LOEWENSTEIN. *Klin. Wochschr.* 5, 354-7(1926).—CaCl₂ ingested does not change the normal blood pressure. Injection of 10 cc. of a 10% soln. gives rise to a hot feeling. The blood pressure is restless, rises above normal, subsides to normal then rises and subsides again; but comes to rest within an hr. Entirely similar results are obtained with equiv. amts. of NaCl, NaI and SrBr₂ and with a 50% soln. of glucose, so this seems to be a hypertonicity effect rather than something specific. The results obtained with high blood pressure cases are quite different. The salts of univalent metals reduce the blood pressure slightly; but the effect lasts for scarcely 1 hr. The bivalent metals are far more effective. In the case of Ca and Sr salts the blood pressure may be reduced for 24 hrs. Re-injection at this time again lowers the blood pressure. The effectiveness of the bivalent metals is directly proportional to their atomic numbers. MILTON HANKE

Lysocithin as a poison. S. BELFANTI. *Rend. d. adunanze dell'accad. med. fis. fiorentina; Sperimentale* 79, 932-6(1925).—Not only cobra venom but also that of *Crotalus terrificus* and *Lachesis Newedii*, and even the poison of the bee are sufficient to convert the lecithin of egg-yolk into lysocithin (I), the action consisting in removal of the oleyl radical. Lipoidal exts. of the pancreas and salivary glands of cattle and horses contain a similar, preformed, highly hemolytic lysocithin ("substance Y"). The toxicity of I for animals is discussed, and expts. are referred to tending to show that poisoning by venom is due to its action in converting lecithin of the poisoned organism into I. The close analogy of hemorrhagic septicemia and anthrax is emphasized. Wasp poison differs from those of the hornet and bee in that it bleaches egg-yolk and coagulates the lecithin, apparently degrading it beyond I and producing only a weak hemolysis whose power is lost within 48 hours. From this was isolated an insol. crystalline fatty acid contg. H₃PO₄. The residue, extd. with Et₂O, again becomes strongly hemolytic. M. HEDELBERGER

Hemorrhagic action of lysocithin. G. GUERRINI. *Rend. d. adunanze dell'accad. med. fis. fiorentina; Sperimentale* 79, 936-7(1925).—Lysocithin prepd. with the aid of venom from *Crotalus terrificus*, or *Apis mellifica* poison, causes capillary hemorrhages when instilled into the conjunctival sac of dogs and rabbits, also in the kidney when injected into the renal artery, thus acting as a true capillary poison and supporting the conclusions of Belfanti (see preceding abstract). M. HEDELBERGER

Aloes socotrina. H. S. STIMPSON. *J. Am. Inst. Homeopathy* 19, 101-4(1926).—Tincture of aloes was administered to rabbits by mouth, intravenously, subcutaneously and intraperitoneally. The respiration was slowed, the blood pressure lowered and the heart rate increased. Large doses produced speedy death. Smaller doses produced purgation, with frequent watery stools and passive congestion of the rectal mucosa. The rate of the isolated heart was decreased. The isolated contracting uterus ceased to contract. The isolated large intestine showed an increase in tonus, a number of

contractions and a decrease in their size. Isolated segments of small intestine from the region of the pylorus showed an increase in tonus and size of the contractions but a decrease in the rate of contraction. The remainder of the small intestine was characterized by a decreased tonus and an increase in the size of the contractions. J. S. H.

Comparative studies of the action and the mode of action of calcium and digitalis. ERNST BILLIGHEIMER. *Z. klin. Med.* 100, 411-57(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 29, 310(1925).—Atropine tachycardia is not perceptibly influenced by Ca. In adrenaline tachycardia a slowing of the pulse of up to 50% is caused, after the drop in blood pressure has taken place. The excessively slowed vagus pulse (*i. e.*, after digitalis) is not influenced by Ca. Conclusion: Ca attacks the vagus endings. In the human being Ca and digitalis have the same site of attack and the same effect. There is a mutual enhancement of the effect on the heart. The Ca level of the blood is affected by digitalis. On the other hand cases with a high blood Ca (encephalitis) have a much higher tolerance to digitalis than those with a low Ca (tetany). The vasoconstrictor effect of Ca is much lower than that of adrenaline and rarely if ever reduces blood pressure. The vagus stimulation is followed by a greater responsiveness of the sympathetic. Therapeutically Ca is indicated in all cases of tachycardia of not purely central nervous origin and in absence of a too gross injury to the vagus. The best results were obtained in myocarditis. Cases with a negative Ca test (no slowing of the pulse after injection) do not respond to digitalis. If the Ca test becomes positive after a few days' digitalis treatment then this treatment may still be successful. For the numerous details see the original. MARY JACOBSEN

The immunity to plant poisons as studied on pyroline. SEBASTIANO ZISA. *Arch. di patol. e clin. med.* 3, 290-304(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 29, 311-5(1925).—Prolonged administration of small doses of pyroline (acetylphenylhydrazine) immunizes dogs and rabbits against its destructive action on blood cells *in vivo* and *in vitro*. The immunity is cellular, histogenetic, not humoral of the antibody type, since the serum of immunized animals has not only no protective but even an aggravating effect in pyroline poisoning. MARY JACOBSEN

Pharmacological studies of the uterus by the "abdominal window" method. F. LUDWIG AND E. LENZ. *Z. Geburtshilfe Gynakol.* 87, 115-28(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 29, 459(1925).—The method is described in a previous paper. The pendulum movement of the uterus cannot be sepd. from the peristaltic movement, as it can in the intestine. Certain contractions are characteristic for certain agents. Adrenaline checks immediately all the motions of the rabbit uterus. The initial intense anemia is later followed by hyperemia. The peristalsis of the gravid rabbit uterus is considerably increased and accompanied by moderate anemia. The main effect of pituitrin on the pregnant and non-pregnant rabbit and cat uterus is tetany with 3 different stages. Placental ext. increases the peristalsis and the blood supply considerably. The very persistent effect of secacarin is characterized by a max. contraction which is replaced successively by a stationary tonic ring contraction, annular peristalsis and finally normal peristalsis with increased tonus. Gynergen has the same effect. Uteramin creates a permanent tonic contraction which gradually gives way to an increased peristalsis of the normal type with higher tonus and free from the constriction rings characteristic for secacarin and gynergen. Atropine causes a prolonged complete relaxation of the non-pregnant uterus of the rabbit. MARY JACOBSEN

The effect of insulin given by mouth. CASIMIR FUNK AND SOPHIE KMLODZIEJSKA. *Medycyna doswiadczalna* 2, 367-8(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 29, 58(1925).—The effect of an alc. soln. introduced by the stomach tube (Winter) is unreliable and without practical value. Stomachal introduction of an aq. soln. causes an increase of blood sugar, apparently owing to absorption of antagonistic substances, which are contained even in the purest preps. MARY JACOBSEN

The pharmacodynamics of atropine and adrenaline. L. F. BACKMANN AND HARALD LUNDBERG. *Uppsala läkareförenings förhandl.* 30, 1-115(1924); *Ber. ges. Physiol. exptl. Pharmakol.* 30, 646-8(1925).—A detailed review. MARY JACOBSEN

Twelve cases of carbon tetrachloride poisoning. M. STRAUB. *Geneeskundige Tijdschr. Nederland. Indie* 65, 624-45(1925).—The poisoning was characterized by kidney and liver lesions. Two cases were fatal. The probable mechanism of the poisoning is discussed. Alc. abuse seems to increase the susceptibility. M. J.

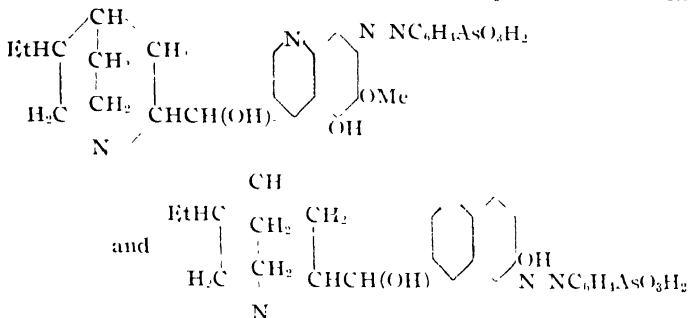
Carbon tetrachloride as a hookworm remedy. W. KOUWENAAR. *Geneeskundige Tijdschr. Nederland. Indie* 65, 646-57(1925).—Even pure CCl₄ causes poisoning, in some cases death. Liver diseases and alcoholism are predisposing factors. M. J.

The action of ultra-violet rays on rachitic manifestations. U. FERLI. *Pediatrics (Riv.)* 33, 1197-212(1925).—From 14 to 15 irradiations of 5-15 min. every second day

may result in complete recovery, if aided by general hygienic measures. The irradiations can be discontinued before the disappearance of the lesions on the radiogram. In nurslings the radiogram does not always permit estimation of the extent of the rachitic process, as a considerable retardation of ossification is often disguised by seemingly insignificant lesions.

MARY JACOBSEN

The action of quinine and quinine derivatives on nagana trypanosomes. A. GIEMSA. *Arch. Schiffs-Tropen Hyg.* **29**, 479-85 (1925).—Discussion and report of the *p*-arsonophenylhydrocupreines that have been suggested as possible anti malaria prepus.:



FRANCES KRASNOW

Intra-arterial anesthesia in dogs. J. P. ARLAND. *Indian J. Med. Research* **13**, 263-4 (1925).—No motor paralysis is obtained, the anesthesia probably being due to paralysis of nerve endings. Dogs take cocaine very well.

F. K.

Effects of quinine on the sugar of the blood. T. A. HUGHES. *Indian J. Med. Research* **13**, 321-36 (1926).—"The effect of insulin on the hyperglucemia produced in rabbits by large doses of quinine is similar to its effect on adrenaline hyperglucemia. Irgotoxin and, in a smaller degree, pituitrin inhibit the glycogenolytic effect of quinine. Quinine, in antimalaria doses, usually causes a lowering of the blood sugar in man. This effect is antagonized by pituitrin. The fall in blood sugar produced by quinine in man may in certain cases give rise to mild symptoms of hypoglycemia. These symptoms can be prevented by the ingestion of carbohydrates or carbohydrate-rich meal $\frac{1}{2}$ to 1 hr. after the drug is taken."

FRANCES KRASNOW

Certain observations on the mechanism of quinine hemoglobinuria in man. I. U. N. BRAHMACHARI AND P. B. SEN. *Indian J. Med. Research* **13**, 337-41 (1925).—"In individuals susceptible to quinine hemoglobinuria, quinine probably remains adsorbed with an unknown substance in the liver for prolonged periods giving rise to a concn. of the drug, at which quinine hemolyzes red corpuscles in the test tube." "Whether hemolysis will take place in the liver will depend upon (1) the concn. of the quinine in the liver and (2) the period during which such a concn. is maintained." No hemolysis was discovered in the peripheral blood during the active stages of quinine hemoglobinuria.

FRANCES KRASNOW

Studies in malaria, with special reference to treatment. I. **Introduction and routine methods.** J. A. SINTON. *Indian J. Med. Research* **13**, 565-78 (1926). II. **The effect of treatment on the prevention of relapse in infections with *Plasmodium falciparum*.** *Ibid* 579-601.—Conclusions are based on 800 cases of malignant tertian malaria, observed under carefully controlled conditions. If this infection is treated for one week with 30 grains of quinine daily, combined with the alkaline treatment, 80% of the cases may be cured. Thirty grains of quinine daily for one week, cinchona febrifuge or cinchona febrifuge and alkali will cure about 50% of malignant tertian infections. Patients infected with *P. falciparum* lend themselves to treatment more readily than those infected with *P. vivax*. III. **The value of "provocative methods" in the diagnosis of uncured malaria infections.** J. A. SINTON, B. RIVAS, J. D. BAILY AND DIVAN CHAND. *Ibid* 603-16.—Little or no advantage was gained in the diagnosis of uncured malarial infections by the use of injections of adrenaline or strychnine.

F. K.

Certain observations on the mechanism of quinine hemoglobinuria in man. II. U. N. BRAHMACHARI. *Indian J. Med. Research* **13**, 695-6 (1926).—A patient giving a history of malarial attacks was now suffering from kala-azar. It was the first appearance of hemoglobinuria. The hemolysis was going on in the liver just as in cases of quinine hemoglobinuria.

FRANCES KRASNOW

Protein therapy and phlorhizin glucosuria. A. FISCHER AND H. WEISS. *Biochem.*

Z. 159, 141-5(1925).—A casein soln. was injected into dogs made diabetic with phlorhizin. The D/N ratio dropped slightly in nearly all and markedly in a few cases. The same was true when serum was used in place of the casein. Therefore, protein seems to aid the metabolism of carbohydrates in phlorhizin diabetics. W. D. L.

The effect of narcophine upon the digestion of meat in dogs. E. ZUNZ. *Arch. intern. pharmacodynamie* 30, 1-63(1925).—Upon subcutaneous injection of 4-16 mg. of narcophine (a double meconic acid salt of morphine and narcotine) the following effects were observed: The meat remained a longer period of time in the stomach and was attacked more slowly by the digestive juices than normally; the acid albumin content of the various parts of the digestive tract is increased; the stomach contained less of proteoses and more of peptones and of abiuret substances, while the intestine contained more proteoses and less of peptones and of abiuret substances than normal; an increase of NH_3 - and $\text{NH}_4\text{-N}$ was frequently observed in the stomach contents. These effects were roughly proportional to the amt. of narcophine given. W. A. PERLZWEIG

The action of eserine and atropine on the isolated intestine of the rabbit. A. D'HAENENS. *Arch. intern. pharmacodynamie* 30, 77-111(1925).—The isolated rabbit intestine reacts *in vitro* to eserine in the same way as it does to pilocarpine. But atropine, which almost always abolishes the effects of pilocarpine, accentuates the action of eserine. W. A. PERLZWEIG

Plain-muscle stimulants in body fluids. S. DEBOER, N. B. DREYER AND A. J. CLARK. *Arch. intern. pharmacodynamie* 30, 141-7(1925).—"Vasoconstrictor and oxytocic substances appear slowly in fluid which has been introduced into the peritoneal cavity. Such peritoneal fluid has about $1/4$ the oxytocic action, but has only about $1/20$ the vasoconstrictor action of serum. Cerebrospinal fluid of the dog usually has feeble vasoconstrictor and oxytocic actions. When pituitary ext. is injected intravenously, it disappears from the blood stream in about 30 min., but no evidence has been obtained that the oxytocic or melanophore dilator principles pass into the peritoneal cavity. In 2 expts. the injection of pituitary ext. caused the appearance of excess of oxytocic substances in the cerebrospinal fluid. The majority of such expts. gave negative results." W. A. PERLZWEIG

The toxicity of serum treated with agar-agar. A. LUMIÈRE AND H. COUTURIER. *Arch. intern. pharmacodynamie* 30, 151-3(1925).—Polemic with Bordet on the interpretation of anaphylactic phenomena induced by the injection into animals of homologous serum treated with agar-agar. W. A. PERLZWEIG

The influence of injection of bases and acids on body reaction. A. LUMIÈRE AND M. SORS. *Arch. intern. pharmacodynamie* 30, 157-69(1925).—"The injection of relatively large doses of alkali (NaOH or Na_2CO_3) into the veins or directly into the heart of guinea pigs, when not fatal, brought the reaction of the blood to p_{H} 9.6, the reaction falling to normal (p_{H} 7.3-7.4) within several hours. Intravenous injections of HCl solns. brought the p_{H} of the blood to 5.6; it rose to normal within a few hours. The same amt. of HCl injected into the left heart was fatal, while it was innocuous when injected into the right heart. Repeated injections of acid or base did not produce any permanent effect upon the reaction of the blood. The addition of acid and base to blood *in vitro* in relatively the same proportions as were used in the above expts. *in vivo* changed the reaction of the blood to p_{H} 6 and 8, resp. W. A. PERLZWEIG

Chloroform and ether. Amounts necessary at different stages of anesthesia. L. DECKERS. *Arch. intern. pharmacodynamie* 30, 229-49(1925).—The results of expts. are given which appear to modify some of the established (European) standards of dosage for general anesthesia. W. A. PERLZWEIG

The influence of chloroform combined with hypnotics upon general excitability in frogs. G. SORBI. *Arch. intern. pharmacodynamie* 30, 251-3(1925).—Iodoform possesses a clearly defined depressing action on reflex excitability. Hypnotic drugs combined with CHI_3 cause an increase in the general excitability in frogs. W. A. P.

Experimental lead poisoning. G. PENNETTI. *Arch. intern. pharmacodynamie* 30, 255-74(1925).—Chiefly an histologic study with small animals. W. A. P.

Poisons of the local or metasympathetic nervous system of the intestine. F. WARMOES. *Arch. intern. pharmacodynamie* 30, 171-227(1925).—The inhibitory action of adrenaline upon the intestine is abolished by atropine or strychnine applied previously or subsequently. But adrenaline always retains its influence upon the tonus, causing the max. of intestinal relaxation after any contraction induced by any of the nerve poisons. Further results of a great variety of combinations of the following drugs applied one after another to the same segment of intestine in an oxygenated bath of Ringer soln. are given: adrenaline, atropine, strychnine, nicotine, cocaine, pilocarpine, eserine, digitalis, quinine, pituitrin, ergotamine. W. A. PERLZWEIG

The localization of arsenic after intravenous injection. A. D' HAENENS. *Arch. intern. pharmacodynamie* 30, 291-309(1925).—The distribution of As in the various organs and body fluids of rabbits after injection of neoarsphenamine, cacodylates and of Fowler's soln. are presented in numerous tables. The spleen, heart, lungs and intestine showed a surprising selective affinity for As and much less in the case of the liver. When administered in the inorg. form As was found to remain in the blood stream about 10 times as long as in the org. forms. W. A. PERLZWEIG

A pharmacodynamic and toxicologic study of somnifene. T. A. REDONNET. *Arch. intern. pharmacodynamie* 30, 321-51(1925).—Somnifene is a 25% aq. soln. of equal parts of diethylbarbituric acid (barbital) and of diethylamine diallylbarbiturate. R. finds it to be greatly superior to other barbituric acid derivs. as a hypnotic for clinical purposes. W. A. PERLZWEIG

Physiology of abnormally induced hypothermia. C. AMSLER. *Arch. expl. Path. Pharm.* 107, 260-70(1925).—Doses of picrotoxin or of Na sautoin which of themselves induce no manifestations in rabbits render the pain centers more sensitive. G. H. S.

Effect of temperature on the occurrence of convulsions in strychnine intoxication. B. H. SCHLOMOVITZ AND S. A. MACHLIS. *Arch. expl. Path. Pharm.* 111, 1-31(1926).—Analysis of the relation of the temp. to the time of onset of strychnine twitches in frogs shows, when subjected to mathematical treatment, a formula corresponding to van't Hoff's law. In the effects which variations in body temp. have on the onset of the strychnine convulsions the heart beat plays only a subsidiary role. G. H. S.

Effect of strophanthin on the absolute power of the frog heart. E. GRIGER AND L. OROSZ. *Arch. expl. Path. Pharm.* 111, 32-7(1926).—Digitalis substances do not increase the abs. power. Under certain circumstances of weakened heart action they tend to restore the power, but, in contrast to caffeine, the activity of the heart is never carried beyond its av. normal initial value. G. H. S.

Transfer of chemical substances from the blood vessels to the tissues. CHUYUNG PAK. *Arch. expl. Path. Pharm.* 111, 42-59(1926).—By employing the method of perfusion with isolated organs it is shown that alkaloids penetrate the vessel wall about as readily as do NH_4Cl , urea, glucose and dihydroxyphenylalanine. Although with many alkaloids the deposition in the muscle tissue of cold-blooded animals is very marked, even after a very protracted period of perfusion the transfer of these alkaloids to the tissues is not arrested. Strophanthin and verodigen also pass readily through the vessel wall, although they are not stored in the tissues. Adrenaline passed through the muscle tissue of both cold- and warm-blooded animals is not destroyed in the tissue, but in the liver of the warm-blooded animal the destructive capacity is so highly developed that even with a very long period of perfusion the transfer to the cells does not stop. G. H. S.

Pharmacological properties of pure apocodeine. OTTO KRAVER. *Arch. expl. Path. Pharm.* 111, 60-7(1926).—Apparently the expts. hitherto performed with apocodeine have been made with impure prepns. Cryst. apocodeine is some 5 times as active as the amorphous com. Apocodeine. On the other hand there is no important qualitative difference between the action of the pure and the com. prepns. Pure apocodeine has a definite narcotizing effect on dogs and through a direct action stimulates the intestine to defecation. It paralyzes the sympathetic ganglia cells and has an emetic effect strikingly like that of apomorphine. G. H. S.

Pharmacology of tetrophan. ERICH HESSE. *Arch. expl. Path. Pharm.* 111, 68-80(1926).—Tetrophan tetany can be induced by suitable procedures either with or without a lactic acid accumulation in the muscle, the degree of tetany in both cases being the same. G. H. S.

Action of thiocyanate on muscle and the reciprocal strengthening of the action of contraction-producing agents. MASAYUKI OKAGAWA. *Arch. expl. Path. Pharm.* 111, 99-113(1926).—Subreactive concns. of NaSCN induce maximal contraction of the isolated frog muscle, if they are combined with subreactive concns. of HCl , NaOH and especially KCl . The capacity of NaSCN to cause muscle twitching is considerably increased by these substances. The effect of weak doses of acetylcholine or of caffeine on the muscle is considerably increased by the addn. of an inactive amt. of thiocyanate. The same effect takes place by the combination of NaI or dimethylguanidine with other substances. Subreactive concns. of NaSCN , NaI and dimethylguanidine chloride mutually strengthen each other as regards the production of muscle twitching, but do not cause contraction. In Ca -free Ringer soln. all of the contracting substances studied show an increased activity. Amts. of Na citrate which tend to induce activity give a stronger action with NaSCN , and this is rendered more intense by the lack of Ca . It

must be assumed that citrate manifests a complex type of action. Novocaine abolishes or prevents the fibrillar twitching due to NaSCN. The antagonistic action of novocaine for thiocyanide contraction is limited. Narcosis in muscle is removed by thiocyanide. G. H. S.

Convulsion-arresting action of *Adonis vernalis* and *digitalis*. M. MASSLOW. *Arch. expl. Path. Pharm.* 111, 114-25(1926).—Large doses of *Adonis vernalis* exert a quieting and paralyzing effect on the nervous system of rabbits and can protect the animals against experimentally induced convulsions. The point of attack is in the cerebrum (cocaine convulsions), in the medulla (camphor convulsions) and in part in the spinal cord (picrotoxin convulsions). It is entirely without action as regards the reflex sensory centers and the motor nerve endings of skeletal muscle. The ability of *digitalis* to abolish convulsions is less marked, although it may weaken them. With *digitalis* the medulla is the primary point of action, the cerebrum being less involved and the spinal cord and motor nerve endings unaffected. G. H. S.

Hydrogen sulfide intoxication by the external application of elementary sulfur in the form of salves. FELIX BASCH. *Arch. expl. Path. Pharm.* 111, 126-32(1926).—When salves which contain S are rubbed into the skin which has been previously damaged by either a pathol. process or by some mech. manipulation an absorption of S occurs (the intact skin absorbs but little) leading to a H₂S intoxication. Both the blood and the urine reveal the presence of H₂S and at certain periods it is eliminated by way of the respiratory tract. The pathol. findings are those of a chronic H₂S intoxication. G. H. S.

Mode of action of insulin. I. Insulin and the glucose distribution between fluid and non-fluid systems. H. HAUSLER AND O. LOEWI. *Arch. ges. Physiol.* (Pflüger's) 210, 238-79(1925).—Glucose added to a paste suspension of vessel tissue in NaCl soln. or in oxalate plasma or serum is not bound by the paste, but remains exclusively in the fluid system. In the presence of insulin, on the contrary, the glucose (about 6%) becomes united with the paste. No glucose combines with the red blood cells of the NaF bovine blood. In human NaF blood the added glucose becomes distributed, even in the absence of insulin, between the blood cells and the plasma; although the addn. of insulin increases the combination with the cells. In a glucose-free NaCl soln. human blood cells satd. with glucose give up less glucose when insulin is present than when it is absent. The extent of the effect of the insulin is in a definite manner dependent upon the glucose concn. of the system, the amt. of insulin, the quantity of red blood cells, and the character of the fluid system. As regards the last, the insulin effect is far weaker in NaCl soln. than in serum or plasma. In defibrinated bovine blood, under the influence of insulin there occurs, as in NaF blood, not only a binding of the added glucose to the blood cells, but also an abrupt disappearance from the blood. This disappearance is not the expression of a direct insulin action, but is purely a result of the fixation of glucose to the blood cells induced by insulin. This is rendered obvious by the fact that an abrupt disappearance of glucose occurs in a wholly similar manner in the absence of insulin, as when glucose combines with the red cells of human blood. It thus appears that before one can assume that insulin has a direct effect on carbohydrate metabolism, the induced, or augmented, combination of glucose with the cells or other structural elements by insulin must be considered as the primary cause of the change in carbohydrate metabolism. **II. Insulin and the phosphate and potassium content of the blood.** H. HAUSLER AND O. HEESCH. *Ibid* 545 9.—The diln. of the blood subsequent to bleeding is effected by a tissue fluid which is slightly poorer in inorg. phosphate and is much poorer in K than is the blood. At the height of the effect due to a subcutaneous injection of insulin the amt. of inorg. phosphate and of K in the blood is materially reduced. This loss is entirely independent of the blood diln., since it occurs when the latter is lacking. In *in vitro* tests insulin may cause a reduction in the glucose of the fluid system and an increase in that of the cells without modifying in any way the distribution of inorg. phosphate and of K. G. H. S.

Effect of adrenaline on the excretion of nitrogen, of creatinine, and of creatine. ALEXANDER PALLADIN AND WERA TICHWINSKAJA. *Arch. ges. Physiol.* (Pflüger's) 210, 436-41(1925).—If rabbits on a normal diet are given daily injections (1 per day) of adrenaline in gradually increasing amts. the excretion of total N and of creatinine are not modified. If, however, the rabbits are injected twice each day, and the amt. of adrenaline given is rapidly increased a markedly augmented excretion in total N and creatinine occurs, and creatine appears in the urine. G. H. S.

Comparison of the effects of *l*- and *d*-adrenaline under different conditions on the gas metabolism of normal and thyroidectomized mice. E. ABDERHALDEN AND ERNST GELLHORN. *Arch. ges. Physiol.* (Pflüger's) 210, 462-76(1925).—Injected subcutaneously

in warm-blooded animals *d*- and *l*-adrenaline lead to the same qual. changes in the gas metabolism. In low concns. the O use is increased; in high concns. it is diminished with a simultaneous fall in body temp. Quantitatively *d*- and *l*-adrenaline differ greatly since to attain a given effect it requires at least 10 times as much of the *d*- as of the *l*-adrenaline. Frequent injections of either *d*- or *l*-adrenaline lead to a tolerance for *l*-adrenaline, as is evidenced by the fact that the fatal dose for the normal mouse causes in the tolerant mouse the characteristic increase in metabolism usual for small amts. of adrenaline. Thyroidectomized mice show a considerably increased adrenaline resistance. Correspondingly, the O use even after the injection of 0.008–0.01 mg. of *l*-adrenaline per g. is increased, although in the normal animal under these conditions death occurs promptly with a marked fall in the O utilization and in body temp. The susceptibility of an animal to intoxication with adrenaline is considerably increased by fatigue. Even 0.004 mg. of *l*-adrenaline per g., or 5 to 10 times this amt. of *d*-adrenaline, will cause, with a simultaneous fatiguing, a complete exhaustion within a very short time (10 to 30 min.) followed usually by death. Normal control animals failed to show a comparable exhaustion even after 1½ to 2 hrs. In this behavior, thyroidectomized animals again showed an increased resistance. G. H. S.

Altering the glucose adsorption of human blood corpuscles by narcotics and lipoids. HANS HÄUSLER AND RAOUL MARGARIDO. *Arch. ges. Physiol.* (Pflüger's) **210**, 566–75 (1925).—Sodium oleate, thymol, camphor, isobutylurethan, Et₂O, and ethylurethan in low concns. inhibit, in higher concns. favor, glucose adsorption by human red blood cells. The same substances in the same concns. inhibit and favor the liberation of hemoglobin by the red cells caused by shaking. G. H. S.

Poisoning by sulfonal; localization of sulfonal and of hematoporphyrin. R. FADRE AND H. SIMONNET. *J. pharm. chim.* [8] **2**, 225–7 (1925).—A rabbit which was given a total of 12 g. sulfonal (*A*) with its food in 12 days was then killed, and the following amts. of *A* were found in the different organs: brain and marrow (wt. 11.5 g.) 0.057 g.; liver (48 g.) 0.043 g.; kidneys (15 g.) 0.028 g.; muscle (24 g.) 0.015 g.; blood (7.5 g.) 0.009 g.; spleen (0.8 g.) 0.007 g. The bile when examd. under ultra-violet rays having shown the fluorescence of hematoporphyrin (*B*), the distribution of *B* in the organs of another rabbit similarly treated was sought. *B* was found with certainty only in the bile, urine and in small quantity in the spleen. Seemingly, *B* formed in the course of poisoning by *A* is, in part, rapidly eliminated through the urine, and too small a quantity is left to be detected in the blood. S. WALDBOTT

MAIER, H. W.: **Kokainismus.** Geschichte, Pathologie, medizinische und behördliche Bekämpfung. Leipzig: Georg Thieme. 269 pp. Paper R. M. 15. Bound 17.50.

I—ZOOLOGY

R. A. GORTNER

Chemical study on pond-snails. NAOYE HASUI. *Okayama, Ig. Kw. Z.* **1922**, 513–22; *Japn. J. Med. Sci.* **2**, 22.—On pond-snails (*Viviparus malleatus* and *Viviparus japonicum*) H. estd. the amt. of glycogen in muscles, liver, digestive organs and ovary, and demonstrated in muscle exts. choline, a cryst. substance which corresponds to taurine and lactic acid. H. G.

Effect of the ambient p_H on the phototropism of marine pelagic copepods. MAURICE ROSE. *Arch. phys. biol.* **3**, 33–41 (1924); *Ber. ges. Physiol. expil. Pharmacol.* **30**, 375.

MARY JACOBSEN

The catalases in the first developmental stages of *Salmo Fario* (salmon trout). U. SAMMARTINO AND N. PETTINELLI. *Riv. biol.* **6**, 467–94 (1924); *Ber. ges. Physiol. expil. Pharmacol.* **30**, 483.—The catalase content of the eggs increases parallel with the development; the max. coincides with the absorption of the yolk sac. There is a subsequent decrease to a constant level. In devitalized eggs the catalase content falls to zero, provided that no bacterial action interferes. MARY JACOBSEN

The regulation of body volume in fresh water organisms. E. F. ADOLPH AND P. E. ADOLPH. *J. Expil. Zool.* **43**, 105–49 (1925).—Earthworms, frogs and flatworms show changes in body wt. when transferred from fresh water to various solns. In earthworms and flatworms water is lost to all solns; in frogs it is lost to hypotonic solns when they are nearly isotonic. Initial losses of water were often followed by adjustments in body water content. When returned to fresh water, the body vol. became approx. normal. In hypotonic chloride solns., almost no loss of Cl from the body occurred, but near isotonicity a slight intake of Cl may occur. Expts. with isolated frog skin showed that the integument alone ordinarily controls the passage of water and solutes. This

passage is not explained entirely by the principles of osmotic pressure. All quant. phenomena can be explained by assuming that electrostatic forces oppose osmotic ones. The body vol. of fresh water organisms is influenced by temp., the chem. nature of the body fluids, and of the medium, and other factors. The vol. is not const. as in the human, but definite means of adjustment exist, and the av. body vol. is characteristic.

CHAS. H. RICHARDSON

The role of aeration in the hatching of fertilized eggs of rotifers. J. C. LITE AND D. D. WHITNEY. *J. Exptl. Zool.* **43**, 1-9(1925).—Fertilized eggs of *Brachionus bakeri* develop normally in aerated water at room temp., but the young are unable to break through the egg membranes. If the newly laid fertilized eggs are sealed in containers with decompg. org. matter, the egg membranes are weakened and the young rotifers can readily break through. Such eggs hatch slowly or quickly according to the amt. of aeration of the water. Fertilized eggs of another species (*Asplanthna*) have a thick inner egg membrane which probably excludes the O_2 and causes the development of the young rotifers to cease. Abnormal fertilized eggs which lack this thick membrane may produce young females that may hatch inside the mother, or if laid, hatch soon after.

CHAS. H. RICHARDSON

Influencing the color changes in fish by means of chemicals. I. The effect of infundin and adrenaline on the melanophores and xanthophores of minnows (*Phoxinus laevis* Ag). LEO ABOLIN. *Anz. Akad. Wiss. Wien* **61**, 170-2(1924).—Over 200 specimens of minnows were injected with 0.05-0.15 cc. of 1:10 to 1:1000 solns. of adrenaline and infundin separately. An injection of 0.07 cc. of a 1:1000 soln. of adrenaline in the muscles of the back caused a typical contraction (max. in 8-10 min.) of the melanophores, the fish becoming very light yellow and remaining so for 2 hrs. The xanthophores are not affected. An injection of 0.08 cc. of an infundin soln. (1:100) caused a marked expansion of the melanophores in the lower layer of the skin and of the xanthophores in both layers. The fish becomes darker and the normally gray parts become pale yellow. A similar dose of 1:10 soln. caused an expansion of the xanthophores which, in some cases, masked the expansion of the melanophores. The effect of infundin was compared with other expansion-producing factors by the examn. of the skin of fish (1) which had been blinded; (2) had been kept over a black surface; and (3) which had suffered destruction of sympatheticus. In (1) a slight expansion of melanophores in the upper layer and localized expansion in the lower layer were observed; in (2) expansion occurred in the lower layer only, being similar to the action of infundin; (3) showed expansion in both layers, indicating a paralysis of the entire system. Whether these color changes are due to expansion of the cells or to an increase in color substance and what part the nervous system plays in this reaction is being investigated. **II. Production of male erythrophore coloring in female minnows (*Phoxinus laevis* Ag) by treatment with infundin.** *Ibid* 172-3.—The upper pigment layer of minnows contains varying nos. of erythrophores in the vicinity of the lips, fin bases and belly which are particularly prominent in the male when in a state of sexual excitation. By injection of 1:10 infundin soln. into an adult normal individual the erythrophores are expanded into star-shaped bodies which give the fish an intensive red color. A soln. 1:100 is less effective; one 1:1000 is without effect. The adult female, which normally does not show this vivid coloring, as well as the partly grown individuals of both sexes responds to the injection of infundin. Individuals of both sexes have an erythrophore system but normally it is stimulated only in the male at periods of sexual excitation.

E. R. SCHIERZ

LEBEDINSKY, N. G.: *Die Isopotenz allgemein homologer Körperteile des Metazoenorganismus.* Berlin: Gebrüder Borntraeger. 36 pp. M. 3. Pfg. 30.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

An examination of the errors introduced by the various approximate methods used for estimating the total quantities of milk and butter fat produced during a lactation. E. J. SHEEHY. *Sci. Proc. Roy. Dublin Soc. [N. S.]* **18**, 185-94(1926).—Daily records of butter fat and milk were kept on 8 cross-bred shorthorn cows. Calcs. were made by assuming weighings on one day each 1, 2, 3, 4, 5, or 6 weeks, the av. errors percent being, respectively, = 0.64, 1.44, 1.48, 2.37, 2.47 and 3.08. Four butterfat calcs. were made on assumed daily tests at intervals of 1, 2, 3, 4, 5 and 6 weeks, on 5 tests at regular intervals, 4 tests at irregular intervals and on tests two consecutive days at

6- and 7-week intervals. Av. percent errors were 3.16, 3.85, 4.64, 2.88, 2.88. For approx. methods Where fat tests have to be at long intervals, mill Results are on individual cows.

The subject "milk" in chemistry teaching. *chem. Unterricht* 38, 282-91(1925).—N. discusses a procedures as follows: % dry material; sepn. of ca microscopic examn.; approx. fat detn.; specific gravitation; detn. of reaction with litmus and phenolphthalein; methylene blue test for reductase which depends on bacterial content; H_2O_2 test for catalase; *p*-phenylenediamine and H_2O_2 test for oxidases; titrational acidity, showing how it is affected by fermentation. M. BEBER

The effect of freezing on the marketability of milk and cream. W. H. E. REED. *Milk Plant Monthly* 15, No. 1, 46(1926).—Freezing of milk and cream injures the flavor, and causes a decrease in the cream line of milk. H. F. ZOLLER

An investigation into the yield and composition of milk from the farm school dairy, Peradeniya. A. W. R. JOACHIM. *Trop. Agr.* (Ceylon) 65, 133-8(1925).—The av. fat content of milk from Scindi cows is 4.9%, of morning milk only 3.6 and of evening milk only 6.5%. When the diet remained the same there was on the av. an inverse relationship between the fat content and the yield and the fat content and hydrometer readings. The latter was almost quant. A. L. MEHRING

The phenomenon of rennet coagulation. A. DE DOMINICIS AND C. LA ROTONDA. *Ann. v. scuola agr. Portici* [2] 17, 1-20(1922).—From 75° on, the action of heat on milk is proportional to the temp. and the time of heating. The effect is to decrease and finally entirely to prevent the action of rennet. This fact is related to the modifications of a phys. character which casein undergoes; the particles tend to unite under the influence of heat into larger and more compact aggregates, thus passing into a state required for sepn. by coagulation, the phenomenon caused by the action of acids. In the presence of rennet, however, the casein does not modify its distribution but solidifies as in processes of gelatinization, the homogeneity of dispersion remaining perfectly preserved; the opposite effects to which the action of heat tends are, therefore, the reason of the unfavorable influence of the cooking of milk on its pptn. by rennet. Curd owes its ability to become fresh cheese to the property of its being in a gelatinous state different than that of the coagulated state. ALBERT R. MERZ

The food value of dried whey solids. J. B. ORR AND J. A. CRICHTON. *Scottish J. Agr.* 6, 63-7(1923).—The av. compn. of "fat-free" whey solids and lactalbumin produced at the government lactose factory at Crewe is: protein 12.0, 76.0; fat 1.0, 2.5; carbohydrates 69.0, 7.5; mineral matter 8.0, 3.0; and H_2O 10.0 and 11.0%, resp. Suckling pigs gained practically as much wt. over a period of 28 days when a mixt. of whey solids and lactalbumin was substituted for a portion of the sow milk as when whole milk was used, the total amt. of solids consumed being practically the same in both cases. Under similar conditions whey solids plus a meal mixt. was decidedly superior to the meal mixt. alone and only slightly less effective than skimmed milk plus meal mixt., the results being based on equiv. amts. of solid matter. Expts. with whey solids as a food for calves are in progress. The possibilities of using whey solids in compounding infant foods are pointed out. The annual production of whey in England is estd. at 100 million gallons, at least 50% of which is wasted. K. D. JACOB

Viscosity and whipping properties of milk and cream. J. C. HERRING AND A. C. DAHLBERG. *Milk Plant Monthly* 15, No. 3, 37(1926).—The viscosity of milk and cream increases with the percentage of fat irrespective of their treatment, providing the treatment was held uniform. The same general statement is true for whipping properties. Cream which has had its viscosity increased mechanically (by homogenization) whips in a shorter time but with less vol. Milk received at the station and immediately cooled to 37-40° F. by a tubular cooler until time of sepg at 90° F. always gave a cream of great viscosity. This indicated the probability that the clumping of the fat globules was largely responsible for the viscosity effect in cream. Expts. conducted with a MacMichael viscometer and a microscope substantiated this belief. H. F. Z.

Moisture in wheat and flour. M. L. THOMPSON. *Am. Miller* 54, 266(1926).—Moisture in flour is important because of its influence on keeping quality and because of its relation to the laws regarding net wt. In wheat high moisture content increases the rate of respiration of the grain which causes heating with its resulting damage to the flour produced from that wheat. The control of moisture in flour is not an easy matter, since it is influenced by (1) original moisture of the wheat, (2) vitreousness of the wheat, (3) amt. of water added in tempering, (4) length of temper, (5) atm. con-

Butter. S. KARPINSKY and J. S. ANDERSON. U. S. 1,574,821, March 2. Cream charged with air is formed into butter by forcing it through a narrow annular space between a rod and a closely spaced surrounding tube.

Margarine, etc. O. MUSTAD and SÖN. Brit. 237,242, July 16, 1924. Mixing of substances rich in vitamins with margarine or other edible fatty materials is carried out in CO_2 , N, H or other gas substantially free from O or air.

Fruit juices. W. S. PIERCE. Brit. 237,592, July 24, 1924. See U. S. 1,556,572 (C. A. 20, 79).

Apparatus for dehydrating fruit or similar materials. B. R. RAGAIN. U. S. 1,575,000, March 2.

Packing and preserving fruit. M. CARBONE. U. S. 1,575,148, March 2. A container is packed with grapes or other fruit and filled with juice of the same or a similar fruit, impregnated with a sterilizing agent such as SO_2 , and then sealed.

Devitalized yeast for use in making bread or other food products. C. HOFFMAN and C. N. FREY. U. S. 1,575,762, March 9. Yeast is treated with a satd. soln. of $(\text{NH}_4)_2\text{SO}_4$ or with a dil. acid soln., heated to about 85° , washed, filtered and dried without rupturing the cell walls.

Apparatus for dehydration of walnuts or other vegetable materials. C. C. MOORE. U. S. 1,574,994, March 2.

Preserving konjak powder. K. TAMANAHA. U. S. 1,574,638, Feb. 23. Konjak powder is mixed with about 5–10% of a substance of acid reaction such as salicylic acid or H_3BO_3 or treated with HCl gas or NaHSO_4 or other acid salt.

Curing cacao beans. W. B. McLAUGHLIN. U. S. 1,575,371, March 2. Cacao beans are maintained out of contact with air at a temp. (usually about 50 – 55°) above that at which organized ferments grow and below that at which the enzyme of the bean is injured, until the purplish red color of the bean changes to a reddish brown which upon drying becomes cinnamon brown.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Colloids in industry. P. M. TRAVIS. *J. Chem. Education* 3, 324–37(1926).

Progress in adsorption technic. R. KOETSCHAU. *Z. angew. Chem.* 39, 210–3 (1926).—See C. A. 20, 955.

Comparison of gas absorption and rectification. W. G. WHITMAN AND G. H. B. DAVIS. *Ind. Eng. Chem.* 18, 264–6(1926); cf. C. A. 19, 757.—The absorption of CO_2 from a gas mixt. by Na_2CO_3 – NaHCO_3 lye in a plate column can be adequately treated by the general absorption equation. The overall rate coeff. for absorption is proportional to the square root of the gas velocity through the column. The coeff. for absorption doubles with every 24° increase in temp. The same absorption equation governs the rate of rectification when steam and CO_2 are passed up through lye. The coeffs. in this case are about 2.4 times as great as those for absorption.

Ultra-purification of gas mixtures. J. A. ALMQUIST AND R. L. DODGE. *Chem. Met. Eng.* 33, 89–92(1926).—Gaseous contact catalyst poisons can be classified as (1) reversible or temporary poisons and (2) non-reversible or permanent poisons. Reversible poisons are those that inhibit the reaction only while present in the gas and from the effects of which the catalyst is able to recover when treated with pure gas. Typical poisons of this type for Fe NH_3 -catalysts include O, CO, and other O-contg. compds that are catalytically converted to H_2O in the presence of H. The non-reversible poisons are those that inhibit catalysis permanently, usually by reacting with the catalyst to form a compd. that is not readily removed by continued treatment with pure gas. S compds. and P may be classed as non-reversible poisons for reduced Fe catalysts. The distinction between the common reversible and non-reversible poisons is not a strict one, since poisons like S may become essentially reversible at high temps. if present in sufficiently small quantities. To avoid the deleterious effects of relatively small concns. of certain poisons, the gas may be submitted to ultra-purification. Suggested methods of removing small quantities of CO , CO_2 , S, halogens, P or H_2O from gases are listed. The methods are taken mostly from U. S. patent literature, and fall mainly in 2 classes: (1) absorption methods, comprising those in which the harmful impurities are retained by the purifying agent; (2) catalytic conversion methods, comprising those in which the harmful impurity is transformed into a harmless

one or into another deleterious impurity that can be more easily removed than the original poison.

R. L. DODGE

An investigation of crushing phenomena. A. M. GAUDIN. *Trans. Am. Inst. Mining Met. Eng.* No. 1565B, 58 pp. (Feb. 1926).—In structurally homogeneous rocks fracture takes place through grains and grain boundaries; in structurally heterogeneous rocks fracture passes in preference through grain boundaries. If a sized product, composed of homogeneous rock grains is crushed, a product results in which the relation between the percentage wt. of grains of various sizes and these sizes themselves follows a definite law. This is discussed for the *Dodge jaw crusher*, 4×7 in.; "*Krom*" rolls, 10×16 in.; *batch ball mill*, 8×10 in.; *batch rod mill*; and 20 in. continuous discharge *Hardinge ball mill*; quartz, *Stony Creek granite* and *galena* are used as materials. Sizing tests are represented graphically by the semi-logarithmic plot, in which the percentage of material retained by a screen and passing the next larger screen is plotted against the log of the screen aperture, and by the logarithmic plot, in which the log of the percentage of material retained is plotted against the log of the screen aperture. Typical size curves are shown for the various types of crushers, and are discussed mathematically for the different kinds and size of feed. Photographs are shown of quartz grains crushed in rolls. The difference in shape is ascribed to the combination of the sorting actions of the screens and the rolls, which are different. It is concluded that rolls crush by breaking through the particle as contrasted with surface wear. The action of a jaw crusher is substantially the same as that of rolls. The action of pebble mills without pebbles is distinctly rounding, the amt. of the material ground off varying substantially as the square of the grain diameters, and showing a diameter of less than 10 microns. In the rod mill the fine grains are of the same shape as those produced by rolls, but the coarser grains tend to be equidimensional. An increase in the no. of rods from 4 to 16 increases the grinding work 20 times. In this type of mill, grinding is done by breaking through the grain. The straight-line relation between the log of the percentage corresponding to a certain range in size and the log of that size which was found to hold for jaw crusher, crushing rolls and rod mill holds for ball milling only when the ratio of size of feed to size of balls is below a certain *critical ratio*. When it is above that ratio, the balls appear to grind grains of intermediate size, chipping off sharp edges from the larger grains and eventually rounding these without pulverizing them. With $7/8$ to 1 in. balls, the critical size is about 2 mm., and with balls twice that size, the critical size is 4.6 mm. The size of *preponderant breaking* is of the order of $1/1000$ of the ball diameter. The relation $y = Cx^k$, in which $y = \%$ of material, x = screen aperture, C = a const., and k = the slope of the straight line in the logarithmic plot, holds for the fine range of roll, jaw crusher and rod mill product under all conditions tested, but for the ball mill product only under certain conditions. The computation of *specific surface*, size of *av. surface*, size of *av. vol.*, and no. of particles is derived in detail. In studying heterogeneous rocks, *Manhattan schist* and *Inwood limestone* are used. The logarithmic size curve obtained from sized feed is not a straight line as with homogeneous material. A larger percentage of rock breaks at the av. grain size in the heterogeneous rocks.

H. STOERTZ

New method of conducting filtration tests. D. R. SPERRY. *Ind. Eng. Chem.* 18, 276-9 (1926).—A recording device for time discharge and time pressure curves is described.

L. A. PRIDGEON

A new principle of heat exchange: the jet system. R. HERTWECK. *Wärme & Kälte Tech.* 27, 234-6 (1925).—Where one fluid is to take up heat from another through a wall (e. g., of a pipe), the rate of heat transfer may be much increased by admitting one or both of the fluids to the wall through orifices in an outer jacket (or inner pipe). In this way the fluid impinges on all parts of the surface in a series of jets, instead of merely flowing along it. The size and cost of equipment are thereby much reduced. The system has been applied to condensers and air and water heaters, and the tests given indicate that the coeff. of heat transfer can be increased several fold.

E. W. T.

Distribution of energy. R. F. STARKE. *Feuerungstechnik* 13, 145-6 (1925).—S. compares the cost of distributing one energy unit as gas, as elec. current and as coal, over different distances and under various conditions. For long distances (100-200 kilometers) gas has the lowest costs.

ERNEST W. THIBLE

Organic insulating materials. A. C. HOPPER. *Electrician* 96, 258-9 (1926).—An outline of: the properties of an ideal insulating material, the effect of increasing voltages, impregnating problems and the question of acidity. Moisture effects, air bubble phenomena, and the desirability of substituting fish oil for linseed oil when prolonged exposure to high temps. is anticipated are discussed. It is claimed (U. S. pat. 1,091,621) that cambric treated with an insulating material consisting of a mixt.

of phenol-formaldehyde resin and stearin pitch in AmOAc soln. retains its flexibility far longer than a linseed oil varnish and maintains its resistivity and in some cases actually increases its resistance with rise of temp. The coated fabric showed increased resistance up to 70°. "Metallized" C filament is the only other known substance having a plus temp. coeff. With a "flushed" filament, the hot resistance approximates $1/2$ the cold resistance; after elec. furnace treatment it is 2.6 times the cold resistance.

W. H. BOYNTON

A high-frequency voltage test for insulation. J. L. RYLANDER. *J. Am. Inst. Elec. Eng.* 45, 217-21(1926). C. G. F.

Theory of absorption in solid dielectrics. VLADIMAR KARPETOFF. *J. Am. Inst. Elec. Eng.* 45, 236-40(1926). C. G. F.

The rescue apparatus, its physiological action on the rescue worker, and its purpose. J. BIALEK. *Montan. Rundschau* 17, 673-82(1925).—A review tracing the development of gas masks used by rescue workers in mines. M. BEBER

The rescue apparatus, its physiological action on the rescue worker, and its purpose. J. BIALEK. *Montan. Rundschau* 17, 703-7(1925); (cf. preceding abstr.).—Increase in CO₂ and decrease in O₂ in the app. exhaust the rescue worker more quickly. If the CO₂ content remains within certain limits (1%) and if air is rich in O₂ (more than 21%), no untoward effects result. Breathing pure O₂ has no ill effects, but is beneficial if the blood has a higher than normal CO₂ content, in that it aids in a more effective gas exchange. O₂ deficiency is much more serious. The rescue worker breathes into a space of higher pressure and from a space of lowered pressure: chest muscles do 41 kg. more work with each inhalation and 17.5 kg. with each exhalation. Useful work is decreased by these amts. Values will vary with the individual and with the app. Gas must be cooled after purification: various methods are given. Essentials of the rescue app. are: (1) it must furnish the wearer with enough air for his activities; (2) it must be air tight; and (3) hinder the rescue worker the least in the carrying out of his duties. The purposes are: (1) to permit rescue workers to go into unbreathable atm. and save people there and (2) to do away with the results of an explosion and bring the mine back to its original condition as quickly as possible. M. BEBER

BADGER, W. L.: *Heat Transfer and Evaporation*. New York: Chemical Catalog Co. 306 pp. \$5. Reviewed in *Mech. Eng.* 48, 295(1926).

HEMMING, EMILE: *Plastics and Molded Electrical Insulation*. New York: The Chemical Catalog Co. Reviewed in *Plastics* 2, 63(1926).

Il notiziario chimico-industriale. (*New Journal*.) Prod. Michele, Editor. Vol. I, No. 1 appeared in Jan. 1926. Publ. monthly Turin, Italy. 72 pp. Annual subscription for foreign countries L. 140. Reviewed in *Chemicals* 25, 41(1926).

LECHATELIER, HENRY: *Science et Industrie*. Paris: Ernest Flammarion. 283 pp. Fr. 7.50. Reviewed in *J. Inst. Metals* 33, 618(1925).

LÉVY, S. I.: *An Introduction to Industrial Chemistry*. London: G. Bell & Sons, Ltd. 288 pp. 15s.

ROUSIERS, PAUL DE: *Les grandes Industries modernes. II. La Metallurgie*. Paris: Armand Colin. 284 pp. Fr. 9. Reviewed in *J. Inst. Met.* 33, 613(1925).

THORPE, THOMAS EDWARD: *Dictionary of Applied Chemistry*. Vol. 5. Revised and enlarged. London and New York: Longmans, Green & Co. 722 pp. 60s. Reviewed in *Tech. Book Review Index* 8, No. 2, 271.

Cooling, liquefaction and separation of constituents of gases. A. SELIGMANN. U. S. 1,573,752, Feb. 16. In low-temp. cooling, liquefaction and sepn. of gases by throttling, the major portion of the decrease of pressure is induced by causing the gases to flow at relatively great velocity through pipes in which friction of the gases occurs throughout the length of the pipe walls such as to "consume" the decrease in pressure.

Magnetic treatment system for separation of constituents of liquid air or other fluid mixtures. P. E. HAYNES. U. S. 1,575,587, March 2.

Heat exchange and expansion system for liquefaction and separation of constituents of air or other gases. A. SELIGMANN. U. S. 1,574,119, Feb. 23.

Heat-exchange system for liquefaction and rectification of air or other gaseous mixtures. F. JORDAN. U. S. 1,574,425, Feb. 23.

Gravity and centrifugal separation of constituents of gas and vapor mixtures. S. P. SZCZEPANOWSKI. Brit. 237,617, July 22, 1924.

Protecting gas-absorbing substances from penetration by liquids. R. OPPENHEIM.

U. S. 1,574,844, March 2. Battery elements or other porous articles are covered with a pectized colloid in sheet form such as cellophane. U. S. 1,574,845 specifies tubular porous battery elements rendered impermeable to liquid while remaining permeable to gases, so as to act as a dialyzer.

Disintegrating talc, iron oxide or other dry materials. H. PLAUSON. U. S. 1,575,717, March 9. The material is subjected to impact against moving parts rotated at a relative velocity of at least 1000 revolutions per min. and in which the peripheral speed is at least 1000 meters per min., the operation being carried out *in vacuo*.

Heating petroleum or other fluids. F. E. WELLMAN. U. S. 1,573,591, Feb. 16. A mass of sand or other granular refractory material is heated and is then permitted to flow over and around vertical tubes or other containers holding petroleum oil which is being cracked or other fluid to be heated.

Heat- and electric-insulation. N. STABILE. Brit. 237,507, Feb. 2, 1925. A molded material is formed from ground leather 65, resin 20, Zn salts, oxide or carbonate 8 and inert fillers such as ground stone or sand 7%.

Electric insulation. G. F. DREHER. U. S. 1,574,562, Feb. 23. An asbestos compn. is impregnated with still wax which is modified by distn. to produce a flow point of about 45–50° and then applied to the compn. at a temp. of about 220°.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Modern British practice in water softening. V. Zeolite or base-exchange methods of water softening. D. BROWNLIE. *Ind. Chemist* 2, 61–4(1926); cf. C. A. 20, 637.—The advantages of the zeolite species of water softener (doulcil, kenzelite, permute) are: (1) zero hardness, (2) ease of dealing with all qualities of H₂O, (3) no sludge, (4) simplicity of plant, (5) operation under pressure, (6) small floor space, (7) no moving parts, (8) alkali beneficial in boiler water and for laundry and bleaching plants, (9) easy control of exact hardness. Disadvantages are: (1) Alk. water is a cause of foaming and priming, and at pressures above 150 lbs. per sq. in. tends to render boiler plate brittle. Such water is objectionable for drinking and cooking, also in dyeing, brewing and other fermentation processes. (2) The zeolite disintegrates (3) CO₂ exerts solvent action on the zeolite. (4) Acids act on the zeolite. (5) Iron in the water ppts. as Fe(OH)₃ and lessens the effectiveness and rate of regeneration of the zeolite. (6) Traces of oil in the water gradually cover the zeolite with a fine film and render it useless. (7) Mud and suspended matter must first be removed. (8) Size of plant depends on the hardness of the water. (9) There is nothing to prevent unsoftened water passing through when the bed is exhausted. (10) Zero hardness is not necessary since 1° or 2° of hardness does not cause pptn. of the Mg and Ca salts of the fatty acids. These remain in soln. and act as detergents. The whole subject is, however, bristling with conflicting opinions and claims. In general, zeolite methods are ideal for water of moderate hardness, not over 12°–15° total with little or no temporary hardness. For a very hard water with little permanent hardness the CaO-Na₂CO₃ method is infinitely superior.

E. G. R. ARDAGH

Problems of hard and soft water. R. A. THUMA. *J. Am. Water Works Assoc.* 15, 152–7(1926).—Softening a water will save soap, fuel, and, in municipal filtration, Cl, reduce corrosion and boiler up-keep.

D. K. FRENCH

Note on the determination of permanent hardness of water by Pfeifer and Wartha's method. ARTHUR LUMSDEN-BEDINGFELD. *J. Soc. Chem. Ind.* 45, 36T(1926).—In the P. and W. modification of the Hehner method of detg. permanent hardness, standard NaOH is used with Na₂CO₃, the water concd. to half vol., the Ca and Mg carbonates are filtered off and the filtrate is titrated. Results by this method are too high because of absorption of NaOH by the filter paper, a 9-cm. filter paper absorbing 0.04 cc. 0.2 N NaOH which could not be washed out with cold water. The modification is held to have no advantage over the original method.

BEN H. PETERSON

Carbonates and bicarbonates in the water of the Nile. V. M. MOSSÉRI. *Bull. inst. Egypte* 7, 155–62(1925).—The alk. to phenolphthalein due to carbonates and also alk. silicates is appreciable (6–11 mg. CO₃ per l.) in May, June and July, the last 3 months of low water; the rest of the year it is slight or hardly perceptible. Bicarbonates are present all the year, the concn., expressed as mg. HCO₃ per l., varying from 98 to 159, with a max. in June and July and a min. in September to December. In equivalents of CO₃ the carbonates (and alk. silicates) represent 0.0–5.5% of the total sol. matter; while the bicarbonates represent 35–44%. The sum of the two ranges from

36 to 45% of the total sol. material, but during the greater part of the year the range is about 40-45%.

P. R. DAWSON

Chemical and chemico-physical researches on the saline water of S. Venera (Acireale) which contains bicarbonates, hydrosulfides, boric acid, bromine, iodine and lithium. R. NASINI, C. PORLEZZA AND A. DONATI. *Ann. chim. applicata* 15, 484-518(1925).—Extensive analyses indicated that the % compn. of the water was approx. the following in mg. per l.: Na 1455.5, K 5.3, Li 0.3, NH_4 19.7, Mg 92.1, Ca 62.3, Sr 5.7, Ba 0.8, Fe (ferric) 0.2, Al 0.2, Cl 2311.5, Br 5.6, I 2.9, SO_4 97.2, HPO_4 0.5, HCO_3 450.7, HS 23.4, NaCl 522.1, Na_2SO_4 60.2, NaHCO_3 123.5, NaHS 5.2, KCl 0.5, K_2SO_4 0.1, KHCO_3 0.1, KHS 0.01, NH_4Cl 3.1, $(\text{NH}_4)_2\text{SO}_4$ 0.4, NH_4HCO_3 0.7, NH_4HS 0.03, MgCl_2 179.0, MgSO_4 21.5, $\text{Mg}(\text{HCO}_3)_2$ 45.3, $\text{Mg}(\text{HS})_2$ 1.8, CaCl_2 70.7, CaSO_4 8.2, $\text{Ca}(\text{HCO}_3)_2$ 17.0, $\text{Ca}(\text{HS})_2$ 0.7, SrCl_2 4.5, SrSO_4 0.5, $\text{Sr}(\text{HCO}_3)_2$ 1.0, $\text{Sr}(\text{HS})_2$ 0.05, SiO_2 39.0, free CO_2 213.0, H_2S 48.5, free H_3BO_3 2.1. Its radioactivity (0.6981 Maché units per l.), its osmotic pressure and certain of the mineral components such as H_3BO_3 impart to the water therapeutic properties which may account for its present high reputation and which should render it of increasing importance.

C. C. DAVIS

Chemical analysis of Capvern water. CH. LORMAND. *Compt. rend.* 182, 404-6 (1926).—This thermal water of Triassic origin gave the following figures: temp. 23.8° (temp. of the air 7°), resistivity 496.5, $\Delta -0.30$, p_{H} 8.0, radioactivity in millimicrocuries per l. 0.405, Ra dissolved $10^{-12} \times 17.7$, residue at 100° 1.9685, residue at dull red heat 1.5406. *Cations:* K 0.00209, Na 0.00983, Li 0.00003, Mg 0.09325, Ca 0.35460, Sr trace, Ra $10^{-12} \times 17.7$, Fe 0.00081, Mn 0.000004, Cu trace. *Anions:* Cl 0.00497, Br trace, S as SO_3 0.86791, Si as SiO_2 0.01052, C as CO_2 0.06830, N as HNO_3 0.00130, hororadioactivity in microcuries 29.3625, radioactive power in mg. of Ra 3.91.

L. W. RIGGS

Water treatment in Ohio. W. H. DITTOE. *J. Am. Water Works Assoc.* 15, 137-41 (1926).—A general study of the condition of water works equipment and operation in 1908 has resulted in the adoption of methods to insure their efficiency.

D. K. FRENCH

Stream pollution. KENNETH ALLEN. *Proc. Am. Soc. Civil Eng.* 52, 520-31 (1926).—A symposium of the results of the Metropolitan Sewerage Commission from 1909 to 1924. Dissolved- O_2 tests are the best criteria of stream pollution. Comparative results show loss of dissolved O_2 as % satn. from 1909 to 1924; at East River, 57 to 14%; Hudson River at 42nd street, 65 to 22%; Morris Heights, Harlem River, 46 to 10%; Upper Bay, 60 to 28%. The vol. of sewage entering New York Harbor is approx. 2,060,000,000 gals. daily. The biochem. demand in the Harbor is estd. at 1,558,700 lbs. daily. A standard of cleanness is proposed: (1) Solid matter recognizable as of sewage origin shall not be visible in the Harbor. (2) Marked coloration, turbidity, effervescence, oil odor or deposits due to sewage shall not occur except in the immediate vicinity of the outlet. (3) Discharge of sewage shall not contribute materially to the formation of deposits injurious to health or navigation. (4) Quality of water at all points suitable for bathing or oyster culture shall conform to the bacteriological purity of drinking water. Activated-sludge plants are contemplated at Wards Island and south of Jamaica Bay. For the other localities fine screening and chlorination will suffice.

BEN H. PETERSON

Water analysis, dissolved oxygen by Winkler method. E. J. THERIAULT. *U. S. Public Health Bull.* 151, 43 pp.(1925).—The Winkler method with the Rideal-Stewart modification was used in an extensive stream pollution investigation. The various modifications that are necessary in the presence of nitrites, iron salts, and easily oxidized org. matter are discussed in some detail. Complete absorption of dissolved O_2 is assured by causing the ppt. of Mn hydroxides to settle a second time. Loss of iodine by volatilization is prevented by titration in the sample bottle itself, and by the use of large ams. of iodide. The KMnO_4 treatment is fully effective in counteracting the interference due to such forms of org. matter that are commonly present in fresh sewage or recently collected industrial wastes. The KMnO_4 modification should give accurate results in the presence of iron salts up to 100 p. p. m. If 2 cc. 40% $\text{KF} \cdot 2\text{H}_2\text{O}$ are added to a 300-cc. sample of the iron salt delay of decolorization of KMnO_4 by oxalates is greatly diminished. When the delay before titration is protracted, 4 cc. 85% H_3PO_4 in 300-cc. sample should be substituted for the usual H_2SO_4 .

C. M. SALLS

The presence of iodates in well-water. C. F. HICKETHIER AND ALBERTO JACOBUECCI. *Z. anal. Chem.* 67, 129-33(1925).—In the examn. of some waters from the Argentine Republic, the presence of nitrites was indicated by testing with Trommsdorff's reagent but subsequent investigation showed that the test was due to iodates. This indicates that residues of an ocean remain from the tertiary period. The reactions of Ilosvay

v. Ilosva and of Riegler are the most reliable and most sensitive tests that are available
HNO₂. W. T. H.

Nitrate determinations. G. W. BURKE. *J. Am. Water Works Assoc.* 15, 169-70 (1926).—Where the presence of org. matter interferes with color comparisons the reduction method is recommended. D. K. FRENCH

In what chemical form does silicic acid exist in water? W. WINDISCH. *Woch. Brau.* 42, 59(1925).—A siliceous H₂O contg. 34.5 parts carbonates per 100,000 of which 22.5 were Na₂CO₃ was subjected to electroösmosis and after the treatment contained only 1 part alk. earth carbonates and 2.5 Na₂CO₃. The N₂O₅ content was reduced from 4.21 to 0.18. The silica content remained unchanged indicating that Si is present as SiO₂ and not as silicate. A good brewing H₂O can be made from hard H₂O by means of electroösmosis. C. N. FREY

Report of advisory committee on official water standards. U. S. Publ. Health Rept. 40, 693-722(1925).—The text of the proposed U. S. Treasury Dept. standard regarding (1) source and protection, (2) bacteriol. quality and (3) phys. and chem. characteristics is given and discussed. The recommended limits for phys. and chem. quality are as follows, in p. p. m.: turbidity 10 (in general not more than 5), color 20 (preferably less than 10), Pb 0.1, Cu 0.2, Zn 5.0, sulfate 250, Mg 100, total solids 1000, chloride 250, Fe 0.3, and carbonates of Na and K expressed as Ca carbonate 50. The supply shall be rejected if Pb, Cu or Zn is present in excess of the amts. specified, but not for failure to conform to the other chem. and phys. requirements unless another more suitable supply is readily available. The bacteriol. standard has been described previously (cf. Jordan, C. A. 19, 2247). A mathematical discussion of the *B. coli* test by L. J. Reed is appended, in which probable *B. coli* densities for various types of samples, using both 5 portions, of 10 cc. each, and portions in geometric series, are shown graphically. B. C. A.

Composition of imported bottled waters. A. E. MIX AND J. W. SALE. *J. Am. Med. Assoc.* 85, 1963-7(1925).—Both imported and domestic waters are classified under their predominating mineral constituents as follows: dolomitic limestone, Vichy type, NaHCO₃, NaCl, MgSO₄ or Na₂SO₄ or both, and the Fe type. Over 250 imported waters were analyzed and classified according to the above scheme. L. W. RIGGS

Colon bacteria in some fissure springs of the Balcones Fault zone. I. M. LEWIS. *J. Am. Water Works Assoc.* 15, 158-68(1926).—While colon bacteria are found in such water, the nature of the catchment area indicates animal rather than human feces responsible. The colon bacteria being of the Escherichia type are not considered of great sanitary importance. D. K. FRENCH

The use of quinic acid in the differentiation of the colon-aerogenes groups. B. H. BUTCHER. *J. Am. Water Works Assoc.* 15, 171-3(1926).—This reagent is considered a valuable one to be used in species identification in the colon-aerogenes group. A formula for prepn. is given. D. K. FRENCH

Equations for determination of pressure drop in water mains. PAUL BRINKHAUS. *Gas u. Wasserfach* 69, 165-8(1926).—Equations, tabulations and charts are given. W. B. PLUMMER

The hydroelectric plants of Rempen and Sieben in the canton of Schwyz, Switzerland. The barrage reservoir of Wägital. A. BIDAULT DES CHAUMES. *Genie civil* 87, 241-5(1925).—The most important development in Switzerland. The reservoir will contain 148 million cu. m. retained by a dam 100 m. high. The fall utilized is 240-260 m. at Rempen. At this point there is a 368,000 cu. m. basin from which the water passes to the Sieben plant after a fall of 190-195 m. The final discharge to the lake of Zurich is by the original bed of the river Aa. JACK J. HINMAN, JR.

Eliminating boiler scale by the Agfil process. D. A. GARDNER. *Power* 63, 261-2 (1926).—A small pulsating d. c. is passed over the inside surface of the boiler. The result is the pptn. of the scale-forming material as a sludge. No theoretical explanation has been advanced. The process has been used in Europe for 3 years. A recent installation in this country is illustrated. D. B. DILL

Relation between stream pollution and extent of sewage treatment required. J. K. HOSKINS. *Proc. Am. Soc. Munic. Improvements* 31, 317.—Point of max. concn. of *B. coli* occurs 10 to 15 hrs. in summer and 15 to 30 hrs. in winter below the sewer outlet. Bacterial decrease is more rapid in summer than in winter. It is possible by knowing the max. concn. to predict the no. of *B. coli* remaining in a stream at stated intervals of time and distance from the sewer outlet. Permissible limits of *B. coli* in raw water to be purified are 1000 to 1200 per cc. The *B. coli* per cc. permissible at max. concn. can be then calcd., considering the time of flow from point of contamination to water plant. BEN H. PETERSON

Military sanitation. ANON. *Army Med. Bull.* No. 15, 1925; *Pub. Health Eng. Abstracts*, Jan. 9, 1926. *Water*.—Military needs for water are discussed, with detailed methods of mobile water purification and sterilization equipment. M. E. F.

Industrial wastes as fertilizer (REGE) 15. Spectrographic analyses of residues of mineral waters (I) water of Salsomaggiore (PORLEZZA, DONATI) 7. Evaporating apparatus for concentrating or drying sewage (U. S. pat. 1,576,471) 1.

Purifying water by use of barium silicate (to remove hardness). A. L. GRANT. U. S. 1,574,477, Feb. 23.

Apparatus for purifying water by ozone. H. B. HARTMAN. U. S. 1,574,389, Feb. 23.

Regenerating water of aquaria. E. W. BETH. U. S. 1,574,783, March 2. Mech. features of raising H_2O by compressed air, sepn. of vitiated air and CO_2 and return flow of the H_2O .

Removal of oil from boiler feed water. J. C. DIJXHOORN. Dutch 14,335, Feb. 15, 1926. Filtration of the oil contg. feed water through a filter press provided with a thin layer of $Al(OH)_3$ (either directly applied or added to the water) removes the finely emulsified oil completely.

Treating garbage. J. T. FETHERSTON. U. S. 1,576,105, March 9. A mixt. of NaCl with a small proportion of an acid-neutralizing substance such as CaO is used for retarding decompn. U. S. 1,576,106 specifies sprinkling salt on the bottom and sides of garbage containers to reduce objectionable odors.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The loess of China. G. B. BARBOUR. *China J. Science & Arts* 3, 454-63, 509-19 (1925).—Chem. analysis gives figures not greatly different from those for ordinary silt loam, and the peculiar characteristics of loess would seem to have a phys. rather than a chem. basis. Mineralogical analysis indicates the presence of minerals predominating in unweathered granitic rocks, which is sited as evidence in favor of the wind action theory of loess formation. WM. H. ADOLPH

Formation and decomposition of humus in the soil. R. BALKS. *Landw. Vers. Sta.* 103, 221-58(1925).—In general, the amt. of chemically bound water is correlated with the clay and silica content of the soil. The catalytic power of the soil is conditioned by the presence of enzymes and colloids. Total N, easily sol. N, carbohydrates, pentosans, sugars and methoxyls were detd. before and after fertilizing. F. M. SCHERTZ

The methods of estimating the absorption capacity and the condition of unsaturation of soils. E. V. BOBKO AND D. L. ASKINAZI. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 25, 1-42.—The method used in detg. the absorption capacity has to be in accord with following conditions: (1) the neutral salt used must be of a nature easy to est. analytically; (2) it must not be present in the soil; (3) it must be very active in replacing bases; (4) it must not act destructively upon the absorbing complex of the soil. $BaCl_2$ meets the requirements. A procedure is also given in case $CaCO_3$ or $CaSO_4$ is found in the soil. An English summary is given. J. S. JOFFE

The influence of available nitrogen on the fermentation of cellulose in the soil. J. A. ANDERSON. *Soil Science* 21, 115-26(1926); cf. C. A. 20, 257.—The rate of cellulose decompn. in the soil increases with the increase in available N until the latter is present in amts. necessary for optimum growth. This point was reached with a ratio of N:cellulose of about 1:35. Further addn. of N was without effect. The amt. of cellulose fermented per mg. of N utilized was not const. but decreased rapidly with increases in the N available. Nitrification proceeded normally in the cellulose-treated soils but the NO_3 formed was immediately utilized by the cellulose organisms. NH_4 can serve as a direct source of N for these organisms. None of the soil processes is inhibited by the addn. of carbohydrates to the soil. Crop failures in such cases are due to the inability of the crop successfully to compete with the microorganisms for the limited amt. of N available. N present in crop residues is as readily available to organisms as a source of N as is NH_3 after their protein is hydrolyzed to the amino acid stage. R. BRADFELD

Nitrogen recuperation in the soils of the Bombay Deccan. I. D. L. SAHASRABUDDHE AND J. A. DAJI. *Mem. Dept. Agr. India Chem. Ser.* 8, 53-68(1925).—When

water is added to the soil, within 10 days a large quantity of N is fixed. This increases for about 35 days and then slowly decreases. Up to 30% H₂O, the larger the quantity of H₂O the more N is fixed. Fixation of N and nitrification are higher at 40° than at lower temps. Increase in N takes place both in the presence and absence of light. The addn. of lime to the soil does not show any increase over the original soil in increasing N fixation, but it facilitates nitrification. If a soil which has fixed the highest quantity of N after being moistened dries up and then becomes moist again, the N increases further for 4 or 5 weeks and then decreases. The soil loses a small quantity of N when heated to 100°. This loss is quickly recovered if sufficient H₂O is added to the soil. The total N fixed in the heated soil is greater than that in the unheated soil.

RUSSELL M. JONES

The relation of the denitrification process to the reaction of the medium. T. M. ZACHAROVA. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 15, 1-22.—The decompn. of nitrates by bacteria Van Iterson is stimulated at the reaction corresponding to the p_H range 7.0-8.2; at 6.1 and 6.4 the process is slow. The limits of denitrification are p_H 5.5 on the acid side and 9.8 on the alk. The decompn. of nitrates is more energetic at p_H 5.5-7.0. Sr(NO₃)₂ is a better source of N for the study as it produces less alky. than KNO₃.

J. S. JOFFE

Denitrification and reaction of the medium in relation to the liming of the soil. T. M. ZACHAROVA. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 29, 1-20; cf. preceding abstract.—Lime application increases the number of denitrifying bacteria in the soil. An English summary is given.

J. S. JOFFE

The ammonia content of soil, and its relation to total nitrogen, nitrates and soil reaction. H. J. HARPER. *J. Agr. Research* 31, 549-53 (1925).—A detn. of acidity and of the total NH₃ and nitrate N occurring in 45 soils showed that there is no correlation between the NH₃ content of soils, total N, nitrate content and soil reaction. The NH₃ content of a soil is evidently in equil. with the products of protein hydrolysis and nitrification just as the nitrate content is in equil. with the NH₃ content of the soil and the plants and microorganisms. The NH₃ content of field soils may occasionally run as high as 70 p. p. m., but the NH₃ occurring in most soils does not exceed 20 p. p. m. and the majority of soils contain less than 10 p. p. m.

W. H. ROSS

Annual report of the agricultural chemist to Punjab government for the year ending 30th June, 1924. P. E. LANDER. *Rept. Operations Dept. Agr., Punjab* 2, Part 2, 37-54 (1925); cf. C. A. 19, 2718.—Analyses of representative samples of Punjab soils and agricultural products displayed at the British Empire Exhibition are tabulated as follows: *Punjab soils*. Chem. and mech. analyses together with the kind of crop usually grown are given for 39 soils from 16 localities. *Oil seeds*. The H₂O and oil content of rape (Japan black and Japan white), desi rai, mustard No. 1, castor, cotton seed (4-F and Mollisoni), toria, safflower, yellow rape, sarson and taramira seed are given. *Oil cakes*. The H₂O, ash, fat, crude fiber, albuminoid and sol. carbohydrate content are given for castor, sarson, black sesame, toria and taramira cake. *Oils*. The sp. gr., viscosity, and acid, sapon., Hehner, R.-M. and I values are given for sarson, toria, linseed, mahua, taramira, sesame, cotton-seed (American and Desi), yellow rape, castor, desi rai, and safflower oil. *Wheats*. The H₂O, ash, N, fat and fiber contents of 10 varieties of Punjab wheats are given. *Grams, barleys and pulses*. The H₂O, fat, ash, crude fiber, albuminoid and sol. carbohydrate contents are given for 9 varieties of Punjab grams, 6 varieties of barleys, and lentils, peas, wild peas and masha masur. *Sugar cane and sugar products*. Seasonal analyses of 23 varieties of sugar cane, and the glucose and sucrose content of sugar cane products known locally as gur, shakkar, khand, rab and shira are tabulated. Figures are given for the glucose and sucrose content of gurs from 10 types of cane grown in 8 districts of the United Provinces. Data are given on the use of sewage H₂O as a fertilizer (cf. C. A. 20, 86). Attempts to isolate bacteria-free cultures of protozoa from soils were unsuccessful. *Azotobacter* was easily and rapidly isolated from 3 different soils by inoculating into Ashby's manitol soln. and after 2 days (before formation of scum on the soln.) prepg. soil plates from the flasks with a mannitol agar according to Burgess (Soil Laboratory Manual p. 94). Growth was very rapid and satisfactory. Close examn. showed that the cultures were pure. Ashby's mannitol agar did not give good growth. K. D. JACOB

The problems and proceedings of agricultural microbiology. E. E. USPENSKII. *Trans. Inst. Fertilizers (Moscow)* 1923, No. 17, 1-10.—A theoretical discussion of a scientific program of soil microbiological research; special emphasis is given to the study of *Azotobacter*, denitrifiers and organisms decomp. org. matter.

J. S. JOFFE

Method of counting soil bacteria according to their physiological groupings. S. RAZOUMOV. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 28, 1-20.—A report of a

study on the detn. of various physiol. groups of bacteria in soil with the aid of elective media following the technic of Hiltner and Störmer. R. also discusses the effect of lime on the various groups. J. S. JOFFE

A comparative study of the bacterial flora of wind-blown soil. I. Arroyo Bank soil, Tucson, Arizona. I. M. SNOW. *Soil Science* 21, 143-65(1926).—A study was made of the aerobic microorganisms growing on an arid sandy soil with p_H values of 8.6-9.0 according to the depth. The surface 6-inch layer was driest, most alk. and the least favorable for bacteria. The nos. of bacteria per g. of fresh soil were: 6 in., 401,000; 12 in., 1,898,500; 24 in., 916,500. Of the total no. of colonies of all depths 52.4% were actinomycetes, 0.77 filamentous fungi, and 46.81% yeasts and bacteria. The actinomycetes were more numerous at 24 in. than at 6 in. Pure cultures were isolated and studied morphologically and culturally. Morphologically, 24% were cocci, 20.4% short non-spore-bearing rods, 13% long non-spore-bearing rods, and 42.6% long spore-bearing rods, 64.8% were Gram-negative. Culturally, 135.3% fermented glucose; 28.5% fermented sucrose; only one form fermented lactose; 70.4% digested gelatin, and 56.5% casein while 32.6% reduced nitrates to nitrites. R. BRADFIELD

Some questions in the oxidation of elementary sulfur. ANON. *Centr. Bakt. Parasitenk. II Abt.* 62, 290-5(1924).—The oxidation of elementary S in soil is almost exclusively biol. in nature. A long series of aerobic bacteria participate which are not ordinarily considered S bacteria. Most aerobes possess this power under favorable conditions. Such common molds as *Aspergillus niger* and *Oidium albicans* may oxidize S. JOHN T. MYERS

Fixation of nitrogen and radioactivity. E. KAYSER. *Compt. rend. agr. France* 11, 716-9(1925).—The addn. of radioactive mineral increased the fixation of N in proportions variable with the species used. F. M. SCHERTZ

Microbiology of soil in relation to liming and phosphorus applications. E. F. USPENSKII. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 34, 65-71.—A discussion of the relation of lime and P in a rational program of soil microbiological research is presented. J. S. JOFFE

The use of standard soils with the potassium thiocyanate test for estimating lime requirement of soils. A. F. GUSTAFSON. *J. Am. Soc. Agron.* 16, 772-6(1924); *Expt. Sta. Record* 53, 120-1.—The advantages of using standard soils instead of a color chart for estg. the quantity of lime needed per acre by red clover, alfalfa or sweet clover are briefly outlined. The use of standard soils is said to have the distinct advantage that the lime requirements of soils for clover can be estd. at any time after settling has occurred during a period of 24 hrs. H. G.

Soil acidity and the use of lime on tea soils. P. H. CARPENTER, H. R. COOPER AND C. R. HARLER. *Quart. J. Indian Tea Assoc.* Part 1, (1925); *Trop. Agr. (Ceylon)* 65, 150-6(1925).—Tea grows well only in soils which are definitely acid. Application of CaO in different forms and combinations with other fertilizers reduced the yields in every case, even when applied as neutral $CaSO_4$. CaO can be applied with benefit only when the soil is excessively heavy and excessively acid. A. L. MEHRING

Comparison of methods for determining the hydrogen-ion concentration of soils. H. NIKLAS AND A. HOCK. *Landw. Vers. Sta.* 104, 87-91(1925).—A tabulated comparison between Clark's and Michaelis's colorimetric methods and the electrometric method is presented. F. M. SCHERTZ

Significance of the electrometric titration in determining the lime requirement of soils. H. NIKLAS AND A. HOCK. *Landw. Vers. Sta.* 104, 93-102(1925).—From 2 curves the authors are able to calc. the amt. of lime or acid necessary to bring the soil to a desired reaction. F. M. SCHERTZ

Lime and phosphoric acid in soil. M. A. EGOROV. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 34, 37-43.—This is a discussion of the influence of various forms of soil Ca on the phosphate in the chernozem district. J. S. JOFFE

The absorption of phosphoric acid by soils. V. V. GEMMERLING. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 34, 46-50.—Most of the P_2O_5 in soils, red and podsol, is not in the form of Ca salts but in combination with Fe and Al oxides; in chernozem part of the P_2O_5 is in combination with Ca. J. S. JOFFE

Lime applications. D. N. PRIANISHNIKOV. *Trans. Inst. Fertilizers (Moscow)* 1925, 51-3.—This is a theoretical discussion of the benefits and injurious effects of lime. J. S. JOFFE

The injurious effects of excessive liming on podsol soils. A. F. TYULIN. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 26, 1-43.—This is a continuation of the expts reported in *C. A.* 20, 1296. An extensive summary of the results is given in English. J. S. JOFFE

The action of lime in the soil and the effects on the crop. D. DRUZHININ. *Trans. Inst. Fertilizers* (Moscow) 1923, No. 20, 1-22.—Acidity and absorption capacity of soils are closely related. The lime additions which give the highest yield increases do not correspond to the lime requirements necessary to neutralize the acidity; it is always higher. Injurious effects of overliming were found to correspond to an increase in alky. Liming increased the permeability of the soil and a correlation has been found between this property and crop yield. J. S. JOFFE

The action of lime on the soil. A. GEHRING AND O. WEHRMANN. *Landw. Vers. Sta.* 103, 279-343(1925).—A detailed paper giving the results of expts. on the effect of a no. of calcareous substances, including CaO and CaCO₃ and certain com. products on several different soils. The results are discussed with special reference to the unfavorable effects of some of the treatments on soils which would be expected to respond to liming. F. M. SCHERTZ

Effect of lime on soil conditions and plant growth in field and pot experiments. D. V. DRUZHININ. *Trans. Inst. Fertilizers* (Moscow) 1925, No. 31, 1-43.—Vegetation expts. on podsol soils, limed and unlimed, were carried out; periodically detns. were made on the pH, total alky. and acidity, NO₃, NO₂, NH₄, Ca and P₂O₅ of the soil soln. and soil ext. It was found that the crop yields are closely related to the absorption capacity of the soils. Base unsatu. may be detd. by extg. with a neutral salt and titrating with phenolphthalein which according to D. gives the desired amts. of lime necessary. The field and pot expts. both checked very well in respect to the detns. mentioned. J. S. JOFFE

The degree of resistance of various limestones to acid solutions circulating in agricultural soil. E. BOTTINI. *Staz. sper. agrar. ital.* 58, 268-87(1925).—With respect to their behavior towards acid liquids limestones may be classed in 3 groups: (1) marly (d. 2.18), concretioned (2.41), arenaceous (2.31), and fossiliferous (2.26) which are most easily decomposable; (2) argillaceous (d. 2.42), of greater resistance than the former; and (3) dolomitic (d. 2.20), saccharoid (2.54), and compact (2.36) which are least easily decomposable. Examn. of 39 limestones showed that their decomposability varies inversely as their d. Exceptions are the concretioned of group (1) and dolomitic of (3), their behavior being explained by their particular compn. ALBERT R. MERZ

Annual report of the economic botanist to the government, Punjab, Lyallpur, for the year ending 30th June, 1924. J. C. LUTHRA. *Rept. Operations Dept. Agr., Punjab* 2, Part 2, 1-36(1925).—Preliminary expts. indicated that limestone nodules occurring in the fields at depths of 3.5 to 7 ft. may be a contributing factor in the cotton root-rot disease. Cotton grown on plots dug to a depth of 6 ft. and refilled with the same soil after removal of limestone nodules was far superior to that grown on untreated soil. The expts. are being continued. K. D. JACOB

The alkaline reaction of soil and its action on plants. WALTER LIEROW. *Botan. Arch.* 6, 457-65(1924); *Botan. Abstracts* 14, 768.—All fertilizers used had, with barley, a more or less pronounced influence on plant yield, but with oats only Mn fertilizing increased the yield beyond the exptl. error. H. G.

Effect of fertilizer salts on soil reaction and on the yield of various plants. BOTHO VON ROSE. *Botan. Arch.* 7, 112-33(1924); *Botan. Abstracts* 14, 769.—Physiologically acid fertilizing with (NH₄)₂SO₄ produced in barley and mustard an increase in yield, and in buckwheat and beans a decrease. Alk. fertilizing with CaCO₃ was detrimental to buckwheat. Alk. fertilizing with NaNO₃ raised not only the abs. crop production but also the proportion of straw to grain to the advantage of the grain. H. G.

Concentrated fertilizers—theory and practice. A. B. BEAUMONT. *Am. Fertilizer* 64, No. 5, 23-5(1926).—A review and discussion. W. H. ROSS

Cyanamide, its derivatives, and hexamethylenetetramine as sources of nitrogen for wheat, cabbage and white mustard in pure cultures. V. BIALOSUKNIA. *Bull. Inter. Acad. Polonaise* 1924 B, 729-37.—Ca cyanamide acts as a poison to plants in sterile water cultures on account of the liberation of free NH₃, C₂H₂ and H₂S (from impurities). Dicyanodiamide, though not poisonous, cannot serve as a source of N except in the presence of sugar (dextrose). Preliminary unsuccessful expts. using hexamethylenetetramine as a source of N are recorded. B. C. A.

How much plant nutrient is carried away during a year by our rivers? OSCAR BRAADLIE. *Meldinger Norges Landbrukshoeiskole* 4, 39-72(1924).—In samples taken weekly for 1 yr. from the Gula River were detd. the content of dry matter, loss on ignition, P₂O₅, K₂O, CaO, nitrate N, NH₃ N, org. N, total N, SO₄ and Cl. The amts. found average smaller than those from other European rivers. This is due partly to the sparseness of the population and partly to the nature of the soils and rocks in the catchment area of this river. C. A. ROBARK

The leaching of fertilizers from soils. A. W. R. JOACHIM. *Trop. Agr. (Ceylon)* 63, 277-82(1924).—Of all sol. chem. fertilizers P_2O_5 in the form of superphosphate is the least likely to be lost by leaching. Nitrates leach out very readily. A. L. M.

Tea fertilizer experiments at the experiment station, Peradeniya. T. H. HOLLAND. *Trop. Agr. (Ceylon)* 65, 3-9(1925).—Applications of potash did not increase the crop of tea in any case and apparently had no effect whatever upon the plant. Applications of N resulted in a darker green color of leaf and healthier appearance of the bushes in every case. A. L. MEHRING

Determination of ammonia nitrogen in ammoniacal fertilizers by the formalin method. WERNER SELKE. *Chem.-Ztg.* 50, 83(1926).—In the case of $(NH_4)_2SO_4$, 50 cc. of a 1% soln. were titrated with N/3 NaOH after the addn. of 5 cc. of approx. 40% CH_2O soln. (neutralized with NaOH), with a strong soln. of phenolphthalein as an indicator. The end point is a faint pink. After correcting for the original acidity of the soln. (dett. with Me orange as an indicator), the results corresponded well with those obtained by the distn. method. With NH_4 superphosphate difficulty was encountered with colloidal Al compds. formed from impurities present. With 25 cc. of a 2% soln. of the phosphate, good duplicates were obtained after allowing for the primary acidity of the soln.; but the results averaged about 0.2% lower than those from the distn. method. It is pointed out that the original acidity of the soln. was detd. with Me orange as an indicator in the case of $(NH_4)_2SO_4$, while phenolphthalein was used with NH_4 superphosphate. If the latter indicator is used with $(NH_4)_2SO_4$, low results are likewise obtained. Although these corrections may be detd. for a given sample, and when applied the results check with the distn. method, it must be concluded that in general the formalin method is inadequate for NH_4 superphosphate and likewise for $(NH_4)_2SO_4$ in case similar impurities are encountered. P. R. D.

Industrial wastes as fertilizer. I. The use of ajowan and mohua cakes as fertilizers. II. The utilization of refuse. R. D. REGE. *J. Indian Inst. Sci.* 8A, 245-65(1925).—The small amt. of thymol remaining in the press cake from ajowan (*Carum copicum*) seeds was shown to be insufficient to check the activity of soil microorganisms. Such material contains 0.862% N, 0.856% P_2O_5 , 2.02% K_2O and 12.7% ash. While of only moderate fertilizer value, it could be demonstrated that a good proportion of the N was in a form readily available to the plant, at any rate after adequate treatment. Where obtainable at low cost the cake could be used as a fertilizer. Mohua cake (from *Bassia longifolia*) contains 8.06% oil, 2.72% N, 0.12% P_2O_5 , 2.03% K_2O and 7.56% ash. An appreciable content of saponin was found to interfere with nitrification. Hence its use as a fertilizer is hardly practicable. A liquid fertilizer was prepd. by mixing powdered and sieved refuse with activated sludge. Only about 25% of its N was slowly nitrified under the most favorable conditions, the rest remaining unavailable. Better results were obtained by thoroughly stirring the refuse into the sludge, with aeration, and subsequently drying the mixt. Such a prepn. underwent fairly good nitrification in soil, but the C-N ratio exerted a marked influence. In no case was there evidence of nitrification where the proportion of refuse exceeded 10 g. per 100 cc. of sludge. It was demonstrated that a sludge effluent fixes 17.9% of the N originally in soln. upon solid waste material. A new method of sewage treatment is suggested in which the raw sewage is aerated or mech. shaken with sludge and refuse. P. R. DAWSON

The utilization of raw phosphate flour. A. N. LEBEDYANTZEV. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 34, 18-30.—Raw phosphates may be utilized on podsol and chernozem soils by grinding to a fineness of 0.02 to 0.005 mm. to increase the availability. An outline of the method of handling raw phosphate for experimental purposes is given. J. S. JOFFE

Chemical examination of the fertilizer found in the Drachenhöhle in Mixnitz, Steiermark (Austria). OTTO DAFERT AND J. HÖFINGER. *Anz. Akad. Wiss. Wien* 61, 138-9(1924).—The "phosphate earth" deposits of this cave were subjected to the solvents usually employed in agricultural analysis for dissolving phosphates to det. the condition in which the phosphoric acid occurred. The lack of const. compn. is attributed to the continual interaction of the phosphates with the soil soln., the dissolved Ca, the solid $CaCO_3$ and the Fe and Al compds. E. R. SCHIERZ

"Surophosphat" or "Dasagdünger." E. BLANCK AND F. ALTEN. *J. Landw.* 74, 38-49(1926).—A report of pot expts. with corn. F. M. SCHERTZ

The so-called "colloidal phosphorite." E. BOTTINI. *Staz. sper. agrar. ital.* 58, 209-16(1925).—This material is an almost impalpable powder, marketed lately in Italy. Its d. is 2.29 and it analyzes H_2O 4.98, PO_4 31.41, CO_2 3.00, Ca 3.57, Fe 6.38, Al 26.31, org. matter 22.47%. It is mostly composed of phosphatic granules of approx.

0.08 mm. diam. (63.06%) and shows colloidal properties only in small part (9.79%). The coarsest portions show the highest % of P_2O_5 while the colloidal portion shows only traces, being mostly org. It, as a rule, yields only traces of P_2O_5 to distd. H_2O , a satd. soln. of CO_2 or solns. of neutral org. and mineral salts. 40% NH_4 citrate, however, dissolves 1.87%. Citric acid dissolves appreciable quantities, the amt. depending on its concn. An aq. soln. contg. 40 g. citric acid, 60 g. formic acid and 100 g. NaCl per l. dissolves 7.10% as compared with 2.24, 7.04 and 10.27% by 0.5, 4.5 and 10% citric acid solns.

ALBERT R. MERZ

The use of phosphorites. G. D'IPPOLITO. *Staz. sper. agrar. ital.* 58, 243-8(1925).—A mineral superphosphate (15.17% citrate-sol. and 16.10 total P_2O_5 , 1.55 H_2O) and a phosphorite (1.80% citrate-sol. and 30.70 total P_2O_5 , 0.50 H_2O) were compared in field expts. Yields were as good from the rock, used either with or without S, as from the superphosphate.

ALBERT R. MERZ

Report of the superintendent of the Government, Guano Islands. W. R. ZEEDEBERG. *J. Dept. Agr. Union S. Africa* 11, 568-70(1925); cf. C. A. 19, 1320.—The av. compn. of guano collected during 1924 was: total P_2O_5 12.3, citric-acid-sol. P_2O_5 11.7, H_2O -sol. P_2O_5 3.1, N 9.4, K_2O 1.7 and CaO 12.7%.

K. D. JACOB

Turf-compost, a mixture for fertilizer. Z. W. LOGVINOVA. *Trans. Inst. Fertilizers (Moscow)* 1926, No. 32, 1-71.—Four types of peat, ranging in N content from 1.67 to 3.01%, were composted with raw rock phosphate to make the P sol. with lime and ashes to convert the org. N into inorg. N compd. and with liquid manure; composts were also made up of various combinations of the 3 principal composts. The results show that the org. N from peat is converted into inorg. N and that the lime necessary to bring this about is higher than that required for the satn. of the peat. Moss peat, strongly unsatd., decomposes raw phosphates, making them available. By composting moss peat with phosphates, moss peat with ashes, and then mixing the 2, previously inoculated with liquid manure, one may obtain a complete fertilizer in which the peat N may be utilized, as well as the P from the phosphate and the K and Ca from the ash. Vegetation expts. with such composts gave just as good a yield of oats as with a complete fertilizer. Meadow peat, slightly unsatd., decomposes phosphates poorly and the rate of decompn. may be correlated with the degree of unsatn.

J. S. JOFFE

Seaweed: its uses to the farmer. A. S. CARLOS. *Fertilizer, Feeding-Stuffs and Farm Supplies J.* 11, 88-9(1926).—The av. compns. of several varieties of dry English seaweed are given as: *Fucus*, N 1.5, K_2O 2.5%; *Ulva*, N 1.3% in plants from clean H_2O of the Dorset coast and 4.75% in plants from polluted waters of Belfast Lough; *Zostera* or "Hel Grass," only small amts. of N and K_2O ; *Laminaria*, stems 10-12 and fronds 5% K_2O , about 1.3% N in all parts of the plant. All of these varieties contain about 0.5% P_2O_5 on the dry basis. The use of seaweed as a fertilizer and feeding-stuff is briefly outlined.

K. D. JACOB

The significance of peat as a material for fertilizer and composts. D. N. PRIANISHNIKOV. *Trans. Inst. Fertilizers (Moscow)* 1925, No. 34, 72-5.—P. classifies the various soil regions as to their adaptability to utilize peat composts to make raw phosphates available.

J. S. JOFFE

Report of the Moscow collective fertilizer experiments. L. L. BALASHEV. *Agr. Courier (Vestnik Silsk. Khoz.)* 1925, No. 8.—This is a report of fertilizer expts. for the period 1907-1917 with a critical analysis of the value of various fertilizer ingredients.

J. S. JOFFE

Rubber fertilizer experiments at the experiment station, Peradeniya. T. H. HOLLAND. *Trop. Agr. (Ceylon)* 65, 10-6(1925).—Expts. covering a period of 10 yrs. with a variety of fertilizers are reported, with yields, effects upon the trees and amts. of rubber obtainable from the latex. The av. rubber content of the latex from trees receiving an excess of N over a period of 10 yrs. was 37.2% and from the controls 34.1%.

A. L. MEHRING

Meadows and pastures. A consideration of the causes of variation in the quality of grass. J. A. MURRAY. *Fertilizer, Feeding-Stuffs, and Farm Supplies J.* 11, 85-7 (1926).—The av. compns. of the dry matter of good and av. pasture grass, and good, av. and poor meadow hay were: albuminoids 20.6, 17.5, 16.0, 11.3, 8.8; oil 4.6, 4.0, 3.6, 2.9, 1.7; carbohydrates 46.3, 48.5, 48.2, 47.9, 44.6; crude fiber 18.4, 20.0, 23.0, 30.7, 39.1; and ash 10.1, 10.0, 9.2, 7.2, 5.8%, resp. The higher fiber content of meadow hay was largely due to the more advanced maturity of the plants rather than to variation in the botanical compn. Applications of N fertilizers promote formation of fiber by hastening the maturity of the plants and correspondingly decrease the value of the pasture. Phosphates have a pronounced beneficial effect greatly improving the digestibility of the org. matter by delaying maturity of the plants and retarding formation of

fiber. Increased development of clovers in pastures treated with phosphate fertilizer does not result in accumulation of N in sufficient quantity to cause excessively rapid maturity and consequent increase in fiber content, the optimum ratio of N to P_2O_5 never being exceeded. Attempts to correlate the chem. compn. and food value of pastures with their botanical compn. have not been generally successful. The compn. of the dry matter of 4 varieties of clover is given. K. D. JACOB

Is rain water a nitrogen fertilizer? V. ILKOV. *Rev. inst. recherches agron. Bulgarie* 3, 325-38(1925).—Analyses of snow and rain water for 3 yrs. show that on the av. there comes down yearly 1186.19 g. of N as NH_3 and 68,998 g. of N as NO_3 per dekar of soil. Rain water during the summer contains more NO_3 N than snow. J. S. JOFFE

The influence of irrigation water and manure on the composition of the corn kernel. J. E. GREAVES AND D. H. NELSON. *J. Agr. Research* 31, 183-9(1925).—Corn grown on a highly calcareous soil with and without irrigation water and manure showed an increase in the N content of the kernel due to the manure and a decrease due to irrigation as a result of the removal by the water of the readily sol. N beyond the feeding area of the plant. The ash, Ca, P and K contents of the kernel are increased with the application of irrigation water, and all the constituents are greatly increased by manure. These results support the contention that the increased ash and mineral constituents of the grain are due to an increased bacterial activity which increases the available plant food in the soil. W. H. ROSS

The nitrogen and mineral requirements of the plantain. R. V. NORRIS AND C. V. R. AYYAR. *Agr. J. India* 20, 463-7(1925).—An analysis of the plantain tree was made to est. total food requirements and to obtain information in regard to the distribution of the various constituents. Tables are included which show the weight and moisture content, % of N, total ash, distribution of K_2O , P_2O_5 , CaO , MgO and insol. mineral matter of the different parts of the tree. A table showing the % compn. of the ash from the fruit (stalk, pulp and rind) leaves, leaf sheaths, central stalk, suckers, rhizomes of suckers, roots and rhizomes of the main tree, is also given. The following is the compn. of the plantain tree: total wt. of tree 87,776, moisture 76,797, dry matter 10,979, K_2O 437, SiO_2 241.7, CaO 141, N 111.5, MgO 77.6 and P_2O_5 46.9 g. R. M. J.

Comparative investigation on the influence of different external factors especially upon the ash content of plants. RUDOLF SEIDEN. *Landw. Vers. Sta.* 104, 1-50(1925).—The external factors considered are leaf position, soil moisture, type of soil, growing period, time of day, light intensity and color, temp., artificial fertilizers and rain. In leaves of trees the ash content decreases from the base of the tree to the apex. The ash content varies with the amt. of water absorbed. It is possible to vary the ash by regulating the amt. of water and fertilizer added to the soil. In the autumn the nutrient salts migrate back to the stem. F. M. SCHERTZ

Action of zeotokol (powdered dolerite) on plant growth. E. BLANCK AND F. ALTEN *J. Landw.* 73, 213-8(1925).—This material had no significant effect upon plant growth. F. M. SCHERTZ

The effects of various methods of applying fertilizers on crop yields. D. G. COR. *Soil Science* 21, 127-41(1926); cf. *C. A.* 20, 1298.—A comprehensive study was made of the various methods of applying the more commonly used fertilizers upon the yields of corn, oats, wheat, clover and potatoes. For oats and wheat the combination fertilizer grain drill is recommended. Most economical returns were obtained with the direct contact in the seed-row method with non-caustic fertilizers. As much as 400 lb. 16% acid phosphate or 300 lb. 2-12-2 commercial fertilizer could be applied to these crops by this method with good results. Larger applications of caustic fertilizers contg. cyanamide should be made separately from the seeding, preferably 10 days in advance. Best returns from the broadcasting method were obtained where the fertilizer was subsequently thoroughly worked into the soil by disking. The side-of-hill application gave the most economical returns and the earliest maturity with corn. The side-of-row method gave the best returns with potatoes. R. BRADFIELD

Coated arsenate of lead. E. R. VAN LEEUWEN. *J. Econ. Entomol.* 18, 744-9(1925).—The following method of prepn. is given: $PbHAsO_4$ is suspended in H_2O in which a known amt. of Na oleate is dissolved. Pb acetate equiv. to the Na oleate is then added with vigorous stirring. The product consists of Pb oleate in minute globules intimately mixed with $PbHAsO_4$. When dried a water-repelling powder is obtained in which the particles of arsenate are coated with Pb oleate. The min. quantity of Pb oleate necessary to cover was detd. as follows: A weighed amt. of $PbHAsO_4$ powder was mixed in C_2H_5 contg. a known amt. of Pb oleate in soln. The C_2H_5 was evapd and a small quantity of the dried powder shaken with H_2O . The coated arsenate is

not wetted and floats whereas the uncoated arsenate sinks. In this way it can be ascertained whether coating is complete. More than 0.25% of Pb oleate is required for complete coating. Expts. indicate that the coated PbHAsO_4 kills a higher % of the beetles than the uncoated, that it spreads evenly on foliage and adheres better than the uncoated compd. It is practically unaffected by rains. C. H. R.

Spreaders for spray materials and the relation of surface tension of solutions to their spreading qualities. R. H. ROBINSON. *J. Agr. Research* 31, 71-81 (1925).—No definite proportional relationship could be established between the surface tension values of spreader solns. and the observed spreading properties of the different substances. Of the materials tried, water-sol. protein substances gave the best spreading at the lowest concn. for the greatest no. of surfaces tested. Skim milk, neutralized with $\text{Ca}(\text{OH})_2$, and certain other milk products appear to be the best materials for practical purposes. The concn. of a spreader soln. that will give the best results depends upon a no. of variable factors, such as the type and age of the surface to be sprayed, the force used and climatic conditions. The amt. of Pb arsenate that adheres to the leaf surface is approx. the same when a spreader is added as when one is not. W. H. ROSS

Preliminary report on colloidal clays as emulsifiers for mineral oils used in spraying citrus groves. W. W. YOTHERS AND J. R. WINSTON. *J. Agr. Research* 31, 59-65 (1925).—Kaolin, fuller's earth and other colloidal clays may be used in lieu of soap in making emulsions of mineral lubricating oils for spraying citrus trees. These emulsions are about as effective against insect pests as the soap emulsions, and are no more likely to cause spray burn. They mix with any water or desired spray combination without special treatment, are easily made, keep indefinitely and cost much less than soap emulsion. The principal objection to these emulsions is that they are a semipaste rather than a fluid. Satisfactory lime-sulfur oil emulsions may also be made with kaolin or fuller's earth, but the use of these emulsions in spraying young orange trees resulted in greater injury than good grove practice would allow. W. H. ROSS

Contributions to the biochemistry of the action of mercury compounds upon the spores of wheat smut. J. BODNÁR AND ALEXANDER TERÉNYI. *Chem.-Ztg.* 50, 109-10 (1926); cf. C. A. 20, 793.—Detns. were made of the Hg adsorbed by spores from solns. of HgCl_2 , HgBr_2 , $\text{Hg}(\text{OAc})_2$ and $\text{Hg}(\text{CN})_2$ in 15 min. The greatest amt. was adsorbed from $\text{Hg}(\text{OAc})_2$, followed by HgCl_2 and HgBr_2 , while none was adsorbed from $\text{Hg}(\text{CN})_2$. In germination expts. on $\text{Ca}(\text{NO}_3)_2$ soln. spores thus treated did not germinate within 20 days in the case of all except $\text{Hg}(\text{CN})_2$ where normal germination took place. In similar expts., with soils as substrates, spores treated with HgCl_2 and HgBr_2 showed no germination, while in the case of $\text{Hg}(\text{OAc})_2$ it was only delayed. The killing action of the Hg halides and the inhibiting effect of the acetate are explained as follows: The former are weakly dissociated and are adsorbed as the entire salts which, as lipid compds., penetrate the cell walls and combine with the protein of the interior; the latter, however, is well dissociated, only the Hg is adsorbed and remains on the surface of the cell, whence it can be gradually removed by the soil moisture. $\text{Hg}(\text{CN})_2$ is without effect since it is not dissociated and likewise does not form lipid compds. Apparently a dissociated Hg compd. behaves as does Cu, merely inhibiting germination. The min. concn. required to inhibit germination in $\text{Ca}(\text{NO}_3)_2$ soln. is 0.0011% in the case of the most effective salt tested, HgBr_2 , and is more than is required for Cu, 0.00075%. P. R. DAWSON

Annual report of the entomologist to government Punjab, Lyallpur, for the year ending 30th June, 1924. M. A. HUSAIN. *Rept. Operations Dept. Agr., Punjab*, 2, Part 2, 55-90 (1925); cf. C. A. 19, 3141.—HCN was effective against adult bruchids and *Trogoderma Khapra* grubs in stored gram but bruchid grubs inside the grain were not killed. CS_2 at the rate of 1 ounce per 15 cu. ft. was effective against all stages of various insects infesting gram in storage. K. D. JACOBS

Possibilities of an ovicide as an auxiliary in codling moth control. L. CHILDS. *J. Econ. Entomol.* 18, 665-74 (1925).—A dil. petroleum oil emulsion contg. 3% oil gave promising results. C. H. RICHARDSON

Laboratory experiments with arsenicals in the control of the codling moth. E. J. NEWCOMER. *J. Econ. Entomol.* 18, 679-80 (1925).—This is a summary of methods and results obtained from lab. work. Pb arsenate, Ca arsenate, Zn arsenite and Paris green were used. C. H. RICHARDSON

Notes on oils. A. L. MELANDER. *J. Econ. Entomol.* 18, 681-6 (1925).—The addn. of Ca caseinate spreaders to oil sprays reduced their effectiveness. C. H. R.

Relation of soil conditions and orchard management to the rosette of pecan trees. J. J. SKINNER AND J. B. DEMAREE. U. S. Dept. Agr., *Bull.* 1378, 1-16 (1926).—A chem. examn. of the soils of 2 pecan orchards subjected to different cultural treatments

showed that the accumulation of org. matter and N in the soils, whether acquired by the growing and plowing under of cover crops or by the addition of manure, composts, etc., stimulates increased growth and yield and results in complete disappearance of all rosette symptoms on the trees. Chem. fertilizers had no influence in decreasing or increasing rosette and no correlation of soil acidity with good or poor pecan orchard was noted.

W. H. ROSS

Spraying for weed eradication. WINIFRED E. BRENCHELEY. *J. Bath and West and Southern Counties Society* 19, 1-20(1924-5).—A summary and discussion of the exptl. data upon the efficacy and economy of various sprays, and combination fertilizer and spray materials, utilized for weed eradication.

P. R. DAWSON

The practicability of quantitative toxicological investigations on mandibulate insects. F. L. CAMPBELL. *J. Agr. Research* 32, 359-66(1926).—The ability of certain mandibulate insects to imbibe completely drops of poison solns. has been utilized as a basis for the development of methods for the quant. toxicological examn. of sol. arsenical stomach-poison insecticides. By the use of these methods it has been found that tervalent As is more toxic than quinquivalent As, that different species vary in susceptibility to As poisoning, and that the min. lethal dose of As for the 2 species studied is about 0.02 mg. of As per g. of insect.

W. H. ROSS

The effectiveness of certain paraffin derivatives in attracting flies. WM. C. COOK. *J. Agr. Research* 32, 347-58(1926).—The relative attractiveness of paraffin alcs. and esters to flies is related to the b. ps. of the compds. As the b. p. becomes higher the attractiveness decreases, and for each of the compds. studied there is a definite optimum concn. which becomes smaller as the b. p. rises. The addn. of a CH_3 group to the acid radical reduces the attractiveness much more than the addn. of a similar group to the alc. radical. Of a given set of isomeric compds., that one is generally most attractive which has the lowest acid radical. Iso or branched chain compds. are relatively more attractive than their normal isomers and the difference in attractiveness increases with the b. p.

W. H. ROSS

A summary of the answers received to questions on the mechanics of spraying. E. R. DEONG. *J. Econ. Entomol.* 18, 722-6(1925).—An analysis of 82 answers to a questionnaire on spray mechanics is given. It includes the trend of opinion on spraying pressures, rate of discharge from nozzles, size of aperture of spray nozzles and related subjects.

C. H. RICHARDSON

The value of sprays for black scale control in California. R. S. WOGLUM AND J. R. LAFOLLETTE. *J. Econ. Entomol.* 18, 726-9(1925).—Three petroleum oil sprays (2 of them mixed with lime-S soln.) have shown results superior to fumigation with HCN. Effects of oil sprays on citrus trees and fruit are discussed.

C. H. R.

Some effects of *Tribolium* on flour. N. M. PAYNE. *J. Econ. Entomol.* 18, 737-44(1925).—*T. confusum* affects the elasticity and viscosity of flour. The adults give off a water-sol. secretion which may be the cause of these effects.

C. H. R.

Combating insect and animal pests with bait-containing arsenic. KREIG. *Centr. Bakt. Parasitenk.* 65, 59-69(1925).—The following formulas are suggested: lead arsenate 60 g., molasses 3 l. and water 100 l., or molasses 10 kg., sodium arsenite 300 g. and water 100 l.

JOHN T. MYERS

House fumigation with calcium cyanide. R. C. SMITH. *J. Econ. Entomol.* 19, 65-77(1926).—Ca cyanide is a promising substitute for NaCN in house fumigation. The relation of temp. and humidity to the evolution of HCN from this compd. is discussed; also the effects of HCN on metals, wall paper colors, costs of fumigating, etc.

C. H. RICHARDSON

Studies of some adsorbed insecticides. C. O. EDDY. *J. Econ. Entomol.* 19, 77-86(1926).— Na_2AsO_3 , Na_2AsO_4 , K_2AsO_3 and K_2AsO_4 were adsorbed on kaolin, diatomaceous earth, fuller's earth, talc and tripoli. Expt. I: A quantity of the As salt was dissolved in enough H_2O to wet thoroughly the carrier and the material was dried and reduced to a fine dust. The quantity of As adsorbed was 0.17-0.42 g. per 100 g. dust, av. 0.24 g. The amt. adsorbed depends chiefly on the kind of carrier and to a lesser degree on the As salt used. The effectiveness of the carriers as absorbents was: kaolin > diatomaceous earth > fuller's earth > talc < tripoli. Na_2AsO_4 is probably adsorbed in greatest quantity and K_2AsO_4 in least. As the amt. of As mixed in the carrier is increased the adsorption of As becomes greater. When NaOH is added in amts. sufficient to neutralize the acidity of the As salt plus 1%, the adsorption of As is decreased; and the relative position of the carriers as absorbents is changed. Expt. II: A large excess of As salt was used in this expt. (200 cc. per 25 g. carrier). The amt. of As removed from the soln. by the carriers varied chiefly with the carrier and less so with the As salt. The order of removal was: kaolin > diatomaceous earth > tripoli =

fuller's earth = talc. Talc removed more As than fuller's earth from solns. of Na_2AsO_4 and K_2AsO_4 , but the same amt. from solns. of Na_2AsO_3 and K_2AsO_3 . The carriers removed the largest amt. of As from Na_2AsO_4 solns., the least from Na_2AsO_3 solns. The amt. of As removed was greater in this expt. than in Expt. I. The variable colloidal nature of the carriers was a disturbing factor. Expts. with these dusts on the Colorado potato beetle (*Leptinotarsa decemlineata*) and the Mexican bean beetle (*Epilachna corrupta*) indicate possibilities for their use against chewing insects without danger to plants.

CHAS. H. RICHARDSON

Determination of nicotine (MACH, SINDLINGER) 7. Bacterial S oxidation in pond soils and its practical value (FISCHER) 11C. A green bacterium [in soils] (SACK) 11C. Use of the chlorine gas process in the paper industry [insecticides from waste liquor] (CONSIGLIO) 23.

ANDRÉ, G.: *Chimie agricole, chimie végétale*. Ed. 3 revised. Paris: J. B. Baillière. V. I, 442 pp., V. II, 460 pp. Reviewed in *Tech. Book Review Index* 8, No. 2, 141(1924).

EMERSON, PAUL: *Soil Characteristics: A Field and Laboratory Guide*. London: McGraw-Hill Pub. Co., Ltd. 222 pp. 12s. 6d. Reviewed in *Bull. Imp. Inst.* 23, 527(1925).

Insecticides. W. K. SCHWEITZER. U. S. 1,574,118, Feb. 23. An aq. slurry contg. dimanganooarsenate is digested with compds. such as MnCO_3 to form less sol. arsenates.

Insecticide. C. N. HAND. U. S. 1,573,490, Feb. 16. A thiourea, *e. g.*, sym. diphenylthiourea, and S are used on cotton or potato plants, etc.

Insecticide and fungicide for injection into trunks of trees. C. M. ROELOFSZ. Brit. 237,256, July 16, 1924. A mixt. of lime, S and Pb arsenate is slaked with a small quantity of H_2O , more H_2O is added after the slaking is completed, and the soln. is strained.

Fungicides. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit. 237,388, May 23, 1924. Seed grain is treated to destroy spores of fungoid diseases by use of a cyanide or hydroferrocyanide together with Hg compds. such as the Na compd. of hydroxymercuri-p-cresol. Cf. C. A. 19, 556.

Colloidal compounds of arsenic. A. CHWALA. U. S. 1,573,375, Feb. 16. Pb arsenate or other As compd. is mech. dispersed in the presence of Na protalbate or other protective colloids and of Ca plumbate or other salts of inorg. acids derived from higher oxides of a metal combining with O in several proportions. The products thus prepd. are suitable for use on plants to combat parasites.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The significance of "buffer substances" in the fermentation industries. P. BERMANN. *Woch. Brau.* 42, 267-8, 273-5(1925).—The Wolff indicator method was tried and found accurate in detg. the p_H of molasses and malt worts. A graphical method for detg. p_H and titratable acidity was developed. The titration curves obtained from molasses fermentations are an indication of significant changes in the wort, and aid in detg. whether or not a normal fermentation has been obtained. Wildier's "bios" may be defined from a physiol.-chem. point of view as a "buffer substance regulating the fermentation of a nutrient soln. by yeast." The buffer substance of a malt may serve as a criterion of its value as a fermenting material.

C. N. FREY

Determination of the final attenuation in malt analysis. L. HEINTZ. *Woch. Brau.* 42, 127(1925).—The mash is prepd. in the usual way and heated to 70°. It is then allowed to stand 55 min. after which the bath is heated to 97-8°. After cooling the mash is filtered, placed in a cask, the cork having an orifice for the escape of gas, and the wort is seeded with yeast. The spent wort is analyzed after growth has ceased.

C. N. FREY

The changes in the degree of dispersion of proteins of barley during malting, mashing and during fermentation. W. WINDISCH, O. KOLBACH AND E. WENTZELL. *Woch. Brau.* 42, 287-8, 295-7, 303-6, 313-7, 323-4, 333-5(1925).—By means of fractional ultrafiltration (Bechhold, C. A. 1, 2762) during mashing, malting and fermenting

it was shown that during malting finely dispersed protein material increased more rapidly than the coarsely dispersed. During the drying of malt the coarse particles and non-ultrafilterable proteins as well as the finely dispersed ultrafilterable proteins are decreased. Cooking with hops increases the amt. of sol. protein at the expense of medium-sized particles of proteins, but the cooking stabilizes the proteins. During storage if the wort has the same p_H as the beer, great changes occur in the dispersion of the protein and a large part of the albumin is coagulated. This makes the procedure of detg. assimilable N during fermentation difficult because the yeast takes up the sol. nitrogenous compds. By cooking the fermented wort changes in the non-filterable soln. take place, most of the coagulation occurring at 70°. If part of the particles of nitrogenous material increases in size and the amt. of ultrafilterable material also increases, there is a consequent decrease of size of particles. Cooking of non-fermented worts produces an increase of ultrafilterable nitrogenous compds. The optimum p_H of protein enzymes of malt is 4.9 and the optimum temp. 46°. The enzymes are destroyed in alk. solns. The liquefying peptase has an optimum p_H of 3.7-4.3 on gelatin and p_H of 6.2 on peptone. The proteins of malt are leucosin, proteoses, edestin, hordein and undetd. nitrogenous substances. Curves are appended showing N content of malt ext., green malt and fermented wort after filtering through membranes. The amt. of coagulated N is also given. The size of the particles passing through the membranes ranged from 15 to 500 μ in diam.

C. N. FREY

Development of free acidity during the fermentation of beers. M. H. VAN LAER. *Petit J. Brass* 33, 674(1925).—The principal factors detg. the increase of free acidity in wort during fermentation are its compn. and the yeast. The term "buffer index" is proposed for the value obtained by the formula $10/(P_1 - P_2)E$, where P_1 is the p_H of the wort and P_2 the p_H detd. after addn. of 1 cc. of 0.1 N acid to 25 cc. of the wort, and E is the ext. in degrees Balling. The buffers in wort prevent an increase of H-ion concn. during fermentation. A wort too rich in buffers would give a beer with insufficient free acidity and in consequence diminished stability. A diminution of buffer index should correspond, therefore, to an increase of free acidity during fermentation. The titration curve of beers indicates that the buffers consist of a mixt. of phosphates and org. acids (lactic and acetic acids and amino acids). Comparative brews with malt and with malt together with 40% of rootlets gave buffer indices of 1.29 and 2.40, resp., indicating that a high proportion of highly degraded N compds. has considerable effect on the buffer index, giving beers with too low free acidity. Forcing conditions during malting would lead to malts rich in buffers and result in beers with an insufficient free acidity. The effect of the yeast during fermentation is to produce less acidity in a medium already acidified before fermentation and more in an alk. wort. With beers of insufficient acidity, less acid will be required to produce the same p_H when added to the wort after primary fermentation than when added before.

B. C. A.

Large fermentation vessels. F. EMSLANDER. *Woch. Brau.* 42, 146-8(1925).—The size of fermenters and the relation of size to fermenting activity are considered.enameled iron is excellent for small fermenters, but cannot be used in constructing large ones. Al is not a satisfactory material for fermenter construction.

C. N. FREY

Production of alcohol from rice straw. NOBORU TAKETOMI. *J. Soc. Chem. Ind. Japan* 29, 43-7(1926).—Rice straw (12.89% ash, 17.49% pentosan, 0.76% crude fats, 35.02% crude fiber and 2.88% crude proteinis of 87.45% dry matter) was heated with 1% H_2SO_4 at about 134° for 30 min. in an autoclave. The liquid thus obtained was neutralized with $CaCO_3$, concd. and fermented with the distillery yeast, Race XII. The yield of sugar produced is about 15% of the dry matter used and that of alc. about 5.4%.

K. K.

Bulgarian wines. D. WESSOW. *Rev. inst. recherches agron. Bulgarie* 3, 13-24 (1924).—Analyses are given and methods of adulteration discussed.

E. H.

In what chemical form does silicic acid exist in water? (WINDISCH) 14. Volumetric determination of alcohol (CHABOT) 7.

Denatured alcohol. H. C. FULLER. U. S. 1,573,697, Feb. 16. EtOH is denatured by the addn. of a halogen-contg. ester of glycerol, e. g., glyceryl monochlorohydrin and monochloroacetylmonoglyceride. U. S. 1,573,698 specifies a chloroacetic ester of ethylene glycol or other halogen fatty acid ester of a polyhydric alc. as the denaturing agent.

Apparatus for mixing alcohol with denaturing substances. F. E. LICHTENTHAELER. U. S. 1,575,433, March 2.

Acetone and butyl alcohol by fermentation. G. W. FRENCH. *Brit.* 237,228, July 17, 1924. See U. S. 1,537,597 (*C. A.* 20, 476).

Diastatic malt sirup or wort. H. E. DUBIN. U. S. 1,573,611, Feb. 16. A diastatic ext. or wort is subjected to a limited or "mild" treatment with a solid adsorbent decolorizing agent such as charcoal to effect decolorization without any substantial reduction of enzyme activity.

Ammonia from vinasses. G. P. GUIGNARD. U. S. 1,576,427, March 9. A vinasse contg. H_2O is heated to 450–550° *in vacuo* (the vacuum and temp. being maintained during the whole treatment) to produce NH_3 and other by-products.

Kiln for drying hops, etc. WOLMER (R. C. PALMER) VISCOUNT. *Brit.* 237,418, July 4, 1924.

Apparatus for separating grains from wort. W. H. CAMPBELL. *Brit.* 237,321, Mar. 26, 1924.

Apparatus for steaming grain. H. R. SPAULDING. U. S. 1,574,210, Feb. 23.

Yeast. C. HOFFMAN, N. M. CREGOR and H. D. GRIGSBY. U. S. 1,575,761, March 9. A mash is prepd. by gelatinizing starch-contg. materials including cereal germs and polishings, the mass is saccharified with malt and digested with papain, the liquid filtered off and yeast is propagated in it with aeration.

Yeast preparation. R. WILLSTÄTTER and H. SOBOTKA. U. S. 1,574,776, March 2. A prepn. rich in vitamins and enzymes and which is adapted for use in baking or brewing is formed by mixing yeast with at least $1/3$ its wt. of a disaccharide other than sucrose, *e. g.*, with maltose, to initiate plasmolysis of the yeast, and then heating the mixt. to produce liquefaction without fermentation. Cf. *C. A.* 19, 2094.

Preserving yeast. L. LINDEMANN. U. S. 1,574,494, Feb. 23. Fresh yeast is distributed and washed in H_2O having a temp. of about 33–43° until tests show complete or nearly complete removal of glycogen. This treatment is carried out with the purpose of increasing the durability of the yeast.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Notes on the preparation and use of the ethyl esters from "the Chaulmoogra oils." B. E. READ. *China Med. J.* 39, 612–8(1925).—An account of the technic followed in the P. U. M. C. Lab., Peking, is accompanied with details as to ester yields on fractionation. Expt. indicates that rotatory power is the best index of purity. The product is guaranteed to be free from free fatty acid, which is the source of irritating therapeutic effects.

Bibliography of chaulmoogra oil. B. E. READ. *China Med. J.* 39, 623–31(1925). W. H. A.

Detection of ethyl phthalate in essential oils. H. THOMS. *Apoth.-Ztg.* 40, 196 (1925).—An adulteration of 10% of Et phthalate may be detected in certain essential oils as follows. The oil is evapd. to dryness on a water bath with EtOH and NaOH soln. If a resinous residue is obtained, this is extd. with water and the aq. ext. evapd. to dryness. The residue is treated with cold H_2SO_4 and resorcinol and heated at 80–85°. Some of this mixt. is then added to NH_3 soln. Freedom from Et phthalate is shown by the absence of any greenish yellow fluorescence after 15 min. Certain phenols such as eugenol interfere with the test since they also yield fluorescent condensation products with resorcinol.

Unpleasant taste of radix primulae. L. KOFLER and M. BRAUNE. *Arch. Pharm.* 263, 424–30(1925).—The root of *Primula veris* as also that of *Primula elatior* contains a substance or mixt. of substances, entirely distinct and separable from saponin, and responsible for its unpleasant taste. The substance dissolves readily in neutral, alk. and acid H_2O . The name "Primelkratzstoff" is tentatively suggested. W. O. E.

Choice of indicators for alkaloidal titrations. H. WALES. *Ind. Eng. Chem.* 18, 390–2(1926).—The procedure followed in the present investigation was essentially that of Rasmussen and Schou (cf. *C. A.* 19, 702, 2388). The indicators (methyl red = a, propyl red = b, bromocresol purple = c, bromophenol blue = d) employed and the

(a) 0.80; cocaine (a) 0.20; cocaine (b) 1.00; cocaine (c) 0.80; cocaine (d) 0.80; acetylmorphine (a) 4.89; emetine (a) 4.90; ethylhydrocupreine (c) 6.33; ethylmorphine (a) 4.99; homatropine (a, b, c) 5.74; hydrastine (no end point with a or d) 4.45; hyoscyne (d) 4.83; hyoscyamine (a, b, c) 5.83; morphine (a) 4.68; narceine salt completely dis-

sociated; narcotine (d) 4.43; nicotine (a) 5.26; papaverine, indistinct cannot be titrated; physostigmine (a) 4.85; pilocarpine (d) 4.31; quinine (c) 6.12; quinidine (c) 6.10; sparteine salt completely dissoc.; strychnine (a) 4.81; thebaine (a) 5.08; yohimbine (a) 4.72. The paper concludes with a bibliography. W. O. E.

Geranium rose oil. ANON. *Perfumery Essent. Oil Record* 17, 46(1926).—A sample grown in S. India from plants imported from Grasse had a rich yellow color, was quite clear and free from deposit, and a little more mobile than the usual geranium oils. The odor character is in keeping with that of the product from the distn. of geranium over roses, reminding one of the naturalness obtained by the use of phenethyl butyrate when toning up rose compns. As a sweetener and improver this sample is shown to be applicable to all kinds of perfumery since it compares favorably with the com. oil distd. over roses. W. O. E.

Travancore wild orange blossom oil. ANON. *Perfumery Essent. Oil Record* 17, 46-7(1926).—The sample was a rich yellow, mobile oil which at once suggests in odor character the Portugal oil (neroli) obtained from *Citrus aurantium*, but which does not occur in commerce; the so-called neroli is usually a mixt. of the several oils of the orange type. It is wanting in the depth and character natural to the Bigarade blossom oil; it is also a little inferior in lasting power to a sample of the best Portugal oil obtainable. W. O. E.

Determination of moisture in cloves. PERCY MAY. *Perfumery Essent. Oil Record* 17, 65(1926).—Introduce 50 g. of the sample together with 100 cc. of petroleum white spirit (d. 0.8135 and b. about 165-95°) into a short-necked flask, connect with a reflux by attaching to the lower end of condenser a graduated eprouvet-shaped receiver having a side connection with the flask. As the spirit boils, and condenses together with entrained H₂O vapor, the latter being heavier sinks into the graduated point while the overflowing spirit returns to the flask. After boiling $\frac{3}{4}$ of an hr. the vol. of the H₂O is read off. Zanzibar and Penang cloves usually carry about 13% of moisture. W. O. E.

Odor intensity and odor quality. JOHN MISSENDEN. *Perfumery Essent. Oil Record* 17, 62-4(1926).—The whole question of odor depends on 3 factors: intensity, quality and olfactory sense. Before a substance can be detected by the organs of smell, it must actually come into contact with the nasal membranes, the degree to which it does so det. the intensity of the odor. Having reached the nasal membranes, the substance will then set up a chem. action with the lipinous fluid contained therein, and this chem. action det. the quality of the odor. It, therefore, becomes obvious that if the chem. action or force of mol. interchange is great, the quantity of substance small and widely diffused into the air, the rate of chem. action will be slow and the effect upon the nerve-centers will be correspondingly slight. On the other hand, if the quantity of substance is great, but the force of mol. change small, the odor of a substance might be quite characteristic though not powerful. Lastly, if both force of mol. interchange and quantity of substance are great, the effect is likely to be protrating, as may be demonstrated by the 2 examples NH₃ and PhNO₂. The whole basis of the "lipin theory" is that anything which causes violent or rapid reaction with lipin is pungent or unpleasant, and anything which causes no reaction is odorless, with a graduated scale between these 2 extremes. A convenient classification of odors seems possible, provided that the rate of chem. action upon lipin be studied, and also provided that a standard lipin can be obtained synthetically. W. O. E.

Crystalline insulin. J. J. ABEL. *Proc. Nat. Acad. Sci.* 12, 132-6(1926).—Insulin was obtained in the form of colorless *rhombohedral* crystals. Dissolve 1 g. of fraction IV (C. A. 19, 2964) in a slight excess of N/6 AcOH and dil. to about 60 cc. Add a 6% soln. of brucine in N/6 AcOH. Sep. the supernatant fluid by centrifugalization and ppt. the insulin by the addn. of N/6 pyridine. It may be recrystd. by dissolving in M/15 Na₂HPO₄ and adding N/6 AcOH with vigorous shaking until a slight turbidity persists. On standing overnight, the crystals sep., m. 233° with slight browning at 215°. The crystals contain *labile* S and give the biuret, Millon, Pauly and ninhydrin reactions. They lose their hypoglycemic activity on boiling for 15 min. with 0.1 N Na₂CO₃. Quantities as small as 0.008 mg. per kg. lowered the blood sugar of rabbits to the convulsion level within 5 hrs. ARTHUR GROLLMAN

Biologic assay of the vaso-hypertensive and oxytocic activities of pituitary extracts. C. HEYMANS. *Arch. internat. pharmacodynamie* 30, 275-90(1925).—By employing a new technic for assaying the vascular activity of pituitary exts., involving the perfusion of the isolated head of a rabbit, H. found great variations in com. prepn., all of these being too weak. Similar results were found in regard to the oxytocic activity of com. prepn. tested. Voegtlin's standard powder is recommended as the most suitable for the international standardization of this biol. product. W. A. P.

Fernand Ranwez (1866-1925). "G. M." *J. pharm. chim.* [8] 2, 160-1(1925).—An obituary. S. WALDBOTT

Action of salts of mercury on the veronal series. Analytical applications. P. FLURY. *J. pharm. chim.* [8] 2, 465-76(1925); cf. P. Lami, *C. A.* 10, 2613.—The 5 medicinal derivs. of barbituric acid (MH_2): (1) MEt , (2) $M(PhEt)$, (3) $M(BuEt)$, (4) $M(CMe_2C_4H_5)$, (5) $M(C_4H_5)$, present definite reactions towards the following 3 Hg reagents: *A*: an acid $HgSO_4$ soln. (50 g. red or yellow HgO in 200 cc. H_2SO_4 , d. 1.84 and 1 l. H_2O); *B*, a more neutral soln. (70 g. crystd. $HgSO_4$ in 45 cc. H_2SO_4 and H_2O to make 1 l.); *C*, a satd. aq. soln. of $HgCl_2$. Cold aq. solns. of 1 to 5 produce with *A* or *B* white gelatinous ppts. insol. in H_2O , sol. in dil. (about *N*) HCl . With *B*, the soly. limits vary from 1:10000 to 1:80000. *C* does not ppt. with 1, 2, 3, but ppts. hot, concd. solns. of 5 (limit 1:125000) and cold concd. solns. of 4 (limit 16600); insol. in dil. HCl . With *D*, 1, 2, 3 the general compn. of the ppts. obtained with *A* and *B* (*D*) = $X D$. *y* HgO is, rather const.; with 1 and *A*, the ratio $x:y = 3:2$; with *B*, 3:2.5; with 2 and *A*, 3:2.5, with 3 and *A* or *B* 3:2.25, varying somewhat with the concn. of 3. The 4 and 5 derivs. form adsorption compds. with *A* and *B*, higher in HgO ; in 4 $x:y = 3:2.5$ and 3:3; 5 also contains $HgSO_4$, and the compn. after washing with H_2O is 3 $M(C_4H_5)_2.5HgO$. 0.55 $HgSO_4.5H_2O$. With *C*, if used in large excess (15 vols.), pptn. of 4 is quant.: 3($M(Me_2C, C_4H_5)2H_2O$) 3.5 HgO . $HgCl_2$; pptn. of 5, yielding 3($M(C_4H_5)_2.H_2O$) 4.5 HgO . 1.5 $HgCl_2$, is not quant. at any excess of *C*. All these ppts. are sol. in dil. KCN , permitting an indirect detn. of Hg by the Denigès $KCN-AgNO_3$ method, given in detail. Detn. is exact for 2 only; for 1 and 3, corrections for soly. must be made. With 4 and 5, results are 20-30% too low in Hg, because in the adsorption compds. the Hg is no longer in the ionic state. S. WALDBOTT

Determination of santonin in flores cinæ. R. FÖDER AND W. SCHNEITER. *Schweiz. Apoth. Ztg.* 63, 405-9, 421-5, 433-9, 453-8(1925).—After a crit. review of the methods of Katz (1899), Heyl and Tunmann (*C. A.* 7, 2090), Goerlich (*C. A.* 5, 1163), Fromme (*C. A.* 6, 3311), Van den Berg (*C. A.* 17, 3226), Favrel (*C. A.* 18, 149), Schaap (*C. A.* 18, 1546) etc., the following method is proposed for official adoption: Shake 10 g. of finely powdered drug with 100 g. C_6H_6 for 30 min., filter off 81 g. and remove C_6H_6 completely by distn. and exposing the residue to a current of air. Boil the residue for 15 min. under reflux with 40 cc. of 15% $HtOH$ by wt., filter hot through cotton, wash with 2×5 cc. of hot 15% alc., cool, add 0.1 g. white bole, again boil for 15 min. under reflux, filter and wash with 2 or 3×5 cc. hot 15% alc. and set aside for 24 hrs. in the dark. Weigh the soln., filter, rinse with a little cold H_2O , dry for 1 hr. at 100° , cool and weigh after 30 min. For each 10 g. of soln. add 0.006 g. santonin (*A*) in calcul. The wt. found refers to 8 g. of drug, which should contain at least 1% of *A*, m. 170° when pure; found m. $163-5^\circ$. When the content in *A* is low (0 to 0.8%), add 1.5-2% of pure *A* so as to obtain well crystd. *A* for detn. S. WALDBOTT

Cod-liver oil, its origin, preparation and active principles, notably its vitamin content. J. LANG. *Schweiz. Apoth. Ztg.* 63, 473-5, 517-9, 535-7, 546-50(1925).—A lecture. S. WALDBOTT

A pharmacodynamic study of the anthelmintic properties of two oils of chenopodium. A. R. BLISS, JR. *J. Am. Pharm. Assoc.* 14, 93-8(1925).—See *C. A.* 19, 1472. I. E. WARREN

Endocrine products. P. S. PITTINGER. *J. Am. Pharm. Assoc.* 14, 99-107(1925).—A review for pharmacists. I. E. WARREN

A pharmaceutical study of acetylsalicylic acid. HARRIET V. SNIDOW AND H. A. LANGENHAN. *J. Am. Pharm. Assoc.* 14, 125-8, 694-703(1925).—History of the discovery, incompatibilities and color reactions. Preliminary expts. with numerous mixts. to det. incompatibilities were made but the work is not completed. I. E. WARREN

The paramerial method for the biologic assay of the digitalis series. ALBERT SCHNEIDER. *J. Am. Pharm. Assoc.* 14, 128-9(1925).—The technic of the method is described. It is essentially the same as that for detg. the phenol coeff. of disinfectants by the paramerial method (*C. A.* 19, 1473). *P. caudatum* and other species of *P.* appear to be quite resistant to the digitalis series. The results obtained by the paramerial method with preps. of digitalis, strophanthus, apocynum and squill, do not correspond with the results obtained by the official 1-hr. frog method. The comparative results are lower than those given in the U. S. P. The method is in the experimental stage, but the results appear promising. I. E. WARREN

The state of silver in protargol (argenti proteinatum) and collargol (colloid silver argenteum cr   ). I. M. KOLTHOFF. *J. Am. Pharm. Assoc.* 14, 183-9(1925).—Com. preps. of protargol and collargol were studied. In detg. *N* in protargol by the Kjeldahl

method a catalyzer must be used. The soln. becomes colorless in 2 hrs. without a catalyzer but the N is 1% low. The N content is 13.8%. Protargol contains about 0.85% AgCl. The collargol specimen contained 67% of Ag of which 4.8% was in the halide state. The Ag-ion concn. was detd. by the potentiometer with a Ag electrode. The value for protargol is about 10 times as great as in collargol. The preps. were titrated with a standardized KI soln., the potentiometric method being used. By this it is possible to det. the total Ag and the Ag present as AgCl. The first rise in potential occurs after the transformation of the Ag proteinate into AgI and the second after the transformation of the AgCl into AgI. Protargol soln. is a good buffer for Ag ions between p_{Ag} 2.8 and 4.0. Collargol contains nearly all of the Ag in the metallic state but only a small part is in an ionogenic state. It contains about 5% of its Ag as AgCl.

L. E. WARREN

Belladonna plaster. F. B. KILMER AND P. L. HUNT. *J. Am. Pharm. Assoc.* **14**, 241-9(1925).—Historical essay. K. and H. conclude that the U. S. P. IX alkaloidal standards for belladonna plaster are satisfactory, and in conformity with the other pharmacopeias of the world. The U. S. P. IX method of assay with slight modifications gives satisfactory results. The principal recommended change is the use of methyl red instead of cochineal as an indicator.

L. E. WARREN

A simple and rapid electrometric determination of alkaloids without the use of hydrogen electrode. STEPHEN POPOFF AND M. J. MCHENRY. *J. Am. Pharm. Assoc.* **14**, 473-6(1925).—A plain Pt wire is used in place of the H electrode. The app. consists of a student potentiometer, lamp and scale galvanometer, Weston standard cell, 2 dry cells and a 3-dial resistance box set up in the usual way. The satd. type of HgCl and a plain Pt wire serve as the electrodes. The latter is cleaned after titration by dipping it into a cleaning mixt. (dichromate) for a few min. and washing it thoroughly. The titration flask is a 300-cc. tall beaker ground to fit tightly against a glass plate. In the plate are 6 openings, one for a stirrer (electrically driven), the second for a HgCl capillary tubing, the third for a T tube into which the Pt wire is fastened and which is used for passing CO₂-free air, the 4th and 5th openings are for 2 burets, and the 6th opening is for washing down the sides of the beaker. Dissolve the alkaloid or alkaloidal salt in either EtOH or a mixt. of EtOH and H₂O, and expel CO₂ from the beaker. To free alkaloids add excess 0.1 N HCl and then KOH until 2 breaks are obtained. Altogether there are 3 breaks, the 1st representing the conversion of alkaloid to the hydrochloride, the 2nd representing the excess of acid added, and the 3rd representing the conversion of the salt into the free alkaloid. Titrate alkaloid salts directly with KOH. The method is simpler than that using either the H electrode or the quinhydrone electrode.

L. E. WARREN

Chemical investigations of corpus luteum. III. On the presence of free amino acids in the acetone extract. M. C. HART AND F. W. HEYL. *J. Am. Pharm. Assoc.* **14**, 770-3(1925); cf. *C. A.* **18**, 1178.—In the follicular fluid of the sow the solids amount to 7.31%, of which 87% is protein. As the corpus luteum develops the protein is reduced to 40% of the dried material, which suggests enzymic action. Protein hydrolytic products such as peptides or amino acids would be expected. In the systematic examn. of the acetone ext. of corpus luteum cryst. material seps., the EtOH-insol part of which is shown to be a mixt. of the amino acids, leucine, isoleucine, and probably valine. The presence of amino acids in corpus luteum is to be expected in consideration of the change of follicular liquid, in which the protein part constituents predominate, to the corpus luteum, in which the protein part is greatly reduced.

L. W. WARREN

Determination of nicotine (MACH, SINDLINGER) 7.

POTTER: **Therapeutics, Materia Medica and Pharmacy.** 14th Ed. revised by R. J. E. Scott. Philadelphia: P. Blakiston's Son & Co. 972 pp. \$8.50.

Proteolytic extracts from Drosera rotundifolia. V. MLADEJOVSKY. *Brit.* **237**, 087, July 8, 1924. A dil. soln. of Na silicate is used for extrn. and the ext. is concd. *in vacuo*

Cyanogen fumigants. DEUTSCHE GES. FÜR SCHÄDLINGSBEKÄMPFUNG. *Brit.* **237**, 344, April 24, 1924. HCN or other CN deriv. is distributed over kieselguhr or other porous carrier and H₂SO₄ or oxalic acid may be added to counteract decomposition. Irritants such as the Me ester of chloroformic acid may be added as warning substances

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

Synthetic ammonia by catalysis. A. T. LARSON. *J. Chem. Education* **3**, 284-90 (1926).—A review. E. H.

Possible potash production from Minnesota shale. H. A. SCHMITT. *Econ. Geol.* **19**, 72-83 (1924).—S. describes the occurrence of the Decorah and Galena formations in the vicinity of St. Paul. Different sections show a K_2O content ranging from 5.04% to 8.24%, with an av. for 84 ft. of 5.96%. After a brief summary of previous work on the recovery and utilization of shale, S. discusses his work and gives his conclusions as follows: The potash is in 2 states of combination, 60% being more easily available than the rest. Much of the potash can be obtained from the shale by heat treatment with Na salts equiv. in amt. to the K and with a slight excess of $CaCO_3$. The K can be rendered sol. and in part volatilized from bricks where salt and $CaCO_3$ have been added to the raw shale. The shale is favorably situated for use in the manuf. of sand-lime brick or port. cement after extn. of the lime. The shale is being used without preliminary heat treatment as a fertilizer with considerable promise of success. C. W. C.

Use of sodium chloride in the manufacture of synthetic saltpeter. D. P. MANOIEV. *Trans. Inst. Applied Chem.* (Russian) **1925**, No. 4, 37-9.—In the manuf. of synthetic $NaNO_3$ either by oxidation of NH_3 or from air, the sources of Na used are NaOH or Na_2CO_3 . M. investigated whether NaCl could be used. This depends on the relative soly. of NaCl and $NaNO_3$ in acidified water: if pure $NaNO_3$ should ppt., the use of NaCl would have the advantage of cheapness over NaOH or Na_2CO_3 . With this in mind, M. studied the soly. of equiv. quantities of NaCl and $NaNO_3$ in acidified water. Conclusion: Either NaCl or a mixt. of NaCl and $NaNO_3$ is pptd. from acid solns., depending on the concn. of the acid. Thus the prepn. of $NaNO_3$ by M.'s method would require a purification of the saltpeter obtained, which could be done by recrystn.

BERNARD NELSON

Separation of aluminum sulfate from iron by means of alcohol. N. VITTOFF. *Trans. Inst. Econ. Mineral. and Petr.* (Russia) **1924**, No. 8, 1-16.—Bauxite from the region of Tichwinsk when treated with 50° BÉ. H_2SO_4 yielded over 99% of the Al_2O_3 . The mixt. of Al and Fe sulfates was treated with alc. (90%), which gave a hydrous Al sulfate with 0.1% of Fe. After the third pptn. with alc. the % of Fe was reduced to 0.0005%. The yield was 97% of the theoretical. The process was carried out on a lab. scale and its industrial application investigated. The theory of pptn. with alc. is discussed. An English résumé is given. J. S. JOFFE

Lead and zinc pigments and salts in 1924. C. E. SIEBENTHAL AND A. STOLL. U. S. Geol. Survey, *Mineral Resources of U. S. 1924*, Part I, 141-8 (preprint No. 11, published Feb. 12, 1926). E. H.

Bakelite in large chemical apparatus. H. LEBACH. *Z. angew. Chem.* **38**, 1091-4 (1925).—A discussion of the use of bakelite as a coating, and in the construction of chem. app., especially that used in corrosive acids, solns., etc. For these purposes it fills a long-felt want. Numerous illustrations of its use in (German) technology are given. W. C. EBAUGH

A noteworthy appearance of phosphine. W. STEFFENS. *Z. angew. Chem.* **38**, 1096 (1925).—Mortar at a certain place in an old building gave PH_3 upon treatment with H_2O . The formation was ascribed to the action of H_2O upon Ca_3P_2 , probably formed from the $Ca_3(PO_4)_2$ originally present by electrolytic reduction from a short circuit. W. C. EBAUGH

Aktivin. J. HAUSNER. *Pharm. Zentralhalle* **67**, 115-6 (1926).—A new accessory for use in connection with the adhesive industry, notably in bleaching dextrin, rendering starch sol. and possessing a germicidal value akin to $HgCl_2$, is $CH_3C_6H_4SO_2NCINa$, which decomps. in the presence of oxidizable material into *p*-toluenesulfoneamide, NaCl and O. W. O. E.

Mica in 1924. BLANCHE H. STODDARD. U. S. Geol. Survey, *Mineral Resources of U. S. 1924*, Part II, 171-81 (preprint No. 15, published Feb. 12, 1926). E. H.

Old Italian violin wood. C. G. SCHWALBE AND R. SCHOPP. *Z. angew. Chem.* **38**, 965-6 (1925).—It was noted that the wood of an old Amati violin showed practically the same compn. as that of modern Italian and German violins, so far as lignin, pentosans, etc., were concerned, but was higher in ash. To test out the legend that the old masters allowed violin wood to lie in running water (probably "hard") for many months, the authors treated violin wood with the cooling water from a lab. still for 80 days

and found that the ash content increased from 0.27% to 1.16%, almost paralleling results from the old wood. W. C. EBAUGH

The role of bicarbonates in dry fire extinguishers. C. GENTSCH. *Z. angew. Chem.* 38, 966(1925).—A dry extinguisher was used to put out a fire, the resultant powder deposit collected and analyzed. Whereas the original contents of the app. had 96.8% NaHCO_3 , that collected afterwards ran 97.0%. It was then found that talcum, MgO , etc., used in the same way as NaHCO_3 , were quite as effective. The formation of a dust cloud, and perhaps the lowering of the temp. by the compressed air used, are factors causing the fire to be extinguished. W. C. EBAUGH

The salt mass from the waters of the Sosnevskaia factory (PASTAGANOV, ZAITZEV)

8. Treating fumes from smelting Cu alloys [for recovery of ZnO] (Brit. pat. 237,232)
9. NH_3 from vinasses (U. S. pat. 1,576,427) 16. Device for dissolving caustic soda (U. S. pat. 1,574,561) 1.

MOORE, HARRY CLARE: Sulphuric Acid Tables. 2nd Ed. revised and enlarged Chicago: Hillison & Etten Co. 40 pp.

- Rubber-lined shipping drum for acids. R. T. GRIFFITHS. U. S. 1,575,681, March 9.

Rubber-lined metal receptacle for acids, etc. E. H. RADABAUGH. U. S. 1,574,690, Feb. 23.

Portable acid-proof receptacle lined with rubber. R. M. WARNER. U. S. 1,575,660, March 9.

Ammonia synthesis. SYNTHETIC AMMONIA & NITRATES, LTD. Brit. 237,394, May 29, 1924. Catalysts for NH_3 synthesis comprize a ferrate or ferrite of a non-poisoning metal, *e. g.*, Ca, Ba, Mg and Mn. Ca ferrite may be formed by fusing mol proportions of lime and Fe_2O_3 and may be used for NH_3 synthesis under a pressure of 90 atm. and at a temp. of 500° .

Calcium cyanide. F. J. METZGER. U. S. 1,573,732, Feb. 16. Ca cyanide or other cyanides are formed by treating carbides with HCN . A compd. of the formula $\text{Ca}(\text{CN})_2 \cdot 2\text{HCN}$ may be obtained.

Heavy basic magnesium carbonate. B. B. GRUNWALD. U. S. 1,573,603, Feb. 16. CO_2 is introduced into a mixt. of calcined magnesite and H_2O and the resulting heat of reaction utilized to produce a product of the desired phys. properties, *e. g.*, for making molded heat insulation.

Light basic magnesium carbonate. B. B. GRUNWALD. U. S. 1,573,604, Feb. 16. A mixt. of heavy MgCO_3 and H_2O is heated, with accompanying agitation, to a temp. of not over 82° to cause expansion of the MgCO_3 to the desired degree. Further expansion is checked by adding cold H_2O .

Light basic magnesium carbonate. R. B. CROWELL. U. S. 1,573,632, Feb. 16. CO_2 is supplied for reaction with MgO in aq. mixt. until the ratio of CO_2 to MgO lies between 0.8 and 0.9 and the material is heated to not over 60° .

Lead carbonate. S. C. SMITH and CHEMICAL & METALLURGICAL CORPORATION, LTD. Brit. 237,308, Jan. 30, 1924. Pb chloride is converted into carbonate by suspending it in aq. NH_3 soln. and passing in CO_2 . Various details of ore treatment and preliminary treatment of solns. to recover different values are described.

Zinc carbonate, etc. S. C. SMITH and CHEMICAL & METALLURGICAL CORPORATION, LTD. Brit. 237,306, Jan. 29, 1924. ZnCl_2 solns. such as those obtained from ores are treated with BaCO_3 to obtain ZnCO_3 and BaCl_2 which on treatment with H_2SO_4 or a sulfate forms BaSO_4 and HCl or a chloride for further use in treating Zn ore. Various details are given for treating Pb-Zn ores.

Aluminum nitrate. T. MEJDELL and Ö. RAVNER. U. S. 1,575,634, March 9. In order to sep. Al nitrate from Fe compds., a hot soln. of Al nitrate is mixed with a relatively cold soln. of Al nitrate (at least one of the solns. contg. the Fe compds. to be sepd.) under such conditions of temp. and concn. that the Al nitrate crystallizes from the mixt.

Barium sulfate. K. EBERS. Brit. 237,268, July 17, 1924. Crude BaSO_4 is bleached by heating with H_2SO_4 in the presence of fluorspar which may be naturally present or may be added. A small proportion of niter or HNO_3 also may be added.

Complex fluorides. A. F. MEYERHOFER. Brit. 237,615, Dec. 20, 1923. Complex fluorides such as Na fluotitanate (but not including fluosilicates, fluoborates or ordinary double fluorides) are obtained by substituting for the Si or B compd. of a previously

proposed process a compd. of another element; *e. g.*, MgF_2 , NaCl and Ti fluoride are caused to react in very dil. HCl . Brit. 237,616 specifies the production of K fluosilicate from KF , SiO_2 and HCl ; and the production of Na fluoborate from B fluoride, NaCl and HF . Cf. *C. A.* 19, 2113.

Apparatus for curing and drying acid phosphate. E. H. ARMSTRONG. U. S. 1,576,022, March 9.

Fused silica. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 237,264, July 18, 1924. Plastic SiO_2 is extruded through an aperture to form a long rod which is cut into sections. The latter are allowed to cool while suspended at one end. An app. is described.

Zinc oxide. H. H. UTLEY and J. MCCALLUM. U. S. 1,574,317, Feb. 23. The Pb and other chloridizable constituents of fume products contg. Zn and Pb are chloridized and the chloridized material is sepd. by volatilization from the ZnO . The residue is mixed with coke breeze or other carbonaceous reducing material and the mixt. is roasted.

Oxides from sulfates. R. JACOBSON. Brit. 237,243, July 16, 1924. Sulfates such as those of Fe or Al (or alum) are heated *in vacuo* and the SO_3 formed may be converted into H_2SO_4 and employed to treat raw materials to form more sulfates. $\text{Fe}_2(\text{SO}_4)_3$ may be decomposed at 630° in a vacuum of 50 mm.

Sulfur from ores. C. MARX. U. S. 1,574,987, March 2. S is distd. from sulfide ores with the aid of a high vacuum and the S vapors are condensed. U. S. 1,574,988 specifies the similar distn. of S when present in ore in elemental form. Cf. *C. A.* 19, 3355.

Activating carbon. E. BATEMAN. U. S. 1,573,509, Feb. 16. Comminuted C , *e. g.*, anthracite or charcoal, is treated with CO_2 at temps. of 650 – 1000° .

Decolorizing-carbon. G. J. ESSELEN, JR. U. S. 1,575,561, March 2. A product for decolorizing and defecating purposes is obtained from the isolated pithy material of the sugar cane, associated with alk. material such as lime.

Decolorizing-charcoal. H. MÜLLER-CLEMM. U. S. 1,575,703, March 9. Sulfite waste lye or other carbonaceous material is carbonized in the presence of K sulfide or other alkali metal sulfide, to produce an active C .

Portable retort apparatus for producing activated carbon. J. N. A. SAUER. Brit. 236,984, April 5, 1924. The retort base may have mounted on it a generator for producing activating gas, *e. g.*, gas from crude oil or gasoline, and also app. for pre-distg. or charring the raw carbonaceous material.

Apparatus for making carbon or lampblack. O. D. HORTON. U. S. 1,574,091, Feb. 23.

Apparatus for bolting carbon black. W. C. CASSELL and C. K. SPRINGFIELD. U. S. 1,573,373, Feb. 16.

Composition for filtrations and other uses. H. A. ENDRES. U. S. 1,574,380, Feb. 23. A mixt. of finely divided siliceous material such as diatomaceous earth with lime and H_2O is heated and the resulting product is then calcined.

Preparing diatomaceous earth for filtering, decolorizing, etc. R. CALVERT. U. S. 1,574,363, Feb. 23. A mixt. of finely divided diatomaceous earth with lime and H_2O is heated to a temp. of about 90 – 105° .

Filter material. H. C. MARTIN. U. S. 1,576,440, March 9. A porous product comprises a compacted and baked mixt. of Si carbide or other mineral grains, moistened with furfural or other resin solvent, and a synthetic resin such as that produced from PhOH and formaldehyde.

Casein solids. A. A. DUNHAM. U. S. 1,575,155, March 2. Acid-pptd. casein, the acidity of which is materially above 0.75% free acid, is treated with a sufficient amt. of acid-neutralizing substances such as borax to reduce the acidity to 0.25 – 0.75% , and adapt the product for molding and machining.

Refining "pearl essence." J. BAISSÉAU. U. S. 1,576,454, March 9. The raw material is treated with a proteolytic compn. or other biological reagent which will cause a fermentation of the org. substances contg. the crystalloids and the latter are recovered from the dissolved products of the fermentation. Cf. *C. A.* 19, 1036, 3150.

Conditioning shoe-bottom filler compositions. G. H. MAXWELL. U. S. 1,573,353, Feb. 16. Filler material such as that comprizing comminuted cork and a sticky waxy binder is permeated with steam while being passed in non-compacted condition through gravity chutes to prep. it for use.

Felt for box toes of shoes. H. P. SHOPNECK. U. S. 1,574,208, Feb. 23. A fibrous pulp such as rag stock is felted with jute or other vegetable fibers of similar length and with asbestos and the material is impregnated with a thermo-plastic binder, *e. g.*, rosin and oil-blown asphalt.

Water-laid felt. H. P. SHOPNECK. U. S. 1,574,126, Feb. 23. A material suitable for use in shoes for box toes comprises rag or wood pulp or other fibrous pulp felted with longer fiber such as cut jute and impregnated with an asphaltic or other thermo-plastic binder.

Plastic compositions including phenolic derivatives. G. J. VOTAPEK. U. S. 1,574,771, March 2. The binding properties of reaction products of phenolic substances and halogen derivs. of S are improved (to adapt the material for better use in plastic compns. such as mixts. with fillers) by the addn. of a small proportion of stearin pitch.

Decomposition of silver for coating purposes. B. BART. U. S. 1,574,544, Feb. 23. A soln. of AgNO_3 or other Ag salt is mixed with a reducing agent such as formaldehyde or rochelle salt and the mixt. is maintained out of contact with the air and applied as a spray or mist to a surface to be coated before reduction of the Ag salt has been completely effected.

Semi-transparent coating. A. BENSON. U. S. 1,574,862, March 2. A coating adapted for use on wood, glass, clay, etc., comprises equal parts of magnesite, SiO_2 and infusorial earth fused together and a soln. of MgCl_2 .

Lamp wick. Z. OLSSON. U. S. 1,573,500, Feb. 16. Lamp wicks are impregnated with alum, $(\text{NH}_4)_2\text{SO}_4$ and oxalic acid to render them resistant to combustion.

Composite sheets of glass and celluloid. G. B. RILEY. Brit. 237,179, May 13, 1924. A sealing material used adjacent to the edges of the sheets comprises pitch, bees wax, or a varnish contg. celluloid 1, AmOAc 10, acetone 5, "methylated spirits" 5 and gum sandarac 2 parts.

Uniting sheets of glass and celluloid. G. B. RILEY. Brit. 237,379, May 13, 1924. Sheets of glass are cemented to opposite sides of a celluloid sheet by heat and pressure after treating the glass sheets with a soln. contg. "isinglass" and a dextrin gum and the celluloid sheet with a soln. of colophony and castor oil.

Composition for preventing accumulation of moisture on glass, etc. M. ROSS. U. S. 1,576,363, March 9. Sep. aq. gelatin solns. are treated with concd. HNO_3 and concd. chromic acid and then mixed.

Extinguishing fires. INTERNATIONALE FEUERLÖSCHER GES. Brit. 236,964, July 12, 1924. CO_2 or other fire-extinguishing gas is permitted to expand from the liquid form and the portion thus solidified is thrown on fires, *e. g.*, those of inflammable liquids.

Composition for cleaning stone, tile, etc. G. A. NELSON. U. S. 1,574,406, Feb. 23. NH_4F 95 and oxalic acid 5% $1\frac{1}{2}$ lbs. and H_2O 1 gal. U. S. 1,574,407 specifies a mixt. of NH_4F 75, oxalic acid 10 and Na_2CO_3 15% $1\frac{1}{2}$ lbs. per gal. of H_2O .

Friction material for lining clutches, etc. J. MACADAM and W. BERRY. U. S. 1,573,982, Feb. 23. A fabric similar to cotton belting is impregnated with cellulose, *e. g.*, by use of a viscose soln.

Composition for treating brake linings. F. E. WIESER. U. S. 1,573,468, Feb. 16, 1924. Turpentine 96, castor oil 16, graphite 8 and oil of citronella 1 part.

Colored bakelite screens for illuminated "imitation fires." CABLE ACCESSORIES CO., LTD. AND F. H. REEVES. Brit. 237,327, April 12, 1924.

Composition for protecting the hands from grease, etc. D. R. KELLOGG. U. S. 1,574,733, Feb. 23. Bentonite 17, soap 4.5 and H_2O 78.5%.

Coated stencil sheets. D. GESTETNER. Brit. 237,000, July 11, 1924.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

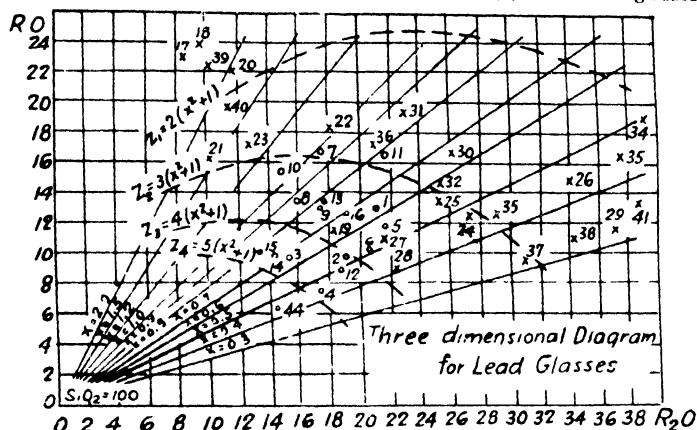
G. E. BARTON, C. H. KERR

Glass sands of Ohio. J. A. BOWNOCKER. *Ohio J. Sci.* 26, 25-41 (1926). The glass sands of Ohio are described as to occurrence, winning and prepn. Chem. analyses of over 100 sands are given, including washed and unwashed material, ganisters, steel sands, blast sands, etc. Only in one case does this material approach the specifications for first-class glass sand and in this instance the Fe content is too great. The other common impurities occur in considerable amounts. Ohio produces about 2% of the glass sand used in the U. S. H. F. K.

American glass sands, their properties and preparation. C. R. FETTKER. *Trans. Am. Inst. Mining Met. Eng.*, No. 1531-H, 25 pp. (Feb., 1926).—The effect of the chem. compn., fineness and size of grain on the value of glass sands is discussed. The Oriskany and St. Peter sandstones are the two major sources of glass sand in the U. S. W. Va., Ill., Penn., N. J. and Mo. in descending order produce over 80% of the glass sand of the country. The methods of winning and prepn. of this material are given. H. F. K.

The devitrification of glasses. K. TABATA, K. YEGAMI AND S. MORIYASU. *Researches Electrotech. Lab. Japan.*, No. 162, 28 pp.(1925).—Samples were taken from depleted and newly manufd. radio transmitting and receiving bulbs whose previous histories were unknown. They were exposed to temps. between 600° and 1000° and observed macroscopically and microscopically for their devitrifying temp. Results of chem. analysis on each glass also are given. It is quant. shown that there are close relations between the chem. compns. and the mode of devitrification of glasses upon heating.

Lead glass and the glass formula. O. KNAPP. *Sprechsaal* 57, 512(1924); *J. Soc. Glass. Tech.* (Abstracts) 9, 112-3.—A graphical study of glass composition based on Tschuschner's formula. A table was given of data for 44 glasses. On the graph the small circles indicated technical glasses, and the small crosses optical glasses. The lines $z = \alpha(x^2 + 1)$, $x = 0.3$ to 2.0 were inserted, using the notation of Tschuschner. The following conclusions were drawn: (1) Lead glasses had either the normal formulas of Tschuschner, or the wider form of general value. (2) Technical glasses were in



two groups, (a) normal, with z between z_1 and z_2 ; (b) hard, with z between z_3 and z_4 . (3) Optical glass varied, but, from examples examined, $2(x^2 + 1) < z < 5(x^2 + 1)$. (4) Soda glasses preponderated above z_1 ; mixed alkali glasses between z_1 and z_3 and potash glasses at z_4 . (5) The limits of molecular composition were: 0.0 to 2.8 alkali:1PbO:0.8 to 14.2SiO₂. These limits were bigger than with lime-glass, and a resistance glass which was rich in lead contained less silica than indicated by $z = 2(x^2 + 1)$. H. G.

Keppeler's rule for lead glasses. O. KNAPP. *Sprechsaal* 58, 110(1925); *J. Soc. Glass Tech.* (Abstracts) 9, 113.—Keppeler's rule for the compn. of stable Pb glasses stated that the relative no. of mols. of silica in excess of the no. of mols. of Pb oxide should be from 6 to 8 times the no. of alkali mols. present. Thus, if the mol. formula of the glass were $xR_2O.yPbO.zSiO_2$, then $8x > z - y > 6x$. A diagram gives the relative values of x to $z - y$ for a large no. of known Pb glasses. For the rule to be correct the points should lie between lines which represent the ratios $z - y = 6x$ and $z - y = 8x$, resp. The bulk of the values lay outside these lines and could only be contained by lines representing $12.5x > z - y > 3x$. H. G.

The construction of the composition of glasses and glazes. H. HERMANN. *Sprechsaal* 58, 15(1925); *J. Soc. Glass Tech.* (Abstracts) 9, 102.—Since devitrification resulted in the deposition of definite compds. it was natural to attempt to arrange glass compns. in the form of amts. of silicates. For the acid alkali-lime glasses (mirror-glass group) and the ordinary alumina-contg. glasses (bottle group), consideration of the products of devitrification led to the calcn. of the relative amts. of metasilicates, aluminosilicates of the nepheline type, alkali silicates, and free silica. Thus, for a green bottle glass:

	Percentage compn.	Mol. compn.		Percentage compn.	Mol. compn.
SiO ₂	63.76	1.061	CaO	15.75	0.281
Al ₂ O ₃	9.58	0.094	MgO	0.67	0.017
Fe ₂ O ₃	1.92	0.012	K ₂ O	3.06	0.033
MnO	0.32	0.004	Na ₂ O	5.10	0.082

By equiv. division the mols. present would be:

0.019 FeSiO ₃	0.005 FeO			
0.003 MnSiO ₃	0.001 MnO			
0.222 CaSiO ₃	0.059 CaO			
0.013 MgSiO ₃	0.004 MgO	Al ₂ O ₃ .2SiO ₂	0.064 Na ₂ O	0.616 SiO ₂
	0.007 K ₂ O		0.027 K ₂ O	
0.257	0.018 Na ₂ O		0.091	
	0.094			

and this could be calcd. to the proportions in which Na₂O + K₂O 1 in the usual way, giving:

0.21 FeSiO ₃	0.06 FeO			
0.03 MnSiO ₃	0.01 MnO			
2.44 CaSiO ₃	0.64 CaO			
0.14 MgSiO ₃	0.04 MgO	Al ₂ O ₃ .2SiO ₂	0.70 Na ₂ O	6.71 SiO ₂
	0.08 K ₂ O		0.30 K ₂ O	
2.82	0.20 Na ₂ O		1.00	
	1.03			

These results should not be taken too literally, since they do not take into account the possibility of assocn. or dissocn. A mathematical discussion of the usual expression for the evaluation of phys. properties in the form of a linear function of the oxide percentages ($A = a_1x_1 + a_2x_2 + \dots$) showed that it could be transformed into a similar expression in terms of silicate percentages.

The determination of boric oxide in glass. K. TABATA AND S. MORIYASU. *Researches Electrotech. Lab. Japan*. No. 153, 32 pp. (1925).—As Chapin's method for detg B₂O₃ in glass is tedious because of the high content of water in the soln. and the inadequacy of the dehydration action of CaCl₂ at the temp. of evapn., T. and M. improved the distn. app. by using paraffin bath instead of ordinary water bath and modified the manipulation by adding MeOH after evapg. the soln. to a sirupy state. Evap. the contents of the flask at about 140°, cool to 40–50°, add MeOH, heat to 80° and finally to 110°. When the vol. of the soln. becomes about that of original, cool to 50–40°, add another portion of MeOH and repeat the same operation 3 times in all. With this improved operation the time necessary for distg. as methyl borate is shortened by half.

The production of colorless glass in tank furnaces with special reference to the use of selenium. III. The influence of arsenious oxides and other constituents of the batch. A. COUSEN AND W. E. S. TURNER. *J. Soc. Glass Tech.* 9, 119–27 (1925); cf. *C. A.* 18, 1736.—As₂O₃ is a necessary factor in the decolorizing of the glasses examined by Se, the amt. needed being at least 30 times that of the Se.

A note on the changes of color of selenium glasses during annealing and reannealing and by exposure to light. A. COUSEN AND W. E. S. TURNER. *J. Soc. Glass Tech.* 9, 111–7 (1925).—Glasses contg. 1000 parts sand, 200 limespar and 370 soda ash with small addns. of Se showed color changes on reheating to 500–625° only when distinct tints were originally present, thus confirming the earlier work of C. and T. (cf. *C. A.* 17, 1536). Exposure to sunlight for 13 months reversed the changes produced by reheating.

An attempt to improve the qualities of glasses intended for lamp-working purposes. W. E. S. TURNER. *J. Soc. Glass Tech.* 9, 133–47 (1925).—Leadless glasses of narrow compn. limits were sent to lamp-working firms to be used in comparison with their present types. The phys. properties and resistance to hot H₂O and to narcotine-HCl were detd.

Post-war apparatus glasses. H. THIENE. *Z. angew. Chem.* 39, 193–4 (1926). Resista glass vessels, as Pyrex imitations, are not found to be superior to Jena-glass articles for general lab. use as detd. by resistance to thermal shock, boiling H₂O, and dil. H₂SO₄. Jena glassware lost only half as much in wt. during boiling with 2 N NaOH soln. as did Resista vessels of similar type.

Pollapas. H. R. SCHULZ, R. SCHMIDT AND L. SCHMIDT. *Keram. Rundschau* 33, 143 (1925); *J. Soc. Glass Tech. (Abstracts)* 9, 104–5.—H. R. Schulz did not attach great importance to "Pollapas," discovered by F. Pollak and R. Ripper of Vienna, because of its disadvantages. It was too soft for window glass, while its inflammability prevented its use for illuminating ware. The low hardness coupled with the small sta-

bility of resin-like materials towards org. acids, alc., etc., precluded its use for chem. ware. The materials from which Pollopas could be made were far more restricted than those from which glass could be produced, limiting the range of variation of properties of the former as compared with the latter material. Samples of Pollopas had not the same homogeneity and freedom from strain as had articles made from glass. R. Schmidt, while pointing out some of the possible uses of the material, also emphasized some of the difficulties involved in its employment. Pollopas had a n similar to that of flint glass (n_D 1.54 to 1.90), and although it could be employed for small lenses it was so soft as to be easily scratched. The material had the following mech. properties as compared with glass and other materials:

	Glass	Juvelith	Pollopas	Iron	
Compressive strength	60—130	11.7	22.3	20—90	} kg. per sq. mm.
Tensile strength	3—9	6	10	9—50	
Bending strength	—	2.5	5.1	—	

For objects made on the lathe, the new material would probably be very suitable, while its non-brittle nature made it suitable for motor-car windows, etc. Although stable to water in the cold, it swelled somewhat on heating, and by heating with an org. coloring agent in a weakly alk. soln. it could be suitably colored in the surface layers. For this reason it could be used for light-filters, while it gave good imitation opal glass and porcelain. The cond. of heat of Pollopas was 0.00184 (glass 0.00108 to 0.00227) and the material was a good elec. insulator. H. G.

Crystals in stalactites from glass kilns. N. N. SMIRNOV. *Trans. Inst. Exp. Silicates* (Russian) 1924, No. 16, 9—17.—Examination of the stalactites showed them to be cryst. They may be placed with the tridymites. J. S. JOFFE

Stalactites from the continuous glass kilns. B. S. SHVETZOV. *Trans. Inst. Exp. Silicates* (Russian) 1924, No. 16, 5—8.—The mechanism of formation of stalactites during the time of cooling the kilns for repairs and their chem. compn. are given. J. S. JOFFE

Tank control and devitrification. H. INSLEY. *Glass Ind.* 7, 1(1926).—A triaxial diagram of the system $\text{SiO}_2\text{--CaO--Na}_2\text{O}$ is the principal feature of this article. Typical soda-lime glass compns. for various purposes are shown on the diagram. The compns. of the compds. which crystallize out, thus causing devitrification, in each case, are connected by dotted lines to these various points. Devitrification can always be prevented by raising the temp. sufficiently at the place where it starts. Where this is impossible, the crystg. temp. can be lowered by slightly changing the compn. of the batch in a direction away from the compd. which crystallizes. E. G. J.

Pulverized fuel for glass furnaces. O. MAETZ. *Sprechsaal* 58, 151(1925); *J. Soc. Glass Tech.* (Abstracts) 9, 133.—The advantages of using pulverized fuel were a saving in wages, use of inferior fuel, easy regulation of temp. and of flame conditions, and actual heat economy. The disadvantages were necessity for a special drying and pulverizing plant, high temp. in the ignition chamber, and possible contamination of the glass by ash. A calcn. was given showing that the saving over briquets was 59%, and that with 10% excess air, a theoretical temp. of 1860° was possible. Further, there was sufficient waste heat to operate a lehr and to raise steam. A plea was made for the trial of pulverized fuel in the glass industry. H. G.

Recuperation increases capacity of English tanks. F. W. HODKIN and W. E. S. TURNER. *Ceram. Indus.* [2] 4, 106(1925); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 127—8.—The air for combustion is preheated first by passage through the flues, the arches of which support the bottom of the tank, and which are superimposed on other flues through which the products of combustion pass in an opposite direction. The air is preheated further by passage through the space between the false crown and the main crown of the furnace. One advantage claimed for this type of furnace is the reduction in the cost of construction by the reduction of the excavation needed due to the absence of regenerators. Approx. 0.8 of a ton of coal is consumed by the producers and boilers per ton of finished glassware. Another unique feature of the tank is the double bridge; this has 3 walls sepd. by cavities through which steam is blown for cooling the blocks. The life of the bridge blocks is very much longer. The bridge inspected had been in operation without repair for 14 months. H. G.

Viscosity determinations in ceramics. E. P. BAUER. *Trans. Ger. Ceram.* Soc.* 5, 2(1924); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 18.—Describes the patented Fischer-Bauer viscometer, in which is measured the speed of descent, through the clay slip, of a known spherical wt. almost counterbalanced by another, outside wt. To obtain

true viscosity the results are compared with a standard like glycerol. $V:V' = ST:S'T'$, where T and $T' =$ time and S and $S' =$ sp. gr. of the liquids. H. G.

A chemical study of the absorption of sulfur dioxide from kiln gases by ceramic wares. F. G. JACKSON. *J. Am. Ceram. Soc.* 9, 154-73(1926).—Two clays, rich in scum-forming bases were studied. One was practically free from S, the other rich in S. Draw trials of both clays were taken at suitable temp. intervals from both lab. and com. kilns. Comparisons of results showed that the temp. attained has much more influence upon the amt. of sulfates formed in the ware than concn. or time of S exposure. Calcs. show that even under most favorable firing conditions, with 0.5% S coal, on a 64-hr. schedule of firing, 12 times as much S is available as is actually absorbed. Further analysis also shows that it is futile to try to avoid sulfate formation, with coal as fuel, by seeking a low-S coal. C. H. KERR

Analyses of pottery from the Gallic "oppidum de Vindalium" (Vaucluse). LOUIS DESVERGNES. *Ann. chim. anal. chim. appl.* 8, 40-1(1926).—The analyses of 2 very old samples are given. W. T. H.

Modern pottery equipment. G. L. MONTGOMERY. *Chem. Met. Eng.* 33, 142 G (1926).—The plant of Thomas Maddock's Sons Co., Trenton, N. J., is described. E. H.

The influence of grain size on the solubility of quartz in feldspar in porcelain fire. KURT WETZEL. *Trans. Ger. Ceram. Soc.* 5, 2(1924); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 137.—Quartz grains of uniform size are dissolved at a uniform rate by melting feldspar. In the series potash spar-quartz the soly. of the coarsest-grained quartz used was 95%, rising gradually to 100% for the finest grains. If a mixt. of grains is used the finest will be completely dissolved and the coarser ones only partially. Practically no difference in soly. was noted between Hohenbocka sand and Norwegian quartz. Different grades of feldspar showed more marked variation. Norwegian feldspar has a higher soly. than soda feldspar from N. Bavaria. Addn. of strong flux such as CaO or MgO increases the soly. A comparison between the soly. of feldspar and a porcelain body showed close similarity. H. G.

Refractories for gas retorts, with special reference to silica. W. EMERY. *Appendix II.* A. SCOTT. *Trans. Ceram. Soc. (Eng.)* 24, 361-401(1925).—A comparison of SiO₂, siliceous and clay refractories, especially as to duration, is made from the inspection of some gas works. The conversion of quartz into cristobalite and the formation of sillimanite (mullite?) are followed in unused and used gas retorts with photomicrographs. H. F. K.

Articles made of molten magnesite. J. BRONN. *Chem.-Ztg.* 49, 1053-4(1925). The difficulties encountered in the manufacture and use of articles made of molten magnesite are described. H. F. K.

Temperature-load determinations and their possibilities. HANS HIRSCH. *Trans. Ger. Ceram. Soc.* 5, 3(1924); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 140.—Describes tests made with a Steger lever press and a new app. developed in the "Laboratory for Clay Industries," Berlin. These both have a sensitive recording device. Small test pieces having a cross-section of 8 sq. cm. were used and heated in an elec. furnace with a temp. advance of 4-5° per min. Pressures used were 1 kg. per sq. cm. for silica brick and 2 kg. per sq. cm. for clay brick. Numerous charts show the behavior of widely different refractory bodies and kaolins. Those with increasing Al₂O₃ content showed a more gradual softening range. Refractories high in SiO₂ showed a preliminary expansion and then a rapid softening. Kaolin showed an irregular curve, indicating a retardation in the softening at certain stages. H. G.

Reddish discoloration of opaque tin oxide glazes. R. RIEKE. *Trans. Ger. Ceram. Soc.* 5, 2(1924); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 25.—The research lab. of the State Porcelain Works, Berlin, traced the discoloration to a small quantity of chrome salts present in the Pb₃O₄, the characteristic bright red color of which had been preserved by the addn. of org. coloring matter. The quantity present was too small to be revealed by analysis and on investigation it was found that as low as 0.0025% Cr₂O₃ led to a decided discoloration. On this account Pb₃O₄ should be closely watched for traces of Cr. Tests also showed that the discoloration developed under oxidizing conditions and disappeared if the glaze was subjected to a reducing atm. H. G.

A practical gas-fired test furnace for plant use. H. G. FISK. *J. Am. Ceram. Soc.* 9, 151-3(1926). C. H. KERR

The design of arches for kilns and furnaces. F. H. NORTON. *J. Am. Ceram. Soc.* 9, 144-50(1926). C. H. KERR

Progress report on investigation of sagger clays. R. A. HEINDL. *J. Am. Ceram. Soc.* 9, 131-43(1926).—A first progress report of a comprehensive study of sagger clays

Chem. analyses, phys. tests, petrographic data and the effect of repeated burns in pottery kilns are given. The clays are classified into 5 groups in accordance with properties in the fired state. Further study is outlined.

C. H. KERR

Investigations leading to the discovery of the cause of excessive sagger breakage. W. STEGER. *Trans. Ger. Ceram. Soc.* 5, 3(1924); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 136.—Three main causes are (1) use of unsuitable raw materials and unfavorable batch compn.; (2) imperfect prepn. of the batch; (3) improper firing. This article also covers the investigation under (1) and (2).

to temp. changes and it is therefore important that in the initial firing all the free SiO_2 is taken into soln. The tests brought out that all clays contg. free SiO_2 have certain crit. temp. ranges in which they are more susceptible to temp. changes on account of the changes of the quartz to other forms. The extent of the vol. changes involved is dependent on the grain size and crystal nature of SiO_2 -bearing material, the finer the grain the greater the change in vol. Materials suggested to take the place of quartz are materials with high Al_2O_3 content, SiC and natural sillimanite.

H. G.

How whitewash can be prevented. H. C. MEYER. *Brick & Clay Record* [2] 66, 128(1925); *J. Am. Ceram. Soc., Ceram. Abstracts* 8, 132.—The causes of scumming are given and a method of testing for sol. sulfates is outlined. The BaCO_3 treatment for the prevention of whitewash or scum is considered the most reliable. Natural BaCO_3 is quite as satisfactory as pptd. BaCO_3 and is considerably cheaper.

H. G.

An accelerated abrasion test. C. H. GEISTER. *J. Am. Ceram. Soc.* 9, 121-5 (1926).—A new, simple abrasion app. is described. An upright, leather wheel rolls on a path of test samples placed on a horizontal revolving disk. There is const. slippage. Sand is fed mechanically. Check tests on various materials show the value of the test.

C. H. KERR

Certain clays from the productive series near Moscow (SMIRNOV) 8. Oven for heat-treating ceramic articles (U. S. pat. 1,573,873) 1.

Apparatus and heat-distributing method for melting glass batch ingredients. R. R. SHIVELY. U. S. 1,575,514, March 2.

Improving the color of clay or other earthy minerals. W. FELDENEHIMER. U. S. 1,573,385, Feb. 16. An aq. suspension of clay or similar material is treated with NaHSO_3 or other acid sulfite in the presence of Zn or other metal which reduces H_2SO_3 and does not form colored oxidized salts.

Fire brick. R. A. DALTON. U. S. 1,573,482, Feb. 16. The body portion of fire brick is formed of slag from a high-temp. forced-draft furnace which is free from ashes, a fire cement which sets hard at atm. temp. and a facing compn. for the brick comprises comminuted carborundum, fire cement and port. cement.

Tunnel kiln adapted for burning clay products. H. W. WEBER and A. O. SCHLEIFERTH. U. S. 1,575,470, March 2.

Tunnel kiln and sagger carrier, adapted for heat treatment. F. A. J. FITZGERALD. U. S. 1,573,543, Feb. 16.

Refractory brick for furnace linings. O. ARAM. U. S. 1,576,021, March 9. A superficial coating of metallic Al is applied to the exposed surfaces of linings of high-temp. furnaces.

Abrasives. D. E. WEBSTER. U. S. 1,576,122, March 9. Abrasive grains are bonded (to form grinding wheels or other articles) by the use of a heat-set phenol-formaldehyde condensation product combined with plaster of Paris forming 0.5-30% of the entire mass.

Abrasive articles. M. L. HARTMANN. U. S. 1,573,400, Feb. 16. A raw mixt. of abrasive grains and bonding material is mixed with comminuted oak wood or other non-volatile org. substance which does not have any tendency to swell during heating, and the mixt. is pressed into shape and burned. Cf. C. A. 20, 1310.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Anhydrite and gypsum cements. P. P. BUDNIKOV AND M. E. LEVINE. *Trans. Inst. Exp. Silicates* (Russian) 1924, No. 14, 1-31.—B. and L. discuss the theories concerning setting of plaster of Paris and show how to prep. such materials from natural gypsum without previous heating. The natural gypsum is ground fine and a catalyzer is added which helps the setting properties. NaHSO_4 is used as the catalyzer.

J. S. JOFFE

Digest of literature on methods of making flexure and tension tests of concrete. D. A. ABRAMS. *Proc. Am. Soc. Testing Materials* 25, Pt. I, 205-8(1925). A. P.-C.

Proposed tentative purchase specification for concrete aggregates. Report of Committee E-5. *Proc. Am. Concrete Inst.* 1926, (preprint). J. C. WITT

Transverse testing of concrete. H. F. CLEMMER AND F. BURGGRAFF. *Proc. Am. Concrete Inst.* 1926, (preprint).—The importance of transverse tests of concrete in highway construction is discussed and a transverse testing machine developed by the Illinois Highway Testing Lab. is described.

J. C. WITT

The effect of varied curing conditions upon the compressive strength of mortars and concretes. H. J. GILKEY. *Proc. Am. Concrete Inst.* 1926, (preprint). J. C. WITT

Extensibility of concrete. W. K. HATT. *Proc. Am. Concrete Inst.* 1926, (preprint).—A series of measurements of the shrinkage and expansion of 1:2:3 concrete (gravel aggregate) under various conditions of exposure were made. The ability of plain concrete and of concrete having fabric reinforcing from 0.26 to 0.33% to undergo extension without the appearance of surface fissures was studied. Fissures were classified as (a) microscopic—about 0.0004 in. in width, and (b) visible without magnification, about 0.0015 in. in width. The general conclusion is that mesh reinforcement will postpone the appearance of visible fissures, and lessen the defects arising from poor strength and curing. Additional tests are under way.

J. C. WITT

Control of concrete mixtures on University of Pittsburgh stadium. W. S. HINDMAN. *Proc. Am. Concrete Inst.* 1926, (preprint). J. C. WITT

Effect of lime on concrete products. P. C. CUNNICK. *Proc. Am. Concrete Inst.* 1926, (preprint).—In general the results of nearly 2000 specimens varying in mix, lime content, age, curing conditions, etc., indicate (1) the appearance of the product is improved by all percentages of lime; (2) up to 40% by weight, hydrated lime gives an av. increase in strength of approx. 1% for each lb. of lime added per sack of cement; all percentages of lime tested showing increase in strength from 28 days to 6 months; (3) absorption is increased, as detd. by the standard immersion method, but not increased as detd. by impounding water on 1 face; (4) permeability as detd. by impounding water on 1 face is eliminated by using 20% or more of hydrated lime; and (5) penetration of dampness into the product decreases as the lime is increased.

J. C. WITT

Destructive agents and protective treatments. Report of Committee E-6. *Proc. Am. Concrete Inst.* 1926, (preprint).—A report on the examn. of several cases of concrete disintegration.

J. C. WITT

Soaps as integral water-proofings for concrete. A. H. WHITE AND J. H. BATEMAN. *Proc. Am. Concrete Inst.* 1926, (preprint).—Soaps added in the concrete mixer are effective in preventing the absorption of water by capillary action—as little as 0.05% fat acid (on the basis of the wt. of concrete) being sufficient. The strength is not impaired by the presence of soaps in such small quantities, provided the concrete is kept damp continuously until it has attained the desired strength, and provided the soaps have not caused foaming and entrainment of air. Soaps will not prevent the penetration of water through cracked concrete, but they will retard the penetration of water into dry concrete. If concrete is kept damp until properly cured there should be only slight diminution in strength due to water-proofing, and conditions may arise in service when the strength is increased. For example, a concrete slab wet and expanded on one side and dry and contracted on the other is subject to powerful shearing stresses which weaken it materially. This condition is improved by water-proofing.

J. C. WITT

Testing standard building units. Report of Committee P-1. *Proc. Am. Concrete Inst.* 1926, (preprint).—Proposed additions to the present specifications. J. C. WITT

The importance of sublimate as material for wood impregnation. R. FALCK AND S. MICHAEL. *Z. angew. Chem.* 39, 186-93(1926).— HgCl_2 is not an ideal impregnating material for wood since it does not penetrate deeply and quickly into the inner

cells but forms an exterior coating which can be removed by is much superior in this respect. HgCl_2 is only slightly reduced lose. HgCl_2 is physically held and does not enter into chem. wood fibers. The addn. of NaCl to the impregnating soln. re HgCl_2 taken up by the wood while NaF does not affect this action of Hg are not chemically held and can be removed by washing.

Marine wood destroyers and their control. F. ROCIL. *Z. ver. deut. Ing.* 70, 89-96(1926).—Abstract of Rept. of Danish Eng. Soc. Copenhagen, May, 1921, on investigation of *Teredo* and *Limnoria* injury on the Scandinavian coasts, printed in *Ingeniren* 41. The report covers: geographical distribution; effect of salinity, temp and pollution of sea water; immunity of certain woods; protection of piles by means of surface coatings, armor and impregnation with creosote; bibliography. A. L. K.

Testing of roofing paper (HERZBERG) 23. Electrolytic cell operation in production of roofing sheets coated with Cu or other metal (U. S. pat. 1,574,446) 4. Electrolytic cell adapted for making roofing sheets with a Cu coating (U. S. pat. 1,574,385) 4.

SMITH, HUBERT SHIRLEY AND CROSTHWAITE, CHARLES DOVETON: **Cement Mortars.** London: The Institution. 19 pp.

Cement. L. SINDIC. Brit. 237,515, Feb. 20, 1925. CaCl_2 for promoting hardening (e. g., 2½-3%) is added to dry cement before, during or after grinding of the clinker "High-temperature cement." P. G. WILLETS. U. S. 1,573,888, Feb. 23. A cement adapted for sealing annealing leers comprizes BaSO_4 60, SiO_2 40 parts and Na silicate soln. of 43° Bé. to form a pasty mixt.

Burning cement. J. J. HENDRICKX and ETABLISSEMENTS POLIET ET CHAUSSON. Brit. 237,182, Feb. 23, 1925. Fuel supplied to a rotary kiln is mixed with sufficient lime or limestone to convert its ash into a cement corresponding in compn. to that produced in the kiln.

Monolithic pavement formed of cement, paving blocks of different thicknesses, etc. H. E. FLETCHER. U. S. 1,573,923, Feb. 23.

Bituminous concrete. PRODER SOC. ANON. AND M. LEVY. Brit. 237,010, April 16, 1924. Mixts. are prepd. from graded fillers and a pitch specially prepd. to exhibit a suitable hardness under penetrometer tests as described in Brit. 228,257 (C. A. 19, 2872); e. g., broken stone 450 may be mixed with sand 380, powd. mineral 300, and oil pitch (which has been steam-distd. at about 340° under a pressure of 4 mm. Hg) 100 parts.

Artificial stone. C. STEED. U. S. 1,573,425, Feb. 16. Particles of Na_2CO_3 or other sol. substance are coated with paraffin or other insol. material, embedded in plaster of Paris or similar plastic material, and, after the latter has set, the coating material is broken and the sol. substance dissolved away to produce an "artificial travertine" finish.

Material for light porous walls. C. MARCZINCZEK. U. S. 1,574,252, Feb. 23. Volcanic ash 40, lime ("hard wall finish") 20, pumice stone 20 and plaster of Paris 20% by vol.

Applying plaster or stucco. W. H. ALTON. U. S. 1,573,896, Feb. 23. Walls, ceilings or other surfaces to be coated are first given a viscous bituminous coating, gravel or other granular material is embedded and plaster is applied to the rough coating thus prepd. after it has hardened. U. S. 1,573,897 specifies mixing the granular material with the bituminous compn. in forming the underlying coating.

Asphaltic paving material. F. E. GREENE. U. S. 1,576,045, March 9. Steam-refined asphalt is heated to about 120-150°, mixed with aggregate and limestone (the latter in excess of the asphaltic material) and the mixt. is agitated and cooked at temps. of about 250-315°.

Highway surfacing. J. H. AMIES. U. S. 1,575,957, March 9. Common earth and mineral substances are heated in a rotating cylinder to about 1100°. Another batch of similar materials is mixed with a small proportion of CaO , in a slaking condition, a portion of the highly heated material is added, and about 12% of highly heated bituminous material is also added.

Felt fabric. R. H. JOHNSON. U. S. 1,574,896, March 2. Sheets suitable for floor coverings are formed of felted cattle hair and a binder including "tapioca gum" and latex.

Roofing felt. F. H. CLARK. Brit. 237,499, Dec. 31, 1924. Rag fiber felt is satd.

with a boiling mixt. of 75% bitumen and 25% pitch, the surplus is removed and after cooling the material is painted with a mixt. of bitumen 60, ochre 15, and "white spirit" 25%.

Waterproof sheets for roofing, etc. W. T. HOFMANN. U. S. 1,574,890, March 2. A felted or similar sheet material is passed through a waterproofing agent and the coating is then roughened by the action of an air blast and further coated with granular surfacing material.

Sheet mastic. F. R. MULLER. U. S. 1,575,378, March 2. Ingredients such as roofing tile compns. contg. rubber are heated and mixed, passed through chilled forming rolls, squeeze rolls and a water bath.

Preserving wood. R. LEEDOM. U. S. 1,574,662, Feb. 23. The surface of wood is charred to produce a dry hot char and a preserving material such as coal tar creosote is applied to the hot surface.

Preserving wood. H. NEUBAUER. U. S. 1,576,209, March 9. An aq. soln. formed from rock salt or other preservative salt is mixed with a plaster or concrete or similar cementitious material and the mixt. is applied as a coating layer on wood.

Treating wood or other surfaces to render them impervious. D. C. ATKINS. U. S. 1,575,521, March 2. The surface of wood, metal, concrete or other materials is treated with S chloride dissolved in gasoline and mixed with linseed oil, to render it resistant to H_2O , oil, acids and alkalies.

"Wood substitute." I. NAYLOR. U. S. 1,573,734, Feb. 16. Corn stalk material, bagasse or other waste vegetable fibrous material is used with a binder of Na silicate. The product is treated with hot air, CO_2 and $NaHCO_3$. Cf. C. A. 19, 1483.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Review of studies on coal published in 1923-5. D. J. W. KREULEN. *Bull. féd. ind. chim. Belg.* 4, 533-46(1925).—Bibliographical. W. B. PLUMMER

Brown-coal research and the art of combustion. WILHELM DE LA SAUCE. *Feuerungstechnik* 13, 117-22(1925).—A review of recent German progress, including spontaneous combustion, boiler and locomotive firing, household use, powd. coal, coking and producers. ERNEST W. THIELE

The coal-mining industry of China. C. Y. WANG. *J. Assoc. Chinese Am. Eng.* 6, No. 10, 2-6(1925).—A survey includes analyses of typical coals and statistics on the uses of coal in China. W. fixes the coal reserve of China at 100,000,000,000 tons. WM. H. ADOLPH

The testing of coal. FRANK DAWSON. *Eng. Rev.* 37, 355-8(1924); *J. Inst. Metals* 33, 555.—The method of making a proximate analysis and detn. of calorific value of coal is described. H. G.

The mechanism of fusion of coals. ÉTIENNE AUDIBERT. *Compt. rend.* 182, 316-8(1926).—The effect of a high rate of heating is to lower the fusion point of the coal. The following data represent the origin of the sample, its % volatile matter, the fusion point under rapid heating (sample plunged in hot heating bath), and that under slow heating (controlled at $1^\circ/\text{min.}$). Anzin, 25%, 335° , 370° ; Lens, 30%, 325° , 360° ; Béthune, 36%, 345° , 370° ; Couriot, 21%, 420° , infusible; Grosménil, 25%, 415° , infusible; Bruay, 42%, 365° , infusible. Since the low rate of heating is approx. that present in com. coke ovens, the latter 3 coals would be classed as non-coking coals, although by heating sufficiently rapidly to give fusion, and subsequent carbonization of the fused mass, the final coke has approx. the same strength, d., etc., as that from the "coking" coals. W. B. PLUMMER

Froth flotation of coal. F. B. JONES AND A. M. JONES. *J. Chem. Met. Soc. S. Africa* 26, 125-38(1925).—A review of British tests on coal cleaning by flotation, and discussion of plant app. and operations. W. B. PLUMMER

By-product processing of coal. H. W. BROOKS. *Mech. Eng.* 48, 233-9(1926).—A review of various low-temp. carbonization processes, viz. the Doherty, Parker, Rolle (brown coal), MacIntire, Piron, Fusion, Thyssen (rotary), Hood-Odell (lignite), MacLaurin, Nielson and McEwen-Runge. Illustrations and brief descriptions are given. W. B. PLUMMER

Origin of carbon disulfide in the carbonization of coal. W. J. HUFF. *Ind. Eng. Chem.* 18, 357-61(1926).—Expts. and app. are described in detail. No evidence in support of the theory of the formation of CS_2 as the sec. reaction product of H_2S

and hot coke is found, it being shown that the CS_2 which may be found in such tests comes from the reheated coke itself. Even in small quantities coal gives appreciable amts. of CS_2 if heated rapidly, although slow heating and free gasification give only H_2S . The interpretation and application of the results are discussed at some length.

W. B. PLUMMER

Spontaneous combustion in the Warwickshire thick coal. I. The application of gas analysis to the detection of heatings. C. E. MORGAN. *Colliery Guardian* 131, 251-2, 316-8(1926).—Analyses of the return air afford an indication of the development of a heating in its early stage, at times even before it can be detected otherwise. The development of a serious heating is always characterized by a variation in the compn. of the return air. A progressive increase of the CO/O_2 ratio and a progressive decrease of the CO_2/O_2 ratio should be interpreted as an indication of heating. A decrease of both the CO/O_2 and CO_2/O_2 ratios indicates oxidation other than that of the coal, possibly pyrites. When heating is absent, the CO/O_2 ratio rarely exceeds 0.30, though a progressive change is of more significance. Discussion. *Ibid* 385. C. C. D.

Contribution on the efficiency of a coal-gas generator. V. IZHEVSKIL. *J. Russ. Met. Soc.* 1925, Pt. 1, 245-55.—This is a description of modified Clement gas generator whose efficiency was raised from 70 to 90%.

J. S. JOFFE

Firing brown coal. ADOMEIT. *Feuerungstechnik* 13, 128-37(1925).—A. describes and illustrates 13 types of German furnace and grate installation for brown coal.

ERNEST W. THIELE

Powdered-coal firing with special reference to brown coal and its low-temperature coke. PRADEL. *Feuerungstechnik* 13, 122-5(1925).—A review. E. W. THIELE

The distillation of lignites for the production of mineral oils and volatile matter. V. NEVEUX. *Genie civil* 87, 321-6 (1925).—A plant in Italy operating on lignite contg. 40% H_2O , 30% volatile matter and 30% residue has a capacity of 50 metric tons per day. Material is charged at the top of a shaft furnace and passes downward to a point of max. heat. Volatile hydrocarbons are not lost with H_2O because of the thickness of the upper layers and the passage of vapors into channels in sepg. walls which divide the mass in the lower part of the furnace. Yield is 36 kg. anhyd. tar and 20 kg. of oil per metric ton.

JACK J. HINMAN, JR.

Carbonization of Canadian fuels. II. Application of the principles of high- and lower-temperature carbonization to wood, peat and different classes of Canadian fuels. R. E. GILMORE. *Can. Chem. Met.* 10, 51-4(1926); cf. C. A. 20, 1314.—Reviews and discusses yields and heat balances of low-temp. carbonization, the compn. and properties of low-temp. coal tar, its com. utilization, etc.

W. B. PLUMMER

Method of determining the dew points of fuel-air mixtures. R. J. KENNEDY. *Bur. Standards, Sci. Papers* 500, 47-63(1925).—The theory of the method is based upon the assumption that the initial condensate in equil. with the remaining vapor is of essentially const. compn. for the range of pressures and temps. encountered in the engine manifold. The dew point is obtained from an equation expressed in terms of the pressure and mixt. ratio of the fuel-air mixt. and developed from the Clausius-Clapeyron equation and the ideal gas laws. The equation involves several consts., characteristic of the fuel which are detd. from measurements of the condensation temp. and the av. mol. wt. as computed from the const. ratio between the pressure and mass of the fuel. The app. used for the measurement of these properties consists of a thin-walled glass vessel of about 1500 cc. capacity, to which is sealed a metal cover provided with a manually operated fan having thin, blackened vanes, a buret graduated in cu. mm., and an outlet connected to a vacuum pump. The vessel is immersed in a water bath which is so fitted that a small area at the bottom of the vessel, which may be viewed through windows in the sides of the water bath, may be cooled locally to any desired degree. A measured quantity of fuel is vaporized in the vessel, which is then cooled, and the temp. of the bath when the last drop of liquid disappears from the cool spot as a result of raising the temp. at the rate of 1° in 3 or 4 min., is taken as the condensation temp. Check measurements do not vary by more than 0.5° . The pressure exerted by a known vol. of fuel is measured by connecting the vessel with a small, closed-end Hg manometer immersed in the bath, nearly evacuated and maintained at a const. temp. high enough completely to vaporize the max. charge employed. The app. is estd. to give results accurate to within about 2° . Measurements of the condensation temp. of alc. agree to within less than 1° with the figures computed from the Smithsonian Physical tables of vapor pressures.

B. C. A.

Determination of unsaturated, aromatic, naphthene and paraffin hydrocarbons, in motor fuels, and their automotive equivalents. GUSTAV EGLOFF and J. C. MORRELL. *Ind. Eng. Chem.* 18, 354-6(1926).—The motor fuel is distd. to 210° in a Hempel column,

the distillate treated with 80% (wt.) H_2SO_4 , washed, and redistd. to the same temp., the contraction with H_2SO_4 plus the residue from the 2nd distn. giving the % unsatd. hydrocarbons (resp. those reacted with H_2SO_4 and those polymerized). Aromatic hydrocarbons are detd. on the distillate from the 2nd distn. by nitration with 25/58/17 (parts by wt.) $\text{HNO}_3/\text{H}_2\text{SO}_4/\text{H}_2\text{O}$, this concn. being such that the nitro products do not dissolve in the acid but form a layer whose vol. may be read. Naphthenes are detd. by the aniline method in the residue from the nitration, and paraffins detd. by difference. Applied to synthetic mixts. the method gave good results. A no. of analyses of cracked and straight-run gasolines are given, and their automotive characteristics discussed.

W. B. PLUMMER

Experimental and theoretical study of anti-knock materials. WM. H. CHARCH, EDWARD MACK, JR. AND C. E. BOORD. *Ind. Eng. Chem.* **18**, 334-40(1926).—By the bouncing-pin app. of Midgley (cf. *C. A.* **18**, 1045, etc.), the anti-knock coeff. (as compared to PbEt_4) has been detd. for about 25 organo-metallic compds., of which most of the Pb compds. had coeffs. of over 60%, the Bi compds. were about 20%, all others being very weak in their action. About 30 other organo-metallic compds. examd. had no action. Expts. on the suppression of the sharp detonation of C_2H_2 in open tubes have shown a lack of parallelism with the action of anti-knock compds. in engine cylinders. A method of approx. detg. the *elec. cond.* of the cylinder gases during operation is shown, the deflection (current) varying from 14.7 during violent knocking down to 0.5-1.5 during smooth running, regardless of whether knocking is eliminated by an organo-metallic anti-knock agent or by changing the fuel (addn. of C_6H_6). A theory of the action of organo-metallic anti-knock agents is formulated based on their decomposition ahead of the flame front to produce "pyrophoric" metallic particles which propagate the combustion smoothly.

W. B. PLUMMER

Recovery of by-products in the gas industry. C. S. HEATH. *J. Western Soc. Eng.* **31**, Tech. Sect. 32-40(1926).—A semi-popularized discussion of tar, light oil etc., their recovery, and the products obtainable therefrom.

W. B. PLUMMER

Removal of organically combined sulfur from purified gas. G. OFFE. *Gas-u. Wasserfach* **68**, 493-4(1925).—Expts. to remove org. S compds. from coal gas by passage over heated Fe turnings are described. The gas contained about 30 g. of org. S per 100 cu. m., of which 95% was CS_2 . The S was reduced to between 1 and 2 g. per 100 cu. m. by passage over heated Fe turnings and then washing in NaOH. The temp. must not be too high. The products of the reaction of the gas with the Fe are C, S, Fe sulfide, H_2S and mercaptans. It is probable that the whole of the CS_2 is decomposed, and that the org. S compds. remaining are not attacked at the temp. used.

B. C. A.

A new instrument for the continuous indication of carbon monoxide in boiler flue gases. W. O. ANDREWS. *S. African Inst. Eng.* **22**, 145-53(1924); *J. Inst. Metals* **31**, 544-5.—It is shown that the amt. of heat undeveloped when even small quantities of CO are present in flue gases may be quite large. An app., invented and patented by A., by means of which the % of CO in boiler flue gases may be continuously indicated is described. A portion of the gas from the flue is aspirated through a soln. of potash then through a small elec. furnace, and finally through a special indicating soln. The potash removes all the CO_2 , the furnace then burns the CO to CO_2 and on the partial pressure of the CO_2 thus produced depends the acidity and thus the color of the indicating soln. The color varies from deep purple to yellow as the % of CO changes from 0 to 0.75.

H. G.

Mechanical grates and ash removers for producers. GWOSDZ. *Feuerungstechnik* **13**, 108-11, 157-60(1925).—A review of recent German patent literature.

E. W. T.

Some specimen calculations for the combined steam power and heating plant. H. WINKELMANN. *Apparatebau* **38**, 42-4(1926).—Calcns. of power and of fuel consumption under varying conditions.

J. H. MOORE

Petroleum and tar hydrocarbons. F. BÖSSNER. *Z. Ver. Gas-u. Wasserfach* **66**, 13-7(1926).—A brief review and discussion.

W. B. PLUMMER

A peculiar form of corrosion in a tar still. R. STUMPER. *Feuerungstechnik* **14**, 7-8(1925).—The still was deeply corroded in peculiar grooves on the top, where condensation took place. The effect is probably due to HCl formed by the disassoc. of NH_4Cl known to be present in the tar.

ERNEST W. THIELF

The study and evaluation of coking coals. R. KATTWINKEL. *Gas u. Wasserfach* **69**, 145-50(1926).—A test has been developed in which 1 g. of coal and 10 g. of sand are mixed and coked in the standard ("Bochumer") coke test crucible, the compressive strength of the resultant button $\times 10 \times 1/A$ being taken as the coking index of the coal, where A is the non-cokable fraction of the coal. In the strength test the load is

uniformly applied by running shot into a container on top of the plunger of the app. The test differs from that of Meurice in the smaller amt. of sand used (M. uses 17 g. sand) and in the app. for the strength test. Detailed data are given comparing this to other methods, showing the effect of fineness of the coal sample, etc. A no. of the coals tested were from com. coking plants so that comparisons could be made on the basis of their known large-scale coking properties.

W. B. PLUMMER

Regulation of coke-oven gas exhausters. W. SCHWEDER. *Gas u. Wasserfach* 69, 168-9 (1926).—A brief discussion.

W. B. PLUMMER

Distribution of energy (STARKE) 13. Temperature and analysis of gases in the throat of a blast furnace (LENT) 9. Coal deposits of Albania (NOWACK) 8. Evaporating apparatus for concentrating or drying peat pulp (U. S. pat. 1,576,471) 1. Mud-laden fluid for sealing or controlling gas wells (U. S. pat. 1,575,944) 22. Apparatus for distilling coal (U. S. pat. 1,573,824) 1.

Mitteilungen aus dem schlesischen Kohlenforschungsinstitut der Kaiser-Wilhelm-Gesellschaft in Breslau. Vol. 2. Ed. by Fritz Hofmann. Berlin: Gebrüder Borntraeger. 250 pp. M. 19 Pfg. 50.

Third Progress Report of the Sub-Committee on Benzol. Pub. by National Bureau of Casualty and Surety Underwriters. Reviewed in *Rubber Age* 18, 358 (1926).

Fuel. L. L. SUMMERS. U. S. 1,576,253, March 9. Raw coal is treated with hot phenol and C_6H_6 or other solvent for its sol. ingredients, and compressed, distd. solid carbonaceous residue is treated with the resulting soln.

Fuels for internal-combustion engines. T. MIDDLEY, JR. U. S. 1,575,436, March 2. A volatile Se compd. such as $Se(C_2H_5)_2$ is added to "low-compression" fuels such as kerosene and gasoline to increase the crit. compression of the fuel. U. S. 1,575,437 specifies the similar use of a volatile Te compd. such as $Te(C_2H_5)_2$. U. S. 1,575,438 specifies a volatile As compd., e. g., $As(C_2H_5)_3$. U. S. 1,575,439 specifies a volatile Sb compd. such as $Sb(C_2H_5)_3$. U. S. 1,575,440 specifies a volatile P compd., e. g., $P(C_2H_5)_3$. U. S. 1,575,441 specifies a volatile Cd compd., e. g., $Cd(CH_3)_2$. U. S. 1,575,442 specifies a volatile Bi compd., e. g., $Bi(C_2H_5)_3$. U. S. 1,575,443 specifies a volatile Ti compd., e. g., $TiCl_4$. U. S. 1,575,444 specifies a volatile Sn compd. such as $Sn(C_2H_5)_4$.

Burning fuel on a centrifugal grate. S. McLEWEN. U. S. 1,575,350, March 2. Coal or other fuel is retained in place by centrifugal force on a rotating grate during combustion.

Briquets. J. S. ROBESON. U. S. 1,576,248, March 9. A binder for making briquets of fuels, ores, etc., comprizes ingredients of waste sulfite liquor or the like, liquid residuum such as wood tar obtained in the destructive distn. of woody tissue, and molasses or similar thick residuum of sugar-bearing plant juices.

Pulverizing coal. H. KREISINGER. U. S. 1,576,335, March 9. In a pulverizing system including a mill and using air as a carrier, coal to be pulverized is preheated sufficiently that the sensible heat of the coal in pulverization is sufficient to dry it for transport in the presence of the carrying air.

Dehydrated lignite. E. P. SCHOCH. U. S. 1,574,174, Feb. 23. Lignite is heated in contact with mixed gas oil and fuel oil or other hydrocarbon oil to drive off moisture and effect impregnation of the lignite with oil. Unabsorbed oil is sepd. and a portion of the absorbed oil is removed by use of super-heated steam.

Enriching water gas. J. R. ROSE. U. S. 1,573,524, Feb. 16. Blue water gas is cooled and led through a mixing tower or chamber in which it is treated with liquefied hydrocarbon gas having a vapor tension of not less than 25 lbs. per sq. in. and not greater than 500 lbs. per sq. in. at atm. pressure and ordinary temp.

Ferric hydroxide, for gas purification, etc. WOODALL-DUCKAM (1920), LTD., E. W. SMITH AND T. C. FINLAYSON. Brit. 237,413, June 24, 1924. A solid mixt. of a sol. Fe salt and an alkali carbonate to the amt. of at least 1.5% is added to H_2O , the carbonate being in excess of combining proportion. The suspension may be oxidized with air and the $Fe(OH)_3$ is readily sepd. from liquids or solids when used in gas purification or the like.

Gas producer. C. W. LUMMIS and G. H. ISLEY. U. S. reissue 16,262, Feb. 16. (Original pat. No. 1,251,064; C. A. 12, 529.)

Fuel feed for gas producers. R. DAAE. U. S. 1,573,811, Feb. 23.

Ascension pipes for gas retorts, etc. ALDRIDGE & RANKEN, LTD. AND T. A. BEAVAN. Brit. 237,111, Aug. 13, 1924.

Apparatus for regulating the flow of gas to different gas-consuming appliances. J. P. FISHER. U. S. 1,575,260, March 2.

Cracking tar oils. CHEMISCHE FABRIKEN VORM. WEILER-TER MEER. Brit. 237,415, June 26, 1924. Gases rich in C_2H_4 are obtained by destructive distn. of tar oils b. 250° or higher in the presence of steam at $800-900^\circ$.

Distilling tars and oils. E. BLÜMNER. U. S. 1,573,370, Feb. 16. Tar or oil is delivered to the lower portion of a column of hot liquid metal such as molten Pb and upward flow through the metal is retarded by baffles, Raschig rings or like devices while the tar or oil is maintained in finely divided condition. A downward return flow of the metal (some of which rises with the tar or oil) is effected out of contact with the rising tar or oil.

Controlling combustion of carbonaceous materials. I. H. DERBY and C. B. EDWARDS. U. S. 1,576,179, March 9. Coal-tar coke or similar carbonized material is prep. contg. Pb oxide in order to improve its burning properties.

Ovens for coking and destructive distillations. J. A. LENCAUCHEZ. Brit. 237,369, May 5, 1924. Heated gas such as distn. or water gas is passed through openings in the floor on which the material undergoing distn. rests.

Coke oven with vertical flues. MASCHINEN-BAU-AKT.-GES. ELSAS. Brit. 237,282, July 18, 1924.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Chlorine in the petroleum industry. LOUIS BURGESS. *Trans. Am. Electrochem. Soc.* 49 (preprint) (1926).—Cl is used to sweeten distillates, and reacts according to the equation:
$$\begin{array}{c} R-SH \\ R-SH \end{array} + \begin{array}{c} Cl \\ Na \end{array} = \begin{array}{c} RS \\ RS \end{array} + H_2O + NaCl. AlCl_3 \text{ forms addn. compds. with petroleum which on heating yield simpler hydrocarbons. This reaction is being used for the production of } gasoline. Cl \text{ is also used in the manuf. of ethylene glycol, a substitute for glycerol as an anti-freeze; in the production of methyl and methylene chlorides; and in the manuf. of aliphatic alcs. and their Cl derivs. H. S.}$$

Protecting "doctor" [in petroleum refining] from carbon dioxide pollution. L. J. CATLIN. *Ind. Eng. Chem.* 18, 319 (1926). E. J. C.

Oxidation of petroleum oils. G. S. PETROV AND A. I. DANILOVICH. *Trans. Karpov Inst. Chem.* (Russian) 1925, No. 4, 143-56.—Hydrocarbon oils were partially oxidized to fatty acids by refining distd. oil of Caucasian origin with fuming H_2SO_4 and submitting the product obtained to a prolonged current of air at 140° . After 40 hrs. the reddish yellow oil obtained possessed the following consts.: acid no. 22.14, sapon. no. 61.58, Br no. 8.59, I no. 11.09. The yield in acids was 5.20% on the amt. of oil taken for oxidation. The acids after being purified had the following consts.: sapon. coeff. 219.0, acid no. 118.0, I no. 14.4, acids sol. in C_6H_6 60.1, acids and resin insol. in C_6H_6 39.1. Hydrocarbon oils have also been oxidized by being heated in a current of moist air in presence of Co naphthenate; the yield in acids was 8.7% at best. The acids when freed from the mineral oil give soaps, about equal in detergent effect to those obtained from sunflower oil. The presence of hydroxy acids insol. in C_6H_6 is harmful to the quality of the soap obtained. BERNARD NELSON.

Proposed method of test for neutralization number of petroleum oil, titration by electrometric method. MAX HECHT. *Proc. Am. Soc. Testing Materials* 25, Pt. 1, 282-5 (1925); cf. C. A. 19, 1940.—A detailed description is given of a revised and simplified app. and method. The outstanding features of the revised set-up are: use of bright Pt electrodes and discontinuance of Hg contacts, simple form of "bridge" consisting of agar-agar and KI, use of alc. KOH instead of $EtONa$, means of equalizing the potential of the Pt electrodes. A. PAPINEAU-COUTURE.

Report of sub-committee XXI on crude petroleum. N. A. C. SMITH. *Proc. Am. Soc. Testing Materials* 25, Pt. 1, 290-1 (1925).—Collaborative tests on Montebello crude, Mexia crude, and Mid-Continent crude showed satisfactory checks for the percentages reported of naphtha in the crudes; but the agreement in the percentages reported as distg. at 105° and at 140° is not very satisfactory. The conditions of distn. (rate of distn. and temp. of condenser H_2O) are being further investigated. A. PAPINEAU-COUTURE.

Investigations on the action of ozone upon petroleum. I. Action of ozone on the

saturated hydrocarbons of petroleum. GEN-ITSU KITA, RYONOSUKE ABE AND SIGERU TADA. *J. Soc. Chem. Ind. Japan* 29, 7-12(1926).—Ozonized O_2 contg. about 5% O_3 was passed into a fraction (50 cc.) of Kurokawa petroleum (b. 150-300°, iodine value 5.66, acid value 0.36, d_{25}^{25} 0.8405, n_D^{25} 1.4578 and α_D^{25} 0.21) and into liquid paraffin (Japan. Pharm IV) at 0° for a definite time. The resulting ozonized oil was boiled with 200 cc. H_2O for 4 hrs. under reflux and its properties were examd. after drying. In the satd. hydrocarbons, iodine and acid values, sp. gr., refractive index and viscosity increased according to the increase of the time of the treatment, while rotatory power decreased. In the liquid paraffin, acid value, sp. gr. and viscosity were increased slightly by the treatment, while rotatory power decreased and iodine value and refractive index were not influenced.

K. K.

Determination of viscosity of oils. M. V. BORODULIN. *Trans. R. Inst. Applied Chem. (Russian)* 1925, No. 4, 17-26; cf. *C. A.* 19, 1624.—A simplified method for detn. of viscosity of oils without the use of a viscometer has been contrived. It is based on the circumstance that the speed of the fall of a drop of water through a layer of a given oil is characteristic of the degree of viscosity of that oil. A test tube with inside diam. 3-3½ cm. is filled with oil to be tested to the height of 10 cm. and immersed to about the same height in a beaker of water. A thermometer placed in the bath and another one in the oil are used as stirrers for the purpose of maintaining a uniform temp. throughout the oil. The water bath rests on a wire gauze over a Bunsen burner or any other source of heat. Three cm. directly above the surface of the oil is the lower end of a glass tube the upper end of which is connected by means of a rubber tube with a buret or a funnel contg. water. A pinchcock which compresses the rubber connection permits delivery of drops of the desired size. When the oil reaches the desired temp. a drop of water is made to fall from the glass tube, and the number of seconds required for it to traverse the layer of oil from the top to the bottom is noted. If the glass tube used is of such a diam. as to deliver drops of the size $1/32$ - $1/35$ cc., then the number of seconds required for the drop to traverse the oil corresponds to the figure expressing the degree of viscosity obtained by the use of Engler's viscometer. The quantity of oil required for a test is considerably less than with a viscometer, and the detns. take much less time. Various improvements of the app. are suggested, all based on the same principle. The figures obtained on running various oils at different temps. are given and their comparison with the figures obtained by using Engler's viscometer.

BERNARD NELSON

The probable future of the utilization of oil shale. R. A. BAXTER. *Wisconsin Engineer* 30, No. 5, 154, 155, 157, 172, 174(1926).—The fuel aspect of oil shale utilization is considered on the basis of a history of the developments in the use of solid and liquid fuels. Comparison is made of oil shales, lignites, and other low-grade fuels of the quality of the oils produced and the nature of the solid residue. The conclusion is drawn that an American oil shale industry will be operating on a commercial scale within the next 8 yrs.

ROBERT A. BAXTER

Life test for transformer oils. E. A. SNYDER AND D. C. COX. *Proc. Am. Soc. Testing Materials* 25, Pt. I, 363-8(1925); cf. *C. A.* 18, 1193.—A revision of previous descriptions of the app. and procedure, including improvements made in the construction of the app. as a result of further experience in several labs.

A. P.-C.

Mineral oils for transformers and circuit-breakers. H. STÄGER. *Schweiz. elektrotech. Verein, Bull.* 16, 188-214(1925); *Science Abstracts* 28B, 426-7; cf. *C. A.* 20, 816.—The general requirements laid down by the draft specification of the Swiss Electrotech. Assoc. are: The oil should appear clear and free from solid particles visible to the naked eye at atm. temp. and also at 110°. The viscosity, as detd. by the Engler method, should not exceed 8 at 20°. The time required for the oil to flow 10 cm. in an inverted tube 15 mm. in diam. under prescribed conditions at -20° should not exceed 10 sec. The flash-point, as detd. by the Marcusson method, should be at least 145°. The oil must withstand, without any discharge, 30,000 r. m. s. volts between spherical electrodes 12.5 mm. diam., 5 mm. apart. The oil should contain neither mineral acids nor bases; a permissible index of acidity is defined in respect of org. acids and in respect of oil tested after removal from app. in service. A sample of oil contg. 2 lengths of cotton is heated to 115° for 336 hrs. (2 weeks); at the end of the first week 1 of the pieces of cotton should not be weakened by more than 20%, and at the end of the fortnight the strength of the other piece should not have decreased by more than 30% total. Stipulations are also made concerning the sludging and acidity of the oil during this test. The procedure to be followed during the various tests is explained in detail, and the app. required is illustrated.

H. G.

Report of sectional committee on penetration (test of asphalt). I. M. LAW. *Proc.*

Am. Soc. Testing Materials 25, Pt. I, 301-6(1925).—Comparative tests with different needles showed that an angle tolerance of $\pm 30'$ can safely be allowed without any practical deviation from results by the present standard needle. A. P.-C.

Petroleum and tar hydrocarbons (BÖSSNER) 21. Effect of rock flowage on the kerogen of oil shale (VAN TUYL, BLACKBURN) 8. Distillation of cellulose, wood, etc., under H pressure (FIERZ-DAVID, HANNIG) 23. Apparatus for distilling shale or wood (U. S. pat. 1,573,824) 1. Distilling oils (U. S. pat. 1,573,370) 21. Heating petroleum (U. S. pat. 1,573,591) 13.

Cracking hydrocarbon oils under pressure. J. E. BELL. U. S. 1,575,031, March 2. Vapors produced by cracking oil under pressure are subjected to a regulated condensation while under pressure, uncondensed vapors are permitted to escape through a fixed orifice, and increase and decrease in the condensation are effected with increase and decrease of pressure.

Decomposing hydrocarbon oils. C. M. ALEXANDER. U. S. 1,573,532, Feb. 16. Crude petroleum or other relatively light oil in atomized liquid form is injected below the surface of a bath of heated heavier oil, *e. g.*, a residuum oil, at such a depth that the lighter oil will be cracked before vaporization. After sepn. of the cracked oil and C, the heavy oil is reused in the process.

Blending and purifying hydrocarbons. G. EGLOFF. U. S. 1,575,905, March 9. Light gasoline-like hydrocarbons such as those contained in casinghead gasoline are blended with a heavier absorbing oil and the mixt. is treated with a purifying compound formed with NaOH and PbO.

Emulsifying, hydrogenating or cracking hydrocarbons or other liquids. J. E. NYROP. Brit. 237,325, April 3, 1924. Material under treatment, *e. g.*, oil and an emulsifying soln., or $C_{10}H_8$ and H for hydrogenation, or petroleum oil, is fed between adjacent rotating plates between which (except at their central portion) a packing is placed, *e. g.*, wire netting, glass wool or nickellized pumice.

Distilling mineral oil. L. GRANGER, C. MARILLER and C. PRACHE. U. S. 1,574,622, Feb. 23. Vapors from oil distn. are condensed in evaporators with rapid circulation of H_2O to insure operation with small temp. drop and production of steam at a temp. only slightly less than the condensed vapors and at a high pressure. This steam is used for heating the oil and for the production of power.

Distillation of mineral oils. J. E. BELL. U. S. 1,576,401, March 9. Oil flows through a series of stills maintained at successively higher vaporizing temp. Part of the vapors given off in each still is condensed by absorbing heat from them in oil of lower temp. and the oil, between successive stills, is heated by the condensed vapors from stills later in the series.

Breaking emulsions. L. G. GATES. U. S. 1,573,389, Feb. 16. Emulsions such as crude petroleum contg. H_2O are brought into intimate contact with grounded filter-press cloths or other medium which is a conductor of static electricity and adapted to bring both phases of the emulsion to the same elec. charge.

Refining and deodorizing bitumens. G. W. ACHÉSON. U. S. 1,574,742, March 2. Crude oil or similar "bitumen" is treated with a solid reflocculated adsorbent material such as reflocculated clay and with concd. H_2SO_4 or other acid reagent, the refined bitumen is sepd. from the acid sludge, and is further treated with an anhyd. oxide such as MgO to effect decolorization.

Apparatus for cooling and condensing hydrocarbon vapors. E. W. ISOM and J. E. BELL. U. S. 1,575,269, March 2.

Coking gilsonite. C. N. FORREST. U. S. 1,573,764, Feb. 16. Gilsonite is heated and coked within such temp. limits (usually about 450° as a max.) as to retain N in the coke unfixed, and the coke is treated in a gas producer to release the N as NH_3 . U. S. 1,573,765 describes an oily product produced by the distn. of gilsonite; it contains a relatively large proportion of N and unsatd. hydrocarbons and yields an oil of terpene odor on redistn. and H_2SO_4 treatment.

Treating natural gas gasoline. G. G. OBERFELL, A. M. BALLARD, R. C. ALDEN, F. L. UTSINGER and W. R. LENTZ. U. S. 1,574,507, Feb. 23. Free S is dissolved in natural gas gasoline and the gasoline contg. the added S is then passed through a soln. of NaOH contg. PbO.

Motor fuels containing tetraethyl lead, etc. T. MIDGLEY, JR. U. S. 1,573,846, Feb. 23. In order to increase the crit. compression of gasoline or similar fuels they are admixed with small proportions of $PbEt_4$ or similar alkyl metal compd.

Mud-laden fluid for sealing or controlling oil or gas wells. B. K. STROUD. U. S. 1,575,944, March 9. A suspension of Fe oxide is used. U. S. 1,575,945 specifies the use of a mud contg. barytes or other slimy compn. with a sp. gr. materially in excess of that of a clay suspension of the same viscosity.

Pressure still for oil refining. D. PYZEL. U. S. 1,574,935, March 2.

Tubular oil-cracking still. J. F. BELL. U. S. 1,574,546, Feb. 23. U. S. 1,574,547 specifies recirculating a portion of hot waste heating gases, together with fresh combustion gases, over the oil-heating elements of the still.

Still for oil ("coke still"). G. H. HURSHMAN. U. S. 1,575,919, March 9.

Apparatus for separating oils from water, etc. G. L. FOGLER. U. S. 1,576,108, March 9.

Apparatus for cracking hydrocarbon oils and for treating the product with hydrogen. F. C. VANDE WATER and F. R. SUNDERMAN. U. S. 1,575,663, March 9.

Apparatus for making oil-gas. C. MATTHEWS, JR. and W. C. MATTHEWS. U. S. 1,574,502, Feb. 23.

Lubricant. I. M. CUSTER. U. S. 1,574,642, Feb. 23. A mixt. comprising deflocculated graphite and coal tar oil is used on springs, nuts, tire rims, etc. Lard, "red engine oil" and kerosene also may be used in the mixt.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Cellulose: Its chemistry with particular reference to the manufacture of rayon. G. J. ESSELEN, JR. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 98-100; *Am. Dyestuff Rept.* 15, 166-8.—An address. L. W. RIGGS

Polysaccharides. XXXIV. Contribution to the knowledge of hydro- and oxycellulose. P. KARRER and TH. LIESER. *Cellulosechemie* 7, 1-6(1926); cf. C. A. 20, 1416.—Hydrocelluloses vary in properties according to the method of prepn. A hydrocellulose completely sol. in 10% NaOH can be produced with a reducing power approaching that of many natural celluloses. It is obtained by treatment of cotton with 84% H_3PO_4 at room temp., followed by warming to 35° for some time. On diln. of the resulting soln. with H_2O the hydrocellulose ppts. This product can be methylated in alk. soln. at low temp. to give a substance contg. 42-43% MeO. The MeO content compares favorably with that of cotton or lichen after methylation. The methylated hydrocellulose is completely sol. in H_2O . Acetylation, as with lichens, must be carried on at higher temp. than with cotton, but hydrocellulose yields cellulose octaacetate in about the same quantities as cotton. The alk. soly. of hydrocellulose is not due to the presence of COOH groups, as its acidity is very low, but probably to peptization or the formation of a NaOH complex. Hydrocellulose, if properly made, can be distinguished from oxycellulose by its low acidity. When prepd. as above described it forms no isosaccharin on heating with $Ca(OH)_2$ soln., being like cotton and unlike oxycellulose in this respect. A study of the xanthogenates of cellulose and lichen showed them to be very similar in properties. The compn. of rapidly dialyzed solns. of each was the same, for in each case 2 $C_6H_{10}O_6$ complexes required 2 S atoms and 2 Na atoms. Their Me esters are alike and their heavy metal salts give the same color reactions. Mention is made of the work of E. Ott, not yet published, which shows the Röntgen diagrams of lichens, pptd. hydrocellulose, H_3PO_4 -hydrocellulose, and oxycellulose to be the same, suggesting their chem. identity. W. H. SWANSON

The distillation of cellulose, wood and similar substances under hydrogen pressure with catalysts. H. E. PIERZ-DAVID and MAX HANNIG. *Helvetica Chim. Acta* 8, 900-23(1925).—The dry distn. of cellulose, wood, starch or lignin is apparently uninfluenced by hydrogen, in the absence of catalysts, even when distd. under H pressure up to 300 atm. In the presence of NiO, however, which is reduced by the H to finely divided Ni, these substances are converted almost quant. into liquid or gaseous compds. Cu has much less effect and Fe practically none, as the reduction of the FeO does not take place until after the decompn. of the principal compds. by the distn. processes. Investigations of gas coals, using the Bergius process, gave negative results. The principal products obtained by dry distn. of the above materials under H pressure are: H_2O , aromatic phenols, volatile org. acids (formic to valeric acid), numerous diketones, a few monoketones, numerous alcs. (including MeOH, whose existence as a cellulose distn. product has previously been disputed), a cyclic glycol, many homologous furans and gas (mainly CO and CO_2). LOUIS C. FLECK

The "copper number" as an exponent of the quality of cellulose. M. L. GRIFFIN. *Paper Trade J.* 82, No. 8, 150-1 (1926); *Paper Mill* 49, 186, 188 (1926).—From a brief discussion of the nature and properties of cellulose, G. concludes that "the cellulose complex in its widest sense may be defined as comprizing all the polysaccharide carbohydrates which form an essential portion of the structure of the plant and which yield cupric reducing sugars on hydrolysis by acids," and that "cellulose may be defined to be the resultant residue from a series of carefully regulated processes of attrition by methods of selective extn., oxidation and hydrolysis, sufficient to effect the complete removal, in the mildest possible manner, of the other constitutional complexes, together with all adventitious and extractive matter." The detn. of the Cu no. is considered to be the most definite measure for diagnosing the chem. condition of cellulose in numerical terms, yet available. G. describes and recommends Brady's method (*C. A.* 15, 2360).

A. PAPINEAU-COUTURE

Evaluation of sulfite pulp. TH. BENTZEN. *Paper Trade J.* 82, No. 8, 197-203 (1926); *Paper Mill* 49, No. 9, 116-24 (1926); *Paper Ind.* 7, 2003-9 (1926).—The technic of the detn. of α -, β - and γ -cellulose is minutely described. The residue obtained in the α -cellulose detn. is shown to be unaffected by a second mercerizing treatment, but degraded slightly by heating 2 hrs. at 40° with water, and degraded considerably with almost complete destruction of fibrous structure by heating 6 hrs. at 70° with water contg. a trace of bleaching powder and then drying. It is suggested that the difference in durability of rag and sulfite papers may be due to the difference in their α -cellulose contents.

A. PAPINEAU-COUTURE

Native fibers not now used which might be used in the paper industry. G. SRI-LERGEREN. *Svensk Pappers-Tid.* 28, 613 (1925).—On the basis of 0.5 mm. min. to 35 mm. max. fiber length and a min. strength of 10-12 kg./mm.² the following hitherto unused fibers might be used: Class I, min. strength 20 kg./mm.², nettle, hops, bean stems and greenwood; Class II, min. strength 15 kg./mm.², reeds, timothy grass, canary reed, manna grass, cock's food grass, feather grass and pine needle fibers; Class III, min. strength 8-10 kg./mm.², beach grass, rushes and spruce and juniper fibers.

W. SEGERBLÖM

Report on the chemical examination of fiber from the bark of terap, tutor and baru. R. O. BISHOP. *Malayan Agr. J.* 13, 382-6 (1925).—Analysis of two samples each of the barks of terap (*Artocarpus kunsi* (King), tutor (*Hibiscus macrophyllus*, Roxb.) and baru (*Hibiscus floccosus*, Mast.) gave the following av. results on the dry basis (except H₂O which is on the wet basis): H₂O 11.75, 13.26, 12.72; ash 6.91, 6.91, 4.35 acid-purification loss 9.22, 6.48, 6.95; hydrolysis—"A" loss 22.53, 13.33, 15.92; hydrolysis—"B" loss 31.11, 25.61, 24.89; cellulose content 64.1, 62.6, 66.3%; fiber length 9-27 (av. 18.0), 1.8-4.5 (av. 3.3), 2.5-3.6 (av. 3.2); av. fiber diam. 0.0333, 0.0257, 0.0257 mm. Tutor and baru gave a yellow-gray color with I and H₂SO₄ in glycerol, and a transient violet followed by a deep blue color with I and ZnCl₂; terap is colored yellow by I and H₂SO₄ in glycerol, and wine-red changing to deep blue with I and ZnCl₂. The bark was pulped by digesting with water to a steam pressure of 65 lb. for 60 min., draining, washing with cold water, digested 6 hrs. with 20% NaOH (at a concn. of 2.5%) at a pressure of 65 lb., washing and beating for 3 hrs. Small bleaching tests showed good color with reference to the consumption of Cl, and it should be possible to produce a satisfactorily bleached paper from one of the three barks. Tutor and baru barks are shown to be almost identical in chem. and microscopic characteristics and appear suitable for making a paper of good quality. Terap bark, though chemically similar to that of tutor and baru, has a much longer ultimate fiber, comparable with that of hemp; and it appears that the terap bast fiber after suitable treatment might be utilized for some of the same purposes as hemp.

A. PAPINEAU-COUTURE

Contribution to the knowledge of lignin from spruce wood. P. KLASON. *Svensk Pappers-Tid.* 28, 609-10 (1925).—K. takes exception to some of the findings of Dorcé and Hall (cf. *C. A.* 19, 2742) and corroborates the work of Tilghman regarding the action of H₂SO₄ on vegetable fibers.

W. SEGERBLÖM

Chemical control in the manufacture of paper. E. HOLTAN. *Papir-Journalen* 14, 5, 17 (1926).—A lecture. The control has become more and more dependent upon chem. analytical figures. These figures are most useful if recorded graphically and as a function of time.

E. O. ELLINGSON

Chemistry of the sulfite process. IX. Influence of hydrogen-ion concentration. R. N. MÖLLER, W. H. SWANSON AND RAGNAR SÖDERQUIST. *Paper Trade J.* 82, No. 9, 58-61 (1926); cf. *C. A.* 19, 2743.—Results of a large no. of exptl. cooks, details of which are given and discussed, lead to the following conclusions: (1) The view of the sulfite pulping process as an acid hydrolysis of wood is confirmed as far as concerns the removal

of carbohydrate material. (2) The removal of lignin is the result of the sp. action of ionized H_2SO_4 . (3) The simultaneous removal of carbohydrate material and lignin are not mutually dependent, and the results obtained with H_2SO_4 and bisulfites depend upon the, at least, dual reactive capacity of the H_2SO_4 . (4) The removal of lignin by H_2SO_4 and bisulfites is hindered by preliminary action of acid reagents, to an extent dependent on the severity of the acid treatment. X. **Easy-bleaching pulp.** W. H. SWANSON AND W. H. MONSSON. *Ibid* 62-4—Expts. described show that in the cooking of spruce for easy-bleaching sulfite the temp. rise to any given max. should be carried on at a rate sufficiently slow to insure max. removal of the lignin at the lowest possible temp. consistent with the time available for the cooking. Bringing the temp. up through the cooking range, above 110° , too rapidly, to compensate for a shorter cooking time, reduces the yield and strength of the pulp. A slower rate of temp. rise, although a longer time for completion of the cook is required, increases the yield and improves the quality of the pulp. Lowering the max. temp. at which the cook is completed lengthens the time required but again increases the yield and improves the quality of the pulp. The reduction of pressure during the later stages of the cook, for recovering SO_2 , serves to increase the yield of desirable pulp slightly, provided the pulp has reached a high degree of purification before the pressure is reduced. Pressure reduction at too early a point slows up the rate of cooking and produces a raw pulp. To effect purification under such treatment requires long cooking or cooking at high temps. and decreases the yield by hydrolysis of the cellulose. Correctly cooked pulps do not suffer loss of strength when properly bleached. Overbleaching is detrimental to strength, particularly with pulp cooked with too rapid a temp. rise. The chem. loss in wt. of pulp on bleaching depends on the bleachability alone; the harder the pulp bleaches the greater will be the loss.

A. PAPINEAU-COUTURE

Kraft pulp and kraft paper. O. HEIJNE. *Svensk Pappers-Tid.* 29, 32-5(1926).—Descriptive.

W. SEGERBLUM

Power and fuel requirements in the paper-pulp industry. A. HARLIN. *Svensk Pappers-Tid.* 29, 9-13(1926).—Cellulose plants used (1924) 500 kg. coal per ton sulfite and 800 kg. per ton sulfate pulp, based on dry unbleached pulp. These figures are higher than Sundblad's ideal figures for 1922. Sulfite alc. required 2.7 kg. coal per kg. 100% alc. The power required for dry unbleached pulp was 300 kw. hrs. per ton of sulfite and 340 for sulfate pulp. Wet pulp required 650 kw. hrs. per ton. W. S.

Fuel requirements of the sulfate pulp industry. G. SUNDBLAD AND A. HARLIN. *Svensk Pappers-Tid.* 29, 61-2(1926).—S. contends that the data by H. (see preceding abstract) were based on 5 old-fashioned sulfate plants in a single district. H. presents new and more complete data to show that his former figures hold for the 26 sulfate plants in Sweden.

W. SEGERBLUM

Apparatus and method for experimental investigations of the production of soda pulp. D. E. CABLE, R. H. MCKEE AND R. H. SIMMONS. *Paper Trade J.* 82, No. 8, 158-61(1926); *Paper Mill* 49, No. 9, 138-44(1926).—A detailed description of a small exptl. chipper by means of which chips of uniform length can be produced, and of a small exptl. gas-heated, rotary soda pulp digester, and also of the technic of the yield tests carried out with this digester.

A. PAPINEAU-COUTURE

A modern soda pulp mill. R. P. WOOD. *Paper Trade J.* 82, No. 8, 147-50(1926); *Paper Mill* 49, No. 9, 162, 164(1926).—Detailed description of the pulp mill of the Tona-wanda Paper Co., at North Tonawanda, N. Y.

A. PAPINEAU-COUTURE

The variation in alkalinity during the cooking of soda and sulfate pulps. C. KULLGREN. *Teknisk Tids.* 22, 174(1925); *Tech.-Wiss. Teil, Papierfabr.* 24, 20-3(1926).—The usual methods of detg. the alkali in black liquor give results of doubtful value owing to the hydrolysis of Na_2S . The Koelichen method (*Z. physik. Chem.* 33, 129 (1900)) is based on the fact that diacetone alc. decomposes to Me_2CO with a velocity proportional to the OH-ion content of the soln. and is recommended for evaluating the alkali in black liquor. Cooking tests on fir wood, by both the soda and the sulfate processes, showed that, although the alky. in normality was approx. the same initially in both liquors, there was a more rapid decrease in the alky. of the sulfate liquor up to 150° . During the latter part of the cooking period, at which the max. temp. prevailed, the sulfate liquor was less alk. than the soda liquor. Cellulose is attacked much less by the sulfate liquor and the pulp yield is higher. The alky. of the soda liquor was about $\frac{1}{2}$ of the initial amt., while that of the sulfate soln. was much less. The role of Na_2S in the manuf. of pulp and the rapid diminution of the alkali content are discussed. NaHS , the hydrolysis product of Na_2S , does not exert a solvent action on the wood but reacts with it to form S compds., which are easily sol. in NaOH . The alky. of the cooking liquor is thereby reduced.

J. L. PARSONS

Needle paper. H. POSTL. Tech.-Wiss. Teil, *Papierfabr.* 24, 23(1926).—Paper suitable for packing needles should be manufd. from clean hemp or linen rags which have been boiled with CaO, thoroughly washed and then beaten. S compds. and an excess of acid in the sizing process should be avoided. After the paper is cooled to room temp., it is moistened and 10–12 hrs. later is passed through 8–10 cold calender rolls.

J. L. PARSONS

Recent developments in the manufacture of pulp and paper in America. WALTER BRECHT. *Wochbl. Papierfabr.* 57, 122–4(1926).—Mfg. conditions in the United States and raw materials for paper-making are discussed.

J. L. PARSONS

The size of the particles in wood pulp. D. KRUEGER. Tech.-Wiss. Teil, *Papierfabr.* 23, 767–8(1925).—The size and arrangement of the crystallites in cellulose depend on the natural conditions of the plant growth and on the treatment of the raw material in industrial processes. From the ease of soly. of cellulose esters and the viscosities of their solns., it is inferred that wood pulp is composed of smaller particles than cotton cellulose. The results of diffusion expts. of carefully nitrated cellulosic material showed that the size of the particles in sulfate pulp is 1.4×10^{-6} cm.; in sulfite pulp, $2.2\text{--}2.4 \times 10^{-6}$ cm.; and in cotton, 3.4×10^{-6} cm. The larger particles of cotton account for the differences in properties of its esters, such as a lesser soly. and greater viscosity. In the ripening of alkali cellulose for viscose, the increase in reactivity is traceable to a diminution of the particle size from 2.4 to 1.4×10^{-6} cm. A suitable test for evaluating the particle size and the ripening of viscose would consist in ascertaining the viscosity of the nitrate soln., prepd. under standard conditions. The diam. of α -cellulose particles is about 1×10^{-6} cm. The usual bleaching process for sulfite pulp reduces the size of the crystallite to $\frac{2}{3}$ the original. When hemp pulp was beaten for 4 hrs. in a beater, the size of the particle was reduced one-half.

J. L. PARSONS

The effect of chemicals on the paper-making properties of pulps. RUDOLF SIEBER. Tech.-Wiss. Teil, *Papierfabr.* 23, 765–7(1925).—The effect of acids, alkalies and alk earth hydroxides on the strength and beating properties of pulps is described. Treatment of a sulfate pulp with 1% H_2SO_4 soln. for 3 hrs. at 50° resulted in a diminution of the paper strength to 13% of the original untreated pulp, but the beating properties, detd. by the Lampen ball mill, were not affected. Lactic acid produced no change when allowed to act in a 2% soln. on sulfite pulp for 48 hrs. at 30° , and this in general was true of org. acids. Comparatively strong cold alk. solns. also have no effect. Treatment of sulfite pulp with $\text{Ca}(\text{OH})_2$ or $\text{Ba}(\text{OH})_2$ at 100° for 2 hrs. altered the strength and beating properties adversely, but the former was partially restored by using 0.1 N H_2SO_4 . When pulp was immersed in a 10% Na_2SO_4 soln., a poorly beaten stock, with inferior strength, was obtained. A similar result was noted when sulfate pulp was beaten and tested after being dried for 14 days.

J. L. PARSONS

Alkali determination in black liquors from sulfate pulp manufacture. A. MATZNER. *Wochbl. Papierfabr.* 56, 1556(1925).—Treat 20 cc. black liquor with sufficient neutral NaCl to form a thick sirup. Add small amts. of distd. water and NaCl with shaking until the vol. becomes about 250 cc. An excess of NaCl should always be present. Heat to boiling, filter, wash with hot satd. NaCl soln., and dil. to 500 cc. Titrate an aliquot portion of the soln. with standard acid.

J. L. PARSONS

Use of the chlorine gas process in the paper industry: its present applications and future possibilities. GIULIO CONSIGLIO. *Papier* 28, 1291–1300(1925).—The mill of the Elettrochimica Pomilio, Naples, for the treatment of esparto uses 160–80 kg. NaO, 400 kg. Cl gas and 20 kg. of Cl as NaOCl, per ton of bleached pulp. The pulp contains 80–81% cellulose, 1.0–1.5% ash and has a Cu no. of about 2.4. The spent alk. liquor can be used for the prepn. of a synthetic tan, for the prepn. of an insecticide which can be used instead of HCN for the destruction of certain fruit tree parasites, and for the prepn. of a binder for fuel briquets. The process is very flexible and allows of wide variations in the relative proportions of NaOH and Cl. In the treatment of wheat and rice straws and of esparto on a com. scale, the consumption of raw materials varied from 11.2 to 33.6% NaOH and 83.9 to 18.0% Cl. Yields obtained under various conditions of treatment were: wheat straw 38.5–42.0%, rice straw 31.7–38.9%, esparto 38.5–42.0%. Tests have shown the possibility of economically treating bagasse by the Cl gas treatment, and the possibility of modifying the process by elimination of the preliminary alk. impregnation for the production of pulp suitable for the manu. of news print at a cost lower than that of groundwood.

A. PAPINEAU-COUTURE

Manufacture of pulp with the aid of chlorine. WILLI SCHACHT. Tech.-Wiss. Teil, *Papierfabr.* 23, 759–62(1925).—Polemic with U. Pomilio (C. A. 20, 287). The manuf. of pulp with the aid of gaseous Cl leads to the production of HCl and HOCl in varying amts., as well as to the chlorination of the lignin. The acids attack the fibers

deleteriously. The De-Vains process, consisting of treating the fibrous material with alkali followed by Cl water, tends to remove the hemicellulose constituents, thereby decreasing the pulp yield. The S process removes most of the lignin with Cl salts and Cl water is subsequently added. Less HCl is produced by this process, and less chemicals and labor are required. Esparto pulp manufd. by this method yielded a paper possessing a density and thickness closely approaching those of a paper made from soda esparto pulp.

Alkali loss in sulfate pulp manufacture. RUDOLF SIEBER. *Tech.-Wiss. Teil, Papierfabr.* **24**, 6-7(1926).—The total alkali loss in sulfate pulp manuf. is 5-10 kg. per ton of pulp. The distribution of these losses is given. J. L. PARSONS

The application of hydrogen-ion control to the manufacture of pulp and paper. W. A. TAYLOR. *Paper Trade J.* **82**, No. 8, 166-77(1926); *Paper Mill* **49**, No. 9, 170-81(1926); *Paper Ind.* **7**, 1983-93(1926).—An explanation of the meaning of H-ion concn and p_H values, with a description of the colorimetric method of p_H detn. and a discussion of its importance in the various operations in the paper industry: bleaching, beating, engine and tub sizing, coloring, coating and water purification. A. P.-C.

Increasing the suspension of the coating mixture by the addition of colloids. B. K. STEADMAN. *Paper Trade J.* **82**, No. 8, 209(1926); *Paper Mill* **49**, No. 9, 166(1926).—Use of protective colloids is suggested for preventing settling out of clay from coating mixts. which are allowed to stand some time before use. Addn. of tannic acid caused flocculation of the mixt. Addn. of 5% of gum arabic improved the suspension, but thickened the soln. with increase in viscosity; the coating mixt. did not spread evenly and there were numerous pin holes in the surface of the coating. Addn. of 3% of S-brand silicate of soda had similar results to the gum arabic, thickening the mixt. even more, but resulting in fewer pin holes. A. PAPINEAU-COUTURE

Glue-bound coated paper. G. K. HAMILL. *Paper Trade J.* **82**, No. 8, 247-51(1926).—The investigation on glue-clay coating mixts. previously reported upon by Gottschalk (*C. A.* **19**, 175) was extended to include satin white and blanc fixe, and the following additional conclusions are drawn: the use of glue introduces no new difficulties in the prepn. and application of coating mixts. contg. satin white and blanc fixe; variations in the other materials employed and in coating procedure influence largely the proportion of adhesive required to produce coated papers of satisfactory printing qualities; printing conditions encountered by coated papers vary widely. A. P.-C.

The manufacture of parchment paper. M. DE KEGHEL. *Papyrus* **6**, 498-501, 524-6(1925); **7**, 27-30(1926).—Detailed description of its manuf., properties and uses. A. PAPINEAU-COUTURE

The influence of water on paper fibers during the manufacturing processes. SIGMUND SMITH. *Tech.-Wiss. Teil, Papierfabr.* **23**, 41-2(1925).—Water acts on paper fibers not only to effect a swelling but also to soften them. Unbeaten fibers, which are not swollen, are stiff but slightly elastic; beaten and swollen fibers are soft and plastic. If the water is pressed out of the latter, they become more like unbeaten fibers in their behavior. Vol. measurements on samples of unbeaten and beaten pulps and rag stocks are tabulated. J. L. PARSONS

Methods for the determination of the size of the particles in paper fillers. RUDOLF LORENZ. *Tech.-Wiss. Teil, Papierfabr.* **23**, 753-9(1925); **24**, *Tech.-Wiss. Teil*, 33-6, 74-6(1926).—Part of a series of articles concerning the colloid chemistry of paper fillers and methods for the detn. of the size of the particles. A brief review of the literature is given. Paper fillers belong to the class of coarse suspensions, but a good filler may approach the limits of a colloidal dispersion. Clay consists of relatively coarse primary particles, which are composed of much smaller secondary particles combined in an electrostatic manner. The technic of measurement of large particles by optical methods, such as the microscope and the ultramicroscope, and by filtration methods, is discussed. The Nöbel, Schone and Schurecht elutriating app. are described. Elutriation processes, however, are not satisfactory for detg. the size of filler particles. The automatically registering sedimentation app. of Sven Oden (*cf. C. A.* **14**, 2116) is described. Neither this method nor the procedure of Mohr is recommended. Elaboration is made of the elutriating app. of Wiegner-Gessner and the flocculation measuring app. of Wo. Ostwald and F. V. v. Hahn. A photographic device for continuously recording the results of the Gessner app. is described. J. L. PARSONS

Bleaching paper fibers with bleaching powder. O. HEIJNE. *Svensk Pappers-Tid.* **28** 510-1, 537-9(1925).—A résumé of theoretical speculations regarding the compn. of bleaching powder, methods of using the powder, recent investigations on its industrial application, and the effect on it of CO_2 . H. recommends the use of catalyzers to hasten the bleaching action. W. SEGERBLOM

Preparation of bleach solutions. ANON. *Zellstoff u. Papier* 5, 485(1925).—The use of an app. (German patent 316,797), invented by G. Braam, for the manuf. of bleach soln. from Cl gas and NaOH is described. The device permits of an accurate measurement of the gas absorbed. J. L. PARSONS

High-density bleaching. A. D. MERRILL. *Paper Trade J.* 82, No. 8, 161-2 (1926); *Paper Mill* 49, No. 9, 196, 198(1926); *Paper Ind.* 7, 2025, 2027(1926).—A discussion of the advantages of high-density bleaching, based on observations of mill-scale operations; and of the advantages of the continuous over the batch method of bleaching, the most important of which are: saving in bleach, time, labor, fiber and first cost of installation, and easier and more accurate control of the bleaching. A. P.-C.

Hardinge system of white water treatment. NOEL CUNNINGHAM. *Paper Trade J.* 82, No. 8, 223, 225(1926); *Paper Mill* 49, No. 9, 110, 112(1926); *Paper Ind.* 7, 1993, 1995(1926).—The system consists essentially of a filter-thickener and a filter-clarifier, such as are used in metallurgical ore dressing, combined in a single rectangular tank, and communicating at the top by pipes through which water overflows from the thickener into the clarifier. White water is admitted into the thickener behind a baffle which forces the incoming flow to a considerable submergence, and sedimentation takes place, assisted by a bottom filter action which can be controlled to effect greater or less deposition of fiber. The water, freed from suspended fiber, carries off slime, etc., into the second compartment, or clarifier, where sedimentation assisted by a comparatively large bottom filter action produced by a strong pump suction collects most of the remaining solids in a cake on the filter surface. A. PAPINEAU-COUTURE

The significance of the α -cellulose test for the pulp industry. J. L. PARSONS. *Paper Trade J.* 82, No. 8, 211-5(1926); *Paper Mill* 49, No. 9, 126-30(1926); *Paper Ind.* 7, 2019-23(1926).—Discussion of the significance of the α -cellulose detn., the necessity for its investigation, and the agencies which are at present working on the problem. P. obtained very concordant results by Jentgen's method (*Kunststoffe* 1, 165(1911)) modified as follows: the pulp and alkali mixt. is stirred intermittently during the 30-min. period; the pulp mass is filtered directly, with no previous addn. of water on a 9-10 cm. Buchner suction filter, the fibers acting as their own filtering medium, the filtrate being again passed through the funnel to remove traces of fibers; the mercerizing container is rinsed and the mass given a preliminary washing with 100 cc. of 5-8% NaOH; 40 cc. of hot 10% AcOH is used; the α -cellulose is dried in a glass-stoppered weighing bottle at 105° to const. wt. A. PAPINEAU-COUTURE

Testing of roofing paper. W. HERZBERG. *Tech.-Wiss. Teil, Papierfabr.* 23, 806-7 (1925).—The standard German requirements for roofing paper are (1) the raw materials must consist of rags, waste material from the textile industry, or old paper; the direct addn. of groundwood, straw pulp, peat, sawdust or mineral fillers is forbidden; (2) the max. ash content shall be 12%; (3) the max. moisture shall be 12%; (4) the sample shall absorb at least 120% of its wt. in anthracene oil in 5 min. at room temp.; and (5) paper of standard thickness (333 g. per sq. m.) shall possess a tensile strength (strips 15 mm. wide) of at least 4 kg. in the wire direction. The results of 63 tests on roofing papers are summarized, over 78% of which were up to standard. J. L. P.

Electrical gas purification for the pulp industry. E. ZOPF. *Wochbl. Papierfabr.* 56, 1540-1(1925); *Tech.-Wiss. Teil, Papierfabr.* 24, 38-43(1926).—Elec. purification of SO₂ gas by the Cottrell-Moeller process is described. The purification efficiency may exceed 99%. The removal of Fe₂O₃ dust, and the sepn. of As and Se from S burner gas tend to prevent the formation of SO₃. J. L. PARSONS

The turbidity of fillers. E. BELANI. *Zellstoff u. Papier* 5, 481-2(1925).—The Olszewski-Rosenmuller half-shade photometer is claimed to be the best and most rapid device for evaluating the turbidity of paper fillers for practical mill control. J. L. PARSONS

The chemical reactivity of pulp and its significance in the sizing of paper. ERIK ÖMAN. *Svensk Teknisk Tid.* No. 22, 176(1925); *Tech.-Wiss. Teil, Papierfabr.* 23, 725-7, 800-2, 813-6(1925).—When sulfite pulp, previously treated with a 0.1% Al₂(SO₄)₃ soln. and washed with water, is immersed in a dil. H₂SO₄ soln. (p_H 3.53), the H-ion concn. of the soln. is decreased to p_H 4.06. Sulfite pulp treated similarly, with the exception of the Al₂(SO₄)₃ soln., showed a p_H 4.35. The extent of the decrease in H-ion concn. varies indirectly with the no. of treatments with the dil. acid. When the pulp, so treated, is washed, a small portion of the ions is recovered, the reaction being reversible. Sulfite pulp in a weakly acid soln. is positively charged; the corresponding negative charge is present in the water as SO₄ ions. It is shown in an analytical manner that this is the case and that the greater portion of H-ions has disappeared. In a weakly alk. soln. (p_H 9.6) sulfite pulp is negatively charged as a result of the reaction

between the OH ions and the H ions forming undissocd. water. The isoelec. point of pulp does not occur at the neutral point (p_H 7.0), but on the acid side (p_H 5.5–6.0) when subjected to acid treatment. If OH ions are added, the isoelec. point is displaced towards the alk. side. The properties of paper made from such a pulp are probably affected in some degree. Sulfate pulp yields many more OH ions than sulfite pulp; the isoelec. point of the former is on the alk. side. Sulfite and sulfate pulps are amphoteric substances. The influence of a wash water with varying H-ion content, in the com. washing of sulfite pulp, tends to displace the isoelec. point of the pulp. In the sizing of paper stock the negatively charged rosin particles are attracted to the positively charged fibers and combine with them. The positive charge on the fibers is due (1) to the absorption of the Al ions, and (2) to the slight acidity of the $Al_2(SO_4)_3$ soln. The term "ionic dispersed soln." refers to an aq. pulp suspension which contains an excess of either positive or negative ions in the soln. A new kind of elec. potential is set up. The results of colorimetric and electrometric H-ion detns. correspond to the theory for the amphoteric character of pulp. J. L. PARSONS

The resolution of plant material by means of nitric acid according to the process of the Dresden Textile Research Institute. PAUL KRAIS. *Wochbl. Papierfabr.* 56, 1513–7 (1925); *Tech.-Wiss. Teil, Papierfabr.* 23, 797–9 (1925).—For the manuf. of pulp from Argentine reeds, straw, sugar cane, other tropical plants and wood chips, etc., under atm. pressure, equimol. amts. of KNO_3 and H_2SO_4 were satisfactory. A soln. contg. 3–5% HNO_3 was sufficient to resolve these raw materials into fibers after a digestion period of 6–8 hrs. at 95–96°. After removal of the acid, washing and neutralizing with CaO and Na_2CO_3 , the mass was easily broken into its fibrous constituents. Washing and bleaching operations follow. A brief review is given of other digestion processes involving HNO_3 . A Krupp Cr-Ni steel was practically resistant towards the action of the chemicals. In the digestion process the acids are allowed to act until the non-cellulosic constituents are oxidized, whereby the concn. of the acid is decreased so that the cellulose is not materially damaged. Straw pulp by this process yields a longer fiber and is stained more intensively by methylene blue than sulfate straw pulp. The economy of the process is briefly discussed. J. L. PARSONS

The colloidal nature of sizing with resins. E. ØMAN. *Svensk Pappers-Tid.* 29, 82–4 (1926).—Concd. sulfite causes much trouble in resin sizing. Ø. discusses 2 theories of the use of Al compds. in sizing involving (a) hydrolysis into colloidal $Al(OH)_3$ and (b) the taking up by the fiber of positive Al and subsequent addition of negative resin. Ø. suggests that the second theory more logically explains the differences in the amts. of resin needed by different plants to produce the same sizing results. Other metals, such as Cr, Fe, Cu and Zn, may be substituted for Al. W. SEGERBLOM

Sizing paper with resin. E. ØMAN. *Svensk Pappers-Tid.* 28, 534–7, 561–3, 585–7, 611–2 (1925).—A summary of work done by different investigators from Øllig in 1807 to date on the use of resin in sizing paper, the use of alum with resin, the effect of resin size on sulfite cellulose, the presence in sulfite cellulose of substances injurious to resin size, and the value of detg. the H-ion concn. W. SEGERBLOM

Effect of iron in sizing paper with resin. E. ØMAN. *Svensk Pappers-Tid.* 28, 483–4, 508–9 (1925).—In sizing the fibers take up Fe from ferric compds. but very slightly from ferrous compds. Ferric compds. are more harmful than ferrous compds. to the color of the paper. The Fe in ferric compds. acts the same as Al in alum in fixing the resin on the fiber. To this extent Fe is helpful. Fe-contaminated alum contains both ferrous and ferric compds., but more of the former. Alum contg. 0.4–0.5% Fe (ferric) is not harmful to white paper and 0.2% Fe (ferric) apparently has no effect on the color. W. SEGERBLOM

Rancidity of oils and its effects on the telegraph perforator tape. W. OGAWA AND S. MIZUSHIMA. *Researches Electrotechn. Lab., Japan* No. 159, 25 pp. (1925).—The cause of deterioration of telegraph perforator tapes now in use in Japan was studied. It was attributed to the rancidity of vegetable oils with which the tape is impregnated. Neutral mineral oil was found to protect the paper tape from deterioration by heat or light and is recommended as suitable impregnating medium. W. OGAWA

Electrification of paper-making machines. S. A. STAEGE. *J. Am. Inst. Elec. Eng.* 45, 272–81 (1926). C. G. F.

Wagner stationary recovery furnace for soda and sulfate mill chemical recovery. C. L. WAGNER. *Paper Trade J.* 82, No. 8, 177, 179 (1926); *Paper Mill* 49, No. 10, 44 (1926).—Description of the Wagner furnace, designed to take the place of rotaries and leachers in soda mills and of rotaries and smelters, with or without disk evaporators, in sulfate mills. The concd. black liquor, at about 35° Bé., is sprayed into the furnace without addn. of auxiliary fuel, and the heat used for steam raising. The fused

ash flows directly into the dissolving tank.' Careful regulation of the air is required with sulfate black liquor, but not with soda liquors. Discussion of the heat balance shows that the amt. of steam generated is almost sufficient for digesting, evapg., causticizing and bleaching; and that by the use of high-pressure turbines power may also be derived, so that the pulp mill can be made practically independent of outside fuel. Less heat is recovered from sulfate than from soda black liquors. A. PAPINEAU-COUTURE

Lime-sludge analysis. R. H. STEVENS AND A. J. ABRAMS. *Paper Trade J.* **82**, No. 8, 243(1926); *Paper Ind.* **7**, 2001(1926).—Filter 100 cc. of the well-mixed slurry (or 10 g. of the filter cake dild. to 100 cc. with distd. H_2O) on a Buchner funnel, stir the residue with 100 cc. of distd. H_2O for 5 min., filter, make the combined filtrate to 250 cc. (A) and dry the sludge (B) at 95–105°. Det. total solids by drying 25 cc. of original slurry to const. wt. To det. free CaO, ppt. the Fe and Al_2O_3 in an aliquot of A, and det. total CaO in the filtrate by pptn. as CaC_2O_4 and ignition to CaO . This is sufficient for routine control work; but for specially accurate work stir 1 g. of B for 10 min. with 450 cc. of distd. H_2O , filter, make up to 500 cc., and titrate an aliquot with 0.1 N HCl to methyl orange end point, and add the amt. of CaO so found to the amt. found in A. To det. total Na_2O , titrate an aliquot of A with 0.1 N HCl to methyl orange end point, calc. to Na_2O , correct for the free CaO previously found in A, and add the Na_2O present as sulfate, detd. by pptn. in A with $BaCl_2$ as usual. To det. $CaSO_4$, boil 1 g. of B with dil. HCl, filter off any insol. material, and ppt. with $BaCl_2$ as usual. A. PAPINEAU-COUTURE

Report of the Committee on Waste (of the Technical Association of the Pulp and Paper Industry). G. D. BEARCE, *et al.* *Paper Trade J.* **82**, No. 8, 143–6(1926).—A review of the present status of waste in the pulp and paper industry, showing recent progress in its elimination. A. PAPINEAU-COUTURE

Small constant-humidity testing cabinet (CARSON) **1**. Polysaccharides (XXXIII) enzymic decomposition of native cellulose (KARRER, *et al.*) **11A**. Dialytic apparatus for recovery of caustic hydroxides from "black liquor" (U. S. pat. 1,573,703) **1**.

SCHROHE, A.: *Die Verwertung der Zellstoff-Ablaugen*. Patentliteratur 1912–1914. Berlin: Otto Elsner. 140 pp. Price, G. M. 2, cardboard covers. Reviewed in *Pulp Paper Mag. Can.* **23**, 1520(1925).

SIEBER, R.: *Ueber das Harz der Nadelholzer und die Entharzung von Zellstoffen*. 2nd revised and enlarged edition. Berlin: Carl Hofmann. 164 pp. Price, bound, G. M. 8. Reviewed in *Pulp Paper Mag. Can.* **24**, 14(1926).

HAUG, A. M.: *Ueber die Natur der Cellulose aus Getreidestroh*. 2nd edition. Berlin: Carl Hofmann. 77 pp. Price, bound, G. M. 6. Reviewed in *Pulp Paper Mag. Can.* **23**, 1519(1925).

LORENZ, R.: *Theorie und Praxis der Harzleimung*. Biberach-Riss: Guenter Staib Verlag. 42 pp. Price, cardboard covers, G. M. 2.

REMMLER, H.: *Herstellung der Sulfitaue*. 2nd revised and enlarged edition. Berlin: Carl Hofmann. 129 pp. Price, bound, G. M. 8.

SIEBER, R.: *Ueber das warmetechnische Verhalten des Sulfitzellstoff-Kochprozesses*. Biberach-Riss: Güntter-Staib Verlag. 200 pp. Price G. M. 6.50. Reviewed in *Pulp Paper Mag. Can.* **24**, 162(1926).

Cellulose esters. SOC. CHIMIQUE DES USINES DU RHÔNE. Brit. 237,567, July 28, 1924. Esterification of cellulose, as in making cellulose acetates, is facilitated by a preliminary treatment of the cellulose with a small quantity of HOAc such that there is formed with the moisture present in the cellulose an acid of preferably 70–85% strength. The treatment is preferably applied to celluloses which have been treated with alk. liquors.

Cellulose acetate. KETOID CO. Brit. 237,591, July 22, 1924. Cellulose or hydrocellulose is treated with ketene alone or in the presence of an inert solvent such as C_6H_6 , toluene, kerosene and benzene, or of glacial HIOAc or Ac_2O which serves to moisten the cellulose before the addn. of the ketene. $ZnCl_2$, chlorosulfonic acid, H_2SO_4 or other catalysts may be used.

Cellulose acetate films. L. J. MALONE AND S. J. CARROLL. U. S. 1,575,778, March 9. Transparent flexible films are made from acetone-sol. cellulose acetate, solvent such as acetone, castor oil and acetylene tetrachloride or other "transparency inducing" substance.

Regenerating black liquor. A. H. WHITE. U. S. 1,575,473, March 2. Black

liquor from the sulfate pulp process is concd. and subjected to destructive distn., the residue is calcined together with CaCO_3 to form a mixt. of CaO , Na_2CO_3 and Na_2SO_4 and this calcined material is caused to react with carbonaceous material at a temp. of 300–900° (usually about 600–700°) in the absence of air until the sulfate is reduced and is leached to recover the sol. salts.

Diffusion apparatus for recovery of caustic alkali from waste liquor, etc. VISCOSSE CO. Brit. 237,468, Oct. 23, 1924.

Pulp articles treated with sulfuric acid. A TINGLE. U. S. 1,575,290, March 2. Food receptacles or other articles pressed from ligneous pulp are treated superficially with H_2SO_4 of about 57° Bc. strength to render them impervious. The acid is then neutralized and the article dried.

Fiber-board from bagasse. T. B. MUNROE. U. S. 1,574,254, Feb. 23. Piled bagasse is subjected to acetic fermentation until the fibers are partially loosened from the bundles in which they occur. The fermentation is stopped before the strength of the fibers is impaired, the material is mixed with fibers from wood, cooked, refined and mixed with fire-resisting material and formed into fiber-board.

Paper-making. K. SVEN. Brit. 237,292, July 21, 1924. Retention of an unusually large proportion of fillers in paper pulp is facilitated by the addn. of auxiliary substances which form colloids with the mordants such as soap solns. especially of the fatty acids, rubber emulsions, gelatin, glue, casein and solns. of inorg. substances such as alkalies, NH_3 , sol. silicates, lime or Ca salts. China clay "mordanted" with Al sulfate may be used as filler.

Felt for the drier portion of paper and pasteboard machines. E. v. ASTEN. U. S. 1,574,592, Feb. 23. Drier felts comprize an inner strengthening core of vegetable textile fiber and an outer layer of asbestos. U. S. 1,574,593 specifies felt made of threads each comprizing a core of worsted yarn with a coating of wool roving.

Bleaching paper pulp. R. B. WOLF. U. S. 1,576,018, March 9. A mixt. of pulp and a bleaching agent is caused to pass in a relatively thin layer in contact with air substantially free from gaseous decompn. products of the bleaching reaction. An app. is described.

Protected paper currency, etc. P. A. SAWYER. U. S. 1,575,940, March 9. A design is printed on paper with ink adapted to give strong adherence with the protective coating employed and, after drying, both sides of the paper are sprayed with a thin soln. of cellulose nitrate or other cellulose ester in a volatile solvent and dried.

Preventing froth on paper machines. J. A. DE CEW. U. S. 1,573,814, Feb. 23. FeSO_4 or other sol. Fe salt is used for pptg. sol. frothing ingredients of paper pulp which has been treated with rosin size and alum.

Paper-making apparatus. A. ALDRICH. U. S. 1,576,126, March 9.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

The stability of explosives considered as an additive property. M. TONEGUTTI. *Ann. chim. applicata* 15, 542–7 (1925).—Expts. were carried out to det. whether the stability of mixts. of different grades of ballistite or of cordite is an additive property (arithmetic mean) of the stabilities of the 2 components, as it is with mixts. of stable and unstable nitrocellulose (cf. Lenze and Pleuss, *C. A.* 14, 3531; de Bruin, *C. A.* 16, 1317). For this purpose the method of Taliani (*C. A.* 16, 342) was chosen as the most precise, the results being shown in the form of decompn. curves similar to his. With mixts. of ballistite, or of cordite of different origin and stability, the stability of the mixt. is equal to the arithmetic mean of the stabilities of the components. On the other hand, with heterogeneous mixts., i. e., with mixts. of ballistite and cordite, the stability of the mixt. is much greater than the arithmetic mean of the stabilities of the components, is in fact the same as that of the more stable component, in this case the cordite. This anomaly is probably due to the vaseline in the cordite exercising a retarding action on the decompn. of the less stable component, the ballistite. C. C. DAVIS

The reaction of nitroglycerin powders to the Angeli test and the relation between this reaction and their stability on being heated. M. TONEGUTTI. *Ann. chim. applicata* 15, 548–54 (1925).—Expts. were carried out to det. whether there is a relation between the acidity of an explosive of the ballistite type and its stability towards heat. The acidity in all cases was detd. by the method of Angeli (*C. A.* 13, 262; 16, 4064). It was found in general that ballistite with an acid reaction is less stable on being heated than neutral ballistite, whether this stability is detd. by the method of Taliani (*C. A.*

16, 342) or by the silvered-vessel test (cf. Marshall, *C. A.* 11, 2407, 3437). On the other hand, in confirmation of the work of Taliani (*loc. cit.*) no relation could be found between the acidity and the stability detd. by the Abel test (cf. Angeli and Errani, *C. A.* 14, 2858). The Abel test is not a criterion of the stability of an explosive on being stored. Neither can a ballistite be regarded as stable by the mere fact that it has a neutral reaction judged by the Angeli method. To obtain an adequate judgment of the keeping qualities of a ballistite, not only must its neutrality be detd. but also its stability according to the Taliani and silvered-vessel test. These 3 tests together are a satisfactory criterion of the keeping qualities. Like ballistite, cordite with an acid reaction is less stable than neutral cordite, but in contrast to ballistite, the Abel test is a better criterion of the stability of cordite than either the Taliani or silvered-vessel test, these last 2 tests revealing no difference in stability between acid and neutral cordites. As in other work (cf. preceding abstr.) this dissimilarity between ballistite and cordite can be explained by the vaseline having a stabilizing action on the decompn. of cordite. This was proved by the fact that the addn. of 5% vaseline to an acid ballistite which was far less stable than a neutral one rendered it just as stable as the neutral one. The silvered-vessel test is, however, a valuable criterion of the relative stability of cordites of different formulas, and of the amt. of nitroglycerin or of vaseline in a given cordite.

C. C. DAVIS

Liquid oxygen as an explosive. F. W. O'NEIL AND HERMAN VAN FLEET. *Trans. Am. Inst. Mining Met. Eng.*, Feb., 1926, No. 1562-A, 42 pp.—The authors seek to describe the present status and possibilities of LOX from results of investigations, research and practical use in this country during the past 4 years, and they conclude that LOX is admirably adapted for quarry work and open-pit mining; the cost of LOX for this work was much less than that of dynamite; the danger of digging into missed holes is eliminated; there is no difficulty in handling the material or charging the holes; the amt. of labor needed to load holes with LOX is less than that with dynamite, as the cartridges are simply dropped into the holes and no ramming is necessary; as there are no lights in open-pit work, there is no danger of the cartridges catching fire. Even should they do so from sparks from steam shovels or locomotives, their burning in the open air would involve no serious consequences. Of special interest are the detailed statements of costs for producing liquid O, and of LOX cartridges. Approx. 400 varieties of C and other blacks were tested as absorbents, and many varieties of paper for cartridge wrappers.

CHARLES E. MUNROE

Variations in the color of smokeless-powder grains. A. J. PHILLIPS. *Army Ordnance* 6, 384-6(1926).—The yellowish brown color which occurs in nitrocellulose for smokeless powder and in smokeless powder grains, made from under-bleached cellulose, have been attributed to Fe but the minute quantity of Fe found in the ash renders this unlikely. P. ascribes it to oxidation of an unknown kind. When the stabilizer, diphenylamine, is introduced various colors, deep brown, greenish brown, dark green, greenish black, or black, may appear. It has been believed that when the grains became black the stabilizer was exhausted, but such is not the case for several of the oxidation and nitro derivs. of Ph₂NH are almost as efficient stabilizers as Ph₂NH itself. It is generally assumed that the black color is due to phenazine. Microscopic examn. of thin sections of black grains show them to have a pale yellow-green color and the apparent blackness is attributed to the presence of variously sized particles, formed in the oxidation of Ph₂NH, in colloidal suspension, and because of the size and shape of these particles light is so absorbed and diffracted as to give to the grains various colors down to black.

CHARLES E. MUNROE

Explosion hazards from the use of pulverized coal at industrial plants. L. D. TRACY. *Bur. of Mines, Bull.* 242, 103 pp.—A description is given of pulverized-coal systems with their driers, pulverizers and distributors, including a discussion of the various hazards of prepn., storage and use with illustrations from disasters. There is given a set of operating regulations through the observance of which explosions may be avoided.

CHARLES E. MUNROE

Fulminating material. Energy per cubic centimeter and per gram at the instant of explosion. E. MATHIAS. *Compt. rend.* 182, 194-7(1926); cf. *C. A.* 20, 1199.—Conclusions reached by 2 independent lines of physico-mathematical reasoning lead to the results 3300 and 2860 kg. m. per cc. resp. for the pure fulminate at the instant of its destruction, or about 4 times the figure for nitroglycerin.

L. W. RIGGS

The pressures developed on explosion of gaseous mixtures at high densities. W. T. DAVID. *Phil. Mag.* [7] 1, 334-7(1926).—Recent work of Bone, Newitt and Townend (*C. A.* 19, 3581) showed that during the explosion of inflammable gas mixts. the ratio of max. pressure developed to the initial pressure of the mixt. before explosion increases

as the initial pressure increases. B., N. and T. suggest the effect may be due to an increase with pressure in the opacity of the gases to radiation emitted during the explosion, thus retaining a higher percent of heat in the gas phase the higher the initial pressure. D. regards this explanation insufficient and considers several other causes such as: departure of the gases from Boyle's law; more rapid equil. between vibratory, rotational and translational energies; smaller heat loss during the explosion period; less dissoc.; more complete combustion at moment of max. pressure; and decrease in sp. heat of gaseous products of combustion at the high temp. developed as the density of the gaseous mixts. increases. Of these D. regards the last two as most important, especially the last one, which is discussed briefly.

S. C. LIND

Amended regulations for the transportation of explosives and other dangerous articles by freight and express. I. C. C., No. 3666. Pamphlet, 15 pp., Feb. 23, 1926. Wash. Govt. Printing Office.—These amended regulations of the I. C. C. become effective July 1, 1926.

CHARLES E. MUNROE

A half century in chemical education. Record of the scientific contributions of Charles Edward Munroe (TAYLOR) 2.

Drying nitrostarch. J. B. BRONSTEIN. U. S. 1,573,673, Feb. 16 A slurry of nitrostarch is placed in long narrow tubular fabric bags and these are exposed to a drying atm.

Impregnating match splints. W. J. ELDER and C. N. MOREHOUSE. U. S. 1,574,238, Feb. 23. Splints are treated with a spray of concd. soln. of NH_4 phosphate or other material which will prevent after-glow.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Azo dyestuff technology. IV. **Manufacture of Direct Deep Black E.** W. C. WHITEHEAD. *Chem. Trade J.* 77, 206-7 (1925). V. **Manufacture of Fast Sulfone Black.** *Ibid* 265; cf. C. A. 19, 3022.

E. H.

Problems of chain warp vat dyeing. C. R. EPHLAND. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 97-8; *Am. Dyestuff Rept.* 15, 165-6.—Among the advantages of chain dyeing are less crocking, brighter and cleaner shades and probably the most uniform method outside of raw stock dyeing.

L. W. RIGGS

Dyeing rayon with vat colors. M. T. JOHNSON. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 94-7; *Am. Dyestuff Rept.* 15, 162-5.—A short paper followed by a long discussion by the members.

L. W. RIGGS

Importance of technical men to the textile industry. E. C. BROOKS. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 90-4; *Am. Dyestuff Rept.* 15, 158-62.—The co-operation of schools of agriculture, engineering, science and business with textile schools is stressed. The study of cotton fiber should begin on the farm.

L. W. RIGGS

Comparison of the affinity of cotton, wool, and particularly of cellulose acetate silk for azo compounds (dyestuffs) containing sulfonic, carboxyl, arsonic and stibonic acid groups. A. J. HALL and M. I. AISCHER. *J. Textile Inst.* 17, 104-10T (1926).—The dyes used were α -naphtholazophenyl-4-sulfonic acid, β -naphtholazophenyl-4-sulfonic acid, phenolazophenyl-4-sulfonic acid and salicylic acid-azophenyl-4-sulfonic acid, and these same basic groups were severally combined with carboxylic, arsonic and stibonic groups, resp., making 16 dyes in all. Wool, cotton and acetate cellulose were dyed with each dye and the colors and fastness to boiling water, soap and light of each sample were noted. Conclusions: Cellulose acetate silk and cotton have but little, and wool has considerable affinity for all of the azo compds. above mentioned. All the dyeings on wool have approx. equally good fastness to boiling water but have little fastness to boiling soap. Dyes contg. the stibonic acid group are less fast than the others. Azo compds. contg. stibonic acid groups have a greater affinity than the corresponding compds. contg. arsonic acid groups for cellulose acetate silk, but these differences cannot be correlated to differences in the solubilities of the azo compds. in water. Azo compds. contg. β -naphthol have a greater affinity than compds. contg. α -naphthol for cellulose acetate silk. The affinity of cellulose acetate silk for azo compds. contg. sulfonic, arsonic, stibonic and carboxylic acid groups increases in the order named. Although none of the organo-azo-As and Sb compds. described above is suitable as dyestuff for cellulose acetate silk, it is believed that satisfactory dyes contg. these acid groups may be prepd.

L. W. RIGGS

New method for the estimation of alkali with special application to wool. H. R. HIRST AND A. T. KING. *J. Textile Inst.* **17**, 94-100T(1926).—Existing analytical methods, when applied to the detn. of alkali in wool, do not give correct results. Wool placed in water contg. terephthalic acid in suspension yields all of its alkali to the acid as Na terephthalate in soln. The Na terephthalate thus formed may be estd. gravimetrically by filtering out the unchanged terephthalic acid, adding dil. H_2SO_4 to the filtrate to convert the Na terephthalate to terephthalic acid and filtering and weighing this. This method is used with dyed fabrics which bleed and thus would obscure the indicator changes of the more accurate volumetric method. In the latter method, with bromophenol blue as indicator, a liquid contg. terephthalic acid and Na terephthalate remains purple until the whole of the salt is converted into acid, when a further addn. of H_2SO_4 changes the indicator. By this method a measured quantity of alkali, whether NaOH, Na_2CO_3 , or soap added to wool can be quantitatively recovered. By using this method in conjunction with that for estg. soap (*C. A.* **16**, 3212) the amts. of alkali present as soap and sorbed alkali, resp., can be detd. **Estimation of sulfuric acid in wool.** *Ibid* 101-3T.—A measured vol. of standard Na terephthalate is added to the wetted sample of wool and the subsequent procedure is the same as that described for the estn. of alkali. L. W. RIGGS

The sulfur content of wool. S. R. TROTMAN AND H. S. BELL. *J. Soc. Chem. Ind.* **45**, 10-2T(1926).—The S content of wool as given in the literature ranges from 0.5 to 5.4%. The object of this study was to det. if such differences actually exist in samples of known origin and purity. The wide differences hitherto reported in the S content of wool are caused largely by the different methods of analysis. The various methods for the detn. of S in org. material were examd. critically, and their actual or possible errors are indicated. The method of analysis adopted was that of Benedict-Denis (cf. *C. A.* **5**, 114, 1287, 1448) modified as follows: About 0.2 g. of wool is warmed with a little NaOH soln., made from metallic Na, till it is just dissolved. A few drops of Br are added and after a few min. the soln. is neutralized with HNO_3 ; 10 cc. of the Benedict-Denis reagent is then added and the detn. is completed according to the Benedict-Denis procedure. The sample of wool for analysis is purified by extn. in a Soxhlet app. with petr. ether and alc. and then washed with hot water. The results on a sample of "Botany web" ranged from 3.06 to 3.30, av. 3.19% of S. The unmodified Benedict-Denis method gave 3.24% of S. The narrow limits of variation in the S content of wool would be expected if keratin or wool protein is a definite chem. compd. L. W. RIGGS

The retting of flax with *Plectridium pectinovorum* (*Amylobacter A. M. Bredemanni* and *Bacillus felsineus* Carbone. G. RUSCHMANN AND W. BAVENDAMM. *Centr. Bak. Parasitenk., II Abt.* **65**, 43-58(1925).—In Germany, *B. felsineus* does not play an essential role in the fermentation of pectin. JOHN T. MYERS

An investigation on the strength and breaking point of artificial (viscose) silk. P. KRAIS. *Z. angew. Chem.* **39**, 196(1926).—An extension of the use of the author's app. gave a more accurate detn. of tensile strength and breaking point of viscose fibers. Single fibers gave an av. of 11.5 g. tensile strength, 31.7% breaking tension at 52% relative humidity and 22°; 8.7 g. and 41.7% at 86% and 17°. Tests in H_2O gave 6.7 g. and 41.7% at 55% and 26°. The effect of very wet air and H_2O is the same. A loss of 41.3% in strength is accompanied by a stretch of 20%. Yarn acts less favorably, losing 57% strength with very little stretch. CECIL E. P. JEFFREYS

Determination of α -cellulose content in artificial-silk cellulose. H. E. WAHLBERG. *Svensk Pappers-Tid.* **28**, 641-2(1925).—Duplicate analyses by the Waentig method showed that results from air-dried material ran lower than results from undried material varying from 1.6 to 6.4% for 7 detns. Corresponding differences for similar analyses by the Jentgen method were 0.1 to 0.6%. One sample dried over Sunday in a drying oven at 110° gave 65.9% α -cellulose in a material which should have given 83%. W. S.

Laboratory preparation of viscose. E. H. MORSE. *Ind. Eng. Chem.* **18**, 398-400(1926).—The prepn. described is intended to be carried out in a factory lab. Sulfuric cellulose is used. The steps described are as follows: treatment with NaOH, presouring, crumpling, xanthation, soln. of xanthate, ripening, filtration and subjection to vacuum reduction to the proper viscosity and pptn. L. W. RIGGS

The mill chemical laboratory—Its coördination with the mill purchasing department. H. B. BURKE. *Am. Dyestuff Rept.* **15**, 149-52(1926).—It is shown how a properly organized and equipped lab. becomes a source of profit especially in the purchasing department. Five sample specification sheets for materials bought are shown, and an example of the system in operation is given. L. W. RIGGS

The processing of furs. WM. D. BAIRD. *Am. Dyestuff Rept.* **15**, 115-7, 171-4

(1926).—The topics discussed are the following: factors affecting the characteristics of furs such as food, climate, season, age and species, fur structure, prep. furs for dyeing by a process called killing to increase the affinity of the fur for the dyestuff, mordanting and dyeing. Details of dyeing and of colors used are given. L. W. RIGGS

Time factor in hair testing. J. C. MANN AND F. T. PEIRCE. *J. Textile Inst.* 17, 82-93T (1926).—The breaking load of a cotton hair varies in a logarithmic relation with the time allowed for the hair to stretch to the breaking point. The more time the hair is given to yield, the lower is its resistance at any given extension or at rupture because its elasticity is imperfect. In making tests this time element must be known quantitatively. L. W. RIGGS

Polysaccharides. XXXIII. Enzymic decomposition of artificial silk (KARRER, *et al.*) 11A. Sandalwood dyestuffs (DIETERLE, STEGEMANN) 10. Cellulose: Its chemistry with particular reference to the manufacture of rayon (ESSELEN) 23. Dialytic apparatus for recovery of caustic hydroxides from mercerizing solutions (U. S. pat. 1,573,703) 1.

COOPER, F. J.: **Textile Chemistry.** New York: E. P. DUTTON & Co. \$5.

Dow Indigo: Midland Vat Blues, Ciba Blues. Midland, Mich.: The Dow Chemical Co. 48 pp. Reviewed in *Chemicals* 25, 41 (1926).

HOELKIN, MARTIN, JR.: **Die Kuntseide auf dem Weltmarkt.** Berlin: Julius Springer. 82 pp. M. 3.90. Reviewed in *Chemicals* 25, 41 (1926).

RIGGS, HOMER C.: **Dyeing Wool Fabrics.** Orange, Mass.: Rodney Hunt Machine Co. 77 pp.

Dyes. FARBERWERKE FORM. L. DURAND, HUGUENIN & Co. Brit. 237,295, July 21, 1924. The process described in Brit. 186,057 (C. A. 17, 343) is modified by the use of a primary or secondary base such as aniline or monoethylaniline in the conversion of leuco compds. of thioindigo or other vat dyes into esters of polybasic acids. Leuco-thioindigo, suspended in a mixt. of aniline and chlorobenzene at a temp. of 0° or lower, may be treated with chlorosulfonic acid.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 237,385, May 19, 1924. Indigoid dyes are prepd. by condensing 2,1-naphthindoxyl with 7-chloroisatin or 5,7-dibromoisatin or other halogen substitution products of isatin. These dyes produce brown to olive shades on cotton from the vat.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 237,375, May 8, 1924. Sulfuretted dyes are produced by treating a 2,5-diarylidobenzoquinone, other than a 3,6-dihalo-2,5-diarylidobenzoquinone, with a S halide or a sulfurous acid halide such as thionyl chloride. The products dye wool from the vat in yellow, orange, brown, violet, greenish and black shades. Numerous examples are given.

Dyes. J. FROHLICH. U. S. 1,575,678, March 9. Vat dyes which dye wool various fast brown tints are formed by the reaction of S dichloride on 2,5-diarylidobenzoquinones. U. S. 1,575,679 specifies dyes made from S monochloride and 2,5-diarylidobenzoquinones, which give with hyposulfite and NaOH bright yellow to brown vats from which wool is dyed fast yellow-brown to red-brown, olive-green, green and gray. Cf. C. A. 19, 2750.

Dyes from naphthalene derivatives. FARBERWERKE FORM. MEISTER, LUCIUS & BRÜNING. Brit. 237,294, July 21, 1924. The dianhydride of naphthalene-1,4,5,8-tetracarboxylic acid, or the acid itself, or its substitution products, is condensed with *o*-diamines, *e. g.*, with *o*-phenylenediamine in PhNO₂. The product dyes cotton yellowish red from a green vat.

Dyes of the anthraquinone series. J. BADDILEY and W. W. TATUM. U. S. 1,574,748, March 2. Dyes are formed of the general formula A-NH-SO₂-(1)C₆H₃-COOH(3)-OH(4) in which "A" represents an anthraquinone residue which may be substituted. They are acid dyes dyeing wool directly and also on a chrome mordant and also may be used on "acetyl silk." Among the starting materials which may be used are: diamino-anthraquinone or 1,4-diaminoanthraquinone or 1,4,5,8-tetraaminoanthraquinone and salicylic sulfo chloride. Cf. C. A. 20, 509.

Triphenylmethane dyes. FARBERFABRIKEN FORM. F. BAYER & Co. Brit. 237,096, July 18, 1924. Dyes derived from a benzaldehyde having a replaceable *p*-substituent such as Cl, NO₂, SO₂H, or CH₂O, and 2 mol. proportions of an *o*-hydroxybenzenecarboxylic acid are condensed with halogenated aromatic bases having *o*-substituents to the amino groups; *e. g.*, 4-, 5- or 6-chloro-2-toluidine, 4,6-dichloro-2-toluidine, 3-chloro-4-tol-

uidine, 4-chloro-2-anisidine, 4-chloroanthranilic ester and 1-chloroaminonaphthalene. The dyes produce on wool bluish red to reddish violet shades changed to fast red-violet by after-chroming.

Azo dyes. F. GÜNTHER. U. S. 1,573,605, Feb. 16. Azo dyes for animal, vegetable and mixed fabrics comprize the grouping $-N:N\text{-aryl}(p)\text{-X-(}p\text{)aryl-N:N-}$ (in which X stands for the azo or azoxy group or the urea grouping) coupled with an *o*-hydroxycarboxylic acid, sulfonic groups also being present. Among the starting materials which may be used for making the dyes are: *p*-nitroaniline-*o*-sulfonic acid and saileylic acid. The dyes generally produce orange to reddish brown shades.

Azo dye. J. HALLER. U. S. 1,576,322, March 9. Azo dyes giving reddish dyeings are prepd. from diazotized asym. *m*-xylydine compds. and 2,3-hydroxynaphthoic acid asym. *m*-xylydide compds.

Vat dyes. H. SCHÖPFER. U. S. 1,574,116, Feb. 23. Dinitroperylene or other nitro derivs. of perylene are heated to about 160–200° with AlCl_3 to produce dyes giving olive-brown or olive-green on cotton.

Dyes for treating photographic emulsions. E. J. WALL and D. F. COMSTOCK. U. S. 1,573,595, Feb. 16. A small fraction of 1% of gelatin is added to colloidal color-sensitizing dye solns. to restrain coagulation and pptn.

Dye intermediates. M. T. BOGERT. U. S. 1,574,337, Feb. 23. By reduction of 2,4-dinitrodiphenyl ether or of other 2,4-dinitroaminodiaryl ethers, products are obtained having the general formula $2,4\text{-(H}_2\text{N)}_2\text{Ar O.Ar}$, in which Ar is aryl. These intermediates yield dyes similar to those obtainable from *m*-phenylenediamine.

Dyeing and printing with vat dyes. M. BADER, T. LOMBARD, C. SUNDER and C. VAUCHER. U. S. 1,575,958, March 9. Thread, fabric or other goods are treated with a H_2O -sol. ester-like deriv. of a vat dye such as an indigo dye and the dyeing is then developed by an oxidizing agent, *e. g.*, a chromate.

Naphthalene diazo oxides and dyes. AKT.-GES. FÜR ANILIN FABRIKATION. Brit. 237,594, July 28, 1924. Acyloxy-4-sulfonaphthalene 1,2-diazo oxides are obtained by treating 6- or 7-hydroxy-4-sulfonaphthalene 1,2-diazo oxide with acid anhydrides or acid chlorides. They may be used to produce dyes by coupling with 1-aryl-3-methyl-5-pyrazolones. The products dye wool in orange to brown shades changed toward red by after-chroming. Various examples are given.

Dyeing. J. M. ESCHACH and J. P. WORMS. Brit. 237,157, Jan. 19, 1925. Animal fibers or tanned vegetable fibers are dyed by treatment with HNO_2 and metallic salt or oxides at temps. not exceeding 80°. Numerous examples are given for producing various colors.

Dyeing cellulose acetate or similar materials. W. DUISBERG and W. HENTRICH. U. S. 1,575,324, March 2. Cellulose acetate threads or other dyes used are of the type $R\text{-N:N-R'}$ in which $R\text{-N:N-}$ stands for the diazo deriv. of an acid-substituted aromatic nitro compd. and R' for an aromatic diamine; *e. g.*, the dye Na 4-nitro-1-benzoate 2-azomethylbenzylaniline gives clear orange shades.

Dyeing wool. C. S. BEDFORD. Brit. 237,054, May 22, 1924. Wool is dyed with chrome dyes such as hematin, fustic, quercitron bark, osage orange, alizarins, gallo cyanins, Mordant Yellow, Brilliant Alizarine Blue R, and Palatine Chrome Black, by sequence dyeing in which it is mordanted with 0.5% its wt. of $\text{K}_2\text{Cr}_2\text{O}_7$ or $\text{Na}_2\text{Cr}_2\text{O}_7$ in the presence of HCl and lactic acid. Various other details are specified.

Apparatus for carbonizing wool by use of acid. A. SHAW and B. SHARP. Brit. 237,420, July 9, 1924.

Dyeing apparatus. B. K. THIES. U. S. 1,576,378, March 9.

Dyeing apparatus. HUSSONG DYEING MACHINE CO. Brit. 237,428, July 29, 1924.

Dyeing apparatus. F. BROUGHTON and A. B. HENSHILWOOD. Brit. 237,056, May 14, 1924.

Apparatus for spray-dyeing. TWO-TONE CORPORATION. Brit. 237,230, July 16, 1924.

Apparatus for dyeing and washing cotton or woolen fabrics. J. BAILEY and E. GILL. Brit. 237,422, July 10, 1924.

Yarn-dyeing apparatus. G. T. THOMAYER. U. S. 1,576,013, March 9.

Yarn-dyeing apparatus. G. T. THOMAYER. U. S. 1,576,234, March 2.

Apparatus for dyeing and other treatment of yarn. JOHN BRANDWOOD and JOSEPH BRANDWOOD. U. S. 1,574,785, March 2.

Lakes. BRITISH DYE STUFFS CORPORATION, LTD., J. BADDILEY, R. S. HORSFALL, A. SHEPHERDSON and H. JACKSON. Brit. 237,457, Sept. 23, 1924. Lakes are prepd. by treating unsulfonated aminoöxyanthraquinones or their alkyl, aryl or nucleus substituted derivs. in a fine state of division with a compd. of a lake-forming metal, *e.*

a blue lake is formed by stirring and boiling a 10% paste of *N*-methyl-diaminoanthra-rufin and $\text{Al}(\text{OH})_3$. Various other examples are given.

Products from viscose. A. KAMPF. U. S. 1,575,210, March 2. In forming artificial silk or similar products unripened viscose is prepd. from unripened alkali cellulose and is "spun" in a bath of acid soln. having a temp. of about 4° . The acid bath contains only such org. substances and salts as are taken up by it during the "spinning" process. Cf. C. A. 20, 830.

Artificial silk threads from viscose. L. HESSE and H. RATHERT. U. S. 1,575,052, March 2. Alkali cellulose is treated with CS_2 in the presence of a reducing agent such as Na_2SO_3 and the xanthate formed is dissolved in alkali in the presence of reducing agents such as the sulfite. The soln. thus formed is injected into a soln. of Na_2SO_4 contg. a comparatively large quantity of H_2SO_4 .

Washing artificial silk. A. PINEL. U. S. 1,573,859, Feb. 23. The material is alternately and repeatedly washed by spraying and dried by centrifugal action.

Apparatus for spinning artificial silk. KOHORN & Co. and A. LEHNER. Brit. 237,214, July 17, 1924.

J-shaped stack, etc., for treating cloth in piled condition. HUNT & MOSCROP, LTD. and E. W. HUNT. Brit. 237,061, June 10, 1924.

Apparatus for recovering liquor for re-use from used laundry solutions. F. L. ROSENAU. U. S. 1,574,170, Feb. 23.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Report of Sub-Committee III on testing paint vehicles. H. A. GARDNER. *Proc. Am. Soc. Testing Materials* 25, Pt. I, 227-31 (1925).—Results of collaborative exposure tests at different stations showed fair agreement. The pigments used consisted of mixts. of ZnO with 50% (of the total) titanox, 50% lithopone, 70% titanox, and 50% white lead, resp.; they were ground in raw linseed oil to a paste contg. 80% pigment and 20% oil by wt., and reduced to painting consistency with varying amts. of oil, turpentine and liquid drier. On the whole, the titanox mixts. stood up best, and of the various reductions, those with least oil and most turpentine showed up best.

Report of Sub-Committee XXIII on anti-fouling paints. A. M. MUCKENFUSS. *Proc. Am. Soc. Testing Materials* 25, Pt. I, 244-7 (1925); cf. C. A. 19, 1783.—Results of a series of panel tests carried through during the summer of 1924 confirmed that the differences in fouling and corrosion are as appreciable in under-water paints by varying the vehicle as they are by varying the pigment.

Some chemical and physical characteristics of paint. A. K. LIGHT. *Chemistry & Industry* 45, 101-3, 122-3 (1926).—A brief discussion of the properties of numerous pigments, oils, driers and thinners, and an outline of some of the phys. and chem. requirements of a good paint.

New researches on the durability of paints. ANON. *Farbe u. Lack* 31, 41 (1926).—A review.

The question of anti-rust pigments. BEISSEL. *Farbe u. Lack* 31, 26 (1926).—A review of American practice.

Chemical pigment colors. A. F. BROWN. *Paint, Oil, Chem. Rev.* 81, No. 10, 11-16, 33, No. 11, 14, 16 (1926).—Prepn. and uses are reviewed.

Contribution to the valuation of white pigments. A. EIBNER. *Z. angew. Chem.* 39, 261-2 (1926).—A criticism of methods and results of Wolski (*Z. angew. Chem.* 38, 834 (1925); cf. C. A. 19, 3602) on measurement of hiding power.

United States Government master specification for shellac, flake orange. Bur. Standards, *Circ.* 302, 6 pp. (1926).

Experiments on asphalt japans. HERMANN MARCUS. *Farbe u. Lack* 31, 43 (1926).—A review of uses and a few formulas.

Cellulose nitrate lacquers. A. E. LAIN. *J. Oil Colour Chem. Assoc.* 9, 33-44 (1926).—British practice in selecting raw materials and manufg. is reviewed. With hard manilas and shellac, which are more sol. in alc. than in other solvents, alc.-sol. sectionable because of their odors, which persist for months. Ester gum, wnuue very ad- sol., has to be used in quantity equal to that of the cellulose nitrate to insure good adhesion. Its use, therefore, demands a high proportion of plasti-zizer to overcome

brittleness. Mastic also must be present in amt. equal to the cellulose nitrate to insure adhesion. Shellac gives better adhesion but the waxy constituents must first be removed by dissolving in methylated spirits and using only the clear liquid. R. J. M.

Light-fastness of lithopone. ANON. *Farbe u. Lack* 31, 54(1926).—A review of recent articles and patents. R. J. MOORE

Production of coal-tar color lakes. HANS HADERT. *Farbe u. Lack* 31, 3, 15, 30 (1926).—A comprehensive review of the composition and preparation of colors for various uses R. J. MOORE

Dissolvan. ANON. *Farbe u. Lack* 31, 6(1926).—A proprietary solvent for cellulose nitrate R. J. MOORE

Gelatinization and crystallization of wood oil. MAX OPPENHEIMER. *Farbe u. Lack* 31, 28(1926).—A review of articles and patents on the treatment of China wood oil. R. J. MOORE

The question of the drying of fatty oils. A. EIBNER. *Z. angew. Chem.* 39, 38–46 (1926).—See C. A. 20, 117. R. J. MOORE

United States Government master specification for ink, drawing, colored waterproof. Bur. Standards, *Circ.* No. 301, 4 pp.(1926). E. H

Pb and Zn pigments and salts in 1924 (SIEBENTHAL, STOLL) 18. Natural iron pigments (KURBATOV) 8. Light-sensitive varnish mixture for photographic use (U. S. pats. 1,574,356–9) 5.

Paint and varnish remover. G. BLENIO. U. S. 1,573,537, Feb. 16. Oil of mirbane to the extent of 15% or more is used with dissolved rubber and solvents such as C.H., acetone and chlorinated derivs. of hydrocarbons.

Powdered paint ingredient for use with either oil or water. M. TSUBATA. U. S. 1,574,854, March 2. Pigments such as ultramarine, ZnO or white lead are mixed with gelatin, formaldehyde and alc., the mixt. is dried and powdered, further mixed with gelatin, drying oil and alc. and this mixt. is also dried and powdered

Sizing for plaster walls. H. WOOD. U. S. 1,576,394 March 9. A major proportion of a mixt. of soap and glue in H₂O comprizes smaller proportions of linseed oil, turpentine, vinegar, japan drier and white lead.

Transfer ink. W. S. LAWRENCE. U. S. 1,573,976, Feb. 23. A fusible transfer ink releasable from a paper transfer base under the action of heat comprizes "cumar" or similar fusible base, a direct dye or other coloring material and Turkey red oil or other emulsifying agent which will cause the emulsification of the coloring material used when the ink is acted on by an alk. washing fluid, so that the dye is liberated and penetrates the fabric to which the ink is applied.

Colored printing ink. H. CAJAR. U. S. 1,576,408, March 9. H₂O is evaporated under a high vacuum from an aq. ink paste in a steam-jacketted levigating and mixing app. Cf. C. A. 19, 739.

Linoleum. G. DUBSKY. U. S. 1,576,181, March 9. A drying oil such as linseed oil is partially oxidized by heating and injecting air into it until it gelatinizes, filling material is added and air is injected into the mixt. at an elevated temp. while agitating it gently to complete the oxidation of the oil.

Resinous condensation products. C. A. NASH. U. S. 1,574,842, March 2. Before the final heat curing and hardening of synthetic resins formed from phenol and formaldehyde or similar substances, they are admixed with about 10% of stearin pitch and 3% of S to improve their molding properties.

Kauri gum. N. BUCHAN. Brit 237,576, July 23, 1924. Purified kauri gum is extd. from the crude gum by Et₂O alone or mixed with a hydrocarbon solvent such as C₆H₆. An app. is described which may be steam-heated.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Detection of coconut oil in cacao butter by means of the ethyl ester number. J. HANUS AND (MISS) B. KOMOROUSOVÁ. *Chem. Listy* 19, 394–7(1925).—The H ester no. is defined as the no. of cc. 0.1 N KOH necessary to saponify the Et esters of the distillate obtained from 5 g. fat after conversion of the glycerides into Et esters. The method lends itself to evaluation of coconut oil and cacao fat mixts.; the nos. for the pure fats being 23 and 3, resp., referred to 1 g. fat taken for analysis. F. C. K.

The use of sintered glass crucibles for the separation of the digitonin compound with sterol in testing fats for phytosterol. J. PRESCHER AND R. CLAUS. *Z. Nahr. Genussm.* 50, 420-3(1925).—An application of the sintered glass filtering medium (cf. C. A. 19, 794).

Chemical reactions of rancid fats. J. BULIR. *Chem. Listy* 19, 357-63(1925).—Altered fats contain active O and give reactions of peroxides. A convenient reagent for their detection is di-*p*-diaminodiphenylamine, but the analysis is more exact if KI is used. The recommended procedure is: 1 cc. of oil or fat is dissolved in 1 cc. petr. ether, 2 cc. of 20% soln. of KI in 90% alc. is added and the mixt. is shaken for 1 min. About 15 cc. H₂O is then added, shaken, and after the I₂ has passed into the aq. layer, a test is made with starch. If the fat is fresh, the soln. remains clear, but if altered, a faint-violet blue tint appears. Similar reaction is obtained with fats renovated by means of oxidizing agents. The peroxide reaction is sometimes negative with butter, even though the butter is very old and rancid. Atm. O is absorbed very rapidly by some fats, such as lard, and very slowly by others, such as cacao butter. This appears to be a function of the position of the unsatd. acid radicals in the mixed glyceride mol.

Soy-bean oil as soap-making material. A. A. HORVATH. *J. Assoc. Chinese Am. Eng.* 6, No. 7, 65-72(1925).—Soap manufd. from soy bean oil has exceptional lathering capacity. It is recommended for domestic use with the hard waters of north China.

WILLIAM J. HUSA

F. C. KRACEK

WM. H. ADOLPH

Determination of viscosity of oils (BORODULIN) 22.

Decomposing fats, oils and waxes by sulfo acids. W. SCHRAUTH. U. S. 1,576,005, March 9. Cyclohexylnaphthalene sulfo acid or a similar sulfo acid of an aromatic hydrocarbon substituted in the nucleus by 1 hydrocarbon radical is mixed with the material to be decomposed, *e. g.*, fats, and with H₂O and the mixt. is heated to effect splitting.

Increasing stability of edible oils. H. BOLLMANN. U. S. 1,575,529, March 2. Immediately after purification of olive oil, soy-bean oil or other edible or "salad" oil a small quantity of lechthin (usually about 0.05-0.1%) is added.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Loss of sugar by inversion in sugar factories in northern India and its prevention by antiseptic measures. C. M. HUTCHINSON AND C. S. RAMAYYAR. *Agr. Research Inst., Pusa, Bull.* 163, 9 pp (1925).—Loss of sugar by inversion was found to be due to infection of the juice by bacteria, molds and yeasts which were present even after liming and passage through the first and second filter presses. Their presence in the latter stages of the process appeared to be due to air-borne reinfection. A yeast of the *Cerevisiae* type, a bacterium of the *Subtilis* group and an *Aspergillus* mold, all of which inverted sucrose rather rapidly were isolated. Other bacteria, molds and yeasts capable of inverting sucrose were isolated. In pure cultures about 6 hrs. were required for the first 3 organisms to produce invert sugar in measurable amts., after which time as much as 7% inversion occurred in 2 hrs. Disinfection of the machinery with a hypochlorite prepn known as "E. C." did to 1 part of Cl per 25,000 materially reduced inversion losses. It appeared that the action of the mass infection existing in the mills and in the channels leading to the liming vats was a cumulative one and owed its effectiveness to a rapidly gained condition of establishment and efficiency similar to that obtaining in a sewage filter bed in which event sterilization to the point of preventing the establishment of a mass infection of the surfaces in contact with the juice should eliminate serious loss of sugar by inversion.

K. D. JACOB

Milling problems of the Cuban sugar industry. H. EDSON. *Facts about Sugar* 21, 297-8(1926).—This article is intended to present a few of the unsolved problems in the mill room and gives the factors involved in increasing the efficiency of extn. Heavy milling, the necessity of variable-speed motors, gear efficiency, maceration methods and the advantage of shredding are emphasized.

T. MARKOVITS

Electrical conductivity as measure of the ash content of raw sugars. F. W. ZERBAN AND J. MULL. *Facts about Sugar* 21, 278-81(1926).—The elec. conl. app. as designed by Toedt is described and the applicability of the same for ash detn. in raw sugars

is presented. For comparison 3 methods were used in the tests (1) total sulfated ash, (2) sulfated ash in the water-sol. part of sugar and (3) ash by elec. cond. The tabulated results show that the agreement between sol. ash by the cond. method and sol. ash by the chem. method is in general very good. Comparison of results by methods (1) and (2) shows that in a no. of individual cases the sol. ash is apparently a little higher than the total ash although the difference of the av. is negligible. Previous literature is reviewed.

T. MARKOVITS

The estimation of errors in the determination of purity. P. F. BEARTS AND A. LECHAT. *Sucre Belge* 45, 37-43, 69-81(1925).—This paper gives the mathematical formulas which are to be applied for the calcs. of the various errors which may arise under various conditions in the detn. of the Brix reading and the polarization in routine operation in a large sugar lab. It is estd. that the final av. error in detg. the apparent purity may be 0.28 to 0.34, these being the sums of the probable relative errors of the several observations. Methods are given to reduce the different errors to a minimum.

T. MARKOVITS

Deterioration of raw sugar in storage. VII. WM. L. OWEN. *Facts about Sugar* 20, 760-3(1925); cf. C. A. 19, 3030.—Deterioration in stored raw sugars is prevented by inoculating them with torulae. VIII. *Ibid* 802-4, 856-8.—Methods for the inoculation of raw sugars with torulae as a preventative against deterioration. O. gives the advantages of the inoculation and concludes that the deterioration of raw sugars can be prevented by their protective inoculation with torulae. Sugars filmed with inoculated molasses are safer with a non-sucrose moisture ratio of 2 to 1 than are uninoculated sugars with a ratio of 3 to 1 as prescribed by the factor of safety. IX. *Ibid* 930 1.—The bacteriological control of raw-sugar factories, the estn. of microorganisms in raw juice and the detn. of special groups of organisms are described. The plate method of quant. analyses of bacteria is given. X. *Ibid* 946-7.—Bacteriol. control in the sugar factory and methods for detn. of microorganisms in sirups and sugars.

T. MARKOVITS

The use of chlorine in the refining of sugar. SHUICHIRO OCHI. *Trans. Am. Electrochem. Soc.* 49, (preprint)(1926).—It is shown that the chlorination process, in combination with the treatment by activated charcoal, is practical for sugar refining. The following has been found experimentally: The coeff. of the velocity of inversion of sugar in Cl water is about half the value in HCl of equiv. concn., at the outset of the inversion, and approaches the value of the equiv. HCl in the course of the inversion. The presence of molasses retards the velocity of inversion by Cl water or HCl. The bleaching action of Cl is not very effective with cane juice, but the chlorinated juice can be bleached easily by the subsequent treatment with activated charcoal. Cl has an efficient action in pptg. the suspended matters in cane juice, and this reaction occurs at a p_H value of 3.5 to 4.0 for the chlorinated juice. At the same time gums and pectins sep. out with the suspended matter. The bleaching action of Cl on the sirup of raw sugar is effective up to 80 to 90% of the original color depth. A bleaching beyond 95% is almost impossible in a short time. The sirup which contains free Cl even once neutralized, turns alk., and is colored dark in the course of the evapn. The use of activated charcoal subsequent to the chlorination, instead of chlorination only, saves a portion of the Cl, and a complete bleaching and neutralization can be obtained.

C. G. F.

• **Comparison of a vacuum quadruple- and a triple-pressure-effect evaporator for sugar juice.** F. STAUDINGER. *Z. Ver. deut. Zuckerind.* 1925, 367-82; cf. C. A. 19, 1787.

E. J. C.

Are special evaporator constructions necessary for pressure evaporation? H. CLAASSEN. *Centr. Zuckerind.* 34, 174-5(1926).—Such constructions as the Vimek Turek are supposed to prevent discoloration but C. holds that the time of contact of juice in them is no shorter than in a standard evaporator of the same size. There is no need for special constructions.

W. L. BADGER

Boiler plant instruments. R. B. WILLIAMS. *Facts about Sugar* 21, 280-1(1926). The installation and use of the CO₂ recorders and other instruments as steam flow meters, draft instruments, pressure indicators, coal meters, pyrometers and other indicating instruments in sugar houses.

T. MARKOVITS

A graphic chart for the pan floor. J. F. VOORWIJK. *Facts about Sugar* 21, 252-3(1925).—A scheme for solving graphically the problems involved in laying out the pan work of a boiler house giving the graphic detns. of the quantities of seeding grain, thick juice, and sirup taken into the boiling pan.

T. MARKOVITS

The Lawaczek viscometer as a control instrument for the dextrin industry. A. STIRNUS AND W. EKHard. *Z. Spiritusind.* 49, 40-1(1926).—A description of the

instrument and its use in detg. the dextrin content of solns. is given. The results obtained are expressed in abs. viscosity units.

Research work on dextrose and levulose. F. BATES. *Facts about Sugar* 21, 250-1 (1925).—Progress of the investigations of the Bur. of Standards on the problems of the manuf. of dextrose and levulose.

Our (Bulgarian) sugar beets. M. STEFANVOA. *Rev. inst. recherches agron. Bulgarie* 3, 539-52 (1925).—This is the report of a series of sugar analyses on 160 samples of beets from the crop of 1924 in Bulgaria. The heaviest section of the beet contains the most sugar, the light lower section of the root the smallest amt. of sugar.

Ways to dispose of sugar beet factory wastes. ANON. *Nation's Health* 7, 776 (1925); *Pub. Health Eng. Abstrs.* Dec. 26, 1925.—Results of expts. on the treatment of sugar beet factory wastes are given.

Nitrogenous substances in beet molasses. E. PARISI. *Ann. chim. applicata* 15, 555-68 (1925).—The only work of importance on the N compds. of beet molasses is that of Ravenna (*Ann. soc. agrar. prov. Bologna* 62, 157 (1912)) who detd. the total N, NH_3 , nitrates, protein, amides and amino acids. The present work includes detns. of N in various groups of compds. Such detns. are of importance because of the differing physiol. effects of the various groups of N compds. and their potential value in various ways. For this purpose a method was devised for sepg. the different groups. The % yields are based on the wt of original molasses. To molasses (100 g.) dild. with H_2O were added alternately in small portions 25% aq. $\text{Hg}(\text{OAc})_2$ and 10% aq. Na_2CO_3 until the white ppt. became yellowish red. The liquid (which should be neutral or alk.) was dild. with 5 vols. of EtOH , let stand 24 hrs., filtered and washed. The ppt. contained the amino and diamino acids, hexonic and purine bases; the filtrate and wash water the inorg. N, betaine, etc. The Hg ppt. when decompl. in H_2O with H_2S , filtered, the filtrate concd. to a blackish sirup and dild. (to 200 cc.) gave 1.19% total N and 0.40% amino N. The remaining liquid on treatment with aq. neutral $\text{Pb}(\text{OAc})_2$ and decompl. of the ppt with H_2S gave 0.041% N. H_2SO_4 was added to the filtrate from the Hg ppt until the soln was 5% concd., the soln filtered and to the filtrate (200 cc.) was added pure phosphotungstic acid (30 g.), the liquid warmed, let stand 48 hrs., filtered, the ppt. washed with a soln contg. H_2SO_4 (5 g.) and phosphotungstic acid (2.5 g.) in 100 cc. H_2O , intimately mixed with powd. $\text{Ba}(\text{OH})_2$, hot satd. aq. $\text{Ba}(\text{OH})_2$ (50 cc.) added, let stand, washed by decantation 5 times with satd. aq. $\text{Ba}(\text{OH})_2$, finally digested with hot aq. $\text{Ba}(\text{OH})_2$ and filtered. The alk. liquors were neutralized with H_2SO_4 , filtered, the excess H_2SO_4 was neutralized with $\text{Ba}(\text{OH})_2$, filtered, satd. with CO_2 and concd. *in vacuo* (to 200 cc.) The N pptd. by phosphotungstic acid was 0.20%. The remaining liquor was acidified with H_2SO_4 , evapd. (to 50-60 cc.), and hot satd. Ag_2SO_4 added until a drop of supernatant liquid gave no ppt. of Ag_2O with aq. $\text{Ba}(\text{OH})_2$. The ppt. could not be identified. The filtrate from the Ag-purine base ppt. was satd. with solid $\text{Ba}(\text{OH})_2$, filtered after 48 hrs. and both ppt. and filtrate were freed of $\text{Ba}(\text{OH})_2$ by H_2SO_4 and of Ag_2SO_4 by H_2S . In the liquids were found 0.07% total N in the lysine fraction and 0.09% total N in the arginine + histidine fraction. The filtrate and wash water from the phosphotungstic acid ppt. on addn. of $\text{Ba}(\text{OH})_2$ until alk., filtering, washing, satg. the filtrate with CO_2 and concg. *in vacuo* (to 100 cc.) gave 0.56% total N and 0.25% amino N in the monoamino-acid fraction. Acidification of the remaining soln. with H_2SO_4 pptd. tyrosine. The filtrate when neutralized with $\text{Ba}(\text{OH})_2$, let stand *in vacuo* over H_2SO_4 , the sirup extd. with cold, then with hot BuOH , evapd. *in vacuo* yielded leucine. The filtrate from the compds. pptd. by the Neuberg reagent freed of Hg by H_2S gave on concn. a thick clear yellow sirup, showing 1.02% total N, 0.36% basic N and traces of amino N. The soln. was acidified (Congo red) with HCl , concd. *in vacuo* to a cryst. paste and extd. with boiling EtOH (350 cc.). The part insol. in EtOH contained 0.15% total N. The EtOH ext. concd. *in vacuo*, hot satd. alc. HgCl_2 (200 cc.) added, let stand 1 week, filtered, the ppt. (9.5 g.) washed with EtOH and crystd. from boiling H_2O gave the compd. $\text{C}_{11}\text{H}_{17}\text{NO}_2 \cdot \text{HCl} \cdot \text{HgCl}_2$, m. 230°. More (21 g.) was recovered by concg. the mother liquors almost to dryness *in vacuo*. This compd. treated in H_2O with H_2S , filtered, evapd. to dryness *in vacuo* gave a cryst. compd. (1.7 g.), m. 245°; hydrochloride, m. 245°; chloroplatinate, needles m. 256°. The preceding compd. was proved by its picrate (m. 182°) and by vol. detn. of its HCl to be betaine, though the m. p. of the hydrochloride (*loc. cit.*) was different from that in the literature (227.8°) and the chloroplatinate was very stable in the air (previous work showing it unstable). Forty-six references to work bearing on the subject are included.

Annual report of the Gurdaspur Agricultural Station for the year ending 30th June

1924. M. S. ALI. *Rept. Operations Dept. Agr. Punjab* 1, Part 2, 1-45 (1925); cf. C. A. 19, 3169.—Analyses of 23 varieties of sugar cane (1) at the commencement of the crushing season—end of Nov. 1923, (2) at the middle of the crushing season—end of Dec. 1923, and (3) in the latter half of Jan. 1924 are tabulated. In general the highest percentages of total solids, total sugars and sucrose, and the lowest percentages of glucose were found at the last period of analysis. No definite relation existed between the amt. of juice and the time of sampling but this figure did not vary greatly. The performance of cane mills and sugar centrifugals with different varieties of cane is shown. Notes on gur-boiling furnaces and sugar making in the Gurdaspur district are given. Better protection against termites was obtained by treating the cane sets with crude-oil emulsion or by spraying the furrows with kerosene before putting in the sets than by treating the sets with kerosene or solignum. Black ants were partially controlled by applying KCN solns. to the nests. K. D. JACOB

Studies on plant colloids. XVI. Behavior of the starch components toward iodine and their protective colloid action. M. SAMEC. *Kolloidchem. Beihefte* 21, 55-77 (1925); cf. C. A. 18, 2975.—Within wide limits the I color of the starch substance is independent of the mean molecular size. It is not influenced by coupling either with a phosphoric-acid-containing substance, with phosphoric acid, or with silicic acid. The cations bound by the amylophosphoric acid have no effect on the I color. There is no simple relation between the I color and the protective colloid action for gold. The amt. of I_2 taken up by the aq. soln. of the starch differs with the various grain constituents. With the same KI concn. amylo compds. absorb more I_2 than erythro compds. The I_2 adsorption of amylo compds. rises with rise in KI concn. till a max. is reached and remains there. It is not essentially changed by age until the time when coagulation becomes visible. It is lowered by heating the soln. to 120° . Increasing dispersion increases the I_2 absorption of amylo compds and *vice versa*. Amylopectin absorbs less I_2 than amyloamyloses. The absorption capacity of the sol obtained from amylopectin is smaller the longer the time of heating required for the prepn. of the sol. The I_2 -combining power of the erythroamyloses decreases with increasing molecular sizes. It is noticeably increased by KI, the I_2 complex, in contrast to that of the amyloamyloses, not being pptd. by excess KI. In general, the sol starches and dextrin absorb the less I_2 the smaller the mol. size. The amyloamyloses show a better protective colloid action for gold than the erythroamyloses. In general, the protective colloid action increases with increasing dispersion. M. BEBER

The rate of solution of sucrose in nearly saturated solutions (KUCHARENKO, NACHMANOVICH) 2. Velocity of crystallization of sucrose from pure aqueous solutions at 60° (KUCHARENKO, NACHMANOVICH) 2. The determination of invert sugar in the presence of sucrose (OFNER) 7.

Maple sugar cakes. A. BROWN. U. S. 1,576,084, March 9. Maple sugar cakes are placed on wire screens, in a container, treated with maple sirup which has been boiled to a temp. of about $107-110^\circ$ and then cooled to about $50-53^\circ$, and the mass is allowed to set for about 12 hrs.

Cereal sugar in loaf or block form. R. E. DALY. U. S. 1,575,975, March 9. Granular dextrose sugar as it comes from a centrifuge, with a moisture content of 12-14%, is subjected to a gradually increasing pressure in a mold (with pressures of 200-2000 lbs. per sq. in.), the compressed material is forced out of the mold and is placed in a drying chamber where its moisture content is reduced to 8-10%, and the cut into blocks.

29—LEATHER AND GLUE

ALLEN ROGERS

Chemical-analytical standards in leather manufacture. A. M. GOLDENBERG. *Collegium* 1926, 10-21.—Data are given, showing normal analyses of the various liquors and the skin and leather at different stages of manuf. The values for finished sole and upper leather contg. 18% H_2O are: ash 1.5 and 0.8%, fat 1.2 and 14%, sol. solids 14 and 8%, hide substance 34-36 and 36-37%, fixed tan 30-31 and 22-23%, yield 281-290 and 270-278, resp. I. D. CLARK

A chemico-histological study of leather manufacture. I. The structure and

properties of freshly flayed steer skin. H. G. TURLBY. *J. Am. Leather Chem. Assoc.* **21**, 117-56(1926).—Descriptions of histological technic and of the microstructure of steer hide, illustrated by 21 photomicrographs. J. A. WILSON

Further studies of quinone tanning. A. W. THOMAS AND MARGARET W. KELLY. *Ind. Eng. Chem.* **18**, 383-5(1926); cf. *C. A.* **18**, 3123.—In neutral soln. NaCl retards and Na₂SO₄ accelerates quinone tanning. Extn. of quinone leather with C₂H₅OH removes some combined quinone, more from undried than from dried leathers and more as the initial tanning took place in more strongly alk. solns. Quinone leather combines with very little gallotannin. J. A. WILSON

Comparison of chrome and vegetable leather. A. DEFORGE. *Halle aux cuirs* **1926**, 37-50.—A review of recent American work on phys. properties H. B. M.

Use of sulfurous acid in the tannery. B. KOEHLER. *Gerber* **52**, 35-7(1926).—The use of liquid SO₂ is advocated for soaking, deliming, pickling and in 2-bath chrome tanning, as a substitute for more costly materials. H. B. MERRILL

Synthetic tanning material from phenols and cellulose. E. KÁRPÁTI. *Chem. Rund. Mitteleuropa u. Balkan* **2**, 71-2(1925).—Equal parts by wt. of crude cresol and concd. H₂SO₄ are heated for 1 hr. on the water bath, and a quantity of cellulose or material contg. it, up to 40% of the wt. of the cresol, is added in small portions to the product at 50-60°, the mixt. being thoroughly stirred. The product is diluted with water to d. 1.263-1.285, and neutralized. A soln. d 1.022 contg. 1% of acid yields a soft, plump leather. B. C. A.

Behavior of synthetic tanning materials toward hide substance. EDWARD WOLESENSKY. *Bur. Standards Tech. Paper* No. 309, 275-87(1926); cf. *C. A.* **20**, 1336.—Syntans obtained by first sulfonating an aromatic compd. and then condensing the sulfonic acid with an aldehyde combine rapidly with hide substance, but to a limited extent, and the limit of combination and the time required to reach this limit are but little affected by the concn. of the soln. This class is suitable only for light leathers unless used in conjunction with other filling materials. The concn. should not exceed 4% nor the time 10 days or the result may be injurious. When the order of sulfonation and condensation with aldehyde is reversed, in the manuf. of syntans, a second class is obtained which possesses much greater filling power, requires a longer time to reach the limit of combination with hide substance, and has a limit of combination which is dependent upon concn. This class can be used for making sole leather and other heavy leathers without the aid of other tanning materials. Concns. greater than 6% and time longer than 4 weeks should not be employed. The destructive action of syntans on hide substance varies from nothing to complete destruction, depending upon how they are made and used, but no relation has yet been found between this behavior and other characteristics of the syntans. J. A. WILSON

Report of the activities of the Naples branch of the royal experimental station for the industry of hides and tanning materials. V. CASABURI. *R. staz. sper. ind. pell. mat. concianti* **1924**, 39-43. R. C. FUSON

Report of the activities of the Turin branch of the royal experimental station for the industry of hides and tanning materials. G. BALDRACCO. *R. staz. sper. ind. pell. mat. concianti* **1926**, 3-24. R. C. FUSON

The fluorescence test. OTTO GERNGROSS AND GEORG SANDOR. *Collegium* **1926**, 1-10; cf. *C. A.* **20**, 517.—Exts., other than quebracho and tizerah, which show fluorescence are donga, reddish in neutral, orange in alk. soln., and pine bark, maletto bark and sulfite cellulose ext., blue violet in neutral and grass-green in alk. soln. On bating, filter paper, etc. (cellulose) an intense yellow fluorescence is shown by quebracho, tizerah and mimosa, a faint yellow by chestnut and hemlock, an intense violet by pine bark and maletto, a faint violet by oakwood, a faint white by mangrove, a faint red by donga, and none by sulfite cellulose ext. The fluorescent substance is absorbed reversibly by hide powder and irreversibly by cellulose. I. D. CLARKE

Gonakie [Acacia arabica]. PAUL AMMANN. *Cuir tech.* **15**, 122-6(1926).—Description and analysis of bark and fruit. H. B. MERRILL

Leather japanning. W. T. LATTEY. *J. Oil Colour Chem. Assoc.* **9**, No. 68, 45-9(1926).—A review of old and modern practice. R. J. MOORE

Dyeing kid skins [for gloves]. LEON CHARVAT. *Ganterie: Halle aux cuirs* **1926**, 57-9.—A description H. B. MERRILL

Experiments on the extraction of chromium from tanned leather by means of Seignette salt (sodium potassium tartrate). L. MASNER AND N. J. BIKESTOVJ. *Chem. Listy* **19**, 391-4(1925); cf. *C. A.* **19**, 3385.—Cr can be extd. from tanned leather scrap by means of any salt or acid that forms an inner complex with it. The extn.

is always incomplete. To obtain the best results a temp. of 80–100° is necessary, with about 1.5 g. of Seignette salt per g. of leather; with the same amt. of salt, the extn. is more nearly complete the more dil. the soln.

F. C. KRACKK

Polluted atmosphere a factor in the deterioration of bookbinding leather. F. P. VEITCH, R. W. FREY AND L. R. LEINBACH. *J. Am. Leather Chem. Assoc.* **21**, 156–76 (1926).—The parts of bindings exposed most to air, such as the back, were deteriorated to a much greater extent than parts less exposed, as the sides, and the parts most deteriorated showed the highest percent of H_2SO_4 . Since many of the bindings examd. were kept in rooms not lighted by gas, the accumulation of acid may be attributed to the atm. of the city at large.

J. A. WILSON

Use of the Cl gas process in the paper industry [tanning materials from waste liquor] (CONSIGLIO) **23**.

Drying gelatin. H. W. LUSHER. U. S. 1,575,348, March 2. Filtered air for use in the drying is divided into 2 portions, one of which is heated and the other of which is passed through an ozonizer. These sep. portions are then mixed before being brought into contact with the gelatin.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The chemistry of rubber. W. J. KELLY AND H. A. BRUSON. *J. Chem. Education* **3**, 253–66 (1926).—A review.

E. H.

The work of the Bureau of Standards on rubber. C. E. WATERS. *J. Chem. Education* **3**, 291–5 (1926).

E. H.

Elastic hysteresis and its importance in connection with the colloidal structure of rubber. HEINRICH FEUCHTER. *Kautschuk* Dec., 1925, 6–10; cf. Feuchter, *C. A.* **20**, 1149.—On stretching raw rubber to 1500% and then allowing it to recover at different temps., the permanent elongation decreases with increase of temp., the temp. permanent elongation curve being S-shaped and resembling the stress-strain curve of the same rubber. This similarity between the curves indicates that heat and mech. work have similar effects and suggests that the elasticity of rubber is a thermodynamic function of its structure. This in conjunction with the Thomson-Joule effect shows that in any rubber system, mech. work can to a certain extent be transformed into elastic strain or into heat and *vice versa*. The heat effect of this reversible colloid reaction is due to a change in the latent internal stresses, and the elasticity is a phys. result of a dynamic 2-phase system, involving changes from the colloidal to the cryst. state and *vice versa*. The relation between elasticity and temp. can also be shown by stretching raw rubber at different rates to rupture, in which case the ultimate elongation increases with the rate of stretching. This is an instance where there is both a dynamic and a thermal (reversible) reaction to the mech. force, the relative values of which depend upon the rate of stretching. This also involves a limiting state, *i. e.*, a max. anisotropy, where the rubber is characterized by a max. thermally reversible state of strain. The other limiting state is that of completely plasticized rubber, where there is a max. irreversible plastic displacement of particles and permanent elongation without internal stress. The anisotropic condition is essentially an assumption of a rigid mol. condition or crystn., and it is characterized by covalent forces and a reversible liberation of heat. The limiting state of plasticity is characterized by disintegration of a solid mol. structure or of crystallizates, which bears some close relation to chem. depolymerization, and is accompanied by a valence stress and an irreversible liberation of frictional heat. The progressive changes in elasticity represented by the hysteresis effect involve not only colloidal reactions, but a process analogous to changes in entropy, where the isotropic unplasticized rubber is transformed progressively through a max. to a min. elasticity.

C. C. DAVIS

The structure of elongated samples of rubber. E. A. HAUSER AND H. MARK. *Kautschuk* Dec. 1925, 10–1.—A preliminary note. Quant. measurements of the interference phenomena described by Katz (*C. A.* **19**, 2144, 2424, 2759) indicate that the position of the interference points is independent of the degree to which the rubber is elongated, but that their intensity increases approx. in proportion to the elongation.

The position of the amorphous ring is also independent of the elongation, but its intensity decreases with increase in elongation. It was also proved that the axes of the crystals formed on elongation rubber lie parallel to the direction of elongation (cf. Katz, C. A. 19, 2144). The interference points also resemble those caused by a true crystal structure in that the sines of their half angular distances from the primary ray increase in exact proportion to the wave length applied. The crystal lattice is apparently of rhombic tetragonal form with definite lateral dimensions. With increase in temp. the intensity of the interference points in elongated rubber varies directly with the ability of the rubber to recover its original length. When, however, the rubber is completely recovered the interference points disappear. If, on the contrary, the elongated rubber is cooled to -4° the intensity of the interference points remains unchanged. After sufficient mastication, rubber no longer exhibits interference phenomena on being elongated. C. C. DAVIS

The Pregl microanalytical determination of nitrogen in rubber (Dumas method). HANS WELLER. *Gummi-Ztg.* 40, 1198-9 (1926).—An accurate method for detg. the % N in rubber mixts. is of potential value in that it offers a means of controlling the uniformity with which an org. accelerator is incorporated in the mixt. Special precautions are necessary if the Pregl method (cf. Pregl, *Die quantitative organische Mikroanalyse*, Berlin) is used, because of the high C content. It is shown to be accurate to about 1% in detg. the N of nitrogenated org. compds. and, therefore, may be of use in testing the purity of an accelerator itself. In detg. the N of rubber mixts., 9-25 mg. of sample should be taken (corresponding to about 0.7-0.2% N). To avoid too rapid combustion and yet for the latter to be complete, the sample should be a uniform strip and should be buried in 0.5 its wt. of KClO_4 . Weighing should be to 0.001 mg. and combustion should extend over 25-35 min. In other respects the regular Pregl method may be followed. The method is accurate enough to show variations in the N content of rubber mixts. in which the org. accelerator is not uniformly incorporated. Thus inhomogeneous mixts. showed in different locations 0.50 and 0.57, 0.69 and 0.75, 1.56 and 1.62% N. Combustion without KClO_4 gave values less than 0.5 those with KClO_4 . C. C. DAVIS

Dental rubber. KATH. *India Rubber J.* 71, 312-3 (1926).—A description of the manuf. and use of dental cements and hard rubbers, with typical formulas of red and pink compds. C. C. DAVIS

Behavior of various tire stocks by various aging methods. W. W. VOGT. *Ind. Eng. Chem.* 17, 1197 (1925).—Correction by J. M. Bierer. See C. A. 19, 3172. H. G.

Further developments and applications of the Bierer-Davis oxygen aging test. J. M. BIERER AND C. C. DAVIS. *Ind. Eng. Chem.* 17, 1197 (1925).—Correction by J. M. Bierer. See C. A. 19, 3172. H. G.

Rubber fertilizer experiments at the experiment station, Petadeniya (HOLLAND) 15.

Measurements of Quality of Factice. Stamford, Conn. The Stamford Rubber Supply Co. 21 pp. Reviewed in *Rubber Age* 18, 358 (1926).

Hard rubber articles. J. F. JOHNSTON. U. S. 1,574,658, Feb. 23. A "blowing agent" is incorporated in rubber compns. for making molded articles, the articles are molded slightly smaller than final size and then heated in a vulcanizing mold of the desired final size and expanded to fit the mold.

"Age-resisting" rubber composition. E. W. FULLER. U. S. 1,573,928, Feb. 23. An alkali or alk. earth salt of α -nitroso- β -naphthol is added in the proportion of about 1%, or less to rubber compns. which may also contain ZnO , S and accelerators.

Vulcanizing rubber. N. A. SHEPARD AND S. KRALL. U. S. 1,576,072, March 9. A small proportion of a reaction product of an aldehyde ammonia with a mustard oil is used as an accelerator.

Vulcanized rubber. H. A. MORTON. U. S. 1,574,676, Feb. 23. A mixt. of rubber, S and accelerator is calendered into a sheet, an activator is applied to the surface of the sheet, it is then rolled on itself and cured.

Accelerators for rubber vulcanization. P. M. PAULSON. U. S. 1,575,806, March 9. Mono-*o*-tolylguanidine or other compds. of the general formula $\text{R-N(R')-C(NH)-NH}_2$ are used as accelerators.

Accelerators for rubber vulcanization. C. S. WILLIAMS. U. S. 1,575,884, March 9. Monophenylguanidine or other compds. of the general formula $R-N(H)-C(NH)-NH_2$ are used as accelerators.

Manufacture of rubber-coated weftless-cord fabric. A. GESSNER, JR. U. S. 1,573,390, Feb. 16. Mech. features.

Apparatus for making balls or other hollow rubber articles. F. T. ROBERTS. U. S. 1,574,113, Feb. 23.

Forming balls or other hollow rubber articles. F. T. ROBERTS. U. S. 1,574,060, Feb. 23. Mech. features.

CHEMICAL ABSTRACTS

Vol. 20.

MAY 20, 1926

No. 10

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Little things in chemical apparatus? A. E. *Tech. Ind. Schweiz. Chem.-Ztg* 1925, 181-9, 203-12(1925).—A discussion, with 32 cuts, of the right and wrong positions of welded seams, shapes of enameled app., location of gages, thermometers, etc., faulty designs of enameled mixers, steam-jacketed vessels and vacuum pans, liquid seals, pumps, etc. J. H. MOORE

New porcelain apparatus for the laboratory. KURT THURMANN. *Oesterr. Chem.-Ztg* 29, 28-9(1926).—A *Buchner funnel* fitted with a jacket, cast integral with the funnel, serves for hot or cold filtrations. Dark blue or white *glazed porcelain plates* find use in testing dry colors by rubbing in oil. A *crucible* for ashing oils and fats is barrel-shaped to avoid loss by spattering. An *evap. dish* has the upper edge constricted to minimize creeping. An *insert for desiccators* has 6 sectors, of triangular shape, constricted at the base, which afford support for crucibles of any size. T. S. CARSWELL

Mechanically recording differential dilatometer. P. CHEVENARD. *Rev. métal.* 23, 92-9(1926).—The Chevenard differential dilatometer (*Rev. métal.* 14, 610(1917); cf. *C. A.* 11, 2743), originally designed for recording photographically, has been modified to give a mechanically produced record. The new instrument is described, and a no. of curves obtained with it are given and discussed. A. PAPINEAU-COUTURE

Rotary air (and vacuum) pump for laboratory work. ANON. *Engineering* 120, 816-7(1925).—3 figs. DONALD W. MACARDLE

A laboratory pump for the circulation of gases. W. FRANCIS. *Fuel in Science & Practice* 5, 39-40(1926).—The action depends upon the motion imparted to a glass piston in a glass tube by a solenoid acting on a soft iron tube enclosed within the piston. The pump is in a vertical position, and when the circuit is made and broken by a pendulum the piston alternately rises by attraction to the solenoid and then falls. During the upward motion a valve at the top closes and a lower valve opens, allowing gas to be drawn in below the piston. When the latter falls, the valves reverse and the gas displaced by the piston flows through the system. The app. is illustrated and various precautions and refinements are described. C. C. DAVIS

A new spiral gas-washing bottle. L. H. MILLIGAN. *Science* 63, 363-4(1926). E. H.

Storage of small quantities of gas at low pressures. J. J. MANLEY. *Proc. Phys. Soc. London* 38, 129-31(1926).—An elaborate *app.* for storing rare or highly purified gases to avoid contamination of air. The gas is delivered to the reservoir by a Sprengel pump, and restored to the exptl. plant by means of barometric traps. A. W. F.

A simple method of preparing ultrafilters. E. MÜLLER. *Kolloid-Z.* 37, 237-8(1925).—The app. consists of 2 glass vessels, *A* and *B*. *A* is fitted with a ground-glass cover and a 2-hole stopper through the opening near the top and designed to hold an easily removable glass framework holding 8 filters. *B* is an ordinary bottle of suitable size fitted with a 2-hole stopper. *A* and *B* are connected with glass tubing, 2 one-way and one 3-way cock all joined together with pressure tubing so that the soln. of colloidion or gelatin can be interchanged between *A* and *B* by alternating air pressure with a vacuum produced with a H_2O pump. H. M. McLAUGHLIN

The temperature of vapor from a solution. K. SCHREBER. *Chem. App.* 13, 13-4, 44-5, 53-5(1926); 3 cuts.—The app. is described by which results were obtained in substantial agreement with those of Möbius. Cf. *C. A.* 18, 1601; 19, 1518, 1806. J. H. MOORE

An improved form of Schiff's nitrometer. R. B. FORSTER. *Chemistry & Industry* 45, 55(1926).—In the usual type the tube is of uniform bore and is graduated from 0 to 100 cc. by $\frac{1}{2}$ cc. The lower part is useless since the N should pass through a considerable height of KOH. Also the graduations on the part used are not fine enough. The instrument is improved by making the lower portion of somewhat greater bore and

ungraduated, while the upper part is graduated from 0 to 25 cc. by 1/10 cc., this without increasing the height of the app. M. A. YOUTZ

The installation of electrical temperature-measuring instruments. MAX MOELLER. *Siemens Z.* 6, 65-72(1926).—Mechanical and elec. measurements are made technically more accurately than those of temp., chiefly because of difficulties involved in installing instruments for the latter purpose. Errors due to cond. of materials of construction, heat transference from gas to tube of thermometer, the protective tube, depth of insertion into heated space, temp. difference between gas and the tube wall, radiation losses, etc., are discussed. Actual detns. on temps. of steam in pipes and of air (still or in quiet motion) under thermostatic control were conducted, and the conclusion was reached that with a correct installation, proper choice of materials of construction and dimensions of the instruments and their jackets, accurate measurements are possible. Special attention is demanded by the cond. of the protective tube and its connections, wall thickness and resistance to corrosion. W. C. EBAUGH

Improvements in mechanical apparatus relating to the Butters filter plant. A. H. DAVIDSON. *J. Chem. Met. Soc. S. Africa* 25, 214-23(1925). H. C. PARISH

Mammoth agitators. STEEN. *Chem.-Ztg.* 50, 18-20(1926).—Mammoth agitators employ the principle of a particle falling a long distance through a liquid contained in a cylinder of comparatively small area. The cylinder may be closed to prevent escape of volatile products, and the operation may be maintained with mixts. under high pressure. The cylinders or towers are often built in series with automatic feed from one to the other, thus decreasing the total height required. Air-lift pumps move the materials with economy and ease. The distance through which a particle is allowed to fall is regulated by the time required for its soln., disintegration, etc. Operations requiring counter-currents are easily conducted. Illustrations are given for agitators working at 40 atms. for converting H into hydrocarbons, the operation requiring 3.5 hrs. in comparison with 17 hrs. by the old method. Other forms of app. for treatment with CO₂, Cl, HCl, soln. of salts, prepn. of cement slurry, etc., are described. W. C. E.

Cut-off device for leaky valves. M. B. *Apparateurbau* 38, 52-3(1926); 1 cut.

J. H. MOORE

Pressure apparatus for conveying slimy products. M. BERGER. *Apparateurbau* 38, 50-1(1926); 1 cut.—A pump using compressed air. J. H. MOORE

A compressed air de-oiler. CONSTANTIN REDZICH. *Apparateurbau* 38, 51-2(1926). 3 cuts.—The Buhring separator. J. H. MOORE

The Jung automatic feeder (as patented by Dallwitz-Wegner) and its use in saccharin manufacture. E. BELANI. *Chem.-Ztg.* 49, 877-9(1925).—The Jung automatic feeder consists of a plunger working in a sleeve, with a discharge pipe at the top. The downward thrust of the plunger is controlled by clockwork, or by a thermometer, so that a definite feed of liquid can be obtained. It finds use in feeding SO₃HCl and PhMe in the production of MeC₆H₄SO₃Cl, and in feeding KMnO₄ in the oxidation of MeC₆H₄SO₂NH₂. A complete description of the technical saccharin process is given. T. S. CARSWELL

Two new monochromators with preliminary separation (double monochromators for the visible and ultra-violet regions. CARL LEISS. *Z. Physik* 34, 103-8(1925). H. C. UREY

Practical form of photo-electric photometer. C. H. SHARP AND C. KINSLEY. *Trans. Illum. Eng. Soc.*, Feb., 1926; *Elec. World* 87, 823(1926).—One of the difficulties in the way of using a photo-elec. cell in a photometer is that no form has yet been produced which has the same color sensitivity curve as that of the eye. However, by the use of suitable color filters comparisons can be made of lights differing in color within certain ranges. A second difficulty is the fact that the current set up by a cell is extremely small—on the order of 0.02 microampere with 100 volts on the cell and 1 foot candle illumination—and its resistance is extremely high, e. g., 5000 megohms in the case mentioned. This suggests the use of a triode amplifier if the indicating instrument is not to be excessively sensitive. In both the earlier and later forms of the photometer, now fully described, a single cell was used in order to avoid the effect of a possible dissimilarity. The cell was exposed alternately to one and the other of the light sources to be compared—that is, by a balance method, as in visual photometry. The principle of the final form of the instrument is shown in a diagram. C. G. F.

IHERING, ALBRECHT: Maschinenkunde für Chemiker. 3rd ed. revised. Leipzig: Joh. Ambr. Barth. 348 pp. R. M. 16.

Acetylene generator. J. L. BRILLANTES. U. S. 1,579,856, April 6.

- Acetylene generator.** I. M. HACKNEY. U. S. 1,578,725, March 30.
- Laboratory apparatus for generating hydrogen, carbon dioxide or other gases.** D. L. WARRICK. U. S. 1,578,942, March 30.
- Apparatus for carbonating water or other liquids.** A. M. HORN and W. T. FARROW. U. S. 1,580,085, April 6.
- Apparatus for treating solutions containing metal-bearing liquids with precipitating gas or for treating other liquids with gases.** W. E. GREENAWALT. U. S. 1,579,355, April 6.
- Apparatus for automatic analysis of flue gases, etc.** L. YOUNG and G. W. RUGGLES. U. S. 1,578,697, March 30.
- Apparatus for determining temperatures by carbon dioxide content of combustion gases.** F. D. POTTER. U. S. 1,577,853, March 23.
- Washing and charging filters for air.** J. H. FEDELER. U. S. 1,577,703, March 23.
- The top and bottom of filter material such as that used for filtering air are alternately subjected to a spray of H_2O and a spray of viscous material.
- Air-cooled water still.** E. C. BALLMAN. U. S. 1,577,675, March 23.
- Apparatus for solidifying carbon dioxide.** T. B. SLATE. Brit. 237,681, May 23, 1924.
- X-ray target.** H. C. RENTSCHLER. U. S. 1,579,779, April 6. A target for X-ray tubes has a focal spot of Th, U or similar material of high atomic wt. surrounded by a material such as Cr or Ti of low atomic wt. and having a m. p. above 1500. The contiguous surfaces of the 2 materials are sintered together.
- Permeable membranes for dialyzing.** J. M. LOONEY. U. S. 1,576,523, March 16.
- Nitrocellulose is mixed with alc. and dissolved by further addition of ether, a H_2O -sol ester such as EtOAc is added to the soln. and it is spread and the solvent removed to form a dialyzing membrane.
- Apparatus for feeding regulated quantities of chemicals to steam boilers or other apparatus.** J. L. HUGHES. U. S. 1,576,911, March 16.
- Electric discharge tubes.** EDISON SWAN ELECTRIC CO., LTD. Brit. 237,923, Aug. 1, 1924. Disintegration of the cathode and noises in speech reproduction due to gas ionization are diminished by including very small quantities of electropositive gas such as H (partly occluded in the electrodes and walls of the tube). Brit. 237,924 specifies tubes contg. Na, K, Rb, Ca, Ba or Sr to absorb gas and facilitate formation of electrons and positive metal ions. The metals are deposited in the form of mirrors.
- Absorption apparatus adapted for vapor recovery.** C. I. VORESS, R. W. SKROOG and V. C. CANTER. U. S. 1,577,200, March 16.
- Heat exchange apparatus adapted for heating viscous oils.** R. C. JONES and J. PRICE. U. S. 1,578,830, March 30.
- Magnetic separator for removing articles of iron and steel from loose flowing materials.** R. GREAVES. U. S. 1,579,354, April 6.
- Radon tube or implant of intense color and ready visibility.** C. H. VIOL. U. S. 1,574,456, Feb. 23.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND BRIAN MEAD

- Emil Warburg, his eightieth birthday.** E. GRUNEISEN. *Naturwissenschaften* 14, 203-7 (1926).—A short biography with portrait. **Emil Warburg and technical science.** H. SCHERING. *Ibid.* 208-11.—Biographical. B. J. C. VAN DER HOEVEN
- Chemistry and pure science.** B. B. BOLTWOOD. *Science* 63, 345-7 (1926). E. H.

The importance to chemical theory of a knowledge of the physical properties of substances. F. G. KEYES. *Nucleus* 3, No. 7, 5-9 (1926). E. H.

Daltonian and non-Daltonian compounds. A. GLAZUNOV. *Chem. Listy* 19, 339-45 (1925).—G. defines a chem. individual as a result of chem. action such that it has chem. and phys. properties peculiar to itself alone; these properties bear no definite relation to the properties of the constituents of the individual. Chemical individuals can be classified into (1) those that have singular points on property-composition curves, and (2) those that show a smooth variation of a given property with composition. Under (1) may be classified all ordinary chem. compds., they follow the law of simple and multiple proportions, etc. As example, consider the m. p. of mixts. of Na and Cl. At the composition corresponding to NaCl there is a singular point, the m. p. of NaCl. It is not exactly clear what substances G. intends to classify under (2), but the idea may

be illustrated by the system Fe + S. In this system FeS dissolves up to 4% Fe in the solid state. This solid soln. is a distinctly homogeneous phase of variable compn. G. calls individuals of the first kind *dallomides*, those of the second kind *bertholides*.

F. C. KRACKH

The compression and decomposition of nitric oxide. E. BRINER, H. BIEDERMANN AND A. ROTHEN. *J. chim. phys.* 23, 157-75(1926).—See *C. A.* 20, 685. R. L. D.

An X-ray examination of *i*-erythritol. W. G. BURGERS. *Phil. Mag.* [7] 1, 289-303(1926).—Erythritol $(CH_2(OH)CH(OH)CH(OH)CH_2OH)$ has two asym. C atoms, although linked with the same groups in both cases. The compd. is thus comparable with tartaric acid. The object of the investigation is to det. by means of X-rays whether a difference in spatial arrangement of the group about the asym. C atoms could be detected. The symmetry is tetragonal-bipyramidal. The body-centered unit cell contains 8 mols. The crystal mol. must have two-fold symmetry, either a center or a two-fold axis. The X-ray evidence leads to the conclusion that the crystal mol. is centrosym. The crystallographic configuration, therefore, confirms that already assigned by stereochemistry.

S. C. LIND

The structure of thin films. VII. Critical evaporation phenomena at low compressions. N. K. ADAM AND G. JESSOP. *Proc. Roy. Soc. (London)* 110A, 423-41 (1926); cf. *C. A.* 19, 759.—By means of a new app., accurate measurements of the surface pressure of monomol. films have been made at room temp. down to 0.01 dyne/cm. At areas greater than 5000 A. U. per mol., the pressures exerted by films of insol fatty substances tend to a value within 25% of that given by the equation $Fa = RT$, where F = force in dynes/cm., a = area per mol. in sq. cm., and R = gas const. The exptl difficulties of measurement at these areas are so great that the divergences from the theoretical values are within exptl. error. Between 100 and 5000 sq. A. U. the pressure-area isothermals closely resemble those for liquid and vapor in 3 dimensions. With longer chains in the mol. there is a horizontal "vapor pressure" region, ending on the one hand in an imperfect gaseous film; on the other hand, in either the condensed or expanded type of film. When the chains are shorter, a condition which corresponds to a higher temp., the "vapor pressure" region disappears, and the films are above their "critical pt." Expanded films are analogous to liquids, not vapors, and there is considerable cohesion between the mols. in them. The heats of two-dimensional evapn. from expanded to gaseous films are of the same order of magnitude as the heats of spreading, from bulk to a condensed film, on a water surface. The evidence, although not complete, indicates loss of orientation in expanded films.

J. H. PERRY

The modifications of amorphous carbon. F. J. NELLENSTEYN. *Chem. Weekblad* 23, 134-5(1926); cf. *C. A.* 19, 3188; 20, 774.—A reply to Honigs criticism (*C. A.* 20, 1132).

B. J. C. VAN DER HOEVEN

The five alkali metals under high pressure. P. W. BRIDGMAN. *Phys. Rev.* 27, 68-86(1926).—New data are given for the effect of high pressure on the m. p. of Rb and Cs. The results of a comparative study of the effect of pressure on the m. p. elec. cond. and vols. of the five alkali metals are given and discussed. Numerically the compressibility is of the order of magnitude of that of a perfect gas under high internal pressure with the electron as the gas unit.

D. C. BARDWELL

Theories of passivity (of metals). H. GERDING AND A. KARSSSEN. *Z. Elektrochem* 31, 135-43(1925).—A crit. survey of the theories of the passivity of metals. The theories are classified under the headings: purely phys., purely chem. and physico-chem. That due to Smits (*C. A.* 9, 3015) by an extension of his theory of allotropy is received the most favorably, since it explains in addn. the phenomena of polarization and overvoltage.

B. C. A

Method of producing monocrystalline metals. I. V. OBREIMOV AND L. V. SHUBNIKOV. *Trans. Phys. Rech. Lab. Leningrad* 100, 21-4(1925).—A modification of Tamman's method; single crystals of Sn, Bi, Pb, Cd, Zn, Sb, Al, Mg and Cu in various sizes from 1 to 30 mm. in diam. and up to 30 cm. long have been obtained. The essential point in the new method is to draw the test tube into a capillary end where a small crystal of the metal is placed as the center of crystn. The cooling of the molten metal in the test tube is started from the capillary end and is allowed to proceed gradually upwards.

R. PIROOMOV

The question of existence of critical density. K. SHAPOSHNIKOV. *J. Russ Phys.-Chem. Soc., Phys. Part* 56, 581-92(1924).—S. favors the hypothesis that the disappearance of meniscus at the crit. temp. is due not to the d. of the liquid and vapor becoming equal, but rather to the process of complete mixing between liquid and vapor which takes place when liquid and vapor have different d. A series of computed tables is given to substantiate this viewpoint.

R. PIROOMOV

Measurement of high vacuum. B. N. KLAYRFELD. *J. Russ. Phys.-Chem. Soc., Phys. Part 57*, 129-32(1925).—An elec. discharge in a capillary tube can be used for the measurement of high vacuum, the method being simple but not very accurate (within 50%). For this purpose 2 electrodes are soldered into the capillary tube of the McLeod gage and the pressure at which the discharge between the 2 electrodes takes place, is detd. by another gage. This happens over the range of pressure in the capillary from 0.05 to 0.005 mm. Hg, depending on the size of the capillary. Knowing the ratio to which the air in the gage is compressed, the original pressure of the gas can be detd. In this way it was found possible to measure the pressure down to 5×10^{-8} mm. Hg.

R. PIROOMOV

Production of high vacuum by means of Langmuir's pumps and its application to distillation of mercury. V. I. ROMANOFF. *J. Russ. Phys.-Chem. Soc., Phys. Part 57*, 124-8(1925).—I. Two Langmuir pumps placed in series and connected to a vessel of 3-5 l. capacity (serving for preëxhaustion) by means of 2 Hg taps, one after the first and the other after the second pump, reduce the use of the oil pumps for preëxhaustion only for starting purposes, since after being started the Langmuir pumps will keep up the necessary preëxhaustion for a very long time. II. The app. for distg. Hg uses the Langmuir pump and operates on the principle described above. It is automatic and continuous. With an energy source of 200-250 w. the production of the app. reaches 0.5-0.7 kg. Hg per hr.

R. PIROOMOV

The production and measurement of high vacuums. G. W. C. KAYE. *Engineering* 121, 240-1(1926).—An abstract of a historical address. The gases absorbed and adsorbed by the materials of the evacuating app. are gradually given off again and deterioration of the vacuum results. The highest measured vacuums obtainable are of order of 10^{-8} mm. (10^{-11} atm.).

W. H. BOYNTON

The determination of the vapor tensions of mercury, cadmium and zinc by a modified manometric method. C. H. M. JENKINS. *Proc. Roy. Soc. (London)* 110A, 456-63(1926).—In the method used, the substance under investigation is used as the liquid in the manometer which is used to indicate a balance between the vapor pressure of the substance and an externally applied pressure of N_2 . The measurement is made statically, the vapor being in contact with a free surface of the liquid. The substance is, therefore, not superheated at the time of measurement. The manometer consists of a tube, $\frac{1}{8}$ in. internal diam. and 18 in. long, bent into a 60° V. In the closed end of this V is sealed a thermocouple sheath, projecting into the tube $\frac{3}{4}$ in. The straight part of the tube is so arranged and heated that different portions of it act as a reflux condenser, an evaporator and a condenser for the metallic vapor. The furnace is mounted in a frame which permits of its rotation about two axes at right angles—circumferentially in the end plates and in a vertical plane about the trunnions. The temps. of the metal in the manometer was detd. by a Pt-Pt,Rh couple. The accuracy of the app. was checked by the detn. of the vapor pressures of Hg. The b. p. of Hg was detd. to be 357° . The accuracy of the pressure readings is approx 2 mm. and that of the temp. about 1° at 600° . A few of the data for each metal are given here: Cd: 503° , 15 mm.; 583° , 60; 645° , 159.5; 698° , 322; 756° , 672; 771° , 799; 804° , 1131; 836° , 1535. Zn: 629.5° , 19 mm.; 709° , 68; 778.5° , 183; 822° , 313; 880° , 589; 904° , 749; 918.5° , 853; 946° , 1104; 982.5° , 1517. The b. ps. of Cd and Zn were detd. to be 767° and 906° , resp. J. H. P.

Absorption of gases by a liquid drop. W. G. WHITMAN, LOUIS LONG, JR., AND H. Y. WANG. *Ind. Eng. Chem.* 18, 363-7(1926).—Absorption rates have been detd. for a drop of H_2O , falling freely through a gas for a distance of 52 cm. Results are given on CO_2 and NH_3 absorption and on humidification of air. The rate coeffs. are higher than those reported for absorption through flat liquid surfaces, from rising gas bubbles, or in wetted wall columns although the ratio of liquid film to gas film coeffs. is about the same.

L. A. PRIDGEON

The air-bubble viscometer. GUY BARR. *Phil. Mag.* 1, 395-405(1926).—The effects of length of bubble and diam. of tube have been examd. and the rates of rise detd. for several oils of known viscosity and surface tension, for water and for glycerol in different tubes. A dimensional analysis of the problem has been made involving certain assumptions which seem to be capable of verification, in any particular case from the appearance of the bubble. Above a certain limit the length of the bubble is without appreciable effect on the rate of rise. For bubbles rising "slowly" in a given tube, i. e., at such a rate that not more than one thickened annulus of liquid appears between the bubble and the walls toward the rear end of the bubble, it has been found that the rate of rise is inversely proportional to the kinematic viscosity, provided that the surface tension is const. An approx. detn. has been made of the form of the function of r/a upon which, in addition to the viscosity, the rate of rise depends. In certain

conditions, *e. g.*, when light oils are examd: in a tube of such a diam. as to give a convenient rate of rise, the rate may vary about 14 times as fast as the diam. and 6 times as fast as the surface tension, but these effects become very much less pronounced when viscous liquids are used in wide tubes. The air-bubble viscometer may be used with confidence for the approx. comparison of viscosities of materials of the same class. A simple modification is suggested which enables a check to be made on the assumed constancy of surface tension.

S. C. LIND

A new optical phenomenon shown by biaxial crystals. S. R. SAVUR. *Phil. Mag.* **50**, 1282-95(1925).—S. takes up the theory of the phenomenon observed by Raman and Tamma, namely, that a biaxial crystal plate suitably cut and oriented produces a real image of a bright object. New expts. confirming and illustrating the phenomenon under different conditions are described, and a mathematical treatment of the theory is presented. The predictions of the theory are given an exptl. test with satisfactory agreement.

S. C. LIND

The physical properties of binary liquid mixtures in the vicinity of the critical temperature of miscibility. N. PERRAKIS. *J. chim. phys.* **22**, 280-310(1925).—Over the whole range of immiscibility, the vapor pressure of binary liquid mixts. varies very little. The m. p. is hard to det. on account of viscosity and supercooling. Detns. on PhOH-EtOH (I), *o*-cresol-EtOH (II) and Ph₂O-EtOH (III) systems show a flat curve of temp. vs. concn. (III), indicating poor miscibility; and a steep curve (I and II), where the miscibility is greater. The systems C₆H₆ plus Me (IV) Et (V) iso-Pr (VI) and *n*-Bu (VII) ales show an increasing miscibility with increasing mol. wt. of the ale. A theoretical discussion leads P. to the conclusion that slightly below the crit temp. (a) the variation of surface tension is substantially zero; (b) the surface tensions of the 2 liquid phases simultaneously in equil. with the air phase are equal. Detns. of the sp heats and heat of mixing of systems (II), (III), (V) and (VII) show that (a) the sp heats observed are greater than those calcd. from the constituents by additivity, (b) the differences are too great to be neglected in the calcn. of the heats of mixing. The curves of ds vs. concn. in systems (II) to (VII) also show a rectilinear portion for mixts. which are near the crit. state (III and IV). The results of the addn. of H₂O to systems III to VII (g H₂O necessary to produce the sepn. in 2 phases) are somewhat difficult to interpret. This is probably due to the fact that this apparently independent variable changes at the same time the miscibility of the 2 phases and the soly of H₂O in one of them. In general for all phys. properties, the proximity of the crit. state is indicated in the diagram "property vs. concn." by a substantially straight line, which may or may not be horizontal.

G. CALINGAERT

The permeability of nickel to hydrogen; influence of pressure. VICTOR LOMBARDI. *Compt. rend* **182**, 463-4(1926); cf. *C. A.* **17**, 3434.—Temp. was maintained const. and the gas was measured by the increase of pressure in the chamber receiving it. The permeability of Ni to H is an exponential function of the temp., and varies proportionally to the square root of the gas pressure. It is not inversely proportional to the thickness of a Ni sheet, but diminishes very rapidly with the first increase in thickness beyond a fraction of a mm., and more slowly with further increase in thickness. Curves show that the logarithm of the permeability decreases linearly as the thickness increases.

G. F. C.

The spreading of solids on water surfaces. N. K. ADAM AND G. JESSOP. *Proc. Rpy. Soc. (London)* **110A**, 441-3(1926).—A. and J. have continued Cary and Ridal's observations (*C. A.* **20**, 133) on the spreading of myristic acid on H₂O at very low comp. pressures. A small pressure, that of the "gaseous" state of the films, is set up within a few seconds after the crystal touches the surface, and the "two-dimensional vapor pressure" very soon afterwards.

J. H. PERRY

The adhesion of mercury in highly evacuated capillaries. CURT HAGEN. *Physik. Z.* **27**, 47-57(1926).—At pressures below 10⁻³ mm. Hg, the Hg in the capillary of a MacLeod gage tends to stick; the length of the sticking Hg thread is a characteristic function of the pressure. The following influences were noticeable: Sharp edges at the top of the capillary prevent sticking, previous heating of the glass diminishes it, the hanging curve flattens at higher temps.; if Fe is used as part of the capillary it does not occur, Cu or brass capillaries show it to a smaller degree, Wood's metal instead of Hg does not show it. No influence on the phenomenon is found to be caused by gas liberated from the glass walls, by sealing wax or by filling the tube with H. The sticking capacity of a standardized capillary may be used for measurement of very low pressures.

B. J. C. VAN DER HOEVEN

The solubility of hydrogen in tin and aluminum at high temperatures. L. I. BIRCUMSHAW. *Phil. Mag.* [7] **1**, 510-22(1926).—It appears to be practically impossible

to sat. a metal with a gas by keeping the unstirred metal at const. temp. in contact with the gas, because of the long time necessary for the attainment of equil. The statement of Sieverts that H_2 is insol. in Sn and Al has not been verified. A small but definite soly. of H_2 in Sn at 800° has been measured, and evidence of a considerable soly. of H_2 in Al just above its m. p. has been found. The rate of soln. of H_2 in Sn is detd. by the rate of diffusion of gas through the bulk of the metal. Very long times appear to be necessary to remove all the gas from a metal by heating *in vacuo*; suggestions are made to explain this fact.

S. C. LIND

Adsorption of ethylene and hydrogen by zinc oxide, iron oxide, nickel and copper. W. A. LAZIER and HOMER ADKINS. *J. Phys. Chem.* 30, 353-8 (1926) — Measurements of the adsorption of H and C_2H_4 at 22° and 74 mm. by catalysts were made in the usual const.-pressure adsorption app. The catalysts were of Cu, Ni, Fe_2O_3 , and ZnO, made by several different methods. The vol. of the gas adsorbed was measured by reference to the vol. of N_2 required to fill the adsorption app. under comparable conditions. The catalytic activity of the catalysts was detd. by measuring the decrease in gas vol. after exposing the catalyst to equimol. mixts. of H and C_2H_4 . The results of the adsorption and catalytic activity measurements indicate that there is a qual. agreement between the 2 manifestations of chem. activity, but there is apparently no quant. relationship between total adsorption and catalytic activity.

R. L. DODGE

The mechanism of the adsorption of ions. R. AUDUBERT and M. QUINTIN. *J. chim. phys.* 23, 176-96 (1926).—See *C. A.* 19, 2153

R. L. DODGE

Adsorption. II. The adsorption by a coconut charcoal of saturated vapors of some pure liquid. F. G. TRYHORN and W. F. WYATT. *Trans. Faraday Soc.* 1926, (advance proof)—The rate of adsorption of the vapors of 14 liquids by a purified coconut charcoal was detd. at 20° . The initial rate is proportional to the vapor pressure of the liquid and inversely proportional to the square root of its mol. wt. For 11 of the liquids, the velocity of adsorption time curves show a discontinuity, which is attributed to the sudden formation of a liquid surface in the charcoal. **III. Stages in the adsorption by a coconut charcoal from vapor mixtures of alcohol and benzene, and of acetone and benzene.** *Ibid.*—The adsorption curves of these binary mixts. consist of 3 parts. In the first, both components are adsorbed in a const. ratio, which is practically that in which they exist in the vapor phase. When condensation occurs in the charcoal, the second stage occurs, during which the liquid phase adjusts itself to be in equil. with the main bulk of liquid by displacement of alc. or acetone by benzene. In the third stage the liquid is isothermally distd. into the intergranular spaces of the charcoal.

ARTHUR GROLLMAN

Determination of the diameter of pore and pore number in filter stones. HERMANN RUOSS. *Chem.-Ztg.* 50, 83-4 (1926) — Two methods are described for the detn. of the diam. of pores in filter plates: (1) hydrostatic detn. of the diam. of the capillary const. of a liquid, and (2) hydrodynamic detn. of the diam. of the capillary by means of the viscosity const. of a liquid. The latter method has been regarded as the most reliable also in consideration of unsym. pores. R. has detd. the av. diam. of pores and speed of filtration, which also is a measure for the permeability, in Schuler filter plates.

D. THUESEN

Colloidal electrolytes. A. LOTTERMOSER. *Z. angew. Chem.* 39, 347-53 (1926).—See *C. A.* 20, 532.

E. J. C.

The preparation of colloidal gold. C. F. BEHRENS. *Naval Med. Bull.*, Wash., D. C., 21, 191-2 (1924); *Abstracts Bact.* 9, 216 — The cause of unsatisfactory colloidal Au has been traced in almost every instance to the K_2CO_3 soln. No carbonate soln. over 24 hrs. old should be used.

H. G.

Action of proteins on gold sols. W. REINDERS. *Chem. Weekblad* 22, 481-4 (1925) — The variations in the protective effect of proteins in sols. of different degrees of acidity and alkyl. have been followed by measurements of the Au numbers and the migration velocities for different values of pH and different concns. of protein. The results are in accordance with the known amphoteric character of the proteins.

B. C. A.

The change with time of the double refraction of streaming sols containing non-spherical particles. I. The behavior of vanadium pentoxide sols. H. FREUNDLICH and H. DANNENBERG. *Z. physik. Chem.* 119, 87-95 (1926) — The rapidity with which the double refraction of a V_2O_5 sol increases with the age of the sol has been studied quantitatively. H_3PO_4 and electrolytes like NaCl have no effect, while H_2AsO_4 decreases the rate of this so-called aging of the sol. Coagulation does not account for the observations since the coagulating action of H_2AsO_4 is negligible in comparison with that of NaCl. It is possible, however, that the aging of the sol is due to the disappearance of the smaller V_2O_5 particles with consequent increase in size of the larger ones, a process

which will be greatly influenced by the H_2AsO_4 on account of the well-known fact that foreign material is adsorbed on the surface of crystals with consequent decrease in rate of crystn. The relation between rate of aging and concn. of H_2AsO_4 can be calcd. approx. from the adsorption isotherm. The aging follows an equation of the second order, as Marc has shown to be true for the process of crystn. The high thermal coeff. also supports the crystn. theory. II. The behavior of benzopurpurin sols. *Ibid* 96-103.—The increase in double refraction, or aging, of a benzopurpurin sol is caused by coagulation, contrary to the case of the V_2O_5 sol. A similarity exists, however, between the two processes of aging, in that the final result in both cases is the formation of fiber-shaped secondary particles arranged parallel to each other in the streaming sols.

PER K. FRÖLICH

Hygroscopicity of gels of ferric oxide, alumina and silica. B. AARNIO. *Geol. Komm. Finland Geotekn. Meddel.* 1920 [25], 12 pp.— $Fe(OH)_3$ pptd. by NH_3 retains 10% of water at 100°, 1.5% at 200° and 1% at 300°, and the corresponding hygroscopicities of the products are 34%, 42% and 29.6%, resp. At 700° no water is retained, and the oxide is no longer hygroscopic. The hygroscopicity of $Al(OH)_3$, similarly pptd. is 24% after heating at 100°, 45% at 400°, 44% at 800°, 17% at 1000° and 0.53% at 1200°, at which temp. the oxide still retains 0.2% of water. The hygroscopicity of silica gel is 41% at 100°, 56% at 200°, 45% at 400°, 50% at 500°, 0.62% at 1000° and 0.5% at 1100°. Its water is completely removed by heating at 1000°.

B. C. A.

The elasticity of jellies of cellulose acetate in relation to their physical structure and chemical equilibria. H. J. POOLE. *Trans. Faraday Soc.* 1926 (advance proof, Feb. 22); cf. C. A. 19, 2153.—The elasticity of jellies of cellulose acetate in various concns. of benzyl alc. and H_2O followed approx. the square of the concn., indicating the rigid phase to result from a dynamic solvation equil. between the cellulose acetate and solvent. The load-strain curves bent continuously towards the load axis, indicating the existence of a rigid fibrillary structure in the jelly. Heating or cooling does not cause a permanent deformation of temporarily deformed specimens. Equil. in elastic properties is only slowly regained after cooling or warming. The attraction of the cellulose acetate mols. is considered to be of a local character and to extend to a distance less than the size of the mols. themselves. The coeff. of inner resistance is proposed to denote the force normal to a face which is required to produce unit velocity of "creep" in a unit cube of jelly in the absence of all elastic controlling forces. Its values run parallel with the viscosity of the parent sols. The effect of variations in its concn. showed benzyl alc. as a solvent for cellulose acetate to be deficient in OH groups. Its partial replacement by H_2O causes a decrease in elasticity and an increase in solvation. Replacement by xylene gives the reversed effects.

ARTHUR GROLLMAN

Temperature of swelling of starch granules. W. ARZICHOVSKI. *Bull. acad. sci. russie* 1918 [6], 349-68.—The swelling of starch granules was studied microscopically, a statistical method being used. Swelling begins at 55°; at 67.5° it is practically complete. The mean temp. of complete swelling of individual granules is $60.97 \pm 0.10^\circ$. The distribution about this mean value only follows Gauss' law of error as a first approximation. The frequency curve is asymmetrical, but there is no indication of the occurrence of 2 kinds of granules.

B. C. A.

Colloid chemistry of humus and peat. WO. OSTWALD AND A. STEINER. *Kolloid-chem. Beihefte* 21, 97-170 (1925).—Humus prepn. made from peat was purified by dialysis; diffusion, ultrafiltration, electrophoresis, surface tension, sedimentation ability and viscosity were studied. Particular attention was paid to viscosity, which showed itself particularly fitted for the study of flocculation. The humus sols prepd. are neg. charged, moderately hydrated systems behaving in many respects, particularly in flocculation, like neg. hydroxide sols such as MoO_4 and V_2O_5 . Flocculation with salts gives essentially the same sort of values. The same flocculation relations are also found in peat suspensions. Flocculation is characterized by either increase in viscosity or increase in filtration time. Increase in viscosity depends on formation of "larger secondary particles" just as does increase in filtration time. These can further combine to aggregates of higher order as is shown by the great influence of previous mech. treatment on the viscosity of flocculated humus sols or of peat suspensions. Addn. of small amts. of alkali causes reprecipitation of humus preps. After flocculation by iron or other heavy metals, org. bases, e. g., pyridine, must be used as peptizing agents. Free Cl_2 (in Cl_2 water) is an especially effective flocculating agent. Neutral, strongly acid, and alk. (particularly) humus preps. show the same surface tension as water, which is remarkable since all preps. foam very readily. The addn. of flocculating agents (particularly Cl_2) in the drying of peat enables one to obtain harder and denser dried prod-

ucts if the drying process is slowed down temporarily at the beginning. Quant. values are given in tables and figures. M. BEBER

The separation of crystalloids from one another by dialysis. LOUIS KAHLBERG. *Phil. Mag.* [7] 1, 385-94(1926).—K. describes expts. in selective dialysis. For non-aqueous solns. a rubber membrane, the ordinary dental rubber dam, was employed by stretching it over a thistle tube. Pyridine proved to be the most suitable solvent; water gave no action; alc. but little; hydrocarbons softened the rubber. Esters, ketones, aldehydes and nitriles proved unsuitable. Substances which are sol. in water were non-dialyzable when dissolved in pyridine, while substances not sol. in water but sol. in org. solvents like hydrocarbons when dissolved in pyridine were dialyzed. Consequently, substances in these two classes could be sepd. by dialyzing the pyridine soln., for example, S from sugar, naphthalene from sugar, S from AgNO_3 , camphor from sugar, etc. For aq. solns. copper ferrocyanide membrane allowed urea to pass but retarded sugar. Lanolin (wool fat) when absorbed in fine China silk or in parchment paper produced a good membrane. Lanolin in collodion membranes was not practical, but by dipping silk into CHCl_3 soln. of lanolin gave good membrane. Substances readily dialyzable through this membrane are boric acid, borax, NaCl , urea; less so Na_2SO_4 ; not at all cane sugar, dextrose, lactose; very difficult egg albumin, litmus and fuchsin. Not only could crystalloids be sepd. from colloids but certain crystalloids could be sepd. from each other. The addn. of a third substance may aid the sepn. It was proved that cholesterol is the effective constituent of lanolin and since cholesterol is contained in all living animal cells, it is suggested that delicate films of cholesterol give to those cells their selective osmotic properties. S. C. LIND

Studies on the coagulation of clay. RENÉ GALLAY. *Kolloidchem. Beihefte* 21, 431-89(1926).—The coagulation of clay has been studied experimentally in an effort to correlate previous data on coagulation phenomena and to subject opposing theories to a critical test. The investigation involves the effect on coagulation of the following variables: degree of dispersion, base interchange, nature of clay, and nature of the coagulating electrolyte. It is found that in a polydisperse system, as exemplified by a clay suspension, the coarser particles tend to facilitate coagulation of the finer ones. The min. concn. of electrolyte necessary for flocculation increases with decreasing particle size. A coarse suspension is more affected by an increase in electrolyte concn. than a fine suspension, a phenomenon which accounts for the step-wise change in viscosity during the coagulation process. The coarser particles may have settled completely even before the finer ones have commenced to agglomerate. By mutual interference particles of different size fall at the same rate, and hence the individual layers which may be formed during the coagulation do not consist of uniformly sized particles. When the clay carries univalent bases, salts of bivalent metals lose part of their efficiency as coagulating agents on account of base interchange, which also accounts for the increase in the pptg. action of K and Na salts for clays carrying bases of bivalent metals. Clay treated with CaCl_2 is more sensitive to a univalent salt than clay treated with NH_4 , K or Na salts. The coagulating action of uni- and bivalent cations increases in the series Li, Na, NH_4 , K, Rb, Cs and Mg, Ca, Ba. The viscosity of the coagulum, and consequently the degree of hydration of the flocculated particles, decreases with decreasing degree of hydration of the adsorbed particles and with increasing degree of hydration of the ions in the external liquid. Na-treated clay gives a more viscous flocculation than clays subjected to pre-treatment with K or NH_4 salts. It is concluded that the hydration theory does account for the effect of certain salts (as introduced, for instance, by fertilizers) on the phys. structure of the soil. PER K. FRÖLICH

Physical chemical properties of solutions of germanium dioxide (and arsenic trioxide). W. A. ROTH AND O. SCHWARTZ. *Ber.* 56, 338-48(1926).— GeO_2 gives neg. charged colloidal solns., as well as weakly acid true solns. On the latter, kept from contact with glass whenever possible, the following properties were detd.: Sp. gr., refraction, cond., f. p. lowering. The cond. of solns. satd. in the cold gives a dissocn. const. of 1.2×10^{-7} ; solns. satd. hot do not give a good const. The at. refraction is calcd. as 8.9, which value is compared with those of the other elements of the same group. The highest concns. obtained are $1/25$ N at 18° , $1/50$ at 0° ; the mol. f. p. lowering, 1.83 to 1.85, shows normal behavior. As_2O_3 on the other hand, is still assocd. to a certain extent in dil. solns. G. CALINGAERT

The growth and solution of crystals. G. FRIEDEL. *Bull. soc. franç. mineral.* 48, 12-69(1925); cf. *C. A.* 18, 1407; 19, 773.—A math. formulation of the phys. laws of growth and soln. Growth or soln. of a surface is detd. by the pos. or neg. character of a single equation in which the surface vector is a const. and the concn. and rate of diffusion are variables. The rate of diffusion is a function of the character of the soln.

(*per se*), and of the crystal, because the angle between 2 surfaces detcs. the "diffusion region" of each surface.

C. B. SLAWSON

The theory of concentrated solutions. II. JEAN LINARD. *Bull. soc. chim. Belg.* **34**, 363-98(1925); cf. *C. A.* **16**, 3021.—A no. of f. p. curves for binary org. mixts. have been studied in order to det. the applicability of Mortimer's modified form (*C. A.* **17**, 2216) of LeChatelier's equation for calcg. each branch of such curves, *viz.*, $\ln C = (Qf/R) - (1/T - 1/T')$, where C is the concn. of the substance which crystallizes out on the branch of the curve in question (mol. %), Q is the mol. heat of fusion of the substance (cal.), R is the gas const. (2.0), T the abs. fusion temp. of the solvent, T' the temp. at which crystn. of the given soln. begins, and f is a correction factor for non-ideal solns. which may be calcd. from π , the relative internal pressure of the component in question referred to $C_{10}H_8$ (as tabulated by Mortimer, *loc. cit.*). The systems $PhNO_2-PhNH_2$, $C_6H_6-CCl_4$, and $PhNO_2-CCl_4$ are complex in consequence of the formation of addn. compds. and do not give curves agreeing with those calcd. by the formula. The systems $PhNH_2$ -cyclohexane and $PhNO_2$ -cyclohexane, forming or tending to form systems contg. 2 liquid phases, likewise do not conform. Systems which present no such complications and to which the formula applies with considerable accuracy, are $C_6H_6-PhNH_2$, $C_{10}H_8$ -cyclohexane, $PhNO_2-C_6H_6$, *m*- $MeC_6H_4NH_2-PhNH_2$, $PhNH_2-CHCl_3$ and *o*- $MeC_6H_4Cl-PhCl$. Other systems described are *p*- $MeC_6H_4NH_2$ -cyclohexane, $CH_2BrCH_2Br-PhCl$, $CH_2BrCH_2Br-CCl_4$, $PhNH_2-C_6H_6$ and *p*- $MeC_6H_4NH_2-C_6H_6$. Curves and data are given for all systems above noted. Although, in general, systems in which the equation does not hold are those in which f as calcd. from π has a value of 1.8-2.2 this cannot be taken as a general criterion of applicability of the equation, since exceptions have been noted. The formula does, however, present a useful method of detg. Q for a given substance by detg. its f. p. curves with several substances of known Q and T , it being obvious from the form of the cooling curves obtained if the system is a complex one (because of addn. compds., etc.), to which the equation does not apply.

W. B. PLUMMER

Condition of ferric salts in solution. N. A. TANANAEV. *Mitt. weiss. techn. Arb. Rep.* (Russia) **13**, 74-5(1924).—Ferric salt solns. contain a small part of the Fe as colloidal $Fe(OH)_3$ owing to hydrolysis, and this part is not detd. in the iodometric method of detg. ferric salts; the difference between the gravimetric and iodometric results is, therefore, a measure of the colloidal $Fe(OH)_3$ present.

B. C. A.

The law of neutral salt action in concentrated solutions. I. The neutral salt action in the acid hydrolysis of cyanamide. G. GRUBE AND G. SCHMID. *Z. physik. Chem.* **119**, 19-45(1926).—The hydrolysis of cyanamide to urea is catalyzed by HNO_3 with marked increase, up to 36 times, by neutral nitrates. Designating the velocity const. in salt-free soln. of a given acidity by v_0 , and that in soln. of the same acidity and salt concn. c by v , $[1/c] \log(v/v_0) = \tau$, in which τ is a const. depending on the salt. The velocity in salt-free soln. increases more rapidly than the HNO_3 concn., and this extra catalytic action of the acid follows the same equation as the neutral salts. The same relation holds for numerous cases in the literature for which $c \geq 1$, with some exceptions at lower concns.; illustrations are sugar inversion, $EtOAc$ saponification, potential of H_2 , quinhydrone and Cu electrodes.

B. H. CARROLL

Some considerations of the reaction-constant equation, and a simple method of determining the end point. R. C. SMITH. *Phil. Mag.* [7] **1**, 496-9(1926).—A method is given of calcg. the end point (time T_∞) of first-order reactions from any 2 measurements having the relation $2t_n = t_{n+1}$, that is, the second interval (from t_0) is twice as long as the first. The expression is $T = T_n^2/(2T_n - t_{n+1})$. Its use and limitations are discussed. A similar method may be applied to second-order reactions but the expression is much more complicated.

S. C. LIND

The calculation of velocity constants. GERHARD SCHMID. *Z. physik. Chem.* **119**, 8-18(1926).—The velocity const., k , of a reaction may be calcd. from ν observations of c and t by the following formula, in which $l = \log c$ for a monomol reaction, or $-1/c^{n-1}$ for a reaction of the n th order. $k = \{l_1 + l_2 + l_3 + \dots + l_{\nu/2} - (l_{(\nu/2+1)} + l_{(\nu/2+2)} + \dots + l_\nu) / [l_{(\nu/2+1)} + l_{(\nu/2+2)} + \dots + l_\nu - (l_1 + l_2 + \dots + l_{\nu/2})]\}$. S. proves that this is equal in accuracy to the method of least squares, and free from the errors of ordinary methods of calcn. of k ; it is adapted to the weighting of observations, but in this case the numerator and denominator must be divided into groups of equal wt. instead of equal no.

B. H. CARROLL

Critical potentials of hydrogen in the presence of catalytic nickel and copper. J. H. WOLFENDEN. *Proc. Roy. Soc. (London)* **110A**, 464-76(1926).—The following criticisms of Gauger's work (*C. A.* **13**, 1226) are made: (1) The specimen curve of G's paper is of unusual form and shows certain breaks, which are not supported by the work of other investigators of the crit. potentials of mol. or at. H, and hence may be fictitious.

(2) The total correction for initial electron velocity and contact potentials seem to have been applied wrongly. (3) The magnitude of this correction seems to be incorrect for 2 reasons: (a) The method of application assumes that the relative sensitivities of the app. for detecting radiation and primary electrons are the same, and (b) the overall contact potential corrected for, is that between the filament (W) and the plate (Pt) connected to the electrometer, whereas the contact potential involved in the main expts. is that between the filament and the target of catalytic Ni. (4) A final uncertainty arises as to the origin of the radiation measured. None of G's expts. detd. whether the effects observed originated in the body of the gas or at the catalyst surface. A modified app. is described in which measurements of ionization from H_2 in the presence of catalytic Ni, plain Ni and catalytic Cu were made. By comparison of these results with those obtained when mol. H_2 was the principal source of ionization, it is concluded that substantial quantities of at H_2 are present at the metal surface in each of the above cases. It is shown that a similarity exists between the effect upon the form of the ionization curve of the presence of the catalyst metal and that of an incandescent grid. The results are of significance in connection with the mechanism of catalytic hydrogenation.

J H PERRY

Remark on the theory of two-phase catalyzers. H CASSEL. *Naturwissenschaften* **14**, 103-4 (1926).—According to Langmuir this type of catalysis takes place at those points where 3 phases meet. In order to account for the reaction speed, however, it is necessary to assume with Volmer (*C. A.* **19**, 1982) that the mols. of gas adsorbed on the gas-solid interface, have a 2-dimensional heat motion, or that of 2 reacting gaseous components each is preferentially adsorbed on one of the two phases of the solid catalyst.

B. J. C. VAN DER HOEVEN

Regions of reaction. I. W. P. JORISSEN. *Chem. Weekblad* **23**, 79-82; *Chem. News* **132**, 149-52 (1926).—The reaction regions of systems of 3 components are presented graphically, by means of triangles, each angle representing 100% of the corresponding component. By suitably varying the conditions a mixt. may be arrived at in which the reaction no more progresses. The instances treated are mainly the explosion regions of: (I) Mixts. of 3 gases, of which one acts only as a diluent, or where any of 2 gases may react with the third: O, H, N; air, CO, N, H, C_2H_4 , O; H, C_2H_4 , air; CO-air mixts. with CCl_4 , $CHCl_3$, CH_2Cl_2 , CH_3Cl , H, NH_3 , O, H, NH_3 , air, CH_4 -air with non-combustible gases such as CCl_4 , C_2HCl_3 , $C_2H_2Cl_2$, C_2Cl_4 , $C_2H_2Cl_4$, C_2HCl_5 . One % of CCl_4 is sufficient to prevent explosion. Practically important cases in which one gas is endothermic are: C_2H_2 , acetone, air, C_2H_2 -saturated hydrocarbons, CS_2 , NO, N; CS_2 , NO, CO_2 ; H, O, S. (II) Gas-solid systems. CH_4 , air, coal dust, and the extinction of mine gas explosions by an inert gas or by mineral dust. (III) Liquid-liquid, and liquid-solid systems (various explosives). (IV) Solid-solid systems (fuses and thermite compds.).

MARY JACOBSEN

Immobile groups of atoms with strong specific external fields as the cause of catalytic activity. F. H. CONSTABLE. *Proc. Roy. Soc. (London)* **110A**, 283-301 (1926).—Surfaces obtained by electrodeposition, reduction of ammoniacal solns. of Cu, and by hammering and polishing were inactive as catalysts. Surfaces produced by the rapid condensation of Cu vapor, or by violent agitation of the atoms in an inactive surface at 820° , or by the thermal decompn. of Cu salts in a stream of inert gas, were active. The inactive forms presented a bright metallic appearance and the surface under the microscope was quite smooth, the surface activity per unit area being probably less than $1/5000$ that of reduced Cu. It has been shown that the activities of preps. of Cu from cuprous and cupric oxides are almost equal, in opposition to Palmer's theory (*C. A.* **14**, 3183) that the inactivity of electrolytic Cu was due to its being composed of cupric Cu. Adkin's theory (*C. A.* **16**, 4116) that Cu atoms when discharged at the electrode will be closely packed, and that there will be a weak field of force at the surface, is confirmed. The metal produced by the decompn. of NH_3 at 820° was deeply pitted. Its activity was const. for some hours, yet on reexamin. the metallic appearance was almost entirely regained. Microscopic examn. showed that the larger pits had been filled up but that the smaller irregularities on the surface had persisted. This is direct evidence that the surface activity is due to the irregular arrangement of the surface atoms. The structure of the surface is fixed at the instant of formation. Catalysts obtained by chem. reaction all showed nearly the same activity and the same temp. coeff. of activity. Variations among the different catalysts were found in the heat of adsorption of H_2 from 9600 to 20,000 cal. per g. mol. which shows that the effective mean field strengths vary considerably with the state of the surface. When active Cu is formed by chem. change, the Cu atoms are suddenly liberated and crystd., there are still remaining atom groups which are frozen in a strained state. The fixation of such

groups of atoms fixes sp. fields of force sufficiently intense to cause such internal strain in the adsorbed mols. that chem. reaction occurs at a measurable rate. The evidence obtained by C. supports the theory of Pease and Taylor that catalytic activity is due to highly unsatd. atoms in the surface, but C. prefers to attribute activity to the electrostatic and magnetic fields of force on the strained atom groups which make up the centers of the surface activity. The rapid condensation of Cu from vapor freezes highly strained arrangements of atoms in the surface and is, therefore, active. As the kinetic energy of the atoms of the catalyst increases with temp., the active configurations slowly change back to the cryst. form, which shows that annealing reduces catalytic activity. The essential feature necessary for the production of active Cu is the sudden liberation of free Cu atoms under conditions in which the kinetic energy of the atoms of the structure is insufficient to cause collapse of the active centers. Thus, methods of prepn. of Cu under the same phys. conditions should give Cu with the same surface activity and showing the same temp. coeff. of activity. This is proven by the prepn. of Cu from Cu formate and valerate. There is apparently some limit to the distortion of the adsorbed mol. produced by the centers of activity of one particular substance. Since the surface fields vary with the nature as well as the arrangement of the surface atoms, the nature and magnitude of the mol. distortion will vary with the chem. nature and the physical state of the surface. This explains the specific action of catalysts. Very small amts. of added material could cause wide variation in the nature and distribution of the activity centers which tentatively account for promoter action. When the reactants form intermediate compds. with the catalyst, the form of the surface is destroyed and any theory of centers of activity as given by C. is invalid. J. H. P.

The influence of minute traces of water on solubility equilibrium. II. ERNST COHEN AND SABURO MIYAKE. *Z. physik. Chem.* 119, 247-53(1926).—See C. A. 20, 1164. E. J. C.

Equilibria in systems with phases which are separated by a semipermeable membrane. XII. Systems in which a substance other than water diffuses. F. A. H. SCHREINEMAKERS. *Verslag Akad. Wetenschappen Amsterdam* 34, 886-95(1925); cf. C. A. 20, 1020.—The series of papers is continued, the "membrane phase rule" applied.

B. J. C. VAN DER HOEVEN

Valency problems. E. MÜLLER. *Z. Elektrochem.* 31, 143-57(1925).—M. develops a scheme for the graphic representation of chem. compds. by an extension of the theory that atoms have a tendency to form an outer shell having the "inert gas number" of electrons, namely, 8. The no. of electrons in the outer shell is denoted by strokes attached to the at. symbol in a manner similar to the representation of ordinary valency. To simplify the formulas, a thick stroke may be used to denote 2 electrons and a thin stroke 1 electron. Compds. may be either "heteropolar," in which electrons are given up by 1 component to "satisfy" the outer shell of the other, resulting in 2 oppositely charged ions, or may be "homopolar," in which the electrons are shared by the components. Application of the scheme serves to throw light on problems presented by the following: aliphatic and aromatic double bonds; the benzene ring and other single ring systems; naphthalene and other condensed ring systems; conjugated double bonds; bivalent C; quadrivalent O; vinyl alc.; nitro and *pseudo*-nitro compds.; ClO₂; the oxides of N; NH₄ salts; triphenylmethyl; the change from propyl to isopropyl alc.; the formation of alc. and CO₂ from sucrose; the hydration of ions; polymerization. Reference is made to the views of Knorr (C. A. 17, 3264). B. C. A.

Action of sulfur monochloride on silica. P. P. BUDNIKOV AND E. A. SHILOV. *Mitt. wiss.-tech. Arb. Rep.* (Russia) 13, 64-5(1924).—By the action of 40 g. of S₂Cl₂ on 5 g. of silica at 1000°, 40% of the silica was converted into SiCl₄ in 1 hr. B. C. A.

Constitution of the system sodium stearate-water. A. VON BUZÁGH. *Chem. Rund. Mitteleuropa u. Balkan* 2, 52-4, 72-3(1925).—With falling temp., the elec. cond. of Na stearate solns. approaches a limiting value at a rate inversely proportional to the concn. It would appear that water in soap gels is only mechanically bound, since the compn. of the liquid phase expressed from gels several weeks old is never the same, and the quantity of stearate dissolved diminishes with the increase of solid phase. Moreover, the cond. of the ultrafiltrate is lower than that of the original system, a behavior attributed to adsorption of stearate mols. by stearic acid set free by hydrolysis. Such conclusions are in agreement with the fact that the basicity of the system increases with the proportion of solid phase. B. C. A.

Thermal analysis of the system boron trifluoride-hydrogen sulfide. A. F. O. GERMANN AND H. S. BOOTH. *J. Phys. Chem.* 30, 369-77(1926).—BF₃ was prepd. from B₂O₃, H₂SO₄ and CaF₂ and was purified by fractional distn. H₂S was similarly purified

and the f. ps. of a series of BF_3 , H_2S mixts. were measured. The compositions of the mixts. were detd. by measuring the vols. of BF_3 and H_2S gas admitted to the f. p. app. Temps. were measured by a liquid-propane thermometer with an accuracy of 1° or 2° . The f. p. curve is compared with the existing curves for H_2S -HI; H_2S -HBr; H_2S -HCl; H_2S - CH_3OH and H_2S - $(\text{CH}_3)_2\text{O}$ mixts. The system H_2S - BF_3 presents a max. at -137° , with a soln. contg. equimol. quantities of the 2 gases, showing the existence of the compd. $\text{BF}_3 \cdot \text{H}_2\text{S}$. Judging from the flatness of the curve at the max., the compd. $\text{BF}_3 \cdot \text{H}_2\text{S}$ is considerably dissocd., so that there should be little difficulty in sepg. H_2S as an impurity from BF_3 by fractional distn. The curve also shows 2 eutectics, one at -148° with 22 mol.-% H_2S and the other at -140° with 53 mol.-% H_2S . The form of the curve at -99° with $87\frac{1}{2}$ mol.-% H_2S indicates that this is the transition point of a cryst. addn. compd., whose formula seems to be $\text{BF}_3 \cdot 7\text{H}_2\text{S}$. The compds. are discussed in the light of the Lewis valence theory.

R. L. DODGE

The accurate measurement of heats of vaporization of liquids. J. H. MATHEWS. *J. Am. Chem. Soc.* 48, 562-76 (1926).—The heats of vaporization of 59 liquids were measured in a new elec. heated evaporator. This evaporator was suspended in the vapor to be evapd., the loss of weight being measured directly. The following data were obtained, the first value being the boiling temp., the second the heat of vaporization in cal. per g. PhH 80.20, 94.35; PhEt 135.17, 81.08; C_7H_{16} 97.23, 76.35; Pr_2CHMe 117.20, 70.86; cyclohexane 80.00, 85.62; methylcyclohexane 99.90, 76.92; cyclohexene 81.60, 88.70; PhMe 109.66, 86.50; $o\text{-C}_6\text{H}_4\text{Me}_2$ 141.41, 82.89; $m\text{-C}_6\text{H}_4\text{Me}_2$ 138.30, 81.85; $p\text{-C}_6\text{H}_4\text{Me}_2$ 137.12, 81.03; CH_2Cl_2 40.48, 78.74; $\text{C}_2\text{H}_4\text{Cl}_2$ 82.21, 77.34; $\text{C}_2\text{H}_4\text{Br}_2$ 130.80, 46.24; EtI 71.16, 45.62; BuI 129.50, 45.93; $\text{ClHC} \cdot \text{CCl}_2$ 85.69, 57.24; $\text{Cl}_2\text{C} \cdot \text{CCl}_2$ 120.69, 50.04; $\text{HCCl}_2\text{HCCl}_2$ 145.03, 55.02; $\text{H}_2\text{CClCH}_2\text{OH}$ 126.55, 122.97; PhCl 130.56, 77.61; PhBr 154.79, 57.63; $o\text{-C}_6\text{H}_4\text{ClMe}$ 158.07, 72.61; $p\text{-C}_6\text{H}_4\text{ClMe}$ 160.38, 73.14; CHCl_3 60.14, 58.80; CCl_4 75.40, 46.55; CS_2 45.29, 84.07; CH_3NO_2 99.90, 134.94; $\text{C}_6\text{H}_5\text{N}$ 114.13, 107.38; MeOH 63.81, 263.31; EtOH 77.42, 201.88; Me_2CHOH 81.25, 159.23; BuOH 116.78, 141.31; $\text{Me}_2\text{CHCH}_2\text{OH}$ 106.84, 138.25; EtCH(OH) CH_3 98.13, 134.41; $\text{Me}_2\text{CHCH}_2\text{CH}_2\text{OH}$ 130.17, 119.84; PhCH $_2$ OH 204.25, 111.58; Me_2CO 56.00, 122.09; MeCOEt 78.20, 105.95; furfural 160.55, 107.51; Et $_2\text{O}$ 33.99, 86.08; EtCOOH 139.30, 98.83; HCO_2Me 31.32, 112.38; HCO_2Et 53.33, 97.21; HCO_2Pr 80.01, 88.15; HCO_2Bu 105.12, 86.76; $\text{HCO}_2\text{CH}_2\text{CHMe}_2$ 97.03, 78.51; AcOMe 56.34, 98.11; AcOEt 76.00, 87.63; AcOPr 100.42, 80.29; AcOCH $_2$ CHMe $_2$ 115.47, 73.76; EtCO $_2$ Me 79.00, 87.59; EtCO $_2$ Et 97.64, 80.07; EtCO $_2$ Pr 120.62, 73.18; EtCO $_2$ Bu 144.87, 71.75; MeCHCO $_2$ Et 91.05, 78.15; PrCO $_2$ Et 118.90, 74.72; $\text{Me}_2\text{CHCO}_2\text{Et}$ 109.22, 72.08; AcOCH $_2$ CH $_2$ Cl 141.50, 80.84. Accuracy claimed ± 0.1 cal. No special precautions are mentioned to avoid spray. Vapor pressure and sp. vols. of Me_2CO , PhH C_7H_{16} were detd. Heats of vaporization calcd. from these data agree with those directly detd. ± 1.0 cal.

F. R. B.

The heats of combustion of homologous and isomeric dicarboxylic acids and their anhydrides. H. HARTMAN. *Tech. Hoogeschool Delft, Dissertation* 1925, 126 pp.—Methods of prepn. of satd. normal aliphatic dicarboxylic acids and of alkyl-substituted succinic acids are discussed. Dissocn. const. of Et- and some Ph-substituted succinic acids were detd. at 25° . On adaptation of the $\text{NCCl}_2\text{CO}_2\text{Et}$ synthesis of Bone and Sprankling to $\text{Et}_2\text{CBrCO}_2\text{Et}$ the product is $\text{HO}_2\text{CCH}_2\text{CHMeCHEtCO}_2\text{H}$ instead of the expected $\text{HO}_2\text{CCH}_2\text{C(Et)}_2\text{CO}_2\text{H}$. The latter, as well as $\text{HO}_2\text{CCH(Et)C(Et)}_2\text{CO}_2\text{H}$, may be prepd. by the method of Higson and Thorpe (*C. A.* 1, 175). *Trichylsuccinic acid*, m. 118° was prepd. by sapon. of ethyl α,β -dicyano- α,β,β -triethylpropionate, b_p 184° , b_p 138° , obtained by ethylation of Et $_2\text{C(CN)CH(CN)CO}_2\text{Et}$. Heats of combustion were detd. for (1) acids of the oxalic series from C_2 to C_{13} , (2) Me- Et- and Ph-substituted succinic acids, (3) anhydrides of the latter. In acids of the oxalic series, 2 thermally homologous series are distinguishable, viz., acids with even or uneven no. of C atoms. The explanation of this alternation probably lies in the differences in crystal structure. Oxalic and malonic acids occupy anomalous positions with respect to their homologs. Normal dicarboxylic acids have a lower heat of combustion than their isomeric alkylsuccinic acids. Of the latter, the *anti* acid has the highest, and the *sym.* acid the lowest heat of combustion. In the dialkylsuccinic anhydrides the heat of combustion is greater when the alkyl groups are in closer proximity. All of the heats of combustion, except that of racemic $(\text{CH}_3\text{EtCO}_2\text{H})_2$, follow Stohmann's rule, according to which the acid with the greatest dissociation const. has also the greatest heat of combustion. Bethmann's views furnish no satisfactory explanation of the relation between constitution and dissociation const. in the alkylsuccinic acids. The heat of hydration of $(\text{CH}_3\text{CO})_2\text{O}$ decreases regularly with successive introduction of Me groups. Those of the Me and the *unsym.* di-Et derivs. show little change, that of the *sym.* di-Me deriv. is 4 cal. lower, of the tri-Me deriv. 6 cal., and of the tetra-Me deriv. 9 cal. lower. The

liquid Et derivs. follow the same order as the solid Me derivs. The solid $(\text{C}_6\text{Et}_3\text{CO})_2\text{O}$ has practically the same heat of hydration as the tetra-Me deriv. For the mono-Ph anhydride the heat of hydration is 12 cal., for the racemic $(\text{CHPhCO})_2\text{O}$, 8 cal..

A. W. DOX

Heats of formation of quinonechloroimines and quinonedichlorodiimines. (MLLE.) S. BALSZKOVSKA. *Bull. Inter. Acad. Polonaise* 9-10A, 409-28(1924).—In an extension of previous work by Swientoslawski (C. A. 5, 1414) the thermal values of the processes whereby the hydrochlorides of aromatic diamines and aminophenols react in aq. soln with Cl water or bleaching powder to ppt. quinonechloroimines have been evaluated. The following results have been obtained: benzidine: $\text{C}_{12}\text{H}_8(\text{NH}_2)_2 \cdot 2\text{HCl} + 3\text{Cl}_2 = \text{C}_{12}\text{H}_8\text{N}_2\text{Cl}_2 + 6\text{HCl} + 58.40 \text{ Cal.}$; $\text{C}_{12}\text{H}_8(\text{NH}_2)_2 \cdot 2\text{HCl} + 3/2\text{Ca}(\text{OCl})_2 = \text{C}_{12}\text{H}_8\text{N}_2\text{Cl}_2 + 3/2\text{CaCl}_2 + 3\text{H}_2\text{O} + 80.21 \text{ Cal.}$; dianisidine: $\text{C}_{12}\text{H}_6(\text{OMe})_2(\text{NH}_2)_2 \cdot 2\text{HCl} + 3/2\text{Ca}(\text{OCl})_2 = \text{C}_{12}\text{H}_6(\text{OMe})_2\text{N}_2\text{Cl}_2 + 3/2\text{CaCl}_2 + 3\text{H}_2\text{O} + 89.72 \text{ Cal.}$; *p*-aminophenol $\text{OH} \cdot \text{C}_6\text{H}_4 \cdot \text{NH}_2 \cdot \text{HCl} + 2\text{Cl}_2 = \text{O} \cdot \text{C}_6\text{H}_4 \cdot \text{NCl} + 4\text{HCl} + 39.92 \text{ Cal.}$; *p*-amino-*p'*-hydroxydiphenyl: $\text{OH} \cdot \text{C}_{12}\text{H}_8 \cdot \text{NH}_2 \cdot \text{HCl} + 2\text{Cl}_2 = \text{O} \cdot \text{C}_{12}\text{H}_8 \cdot \text{NCl} + 4\text{HCl} + 30.99 \text{ Cal.}$ The formation of small quantities of decompn. products renders the thermal data obtained for picramic acid untrustworthy. It is not possible to det. the heats of formation of the corresponding Br derivs., the main reaction being always accompanied by a bromination of the nucleus. From the present data and those of Swientoslawski (*loc. cit.*) on *p*-phenylene- and *p*-naphthylenediamines a mean value of 21.92 cal. is obtained for the difference between the heats of reaction using bleaching powder and Cl water. Replacement of the benzene nucleus by diphenyl causes a mean decrease of 9.47 cal. in the heat of reaction. Comparison of the thermal data for benzidine and dianisidine shows that the introduction of electropositive methoxy groups into the nucleus results in an increased thermal effect. 3,3'-Dimethoxydiphenoquinone-4,4'-dichlorodiimine is formed as a reddish brown, amorphous, unstable ppt. on treating solns. of dianisidine dihydrochloride with bleaching-powder soln. 4,6-Dinitro-*o*-benzoquinone-2-chloroimine is formed as a yellow ppt. on treating a soln. of picramic acid in presence of HCl with Cl water in the cold. The substance, which has not yet been obtained pure, is very sol. in acetone, AcOH and alc.

B. C. A

Thermochemical researches on diazo compounds. W. SWIENTOSLAWSKI. *Roczniki Chem.* 5, 214-31(1925).—The methods employed by S. (cf. C. A. 12, 1640) for the thermochem. investigation of diazo compds. are described and illustrated by the cases of aniline and *p*-bromoaniline. From these, and from previously published results (*loc. cit.*), the following conclusions are reached. Substitution in the benzene ring of electronegative groups has not a const. effect on the heats of various reactions of substituted anilines. Thus, where q_{am} , q_{dz} , q_n , and q_{is} , are, resp., the heats of formation of amine hydrochloride, of diazonium chloride and of *n*- and *iso*-diazohydrate Na salt, i_n and i_{is} , the heats of isomerization of the diazonium into the *n*- and *iso*-diazohydrate forms, and *A* and *B* the heats of diazotization of amine and of coupling of *n*-diazohydrate with solid β -naphthol, the effect of electronegative substituents is to diminish q_{am} , q_{is} and *A*, and to enhance q_{is} , q_n and *B*, while i_n and i_{is} remain unchanged. These differences may be considerable, q_{am} varying from 7.60 to 1.81 cal., *A* from 19.97 to 12.47 cal., q_n from 3.77 to 5.65 cal. and q_{is} from 8.80 to 11.00 cal. *B* increases inversely with *A*, so that $A + B + i_n = 50 \text{ cal.}$ is const., and independent of substitution, the derivs. of *o*- and *p*-aminobenzoic and of sulfanilic acids deviating, however, from this rule. The mean values of i_n and i_{is} are +0.5 and -2.3 cal., and in all cases $q_n < q_{is}$, the difference being from 5 to 6 cal. Contrary to Hantzsch's statement, $i_{is} - i_n$ gives a negative mean value of about 3 cal., although in the isomerization of salts heat is evolved, since $q_n < q_{is}$, so that $(q_{is} + i_{is}) - (q_n + i_n) = +3 \text{ cal.}$, the salt of *p*-sulfodiazobenzene being, however, an exception to this rule.

B. C. A

Thermochemical researches on the diazo derivatives of aminophenols. W. SWIENTOSLAWSKI AND (MLLE.) Z. BLASZKOVSKA. *Roczniki Chem.* 5, 233-51(1925). cf. preceding abstr.—Certain reactions of picramic acid and of *p*-amino-*p'*-hydroxydiphenyl are examd. thermochemically. The heats of formation of the hydrochlorides are, resp., 0.746 and 6.0 cal., of formation of Na salts 10.20 and 6.41 cal., of diazotization 25.56 and 19.91 cal. The product of diazotization of picramic acid is a quinone diazide which yields with NaOH a normal diazohydrate salt, 9.34 cal. being evolved. The heat of coupling of the quinone diazide with β -naphthol is about 41 cal. With the aminohydroxydiphenyl, the heat of formation of the Na salt of the diazohydrate is 24.13 cal., and of coupling with β -naphthol about 27 cal. Picramic acid exhibits greater divergences from the properties of other amines than the aminohydroxydiphenyl.

B. C. A.

The data of thermochemistry. F. RUSSELL BICHOWSKY. *Ind. Eng. Chem.* 18,

417-8(1926).—The unsatisfactory state of existing tabulations of thermochem. data is pointed out and a plea made for new investigations. F. R. BICHOWSKY

The electrical conductivity of crystalline, molten and dissolved $\text{AgTi}(\text{NO}_3)_2$. A. I. RABINOVICH. *J. Russ. Phys.-Chem. Soc.*, Phys. Part, **56**, 555-9(1924); *Trans. Karpov Inst. Chem.* **1925**, No. 4, 41-55.—The comparison of elec. cond. of the double salt $\text{AgTi}(\text{NO}_3)_2$ in cryst. and supercooled state has shown that the degree of breaking down of the crystal space lattice equal to 1.30 at the m. p. of the salt (82.5°) falls rapidly to 1:130,000 at 65°. The elec. cond. and viscosity of various systems from dil. soln. to pure molten salt have been studied at 100°. R. PIROOMOV

The hydrolysis of aluminum sulfate—an application of the quinhydrone electrodes. A. J. PELLING. *J. Chem. Met. Soc. S. Africa* **26**, 88-95(1925).—The degree of hydrolysis of $\text{Al}_2(\text{SO}_4)_3$ is calcd. at 15° and six concns. from the H-ion concn. as detd. by measuring, to a precision of 0.0001 v., the e. m. f. of the cell $\text{H}_2 | \text{Al}(\text{SO}_4)_3 \text{ aq} | \text{satd. KCl} | \text{Hg}_2\text{Cl}_2$. Corresponding measurements, to a precision of 0.0005 v., were made with the cell $\text{Pt} | \text{quinhydrone} + \text{Al}_2(\text{SO}_4)_3 \text{ aq} | \text{satd. KCl} | \text{Hg}_2\text{Cl}_2$, but were not used in the calcn. The first stage in the hydrolysis is represented by either (1) $\text{Al}(\text{SO}_4)_3 + 2\text{H}_2\text{O} = \text{Al}_2(\text{SO}_4)_2(\text{OH})_2 + \text{H}_2\text{SO}_4$ or (2) $\text{Al}_2(\text{SO}_4)_3 + 2\text{H}_2\text{O} = 2\text{Al}(\text{SO}_4)(\text{OH}) + \text{H}_2\text{SO}_4$, for which the respective hydrolysis consts. are $K_1 = x^3/(1-x)^2V$ and $K_2 = x^2/(1-x)V$, where x is the degree of hydrolysis and V is the diln. K_2 is a better const. than K_1 in contrast with the result at 25° of Denham (cf. *C. A.* **2**, 1089). The results are tabulated. P. believes the Clark shaking H electrode is better for this work than the ordinary bubbling electrode used by Denham. The differences between the H-ion values as detd. by the two electrodes are supposed to be due partly to exptl. error and partly to "salt effect". E. R. SMITH

The direct oxidation of the manganous ion to permanganate. A. N. CAMPBELL. *Trans. Faraday Soc.*, Feb. 22, 1926 (advance proof). Manganous ion can be anodically oxidized to permanganate. The optimum conditions are: c. d., 17 amp. per square decimeter; anolyte, a satd. soln. of K_2SO_4 in H_2SO_4 containing 198 g. per l.; time, 3 hrs.; Mn content, 0.7767 g. per l. of electrolyte; temp. about 0°. The catholyte consists of the Mn in a satd. soln. of K_2SO_4 and is placed in a porous pot. The anode is a smooth Pt foil; the cathode a Pt crucible. Neither NO_3^- nor Cl^- may be present. Spectrographic studies show MnO_4^{2-} to be the only oxidation product formed. A. G.

Presence of divi-manganese (atomic number 75) in manganese salts. V. DOLEJŠEK AND J. HEVROVSKÝ. *Chem. Listy* **20**, 4-12(1926).—In electrolysis of MnSO_4 solns. with a dropping Hg cathode, registered by means of Hevrovsky's polarograph, an impurity present in proportion of $1/10,000$, and sepg. at a potential of 1.00 v. with respect to the normal calomel electrode is detected. To collect a large quantity of this impurity a Pt foil, placed in elec. contact with Mn amalgam was immersed in a concd. soln. of MnSO_4 , to collect a deposit of any metal more noble than Mn present in the soln. The deposit was dissolved in HCl, and pptd. by H_2S . The filtrate yields a residue, which, when examd. X-spectroscopically, shows lines of element at no. 75 ($L_{\alpha_1} = 1430 \times 10^8 \text{ U}$, $L_{\beta_1} = 1253.3 \times 10^8 \text{ U}$, $L_{\beta_2} = 1204.3 \times 10^8 \text{ U}$ and $L_{\gamma_1} = 1059 \times 10^8 \text{ U}$). The authors criticize the work of Noddack and coworkers as inconclusive. Their X lines, when subjected to analysis, appear to be due to Tl and Zn. Because of this, it is doubtful whether they really discovered this element, so that their name rhenium can be superseded by the old Mendelyev name divi-manganese. F. C. KRACEK

Conductivity measurements in mixtures of methanol and ethanol. HEINRICH GOLDSCHMIDT AND HARALD ARFLOT. *Z. physik. Chem.* **119**, 1-7(1926).—Cond. of HCl and NaBr at various dilns. in mixts. of MeOH and EtOH. The cond. of the acid and the salt vary in like manner with change in composition of the solvent, in contrast with the marked difference in their behavior on addn. of H_2O to alc. solns. Cf. *C. A.* **18**, 1603. B. H. CARROLL

Electric conductivity in monocrystals and crystalline aggregates. A. JOFFÉ AND E. ZECINOWITZER. *Physica* **6**, 36-9(1926) (in German).—The cond. of NaCl monocrystals, obtained artificially from molten salt, was measured. The same crystals were then subjected to compression at high temps. (600°) and thus plastically deformed (d. changing from 2.9 to 2.0 mm) into a cryst. aggregate. It was found that as long as no free crystal faces appear, no change in cond. occurs; it was 1.13 and 1.09×10^{-7} before and after compression at 530°; 3.90 and 3.93×10^{-7} at 597°. It is plausible to explain the cond. solely by normal dissoen. of the lattice, not by local "Auflockerung". Also in *Z. Physik* **35**, 446-8(1925). B. J. C. VAN DER HOEVEN

Refractive index of organic substances and atomic structure. K. FAJANS AND C. A. KNORR. *Ber.* **59**, 249-65(1926). The concept of at. refraction is insufficient to account for the observed indices. F. and K. using the Lewis-Langmuir octet theory

Metastationary atomic and molecular states. ADOLF SMEKAL. *Z. Physik* **34**, 81-93(1926).—It is suggested that atoms and mols. may exist in stationary states of very short life period which are not fixed or are only partially fixed by the quantum conditions and that these states differ from those which are quantized only in their *a priori* probability. The existence of dispersion is given a phys. interpretation in this way.

H. C. UREY

Theory of rotatory polarization. R. DE MALLEMANN. *Ann. phys.* [10] **4**, 456-8 (1925); cf. *C. A.* **19**, 3059.—Theoretical. Mistakes in earlier papers are pointed out and corrected. The rotatory power is independent of the choice of axes used to describe the symmetry of the mol., but in anisotropic liquids or gases a structural rotatory power exists which is absent in ordinary liquids or gases.

B. C. A.

The nucleus of the atom. J. A. CROWTHER. *Scientia* **39**, 63-72(1926).—A review.

E. H.

Nuclear momentum and atomic structure. J. KUDAR. *Physik. Z.* **27**, 59-62 (1926).—K., following a suggestion of Braunbek (*C. A.* **16**, 4126), assumes, that the nucleus of a He atom possesses a uniaquantic angular momentum, opposing the total angular momentum of the electrons; the momentum-free He model, obtained in this manner, has one magneton. The same model is present as K shell in the alkali atoms and can be employed for the explanation of the relativistic behavior of their doublets if a special form of spatial quantization is used.

B. J. C. VAN DER HOEVEN

Radium ore deposits in the Fergana district, Turkestan. A. F. FERMAN AND D. I. STZERBAKOV. *U. S. S. R. Sci. Tech. Dept.* **74**, 1-37(1925).—This is a report of a commission which investigated during 1924 the deposits of radioactive minerals in Turkestan. The commission found that it would pay to exploit the Ra ores extg. as by-products V, Ba, Cu, onyx, marble and others.

J. S. JOFFE

Radioactive manganiferous nodules from Tanokami, Oomi Province. S. IIMORI. *Sci. Papers Inst. Phys. Chem. Research (Japan)* **4**, 79-83(1926).—The black nodules from the bed of the Kichijo River and those lying just on the back of Tanokami Hill were found to be feebly radioactive. Also in *Bull. Chem. Soc. Japan* **1**, 43-7(1926).

L. D. R.

The tracks of α -particles emitted by actinium emanation and its next disintegration product. SUEKICHI KINOSHITA, HAZIME IKEUTI AND MINESABURO AKIYAMA. *Anniv. Vol. II Nagaoka* **1925**, 283-93.—Act_{Im}, an α -ray product, gives rise to ActA, another α -ray product, having a period of $2/1000$ sec. Under ordinary conditions, the atom of the emanation will suffer 2 α -disintegrations in exceedingly rapid succession. This was tested by means of the condensation method of C. T. R. Wilson. 3505 tracks were photographed, 3334 of which were in pairs. From the elec. sepn. of the pair of doublets, $L = 0.0032$ sec.

MARIE FARNSWORTH

The chemical action of α -particles on acetylene. W. MUND AND W. KOCH. *J. Phys. Chem.* **30**, 289-93(1926); cf. *C. A.* **20**, 540.—The ratio of the no. of reacting mols. to the no. of ions produced for polymerization of C_2H_2 is not influenced by the amt. of air, change of pressure or change of temp. The mean value of 11 measurements is 20.2.

L. D. R.

Atom disintegration by α -rays. III. The disintegration of carbon. HANS PETTERSSON. *Anz. Akad. Wiss. Wien* **61**, 130-1(1924).—Under the influence of α -rays C yields H and α -particles. The latter have a range of 10.5 cm. The H-particles have been observed in the direction of, as well as perpendicular to the direction of the α -rays and found to have ranges of 8 and 16 cm., resp. Atom fragments of range 1.5 cm. have been observed. The results with C as well as those with Be and Si are in agreement with P.'s explosion theory of atom decompn. **IV. Decomposition of nitrogen and oxygen—helium as a product of disintegration.** GERHARD KIRSCH. *Ibid* 131.—When N and O are subjected to rapid α -rays H, He and secondary α -rays result. The dependence of the no. and the range of the secondary rays upon exptl. conditions makes it improbable that they come from the primary radioactive substance. The energy of the bombarding α -particles is transferred to that of the H.

E. R. SCHIERZ

The chemical action of radium emanation. XVI. The action on potassium dichromate, potassium chromate and potassium permanganate. ANTON KAILAN. *Anz. Akad. Wiss. Wien* **61**, 161-2(1924).—Aq. solns. of $K_2Cr_2O_7$ (I), K_2CrO_4 (II) and $KMnO_4$ (III) contained in glass vessels with walls 1 mm. thick have been subjected to the action of Rn from a prepn. contg. 110 mg Ra for a period of 2 mos. I was reduced at the rate of 3×10^{14} mol./sec.; III in neutral and N/80 acid soln. at the rate of 1.5×10^{12} mol. sec., and in N/18 alk. soln. approx. 5×10^{12} mol./sec. The rate of II, though appreciable, is less than that of I.

E. R. SCHIERZ

The alteration of benzene vapor under the influence of α -particles. W. MUND

AND E. BOGAERT. *Bull. soc. chim. Belg* **34**, 410-5(1925).—In 2 expts in an approx. 175-cc. vessel, contg. C_6H_6 vapor at 100° and 0.041 curies of radon, the pressure decreased 1.04 cm. Hg in 25.7 hrs and 0.75 cm in 17 hrs. From these the no. of C_6H_6 mols. disappearing per α -particle emitted is calcd. resp. as 2.19×10^6 and 2.01×10^6 , which is the same numerically as the value (2.10×10^6) calcd. by Bragg for the no. of ion pairs formed in C_6H_6 vapor by an α -particle. W. B. PLUMMER

The half period of ionium. O. KOBLIC. *Chem. Listy* **19**, 380-91(1925).—Io sep'd from 20.00 g. Joachimstal pitchblende ($63.65 \pm 0.5\%$ U) yields the same satn. current as 0.300 mg. (Io, Th) O_2 obtained from the same source. The Honigschmidt and Horowitz (*C. A.* **11**, 1581, 1598) value of the at. wt. of Io from Joachimstal pitchblende is 231.51, which places the Io/Th ratio = 3.7. Soddy and Hitchins (*C. A.* **18**, 2463) obtained 10/9 for the same ratio by an indirect method based on 1.1×10^4 yrs. for the half period of Io. K. uses the Honigschmidt value, and accordingly, 0.079 mg. Io has the same activity as Io obtained from, and in equil. with, 12,730 mg. U $_1$. The radioactive const. of Io, calcd. on the assumption of $\lambda_{Io} = 1.54 \times 10^{-10}$ is equal to $\lambda_{Io} = 2.40 \times 10^{-6}$ which corresponds to the av. life of 4.17×10^4 yrs., or a half period of 2.90×10^4 yrs. F. C. KRACEK

Scintillations in zinc sulfide. J. STALONY-DARBOVSKI. *Roczniki Chem.* **5**, 193-214 (1925).—The luminescence produced by thorium in thin layers of ZnS is investigated. It is found that each scintillation, on examn. through a lens magnifying up to 40 times, consists of a small bright spot of light surrounded by a diffuse aureole, the shape of which depends on the location of the Th atom in the layer, and the diam. of which varies from 0.1 to 0.3 mm. The duration of the scintillations is det'd. in 3 ways, the first method being that of Wood (*Phil. Mag.* **10**, 427-30(1905)), depending on the measurement of the length of the arcs of light appearing on the screen during its rapid rotation. In this way, the duration of the scintillations is shown to be of the order of $1/200$ sec. and not, as Wood found, $1/20,000$ sec., the greater part of the arc being invisible at the high speeds of revolution used by him. In the second method, the no. N of scintillations appearing per min. on a fixed screen of 1 sq. mm. surface are det'd. Before this screen is placed a revolving opaque glass disk, possessing a window in the form of an arc of angle α , and the no. of scintillations per min., $N_{\alpha\beta}$, is again counted, being less than N but greater than $N\alpha/2\pi$, the no. which would appear if the scintillations were of infinitely short duration. The duration of the scintillations, t , is given by the formula $t = (N_{\alpha\beta} - N\alpha/2\pi)/Nn$, where n is the no. of revolutions per second of the disk. The minimal value of t found was $1/29$ sec. The third method is more convenient than the preceding ones, and gives more accurate results. A streak of radioactive matter is disposed radially on a glass disk, and is covered on the other side by a large sector of black paper. This disk is placed before a screen of ZnS, of area 0.5 sq. cm., and revolved, the speed being reduced until the sparks cease to be visible, when $t = \beta/2\pi n$, where β is the angle between the streak of radioactive matter and the edge of the sector. In this way, t was found to be $1/6$ sec., results of the same order being obtained with various samples of ZnS. A disk phosphoroscope is also described, in which half the revolving disk is within a box contg. the source of illumination, the other half showing bands of phosphorescence strikingly similar to those obtained with thorium as the excitant, i. e., a bright band followed by a larger diffuse region; this suggests that the mechanism of luminescence is the same in both cases. B. C. A.

Diamagnetism and the anomalous Zeeman effect. P. TARTAKOVSKII. *Z. Physik* **34**, 216-26(1925).—In the anomalous Zeeman effect it is necessary to multiply the precessional frequency of the electrons by the Landé g factor in order to secure the proper additional energy of the electrons in the magnetic fields. Therefore, this factor must also be used in calcg. the diamagnetic susceptibility. T. does this and calcs. the susceptibility of He, Li, Na, K, Cs assuming that the orbits are elliptical but that the effective quantum no. and effective at. nos. are to be used. The exptl. data on the ionic susceptibilities are used in calcg. the values for the neutral atoms. H. C. UREY

The influence of degassing a metal plate bombarded with cathode rays on the liberated electron rays. CARL TINGWALDT. *Z. Physik* **34**, 280-4(1925).—It is found that degassing the reflector and applying a compensating potential for the elec. double layer on the plate causes the reflection of electrons to be independent of the angle of incidence for electrons of 4 to 500 v. velocity. H. C. UREY

The ionization of hydrogen by slow electrons. HARTMUT KALLMANN AND MAX BREDIG. *Z. Physik* **34**, 736-50(1925), cf. *C. A.* **20**, 332. The ions produced in H by 15-30 v. electrons were identified by magnetic deflection. H^+ , H_2^+ , and H_3^+ appear at very nearly the same potential. H^+ is observed at higher potentials than the others and is due to dissociation of H_2^+ after falling through the elec. field and before entering

the magnetic field. H_2^+ is the most abundant and is the primary product. The disappearance curves of the ions with decreasing exciting potential and the effect of pressure on the relative intensities indicate that H^+ and H_3 are produced by secondary reactions. The H_3^+ may result from a tertiary reaction but the evidence is not conclusive. H. C. UREY

The action of an external metal mantle on a glow discharge. SR. PROCOPIU. *Physik. Z.* 27, 57-8(1926).—A glow discharge (420-550 v., 10^{-5} to 10^{-3} amps.) can be interrupted by connecting a metal ring, which surrounds the tube on the outside with the cathode. The ring has to be near the dark space or the first two or three layers of the positive column; nearer the anode the current only decreases, near the cathodic glow it increases somewhat. With potentials above 550 v. the effects are less marked. The tube was 45 cm. long and had 0.3 mm. Hg pressure. (Cf. Dunoyer and Toulon, C. A. 19, 602.) B. J. C. VAN DER HOEVEN

Why are the stability conditions for an electric arc the reverse of those for a triode? H. BARKHAUSEN. *Physik. Z.* 27, 43-6(1926).—In an elec. arc a current change causes a potential change (de/di negative, labile for $-de/di > R_a$, the external resistance); in a triode the potential change is primary and causes the current fluctuation (de/di also negative, labile for $-de/di < R_a$). Mathematically the relations can be derived if a positive inductance is assigned to the arc, a positive capacity to the triode. B. J. C. VAN DER HOEVEN

Production of ultra-violet light by the impact of low-speed electrons on a metal surface. PIERRE BRICOUT. *Compt. rend.* 182, 213-5(1926).—A cylindrical quartz high-vacuum tube is described, contg. a straight filament (Pt covered with alk. earths) in the axis, a flat Pt anode near to the filament and in one plane with it (no direct radiation can hit the anode) and a cylindrical Mo plate surrounding both elements. The anode is brought to a potential of some volts, the Mo plate on a potential of several thousand volts, a magnetic field parallel to the filament causes the electrons to deflect and bombard the anode. The radiation produced is, after concn. by a fluorite lens, analyzed in a spectrograph. For an electron current of 1 ma., anode of 10 sq. mm. at a potential of 6 v. radiation of between 2300 and 2100 Å. U. was emitted by the metal. B. J. C. VAN DER HOEVEN

Model gratings to illustrate the diffraction of X-rays by crystals. W. L. BRAGG. *Mem. Proc. Manchester Lit. & Phil. Soc.* 69, 35-8(1925).—A half-tone printing process plate, ruled with 400 lines to the in., is laid with its ruled side in contact with a fine-grained photographic plate and exposed to light. Several exposures are taken on the same plate, the original grating being moved a fraction of $1/400$ in. between each exposure. By varying the time of exposure and length of movement of the original grating, any type of group of lines may be obtained on the photographic plate. When these plates are developed and used as gratings with a monochromatic source of light, the intensities of the different orders depend upon the arrangement of the lines, just as the intensities of diffracted X-rays depend upon the arrangement of at. planes. Spectra of the rock-salt (111) and diamond (111) types were reproduced. R. J. HAVIGHURST

Some studies of the Stark effect. C. E. DEPPERMAN. *Astrophys. J.* 63, 33-47 (1926).—The Stark effect for the Zn triplet $1s - 1p$ was studied under fields from 30,000 to 40,000 v. per cm., and with dispersions ranging from 10 to 4 Å per mm. The Stark effect, if any, was found to be negligible. Nagaoka's positive results are apparently due to the pole effect. Preliminary results for the similar $1s - 1p$ triplet of Cd and the Tl line $1\pi - 1\sigma$ (5350.5 Å. U.) also show no appreciable Stark effect. W. F. MEGGERS

Electro-optical investigations in sodium-vapor. (Anomalous electrical double refraction; Stark effect of the resonance radiation.) H. KOPFERMANN AND R. LADENBURG. *Ann. Physik* 78, 659-79(1925).—A positive elec. double refraction of Na vapor in the immediate vicinity of the D_2 line is exptly. established, but at the D_1 line it is not seen and is certainly less than $1/10$ as large as at D_2 . This effect has nothing to do with the usual cause of elec. double refraction, viz., the orientation of asymmetrical atoms in the field; it rests rather on the elec. displacement of the D_2 line (the quadratic Stark effect), since for D_2 the π - and σ -components are displaced toward red by different amts., but for D_1 both components are equally displaced. W. F. M.

A relation between the chemical elements in the effect of an electric field upon their series lines. J. STARK. *Ann. Physik* 78, 425-33(1925).—The Balmer series of H is represented by $\nu = 2w - mw$ and it is pointed out that so far as our knowledge goes all other elements are characterized by several series, i. e., instead of a single series of terms mw as in H there are at least 5 series of terms, ms , mp , md , mf_1 and mf_2 . It is recognized that the type and magnitude of the Stark effect of a series line of an element

is detd. by its term, and the effects for the different elements may be compared in relation to their terms. For purposes of this comparison the difference of the term for a series line of an element as compared with the term of the H-series line of the same no. is called the *H-difference* of the series line first mentioned. In 3 tables the available observational data are compiled for *ms*, *mp* and *md* series lines; the element, wave length, series notation, H-difference and $\Delta\lambda$ effect in a field strength of 28,000 v. \times cm.⁻¹ being given for each line. The following law or regularity is formulated: For lines of the *ms*-, *mp*- and *md*-series of heavy elements the $\Delta\lambda$ -effect of an elec. field has the same algebraic sign as the H-difference of the terms, and for a given type of series in different elements the magnitude is smaller the larger the corresponding H-difference is. It is seen also that for every element the H-difference in any type of series decreases with increasing member no. *m* and in fulfilment of the above law the corresponding $\Delta\lambda$ -effect increases with higher members of series. Reduced to the same H-difference the $\Delta\gamma$ -effects are largest for *ms*-series and decrease in the order *ms*, *mp*, *md*. Some general considerations of electron displacement and imposed elec. field are outlined.

W. F. MEGGERS

The quenching of resonance radiation and the breadths of absorption-lines. R. W. DITCHBURN. *Proc. Cambridge Phil. Soc.* 23, 78 84(1926). C. C. KIESS

Polarization of radiation scattered by an electronic system in a magnetic field. G. BREIT. *J. Optical Soc. Am.* 12, 195-205(1926); cf. *C. A.* 20, 542.—The classical theory of the polarization of radiation scattered by an electronic system leads to results which cannot well be harmonized with exptl. facts. A quantum hypothesis is made which appears to account for the phenomena more satisfactorily. C. C. KIESS

Arc spectrum of phosphorus. N. K. SUR. *Nature* 116, 542(1925).—Series relations arising from Saltmarsh's observations (*C. A.* 18, 2286) are pointed out.

B. C. A.

Ultra-violet absorption spectra of mono- and di-derivatives of benzene. F. W. KLINGSTEDT. *Acta Acad. Aboensis Math. Phys.* 3, 1-82(1924); cf. *C. A.* 17, 686.—The absorption of ultra-violet radiations up to 1944 Å. U., has been examd. quantitatively for toluene, phenol, aniline, the xylenes, cresols, toluidines and dihydroxybenzenes. All compds. which show narrow absorption bands in the vapor state give also in indifferent solvents spectra with narrow (10-30 Å U.) bands similar to the spectra of their vapors. The characteristics of the absorption spectra of the compds. mentioned are described. Substitution in the benzene nucleus by Me, hydroxyl, or amino groups results in a displacement of the selective absorption towards the red, an increased total absorption in the inner ultra-violet, an increase in the mol. absorption coeff. of the strongest inner bands, and a change in the no., form and distribution of the different bands. Similar effects are observed in substituted toluene derivs. The selective absorption of *p*-derivs. is distinguished, apart from the nature of the substituent, by a large no. of sharply defined narrow bands, begins at longer wave lengths, and is more marked in the extreme ultra-violet than is the case with the other isomerides. *o*- and *m*-Derivs. are similar in the middle ultra-violet and to a certain extent in the outer ultra-violet. The absorption spectra of the hydrocarbons examd. have no definite benzene character. The absorption spectra of the phenols, apart from those parts of the spectra of *p*-derivs. which contain numerous bands, are generally similar. The amines are generally similar in their absorption spectra up to the outer ultra-violet, except that aniline and *p*-toluidine have narrow bands in the inner ultra-violet.

B. C. A. •

The effect of pressure on the absorption of hydrogen chloride in the infra-red. GORTHOLO BECKER. *Z. Physik* 34, 255-72(1925).—The effect of pressure on the absorption of the 3.4 μ vibration-rotation band of HCl was studied. The absorption was increased by increased pressure due to air and also due to increasing the pressure of HCl, keeping the product of density and thickness of layer const. It is found that this is due to the broadening of the lines but that the broadening does not depend on the no. of collisions alone.

H. C. UREY

Measurements of the rotation spectrum of HCl in the long-wave-length infra-red. M. CZERNY. *Z. Physik* 34, 227-44(1925).—Measurements have been made for the first time on a pure rotation spectrum of a diatomic mol. The lines were sepd. by a diffraction grating. A water-free chamber was used for the expts. and the necessary windows consisted of Japanese lacquer which was shown to transmit 99% of the light. Seven absorption maxima were observed in the region from 42 to 100 μ which had nearly const. frequency differences. It is necessary to use half quantum nos. in order to calc. the frequencies from the usual theory of band spectra. The data agree with the data on the vibration-rotation spectrum except for a small const. differenc. H. C. U.

A second spark spectrum of neon. LÉON BLOCH, EUGÈNE BLOCH AND GEORGES

DÉJARDIN. *Compt. rend.* **182**, 451-2(1926).—The method of oscillating discharge in electrodeless tubes has permitted recognition of 3 successive ionizations for A, Kr, Xe (cf. *C. A.* **19**, 1988). Similar expts. have produced a new spectrum of Ne which it appears reasonable to consider as the second spark spectrum, Ne III. A table of about 100 lines (2263.17 to 3786.29 A. U.) is given to describe this spectrum. W. F. M.

Spark spectrum of lithium. S. WERNER. *Nature* **116**, 574(1925).—With an app. including a very intense source of light, and so arranged that fluorite windows are not introduced in the path of light, the classification of the spectrum denoted by Schüller as the doublet system of the Li II spectrum has been extended, and the conclusions already reached (*C. A.* **19**, 1375) have been confirmed. B. C. A.

The interpretation of the alkaline earth spectra by models. GREGOR WENTZEL. *Z. Physik* **34**, 730-35(1925).—A discussion of the structure of the alk. earth spectra on the basis of theories of others and the assignment of the spark X-ray levels to the general scheme of multiplet levels. H. C. URKY

The vacuum spark spectra of some of the heavier elements, and series classification in the spectra of ionized atoms homologous with copper, silver and gold. J. A. CARROLL. *Trans. Roy. Soc. London* **225A**, 357-420(1925).—With the vacuum grating spectrograph the spark spectra of the following elements were photographed in the extreme ultra-violet: Hg, Ga, In, Tl, Ge, Sn and Pb. The wave lengths derived from measurement of the plates are tabulated. The lines of Tl have been detd. within a few hundredths A. U. and are, therefore, recommended as standards of reference for wave-length measurements in the extreme ultra-violet down to 1000 A. U. From these data lines have been selected as representative of the doublet series systems of Hg II, Ga III, In III, Tl III, Ge IV, Sn IV and Pb IV. In each spectrum pairs of lines representing the combination $1s - 2p_{1,2}$ have been found. Additional pairs give combinations between other p , d , f and g terms. The justification for the given classifications is based on the agreement of the observed $\Delta\nu$'s and term values with the theoretical results of Sommerfeld, Landé and Hartree. An approx. relation for a sequence of d -terms is homologous spectra is $\Delta\nu(d)/C^2 = \text{const}$, where C is the charge on the core of the atom. C. C. KIESS

Arc spectrum regularities for ruthenium. W. F. MEGGERS AND OTTO LAPORTE. *J. Wash. Acad. Sci.* **16**, 143-54(1926).—In a preliminary note (cf. *C. A.* **19**, 2601) the identification of the term with lowest energy in the arc spectrum of Ru as a result of under-water spark absorption observations was announced. Zeeman effect measurements show that this is a quintet-F term. Eighteen multiplets contg. about 160 lines are given as representative of quintet, triplet and inter-system term combinations. A table of relative term values is given and the electron configurations which are responsible for these terms are discussed. W. F. MEGGERS

Excitation of the second spectrum of neon by electronic impact. GEORGES DÉJARDIN. *Compt. rend.* **182**, 452-4(1926).—Spectroscopic examn. of luminous discharge in electrodeless tubes revealed a second spectrum of Ne (*C. A.* **19**, 1988), and the conditions for the excitation of this spectrum are now investigated by the method of electron impact. Using a 3-electrode tube contg. Ne at 0.01 to 0.1 mm. Hg pressure, lines appeared at 52 v. and this spectrum was completely developed at 60 v. applied potential. With gas at a pressure of 1.6 mm. Hg, lines appear between 28 and 30 v. and evidence is obtained of 2 crit. potentials, viz., 28 v. and 49 v. for the second spectrum of Ne, the difference, 21 v., being the ionization potential of the gas. The ratio of the higher crit. potential to that of ionization is 2.28 while for A this ratio has been found to be 2.24 and for Kr and Xe 2.22. The theoretical interpretation of these phenomena is still uncertain. W. F. MEGGERS

The spark between carbon rods impregnated with a mixture of oxides of molybdenum, titanium and vanadium as the source of a closely spaced line spectrum in the visible region. MARION EPPLEY. *J. Frank. Inst.* **201**, 333-5(1926).—Directions are given for coating the extremities of C electrodes with V_2O_5 , MoO_3 and TiO_2 for the purpose of securing a spectrum with closely spaced lines of nearly uniform intensity between 6678 A. U. and 3990 A. U. C. C. KIESS

The spectrum of ionized oxygen (O II). A. FOWLER. *Proc. Roy. Soc. (London)* **110A**, 476-501(1926).—New measurements of the spectrum of ionized O have been made between 6721 A. U. in the red and 1956 A. U. in the ultra-violet. About 160 of these lines have been classified as members of the doublet and quartet systems. The lowest level thus far found in each system is a p term above which come other s , p' , d , d' and f terms. If the lowest level is 1^2s the sequence of 2^2p terms suggests for it a value of approx. 240,000 cm^{-1} , which would give an ionization potential of about 30 v., in good agreement with that deduced from astrophysical data. Comparison of the O II spectrum with

N I shows close similarity between the two, the wave-nos. of several groups of O II lines being closely double those of the corresponding groups of N I. C. C. KIRKS.

A band spectrum of tin monochloride exhibiting isotope effects. W. JEVONS. *Proc. Roy. Soc. (London)* 110A, 365-90(1926).—Measurements are given on the heads of two new groups of ultra-violet emission bands due to a chloride of Sn. One group consists of two very similar systems, to which vibrational quantum nos. are assigned; the two systems have a common initial electronic state, but two distinct but evidently closely related final electronic states. The bands of both systems are degraded toward the violet. If these two systems are attributed to SnCl^{35} , certain additional nearby weaker bands fall in exactly the theoretical positions for SnCl^{37} . That the bands are due to a diatomic mol., which must be SnCl , is shown also by the structure of the systems. There is some evidence of the Sn isotope effect. In the second group of bands, which are degraded toward the red, little is known as yet about assignment into systems, or as to the nature of the emitting mol. R. S. MULLIKEN.

The magnesium hydride band spectrum. W. M. WATSON AND PHILIP RUDNICK. *Astrophys. J.* 63, 20-32(1926).—New wave length detns. of the lines in the $\lambda\lambda$ 5622, 5211 and 4845 bands have been made, and the several P , Q and R branches, all terms of which are doublets, assigned. A correlation between abnormal septis and unequal intensities in the doublets near the origins of the bands is noted. The various combination relations are tested, and is shown that the combination involving the Q branch does not hold in any one band. Rotational and vibrational quantum assignments are made, and the form of the approx. final term is found to be given empirically by $\Delta f(m) = 12.0 m - 0.06 m^2$. The predicted isotope effect for a diatomic MgH mol. exists in all the bands, namely, the occurrence of two faint companions to each band line, and with the displacements as given by the theory. Reasons for considering the carrier to be MgH are presented. A possible identification of the electronic frequency with an electron transition in the Mg atom is made. The moment of inertia of a dipolar carrier is computed to be $4.6 \times 10^{-40} \text{ gm cm}^2$, and the internuclear distance $1.7 \times 10^{-8} \text{ cm}$. W. F. MEGGERS.

The band spectrum of aluminum. G. ERIKSSON AND E. HULTHÉN. *Z. Physik* 34, 775-87(1925).—The band spectra of an Al are burning in air and H_2 are studied. The wave lengths of the heads of the Al oxide bands and of the individual lines of the Al hydride bands were measured. The oxide bands form a band group in which transitions between 8 initial vibration states and 10 final vibration states are observed. The bands for which the change in vibration quantum no. is zero fall off in intensity more rapidly than other bands. Three Al hydride bands are described which arise from transitions between two initial and two final vibration steady states. The lower states are double. H. C. UREY.

Systematic relations between electronic structure and band-spectrum structure in diatomic molecules. I. R. S. MULLIKEN. *Proc. Nat. Acad. Sci.* 12, 144-51(1926).—Recent developments in the theory of electronic band spectra are reviewed and the following simple postulates are constructed from a consideration of the structure of known band spectra, taking into account the occurrence of apparent nearly integral and half-integral rotational quantum nos., the "missing lines" near the band origins, the occurrence of P , Q and R branches, and the nature of the electronic multiplicity. (1) The electronic state of every mol. can be characterized by a term designation, e. g., 1S or 2P ; this is associated with an electronic quantum no. j_e identical with Sommerfeld's at. inner quantum no. j for the given term type. (Or in some cases (e. g., CH) each atom may have its own individual j_e , uncombined with that of the other atom.) (2) The vector or vectors j_e set themselves parallel (ϵ components) or perpendicular (σ components), or nearly so, to the nuclear angular momentum vector m , and the rotational energy term is given by the formula $E^m = Bm^2 + \frac{1}{2} = B(\sqrt{j_e^2 - \sigma^2} + \epsilon)^2 +$ (3) The mol. j has integral values for odd mols., half integral values for even mols. and is subject to the selection principle $\Delta j = 0, \pm 1$; the occurrence of P , Q and R branches being detd. in accordance with the correspondence principle. These postulates are elucidated by some supplementary remarks and conclusions. A detailed account of their application to individual band spectra, and discussion of the problems of mol. structure, and of "rotational doubling" in band spectra will be given in sep. papers. W. F. MEGGERS.

Systematic relations between electronic structure and band spectrum structure in diatomic molecules. II. The ZnH , CdH and HgH molecules and their spectra. ROBERT S. MULLIKEN. *Proc. Nat. Acad. Sci.* 12, 151-8(1926).—The band spectra of ZnH , CdH , HgH are interpreted in accordance with the general postulates given in I (cf. preceding abstract). The evidence that the emitters are those named seems

conclusive. For each mol. there are two closely related band systems having a common final limit; these are believed to parallel the transitions ${}^2P_{1,2} - {}^2S$ of the respective metal atoms, Cu, Ag and Au. Further details concerning molecular stability, the "missing lines," and the existence of double rotational terms are given. W. F. MEGGERS

Photographic spectra of tribo-luminescence. D. M. NELSON. *J. Optical Soc. Am.* 12, 207-15(1926).—Various natural and artificial substances were examined for tribo-luminescence, and of these the following three were selected for examn. with a spectrograph: sphalerite, chlorophane and artificial zinc sulfide. Disks of each, mounted on the shaft of a motor, were excited to luminescence by being rotated against brushes of various kinds. The emitted light was found to consist in each case of a narrow band of continuous radiation extending from the green into the orange with max. in the greenish yellow. C. C. KIESS

The excitation of gas spectra by chemical reactions. HANS FRÄNZ AND HARTMUT KALLMANN. *Z. Physik* 34, 924-50(1925); cf. *C. A.* 19, 2452.—In this work the excitation of the Na and Hg lines by reactions between Na and the halogens and between Hg and the halogens has been studied. Possible intermediate reactions for the reaction of Na with the halogens are presented and the energy available for the excitation of spectra for these reactions is calcd. From the calcs. it would seem that the Na lines could be excited but that the Hg lines could not. It is found exptly. that both the Na and Hg lines are excited and that the intensities are about the same for the reaction of Na and Cl_2 but that only Na lines appear for the reaction of Na and Br_2 . Only band spectra of the Hg halides appear in the Hg and halogen flames. The distribution of the intensity of these bands when excited by discharges and chem. reactions is discussed. H. C. UREY

Measurement of the coefficients of the absorption of light by fluorescent substances. S. PIENKOVSKI AND A. JABLONSKI. *J. phys. radium* [6] 6, 177-81(1925).—The fall of intensity of the fluorescence formed by a beam of parallel monochromatic rays passing through the liquid is measured photographically. From this the coeff. of absorption of light can be calcd. The method is applicable both to visible and to ultra-violet light if it is monochromatic. Results obtained for fluorescein were found to be in good agreement with those obtained by other methods. B. C. A.

Permanent modifications in fluorescent liquids. (MLLE.) M. ASTERBLUM. *Bull. inter. acad. polonaise* 7-8A, 297-318(1924).—Exposure of glycerol solns. of fluorescein to ultra-violet light results in a change in the color of the fluorescence from green to blue. The intensity of fluorescence diminishes and after prolonged exposure the soln. no longer gives out light. The soln. does not recover its initial properties on long keeping. Indication of the formation of modifications on illumination is afforded by the appearance of a new band between 4900 and 4470 Å. U. in the fluorescence spectrum and the diminution in intensity of the band at 5500 Å. U. characteristic of normal fluorescence. On prolonging the action of the exciting light the new band in turn disappears. The absorption spectrum of the modified solns. shows a decreased absorption in the region 4900 Å. U. and an increased absorption in the region below 4600 Å. U. Purely chem. processes, e. g., oxidation by the air, action of alk. impurities, etc., may bring about similar changes. The max. wave length of the light capable of producing this modified fluorescence is about 2540 Å. U. Glycerol solns. of methylene violet, corallin, crocein, esculin, erythrosin, eosin and rhodamine lose their fluorescent properties on exposure to the action of ultra-violet light. The rate at which these modifications are formed depends on the concn., in general the rate being greater the more dil. the soln. Solns. of erythrosin, eosin and rhodamine in benzyl alc. are much more sensitive to the action of light than are the corresponding glycerol solns. B. B. A.

Fluorescence and channeled absorption spectra of bismuth vapor at high temperatures. A. L. NARAYAN AND K. RANGADHAMA. RAO. *Nature* 114, 645(1924); *J. Inst. Metals* 33, 401.—At 1300° Bi vapor exhibits an absorption spectrum composed of a great no. of bands presenting a fine structure and extending from 6500 to 4500 Å. U. In this region 400 bands have been photographed, and these all shade off toward the red. The vapor emits an orange-yellow fluorescent radiation, the spectrum of which contains 24 bands between 6600 and 5050 Å. U. H. G.

Determination of the life period of the activated state of fluorescent molecules. FRANCIS PERRIN. *Compt. rend.* 182, 219-21(1926).—The value $1/4$ for max. polarization of a circular oscillator has to be changed into $1/2$; it appears from this (cf. Vavilov and Levshin, *C. A.* 17, 3838) that this form of oscillator has to be abandoned. The equation $p = p_0\eta/(\eta + s)$ ($s = (1 - 1/2p_0)RT\tau/V$), however, remains generally valid for p as a function of η (p is polarization, p_0 polarization for zero Brownian rotational motion, η viscosity, $V = N \cdot 1/\tau r^3$ the actual vol. of fluorescent substance, τ the av. life. From

this equation is found for erythrosin $t = 0.16 \times 10^{-8}$ sec., bengal rose 0.14×10^{-8} sec. in alc. soln. The p_0 and τ are generally independent of η but depend upon the dielec. const. of the solvent. If $\tau/\tau_0 = k$ a const. equal to the quantum efficiency of fluorescence, the theoretical period τ_0 can be evaluated from an equation of Einstein, it depends upon the absorptive power of the substance; its value for fluorescein in alk. aq. soln. is $\tau_0 = 0.6 \times 10^{-8}$ sec., in good agreement with $\tau = 0.4 \times 10^{-8}$ sec. for the same substance in water/glycerol mixts.

B. J. C. VAN DER HOEVEN

The decomposition of hydriodic acid in light: independence of the decomposition of hydriodic acid in light of the state of aggregation and temperature, and inquiry into the meaning of the mechanism of the process. MAX BODENSTEIN AND FRITZ LIENEWEG. *Z. physik. Chem.* 119, 123-38(1926) —The dissociation of HI in the gas phase by radiation from a Hg arc was followed by titration for I_2 and acid; the rate at 150° and 175° under otherwise identical conditions was found to be the same. In aq. soln., 1.84 mols. were found to be dissoc. per quantum of radiation of $300m\mu$ wave-length absorbed, agreeing within the limits of error with the work of Warburg in the gas phase, and fulfilling the prediction from the Einstein relation that the yield per quantum should be independent of temp. or state of aggregation. The reaction in aq. soln. was followed colorimetrically by the I formed. The reaction in the gas phase is unaffected by din with N_2 , and is not sensitized for long wave lengths by I_2 vapor, but it is still impossible on the available evidence to det. whether the primary reaction is dissoen into atomic H and I, or formation of activated HI mols. This can be done when it is found by expts. with monochromatic radiation whether I_2 vapor retards the reaction. B H C.

Evidence for the existence of activated molecules in a chemical reaction. O. R. WULF. *Proc. Nat. Acad. Sci.* 12, 129-32(1926) —On the assumption that the radiation emitted in the rapid decompn. of O_3 involves 2 mols., its wave length according to the quantum theory should be 4120 \AA . U. Actually it corresponds to an energy of twice this value, which is considered as proof of the existence of activated mols. as postulated by Arrhenius.

ARTHUR GROLLMAN

Excitation of resonance in neon by lines of the visible neon spectrum. W. DE GROOT. *Naturwissenschaften* 14, 104(1926).—If an image of the light of a Geissler tube with Ne filling is formed inside a Ne discharge tube resonance light (6402, 6334, 6143 and 6506) is observed. The same effect is found, the intensity varying with the place, owing to difference in concn. of metastable atoms, in a tube with striated discharge. If the same expt. is performed on a tube in which Ne is being excited by electron impact and the voltage so regulated that only 2s atoms are present, the red resonance light appears in a previously dark space as soon as the Geissler tube is ignited. Also in *Physica* 6, 53-6(1926).

B. J. C. VAN DER HOEVEN

The collision damping of the mercury resonance line. WILHELM ORTHMANN. *Ann. Physik* 78, 601-40(1925).—For the width of a spectral line 5 causes have been suggested: (1) Doppler effect, (2) radiation damping, (3) collision damping, (4) intermol. fields and (5) perturbations of the stationary orbits. The first 2 causes are always present, the last 3 only when the gas is investigated at high d. or mixed with other gases. In this paper it is shown that the collision damping can be studied apart from the other line-widening causes and that in the widening of the Hg resonance line 2536.7 \AA . U. by the addn. of foreign gases it plays the principal role next to Doppler effect.

W. F. MEGGERS

Photochemistry of some cinnamic acid derivatives (STORBE) 10. Velocity of chlorination of toluene (BERGEL) 10.

D'AINVILLE, JEAN VARIN: *L'origine tourbillonnaire de l'atome et ses conséquences*. Paris: Gauthier-Villars. 214 pp. Fr. 20.

HONORÉ, F.: *Le radium*. Paris: Gauthier-Villars & Cie. 145 pp. Fr. 18.

Treating carnotite ore. K. B. THEWS. U. S. 1,577,411, March 16. In recovering V, U and Ra from carnotite ore it is first subjected to a reducing heat in the presence of a reducing agent such as coal, coke or sugar (the heat being applied from an external source) and is then treated with an acid solvent such as HCl soln. preparatory to further treatment for recovery of its values. Cf. C. A. 19, 1242.

4—ELECTROCHEMISTRY

COLIN G. FINK

Chrome-nickel electric ingots. J. H. HRUSKA. *Iron Age* **116**, 1801, 1845-6 (1925).—The detn. of the principal factors influencing the chem. and mech. properties of steel are most conveniently ascertained from empirical logs of various heats, chem. analyses and heat balance sheets. H. includes one of these complete records to show satisfactory practice for the manuf. of high-grade Ni-Cr steel for an approx. 5-ton ingot. Characteristics of the furnace, specifications for the metal, record of the heat, analyses, etc., are given. The heat distribution per ton of Ni-Cr steel melted in a 7-ton Heroult furnace is summarized as: steel 51.9%, slag 7.0%, cooling rings 2.8%, transformer 1.1%, radiation 37.2%, the total heat distribution being 648,100 cal. The design of molds, correct pouring temp. and segregation are discussed briefly. A. D. S.

Electrothermic manufacture of zinc. FRIDTJOF ANDERSEN. *Mödd. Sveriges Kem. Ind.* **1923**, 67-78; *J. Inst. Metals* **33**, 471-2.—A. gives an account of the electrothermic production of Zn, dealing especially with the methods used at Trollhättans Elektrotermiska Aktiebolag, Sweden. The production costs of electrothermic and electrolytic Zn are discussed. H. G.

An electric resistance furnace for high temperatures. BO KALLING. *Teknisk Tids.* **1922**, 146-7; *J. Inst. Metals* **33**, 546.—An elec. resistance furnace is described whose resistance element consists of a graphite cylinder cut up zigzag shape. With such furnaces temps. above 2000° have been attained and maintained for long periods of time. H. G.

Rating of heating elements for electric furnaces. A. D. KEENE AND G. E. LUKE. *J. Am. Inst. Elec. Eng.* **45**, 222-6 (1926).—The authors describe the method of calcg. the operating temp. and the factors of safety of furnace resistor elements for reasonable service. Problems are worked out for Ni-Cr resistors of the rod type (single banked and double banked) and of the ribbon type (single banked) to illustrate the difference in the factors of safety at a dissipation of 15 w. per sq. in. and in the cost of metal per kw. radiated at a const. factor of safety. It is pointed out that the shape of the element does not necessarily insure lower cost of metal if consideration is given to the factor of safety and the life of the element. A. D. S.

Electrolytic separation of alkali and alkaline-earth metals. R. SAXON. *Chem Trade J.* **77**, 236 (1925).—With an anode of Meldrum's acid-resisting metal and a porous cathode compartment contg. Hg, electrolysis of a paste of NaOH and water yields an amalgam contg. 3.4% of Na. The Hg is preferably covered with a little petroleum. Li, Rb, Ba and Ca have been obtained by a similar method; for the last a mixt. of the chloride, nitrate and iodide is used. B. C. A.

The electrodeposition of copper from solutions containing cuprous chloride. GUENTHER HAENSEL. *Wiss. Veröffentl. Siemens-Konzern* **4**, No. 2, 111-57 (1925).—A long series of expts. was carried out. The cuprous ion content of the solns. was detd. by means of a new rapid, analytical method employing KBrO_3 : $6\text{CuCl} + \text{KBrO}_3 + 7\text{HCl} = \text{KCl} + \text{HBr} + 3\text{H}_2\text{O} + 6\text{CuCl}_2$. The electrolyte was 3 N Cl^- , 0.25 N HCl, 0.33 A CuCl. Electrolysis proceeded smoothly when precautions were taken to exclude the air. The soly. of CuCl in various alkali and alk. earth chlorides was detd.: CuCl is most sol. in KCl and NH_4Cl solns. In all cases the cathode deposit was nodular; addn. of gelatin improved the structure. It was not possible to bring about a refining of the Cu anode such as obtains in sulfate solns. On the other hand it was comparatively simple to carry out a refining process for Bi and Sb with chloride baths. Attempt to refine Ag in a chloride bath failed. C. G. F.

The parting plant of the U. S. S. Lead Refinery, Inc. F. F. COLCORD. *Trans. Am. Electrochem. Soc.* **49** (preprint) (1926).—An electrolytic process of refining doré or impure Ag is described. The electrolyte consists of Ag and Cu nitrates, a typical compn. of which is Ag, 50 g. and Cu, 60 g./l., and in some cases a small amt. of free HNO_3 . Horizontal graphite or C plates are used as cathodes in the bottom of the cell and the doré or impure Ag is placed in a basket lined with cotton duck and mushn and immersed in the top of the soln. The Ag deposits on the cathode in cryst. form and is periodically scraped from the cathode and removed from the cell. The anodic Au residue is also removed at intervals and is purified by boiling with H_2SO_4 before being cast into bars. The cells are operated in series at 160 amp., corresponding to an anode c. d. of 40 amp./sq. ft. (4.3 amp./sq. dm.), and the cell voltage is 3 v. Details of the plant construction and operation are given. G. DUBERNELL.

The conductivity of electrolytes used in the electrolytic separation of silver and gold.

F. F. COLCORD, E. F. KERN AND J. J. MULLIGAN. *Trans. Am. Inst. Mining Met. Eng.* 1926, No. 1574-D, 9 pp.—The sp. cond. of pure and mixed solns. of AgNO_3 and $\text{Cu}(\text{NO}_3)_2$ up to 80 g./l. are given. $\text{Cu}(\text{NO}_3)_2$ increases the cond. about twice as much as AgNO_3 . It was found that HNO_3 was reduced and NH_4NO_3 formed in the refining electrolyte, which was dil. in HNO_3 and concd. in metal. This accounted for the "aging" of the electrolyte. Sp. cond. curves are given showing the increase due to NH_4NO_3 , which was comparable to that with $\text{Cu}(\text{NO}_3)_2$. Increasing AgNO_3 and $\text{Cu}(\text{NO}_3)_2$ concns. gives coarser Ag crystals at the cathode; less than 40 g./l. of AgNO_3 tended to give fine crystals. The presence of NH_4NO_3 is considered beneficial if both the Cu and the Ag concns. are above 50 g./l.; it tends to give more compact and finer Ag crystals. G. DUBPERNELL.

Refining of silver by electrolysis. A. A. BULAKH. *J. Russ. Met. Soc.* 1925, Pt. 1, 289-96.—This is a discussion of a modified improved bath for the electrolytic refining of silver. Several diagrams of the bath are given. J. S. JOFFE.

Studies on electroplating. VI. Barrel plating. A. Preparation of the work. W. E. HUGHES. *Metal Ind.* (London) 28, 101-3(1926); cf. *C. A.* 19, 3223, 20, 713.—Various methods of cleaning objects preparatory to barrel plating are considered, tumbling barrels, sand blasting, pickling, electrolytic cleaning in boiling NaOH and the bright dipping of brass and Cu. The compns. of 4 representative bright dips taken from the literature are given and discussed and their use and maintenance are reviewed. G. DUBPERNELL.

"Bugs" increase profits in plating practice. W. S. BARROWS. *Can. Foundryman* 15, 24-5(1924); *J. Inst. Metals* 33, 474.—If alk. solns. are used to remove grease or oil from polished castings before plating, the soln. should be heated to a temp. at least as high as the m. p. of the grease to be removed. If paraffin is used in the grinding, it is particularly important to use a very hot cleaning soln., but if tallow is used instead of paraffin, a cooler cleaning bath will serve. In Ni-plating, with a simple double sulfate soln., $5\frac{1}{2}^\circ \text{Bé.}$ should not be exceeded. The addn. of 2 oz. H_3BO_3 per gallon will assist in the production of fine, tough, white deposits which will "color" easily, while the addn. of 1 oz. NH_4Cl per gallon gives a deposit that is more mat and a dull white in color. H. G.

Chromium plating on printing plates. H. E. HARING. *Metal Ind.* (N. Y.) 24, 68-9(1926); cf. *C. A.* 20, 552. G. DUBPERNELL.

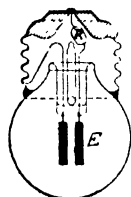
Chemical analysis and the electroplater. JOSEPH HAAS AND E. R. UNRUH. *Metal Ind.* (N. Y.) 24, 16-7, 70-2; *Metal Ind.* (London) 28, 225-6, 243, 267(1926). A general article considering the application of chem. analysis and scientific control to electroplating processes. Scientific control in electroplating includes (1) chem. analysis of plating chemicals and solns.; (2) regulation of elec. conditions; (3) records of results; (4) experimentation with solns. under varying conditions; (5) proper interpretation of 1, 2, 3 and 4 collectively. These topics are discussed and their application is considered. Sample forms are shown for recording analyses and other data on Ag and Ni solns. G. DUBPERNELL.

Control storage batteries. Their characteristics, methods of operation and charging equipment. E. A. HOXIE. *Gen. Elec. Rev.* 29, 232-42(1926). A consideration of the important points to be considered in selecting a battery best adapted to a definite case and in maintaining it so as best to realize the advantages derived from its use. General battery characteristics, types, methods of operation and detn. of battery capacity are discussed, also low-voltage control, floating and charging app. and motor generator sets. A scheme of connection when 140 v. generators are used is indicated. Advantages claimed for the use of 60-cell batteries include maintenance of the battery in a fully charged condition, a longer useful life, economy and simplicity. Each advantage is discussed. The requirements of a floating and charging source for control batteries are summarized. Selection of a motor-generator set for a 60-cell battery is aided by reference to a table that indicates the size of a 140 v. generator set for floating and charging. W. H. BOYNTON.

The Edison accumulator. CLAUDE DE ALBERTIS. *Bull. assoc. ing. éléc. Montebore* [7] 1, 160-70(1923); *J. Inst. Metals* 33, 468.—The manuf. of Edison accumulators at the Edison Works in Orange, New Jersey, is described. The most important operation is the prepn. of the positive plates, which consist of a no. of Ni-plated steel tubes packed with $\text{Ni}(\text{OH})_2$. The tubes are made of steel ribbon, which is perforated and then plated with Ni in a bath of NiSO_4 . After plating, the strips are heated to a high temp., so as just to melt the Ni. A sound coating which will not flake off is thus ensured. In order to assist the oxidation of the $\text{Ni}(\text{OH})_2$, which takes place during charging, the

NiO is packed in the tubes in layers, with pure Ni separators between them. These Ni separators are only $1/1000$ mm. thick, and are made by depositing thin layers of Ni and Cu alternately on a revolving Cu cylinder. When 125 layers of each have been deposited, they are removed from the cylinder and cut up into squares. The Cu is then dissolved, leaving a no. of thin leaves of Ni. The advantages and uses of the Edison accumulator are described, and an account of the chem. reactions during charging and discharging is given. H. G.

Recent developments of Moore gaseous conductor lamps. (Neon.) D. McFARLAN MOORE AND L. C. PORTER. *Trans. Illum. Eng. Soc.*, Feb., 1926; *Elec. World* 87, 822(1926).—For some years past the smallest-wattage 110-volt incandescent lamp



ordinarily used has been the 10-watt size. The gap between this size and zero can be filled in with gaseous conductor lamps, of which a new form is described. Some of these require only 0.01 watt. One type is shown in the figure. The glow is due to corona, the electrodes becoming luminous alternately in successive half cycles of the a. c. In this particular case the bulb is spherical, 3.2 cm. in diam., and is provided with a medium screw base. The 2 straight wire electrodes *E* are of pure Mg, 2.3 mm. diam. and 11 mm. long. They are welded to the Ni lead-in wires, the parallel gap between them being about 0.8 mm. After the bulb is thoroughly exhausted it is charged to 30 mm. with a gas prepd. from com. Ne and composed principally of Ne and He. Because the resistance decreases with increasing current, a series resistance, *R*, of 15,000 ohms is used, placed in the base. On a c., as the potential is gradually increased the first faint luminosity appears at 80 volts, with 0.00002 amp. flowing. At 90 volts, with 0.00018 amp., there is full corona. Above this the current increase is proportional to the voltage, and at 142 volts the current is 0.0033 amp. A number of other types have been developed. The behavior on d. c. is interesting. If one of these corona lamps is connected in series with a resistance of several hundred thousand ohms and in parallel with a condenser, bright flashes occur at definite intervals, the frequency of which may be varied from many thousands per sec. to one flash in about five min. This property has been used in the transmission of photographs. Since there is nothing corresponding to the time lag of the incandescent lamp, due to the heating or cooling of the filament, the response to the application or cutting off of voltage is instantaneous. Various applications are suggested. C. G. F.

Electrical resistance units with large temperature coefficients. (Nitric oxides.) H. GRUSS. *Wiss. Veröffentl. Siemens Konzern* 4, No. 2, 105–11(1925).—The problem was to increase the normal temp. coeff. of Fe or Ni (which is approx. 5% per 10°) to an enlarged coeff. of about 20% per 10° . Iron wire 0.04 mm. diam. was mounted as a filament into a bulb filled with $\text{NO}_2 + \text{N}_2\text{O}_4$ mixts. of predetd. pressure. N_2O_4 was prepared by the As + fuming HNO_3 method and dried over P_2O_5 . The gas was cooled and oxidized to N_2O_4 by means of dry O_2 . The N_2O_4 was purified by fractional distn. To avoid formation of HNO_3 , last traces of moisture were carefully eliminated. Upon analysis the N_2O_4 gas was found to contain only about 0.001% impurities. The bulbs were sealed and consequently high temp. of filament and of gas corresponded to high pressures of the nitric oxide gas. Accordingly, the temp. coeff.-temp. curves show a very sudden and sharp rise which accounts for the inapplicability of these bulbs as general temp. measuring devices. Upon diluting the nitric oxide gas with an indifferent gas the curves approach a right line but the sensitiveness of the bulbs decreases to 0.8% rise in resistance per 1° . In one expt. the bulb was filled with a large excess of N_2O_4 , part of it liquefying in the bulb. A negative temp. coeff. was obtained. With a mixture of CCl_4 and H_2 the proportion of H_2 is a function of the temp. and a very large negative temp. coeff. is possible. C. G. F.

A high power laboratory for testing oil circuit breakers and other apparatus. W. R. WOODWARD. *Elec. J.* 23, 102–6(1926).—W. discusses a lab. method of testing oil circuit breakers under controlled and observed conditions. Details are given of the testing equipment including 2 generators [rated at 20,000 k. v. a. (13,200 v.) and capable of testing a 25,000 v. circuit breaker], motors, switches for voltage control, reactances, etc. A. D. S.

Ionization studies in paper-insulated cables. C. I. DAWES AND P. L. HOOVER. *J. Am. Inst. Elec. Eng.* 45, 337–47(1926).—A statement of some preliminary results, some tentative conclusions, and a description of the method developed for making measurements of the ionization phenomena occurring in paper-insulated, high-voltage power cables. A new type of bridge was devised for very accurate measurement of dielectric losses at extremely low power factors. The investigation is being conducted at the

Harvard Eng. School under the auspices of the Impregnated Paper-Insulated Cable Research Committee.

New uses for electric gas purification. EMIL ZOFF. *Chem.-Ztg.* **50**, 81-2(1926); cf. *C. A.* **20**, 1520.—This is a review of recent applications of the Cottrell-Moller method of removing dust from smoke and gas by elec. pptn. Diagrams and photographs are shown. Wide application has been possible in the briquet industry, resulting in an increase of 7.5% in output. The method is also being used in coke ovens, illuminating gas plants, gas producers, oil shale distn., H_2SO_4 plants, smelting furnaces, cellulose industry, etc. In S burners and smelting furnaces generally, the gases can be purified from a content of 0.1 g. of solids per cu. m. to 0.003 g. per cu. m. Numerous applications are also found in the cement, gypsum, lime and chem. industries generally.

Electric dust precipitation in brown coal briquet factories. F. FISCHER. *Z. Ver. deut. Ing.* **70**, 253-60(1926).—A description and diagrammatic sketch of the elec. installation are given, the high tension e. m. f. being about 55,000 v., an Al disk rectifier being used. In *briquet* manuf. the dust is produced in the drier to which the raw coal is fed. This coal contains about 58% H_2O , and is dried to a content of 14%. The amt. of dust produced depends upon the pressure at the end of the drier, the H_2O content of the raw coal, the no. of tubes in the drier, etc., but is usually about 6-8% of the raw coal handled. In the old method of dust pptn., depending chiefly upon the mech. action of baffle plates and H_2O sprays, the dust recovered contained 45% H_2O , while in the elec. process, the dust recovered contained only 8-15% H_2O . Freedom from explosion in the dust pptn. chamber is insured by maintaining the proper humidity conditions, and curves are shown giving the relation between relative humidity, rate of feed to drier, temp. of dust, etc. A crit. point in the relative humidity of the dust is found, below which the vapors are apt to ignite, particularly if there is arcing at the electrodes. This is at about 22% relative humidity. Safety devices which operate warning signals are installed to insure further against arcing and sparking. An app. for detg. the amt. of dust recovered is described, and it is found that under proper operating conditions the loss is only about 0.25% of the coal fed to the drier, while in the older methods the loss is about 1.42%. Cost figures are given for the 2 methods for installations of 1500 tons of briquets daily, and show an operating cost for the elec. method only about $\frac{1}{3}$ as great as for the old method.

H. STOERTZ

Chemistry of bleaching powder (OCHI) 18. Refractories for electric furnaces (BERLIN, HARDÉN) 19. Photoelectric photometer (SHARP, KINSLEY) 1.

ALLMAND, ARTHUR JOHN. **Principles of Applied Electrochemistry.** 2nd ed. revised and enlarged by author and H. J. T. Ellingham. London and New York: Longmans, Green & Co. 727 pp. \$10.50.

BARTON, LARRY J.: **Refining Metals Electrically.** Cleveland, Ohio. The Penton Pub. Co. 414 pp.

DEBAR, RUDOLF: **Die Aluminium Industrie.** 2nd ed. revised by Rudolf Debar. Brunswick: F. Vieweg & Sohn. 338 pp. R. M. 20

Revoluble electric arc furnace adapted for treatment of iron sand, etc. W. A. LOKE. U. S. 1,580,060, April 6

Connected sectional electrode for electric furnaces. A. H. LAURELL. U. S. 1,579,824, April 6. Mech. features.

Electric rotating resistance furnace. F. ANDERSEN. U. S. 1,576,621, March 16

Electric resistance furnace adapted for heating metals, etc. M. D. DOMINGUEZ. U. S. 1,579,476, April 6

Temperature regulation and air circulation within electric furnaces. J. W. HARSCH. U. S. 1,578,027, March 23.

Electrolytic apparatus for separating metals such as silver, gold and platinum. A. DASSBACH. U. S. 1,577,898, March 23.

Roller-conveyor apparatus and electrolytic cells for electroplating metal sheets. AKT.-GES. FÜR INDUSTRIEWERTE. Brit. 237,863, July 31, 1924

Electrolytic cell adapted for decomposing water, etc. F. PETZ. U. S. 1,579,138, March 30.

Electrolytic cells for decomposition of water, etc. R. PECHKRANZ. Brit. 237,903, Aug. 2, 1924. Bituminous products from petroleum refining or similar materials, which may be used to impregnate asbestos or other fibrous materials, are used for packing the joints of the app., which may be of the filter-press type.

Electrode for electrolytic cells adapted for use as condensers. H. O. SIEGMUND and B. E. BROWN. U. S. 1,578,857, March 30. Al is used in sufficient proportion with other materials, *e. g.*, 2% of Si, as to be substantially non-film-forming.

Electric battery. W. J. QUIRK. U. S. 1,576,786, March 16. Structural features.

Primary electric battery. M. L. MARTUS, E. H. BECKER and J. G. ROSS. U. S. 1,579,558, April 6. Structural features.

Primary electric battery. M. L. MARTUS, J. G. ROSS and E. H. BECKER. U. S. 1,579,228, April 6. Structural features.

Dry-cell electric battery. W. F. HENDRY. U. S. 1,578,891, March 30. Structural features.

Storage battery. J. L. LANGE. U. S. 1,577,912, March 23. Structural features.

Storage battery. O. E. HUEBNER. U. S. 1,576,974, March 16. Separators for storage batteries are formed of sheet material such as wood, paper, rubber or celluloid having apertures pierced through the material by high-tension elec. discharges.

Forming rubber battery jars, etc. J. WESTREN. U. S. 1,578,787, March 30. Mech. features.

Protective coating for battery terminals. P. A. WOLFF. U. S. 1,578,494, March 30. Paraffin 16, beeswax 1, Na_2CO_3 4, glycerol $1\frac{1}{2}$, paraffin oil 1 and resin 2 oz. are used together.

Electrostatic separation of suspended particles from gases. H. A. WINTERMUTE. U. S. 1,579,462, April 6.

5—PHOTOGRAPHY

C. E. K. MEES

Standard light source for plate testing. S. E. SHEPPARD. *Brit. J. Phot.* 72, 518-20(1925); *Phot. Ind.* 23, 924-6(1925).—Report of a committee of 8 members of the Optical Society of America presented to the 1925 International Congress of Photography held at Paris. It is recommended that: (1) The photographic unit of intensity be defined as one visual candle power of radiation having a spectral compn. identical with that emitted by a complete radiator (black body) at a temp. of 5000°K . (2) In the detn. of speed, the illumination incident on the photographic material shall be not less than 1.0, nor greater than 10.0, meter candles. (3) The exposure be non-intermittent and that the variation in exposure be produced by a variation of the time factor of exposure. G. E. M.

Determination of silver in photographic preparations. W. MEIDINGER. *Z. weiss Phot.* 23, 282-5(1925).—Practically identical results are obtainable, in the estn. of Ag in a photographic emulsion, by the 3 similar titration methods of Liebig, Eggert and Marasco. Eggert's procedure has, however, an advantage in rapidity over the 2 others. Misapprehensions in Marasco's article (*C. A.* 18, 3018) as to the soly. of AgCN in NH_3 , and the identity of Eggert's method with the earlier ones of Rebière and Dénigès, are pointed out. C. E. K. M.

Neutral salts and dyes as desensitizers of silver bromide and of bleach-out dyes. G. KÖGEL and A. STEIGMANN. *Phot. Ind.* 23, 1387-9(1925).—The investigations of Sheppard with thiocarbamide lead K. and S. to allude to a certain identity between bleach-out and AgBr sensitizers, and they show that this identity is easily comprehended on the basis of their photochem. dehydration-hydration theory. They describe a preliminary investigation of the Casolari reaction, according to which an aq. soln. of $\text{Na}_2\text{Fe}(\text{CN})_6\text{NO}$ and NaCNS turns blue in the light of a Hg quartz lamp. $\text{Na}_2\text{Fe}(\text{CN})_6\text{NO}$ is also a strong photographic desensitizer. The same reaction was observed with $\text{Na}_2\text{Fe}(\text{CN})_6\text{NO}$ and either semicarbazide or thiosemicarbazide (Kögel's bleach-out sensitizers and, in the case of the latter, Sheppard's AgBr sensitizer). The Casolari reaction is very markedly inhibited by NH_3 , which also represses the desensitizing power of $\text{Na}_2\text{Fe}(\text{CN})_6\text{NO}$. K. and S. suggest that the action of the desensitizers formed during the natural ripening of an emulsion is prevented by NH_3 . They mention similarities in the action of nitro compds. in desensitizing photographic plates and the bleaching of dyes. A. P. H. TRIVELLI

History of the toning and intensification of silver images by means of ferricyanides. J. M. EDER. *Phot. Ind.* 23, 1355-6(1925).—Priority is accorded to Selle (1865) for the use of $\text{K}_3\text{Fe}(\text{CN})_6$ with $\text{UO}_2(\text{NO}_3)_2$ for the intensifying and toning of a (collodion) Ag image. The chemistry of the reaction between Ag, $\text{K}_3\text{Fe}(\text{CN})_6$ and $\text{Ph}(\text{NO}_2)_3$ (or similar salt) was first elucidated by E. in 1876. E. remarks the importance of the reaction

between Ag and $K_3Fe(CN)_6$ in the theory of the bromoil, kodachrome and certain dye-mordanting processes.

Desensitization with basic scarlet N. R. MAUGE. *Bull. soc. franç. phot.* **12**, 127-9(1925).—A description is given of the properties and method of use of basic scarlet N.

A. P. H. TRIVELLI

H. ELFERINK

Color photography. J. G. ZIMMERMAN. U. S. 1,579,161, April 6. A sensitized plate is exposed beneath a suitable multicolor selective screen, and a colored positive is printed directly from the negative.

Photographic printing papers. J. HALDEN & CO., LTD AND J. H. W. RUMSEY. *Brit.* **237,777**, Nov. 11, 1924. In sensitizing paper or fabric for use in a ferrogallie process, the material is first coated with $BaSO_4$, together with an adhesive such as glue or gelatin, dried and then treated with a coating compn. contg. gelatin, tartaric acid, $Fe_2(SO_4)_3$ and $FeCl_3$. Gallic acid may be applied before or after printing.

Photographic and carbon tissue resist etching process for producing intaglio printing plates or cylinders. W. E. CROWE. U. S. 1,577,181, March 16.

Gelatin. A. JENNY and J. ANGERSTEIN. U. S. 1,577,642, March 23. An acid gelatin soln. is subjected to the action of an elec. current between diaphragms which sep. the soln. from the electrodes, and the soln. is afterward neutralized. This treatment serves to produce a product suitable for *photographic emulsions*.

Photographically sensitive composition. C. E. TEBBS and J. HELFRICH. U. S. 1,579,898, April 6. A film formed of a mixt. of dragon's blood, shellac and an alkali metal chromate, proof against electrolytic action, is used on printing plates in photo-engraving.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

The complex compounds of thorium and formic acid. Supplement: **Aluminum and manganese formate.** R. WEINLAND AND ADOLF STARK. *Ber.* **59B**, 471-9(1926). Th and $HCOOH$ form complex anions, the coordination no. of Th being 6 with NH_4 , Ba and Sr as cations while with K and pyridine it appears to be 5. By a binuclear formulation this hypothetical number can be avoided and Th is given the coordination no. 6. The methods of prepn. of the following compds. are given: NH_4 , Ba and Sr hexaformatothoriate, $[Th(form)_6]M_2$, (M being a univalent metal) the 2 latter with 2 mols. water of crystn. K and pyridine pentaformatothoriate, $[Th(form)_5]H$ M. hexaformatopentahydroxotrithorium perchlorate, nitrate, chlorate, thiocyanate and formate, $[Th_3(form)_6](OH)_6R$ (R being the univalent acid residue) with 12, 10, 16, 7 and 2

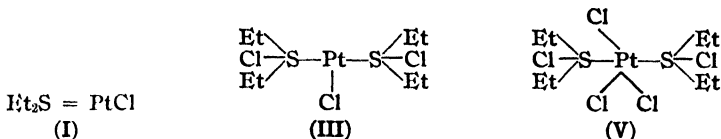
mols. of water of crystn., resp., Mn formate, $[Mn_3(form)_6]form_3 + 2H_2O$, which is decomposed by water and $EtOH$, and basic Al formate $Al(form)_2OH + H_2O$. E. K.

Oxides of iron, chromium and antimony, and the nature of the combination with oxygen. A. SIMON. *Oesterr. Chem. Ztg.* **28**, 195-6(1925).—Just as a part of the H_2O in hydrated oxides may be considered as fixed in position in the space lattice, while the rest has a certain mobility, so can a part of the O in oxides of Fe, Cr, Sb and As be fixed while the remainder is not. A similar condition is observed with higher oxides of U, which tend to change into U_3O_8 . X-ray studies on U-bearing minerals confirm this view. Studies on the isobar of the Fe_2O_3 to Fe_3O_4 transformation indicate that above 1300° a part of the O is in a mobile state. In the CrO_3 - Cr_2O_3 transformation there are indicated compds. Cr_6O_{13} and Cr_7O_{12} (the latter hitherto unknown). With CrO_3 a part of the O is mobile. In the Sb_2O_5 - Sb_2O_3 transformation at 430° there is formed Sb_5O_{13} (hitherto unknown); at 700° this decomposes into Sb_2O_3 and the latter at 910° yields Sb_2O_3 , with no intermediate oxides apparent.

W. C. EBAUGH

Varying valency of platinum with respect to mercaptanic radicals. II. PRAFULLA CHANDRA RAY AND KSHITISH CHANDRA BOSE RAY. *Quart. J. Indian Chem. Soc.* **2**, 178-90(1925); cf. *C. A.* **17**, 1470; **18**, 3558.—By interaction of Et_3S and $PtCl_4$ under various conditions the following compds. were prepd. $(Et_3S)PtCl$ (I), did not m. 250° ; $(Et_3S)_2PtCl_2$ (II) (see below); $(Et_3S)_3PtCl_3$ (III), orange-red crystals, m. 109° ; $(Et_3S)_2PtCl_2$ (IV), yellow crystals, m. 198° ; $(Et_3S)_2PtCl_2$ (V), orange crystals, m. 90° . Six isomeric modifications of II were isolated: (α) golden yellow plates, m. 108° ; (β) pale white crystals, m. 108° ; (γ) greenish yellow crystals, m. 110° ; (δ) colorless needles.

m. 104°; (e) lemon-yellow monoclinic plates, m. 96°; (f) (cf. *C. A.* 17, 1470), m. 77°
Possible structural formulas for I, III and V are as follows:



III may be considered as a mol. compd. of II and IV; on crystn. from boiling EtOH it breaks down into the component mols. Evidence is adduced for the formula $\text{H} \left[\begin{array}{c} \text{Pt} \\ \text{Cl}_6 \\ \text{OH} \end{array} \right] \cdot (\text{Et}_2\text{S})_2 \cdot \text{H}_2\text{O}$ to represent V. Ebullioscopic detn. of the mol. wt. of I in CHCl_3 indicates the formula $[(\text{Et}_2\text{S})\text{PtCl}]_3$. Disodium dithioethyleneglycol and PtCl_4 when refluxed in Et_2O soln. give a brick-red ppt. of the formula $\text{Pt}(\text{C}_2\text{H}_4\text{S}_2)_2 \cdot \text{PtCl}_2 \cdot \text{Et}_2\text{O}$; a similar procedure with MeAc as solvent gives a chocolate-colored ppt. of the formula $2\text{Pt}(\text{C}_2\text{H}_4\text{S}_2)_2 \cdot \text{C}_2\text{H}_4\text{S}_2$.

DONALD W. MACARDLE

Preparation of pure nickel monoxide (NiO). M. LE BLANC AND H. SACHSE. *Z. Elektrochem.* 32, 58-62(1926).—NiO prepd. at different temps. has different colors varying from gray-black to green, accompanied by a varying Ni_2O_3 content (detd. with KI). Heating of NiCO_3 in the air never gives pure NiO; the oxide takes up some O_2 on cooling (Ni_2O_3 up to 1.4%); cooling in dry N_2 yields a pure product with one % water; NiCO_3 in *vacuo* at temps. higher than 280° decomposes to NiO free of higher oxides with less than 0.5% water. If instead of vacuum the decompn. takes place in an indifferent gas dried by CaCl_2 the oxide contains some 5% water.

B. J. C. VAN DER HOEVEN

The constitution of nickel carbonyl and the nature of secondary valence. A. A. BLANCHARD AND WM. L. GILLILAND. *J. Am. Chem. Soc.* 48, 872-82(1926).—The reactions of $\text{Ni}(\text{CO})_4$ with Br, S, O and Grignard reagents are described and indicate that it is a loose association of Ni and CO, either constituent reacting alone with substances with which it would be expected to react were it in the free state, leaving the other constituent uncombined. This supports the claim that $\text{Ni}(\text{CO})_4$ is a compd. in which secondary valence alone is exerted, the primary valences which both Ni and CO are capable of developing remaining dormant. The authors propose a structure for carbonyls in which 4 electrons of each carbonyl group are held in the sheath of the nickel atom and 16 of the Ni sheath are shared, leaving 2 which are put in the polar axis unshared. Such electrostatically self-contained structures can account for the extreme volatility of these complex molecules. CH_2O_2 is formed in small amts. from CO and H_2O in the slow oxidation of $\text{Ni}(\text{CO})_4$.

H. STOERTZ

The transformation and oxidation of the sesquioxide of chromium. L. BLANC AND G. CHAUDRON. *Compt. rend.* 182, 386-8(1926); cf. *C. A.* 19, 1653.—B. and C. try to define the oxidation reactions whereby blue $\alpha\text{-Cr}_2\text{O}_3$ changes in air at 500° to olive-green $\beta\text{-Cr}_2\text{O}_3$. The method was by differential thermal analysis in a Saladin-LeChâtelier app. This change takes place with incandescence at different temps. depending on the atm. and pressure. Both varieties of Cr_2O_3 are oxidized to corresponding α and β -oxides of the compn. Cr_2O_5 and the transformation of the $\alpha\text{-Cr}_2\text{O}_3$ in air at 500° into the $\beta\text{-Cr}_2\text{O}_3$ is hindered by the transformation of the $\alpha\text{-Cr}_2\text{O}_3$ into $\beta\text{-Cr}_2\text{O}_3$ at about 440°. Guignet's green is evidently only finely divided $\beta\text{-Cr}_2\text{O}_3$.

P. B. P

Basic stannous sulfate. C. M. CARSON. *J. Am. Chem. Soc.* 48, 906-11(1926) NaOH soln. of varying concn. was allowed to act upon SnSO_4 in a flask suspended in boiling H_2O and shaken for 1 hr. The resulting mixt. was filtered quickly and the ppt. dried and analyzed. Sn was pptd. as sulfide and weighed as oxide. A curve is given showing variation of SO_4 content with NaOH used, from which it is seen that within 2 regions of alkali variation the ppts. remain approx. const. in compn., indicating 2 definite compds. having the probable formulas: SnSO_4 , SnO and $\text{SnSO}_4 \cdot 2\text{SnO}$ -unknown- H_2O . Methods of analysis are described, with methods of correcting the analyses of incompletely sepd. solid phases for the retained liquid phase.

H. STOERTZ

Researches on the complexes of stannous iodide. T. KARANTASSIS. *Bull. soc. chim.* 39, 43-4(1926); cf. *C. A.* 20, 1039.—The complexes $\text{SnI}_2\text{N}(\text{CH}_3)_4$, $\text{SnI}_2\text{As}(\text{CH}_3)_3$, $\text{SnI}_2\text{NH}_3\text{C}_2\text{H}_5$ and $\text{SnI}_2\text{NHC}_2\text{H}_5$ are obtained from the union of SnI_2 and org. bases contg. I. Such complexes are all of the same type; SnI_2BH and show analogy with the salts of K and NH_4 . Rb and Cs further form salts of the type $(\text{SnI}_2)_2\text{MI}$.

P. B. P

The preparation of mosaic gold. HANS HADERT. *Chem.-Ztg.* 50, 7-8(1926).—

Mosaic gold made by the wet process is of inferior quality; therefore the dry method is preferred. Mix 14 kg. Sn filings with 6.5 kg. of Hg, and heat in an enameled vessel on a sand bath, with const. stirring. An amalgam forms which hardens on cooling. Mix 8 kg. of powdered S and 6.8 kg. NH_4Cl with the amalgam (finely divided), put in glass vessels loosely stoppered with a porcelain cover, and heat gradually in a sand bath until vapors cease coming off (about 4 hrs.), after which heat the bath to redness. Then allow the fire to die down gradually. In the flask are found golden-yellow crystals of mosaic gold. They adhere easily to objects they touch. Usually two grades are sepd from a batch, those in the upper part of the container being of better quality than the others. Mosaic gold is especially adapted for gilding, as it does not tarnish readily. Different shades of mosaic gold are made by varying the proportions of components used.

W. C. EBATUGH

Preparation of disilicon hexachloride. J. B. QUIG AND J. A. WILKINSON. *J. Am. Chem. Soc.* **48**, 902-6 (1926).—The yield of *disilicon hexachloride* obtained by passing Cl over ferro-silicon at 200° was greatly increased by passing the Cl first through SiCl_4 so that vapors of the tetrachloride were present in the gas. A yield of 34.9%, calcd on the basis of the wt. of Si used from the 50% Fe-Si added, was obtained when SiCl_4 was aspirated at the rate of 0.5152 g. per min. If the SiCl_4 is increased beyond this point, the yield is reduced, indicating that the first increase in yield is due to a hastening of the final chlorination and not to a reduction of SiCl_4 by Si. App. and methods of analysis are described.

H. STOERTZ

The action of red phosphorus on iodine in organic solvents. R. N. TRANLER AND F. E. E. GERMANN. *J. Am. Pharm. Assoc.* **14**, 476-7 (1925); cf. *C. A.* **19**, 3440. Red P reacts with I in CS_2 to form PI_3 . The reaction is complete provided sufficient red P is present. If moisture is present the iodide formed reacts with the H_2O yielding HI and P acid, both of which can later be removed from the remaining red P by washing with H_2O . The error in the work of the former experimenters rests in their failure to recognize that a chem. reaction, not adsorption, was the main factor in the removal of free I by red P from the solns. used.

L. E. WARREN

The oxidation of hydrazine. I. Potassium azo-disulfonate. E. KONRAD AND L. PELLENS. *Ber.* **59B**, 135-8 (1926).—The mechanism of oxidation of hydrazine must be studied first on some of its stable derivs. Potassium hydrazine disulfonate is very stable in acid solns. It was oxidized in alk. soln. by KOC with evolution of N_2 . At temps. below 0° the soln. turns yellow and the salting out with KCl ppts. K azo disulfonate $\text{KO}_2\text{SN}=\text{NSO}_2\text{K}$, insol. in H_2O and org. solvents, easily hydrolyzed to $\text{N}_2 + \text{K}_2\text{HSO}_3 + \text{KHSO}_4$. The sym. formula $\text{HSO}_2\text{IINNHSO}_2\text{H}$ should be adopted for hydrazinedisulfonic acid.

G. CALINGAERT

The reaction between hydroxylamine and ferric chloride. A. D. MITCHELL. *J. Chem. Soc.* **1926**, 336-50.—“The rate of reaction after the early stages is directly proportional to the concn. of NH_2OH and to the square of that of FeCl_3 , and inversely proportional to the concn. of ferrous salt and to the square of the H^+ concn. The most probable interpretation is that reaction proceeds by way of an intermediate equil. involving a complex of the type shown: $2\text{Fe}^{+++} + \text{NH}_2\text{OH}^+ \rightleftharpoons \text{Fe}^{++} + 2\text{H}^+ + (\text{NOH, Fe, H})^{+++} \rightarrow \text{N}_2\text{O}$, etc. The abnormal temp. coeff. of 6.5 for a 10° rise would thus be partly due to a more favorable displacement of the equil. ‘Salt effect’ is negative—reaction velocity is depressed by the addn. of indifferent salts.”

F. L. BROWNE

Bismuth compounds. I. B. HEHNER AND A. LIKIERNIK. *Arch. Pharm.* **264, 46-55 (1926).—Constitution of bismuth nitrate and tartrate.** The behavior of $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ in a desiccator over H_2SO_4 of varying concn. was observed *via* van Bencelen, and the resulting data were tabulated. Substituent compds. of Bi nitrate with mannitol,

glycerol and sorbitol were studied analytically, viz.: $\left[\text{Bi} \begin{smallmatrix} \text{ } \\ \text{NO}_3 \end{smallmatrix} \right]^{1/2} \text{mannitol} \left[\text{NO}_3 \right]_2$,

$\left[\text{Bi} \begin{smallmatrix} \text{glycerol} \\ \text{NO}_3 \end{smallmatrix} \right] (\text{NO}_3)_2$ and $\left[\text{Bi} \begin{smallmatrix} \text{sorbitol} \\ \text{NO}_3 \end{smallmatrix} \right] (\text{NO}_3)_2$, likewise solns. of the nitrate in neutral

salts, viz.: $\left[\text{Bi} \begin{smallmatrix} (\text{NO}_3\text{NH}_4)_3 \\ \text{NO}_3 \end{smallmatrix} \right] (\text{NO}_3)_2$, BiONO_3 dulcitol and BiONO_3 mannitol. Of the

tartrates, the following were prepd.: $\left[\text{Bi} \begin{smallmatrix} (\text{OH})_2 \\ \text{NO}_3 \end{smallmatrix} \right] \text{O} \cdot \text{OCCH}(\text{OH}) \text{H}_2\text{O} \left[\text{Bi} \begin{smallmatrix} (\text{OH})_2 \\ \text{C}_4\text{H}_5\text{O}_6 \end{smallmatrix} \right] \text{C}_4\text{H}_4\text{O}_6$

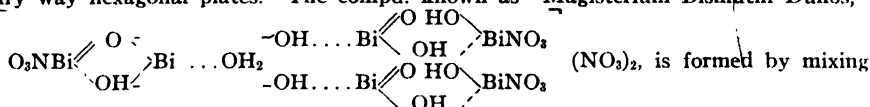
$\text{BiO} \cdot \text{OCHCHOH} \dots \text{BiO} \cdot \text{OH}$
and

$\text{NaOOCCHOH} \dots \text{BiO} \cdot \text{OH}$
basic bismuth nitrate. The first decompn. product of Bi nitrate with H_2O has the for-

II. B. HEPNER. *Ibid.* 55-65.—*Constitution of*

mula $\text{Bi} \begin{array}{c} \diagup \text{O} \\ \diagdown \text{NO}_2 \\ \diagdown \text{OH}_2 \end{array}$ and consists of characteristic scales (very thin striped microscopic plates), which on 8 hrs.' dehydration in a desiccator had rather uniformly the compn. $(\text{Bi}_2\text{O}_3) \cdot (\text{N}_2\text{O}_5)(\text{H}_2\text{O})_{1.9}$. The H_2O loss was unaccompanied by any loss of HNO_3 , the ratio of $\text{Bi}:\text{HNO}_3$ remaining 1:1. The compd. $\left[\text{O}_2\text{NBi} \begin{array}{c} \diagup \text{O} \\ \diagdown \text{OH} \end{array} \right] \text{BiOH} \left| \text{NO}_3 \right.$ was obtained by

heating equal parts of Bi nitrate and H_2O on the H_2O bath until the scales change into heavy crystals, or on protracted standing of the scales with the mother liquor (1 part of nitrate to 11 parts of H_2O), or finally by continued action of HNO_3 contg. less than 6% N_2O_5 . Prepd. in the wet way the crystals are microscopically monoclinic, in the dry way hexagonal plates. The compd. known as "Magisterium Bismuthi Duflos,"



1 part of Bi nitrate with 24 parts of H_2O , and dissolving this mixt. in 120 parts of H_2O , or by heating 1 part of the nitrate with 24 parts of H_2O at 75° until the ppt becomes cryst. It is also formed by allowing the scales to stand for about a year covered by H_2O . When formed slowly at the ordinary temp. large rhombs are obtained, at higher temp. small rectangular crystals. On drying over H_2SO_4 , the salt loses neither H_2O nor HNO_3 . The final degradation product by the action of H_2O on Bi nitrate is

$\text{O}_2\text{NBi} \begin{array}{c} \diagup \text{O} \\ \diagdown \text{OH} \end{array} \text{BiO}$, formed by digesting 1 part of Bi nitrate with 24 parts of H_2O on the H_2O bath in 2-hr. periods, rejecting the H_2O at the end of each period. It is a cryst powder of hexagonal aggregates. W. O. F.

Ammonium carbonates. C. BONNIER. *Ann. chim.* 5, 37-94 (1926).—The equilibria were studied by disson. tension of dry NH_4HCO_3 (a), and the tension of its aq solns. (b), both by static methods. (a) Equilibria were reached in 2.5 hrs. at 60° and 6 days at 25° . $\log p = 27.5 - (7680/T)$. The heat of formation, L , of NH_4HCO_3 from CO_2 , NH_3 and H_2O was calcd. as 38.3, agreeing fairly well with the value, 40.5, from other data. By using the latter value $\log K = 70.98 (20250/T)$, where $K = p_1 p_2 p_3$, the product of the partial pressures of the components. From this formula $K_{20} = 6.5$, $K_{25} = 20.7$, $K_{30} = 63.5$ (b) The effects of concn., temp., and vol. of the gas phase were studied. With increasing H_2O the pressure rises rapidly to 4.5 parts (satn. at 20°) and then decreases gradually. At 25° , 1 g. dissolves in 3.9 g. H_2O ; and at 30° in 3.5 g. With increasing gas space the pressure decreases slightly. With excess of NH_3 at 20° the pressure decreases to 3.3 cm. at 0.215 part $\text{NH}_3(\text{NH}_4)_2\text{CO}_3$, and then increases, the curve being parallel to but slightly below that for NH_3 in H_2O . The combination to $(\text{NH}_4)_2\text{CO}_3$ is not complete, since the minimum is higher than the pressure of H_2O , 1.7 cm.; and CO_2 exists in the gas phase even with excess NH_3 , since the pressure varies slightly with the vol. of the gas phase. From theoretical consideration for which the original must be consulted, the formula $P = 1.7 + w\sqrt{aK}/\sqrt{q(V + bq)}$ was derived, in which P is the total pressure, w is the wt. of NH_4HCO_3 dissolved, q is the wt. of H_2O in the soln., V is the vol. of the gas phase, K is the equil. const., and a and b are functions of the solubilities of CO_2 and NH_3 , resp., in the soln. The observed pressures agreed well with those calcd. by this formula. It is shown that H_2O does not act upon NH_4HCO_3 merely as a solvent, but as a reagent with high affinity for NH_3 . liberating CO_2 . A. W. FRANCIS

The action of hydrogen and water on phosphorus at high temperatures and under pressure. (Preliminary paper.) V. IPATIEV AND V. NIKOLAIEV. *Ber.* 59B, 595 (1926).—When white P is heated with H in a closed tube under 360° , PH_3 forms. In the presence of water also H_3PO_4 is obtained, while with water alone in the absence of H, H_3PO_4 and PH_3 are obtained. The formation of the latter from P and H_2O starts at about 290° and 40-50 atm. and is indicated by a break in the temp.-pressure diagram. A *cryst. purple modification of P* is obtained in the presence of water when the temp. is raised to 248° under a pressure of 48 atm. and then allowed to drop quickly. The purple P is sol. in CS_2 . Over 216° and 89 atm. the *black crystalline P* forms, which is insol. in CS_2 . EMIL KLARMANN

Optically active tripyrocatechol-arsenic acid. ARTHUR ROSENHEIM AND WILLIAM PLATO. *Ber.* 58B, 2000-9 (1925).—The constitution suggested by Reihlen (*C. A.* 19,

2307) for tripyrocatechol-arsenic acid indicated the possibility of splitting the ordinary acid into optically active isomers. For the *l*-form, sepd. as the cinchonine salt, an av. mol. rotation of about -2400 was found for several compds. of the active anion. Corresponding values were found for the *d*-form, sepd. as the quinine or the cinchonidine salt. Optical activity could be explained only by the assumption that the pyrocatechol was bivalent in the complex anion. Observed values for optical rotation of the free *d*-acid, the free *l*-acid, and about a dozen salts of the *d*-, *l*- and *dl*-acids are given. A slow racemization of the active anion was noted in neutral soln; this was greatly favored by H^+ and repressed by OH^- .

Nitrosiselenic acid. JULIUS MAYER AND WALTER GULBINS. *Ber.* 59B, 456 (1926).—The purpose of the paper is the prepn. of a Se analog of nitrosulfuric acid $(HO)ON \cdot SO_3H$. When nitrosyl-selenic acid $SeO_2(O \cdot NO)(OH)$ is dissolved in $H_2SeO_4 + H_2O$ and a droplet of Hg is added, the soln. becomes blue. It is decolorized by the addn. of oxidizing agents or water with formation of NO. The blue color is intensified by the addn. of a Cu-selenate soln. The agreement in the behavior of the S and Se compds. suggests the formula $(HO)ON \cdot SeO_2H$ for nitrosiselenic acid. The same compd. forms, when a soln. of $NaNO_2$ in strong H_2SeO_4 is shaken with metallic Hg.

Caro's reagent. REECE H. VALLANCE. *J. Soc. Chem. Ind.* 45, 66T (1926).—Twenty g. of $K_2S_2O_8$ were triturated with 13 cc. concd. H_2SO_4 in the cold, dild. in ice- H_2O , and neutralized at 0° with K_2CO_3 soln. The resulting soln. was evapd. in vacuum at 50° , yielding nearly *N* solns. of $KHSO_5$.

DONALD W. MACARDLE

EMIL KLARMANN

T. S. C.

Thermal analysis of the system BF_3-H_2S (GERMANN, BOOTH) 2.

COPAUX, H. and PERPÉROT, H.: *Chimie mineral.* Paris. Colln. Fr. 18.

MOLES, E. and CRESPI, M.: *Estudios acerca de los permanganatos.* Madrid Impr. Clásica Española. 61 pp. Pta. 50.

MOLES, E. and PORTILLO, R.: *Acerca de algunos complejos organicos del bismuto.* Madrid: Impr. Clásica Española. 57 pp. Pta. 50.

ODDO, GIUSEPPE: *Trattato di chimica inorganica.* Palermo, Rome. Remo Sandron. 868 pp. 75 Lire.

Handbuch der Arbeitsmethoden in der anorganischen Chemie. Vol. 2. Edited by Arthur Stähler. Berlin: W. de. Gruyter & Co. R. M. 54.

7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

Normal solutions of fixanal. E. ÖMAN. *Svensk Pappers-Tid.* 28, 512 (1925).—Testing fixanal solns. of NaOH, HCl, $Na_2S_2O_3$ and KI_3 showed them to be very reliable.

W. SEGERBLÖM

Austrian standard methods for the analysis of metals. Analysis of alloy steels. SWOBODA. *Oesterr. Chem.-Ztg.* 29, 35 (1926); cf. *C. A.* 19, 1112.—Directions are given for the detn. of C, Mn, Si, P, Cu, As, Ni, Cr, W, V, Mo, Ti and Co.

W. T. H.

Separation of calcium from magnesium, iron, aluminum and phosphoric acid. W. F. JAKÓB. *Roczniki Chem.* 5, 159-72 (1925); cf. *C. A.* 19, 223.—As is well-known, CaC_2O_4 can be pptd. in the presence of Mg, Al and PO₄ in dil. acid soln. contg. NH_4 citrate. After filtering off the ppt. it is well to purify it by boiling with a slightly acid soln. of NH_4 citrate.

W. T. H.

Detection of small quantities of magnesium, nitrate, and copper in very dilute solution. F. L. HAHN. *Festschr. Physik. Ver.*, Sep., 1924, 6 pp.—For the Mg test, see *C. A.* 19, 797. For the nitrate test, see *C. A.* 20, 158. Cu may be detected by the marked acceleration its presence has on the reaction between ferric salts and thiosulfate.

W. T. H.

Volumetric determination of calcium in mineral substances containing phosphoric acid, magnesium, iron and aluminum. R. MELLET. *Schweiz. Apoth. Ztg.* 63, 377-80 (1925); cf. *C. A.* 19, 2180; Canals, *Ibid.*—Reply to criticism by Canals. An inadvertent omission caused the apparent error. The sepn. of Ca and Mg oxalates by boiling H_2O as recommended by Canals (cf. *C. A.* 16, 1615, 3044) ignores the soly. of CaC_2O_4 in H_2O at $95^\circ = 0.0014\%$ (Richards, 1901); still, the washing of the Cu ppt. with hot H_2O may lead to correct results by compensation of errors.

S. WALDBOTT

Modification of Knop's method for the titration of iron. O. ROTHE AND A. P. SOBRINHO. *O. Brasil Tech.* 2, 79-90(1925).—A discussion of the $K_2Cr_2O_7$ titration of Fe^{++} with diphenylamine as indicator. W. T. H.

Determination of chromium in chromite. E. DITTLER. *Z. angew. Chem.* 39, 279(1926).—In the $KMnO_4$ method for the detn. of Cr it is often recommended to use an empirical value for the value of 1 cc. of $KMnO_4$ in terms of Cr. A careful comparison of values obtained in some 19 analyses with values obtained by the iodometric method shows that the true stoichiometric ratio is practically correct. Possibly increasing the $KMnO_4$ value 0.3 of 1% is justifiable but certainly the 5% increase recommended by some is altogether wrong. W. T. H.

Volumetric determination of nickel in alloys. OSKAR VON GROSSMANN. *Metall u. Erz* 22, 157-9(1925).—Dissolve 1 g. of alloy in 20 cc. of 7.5 N HNO_3 . Dil. to 150 cc. and remove Cu and Pb by electrolysis. Dil. to 500 cc. in a measuring flask and mix. To an aliquot part, add 5 cc. of 25% NH_4 tartrate and 25 cc. of NH_4OH . Add enough 0.5% KCN to destroy the green color and 10-15 cc. of NaOH to keep Zn in soln. Add 2 drops of 20% K_2S_8 soln. as indicator and titrate with KCN until the red color changes to yellow. C. G. KING

Phenylarsonic acid as a reagent for the determination of zirconium and thorium. A. C. RICE, H. C. FOGG AND C. JAMES. *J. Am. Chem. Soc.* 48, 895-901(1926).—Phenylarsonic acid, $C_6H_5AsO(OH)_2$, forms a very insol. compd. with Zr and pptn. results in the presence of considerable mineral acid. The corresponding Th salt is insol. in fairly strong AcOH solns. Detailed directions are given for the detn. of Zr in the presence of Fe, Al, Ti, Th, elements of the cerite group, U, Bi, Co, Mn, Co, Ni, Co, Zn, alkalies and H_3PO_4 , as well as for the detn. of Th in the presence of rare earths, e. g., in monazite sand. W. T. H.

The separation of germanium. I. WADA AND S. KATO. *Sci. Papers Inst. Phys. Chem. Research* 3, 243-61(1925).—Detailed directions are given for the detection of Ge in the presence of other elements which are likely to interfere. By means of H_2S first in acid soln. and later in ammoniacal soln. it is possible to remove most other elements that are likely to interfere with the Ge test. Small quantities of Se and As are likely to escape pptn. by H_2S . Distn. with HBr and Br_2 causes complete volatilization of $GeBr_4$ but Se and As also distil. From the aq. soln. of the distillate, Se can be pptd. by SO_2 . Then, by adding HNO_3 and evapg. to dryness, a residue is obtained which yields volatile GeF_4 when heated with HI and Cl_2 and, under these conditions, no As is distd. The Ge in the aq. soln. of the distillate will give a white ppt. of GeS_2 , after the Cl_2 is driven off by a stream of air and H_2S is introduced. The ppt. on ignition yields GeO_2 . W. T. H.

Volumetric determination of uranium, vanadium, copper and iron in uranium ores. A. S. RUSSELL. *J. Soc. Chem. Ind.* 45, 57-60T(1926).—(I) To the soln. contg. these elements, add H_2SO_4 enough to make the concn. of acid about 6 N. Shake with 3% Zn amalgam until the lavender color due to bivalent V is not further changed in intensity, decant the reduced soln. into a flask, wash the amalgam and allow 30 sec. for the oxidation of tervalent U to the quadrivalent uranous condition. Pour the soln. into an excess of 0.1 N $KMnO_4$, heat to 80° and titrate the excess permanganate with standard uranous soln. Assume the oxidation by $KMnO_4$ to be of V^{II} to VV , U^{IV} to UVI and of Fe^{II} to Fe^{III} . (IIa) To the hot soln. which has just been titrated with uranous soln., add NH_4OH until a permanent ppt. just fails to form. Cool to room temp., add 5 g. KI and a suspension of some freshly pptd. Cu_2I_2 to act as catalyzer. After 3 mins. titrate the liberated I_2 with $Na_2S_2O_3$. This gives the Fe and V, each being reduced 1 valence. (IIb) To the original soln. which has been fully oxidized but not treated with Zn-Hg, add KI and continue as in (IIa). This gives the Fe, V and Cu, each element experiencing 1 valence change. (III) Acidify and oxidize another portion of the original soln. as in (I), add H_3PO_4 and a few drops of a satd. soln. of diphenylamine in concd. H_2SO_4 and titrate with standard $FeSO_4$ soln. to the disappearance of the blue. This gives the V, reduced from a valence of 6 to 5. In the absence of V, the analysis is simpler. By the first procedure, the U and Fe are detd., by IIa the Fe alone and by IIb the Cu and Fe. Procedure III is unnecessary in this case. To test a ppt. of UO_2 to see if $1/2$ of the U is in the quadrivalent condition, add 0.6 g. of the oxide to 150 cc. of 6 N H_2SO_4 at 80° and an excess of $KMnO_4$ over that needed to oxidize the quadrivalent U to the hexavalent condition. When the oxide has all dissolved, titrate the excess $KMnO_4$ with standard $FeSO_4$ soln. W. T. H.

Determination of gold dissolved in mercury. G. TAMMANN AND K. KOLLMAN. *Z. anorg. allgem. Chem.* 151, 269-70(1926).—When Zn is deposited electrolytically on Hg contg. Au, the e. m. f. of the Hg electrode is changed but slightly until enough Zn

has been added to form AuZn, then there is a sudden change in cathode potential. For quantities of Au up to 0.005%, this furnishes a means of detn. W. T. H.

Spectroscopic detection of minute quantities of mercury. J. J. MANLEY. *Proc. Phys. Soc. London* 38, 127-8(1926).—Necessity arose for testing spectroscopically for traces of Hg in vertically placed U-tubes forming parts of permanent app. To accomplish this, external electrodes were provided by partially immersing the tubes in water contained in insulated beakers and wires from the high potential terminals of an induction coil activated by a 6-volt accumulator were lead into each beaker. When the coil was activated, the evacuated U-tubes, in one of which the test was to be made, were brought to a bright glow, like an ordinary spectrum tube. An end-on view of the glow within the excited tube could be obtained with the aid of a totally reflecting prism formed upon one of the limbs of the U-tube. The light was thus reflected horizontally and received in the usual way by a Hilger wave-length spectrometer.

W. T. H.

Microchemical estimation of very small amounts of mercury. E. J. HARTUNG. *Sci. Australian* 29, 509(1924); *J. Inst. Metals* 33, 427.—The Hg is deposited from a suitable soln. on a clean Cu strip. This is then heated in a tube fitted with a capillary extension, which is cooled by a wet thread. The condensed globules are measured under a microscope and their total mass is calcd. In this way as little as 0.001 mg. can be estd.

H. C.

Electrolytic separation of copper and cadmium. A. JILEK AND J. LUKAS. *Chem. Listy* 20, 18-21(1926); cf. *C. A.* 19, 3231.—Cu free from Cd can be deposited by a current of 1 amp. at 4 v. in a soln. contg. 15 cc. concd. HNO_3 , 6 g. tartaric acid and 15 g. 40% HF per 100 cc.

F. C. KRACEK

Silver determination in retort ash (zinc distillation). H. HASSREIDTER. *Metall u. Erz.* 22, 403-4(1925).—A suitable Pb button can be obtained by melting 5 g. of the ash with 25 g. of mixed borax and soda and enough KNO_3 to give a 20-30 g. button. Or, 15 g. of ash can be fluxed with 75 g. of PbO_2 , 10 g. of sand and 45 g. of soda, in which case the button will weigh about 60 g. Cupel and finish the assay as usual. C. G. K.

Electrolytic determination of moderate amounts of arsenic. J. MOIR AND J. S. JAMIESON. *J. South African Chem. Inst.* 8, 16-8(1925).—The app. is a modification of Thorpe's electrolytic app. with substitution of the generator cell by a narrow cylinder, and of the porous pot by an alundum crucible. A Cd electrode is used (activated by reversal of the current and subsequent deposition of porous Cd on restoring the normal direction) and Pt anode. The pressure of the anode liquid (1.5- H_2SO_4) prevents outward diffusion of the arsenical liquid. The cross tube is filled with Pb acetate cotton wool, and the gas exit connected with AgNO_3 tubes; the contents of these are titrated with dil. I soln. after addn. of a large excess of KI.

B. C. A.

Determination of small amounts of selenium in sulfide ores. MAX SCHMIDT. *Metall u. Erz.* 22, 511(1925).—Treat 10-20 g. of ore with aqua regia. Heat 10 mm., add 10 g. of NaOH and evap. to dryness. To the residue add enough concd. HCl to decompose the nitrates. (If a red residue remains repeat the treatment.) Dil., filter off the siliceous residue and in the filtrate remove Pb as PbSO_4 . To the filtrate from the PbSO_4 , add HCl and sat. with H_2S . Filter and digest the sulfides with $(\text{NH}_4)_2\text{CO}_3$ soln. to remove As. Dissolve the residual ppt. in aqua regia and ppt. Se with 10% SnCl_2 in concd. HCl. The method serves for the detn. of as little as 0.0001% Se.

C. G. KING.

The analysis of antimony pentasulfide. LOTHAR HOCK. *Kautschuk* Dec., 1925, 11-3.—In analyzing com. Sb_2S_5 it will be found advantageous to convert the substance to black Sb_2S_3 *in vacuo* rather than in a current of CO_2 . Place the Gooch crucible contg. the Sb_2S_5 (extd. with CS_2) at the bottom of a glass tube which fits loosely in an outer slightly longer tube (25 cm. long, 45 mm. internal diam.). Close both tubes at the bottom and immerse to about 0.5 their depth in an elec. oven at 300°, or in a bath of boiling BzOH . The outer tube has a ground-glass stopper from which a tube leads to a vacuum pump. On gradually heating, the sulfide decomps. and the S liberated sublimes in the cold upper portion of the inner tube. The Sb_2S_3 usually becomes of const. wt. in about 35-40 min. The approx. compn. of the original material ($\text{Sb}_2\text{S}_5 + \text{S}$) can be calcd. from the wt. of S extd. by CS_2 from the original material, the final wt. of Sb_2S_3 and the loss of wt. by decompn. It can be shown in this way that there must exist a compd. Sb_2S_5 and that contrary to Kirchhof (*C. A.* 15, 1469) Sb_2S_4 is not the only sulfide above Sb_2S_3 .

C. G. DAVIS

Report of sub-committee on determination of water. W. H. FULWEILER. *Proc. Am. Soc. Testing Materials* 25, Pt. I, 416-23(1925).—A discussion of the detn. of H_2O in different materials, bringing out the advantages of the method consisting in distn.

in the presence of a solvent (Method D 95-24), suggesting the possibility and advisability of extending its use to other classes of materials than those for which it is used at present. A bibliography of 56 references is given in connection with the method. A. P.-C.

Rapid method for the determination of moisture content. J. TAUSZ AND H. RUMM. *Z. angew. Chem.* 39, 155-6 (1926).—This ingenious method is suitable for the detn. of moisture in all sorts of materials, such as wheat flour, rye flour, white bread, yeast, butter and petroleum. It is based upon the principle of distg. with a less volatile liquid which has been used by others but the liquid used and the app. recommended represent improvements. The substance is mixed with considerable $C_2H_2Cl_4$ and heated in a dry flask. The distillate passes through a fractionating tower, which serves at first to condense all the $C_2H_2Cl_4$, and the steam is caused to condense and pass through a capillary into a gas buret contg. $C_2H_2Cl_4$ as confining liquid. The water, being of less d., floats upon this liquid. The distn. is continued, with gradually increased temp., until clear $C_2H_2Cl_4$ is obtained as distillate, the lack of turbidity showing that all water has been removed. Then the water is pushed up, by the leveling device, into a narrow measuring tube. The results of numerous analyses indicate that the method is very suitable for the analysis of substances which are easily decompd. and partially burned when heated directly. W. T. H.

New method of silicate analysis. ROBERT SCHWARZ AND ADOLF SCHINZINGER. *Z. anorg. allgem. Chem.* 151, 214-20 (1926).—It is proposed to substitute Li_2CO_3 for Na_2CO_3 or $NaKCO_3$ in the analysis and after such a fusion, even the alkalis can be detd. in a single sample. The analysis proceeds in the conventional way up to the detn. of Mg. Owing to the slight soly. of Li_3PO_4 it is not advisable to attempt pptn. of $Mg-NH_4PO_4$ in the presence of Li. Pptn. of $MgNH_4AsO_4$ and subsequent iodometric detn. of the As proved satisfactory. For the detn. of alkali it is necessary to remove the Li which is best accomplished by adding $(NH_4)_2HPO_4$ and then, since $LiPO_4$ is appreciably sol. in NH_4 salts., evap. down to dryness and gently ignite. After this treatment the $LiPO_4$ is insol. in alc. After filtering it off, the phosphate can be removed by adding $FeCl_3$ and carrying out the basic acetate sepn. The alkalis can then be detd. as usual. The results obtained in the analysis of an Al silicate showed good agreement for SiO_2 , Al_2O_3 , MgO , Na_2O and K_2O with analyses carried out after Na_2CO_3 fusion and by the J. L. Smith method. W. T. H.

Confining liquids for gas analysis. F. G. HOFFMANN. *Feuerungstechnik* 14, 98-101 (1926).—Soln. of the gases, especially CO_2 , is an important source of error in gas analysis. Satg. the liquid with the gas is not satisfactory, since the gas compn. changes during the analysis. Of 19 liquids examd., a 22% soln. of pure NaCl dissolved the least CO_2 ($1/3$ as much as pure water). Acidified water is no better than pure water. ERNEST W. THIELE.

Sampling and examination of mine gases and natural gas. G. A. BURRELL, F. M. SEIBERT AND G. W. JONES. *Bur. Mines, Bull.* 197, 108 pp. (1925).—A revision of *Bull.* 42 of like title (cf. *C. A.* 8, 1671). Minor changes have been made in the construction and operation of various app. for the exact analysis of mine gases, the detn. of CH_4 in mine air, etc., and in the *Bur.* of Mines standard Orsat app. (known by the trade name of "Burrell gas app.," cf. *C. A.* 20, 846). Detailed working sketches of all parts of these app. and exact directions for their use are given. The section on sampling has been considerably revised, that on analysis by means of the gas interferometer has been enlarged, sections on the I_2O_5 and pyrotannic methods for CO have been added and numerous other addns. and revisions have been made. W. B. PLUMMER.

Determination of carbon monoxide in hydrogen. P. SCHUPTAN. *Z. anorg. Chem.* 39, 276-8 (1926).—CO present in H_2 can, in the absence of O_2 , be detd. in quantities up to 10% by measuring the contraction that results on passing the gas over $Ni-Al_2O_3$ catalyzer heated to 200-300°. CO unites with $3H_2$ to form CH_4 and 3 mol. of H_2O so that the contraction is 3 times the vol. of the original CO. The preparation of the catalyzer is described in detail. The reaction does not take place satisfactorily if the temp. is too high or the CO content greater than 10%. W. T. H.

Analysis of a mixture of unsaturated gases. A. F. DOBRYANSKII. *Petroleum. Domain* 1925, 565-73.—The gases with a double bond contained in the products of pyro-genetic decompn. of petroleum consist chiefly of ethylene, propylene, isobutylene and erythrene. The method of analysis of these gases devised by D. is based on the selective soly. of unsatd. hydrocarbons in H_2SO_4 of different concns. The easiest to dissolve is isobutylene, next come erythrene, propylene and ethylene in this order. The acid contg. 83-84% of the monohydrate practically ceases to dissolve ethylene in the absence of strong agitation; for propylene the limiting concn. of the acid is 63.61% of H_2SO_4 , for isobutylene 45%. α - and β -Butylenes are sparingly sol. and in this

spect resemble propylene; almost the same holds true for erythrene. The app. used is Hempel's buret and pipets. Three pipets are filled, resp., with H_2SO_4 of 63–64%, 83–84 and 100% monohydrate (the latter may contain 2–1% of SO_3 in soln.). It is also necessary to have 1 pipet with alkali soln. for absorption of vapors of SO_3 and 1 pipet with Br water (200 cc. water, 10 g. KBr and 5 g. Br) to det. the general contents of unsatd. hydrocarbons. The dry gas is introduced into the pipet contg. the weakest acid and kept in contact with the acid until the absorption ceases. The change of vol. is noted and the residual gas is introduced into the next pipet. If the original vol. is V , that after treatment with 64% acid a , after treatment with 84% acid b , and after treatment with 100% acid and with alkali is c , the vol. of isobutylene will be $V-a$, the vol. of propylene $a-b$, the vol. of ethylene $b-c$, the vol. of satd. hydrocarbons and air c . The results obtained differ from the true values by only 0.2–0.4 cc. B. N.

Quantitative determination of erythrene. A. F. DOBRYANSKII. *Petroleum Domain* 1925, 574–7; cf. preceding abstr.—When using the method described in the previous abstract erythrene will be partly dissolved in the acid of the same concn. that dissolves isobutylene. The inconvenience caused thereby is not very great, as erythrene is seldom contained in petroleum gases in amts. greater than 2–1%. For the determination of erythrene D. proposes the following method based on its transformation into the dibromide. The gas is introduced into an air-tight app. contg. a soln. of KBr and H_2SO_4 in water; then a weighed quantity of KBrO_3 is made to react with the liquid: $\text{KBrO}_3 + 6\text{KBr} + 3\text{H}_2\text{SO}_4 = 3\text{K}_2\text{SO}_4 + 3\text{H}_2\text{O} + \text{KBr} + 3\text{Br}_2$. Br is evolved and combines with the unsatd. gases forming dibromides with ethylenes and tetra bromides with diethylenes. A sufficient quantity of KI is introduced in order to bind the excess of Br, and the I set at liberty is titrated by means of a standard thiosulfate soln. Knowing the total quantity of the unsatd. hydrocarbons by the method given in the preceding abstract it is easy to calc. the amt. of the ethylenic hydrocarbons. Examples of calcs. and a figure of the app. are given together with a detailed description of the operating method. About 2½ hrs. are required for the analysis and the precision attained is 0.9% of the theoretical. BERNARD NELSON

Determination of small quantities of alcohol and ether vapors in the presence of one another. E. v. SOMOGYI. *Z. angew. Chem.* 39, 280–1 (1926).—The vapors are passed first through a tube contg. 100 cc. of 9 N H_2SO_4 , which absorbs the alc. but not the ether. The gas is then passed through a mixt. of 50 cc. N $\text{K}_2\text{Cr}_2\text{O}_7$ and 50 cc. of concd. H_2SO_4 , which at once oxidizes the ether to acetic acid. The excess of $\text{K}_2\text{Cr}_2\text{O}_7$ can be detd. iodometrically. For the alc. detn. take 25 cc. of the contents of the first tube, 50 cc. of 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ and enough 18 N H_2SO_4 to make exactly 100 cc. After 6 hrs. det. the excess dichromate iodometrically. Or, after heating 2 hrs. at 60° in a closed flask, the oxidation of the alc. can be regarded as complete. W. T. H.

The value of by-products of saccharin manufacture in analytical chemistry (HERZOG) 10. *p*-Nitrophenylhydrazine, its preparation and gravimetric utility (HODGSON, BEARD) 10.

KEANE, CHARLES A. and THORNE, P. C. L.: **Technical Method of Chemical Analysis.** Vol. I. 2nd Ed., revised. New York: D. Van Nostrand Co. 702 pp. \$18.

KOLTHOFF, I. M. and FURMAN, N. HOWELL. **Potentiometric Titrations.** New York: John Wiley & Sons, Inc. 345 pp. \$4.50.

SAZ, P. EUGENIO. **Teoria y practica del analisis químico mineral.** Vol. I and II. Barcelona, Spain: Tipografia Catolica Casals. Vol. I. 700 pp. 25 pesetas. Vol. II. 580 pp. 20 pesetas.

SNELLGROVE, D. R. and WHITE, J. I. **Qualitative Inorganic Analysis.** London: Methuen & Co., Ltd. 282 pp. 7s. 6d. Reviewed in *Chem. News* 132, 161 (1926).

Determination of carbon monoxide. S. H. KATZ. U. S. 1,578,666, March 30. The filtered gas to be tested is passed over "hopcalite" and the temp. increase is measured. The filter used is adapted to remove suspensoids tending to poison the "hopcalite."

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY

Observations on chalmersite, CuFe_2S_3 . PAUL RAMDOHR. *Metall u. Erz* 22, 471-4 (1925).—The phys. characteristics and occurrence of chalmersite are given, with photomicrographs. It is often not recognized as such because of pseudomorphic occurrence with pyrite and chalcopyrite.

C. G. KING

The optical properties of amethyst quartz. C. V. RAMAN AND K. BANERJI. *Trans. Optical Soc. (London)* 26, 289-92(1924-5).

D. E. SHARP

Experimental investigation of the mixing of potassium and sodium feldspars. E. DITTLER AND A. KÖHLER. *Anz. Akad. Wiss. Wien* 61, 101-2(1924).—D. and K. subjected 0.02 mm. sections of perthite, micropertthite, granulite, cryptopertthite and antipertthite on Pt to a temp. of $1000 \pm 25^\circ$ for 500 hrs. or more in an elec. resistance furnace. Before heating the orthoclase and albite lamellas of a section of micropertthite showed extinction angles of 4.5° and 19° . After heating, the extinction became almost uniform, 6° and 8° . The original micropertthite has the properties of an anorthoclase. The other feldspars reacted similarly. Antipertthite contg. 15-20% anorthite showed only slight changes at the edges of the orthoclase inclusions. The fact that albite and orthoclase form mixed crystals probably has a bearing on the ease of diffusion.

E. R. SCHIERZ

Behavior of feldspars at high temperatures. E. DITTLER AND A. KÖHLER. *Anz. Akad. Wiss. Wien* 61, 153-4(1924).—A section || (010) of perthite, of which the microcline contained 7% albite, the plagioclase about 7.6% K feldspar and 2.9% anorthite, showed an extinction angle of microcline lamellas with respect to cleavage cracks = 6.5° ; to the albite lamellas, $20 \pm 1^\circ$. After having been heated to 1000° (cf. preceding abstract) the extinction angle for both was the same as that of the K feldspar, 6° . In some areas where the reaction was not quite complete readings of $11-13^\circ$ were obtained. In sections (001) the characteristic grating structure had disappeared. Sections || (001) of microcline and amazon-stone showed a similar loss of grating structure. This is the result of a rearrangement of the twin lamellas, thereby approaching the higher degree of symmetry exhibited by the orthoclase. In the case of the plagioclase of zonal structure with anorthite content of 20-70% no diffusion is evident even after the high temp. is maintained for 1000 hrs.

E. R. SCHIERZ

Crystallographic investigation of diopside from Saulera, Val d'Ala. M. LUCIANO. *Mem. accad. Lincei* [v] 14, 886-98(1924).—Measurements of crystals of diopside from Saulera give: $a:b:c = 1.0931:1:0.5892$, $\beta = 105^\circ 47.5'$, $d = 3.289$. Contrary to Striiver's statement, these crystals differ distinctly from those of Testa Ciarva.

B. C. A.

Structure of kaolin. Theory of the structure of silicates. M. DOMINIKIEWICZ. *Roczniki Chem.* 5, 252-90(1925).—The space configuration of quartz is, on the basis of its crystal form, of its property of rotating the plane of polarized light, and of the tendency of oxy-Si compds., e. g., silicoformaldehyde, to form rings contg. 6 Si atoms, assumed to consist of spirally disposed rings each contg. alternately 6 Si and 6 O atoms. On this assumption, the structural formulas of various silicic acid derivs. are deduced. The difference between ortho- and meta-silicates depends only on different quant. relationships between the metal and silicic acid, with the probability that for salts of bivalent metals 2 silicic acid nuclei are joined by the metal. For the aluminosilicates only this type of formula can be considered, and the structure of semi-hydrated kaolin, $\text{H}_{24}\text{Al}_2\text{Si}_2\text{O}_{36}$, contg. 4 silicic acid nuclei joined by $-\text{O}-\text{Al}-\text{O}-$ groups is given. From this follows directly, by hydration, the structure of kaolin. This hydration is an ionic reaction, taking place at the 8 $-\text{Si}-\text{O}-\text{Al}-$ groups of the 2 inner satd. rings, and at the 4 free $-\text{Si}-\text{O}$ groups in the 2 outer unsatd. rings. At these 8 inner hydration points various other addn. processes may occur, giving rise to other minerals connected genetically with kaolin, such as margarite, prismatine, nephelite, etc.

B. C. A.

Amphibolites from Austria. A. MARCHET. *Min. Petr. Mitt.* 36, 170-211(1924), 36, 229-320(1925).—Detailed petrographical descriptions with 25 chem. analyses are given of amphibolites, *granulites*, *eclogites*, and other rocks from the Waldviertel in Lower Austria.

B. C. A.

A communication concerning the Bolivian Andes and the economic value of their mineral deposits. RICHARD PILZ. *Metall u. Erz* 22, 363-76(1925).—A discussion with bibliography and analyses of the deposits of Au, Cu, Ag, Sn, Bi and petroleum.

C. G. KING

Phosphate deposits of Esthonia. YA. V. SAMOILOV. *Trans. Inst. Fertilizers (Moscow)* 1923, No. 21, 1-22.—The Esthonian deposits are biolites and their org. origin

has not been wiped out by subsequent geochem. processes. S. claims that formations of the type found near the Baltic are not numerous. The geological and chem. characters of the phosphate are given. An English summary is added. J. S. J.

Juravinsky deposits of white clays, alunite and bauxite. S. G. TUMANOV. *Trans. Inst. Exp. Silicates* (Russian) No. 8, 1-24(1923).—A report of the geology of the deposits, their genesis, and possible utilization. J. S. JOFFE

Geology of the Baxter Basin gas field, Sweetwater County, Wyoming. J. D. SEARS. U. S. Geol. Survey, *Bull.* 781-B, 13-27(1926).—Records of 23 wells are given, 12 of these yielding gas and 2 showing a little oil. The gas yield totals over 230 million cu. ft. per day. The prospects for oil are not favorable. L. W. RIGGS

The origin of hydrogen sulfide in Persian natural gas and a method of preparing unsaturated hydrocarbons. W. H. CADMAN. *J. Inst. Petr. Tech.* 11, 487(1925).—Persian natural gas contains 12-13% of H_2S . The reservoirs are overlaid by the Lower Fars series including gypsum. Expts. showed that H_2S was immediately evolved together with unsatd. hydrocarbons when S-free natural gas was passed slowly through a silica tube contg. anhydrite heated to dull redness. M. BETH HART

Origin of alkali land (HOWARD) 15. The petroleum reserves of Trinidad (ANON.)

22. Silicate analysis (SCHWARZ, SCHINZINGER) 7.

BISCHING, ANTON and KOZESCHNIK, FRANZ: *Grundriss der Mineralogie, Gesteins- und Bodenkunde.* Berlin-Schöneberg: K. Scholtze. 126 pp. R. M. 3.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

Johan-August Brinell (1849-1925). LEÓN GUILLET. *Rev. métal.* 23, 118-20 (1926).—Biographical with bibliography of his published works. A. P.-C.

Platinum: Its uses and production. E. M. WESTON. *S. African Mining Eng. J.* 34 [II], 179-80(1923); *J. Inst. Metals* 33, 500.—Statistics of production and brief notes of the use of Pt in industry. H. G.

The absorption of gases by silver and the spurt and the homogeneity of solid silver. W. STAHL. *Chem.-Ztg.* 49, 675-6(1925).— O_2 alone is sol in Ag. To prevent the spurt and obtain a homogeneous ingot, S suggests the addn. of a few hundredths of 1% of Al. This removes O_2 and leaves only minute traces of Al in the Ag ingot. G. C.

Studies in slag formation. HERBERT LANG. *Eng. Mining J. Press* 121, 485-90 (1926).—All other bases than Fe have to be satisfied fully before any Fe whatever becomes scorified and enters the pyritic slag. In converter slags as much as 30% magnetite has been found. Al_2O_3 is thought to act either as an acid or base. It should be avoided in fluxes as it has a bad influence in making the slags less fusible and requiring more fuel. Neglect of this principle has caused many failures in smelting. H. C. P

Leaching copper mat and speiss with nitric acid. SIXT. *Chem.-Ztg.* 49, 943 (1926).—Mat contg. Cu 35, Pb 45, Sb 1.5, Sn 1, S 14% and traces of Fe was pulverized and treated with a little more HNO_3 than required for soln. of the metals. The insol. residue contained practically all the Pb, Sn and Sb, but Cu in very small amounts. From the filtrate, with HNO_3 to the extent of 50 g. per liter, Cu was deposited on the Pt cathode, Pb sepg. on the anode as PbO_2 . Magnetite anodes were not suitable. Speiss contg. Sb 18, Sn 8, As 37, Cu 20 and Pb 51% also appears suitable for treatment as above. The Pb is sepd. by H_2SO_4 or by fractional crystn. of the nitrates. Upon electrolyzing the nitrate soln. in HNO_3 , Cu is pptd. practically free from As. If the concn. of H_3AsO_4 becomes too great, pptn. by lime is indicated. W. C. EBAUGH

The roasting of copper concentrate. A. T. FRV. *Chem. Eng. Mining Rev.* 18, 141-4(1926).—Two of the chief requirements in the roasted Cu concentrate are high soly. of Cu and low soly. of Fe. The temp. should not be allowed to rise above $900^\circ F$. It is during the burning stage; otherwise an insol. CuFe forms to a serious extent. It is probable that in the part of the furnace occupied by the burning stage the clearance between arch and hearth should be at least double, and perhaps more, that of the finishing stage. Another suggestion is to make the charge and gases pass through the furnace in the same direction. H. C. PARISH

Combustion in the open-hearth furnace with special reference to automatic control. K. HUSSENER. *Trans. Am. Inst. Mining Met. Eng.* Feb., 1926, No. 1568-C, 32 pp.; *Blast Furnace & Steel Plant* 14, 162-8(1926).—As results with the thermocouple for

low range temps. and with optical or radiation pyrometers for high temps. are not strictly accurate in drawing up heat balances, this investigation was conducted with a radiation-protected pyrometer. A large no. of exact heat balance sheets under varying conditions are necessary. Preheating temps. for the present type of checker chambers are naturally low, and on new construction particular care should be taken to increase the size of the chamber and to obtain equal distribution. Open-hearth furnace results depend upon the amt. of gas completely burned for a given period and on as low an excess of air as is possible. Forced-draft and induced-draft fans and equipment with automatic combustion control are necessary.

W. H. BOYNTON

Manufacture of iron and steel in Sweden. L. NORDENFELT. *J. Chem. Met. Soc. S. Africa* 25, 315-28(1925).—The height of Swedish charcoal blast furnaces is 50-60 ft. and the max. internal diam. is 10 ft. Coke blast furnaces are 65 to 95 ft. high and 20 to 30 ft. internal diam. The 24-hr. pig-Fe output for charcoal furnaces is 18 to 20 tons and in exceptional cases 45 to 50. For coke furnaces it is 350 to 800. The use of charcoal as blast-furnace fuel is characteristic of the Swedish Fe industry. This has an important bearing on the quality of the pig Fe. The small amt. of ash that comes from charcoal only contains 0.004% S, 0.003% P and about 10% H₂O. The CO₂-reducing capacity of coke is at the best only 1/2 that of charcoal. The wt. of coke is 27 lbs. per cu. ft. as against 9 lbs. for charcoal. Fe dropping down in front of the tuyères in a coke furnace and collected in the hearth contains more O than Fe made in a charcoal furnace. Swedish Bessemer steel is made entirely by the acid process. Blowing is stopped at 0.65% C which assists in splitting up FeO at the high temp. from oxidation of Mn and Si. In the Siemens-Martin open-hearth process as used in Sweden, wood gas is used as fuel rather than coal gas, thus minimizing S contamination from the fuel. **Discussion.** *Ibid* 26, 65-6(1926).—The CO₂ varied from 0.76 to 1.7% and the CO was found to be about 36% in samples of gas drawn off at 5-day intervals from a tuyère from which the blast had been shut off and the nose of the tuyère closed with clay. These figures refute the statement that an oxidizing layer exists. It is suggested that instead the presence of FeO in pig Fe may be due to particles of refractory oxide which have been present in the charge and have resisted reduction in their passage through the furnace.

H. C. PARISH

Pig iron mixers. E. LEPEVRE. *Rev. métal.* 23, 82-91(1926).—An address reviewing standard present-day practice.

A. PAPINEAU-COUTURE

The production of iron from silicates and pyrite. G. TAMMANN AND G. BÄTZ. *Z. anorg. allgem. Chem.* 151, 129-39(1926).—By heating a mixt. of finely powd. hornblende (6.5% Fe) and powd. charcoal directly to 1400°, 82.3% of the Fe is reduced to metal. This recovery can be increased to 92.5% if the mixt. is first heated for some time at 600°, in order to free the charcoal from gas. An addition of 5% lime increases the yield of metallic Fe to 95.8-99.1%. The Fe in basaltic rocks that are rich in silica is reduced to a much less extent; the reduction, however, proceeds slowly after an extended heating. Fe₂O₃, Fe₃O₄ and FeO react with quartz at about 950°. Fe₂O₃ and Fe₃O₄ apparently do not combine directly with SiO₂, but after some FeO (which, in the solid state, readily combines with SiO₂) has first formed, the Fe₂O₃ is dissolved in the silicate melt. It is shown that of six Fe silicates, prep'd. in a graphite tube, with increasing concns. of SiO₂, the orthosilicate was strongly reduced by H₂ at 850°. With increasing concns. of SiO₂, the relative amts. of reduced Fe obtained are large, which explains the permeability of quartz to H₂ at high temps. The reduction of pyrite to metallic Fe with lime and charcoal gives very low yields. In the action of lime on pyrite, only a small amt. of FeO is formed, but considerable amts. of a difficultly reducible Ca-Fe oxysulfide are formed.

J. H. PERRY

Combustion of gas in the blast furnace. JOSEPH LILOT. *Rev. universelle mines* 9 [7], 188-90(1926).—The gas from a blast furnace varies among different furnaces, but is fairly const. for any given furnace. The gas studied had the % compn.: CO₂ 8.85, O 0.51, CO 26.32, H 2.00, CH₄ 1.00, N 61.32. Calcs. show that for a mixt. of this character, its combustion either with excess or with insufficient air results in less CO₂ in the gaseous products of combustion than does the theoretical amt. of air required, i. e., in the combustion of blast furnace gas the max. proportion of CO₂ in the gaseous product is obtained by theoretically correct combustion. For this reason an automatic CO₂ registering app. is effective in controlling the combustion of blast furnace gas, in which case the ideal CO₂ content of the gas is calcd. from the av. analysis of the latter. The supply of air is then varied to maintain the CO₂ const. C. C. DAVIS

A method of determining comparable blowing practices for iron blast furnaces. J. S. FULTON. *Proc. Eng. Soc. Western Penn.* 41, 480-75(1926).—A comparison of the blowing practice of individual stacks of the same plant and by comparative per-

formance of separate works. Factors affecting delivery in any blowing-engine running to give const. wind are listed. Gas analysis for various C rates, and cold blast for various C rates are shown in curves. For fair comparison of different furnace performances the data necessary are: (1) long tons of iron produced per day (av. of 30 days), (2) net lbs. of dry C in the coke per ton of iron, (3) cu. ft. of wind per min. at intake temp., humidity, barometric pressure, and blast pressure, and (4) min. actually on blast per day. From these there may be developed: (5) cu. ft. of air at 0° at 14.7 lbs., absolute pressure and humidity. 5 divided by 3 will show % of the wind accounted for or the plant volumetric efficiency; (7) adiabatic air and horse-power hrs. for compressing and delivering the wind specified in item (3) may be developed; (8) the adiabatic h p. hrs. may be apportioned per long ton of iron or short ton of C. A table shows the results from a no. of plants. Means of comparing operating results are shown. A discussion follows.

W. H. BOYNTON

Effect of the physical properties of ore and coke on the capacity of the blast furnace. T. L. JOSEPH, P. H. ROYSTER AND S. P. KINNEY. *Proc. Eng. Soc. Western Penn.* **41**, 428-59(1926).—An effort to show the relations existing between the physical properties of coke and ore and the furnace capacity, and to correlate with blast furnace practice some of the exptl. results of the work of the U. S. Bur. of Mines. Points considered include: combustion of coke in the furnace hearth, combustibility of coke, the effect of size, and coke in relation to furnace capacity. Also the effect of combustion zones on stock travel, the relation between size of ore and furnace capacity. No marked difference is evident in combustibility of cokes. The size of the coke has a greater effect on the length and shape of the combustion zone. The flow of stock in the shaft is not uniform and is regulated by C gasification in the localized zones of combustion at the noses of the tuyères. The capacity of the furnace may be increased by changes permitting better contact between gas and solid. A bibliography and an extended discussion are appended.

W. H. BOYNTON

Some observations regarding blast furnace design. A. G. MCKEE. *Proc. Eng. Soc. Western Penn.* **41**, 391-411(1926).—An address showing the trend of blast-furnace design toward a cylinder from top to bottom. Possible future developments of this trend are indicated. A proposed arrangement of large bell, cross-sections of blast-furnace construction, possible developments and a modern type of distributor are illustrated. A discussion follows.

W. H. BOYNTON

Modern blast furnace stoves. A. E. MACCOUN. *Proc. Eng. Soc. Western Penn.* **41**, 412-27(1926).—A brief study of blast furnace stoves. The 2-pass stove of either side- or central-combustion type is generally preferred, due to simplicity of construction and upkeep. Discussion brought out the advantageous practice of having 2 sets of app., and the necessity of studying the means of introducing gas to the stoves. A central stack for a group of stoves is advisable. Pressure burners tend to increase the gas-burning efficiency. The question of stove insulation is touched upon.

W. H. B.

Reclamation of foundry sands. Method practiced at the Ohio Brass Co. A. A. GRUBB. *Metal Ind.* (N. Y.) **24**, 143-5(1926); cf. C. A. **20**, 354. An address.

E. J. C.

Melting high-chromium alloys in acid furnace. R. S. KERNS. *Foundry* **54**, 229-31; *Iron Trade Rev.* **78**, 812-4(1926).—Some of the uses of high-Cr alloy steels are given. Results indicate a very low Cr loss when melting these in the acid elec. furnace. About 30% of the charge of ferrochrome is melted with the scrap charge and the remainder is added in small quantities at short intervals. The pouring temp. is judged by means of the skin test when Ni is used and by the fracture when Ni is not used. The stream of metal entering the mold must not be stopped. The casting is ground carefully to guard against burning, which produces hard spots.

W. H. BOYNTON

Oven design shows advance. C. A. BARNETT. *Foundry* **54**, 240-1(1926).—A general classification of ovens includes: shelf-ovens, drawer-type ovens, portable rack-type ovens, car-type ovens, and conveyor ovens. Characteristics of each type are outlined. Economic, efficient operation of any type depends upon the kind of fuel, its cost, and the combustion and ventilating system efficiency. Coke, fuel oil, gas and electricity are employed, the latter being too expensive, in general, for core and mold ovens.

W. H. BOYNTON

Crystal growth in recrystallized cold-worked metals. W. FREITKNECHT. *J. Inst. of Metals* **1926** (advance copy), 35 pp.—This investigation was made to study the causes of the formation of the very large crystals obtained by Carpenter and Elam (C. A. **14**, 3391) on heating recrystd. Al sheets. The chief material used was pure commercial Al (99.6%) supplemented by some very pure Al (99.98%) and Ag. These were

subjected to various degrees of deformation followed by thermal treatment for varying lengths of time. Changes in crystal size were followed either by counting the crystals after each heat treatment or by photographs. From the results F. concludes that for Al: (1) The rate of crystal growth increases with severity of cold work and with increasing temp. Max. crystal size is obtained in sheets with 30% reduction in thickness. There are always some small grains left unabsorbed among the large crystals, and they can be embedded entirely in a large crystal. When growth is completed, min. grain size depends only on the temp. of heating. (2) Reduction of thickness is not an exact measure of the real degree of deformation; the degree of deformation is less in cross-rolled sheets than in sheets always rolled in the same direction, and is less in sheets rolled with many drafts than in sheets rolled with few. (3) Previous heat-treatment exerts considerable effect upon subsequent growth at another temp. When the temp. of the first treatment is the higher, subsequent growth is retarded; the reverse is true when the first treatment temp. is lower. (4) After recrystn. is completed all further changes are due to the growth of existing crystals. *No relation exists between crystal size and capacity to grow.* Small grains can invade larger ones. Growth is very discontinuous. Grains which have grown in an earlier stage can decrease, then remain stable, finally disappear or even start to grow again. (5) With very pure Al the crystal size is much larger after recrystn. is completed than in pure commercial Al; subsequent growth is faster; and the final grain size is a max. at 40% reduction in thickness. Twins occur more frequently in the very pure Al. Very pure Ag differs from Al only in that max. grain size results from 50% reduction in thickness and the final size is always much finer than in Al heated to a corresponding temp. Difference of internal energy due to differences in compn. or internal strain is the main cause of crystal growth. The two necessary conditions to give large crystals are (1) a not too great amount of remaining strain due to the mutual interference of the recrystd. grains, (2) a certain amt. of resistance which is slowly removed on heating for a long period. R. H. ABORN

The interpretation of the macrostructure of cast metals. R. GENDERS. *J. Inst. of Metals* 1926 (advance copy), 21 pp.; 14 photomicrographs.—This paper deals principally with the influence of factors necessary to correlate the interpretation of the macrostructure of non-ferrous alloys with that of steel. Crystn. of metal may occur in the metastable range of undercooling usually only by inoculation, while in a lower (labile) range spontaneous solidification may occur. Of the two types of crystals in metal macrostructure, the elongated type results from successive deposition of solid in the metastable cooling range, while the equi-axed polyhedral type may occur in either range. The macrostructure of ferrous alloys is briefly reviewed, the most desirable one consisting entirely of equi-axed (free) crystals, and therefore the lowest possible casting temp. is used. Indications gained from steel can be applied to cast non-ferrous alloys only to a limited extent because of the high thermal cond. of the latter (especially Cu alloys). This fast solidification tendency introduces another factor which is relatively negligible in ferrous alloys, *i. e.*, the flow of metal within the mold. To investigate these factors, G. prepd. ingots from 2 alloys, similar in f. p., density and thermal cond. but differing widely in color. A 90–10 red brass and a 50–30–20 (Cu, Zn, Ni) white nickel silver were used. They were poured one after the other into an exptl. cast-iron mold in 3 different proportions 25:75, 50:50, and 75:25. Variations in casting methods employed included top and bottom pouring, and single and multiple nozzle. The castings were sectioned, polished, etched and studied for color variations. Very slow and very rapid top pouring lead to predominant columnar crystn. the former by avoiding turbulence and the latter by allowing time for it to subside, thereby permitting simple temp. gradients. A medium pouring rate retards the growth of columnar crystals and encourages equi-axed crystal formation in the central region because turbulence of the liquid is concurrent with solidification. A multiple nozzle reduces turbulence, thus increasing the proportion of columnar crystals. Bottom casting tends to equalize the temp. and thus increases the proportion of equi-axed crystals. Columnar crystn. may lead to better physical properties than equi-axed crystn., since solidification is not directional in the latter, and there will be contraction cavities between crystal boundaries, which probably do not weld during working. Thus non-ferrous sand castings are in general weaker than chill castings. The greater the temp. interval between liquidus and solidus the greater the proportion of equi-axed to columnar crystals. This method has proved valuable in studying the mode of metal flow in molds of complicated design. R. H. A.

Recrystallization [of iron, steel, and copper] after hot deformation. H. HANEMANN and F. LUCKE. *Stahl u. Eisen* 47, 1117–22 (1925).—Cylinders of soft Fe (0.06% C, 0.02% Si, 0.14% Mn, 0.01% P and 0.027% S), steel (0.49% C, 0.67% Mn, 0.34% Si, 0.031% P and 0.029% C), and electrolytic Cu were heated to various temps. in a

vacuum furnace, then given a blow with a steam hammer to reduce their height, subsequently annealed at the same temp. for a short time, and slowly cooled. The grain size of the metal was then detd. by Jeffries' method. Soft Fe showed no recrystn. at 650° after this treatment, but at 750° recrystn. ensued with a min. reduction of 6.5% in height, the new grains being very coarse with 6.5–10% reduction, and fine again after more severe work; at 850° the min. reduction was 7%, but as the temp. was raised above this, recrystn. ensued after progressively less work. Similar results were obtained with steel and Cu, the min. temps. for recrystn. of which were 800° and 500°, resp., and the corresponding reductions in height 4.2 and 3.6%. In all cases the no. of recrystn. nuclei were proportional to the degree of reduction, a large reduction resulting in a finer grain.

B. C. A.

Certain new features in the microscopy of metals with high magnification. CARL BENEDICKS AND PER SEDERHOLM. *Jernkontorets Annaler* 109, 337–57 (1925).—The effect of vibration can be eliminated by loading the microscope, moving the center of gravity of the system to the part which is the most sensitive to vibrations, and by suspending the system elastically in a plane through or nearly through the center of gravity. Better images can be obtained by using oblique illumination, producing relief in the image. Some other features regarding the design of the app. are also discussed.

C. A. RUBAK

The polymorphism of iron. H. BREDEMEIER. *Z. anorg. allgem. Chem.* 151, 109–12 (1926).—A short thermodynamic consideration of α -, β - and γ -Fe.

J. H. PERRY

The thermoelectricity of steels in relation to working and tempering. PAOLO ROSSI. *Nuovo cimento* [N. S.] 2, 399–414 (1925).—Thermocouples were made of worked steel vs. annealed steel and of tempered steel vs. annealed steel. The e. m. f. of these couples were measured at diff. temps. With increase in temp there is a slow increase in e. m. f. followed by a diminution to zero at the critical point of steel. The inversion in thermoelec. effect in the tempered steel-annealed steel couples indicates an inversion in sign of the 2 consts. a and b in Avenarius' formula. The behavior of tempered steel on heating is similar to that of cold-worked steel in that the e. m. f. falls to zero after reaching a max.

L. T. FAIRHALL

[Hardness of] chill-cast iron. P. GOERENS AND H. JUNGBLUTH. *Stahl u. Eisen* 45, 1110–7 (1925).—The Shore hardness no. of chill-cast Fe increases in direct proportion to the C content from 56 at 2.4% C to 84 at 4.2% C when the Si content is const. The thickness of the hard outer layer varies considerably with the rate of cooling, cooling temp., and Si content. In general, the thicker the walls of the mold, i. e., the greater the cooling on pouring, the thicker is the hard layer, and the larger the Si content the thinner the hard layer. With 0.3% Si the thickness is 60 mm. with 0.8% Si, 15 mm., and with 1.1–1.4% Si, 0.8–0.6 mm. Mn between 0.25 and 0.6% and S between 0.17 and 0.068% have no influence on the hardness.

B. C. A.

Alloys of iron and iron sulfide. B. BOGITCH. *Compt. rend.* 182, 217–9 (1926).—Fe-FeS mixts. did not form 2 liquid phases when melted out of contact with foreign bodies (in a refractory crucible under a layer of molten Na silicate); when melted in a graphite crucible, under molten Na silicate, at about 1600°, there was sepn. into 2 liquid phases, visible with the naked eye or under a low magnification, the upper one with about 22% (21.7–23.1%) S, and the lower one with 4.2–7.9% S and 2.4–1.3% C. At 1350–1400° no sepn. took place, even after heating 1 hr. The relative thickness of the layers varies with the S content, the thickness of the top layer decreasing with the S content. Fusion under oxidizing conditions caused no sepn. into layers, but considerable segregation of the S (extreme values found being 21.10% S in the bottom and 10.3% in the center). Addn. of low percentages of Cu causes considerable segregation; with more than 3% Cu there is formation of 2 layers, the upper one being a Cu mat. A. P.-C.

Properties of certain heat-treated nickel-chromium steels. LEON GUILLET. *Compt. rend.* 182, 249–51 (1926).—Test bars of steel contg. C 0.26, Ni 3.76, Cr 0.67, Mn 0.54, Si 0.11, S 0.037, P 0.0 and 21% were subjected to the following treatments: (A) heated 20 min. in a salt bath at 900°, quenched in oil, tempered at 650°, cooled between 650° and 410° in 35 hrs., air cooled from 410° to atm. temp., tempered a 2nd time at 650°; (B) same as A, except that the order of the 2 temperings was reversed. After A, the test bars had a resiliency of 16.4 and bending angle of 163°, while after B the values were 5.6° and 166°, resp. Comparative resiliency tests, carried out on bars treated according to B, were made at temps. of 200–650° and at atm. temp. after heating to the same temps. and air-cooling. The results show that the brittleness has been destroyed in the tests made at 200° and over, while normal resiliency is restored in the bars tested at room temp. after having been heated to about 500° or over. After heating to 500–550°

and air cooling the metal is not brittle, unless cooling was very slow. The resistance to repeated impacts of the steel with low resiliency is much lower than that of the other one, but the tensile strengths of the two were practically identical. Micrographic examn. and dilatometric and thermo-elec. measurements showed no difference between the bars treated according to A and B.

Hard spots on steel forgings. J. D. GAT. *Blast Furnace & Steel Plant* **14**, 74-8 (1926).—A summary. Some generalizations, some facts as a basis for further investigations and some means of elimination and prevention of hard spots are mentioned. Hard spots are experimentally traced to C deposits from fuel oil. Several photomicrographs of cast iron, steel and a considerable range of annealing temps. are shown.

Effect of temperature and chemical composition on the viscosity of iron. P. OBERHOFFER AND A. WIMMER. *Stahl u. Eisen* **45**, 969-79(1925).—The viscosity is measured by the logarithmic decrement of a pendulum swinging in the molten Fe. For pure Fe-C alloys a sudden increase in viscosity is observed at 1335° for 2.62% C, and 1180° for 3.43% C, which corresponds with the sepn. of solid solns. from the liquid. P increases the viscosity of the Fe, but lowers the initial solidifying point, which accounts for the apparent increase in fluidity in practice. MnS increases the viscosity considerably, and C and Si also increase it. These observations are confirmed by expts. with various kinds of pig Fe.

Phosphide in manganese steel. I. PIWOWARSKY. *Stahl u. Eisen* **45**, 1075-6 (1925).—Photomicrographs of cast Mn steel contg. 1.39% C, 14.2% Mn, and 0.13% P, and possessing unsatisfactory toughness, showed that a phosphide eutectic was present in the grain boundaries in addn. to the carbide network. Matwieff's etching process with alk. and neutral solns. of Na picrate served to indicate the presence of free phosphide and free carbide in the boundary inclusions. On heating for 15 hrs. *in vacuo* at 1050° and quenching in cold water the carbides and phosphides were dissolved. The phosphide eutectic is deposited in heterogeneous components in consequence of the incomplete diffusion of the primary mixed crystals. The carbides and phosphides are not in intimate mixt. but sep. The quenched steel contains micro-cavities in the austenite grains, but specimens which showed no phosphide segregation did not show such cavities after quenching. It is suggested that the soln. of the phosphide eutectic increases the contraction of the Fe.

Behavior of iron, brass, and bronze in saline waters at the ordinary temperature and at the temperature and pressure of a boiler. O. BAUER. *Stahl u. Eisen* **45**, 1101-9 (1925).—See C. A. 20, 1211.

The three-component system: iron-chromium-carbon. TH. MEIERLING AND W. DENECKE. *Z. anorg. allgem. Chem.* **151**, 113-20(1926).—A study of the Fe-Cr-C system, with concns. of C varying from 0.70 to 2.60% and of Cr from 0 to 20%, has confirmed the hypotheses of Fischbeck (C. A. 19, 1084). A study of the change in the Brinell hardness has yielded the following data on Brinell hardness for (a) normal and (b) very slow annealing, resp., the % of C and of Cr varying as shown: 0.74% C, 1.99% Cr, 255, —; 0.75% C, 4.96% Cr, 500, 230; 0.73% C, 8.92% Cr, 675, —; 0.76% C, 14.99% Cr, 480, 250; 0.77% C, 19.70% Cr, 410, 200. The soly. limits of the mixed crystal in the Fe corner of the 3-component diagram, as well as the location of the perlite point with different concns. of Cr, have been detd.

"Wiegold" [dental] alloy. W. ZIMM. *Deut. Zahnärztl. Wochschr.* **28**, 1-4(1925).—"Wiegold" alloy is a brass contg. Al and resembling Au in appearance. The old alloy contained 66.93% Cu, 32.79% Zn, 0.28% Al, and traces of Pb and Fe, while the latest alloy contains 67.73% Cu, 32.0% Zn and 0.27% Al. The structure of each alloy is homogeneous α , and this structure is maintained after annealing and slow cooling. "Randolf metal," on the other hand, loses its homogeneity even after a short anneal at a low temp. Neither alloy is quite homogeneous after normal cooling of a cast ingot in air, but the second becomes more so on aging. The best results are obtained by casting in a hot mold, followed by very slow cooling. Correctly worked "Wiegold" has a relatively high resistance to corrosion, and in this respect represents a considerable advance on "Chrysite" and "Randolf metal."

"Wiegold" dental alloy. E. WANNENMACHER. *Deut. Zahnärztl. Wochschr.* **28**, 54(1925).—A reply to Zimm (cf. preceding abstr.). The "Wiegold" alloy analyzed by W. contained 68.1% Cu, 31.3% Zn, 0.5% Pb and no Al; it was not metallographically homogeneous and was less resistant to corrosion than "Randolf metal." W. considers that brass alloys should not be used for dental purposes.

"Wiegold" [dental] alloy. J. BOCK. *Deut. Zahnärztl. Wochschr.* **28**, 68(1925).—B. finds 0.35% Pb in "Wiegold," approx. the same Pb content in "Randolf" and

"Goldal," and 1.39% Pb in "Chrysite," and agrees therefore with Wannenmacher's criticism of Zimm's paper (cf. preceding abstr.). B. C. A.

Alloys of high electrical resistance. S. F. ZHEMCHUZHNIK, S. A. POGODIN AND V. A. FINKELZEN. *Russ. Acad. Sci.* 1923, 3-47.—Mainly a summary of work dealing with Cu-Ni, Mn-Cu, Mn-Ni Cr-Ni and Fe-Ni alloys B. C. A.

Improving aluminum-lithium alloys. P. ASSMANN. *Z. Metallkunde* 18, 51-4 (1926).—Alloys contg. up to 12% Li were carefully prepd. and the corresponding portion of the equil. diagram was detd. by thermal and microscopic methods. The amt. of Li held in the α -solid soln. was found to decrease from a max. of 3.5% at 598° to 2.2% at room temp. A eutectic between the α - and β -phases was found to melt at 598° and contained 7.8% Li. Alloys with more than 4% Li were found to be strongly corrodible, and the oxidizing tendency of the alloys contg. more than 10% Li was sufficient to decompose water; because of this difficulty no alloys were made contg. more than 12% Li. The equil. diagram of Czochralski and Rassow (Czochralski, *Moderne Metallkunde*, page 36) was essentially confirmed. Brinell tests of annealed specimens showed rapid increase in hardness between 2 and 3.5% Li (the satn. range of the α -solid soln.), with a slower increase above 3.5%. Replacing the Li by Mg gave a similar curve lying below the former on a wt. % basis, but above on a % basis. Possible improvement by mech. and thermal treatment was investigated. A max. increase of 16% in hardness (65-76) in the α -satn. limit region was obtained by annealing cold-worked material at 500°, quenching and aging 5 days at room temp. Aging at 100° gave no noticeable difference, while at 200° the beneficial effect was entirely lost. Prolonging the annealing time (previous to quenching) from 1/2 hr. to 6 hrs. resulted in a higher Brinell value for the cast than for the worked material. The effect of Cu or Zn in Al-Li alloys also was investigated. Max. hardness (> 80) was obtained in a 0.4% Li alloy contg. either 4% Cu or 12% Zn quenched from 500° and aged at room temp. The detrimental effect of higher aging temps. was observed also in these alloys. Hardness comparable with that of duralumin can be obtained by the addition of Mn and Ni. The cause of this increased hardness was in no case evident under the microscope. Further investigations bearing on the theory of these effects will follow in a later paper. Cf. C. A. 20, 1381. R. H. ABORN

Notes on galvanizing. ANON. *Chemistry and Industry* 45, 139 (1926) —Zn coatings on impure Fe are not lasting, as the impurities (Cu, C, Si) set up local electrolytic action. T. S. CARSWELL

The chemical reaction of the rusting of iron. JOEL SCHEIBER. *Farbe u. Lack* 31, No. 11, 125 (1926).—A review of the electrochem. theory of rusting. R. J. M.

Why boiler tubes burnt out. G. C. REINHARD. *Power* 63, 513 (1926) —Corrosion of tubes in an oil-fired boiler appeared to be related to the formation of ferrous and ferric sulfates on the tubes. The fused sulfates acted as a flux for the Fe, weakening the tube enough to cause blistering and blowouts. The cleaner the tubes were, the more rapidly did corrosion occur. D. B. DILL

Peculiar examples of corrosion of boiler parts. ROBERT STUMPER. *Feuerungs-technik* 14, 97-8 (1926).—A piece of open-hearth steel in contact with Cr-Ni steel lost about twice as much by corrosion as an isolated piece in the same water. Anodic corrosion of a bronze contg. 2.4% Zn occurred in a boiler water having 0.5 g. Na₂CO₃ per l. ERNEST W. THIELE

Cutting tests with high-speed steel. R. HOHAGE AND A. GRUTZNER. *Stahl u. Eisen* 45, 1126-30 (1925).—The cutting power of a high-speed steel contg. normal amounts of C and Cr increases rapidly with the W content between 17 and 22% W, but is practically const. with 23-27% W; addn. of V to steel contg. 14-18% W increases the cutting power, but V. has no effect when the W is above 22%. The curve showing the relation between the W and V contents for max. cutting power is a straight line. Mo increases the cutting power more than W, 0.6 pt. Mo having the same effect as 1 pt. W, but the Mo steels have a coarser grain structure when annealed above 1100° for hardening. B. C. A.

Welding aluminum. E. LÜDER. *Apparatebau* 38, 57-8 (1926) —A general discussion. J. H. MOORE

Autogenous and electrically welded boilers and tanks (holders). E. HÖHN. *Z. Ver. deut. Ing.* 70, 117-22 (1926).—A comprehensive report on tests conducted for an association of steam boiler owners in Switzerland, covering welding by water gas, oxy-acetylene and elec. arc; comparisons with riveted joints and seams, etc. Illustrated by numerous detailed drawings, tables and graphs. W. C. EBAUGH

The industrial application of detonating gas and other innovations in the metal-atomizing process. M. U. SCHOOP. *Z. angew. Chem.* 39, 146-7 (1926).—New forms of

burners are described wherein a mixt. of gas and O is effected at some distance from the burner, and then mixed with more O at the burner through the use of two slit openings facing each other. Increased metal deposition and decreased gas consumption per unit of time are claimed. Particles of metal are said to be shot off larger and hotter than were obtained with the earlier types of "pistols," and produce better coatings.
W. C. EBAUGH

Roasting and burning ores, etc. (APOLD, FLEISSNER) 13. Corrosion and rusting of wrought iron and steel gas barrel (ANON.) 21. Crude coal gas for recovering scrap Cu and brass (BERTHOLET) 21. Selecting refractories for use in metallurgical furnaces (THEWS) 19. Gas producer [adapted for iron smelting] (Brit. pat. 237,883) 21.

HARTMANN, FRIEDRICH: *Das Färben der Metalle*. Eine Anleitung zum Färben aller wichtigen Metalle auf chemischem, elektrochemischem u. mechan. Wege. Vienna: A. Hartleben. 428 pp. R. M. 10.

HILLET, H. W. and MACK, F. L.: *Molybdenum, Cerium and Related Alloy Steels*. New York: The Chemical Catalog Co., Inc. 299 pp. \$4.

MARGRIE, WILLIAM: *Coal and Iron*. London: Watts & Co. 1s.

O'HARRA, B. MARVEL: *Bibliography on Zinc Retorts and Condensers*. Rolla, Mo.: Missouri School of Mines & Metallurgy. 15 pp.

Ore flotation separation. C. P. LEWIS. U. S. 1,577,328, March 16. An ore pulp, *e. g.*, one contg. Pb, Zn and Fe, is mixed with a flotation agent comprising a heavy hydrocarbon and a hydrocarbon of the benzene series, *e. g.*, a mixt. such as "solvent naphtha, and subjected to froth flotation. Cf. C. A. 20, 33.

Mineral flotation separation. B. M. McATEE. U. S. 1,579,722, April 6. Mech. features.

Multiple-deck thickener for ore pulps, etc. C. W. ANKENY. U. S. 1,578,625, March 30.

Metallic values from concentrates or slimes. H. FLECK and W. G. HALDANE. U. S. 1,577,217, March 16. Concentrates or slimes which may contain metallic values such as Ra compds. are treated with NH_4HF_2 or other reagent capable of converting the contained Si into a volatilizable compd., which is allowed to evap. from the mass unaccompanied by any of the values to be recovered.

Cement and metallic iron from ores. E. C. ECKEL. Brit. 237,779, Nov. 17, 1924. A mixt. of Fe ore low in SiO_2 , aluminous material such as bauxite, and CaCO_3 is fused, reduced Fe and slag are allowed to sep. and the slag is ground to form cement. Various details are given. Cf. C. A. 19, 2631.

Recovery of flaky precious metals from sand. D. H. DONEGAN. U. S. 1,576,954, March 16. Mech. features.

Blister copper from "black copper." M. H. MERRISS. U. S. 1,576,776, March 16. A mass of "black copper" or similar material is preliminarily heated until it is at least partially melted. Air is then blown through it and the quantity and temp. of the air are controlled to effect rapid oxidation of impurities. The heat produced by the oxidation is utilized for producing blister Cu from the mass.

Treating copper ores. W. E. GREENAWALT. U. S. 1,579,356, April 6. Cu ore is agitated with an acid soln. to ext. a portion of the Cu, the soln. is sepd. from the ore and the ore sands are sepd. from the ore slimes. Cu is pptd. from the soln. and the sands are treated by percolation with the barren soln. from which the Cu has been pptd. Cf. C. A. 19, 2321.

Treating ores containing copper, gold and silver. H. V. WELCH. U. S. 1,578,618, March 30. Au, Ag and Cu are extd. from ore by a cyanide soln. and the soln. is treated with a reagent such as Zn to ppt. the Au, Ag and Cu and regenerate sol. cyanide for further use in ore treatment. The cyanide content of the soln. is so adjusted that the soln. during the pptn. of the Cu contains an excess of 4 mols. of cyanide (calcd. as NaCN) for each mol. of Cu in the soln.

Refining copper-nickel mat. N. V. HYBINETTE. U. S. 1,577,422, March 16. In utilizing bessemerized Cu-Ni mat Cu is cemented on it from a Cu-Ni sulfate soln., the remaining mat and cement Cu are roasted, leached with H_2SO_4 to form a CuSO_4 soln., the leached residue is reduced, dissolved to form a Cu-Ni soln. and Cu from this soln. is cemented on a further quantity of bessemerized mat.

Separating zinc or other metals from ores, etc. L. E. WEMPLE. U. S. 1,578,694, March 30. Metalliferous material contg. a volatilizable metal such as Zn ore is mixed

with carbonaceous fuel and flux and the mixt. is blasted into a heated furnace chamber in which the temp. is maintained high enough to effect reduction and volatilization of the metal. The vaporized and fumed material is passed through a tortuous passage, while hot and under oxidizing conditions for part of the time at least, and the oxidized product is collected free from slag.

Metallurgical furnace adapted for zinc production. P. THARALDSEN. U. S. 1,579,340, April 6.

Cast-iron car wheels. J. M. KELLER. U. S. 1,579,214, April 6. Chilled tread portions of cast Fe car wheels comprise 3-4% of combined C and 0.6-3.5% Cu.

Purifying molten metals. H. G. LAPSLEY. U. S. 1,578,014, March 23. Molten metals such as Cu, Fe or steel are treated with a chem. compd. of Al and B.

Gas-fired furnace for melting metals, etc. W. H. CHENOWETH and G. C. SCHUMPE. U. S. 1,579,077, March 30.

Temperature and combustion regulation in melting iron or other metals. Y. A. DYER. U. S. 1,578,648, March 30.

Refining crude iron. F. BURGERS. U. S. 1,578,009, March 23. Fuel is introduced into a furnace through a chute and preheated by gases arising from burning fuel. Crude Fe is melted in a sep. furnace and the molten metal is conveyed to the refining furnace and introduced at a point near its vertical axis and below the upper limit of incandescence.

Aluminum alloy. V. E. HYBINETTE. U. S. 1,579,481, April 6. Light alloys are described which contain Al in excess of 90% together with Ni 0.5-3.0 and metals of the Cr group 0.25-1.50%, and which also may contain other ingredients.

Aluminum alloy. T. S. FULLER and D. BASCH. U. S. 1,578,979, March 30. An alloy which is suitable for casting comprises Al together with Zn 3-8 and Mg 0.25-1.5%.

White gold alloy. E. M. WISE. U. S. 1,577,995, March 23. An alloy contg. 30-80% Au contains also Ni, Cu and Zn in the relative proportions of Ni 33-53.1, Cu 26.4-46.5 and Zn 10.6-30.7 parts.

Plated wire. C. G. KING. U. S. 1,579,819, April 6. A seamless wire adapted for the manuf. of jewelry comprises a core of Ag and a shell of "white gold" of approx. the same color as the core.

Chill molds for casting ingots or plates for use in rolling mills. O. JUNKER. Brit. 237,622, July 26, 1924. H₂O-cooled mold sides are formed of thin sheet metal, preferably Cu.

Electric system for protecting boilers, evaporators or other metallic structures against corrosion. G. H. ELMORE and H. J. CREIGHTON. U. S. 1,576,581, March 16.

Protecting ferrous metals from corrosion. I. T. BENNETT. U. S. 1,578,254, March 30. Steel or similar metal is coated with Cr and with an overlying layer of Ni.

Cutting or welding metals by flame. R. H. BROWNLEE and R. H. UHLINGER. U. S. 1,577,171, March 16. A flame for cutting or welding is formed with O and a gas mixt. comprising H with a smaller proportion of natural gas or other hydrocarbon material. CO 10% or less may also be present.

Electrode for arc welding. E. A. E. TÖRNBLÖM. U. S. 1,577,506, March 23. Metal electrodes are coated with an alk. compn. such as K₂CO₃ mixed with gum tragacanth.

Electrodes for resistance welding. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 237,902, July 30, 1924. A mixt. of finely divided W 9 and Cu 1 part is molded under pressure and heated to 1200-1600° in H.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Organic chemistry and X-rays. SUZANNE VEIL. *Rev. gen. sci.* 36, 535-41 (1925) — A popular review. DONALD W. MACARDLE

Chlorine in the organic chemical industry. J. T. CONROY. *Trans. Am. Electrochem. Soc.* 49 (preprint) (1926).—A non-technical discussion of the uses and applications of Cl in the prepn. of org. compds. Achievements are noted and new lines of investigation forecast. C. J. BROCKMAN

The hydrogenation of organic substances at a high temperature and under pressure. ANDRÉ KLING AND DANIEL FLORENTIN. *Compt. rend.* 182, 389-91 (1926).—An attempt is made to explain the mechanism of the Bergius process of hydrogenating org. substances under pressure at elevated temps. There exists for each mol. c. temp. above which dissociation or a breaking down (cracking) of the mol. begins. This temp. corresponds

in most instances to the thermic level at which hydrogenation of the new simpler mols. is possible. Insofar then as hydrogenation under pressure and at an elevated temp. is concerned, it is probable that mol. H reacts on the nascent org. mols. at the instant when the original mol. dissociates. This method should be of value in the general study of the *influence of heat on org. compds.*, for with H present to combine immediately with new mols. there is no tar formed and if conditions are suitably chosen, only satd. hydrocarbons are formed. The method also allows mols. of differing stability to be distinguished and indicates which of any no. of constitutions attributed to them is the most probable. Thus oils which can be hydrogenated only with great difficulty give almost exclusively cyclic (C_6H_6) mols., indicating that the original mols. have a cyclic structure. It can be shown in this way that oils from French schists contain besides aliphatic and naphthene compds. about 10% of derivs. with a C_6H_6 nucleus which are hydrogenated only in a 2nd phase of the process.

C. C. DAVIS

Liberation of hydrogen from carbon compounds. II. The interaction of ethyl alcohol, acetaldehyde and acetone with fused caustic alkalis. H. S. FAY AND E. L. SCHULZE. *J. Am. Chem. Soc.* **48**, 958-68(1926); cf. *C. A.* **18**, 3357.—The reactions taking place when the vapors of EtOH, AcH and Me_2CO are bubbled through an excess of an equimol. mixt. of fused caustic alkalis may be readily explained in terms of an apparently general type reaction $(M = Na \text{ or } K), R(H)_n + n MOH \rightarrow R(OM)_n + nH_2$, which involves the acidic dissociation of the alkalis, the ultimate oxidation of the C compd. to carbonate and the liberation of H. Similar type reactions explain the intermediate formation of acetates and CH_4 . The incomplete reaction of EtOH at temps. of 250° and 300° and the occurrence of several simultaneous changes made it impossible to establish exact stoichiometrical ratios but the data obtained confirmed in some measure the occurrence of the following reactions: $EtOH + NaOH \rightarrow AcONa + 2H_2$; $AcONa + NaOH \rightarrow Na_2CO_3 + CH_4$; $EtOH + 6NaOH \rightarrow Na_2CO_3 + Na_4CO_4 + 6H_2$; $EtOH \rightarrow C_2H_4 + H_2O$. AcH reacted completely with the fused alkalis at 250° according to the equation $AcH + NaOH \rightarrow AcONa + H_2$. At 300° and 350° the yields of H, CH_4 and carbonates were practically those calcd. for the reaction $AcH + 2NaOH \rightarrow H_2 + CH_4 + Na_2CO_3$. The reactions of Me_2CO were analogous to those of AcH. At 250° CH_4 and acetates were the chief products of the reaction which conformed, at least to the extent of 70% of the calcd. amts., to the reaction $Me_2CO + NaOH \rightarrow AcONa + CH_4$. At 350° the yields of CH_4 and carbonates were more than 90% of those calcd. from the equation: $Me_2CO + 2NaOH \rightarrow Na_2CO_3 + 2CH_4$. Details of runs are given.

C. J. WEST

Action of nitric-sulfuric acid on dichloro- and monochloromethyl ether. J. HOUBEN AND E. PFANKUCH. *Ber.* **59B**, 86-9(1926).—Moreschi (*C. A.* **13**, 3319) assigned to the compd. he obtained from $(ClCH_2)_2O$ with $HNO_3-H_2SO_4$ the structure $O-NCH_2OCH_2ONO_2$ (I) because, according to him, $MeNO_2$ is produced from it on hydrolysis. As a matter of fact, H. and P. find that on alk. hydrolysis it loses 0.5 of its N as nitrite and the other 0.5 as nitrate, but that I is nevertheless correct is shown by the mol. refraction. Together with I is formed a 2nd compd. (II) of considerably higher b. p., usually only in small amt. but sometimes becoming the chief product: the condition under which this occurs have not been definitely established. II seems to be a *nitro-nitroxymethylal*, $O_2NCH_2OCH_2OCH_2ONO_2$. $ClCH_2OMe$ reacts in the same way as $(ClCH_2)_2O$ with $HNO_3-H_2SO_4$. I b_p: 48°, mol. wt. in C_6H_6 147.9, d₄ 1.5005, n_D 1.43276, yield, generally about 60%. II b_p 88-9° (the distn. must be carried out with the greatest care and with only small amts. of material, as the II explodes with extreme violence), mol. wt. in C_6H_6 183-93.

C. A. R.

Organic compounds of phosphoric acid. I. Formation of primary phosphoric acid esters. F. ZETTSCHKE AND M. NACHMANN. *Helvetica Chim. Acta* **8**, 943-5(1925). The method depends on the reaction of AgH_2PO_4 in excess H_3PO_4 with the halide of 1 mol. halogen is quant. pptd., even when dihalides are used, but the yields are small, owing possibly to sapon. of the esters by the excess H_3PO_4 . 7.7 g. Ag_3PO_4 in 12 cc. 84% H_3PO_4 at 60-70°, treated with 8 cc. H_2O , cooled with ice, and shaken with 6.3 g. $PhCH_2Cl$ in 20 cc. alc., added in small portions, then shaken 1 hr. longer, gave, when extd. with Et_2O , treated with $Ba(OH)_2$, and shaken out again with Et_2O to remove a pleasant smelling by-product, 13.7% of $PhCH_2OPO_3Ba$. C_2H_5I yielded, in the aq. portion after the 1st Et_2O extn. 10% of $C_2H_5OPO_3Ba$. $HOCH(CH_2I)_2$ yielded, also in the aq. fraction, after successive treatment with H_2S , $Ba(OH)_2$, and CO_2 , the *Ba 1-iodo-2,3-propanediol-3-phosphate*, slightly brownish, friable, hygroscopic mass. $(CH_2)_3Br_2$ gave *Ba 1-bromopropanol-phosphate*, similar to the preceding salt. No ester salts could be isolated when $o-O_2NC_6H_4CH_2Cl$ and $ICH_2CH(OH)CH_2OH$ were used.

M. HEIDELBERGER

Complex salts of β, β', β'' -triaminotriethylamine with nickel and palladium. F. G. MANN AND WM. J. POPE. *J. Chem. Soc.* 1926, 482-9; cf. C. A. 20, 578.—($\text{H}_2\text{NCH}_2\text{CH}_2$)₃N.3HCl and 33% aq. NaOH are warmed until NaCl alone remains undissolved; the mixt. is then poured into a hot soln. of Ni succinimide in EtOH, the green soln. boiled 30 min. (blue), cooled, filtered and concd. when the deep blue soln. contains 2 complex ions $[\text{Ni tren}]^{++}$ and $[\text{Ni}_2 \text{tren}_2]^{++}$ [$\text{tren} = (\text{H}_2\text{NCH}_2\text{CH}_2)_3\text{N}$]. Pouring the soln. into a hot concd. soln. of KSCN gives *triaminotriethylaminenickelous thiocyanate* (I), deep blue bipyramidal orthorhombic crystals, darkens 260°, m. 285° (decompn.); with Na_2PtCl_6 there ppts. the *nickelous platinum tetrachloride dithiocyanate*, russet-brown, shrinks 211-3°, does not m. 280°. I and Ag_2SO_4 give the *nickelous sulfate heptahydrate*, deep blue; over CaCl_2 for 24 hrs. there results the *dihydrate*, reddish blue powder, which on prolonged exposure to CaCl_2 or on heating to 100° *in vacuo* gives the *anhyd. sulfate*, pale blue, does not m. 300°. Mol. wt. detns. in H_2O indicate that the sulfate has the simple formula $(\text{Ni tren})\text{SO}_4$ and that the apparent mol. wt. approaches to 150 at great diln. and increases with increasing concn. as the degree of ionization falls. The equiv. cond. at 25° is also given. Pouring the above concd. soln. into KI soln. gives the *tristriaminotriethylaminenickelous tetraiodide* (II) deep violet with 3.5H₂O; a dihydrate was obtained in 1 expt.; the anhyd. salt, pale violet, m. 307-9 (decompn.); *tetrabromide*, pale reddish blue, does not m. at 290°. Attempts to resolve the iodide were unsuccessful; the *tetra-d- α -bromocamphor- π -sulfonate*, pale violet, shrinks 180°, m. 183-5° (decompn.), was converted into the *tetrapurate*, dark yellow, with 3H₂O, m. 205-6° (decompn.) and inactive. The *tetra-d-camphor β -sulfonate*, reddish violet, m. 233-5°, likewise gave an inactive iodide. II and $\text{NH}_4\text{d-bromocamphorsulfonate}$ in H_2O gave *triaminotriethylaminenickelous d-bromocamphorsulfonate*, bluish violet plates with 2H₂O, changed to the anhyd. blue salt at 110°, m. 263-6° (decompn.); with KSCN it gives I. This degradation of the Ni complex of coordination no. 6 to that of 4 by NH_4 salts was found to be general. *Triamino triethylaminepalladium iodide*, cream-colored powder, darkens 220°, m. 221-6° (decompn.); if the soln. before pouring into KI, as above, is made acid and treated with PdCl_2 soln., a chocolate-colored ppt. is formed, which may be the palladium chloride ($\text{Pd tren})\text{PdCl}_2 \cdot \text{H}_2\text{O}$; it decomps. on crystn. from boiling H_2O . C. J. WEST

$\gamma, \gamma', \gamma''$ -Triaminotripropylamine and its complex compounds with nickel. F. G. MANN AND WM. J. POPE. *J. Chem. Soc.* 1926, 489-93.—Passing dry NH_3 through molten phthal- γ -bromopropylimide at 150° gives the *HBr salt*, m. 213-5° (crystg. from AcOH with 1 mol. of AcOH of crystn. lost at 100-5°), of *triphtalimidetripropylamine*, m. 150-1°; heating with 1.1 HCl for 7 hrs. gives $\gamma, \gamma', \gamma''$ -triaminotripropylamine-4 *HCl* (I), slightly deliquescent, crystg. with 0.5H₂O not lost *in vacuo* at 100°, m. 227-9° (decompn.); *chloroplatinate*, orange needles with 3H₂O, darkens 250°, m. 257-8°, *chloroaurate*, orange-yellow, m. 191-2° (decompn.), contains 3H₂O; *picrate*, pale yellow, softens 190°, m. 222° (decompn.); 1 g. dissolves in about 1 l. of H_2O . *Tri Bz deriv.*, m. 129-31°. I, warmed with 33% aq. NaOH, the soln. added to a hot soln. of Ni succinimide in EtOH, boiled, filtered and concd., then filtered into a concd. cold soln. of KSCN, gives *triaminotripropylaminenickelous thiocyanate*, $\text{C}_{11}\text{H}_{24}\text{N}_6\text{S}_2\text{Ni}$, pale lilac-blue, m. 260-1° (decompn.); on recrystn. from hot H_2O some decompn. occurs, the iodide, with 1.5H₂O, apple-green powder, if the concd. soln. is poured into concd. hot KI soln. (instead of the KSCN soln.), there results the *hydroxyiodide*, deep blue, with 2H₂O; while it is stable in the presence of hot H_2O , it cannot be heated at 100° *in vacuo* without slight decompn.; with KI there results a sea-green addn. product, which is decompd. by cold H_2O . Aq. solns. absorb CO_2 from the air. C. J. WEST

Anomalous course of Grignard reactions. G. STADNIKOV AND ANNA WEIZMANN. *J. prakt. Chem.* 112, 177-86 (1926).— PrMgBr and other Grignard reagents from alkyl halides react normally with BzH , forming sec. alcs.; the same Mg-org. compd. in the form of a complex with PhNMe_2 or with benzohydryl Bu ether reacts with BzH but gives little or no sec. alc., the starting materials being recovered. Several expts. are quoted. C. J. WEST

Organic lead compounds. RICHARD DANZER. *Monatsh.* 46, 241-4 (1926). *Tetrabutyllead*, b_{10} 156° (in CO_2 stream), in 7 g. yield from 32 g. PbCl_2 and BuMgCl from 20 g. BuCl ; mol. wt. in freezing C_6H_6 normal. *Dibutyllead dibromide*, pale yellow needles, results as a by-product. *Triisobutylbutyllead*, b_{10} 145-6°, from BuMgCl and (isoBu)₃PbBr. C. J. WEST

Distillation of aqueous formaldehyde solutions. E. W. BLAIR AND H. TAYLOR. *Soc. Chem. Ind.* 45, 65-6T (1926); cf. C. A. 19, 1214.—Distns. of aq. CH_2O solns. at concns. from 1 to 45% indicated that a mixt. of const. b. p. is formed, contg. about 30% CH_2O . T. S. CARSWELL

Preparation and use of aldehyde esters formed by ozonation of the methyl esters of various unsaturated acids. C. R. NOLLER AND ROGER ADAMS. *J. Am. Chem. Soc.* **48**, 1074-80 (1926).—A mixt. of air and O_3 was bubbled through a soln. of 0.5 mol. of unsatd. ester in 300 cc. glacial AcOH until Br-AcOH was no longer decolorized. The ozonide was dild. with Et_2O , and Zn dust and H_2O added to decomp. the ozonide and to prevent oxidation of the aldehydes formed. The yield averages 55-60%. Me oleate gives Me η -aldehydoctanoate (I), b_3 111-2° (cor.), n_D^{20} 1.4384, d_4^{20} 0.9704; semicarbazone, m. 104-5°. Me undecylenate gives Me θ -aldehydononanoate, b_3 120-1° (cor.), n_D^{20} 1.4410, d_4^{20} 0.9663; semicarbazone, m. 98-100°. Me erucate gives Me λ -aldehydodecanoate, b_3 152-3°, n_D^{20} 1.4469, d_4^{20} 0.9399; semicarbazone, m. 116.5-7.5°. On standing I gives a trimer, m. 34-6°, mol. wt. in freezing C_6H_6 506, 526; it appears to be depolymerized by heating at 3 mm. and 200°. The trimer of the free acid m. 112-3°. On standing in the air these esters oxidize readily to the esters of the corresponding acids; these esters could also be isolated from the high boiling fractions. The Me (mono) ester of azelaic acid, m. 22-4°, b_3 158.5-9.5°, n_D^{25} 1.4451, d_4^{25} 1.0348; of sebacic acid, m. 40-1°; of brassylic acid, m. 57-7.5°. I and BuMgBr give 38% of Me θ -hydroxytridecanoate, b_3 154-5°, n_D^{20} 1.4490, d_4^{20} 0.9316. The free acid m. 49-51°. From the ester through the bromide and the unsatd. acid there is formed $C_{13}H_{26}O_2$, m. 42-2.5° (cor.). C. J. WEST

Preparation of dibromoacetaldehyde acetal by direct bromination of paraldehyde. RUDOLF DWORZAK. *Monatsh* **46**, 253-9 (1926).—The action of 1 mol. Br upon 1 mol paraldehyde gives a small amt. of dibromoacetal, in some cases in sufficient amt. to be isolated. Two mols Br give about 40% of the acetal, but also considerable amts. of tetrabromobutyraldehyde. Three mols of Br also give, in the 1st instance, the same products; some tribromoacetal is also formed, but the amt. is not sufficient to make the method 1 of prepn. C. J. WEST

Effect of heat on chloral hydrate. J. D. MOUNFIELD AND J. K. WOOD. *J. Chem. Soc.* **1926**, 498-9.—Dilatometric measurements with chloral hydrate, with "liquid paraffin B. P." as the indicating liquid showed that the hydrate suffers a change of vol at 32°; densimeter expts. showed a complete absence of a break in the vapor pressure curve in the vicinity of 32°; thus the change which occurs at 32° probably does not correspond to a change in modification but marks the commencement of the dissociation of the hydrate. C. J. WEST

Hydroxymethyleneketones. FRICH BENARY, HANS MEYER AND KURT CHARLUS. *Ber.* **59B**, 108-12 (1926).—Compds. of the type $RCOCH:CHOH$ are not, with the exception of the 1st member of the aliphatic and of the aromatic series, as unstable as has hitherto been assumed (cf. Couturier and Vignon, *C. A.* **4**, 1093). *Hydroxymethylenemethyl Et ketone* (Et β -hydroxyvinyl ketone), obtained in about 80% yield from $MeCOEt$, HCO_2Et and Na in Et_2O , m. 73°, gives a violet color with alc. $FeCl_3$ even when $NaOAc$ is previously added, $b.$ 145-8°, sublimes *in vacuo*, is decompd. by hot dil. alkali into $MeCOEt$ and HCO_2H , titrates as a 100% enol by the Meyer Br method; its Na salt in H_2O at once gives with $PhNH_2 \cdot HCl$ the aniline deriv., $EtCOCH \cdot CHNHPH_2$, m. 128°, and with PhN_2Cl a benzeneazo deriv., yellowish, m. 137-8°, sol. in concd. H_2SO_4 with dark red color; as it gives no color with $FeCl_3$ it is supposed to have the aldehyde structure, $EtCOC(CHO) \cdot NNHPH_2$. *Hydroxymethylenemethyl Pr ketone*, mobile oil b_{16} 54°, rather quickly thickens and turns red in the air or a desiccator, gives a strong red color with alc. $FeCl_3$, is easily hydrolyzed by cold $NaOH$. *Et γ -hydroxymethylenemethyl α,α -diethylacetate*, from HCO_2Et and $AcCEt_2CO_2Et$, oil of aromatic odor, $b.$ 121°; *Cu salt*, blue-green, m. 76°; *aniline deriv.* yellowish, m. 70°. *Hydroxymethylenemethyl p-tolyl ketone*, light yellow, m. 40-1°, gives a red color with $FeCl_3$, slowly deliquesces to a viscous red oil in the air or a vacuum desiccator, is stable for a long time in sealed vessels; *Cu salt*, light green, m. about 218° (decompn.); *aniline deriv.* yellowish, m. 164-5°. "benzeneazo deriv." orange-yellow, m. 144°, forms a phenylhydrazone, orange-yellow, m. 161-2°; *1-phenyl-5-p-tolylpyrazole*, from the ketone and $PhNHNH_2$ on the H_2O bath, m. 94°. *ω -Hydroxymethylene-p-methoxyacetophenone*, light yellow, m. 50-1°, gives an intense red color with alc. $FeCl_3$; *Cu salt*, olive-green, m. 192-4°; *anilide*, light yellow, m. 158°; "benzeneazo deriv." orange, m. 136-7°, gives no color with alc. $FeCl_3$ and forms a phenylhydrazone, golden yellow, m. 218-9°; *1-phenyl-5-p-methoxyphenylpyrazole*, m. 90-1°. *Hydroxymethylenemethyl α -naphthyl ketone*, light yellow oil which cannot be distd. without decompn.; *Cu salt*, gray-green, m. 165-8°; *aniline deriv.*, light yellow, m. 116-8°. C. A. R.

The highest melting saturated acids (lignoceric and hexacosanic acid) of peanut oil. D. HOLDE AND N. N. GODBOLE. *Ber.* **59B**, 36-40 (1926).—The difficulty en-

countered by previous workers in obtaining pure lignoceric acid (I) from peanut oil and the different m. ps. of I which they report are due to the presence, hitherto not observed in peanut oil, of an acid $C_{26}H_{50}O_2$ (II). Bv distn in a high vacuum of the "crude arachic acid" and by a modified fractional pptn of the high melting acids with LiOAc (using $EtOH \cdot CHCl_3$ instead of $EtOH$ as the solvent) H and G obtained, together with pure I, m. 80.5–1.0°, small amts (actually isolated, 0.01%; amt estimated present, 0.1–0.2%) of II, m. 78.5–9.0°; with which of the known "cetotic acids" II is identical is a question reserved for a later paper. C A R

Isoboleic acid, and other fatty acids formed in the distillation of 10-hydroxystearic acid. V. VESELY AND H. MAJTL. *Chem. Listy* 19, 315–56 (1925), *Bull. soc. chim.* 39, 230–48 (1926).—Michel, Constantin and Saytzeff (*J. prakt. Chem* [2] 37, 269) observed the formation of a mixt. of unsatd. fatty acids during the distn of 10 hydroxy stearic acid under 160–200 mm. In their opinion this mixt. is composed of ordinary oleic acid and a solid isomer, which they termed isoleic acid. The latter is not the same as elaidic acid. From theoretical considerations V. and M. conclude that splitting off a mol. of H_2O from 10 hydroxystearic acid should lead to the formation of the 4 following acids: $\Delta^{9,10}$ -oleic acid (I), its *trans*-stereoisomer (ordinary elaidic acid) (II), *cis*- $\Delta^{10,11}$ -oleic acid (III), and its *trans*-isomer, isoleic acid (IV). It was found that the distillate contains a eutectic mixt. of II and IV, m. 35.6°, and a liquid soln. of I and III. F C. KRACEK

Octadecenic acids. AD. GRÜN AND WALTER CZERNY. *Ber.* 59B, 54–63 (1926).— β - $C_{10}H_7SO_3H$ (I) has been found to catalyze the formation of olefinic acids from HO esters (C. A. 14, 3416). In these cases, however, the olefinic acids were not isolated and their formation was shown only indirectly (detn. of HO, I nos., etc., of the products before and after the reaction). The suitability of I for this purpose has now been studied with a homogeneous compd. of known structure, viz., Et 12 hydroxystearate (II); this, in the presence of I, readily loses H_2O almost quant. and yields a mixt. of *cis*- and *trans*- $\Delta^{12,13}$ -octadecenic acids (III), whose structure is established by converting them into the acetylenic acids and oxidizing the latter (C. A. 20, 301). The II, prepd. by incomplete hydrogenation of castor oil to avoid reduction of the HO group (5 kg. oil with 1.5% Ni on a carrier hydrogenated at barely 80° for 3 hrs. until it was about 75% satd.) and esterified directly with 2% alc. HCl, m. 51–13°. Heated 1 hr. at 220° with 2% I and boiled in alc. until the partly saponif. product is completely converted back into the ester, it yields quant. the *Et* ester of III as a moderately viscous oil, b_D^{20} 18.4°, also obtained in 70% yield from the hydroxystearic acid boiled with $SOCl_2$, freed from the excess of $SOCl_2$ *in vacuo*, dried over P_2O_5 and KOH, dropped into alc., dild. with petroleum ether, washed free of mineral acids and distd. *Elaidic acid form* (IV) of III, m. 39.7–40.1°, solidifies 39.5°, b_D^{20} 19.6° (yield, about 60%). *Oleic acid form* (V) of III, sepd. from IV by fractionation of the Pb salts from alc. contg. AcOH, only liquid with the viscosity of oleic acid, m. (after standing 21 hrs. at 0°) 9.8–10.1°, solidifies 8.2°, b_D^{20} 19.6°; 10 g. shaken 3 min. at 25° with 5 g. HNO_3 (d. 1.4) and 1 g. Hg, then 1 min. more after 20 min. and allowed to stand 2 hrs. gives about 40% IV. $\Delta^{12,13}$ -Dibromooctadecenic acid (VI), from III and Br in petroleum ether below 3.5°, yellowish oil, does not cryst. at -20°, gives with boiling alc. KOH a viscous liquid consisting apparently of bromooctadecenic and octadecenic acid (neutralization no. 154.6, Br 20.6%). *Et* ester of VI, from the *Et* ester of III, oil; boiled 2 hrs. with 2 N alc. KOH and re-esterified with alc. HBr it yields *Et* 12-(or 13)-bromo $\Delta^{12,13}$ -octadecenate, b_D^{20} 19.3–5°; 3 parts of this evapd. with 2 parts cone. KOH and heated 10 hrs. at 180° gives $\Delta^{12,13}$ -octadecenic acid, m. 34.2°, which with alk. $KMnO_4$ and CrO_3 yields dodecanedioic acid, m. 123.2°, and capronic acid, with smaller amts. of undecanedioic acid and valeric acid. C A R

Addition products of iodine monobromide and hypoiodous acid to unsaturated compounds. II. D. HOLDE AND A. GORGAS. *Ber.* 59B, 113–5 (1926), cf. C. A. 19, 2637.—In continuation of the earlier work, H. and G. have succeeded in raising the yield of pure IBr derivs. of unsatd. acids prepd. according to Hannus from about 50% to 74–97% and have thus been able to bring the results of synthesis into better harmony with the quant. course of titrimetric analyses by the Hannus method. The degree of purity of the products has also been raised. The Ca salts of the IBr and HOI addn. products of erucic (I), oleic (II) and linolic acid (III) were prepd. by pptg. alc. solns. of the alkali salts with $CaCl_2$; those of the BrI derivs. are solid, white, cryst. and yet sticky; the stickiness of these salts, which are easily sol. in C_6H_6 and insol. in petroleum ether, could be greatly diminished by pptg. from C_6H_6 with alc. but not completely removed by washing with Me_2CO . The salts are quite stable towards light and air. The Ca salts of the HOI derivs. are likewise solid and sticky but even at a low temp. have a

glassy transparency, are non-cryst. and not sol. even in hot petroleum ether. Attempts to prep. TI salts of the addn. products by titration with TIOH failed on account of pptn. of TII on addn. of the aq. TIOH to the solns. in 96% alc. With I and III the I no. detn. according to Hanus was carried out in AcOH instead of CHCl_3 and the addn. products were accordingly extd. with petroleum ether instead of CHCl_3 . Iodobromobenzoic acid (97% yield), m. 37-8°; *Ca salt*, darkens 120°, m. 136° (decompn.). Diiododibromostearic acid, m. 77.8° (yield, 62% from petroleum ether, 74% from Et_2O); *Ca salt*, turns brown 100°, m. 115° (decompn.). *Ca iodohydroxystearate*, m. 190-4° (decompn.). Iodo-hydroxybenzoic acid; *Ca salt*, m. 184-8° (decompn.). Diiododihydroxystearic acid; *Ca salt*, gradually liquefies on heating. C. A. R.

Relative ease of 1,4- and 1,6-addition. E. P. KOHLER AND F. R. BUTLER. *J. Am. Chem. Soc.* 48, 1036-48 (1926).—For some reason inherent in the nature of long conjugated systems 1,6-addn. does not take place as easily as 1,4-addn. $\text{CH}_2(\text{CO}_2\text{H})_2$ (90 g.) and 60 g. $\text{CH}_2:\text{CHCHO}$ in 200 g. $\text{C}_6\text{H}_6\text{N}$ give 30 g. pure $\text{CH}_2:\text{CHCH}:\text{CHCO}_2\text{H}$, m. 72°; the Me ester (I) b_{25} 77-80° (64% yield). I (25 g.) and 55 g. $\text{CH}_2(\text{CO}_2\text{Me})_2$ are condensed by MeONa, giving 36 g. *tri-Me 3-pentene-1,1,5-tricarboxylate*, b_{11} 147-50°, and 1.5 g. of an oil, b_{11} 151-60°; the structure of the main fraction was established by decompn. of the ozonide. $\text{CH}_2(\text{CO}_2\text{Me})_2$ and Me sorbate give 62% of *tri-Me 2-methylpentene-1,1,5-tricarboxylate*, b_{10} 155°, b_{23} 185°. The reaction is reversible. Among the decompn. products of the ozonide is *propane-1,1,2-tricarboxylic acid*, isolated as the *tri-Me ester*, b. 127-31°, whose *hydrazide* m. 208° (decompn.). There was also isolated from the decompn. products a small amt. of a *compd.* $\text{C}_{11}\text{H}_{14}\text{O}_7(?)$, b. 164-7°; it reduces $\text{NH}_4\text{OH}\cdot\text{AgNO}_3$ but not fuchsin. I and PhMgBr give about 75% of β -phenyl- β -vinylpropionophenone, b_{10} 190°, oxidized by KMnO_4 in Me_2CO to $\text{BzCH}_2\text{CHPhCO}_2\text{H}$, m. 150°. There is also formed a 1,2-addn. product, which could not be purified but on oxidation with CrO_3 in AcOH gave BzPh and BzOH . Me β -phenylcinnamylideneacetate, m. 49°, formed by eliminating H_2O from $\text{PhCH}:\text{CHC}(\text{OH})\text{PhCHCO}_2\text{Me}$. This does not react with $\text{CHNa}(\text{CO}_2\text{Me})_2$ but with PhMgBr gives 40% of 1,3,5,5-tetraphenyl-1,3-pentadiene-5-ol, m. 121°; the concd. H_2SO_4 soln. is red by transmitted, deep blue by reflected light. A $\text{MeO}\%$ soln., satd. with HCl, gives triphenylstyryllane, m. 158°. C. J. WEST

Preparation of ethylene bromohydrin. F. H. McDOWALL. *J. Chem. Soc.* 1926, 499-500.—In the prepn. of $\text{HOCH}_2\text{CH}_2\text{Br}$ the Br is dropped from a small, finely pointed buret down a guide-tube of small bore, the lower part of which reaches to the bottom of the reaction vessel and is placed as far as possible from the C_2H_4 inlet. With an efficient stirrer the Br is dissolved by the H_2O before contact with the C_2H_4 is possible. The yields are good and the quantity of C_2H_4 used is slightly in excess of that absorbed. C. J. WEST

The heating of ethylene oxide and the mean temperature at which decomposition occurs. E. PEYTRAL. *Bull. soc. chim.* 39, 206-14 (1926); cf. C. A. 12, 579.—When ethylene oxide vapor is passed rapidly through a hot tube there result H_2O , AcH and a gas consisting of CO (44.7%), H (28.3%), CH_4 (15.0%), C_2H_2 (5.0%) and C_4H_2 (7.0%). The primary reactions are: (1) $4\text{CH}_2.\text{O}.\text{CH}_2 = 4\text{H}_2\text{CO} + \text{C}_4\text{H}_2$; (2)

$\text{CH}_2.\text{O}.\text{CH}_2 = \text{H}_2\text{O} + \text{C}_2\text{H}_2$; (3) $\text{CH}_2.\text{O}.\text{CH}_2 = \text{AcH}$. The secondary reactions are

(4) $\text{AcH} = \text{CO} + \text{CH}_4$; (5) $\text{H}_2\text{CO} = \text{CO} + \text{H}_2$; (6) $\text{C}_2\text{H}_2 + \text{H}_2 = \text{CH}_2.\text{CH}_2$. Of 100 mols 56 decomp. according to equation 1, 10 according to equation 2 and 34 according to equation 3. The decompn. is exothermic and calcs. based on the heats of the several reactions and the speed with which the gas traverses the tube show that at the moment when decompn. takes place the temp. of the gas rises during an interval of about 0.002 sec. from approx. 571° to 1200°. REYNOLD C. FUSON

Organic halogen oxides: oxidation of 1-chloro-1-heptene and 2-chloro-2-octene with perbenzoic acid. N. PRILESHAIEV. *Ber.* 59B, 194-8 (1926); cf. C. A. 6, 2407. From 37 g. 1-chloro-1-heptene, b_{73} 149-50°, oxidized 25 days with BzO_3H (4.5 g active O) is obtained 13 g. of a product b_{80} 93-5°, d_{16}^{20} 0.9874, n_D^{20} 1.4370, having the compn. of chloroheptene oxide, $\text{C}_7\text{H}_{11}\text{CH}.\text{CHCl}.\text{O}$; it has an intense enanthal and geraniol odor, is

oxidized by 1% KMnO_4 , forms a mirror with Tollens' reagent and reddens fuchsin- SO_2 boiled with CaCO_3 , it yields the aldehyde *alc.*, $\text{C}_6\text{H}_{11}\text{CH}(\text{OH})\text{CHO}$, m. 98.5-9.5°. 2-chloro-2-octene, from $\text{C}_8\text{H}_{17}\text{COMe}$ with PCl_5 and subsequent treatment with alkali, b_{80} 84-6°, d_{16}^{18} 0.8923, n_D^{16} 1.4424; 90 g. with BzO_3H (16 days) yields 25 g. 2-chlorooctene-2-oxide, b_{21} 81-2°, d_4^{20} 0.9755, d_4^{16} 0.9609, n_D 1.4359, slowly oxidized by 1% KMnO_4 and

contains C 50.58, H 9.28, Ca 11.41%. The above results indicate that, contrary to hitherto almost universal opinion, chloro oxides with the Cl in the oxide ring are quite stable compds. which with alkalis yield chiefly in the normal way α -aldehyde or α -ketone alcs. C A R

Resolution of *dl*-alanine and the formation of *trans*-2,5-dimethylpiperazine. F. B. KIPPING AND WM. J. POPE. *J. Chem. Soc.* **1926**, 494-7. *dl*-Alanine is resolved by means of the *d*-hydroxymethylenecamphor deriv. of the Et ester, which m 108.9, $[\alpha]_{\text{H}_2\text{O}}^{25^\circ}$ 256°; it is decompd. by distg with steam in the presence of concd HCl. The reduction of *l*-lactimide with Na and EtOH or AmOH gave only the optically inactive *trans*-2,5-dimethylpiperazine. The lactimide was not reduced by colloidal Pd or Pt, by Ca or CaH₂ and EtOH or by Al-Hg in dil EtOH. No evidence is thus obtainable as to whether inactive lactimide is the *dl*- or *cis*-compd., or the internally compensated or *trans*-compd. C J WEST

Molecular rearrangement of α -keto alcohols. A FAVORSKII. *Bull. soc. chim.* **39**, 216-20 (1926).—By heating alc EtCH(OH)COPr with a few drops of concd H₂SO₄ in a sealed tube at 120-30° EtCOCH(OH)Pr is obtained. Similarly, MeCH(OH)COEt, MeCH(OH)COCMe₃ and Me₂C(OH)COCHMe₂ are transformed into MeCOCH(OH)Et, MeCOCH(OH)CMe₃ and MeCOCOCH(Me)CHMe. Me₂C(OH)COCMe₃

(I) goes to MeCOC(OH)MeCMe₃. The structure of the products has been proved by treatment with MeMgI and subsequent oxidation of the resulting glycols. The case of I indicates that an ethylene oxide is an intermediate in the rearrangement, which proceeds as follows: $\text{RCOCH(OH)R} \rightarrow \text{RC(OH)OCHR} \rightarrow \text{RCH(OH)COR}$ B Z CH-

(OH)Me, which is similarly transformed into PhCH(OH)Ac, is found to undergo the same rearrangement under the conditions of alc fermentation. The mechanism of alc. fermentation of sugars is discussed. RENOLD C FUSON

The preparation of propylidene- and of isoamylidene-acetone with the intermediate formation of the corresponding ketols. PASTUREAU AND ZAMENHOF. *Compt. rend.* **182**, 323-5 (1926).—Far higher yields of EtCH·CHCOMe (I) and Me₂CHCH·CH·CHCOMe (II) than those obtainable by the method of Barbier and Bouveault (*Compt. rend.* **118**, 198 (1894), **120**, 1269 (1896)) were obtained by a new method. This is based on that of Grignard (*C A* **1**, 1389; **19**, 1247) and consists essentially of adding the mixt. of aldehyde and Me₂CO in cold Et₂O by aq. NaOH, isolating the intermediate ketol and dehydrating the latter. This method gave 3-hexanolone, EtCH(OH)CH·CHCOMe, in 60% yield, colorless, odorless liquid, b₂₅ 90°, d₄¹⁵ 0.951, n_D¹⁶ 1.4368, has great tendency to form I, particularly when rectified *in vacuo*, and 2,4-methylheptanolone, Me₂CHCH₂CH·CH(OH)CH₂COMe in 70% yield, colorless, mobile liquid, b₇₅ 75°, d₄¹⁵ 0.9247, n_D²⁰ 1.4366, can be rectified *in vacuo* without decompn. Among various methods of dehydration tried, the best results were obtained with that of Loequin (*C A* **17**, 2559). Transformation of the ketol was easily accomplished and 90% yields of I and of II were obtained. The yields of I and of II, based on the EtCHO and Me₂CHCH₂CHO, were 54% and 63%, resp. C C DAVIS

Irreversible reduction of organic compounds. II. The dimolecular reduction of carbonyl compounds by vanadous and chromous salts. J. B. CONANT AND H. B. CUTTER. *J. Am. Chem. Soc.* **48**, 1016-30 (1926), cf. *C A* **19**, 204. CrCl₃ in aq. or EtOH soln is without effect at 25° on representative aliphatic aldehydes and ketones, aromatic ketones, satd. and unsatd. acids and esters, alcs, C₆H₄ or diphenylbutadiene. Typical aromatic aldehydes, α,β -unsatd. aldehydes, PhCH·CHBz and certain other α,β -unsatd. ketones are reduced by CrCl₃ and VCl₃ with the formation of dimol products. Me₂C·CHAc is not reduced. The amt. of monomol reduction, if any, must be very small. It seems probable that the dimol reduction process proceeds through an addn. product of the CO compd. and the inorg. acid present and is analogous to the reduction of the halochromic salts of arylcarbmols. PhCH·CHAc (20 g.), reduced by an excess of EtOH-CrCl₃, gives 5 g. of a product m 161° (Harries, *Ber.* **29**, 381, 2121 (1896)). PhCH·CHBz is best reduced by VCl₃ in Me₂CO; there results 45% of low melting dimol. product (I), 35% of high melting product (m 258-60°), corresponding to the product obtained by Harries (*Ann.* **296**, 329 (1897)), 10% of unchanged ketone and 10% of non-cryst. oils. I is α,δ -dibenzoyl- β,γ -diphenylbutane, n. 194°, b₅ about

360° giving I and a few % of the high melting isomer. Both isomers give the *dibromide*, $C_{30}H_{22}OBr_2$, m. 171°. I and EtONa give *2,4,5-triphenyl-1-benzoylcyclopentene*, m. 123°, reduced by Zn in AcOH to the *pentane deriv.*, m. 148–51°. *p*-MeOC₆H₄CHO (20 g.) gives 6 g. isohydroanisoin, m. 101°. BzH and aq. acidic VSO₄ give a mixt. of hydrobenzoin and isohydrobenzoin (90% yield); no trace of PhCH₂OH or PhMe was found. CH₂:CHCHO with VSO₄·7H₂O gives 30% of divinylglycol; when a purple soln. of VSO₄ contg. an excess of H₂SO₄ and ZnSO₄ was employed the yield of divinylglycol was only 9%; 27% of the material was changed into a *compd.*, C₁₂H₁₈O₃, b. 167–8°, n_D^{20} 1.14438, does not yield a cryst. bromide, does not react with NaHSO₃ or H₂-NCONHNH₂. The recovered CH₂:CHCHO gave a very faint test for EtCHO. MeCH:CHCHO gives 18% of dipropionylglycol and other products which were not obtained pure. PhCH:CHCHO gives only 5% of diphenylvinylglycol. C. J. WEST

Mutarotation of mixtures of molybdates and of ethyl malate. Probable constitution of molybdomalic derivatives. E. DARMOIS. *Compt. rend.* **182**, 455–7 (1926).—A continuation of previous work (C. A. **17**, 2564). Di-Et malate does not react with MoO₃ or molybdates in the cold, but at 100° there is considerable reaction; with, however, reduction of MoO₃, particularly in acid soln. Polarimetric detns. were made most successfully at about 80°. By using the proportions MoO₃/2C₄H₆O₆Et₂ and 2MoO₃/C₄H₆O₆Et₂, which correspond to 2 series of molybdomalates and the compds NaH₂(MoO₄)₂, Na₂H₂(MoO₄)₂, Na₂MoO₄ and Na₂MoO₄ + NaOH, and following the reaction by the progressive changes in rotation, it was shown that, as with tartrates, the reaction is rapid only with molybdates of greater basicity than NaH₂(MoO₄)₂ and that this rate is also a function of the proportion: ester/MoO₃ and of the total concn. The changes in rotation also indicate that C₄H₆O₆Et₂ is sapon. in 2 stages: (1) formation of C₄H₆O₆HEt which then combines with MoO₃ to give the *l-compd.* MoO₃·2C₄H₆O₆NaEt (corresponding to Na₂MoO₄·2C₄H₆O₆Et) and (2) subsequent sapon. of the 2nd Et group, giving the *d-compd.* 4MoO₃·2C₄H₆O₆Na₂. Since it has already been shown (C. A. **19**, 786) that the formation of complexes requires the presence of 2 OH groups in α -positions, the formula of *l* Et malate must be HO₂CCH(OH)CH₂CO₂Et, and its *addn compd. with MoO₃* must be bound by the 2 free OH groups. C. C. DAVIS

Tartaric acids. LOUIS LONGCHAMRON. *Compt. rend.* **182**, 473–4 (1926).—Though Pasteur discovered inactive tartaric acid, no properties were given, and it has never since been isolated in pure cryst. form. *d*-Tartaric acid was boiled with a large excess of aq. NaOH, acidified with HCl, the liberated acids were pptd. by CaCl₂, the Ca tartrates decompd. by H₂SO₄ (1:1) and the liquid was concd. On cooling the *dl*-acid crystd. in long prisms, and on further concn. and repeated crystn. *hydrated inactive tartaric acid*, C₄H₆O₆·H₂O, was obtained, triclinic plates, parameters, $a:b:c = 0.6424:1:0.7925$ and angles $\alpha = 90^\circ 16'$, $\beta = 96^\circ 31'$, $\gamma = 75^\circ 46'$, d. 1.668, m. above 120° in its H₂O of crystn. When inactive C₄H₆O₆·H₂O was crystd. from strong H₂SO₄ or better from H₂O above 50°, crystals of *anhyd. inactive C₄H₆O₆*, totally different from the preceding, were obtained, i. e., octahedrons belonging to the orthorhombic system parameters, $a:b:c = 0.9467:1:1$, d. 1.737, m. 159–60°. *Active hydrated acid*. Solv. curves showed that this is stable below –5°, but that it may be easily obtained above 0° by inoculating a supersatd. soln. of the crystd. hydrate described above or with *l* l tartrate. Its compn. was C₄H₆O₆·H₂O, orthorhombic crystals similar to the preceding hydrate, parameters $a:b:c = 0.4716:1:0.5304$, d. 1.582, dehydrates rapidly at room temp. The existence of the hydrate explains certain anomalies described in the literature. C. C. DAVIS

Urea and guanidine derivatives of the sulfofatty acids. III. RUDOLF ANDREASCH. *Monatsh.* **46**, 23–30 (1925); cf. C. A. **19**, 237. —Guanidine-HCl and MeCHBrCOBr give α -bromopropionylguanidine, analyzed as the H₂PtBr₆ salt, red. K₂SO₃ gives *guanido- α -sulfopropionic acid*, sinters 295°, m. 306° (decompn.); the mol. wt. in boiling H₂O normal. α -Bromobutyrylguanidine, analyzed as the HBr salt, and the H₂PtBr₆ salt, garnet-red; K₂SO₃ gives *guanido- α -sulfobutyric acid*, sinters 300°, m. 314° (decompn.), mol. wt. in boiling H₂O normal. *Guanido- α -sulfoisobutyric acid*, m. 168°, the intermediate *guanidine* was analyzed as the H₂PtBr₆ salt, garnet-red. MeCHBrCONH₂ and (NH₄)₂SO₃ in H₂O give *NH₄ propionamide- α -sulfonate*, tablets. *K butyramide- α -sulfonate*, needles with 1H₂O; *NH₄ salt*, prisms. *NH₄ isobutyramide- α -sulfonate*, K₂SO₃ has only a reducing action on bromodimethyldiluturic acid, the Br being replaced by H (or K). C. J. WEST

Quantitative study of the action of mercury salts on the dialkylbarbituric acids. I. Phenylethyl, diethyl and butylethyl derivatives. PAUL FLEURY. *Bull. chim. chim.* **37**, 1656–68 (1925). —HgSO₄ in acid soln., poured in excess into aq. or alc. phenylethylbarbituric acid (I) gives a ppt. with the compn. about 2.5HgO:3 I. This can be used

and dissolves in about 50 parts H_2O at room temp. **I** with $ZnCl_2$ in hot Ac_2O gives the penta-Ac deriv., $[\alpha]_D^{20} -15.9^\circ$ (C_6H_5N), readily hydrolyzed back to **I** by 0.25 mol. alc. $NaOEt$. Shaken in C_6H_5N with 8.5 mols. Ac_2O until it dissolves (about 36 hrs.), **I** gives 63% of a tetra-Ac deriv. (**IV**), begins to sinter about 85° , m. around 100° , mol. wt. in freezing H_2O 400-3, $[\alpha]_D^{23} -6.9^\circ$, sol. in 15 parts H_2O at room temp., reduces Fehling soln. only after some boiling, slowly and continuously evolves N in aq. Me_2CO with acidified KNO_3 , showing that the NH_2 group is not acetylated, is hydrolyzed back to **I** by $NaOMe$ in $MeOH$, yields with $AcCl$ in C_6H_5N 85% of the penta-Ac deriv. and 3.9 g. with 1.5 mols. $BzCl$ and 1.5 mols. C_6H_5N in $CHCl_3$ (distd. from P_2O_5) gives 2.5 g. tetraacetyl-d-glucose-benzoylurea, sinters around 195° , m. $211-2^\circ$, $[\alpha]_D^{20} -29.7^\circ$ (C_6H_5N), does not reduce Fehling soln. even on boiling (probably on account of its slight soly in H_2O). Tetraacetylheronal(?) -glucoside (1.5 g. from 8 g. **IV**, 1 mol. $Et_2C(COCl)_2$ and 2.2 mols. C_6H_5N kept 50 hrs. at 50° in $CHCl_3$), $[\alpha]_D^{19} -20.2^\circ$ (C_6H_5N), sinters 165° , m. $169-70^\circ$, becomes smeary when rubbed with $NaOH$ and then dissolves, at once gives a white amorphous ppt. in hot dil. alc. with $Hg(NO_3)_2$, reduces Fehling soln. only after some boiling and not more rapidly if previously heated with acids. Triacetyl-l-arabinose-urea (88% from **III** with Ac_2O in C_6H_5N), $[\alpha]_D^{24} 45.9^\circ$, reduces Fehling soln. only after some boiling, begins to sinter 210° , m. 212° (decompn.), readily hydrolyzed back to **III** by 0.25 mol. $NaOMe$ in $MeOH$. Pentabenzoyl-d-glucosethiourea (2.8 g. from 2.4 g. **II** in C_6H_5N with $BzCl$), $[\alpha]_D^{18} 45.0^\circ$ (C_6H_5N), m. 205° , hydrolyzed back to **II** by 0.25 mol. $NaOMe$. Octabenzoyl-di-[d-glucose]-urea (5.5 g. from 3.3 g. **I** with 13.6 mols. $BzCl$ in C_6H_5N), generally seps. with 1 mol. $EtOH$, begins to sinter about 140° , m. around 150° ; dil. solns. in $CHBr_3$ show no appreciable depression in the m. p., 2% solns. only a very slight lowering, and under the ultramicroscope the Tyndall effect can be distinctly observed; 6 g. in $MeOH$ satd. with NH_3 at 0° , shaken at room temp. until dissolved, again satd. with NH_3 at 0° and kept 12 hrs. at room temp. gives 1.5 g. di-[d-glucose] urea, needles or columns with 2.5 H_2O , $[\alpha]_D^{17} -34.3^\circ$ to -35.8° (H_2O), mol. wt. in freezing H_2O 350-78, turns brown about 205° , carbonizes around $235-45^\circ$. Hexabenzoyl [di-l-arabinose]-urea (2.1 g. from 2 g. **III**), needles with varying amts. of $EtOH$ of crystn., $[\alpha]_D^{19} 163.0^\circ$ (C_6H_5N), sinters 250° , m. 260.1° (decompn.), reduces Fehling soln. only after energetic acid hydrolysis ($AcOH-HCl$); 3 g. in aq. C_6H_5N with NH_3 gives 0.2 g. di-[l-arabinose]-urea, $[\alpha]_D^{19} 62.1^\circ$ (H_2O), becomes discolored 205° , decomps. around 227° .

C. A. R.

Specificity of the α -glucosidase from yeast. BURCKHARDT HELFERICH, WILHELM KLEIN AND WILHELM SCHAFER. *Ber.* 59B, 79-86(1926).—It has hitherto not been possible, because the necessary derivs. of α -Me glucoside (**I**) were not available, to determine whether the ability of α -glucosidase (**II**) to split off the glucosidic Me group is affected in the same way as that of β -glucosidase by changes on the 6-C atom (cf. Fischer, *C.* 14, 1688, and earlier papers). In the present paper is described a method for changing the HO on the 6-C atom of **I** in various ways. The ethers of Ph_3COH react with PCl_5 or (usually less satisfactorily) with PBr_5 according to the equation $ROCPH_3 + PCl_5 \rightarrow RCl + Ph_3CCl + POCl_3$, and as no HCl is formed it seemed possible that ethers sensitive to acids at other points in the mol. (especially that of **I**) might in this way be converted into the corresponding chlorides if the free HO groups were temporarily protected by acylation. Such proved to be the case, and a study of the action of **II** from yeast on the compds. obtained in this way showed that it is more sensitive than the β -glucosidase to changes in the substrate. 2,3,5-Triacetyl-6-triphenylmethyl- α -methylglucoside (**III**), m. 136° , is obtained in 69% yield from **I** heated 2 hrs. on the H_2O bath with 1 mol. Ph_3CCl in dry C_6H_5N and then allowed to stand 18 hrs. at room temp. with 9 mols. Ac_2O ; 20 g. of this is warmed a few min. with 1 mol. PCl_5 , freed from as much as possible of the $POCl_3$ at 40° in *vacuo*, extd. with Et_2O , washed with H_2O and $KHCO_3$, dried with Na_2SO_4 , evapd., satd. in $MeOH$ with NH_3 at 0° , allowed to stand 5 hrs. at room temp., evapd. in *vacuo*, extd. with 50 cc. H_2O , evapd. to dryness in *vacuo*, extd. with 50 cc. cold $AcOEt$, evapd. in *vacuo*, freed from most of the $AcNH_2$ still present by sublimation in a high vacuum and acetylated in C_6H_5N with 8.5 g. Ac_2O , giving 3.7 g. 2,3,5-triacetyl- α -methylglucoside 6-chlorohydrin (**IV**), sinters 95° , m. $98-9^\circ$, $[\alpha]_D^{18} 163^\circ$ (C_6H_5N), reduces Fehling soln. only after hydrolysis with $AcOH-HCl$; with aq. Br_2 (OH)₂ at room temp. it gives 40% of α -methylglucoside 6-chlorohydrin (**V**), sinters 102° , m. $110-2^\circ$, $[\alpha]_D^{21} 139.72^\circ$, reduces Fehling soln. only after hydrolysis with acids. *Br* analog (**VI**) of **IV** (yield, 51%), m. 117° , $[\alpha]_D^{19} 125.8^\circ$ (C_6H_5N). *Br* analog (**VII**) of **V**, from **VI** with NH_3 and $MeOH$ (yield, 6.5%), sinters 126° , m. $129-30^\circ$, $[\alpha]_D^{19}$

107.4° (H₂O). *Anhydro-α-methylglucoside* (VIII), prepd like the β-compd (Fischer, C. A. 6, 1295) in 75% yield, very hygroscopic, m. 89–95°, $[\alpha]_D^{20}$ 40.3°, has a very bitter taste. *Triacetyl-α-methyl-d-isorhamnoside* (50% from VI in 50% AcOH and a drop of PtCl₄ slowly treated on the H₂O bath with Zn dust), m. 75°, $[\alpha]_D^{20}$ 159.2° (CHCl₃), hydrolyzed quant. by NH₃ in MeOH to *α-methyl-d-isorhamnoside* (IX), m. 98–9°, b₁ 162–3°, has a sweetish taste. 6-Me ether (X) of I, b₁ 195–200°, $[\alpha]_D^{19}$ 127.9° (H₂O). II does not hydrolyze V, VII, VIII, IX or X.

Acetone-sugars. VII. Constitution of diacetonegalactose. KARL FREUDENBERG AND KARL SMEYKAL. Ber. 59B, 100–7 (1926); cf. C. A. 19, 1561—6 Me ether (I) of diacetonegalactose (II) (6 g. from 10 g. II refluxed with Na in Et₂O, evapd., al. lowed to stand 12 hrs. at 35° with MeI, freed from most of the NaI by pptn. with Et₂O distd. under 1 mm. and freed from unchanged II by treating with *p*-MeC₆H₄SO₂Cl in dry C₆H₅N at 35°), b_{0.5} 109–15°, $[\alpha]_{578}^{20}$ –66.6° (without solvent); 3 g. refluxed in 1% H₂SO₄ gives 1.6 g. *galactose 6-Me ether* (III), m. around 128°, $[\alpha]_{578}^{22}$ 114° in H₂O 5 min. after soln., 77° (const.) after 3 hrs., reduces Fehling soln.; *phenylhydrazone*, decomp. 182–3°, $[\alpha]_{578}^{17}$ 14.5° (C₆H₅N), shows no mutarotation; *osazone*, yellow, m. 201–5°, $[\alpha]_{578}^{17}$ 135° (C₆H₅N). Boiled 24–36 hrs. in H₂O with yellow HgO and CaCO₃ III gave *galactonic acid 6-Me ether* (IV), m. 156°, has an acid taste, can be titrated with NaOH and phenolphthalein, $[\alpha]_{578}^{18}$ –5.54° in H₂O 5 min. after soln., –10.2° (const.) after 8 days. The lactone was not isolated in cryst. form but, besides the change in rotation, further evidence of its formation is the fact that when 0.3598 g. IV in H₂O is twice evapd. to a sirup on the H₂O bath, taken up in cold H₂O and immediately titrated (phenolphthalein) a red color, persisting about 30 sec., is obtained with 1.5 cc. 0.2 N NaOH and this continues until 8.65 cc. (caled, 8.56) has been added, when the color is permanent even on boiling. *NH₄ salt* of IV, m. 185°, rotation in H₂O about 30°, *PhNHNH₂ salt*, m. 158–9°, $[\alpha]_{578}^{17}$ 4.7° (H₂O), forms an acid aq. soln. Heated with H₂NO₃ (d 1.15) 2.5 hrs. on the H₂O bath IV gives no trace of mucic acid (galactose under the same conditions gives 80%, and galactose Me ether gives IV and considerable (C₆H₅)₂). With Ag₂O in H₂O on the H₂O bath IV yields 43%, MeOCH₂CO₂Ag, further identified by converting it into the K salt and refluxing this in alc. in the presence of a little NaI, with *ω*-bromoacetoveratrone, which gave *ω*-[methoxyacetyloxy]acetoveratrone, m. 70°. This establishes the structure of IV as a 6-Me ether and that the 6-HO group in II is free. *Diacetonegalactosyl-6-dimethylamine*, from the MeC₆H₄SO₂ deriv. of II with alc. NHMe₂, at 100°, oil with the consistency of glycerol, b₁ 110–5°, $[\alpha]_{578}^{16}$ 85.78°; *methiodide*, $[\alpha]_{578}^{18}$ –32° (H₂O), converted by N H₂SO₄ at 70° into *galactosyl-6-trimethylammonium iodide*, crystals with 1H₂O, sinters 90°, decomp. 140°, $[\alpha]_{578}^{12}$ 65.3° (H₂O) after 5 min., 51.8° (const.) after 12 hrs. *Diacetoneglucose* (V), m. 102°, can be obtained in 45–55 g. yield from 65 g. *α*-glucose shaken 4–5 hrs. in 1.8 l. Me₂CO and 55 cc. concd. H₂SO₄. Assuming that in II the 1st Me₂CO residue is combined with the HO groups on C atoms 1 and 2, the 2nd can be only on C atoms 2 and 5 or 3 and 4, the latter structure (that of a (1,2)(3,4)-diacetone-*α*-galactose (1,5) with an amylene oxide ring) is given the preference by F. and S. Like II, V is formed from both the *α* and the *β* sugar, hence when galactose dissolves in Me₂CO-H₂SO₄ it must first form an equil. mixt. of the 2 forms which, as the acetonation proceeds, is shifted in favor of I form, the entering Me₂CO residues do not have a choice between a butylene and an amylene oxide but must react with whatever form is present and, unless all observations hitherto made on the tension of O-contg. rings are deceptive, the amylene oxide ring is preformed in the galactose itself. F. and S. believe that this view that II contains the galactose in the same form as in the free sugar and its natural derivs. also holds for other sugars. It would then follow, from the structure of the Me₂CO derivs., that free glucose has the butylene, fructose and probably xylose and arabinose the amylene oxide structure, while mannose and rhamnose (it will be shown in a later paper that the 1 HO group in the Me₂CO derivs. of rhamnose is free) would again be butylene oxides. (Oile and Berend (C. A. 1, 20, 1389) have reached the same conclusions as F. and S. as to the structure of II.

C. A. R.

Identity of isomaltose with gentiobiose. HENRY BERLIN. J. Am. Chem. Soc. 48, 1107–11 (1926).—The crude sirup, representing the unfermentable portion of the product obtained by the action of concd. HCl upon *d*-glucose as described by Fischer (Ber. 23, 3687 (1890)) and by Friedrichs (C. A. 8, 2153), upon acetylation, yields cryst. *β*-gentiobiose octaacetate in a yield corresponding to about 1 g. of gentiobiose per 100 g. of *d*-glucose. Evidence is presented that the disaccharide osazone which Fischer

obtained in low yield from such a sirup and named isomaltose osazone, is gentiobiose osazone.

C. J. WEST

Hexahexosan and trihexosan. P. CASTAN AND A. PICTET. *Helvetica Chim. Acta* **8**, 946-8(1925) (in French); cf. P. and Jahn, *C. A.* **17**, 270; P. and Stricker, **19**, 976.—Hexahexosan ($C_6H_{10}O_6$)₆ (I) is best freed from the higher polymers which cause it to give a violet color with I-KI soln. by repeated pptn. by alc.; it then gives a bright red color. In a mixt. the higher polymers react first when the I is added in small amts. When a red soln. is slowly warmed, it turns violet, then blue, and finally colorless; on cooling, the colors reappear in inverse order. $[\alpha]_D^{20}$ of I 173.2° (H_2O , c 2.89), mol. wt. 974 (calcd. 972). I can be filtered on collodion and is not pptd. by reagents for dextrans. Treated with AcBr according to Karrer, Nägeli, Hurwitz and Wälti (*C. A.* **16**, 64), 1 g. gave 0.5 g. heptaacetylmaltose (II) and 0.05 g. glucose, thus behaving like starch and the amyloses. Barley amylase, purified from maltase by pptn. by alc., gave at 25° in the absence of buffers, after 18, 24 and 48 hrs., 32.2, 36.3 and 42.3% maltose, resp. After 35 days at 25° emulsin gave barely 20% maltose, but no other definite product could be isolated although the soln. no longer gave a color with I. Attempts at polymerization failed. Trihexosan (III) gave 96.3% glucose on hydrolysis. After the action of amylase only maltose could be isolated, splitting occurring one-half as rapidly as in the case of I, contrary to the effect of emulsin (P. and Salzmann, *C. A.* **19**, 976). AcBr and 1 g. III gave 0.30-0.35 g. II and 0.13 g. glucose. M. HEIDELBERGER

Dihexosan and tetrahexosan. A. PICTET AND R. SALZMANN. *Helvetica Chim. Acta* **8**, 948-9(1925); cf. *C. A.* **19**, 976.—An analysis is given of dihexosan (I), obtained by the action of emulsin on trihexosan. Dissolved in concd. HCl and shaken with Ag₂CO₃ I yields maltose, identified as the osazone, also obtained from I and amylase. Acetylated as in the preceding abstr. I yielded β -octaacetylmaltose, and is, therefore, a maltose anhydride, like diamylase and maltosan. As a by-product in the prepn. of I tetrahexosan (II) is obtained, prisms, m. 260°, mol. wt. 647 (calcd. 648), $[\alpha]_D^{20}$ 162.6° (H_2O , c 2.92), apparently owing to repolymerization of the I by the emulsin. II is slowly attacked by amylase, yielding maltose. M. HEIDELBERGER

Amylose-octadextrin. PETER KLASON AND KNUT SJÖBERG. *Ber.* **59B**, 40-5 (1926).—See *C. A.* **20**, 1222. C. A. R.

Lignin. I. Lignin of pine wood. ALFRED FRIEDRICH AND JAKOB DIWALD. *Monatsh.* **46**, 31-46(1925).—The wood meal is freed from resins by extn. with EtOH-C₆H₆ for 7 hrs., and from gums by extg. 4 times with 5% NaOH at room temp. (36 hrs. for each extn.). After washing with H₂O, AcOH and then again with H₂O, the dried wood is mixed with an equal vol. of HCl (1 part HCl (d. 1.17) + 1 vol. H₂O) and allowed to stand for 48 hrs. The moist (acid-contg.) product is then heated with 10 parts 96% EtOH for 8-10 hrs., the ext. filtered, concd. to 1/3 of its vol. and pptd. with 10 parts H₂O, giving 8-10% of primary lignin (I), C₁₄H₃₀O₇(OMe)₆, light cocoa-colored powder very hygroscopic, begins to decomp. about 90°. Lignin prepd. from wood extd. with warm NaOH contains 1 less MeO group. Conc'd. solns. in org. solvents are deep brown but H₂O ppts. from these solns. a much lighter powder. I is sol. in NaOH but insol. in Na₂CO₃; the product obtained by allowing I to stand in warm 2 N NaOH for 2 hrs. contains but 3 MeO groups and is sol. in Na₂CO₃. After standing several hrs. in conc'd. HCl, I gives a product with only 16.5% MeO (I contains 21% MeO). Depending upon the mode of action of Br, reaction products with 4, 5 or 6 atoms Br are obtained; all are amorphous, red-brown products, decomp. about 100°; the mol. suffers considerable decompn. or change in the reaction. Warming I with 3% H₂O₂ on the H₂O bath gives a product approx. C₂₂H₃₈O₇(OMe)₃, amorphous light yellow powder, which has no reducing power and does not give the color reactions of I. In NaOH, shaken with Me₂SO₄, gives the compd. C₃₄H₅₂O₈(OMe)₆, yellow-brown, decomp. 110°. BzCl gives a compd. C₃₆H₄₆O₁₂(OMe)₆, light yellow. The color reactions are described. Mol. wt. detns. by the osmotic method of Barger-Rast give values of 565-795 for I and 524-625 for the oxidation product. C. J. WEST

Synthesis of dihydrochaulmoogric and dihydrohydnicarpic acids. II. C. R. NOLLER AND ROGER ADAMS. *J. Am. Chem. Soc.* **48**, 1080-9(1926); cf. Shriner and A. C. A. **20**, 172.—Cyclopentanone, b. 129° (cor.) (all temps. are cor.), n_D^{20} 1.4370, d_4^{20} 0.9502. Cyclopentanol, b. 139°, n_D^{20} 1.4530, d_4^{20} 0.9488. Cyclopentyl bromide, b. 135.6°, n_D^{20} 1.4882, d_4^{20} 1.3900; the Mg deriv. with gaseous HCHO gives 62.4% of cyclopentylcarbinol, b. 162-2.5°, n_D^{20} 1.4579, d_4^{20} 0.9313; with (CH₂)₃IO, γ -cyclopentylpropanol, b. 85.6°, n_D^{20} 1.4590, d_4^{20} 0.9137 (phenylurethan, m. 55.5-4°). (CH₃)₂CHMgBr and CHO(CH₂)₁₁CO₂Me give Me- μ -cyclopentyl- μ -hydroxytridecanoate (I), b. 205-10° m. 29-9.5°; the free acid, m. 70.5-1°. The low boiling fraction is Me- μ -hydroxytride-

anoate, m. 38–40° (phenylurethan, m. 73.5–4°); the free acid, m. 77–75°. A 2nd fraction contains the *pinacol* of *Me* λ -aldehydododecanoate, m. 58–9°. I is converted through the bromide and the unsatd. acid to μ -cyclopentyltridecanoic acid, m. 70–1°, identical with dihydrochaulmoogric acid; the amide of each m. 105.6°. *Me* κ -cyclopentyl- ϵ -hydroxyundecanoate, from cyclopentylmethyl bromide, Mg, and $\text{CHO}(\text{CH}_2)_8\text{CO}_2\text{CH}_3$, b₈ 175–80°; the free acid, m. 60–60.5°; by the above procedure there was obtained κ -cyclopentylundecanoic acid, m. 63–3.5°, identical with dihydrohydnoacarpic acid; the amide of each m. 114–5°. III. The synthesis of homologs of dihydrochaulmoogric and dihydrohydnoacarpic acids containing a cyclohexyl in place of a cyclopentyl group. G. S. HIERS AND R. ADAMS. *Ibid* 1089–93 — β -Cyclohexylethanol, b₆ 86.9°, b₁₀ 98–101°, n_D^{25} 1.4698, d_4^{25} 0.9165, in 53% yield from $\text{C}_6\text{H}_{11}\text{MgBr}$ and $(\text{CH}_3)_2\text{CO}$, the bromide, in 65% yield, b₆ 70–1°, n_D^{25} 1.4888, d_4^{25} 1.2069. With $\text{CHO}(\text{CH}_2)_8\text{CO}_2\text{Me}$ the Grignard reagent from the bromide yields 26% the *Me* ester, b₁ 192.8°, m. 35.6°, of κ -cyclohexyl- θ -hydroxyundecanoic acid, m. 76–7°. From this is prepd. as above cyclohexylundecanoic acid, m. 58–9°. μ -Cyclohexyl- μ -hydroxytridecanoic acid, m. 72.3°; *Me* ester, b₄ 212–7°. μ -Cyclohexyltridecanoic acid, m. 63–4°. C. J. WEST

Geometrical isomerism in the cyclohexane series. Action of phenylmagnesium bromide on cyclohexene oxide. P. BEDOS. *Bull. soc. chim.* 39, 292–305 (1926), cf. C. A. 19, 1702. — When cyclohexene oxide (I) is treated with PhMgBr and the reaction mixt. decompd. with H_2O in the presence of Et_2O , the chief product is cyclohexane 1,2-bromohydrin (II), b₈ 87–8°, d_4^{12} 1.402, n_D^{12} 1.528, phenylurethan, m. 87–8°. There is obtained also some *o*-phenylcyclohexanol (III), b₁ 138–40°, n_D^{16} 1.5115, which appears to be a geometrical isomer of the III (m. 54.5°) prepd. in other ways; the 2 isomers, however, form the same phthalate and the same phenylurethan. KOH reconverts II into I. If the reaction mixt. is freed from Et_2O and then decompd. with H_2O there result considerable amts. of diphenyl, III and 2-cyclohexenol (IV), b₁ 164.6°, b₂ 65°, d_4^{26} 1.00, n_D^{26} 1.499. IV absorbs Br but attempts to study the double bond by reduction and oxidation were unavailing. REYNOLD C. FUSON

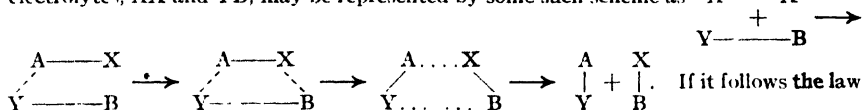
Inactivation of the catalysts in the transformations of carbon compounds. N. D. ZELINSKII (WITH MRS. M. B. TUROVA-POLLAK). *Ber.* 59B, 156–62 (1926), cf. C. A. 19, 1392. — According to the views developed in the earlier paper, the catalyst, depending on its own nature and the nature of the catalyzed mols., changes the form of the latter. If an org. substance is being catalyzed, it in part undergoes a deep-seated decomposition of the mols. in contact with the catalyst, there are always some whose temp. rises above the mean temp. and these decomp. and gradually cover the active surface of the catalyst with a thin film of C, thereby progressively decreasing the activity of the catalyst, removal of this film should then restore the activity of the catalyst if the structure of the extreme outside layer of the contact mass has not been materially altered by the deposition of the C. Willstätter and others have found that Pt black inactivated by use for catalytic hydrogenation can be reactivated by periodic treatment with O; this they believe to be due to the formation of a peroxide which, and not the Pt itself, acts as the catalyst through the formation of intermediate compds. with H. This reactivation, however, may also be explained as resulting from the action of the O on the film of C formed on the catalyst during the preceding reaction. Preliminary expts. showed that pure birch charcoal (with an activity of 12.5% with respect to petroleum ether) is oxidized even at room temp. in a current of O (yielding 0.004% CO_2 per hr.) and the oxidation is, as was to be expected, much more energetic in the presence of Pt or Pd black. The amt. of CO_2 formed from various Pt and Pd catalysts whose activity had been weakened or completely annulled by previous use for hydrogenation or dehydrogenation was then detd. at gradually increasing temps. The results obtained with 9 such catalysts (Pd-asbestos, Pt- and Pd charcoal and active birch charcoal) are reported. The curves all have the same general form, the formation of CO_2 begins at room temp., rises steeply to a max. at 150–250° and then falls as steeply as the temp. is further increased to around 300°; after such treatment the original activity of the catalyst is completely restored. C. A. R.

Reduction of *o*-phenyleneaceticpropionic acid and different aromatic amines with hydrogen by the use of platinum oxide-platinum black as catalyst. XII. G. S. HIERS AND ROGER ADAMS. *Ber.* 59B, 162–70 (1926), cf. C. A. 20, 376, Helfer, C. A. 18, 270; Skita, C. A. 19, 824. The present work confirms the observation that the Pt oxide–Pt black catalyst (I) of A., when properly prepd. and used, often if not always is a better catalyst than colloidal Pt, even when employed under the hitherto most favorable conditions known. From 10 g. *o*-HO.CCH₂.C₆H₄.CH₂.CH₂.CO₂H in 150 cc. of 95% alc. re-

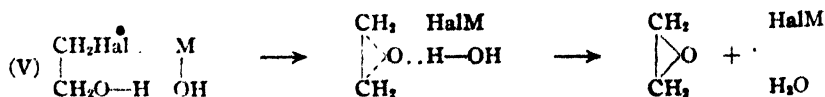
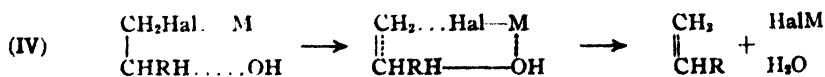
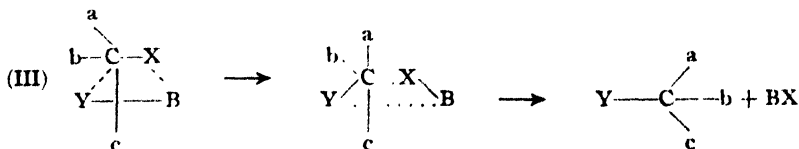
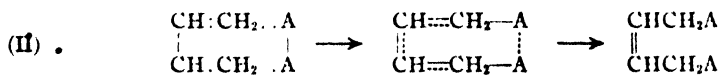
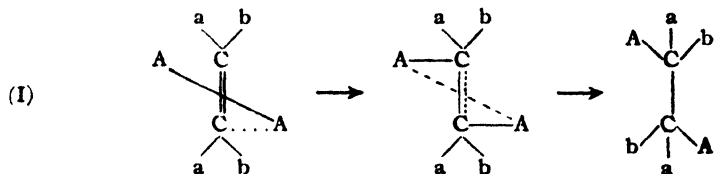
duced 51 min. with 1 g. I at 50° and 2-3 atm. is obtained quant. the hexahydro deriv., although not in a form as easily purified as that obtained by Helfer and by S.; the product is apparently a mixt. of stereoisomers, m. 73-7°, the m. p. rising only gradually on recrystn.; purification through the Na salt gave a product m. 78-92°. Comparative expts. on PhNH₂, PhNHMe, PhNMe₂ and PhCH₂NH₂ with S.'s colloidal Pt (II) and with I showed that a smaller amt. of I than of II is required to obtain the same degree of reduction; complete reduction can be effected with relatively small amts. of I, although in this case a long time is required; to obtain complete reduction with II, the concn. of the II must be high; increase in the concn. of I beyond a certain point apparently does not reduce the length of time required for reduction; increase in temp. increases the velocity of reduction with II more than with I. Alc. is a better solvent than AcOH with I; reduction (of PhNH₂.HCl) is more rapid in 95% than in abs. or in more dil. alc., but 75% alc. was used as it is a better solvent, as a whole, for all the amines which were studied. With I the velocity of reduction increases in the order PhNMe₂ → PhNH₂ → PhNHMe. The products are the same as those obtained by S. but in the reduction of PhNH₂ the relative yields of C₆H₁₁NH₂ and (C₆H₁₁)₂NH do not vary as widely with small variations in the exptl. conditions. C₆H₁₁NH₂, which b₇₄₄ 132-3°, forms with H₂O a const.-boiling mixt. b₇₄₈ 94-5°; the only satisfactory agent for removing the H₂O from this mixt. is Na. PhNMe₃Cl is reduced only very slowly; 4 mols. H₂ are taken up, with formation of Me₃NHCl and C₆H₁₂. Traces of Fe³⁺ salts act as a catalyst poison in the reduction of amines, and an exhausted catalyst cannot be reactivated with O.

C. A. R.

Stereochemical studies. XI. The reaction distances of anions. BROR HOLMBERG. *Ber.* 59B, 125-34(1926); cf. C. A. 20, 372.—The reaction between 2 non-electrolytes, AX and YB, may be represented by some such scheme as $A \cdots X + Y \cdots B \longrightarrow$



for a bimol. reaction, it passes through the intermediate stages with immeasurable velocity and no isolation or other direct proof of an intermediate product is possible, and the 3 intermediate formulas represent merely arbitrarily chosen moments of a continuous process. The novel point in them is that to the mols. AX and BY are ascribed at least at the instant of reaction, different intramol. distances, designated *reaction distances* (R.D.) $A \longleftrightarrow X$ and $B \longleftrightarrow Y$. When, e. g., a compd. A₂ undergoes *trans*



the Na salt of the above acid with KOH at 310°, was prepd. by converting *o*-xylene through the 3-NO₂ deriv. into the *vic-o*-xylidine (whose Ac deriv., m. 135°), thence into the xylenol and 2,3,4-Me₃(HO)C₆H₂CHO, m. 171-2°, and reducing the latter by the Clemmensen method; its *Ac* deriv., b. 239-41°; phenylurethan, m. 126.5-7.5°; benzeneazo deriv., yellow-red, m. 110-1°. The yield of I, b. 248-9°, has been increased to 85% by letting the mixt. of II, amalgamated Zn and HCl stand several hrs. at room temp. before heating; acetate, m. 59-60°; phenylurethan, m. 148-9°. C. A. R.

Ketonic fission of tertiary alcohols. V. GRIGNARD AND F. CHAMBRET. *Compt. rend.* 182, 299-302 (1926).—The discovery that certain tertiary alcs. decomp. on distn. to ketones (C. A. 17, 3157) led to a systematic study to det. whether the reaction is general. The present work deals with several series of satd. alcs. and α -, β - and γ -ethylenic alcs., the majority of the alcs. being new and described only recently by Chambret (*Diss. Lyon* 1925). On distn. the satd. alcs. and β - and γ -ethylene alcs. were very resistant, but on prolonged boiling traces of ketones were formed. The α -ethylenic alcs. on the contrary decompd. easily on distn., particularly *in vacuo*. Phenylmethyl- α -octenecarbinol gave PhCOMe, benzylmethyl- α -octenecarbinol gave *enanthydric-acetone*. The latter, prepd. in 70-5% yield by the method of G. and Dubien (C. A. 19, 1247), closely packed leaflets, m. 70-2°, changing in a few months to a *dimer*, m. 100-3°. As the temp. of distn. was increased, dehydration of the alcs. decreased and the ketonic decompn. increased, so that at 650-700° the latter was practically the only reaction, except for charring. With brick dust or pumice only dehydration occurred, but with glass wool excellent results were obtained, charring no longer being extensive and the max. yields of ketones being obtained at lower temps. (550-600°). With both glass wool and distn. *in vacuo* the yields were a max. at 400-500° and charring was eliminated. With glass wool either at ordinary pressure or *in vacuo*, the reaction is a general one. The following data give the alc., the ketone formed and its approx. % yield: MeCPr (OH)CH₂CH:CH₂ \rightarrow MeCPrCO (50 at atm. pressure, 60-5 at 500° and 160 mm.), MeC(CH₂Ph)(OH)CH₂CH:CH₂ \rightarrow Me(PhCH₂)CO (60 at atm. pressure, 90 at 400-50° and 30 mm.), MeCPh(OH)CH₂CH:CH₂ \rightarrow PhMeCO (80), MeCnBu(OH)CH₂CH:CHMe \rightarrow MeBuCO (30), MeC(CH₂Ph)(OH)CH₂CH:CHMe \rightarrow Me(PhCH₂)CO (60-5 at atm. pressure, 90 at 400° and 30 mm.), MeCPh(OH)CH₂CH:CHMe \rightarrow PhMeCO (80), γ -butenylmethylbutylcarbinol \rightarrow Me(CH₂:CHCH₂CH₂:CO (20-30), γ -butenylmethylbenzylcarbinol \rightarrow Me(CH₂:CHCH₂CH₂:CO (50-60), γ -butenylmethylphenylcarbinol \rightarrow PhMeCO (50), γ -pentenylmethylbutylcarbinol \rightarrow Me(MeCH:CHCH₂CH₂:CO (50), γ -pentenylmethylbenzylcarbinol \rightarrow Me(MeCH:CHCH₂CH₂:CO (50-60), γ -pentenylmethylphenylcarbinol \rightarrow PhMeCO (50-60), MeC(OH)Bu₂ \rightarrow MeBuCO (30), PhC(OH)Me₂ \rightarrow PhMeCO (80), PhC(OH)Me₂ \rightarrow PhMeCO (80), PhCH₂C(OH)Me₂ \rightarrow Me₂CO (60), EtCPr(OH)Bu \rightarrow unidentified mixt. Excellent yields were obtained *in vacuo* and the method should be of value in the *prepn.* of ketones when the corresponding alc. is more economical than the acid. It also offers a means of detg. the "affinity capacities" of the different radicals united to the tertiary C, the group with the least capacity forming the hydrocarbon on decompn. to the ketone. The results indicate that the capacities decrease in the order: Et > Me > γ -ethylenic > PhCH₂ or aliphatic radical (except Me) > α -ethylenic. The results did not, however, allow the α -ethylenic to be distinguished from the γ -ethylenic radical. The probable necessity of higher temps. and the catalytic process of Sabatier and Senderens render this method of doubtful value or utility in the *prepn.* of aldehydes from primary alcs. C. C. DAVIS.

Velocity of chlorination of toluene. F. BERGEL. *Ber.* 59B, 153 5 (1926). In connection with the revision of Cattermann's *Praxis des organischen Chemikers*, it became necessary to det. whether in the *prepn.* of PhCH₂Cl light really does not accelerate the chlorination of the side chain, as claimed by Book and Eggerth (C. A. 18, 668). A series of comparative expts. in the light and in the dark under the conditions given in the 19th edition of G.'s book showed that sunlight does quite materially accelerate the chlorination; Erdmann's statement, however, that PCl₅ catalyzes the chlorination of side chains in C₆H₅ derivs. (*Ann.* 272, 150) does not hold, at least insofar as the *prepn.* of PhCH₂Cl is concerned. C. A. R.

Nitration of aromatic compounds with bismuth nitrate. L. SPIEGEL AND HERBERT HAYMANN. *Ber.* 59B, 202-4 (1926).—Bi(NO₃)₃ (I) exerts a nitrating action on certain aromatic compds. at relatively low temps. without the aid of an acid (such as H₂SO₄) to set free the HNO₃. With C₆H₆ and PhMe no NO₂ derivs. can be isolated even after long boiling with I, although the formation of MeC₆H₄NO₂ can be detected by the odor. *p*- and *m*-xylene after several hrs. in sealed tubes give the corresponding toluylic acid. C₁₀H₈ gives a little α -C₁₀H₇NO₂; anthracene yields the quinone. PhOH reacts at room

temp., also in AcOH; with $1/3$ mol. I are obtained *o*- and *p*- $O_2NC_6H_4OH$ in the ratio 2:1.1; with more I the yield of mono- NO_2 derivs. decreases and tarry mixts in which picric acid could be detected are formed; PhOMe gives practical amts. of the *o*- and *p*- NO_2 derivs. only with 1 mol. I on the H_2O bath; β - $C_{10}H_7OH$ under widely varying conditions forms only smearable products, but its Et ether with I in AcOH at room temp. yields α , β - $C_{10}H_6(NO_2)_2OEt$ (II); *o*- $HOC_6H_4CO_2Me$ gives the 3- NO_2 deriv. Benzoquinone gives a small amt. of nitranilic acid, and anthraquinone at 200° yields the *o*- NO_2 deriv. PhNO₂ and $MeC_6H_4NO_2$ yield no more highly nitrated products, II gives the 1,8 di- NO_2 compd. $BzOH$, *o*- $C_6H_4(CO_2H)_2$, $PhSO_3H$ and $C_{10}H_7SO_3H$ and their esters do not react. ($C_6H_4(CO_2Et)_2$ is sapond. on long boiling with I). PhNH₂ does not react, PhNHAc only after the addn. of Ac_2O (which, however, liberates HNO_3 from I) with formation of the *o*- and *p*- NO_2 derivs.; *p*- $MeC_6H_4NH_2$ with $2/3$ mol. I forms an addn. product without being nitrated. *Addendum*.—Decompn. of $Bi(NO_3)_3$ on heating. S. and H.'s results agree best with Ivon's (*Compt. rend.* 84, 1161(1877)) as to the temp. (140°) at which the basic salt obtained by heating the crystd. I attains the const. compn. $BiONO_3 \cdot 0.5H_2O$ but they also find that this salt can be obtained by long heating at 120° if the HNO_3 liberated is removed as fast as it is set free by means of a current of dry air.

C. A. R.

Some *p*-phenoxyureas and thioureas derived from *p*-phenoxyaniline. The effect of the phenoxy group on the taste. N. A. LANGE and W. R. REED. *J. Am. Chem. Soc.* 48, 1069-74(1926).—Detailed directions are given for the prepn of *p*- $O_2NC_6H_4$, OPh ; the *p*- NH_2 deriv. (I) b.p. 315–20°, m. 82° (all m. ps. are cor.), the HCl salt (II) m. 222°. II and KCNO give 86% of *p*-phenoxyphenylurea, m. 178° and is tasteless. I and PhNCO give 70% of *p*-phenoxycarbanilide, m. 201° and is tasteless. The *p'*- Me deriv. m. 204°. α -*p*-Phenoxyphenyl- β - α -naphthylurea m. 216°; 86% yield. II and KCNS give 84% of *p*-phenoxyphenylthiourea, m. 181° and has a very slightly bitter taste. *p*-Phenoxythiocarbanilide, m. 140° and has a very slightly bitter taste, yield, 90%. I and CS_2 in EtOH contg. a little NaOH give 36% of *p,p'*-diphenoxythiocarbanilide, m. 172°, and is tasteless. These results indicate the effect of the PhO group in decreasing both the sweet and the bitter taste.

C. J. WEST

Nitration of benzylamine derivatives. R. ROBINSON. *Chemistry & Industry* 45, 9-10(1926).—The nitration of $PhCH_2NH_2$ and $(PhCH_2)_2NH$ at 90–100° yields appreciable quantities of *p*- NO_2 compds. Nitration of $(PhCH_2)_2NMe$ yields *m,m'*-dinitro derivs., together with the *o*- and *p*-derivs. Nitration of $PhCH_2NMe_2$ yields chiefly the *p*-deriv. About 50% of the *m*-deriv. is formed in the nitration of benzylpiperidine. Benzylphthalimide is nitrated largely in the *p*-position. Nitration of benzyltrimethyl ammonium nitrate yields 75% of the theory of *m*-deriv.

T. S. CARSWELL

New method for the thioxyanation of organic compounds. H. P. KAUFMANN and W. OEHRRING. *Ber.* 59B, 187-94(1926).—If $PhNH_2$, e. g., in a strongly acid soln contg. NaSCN is treated in the cold with Br, the reaction $2NaSCN + Br_2 = 2NaBr + (SCN)_2$, being ionic, proceeds so rapidly that the reaction $PhNH_2 + Br_2 = BrC_6H_4NH_2 + HBr$ is negligible if an excess of NaSCN is used. The hydrolysis $3(SCN)_2 + 4H_2O = 5HSCN + H_2SO_4 + HCN$ is greatly retarded in the presence of the acid, and the same is true of the polymerization, so that under these conditions the reaction $PhNH_2 + (SCN)_2 = p\text{-}NCSC_6H_4NH_2$ (I) + HSCN takes place. Numerous other substances have been successfully thioxyanated in this way. I, m. 57–8°, was obtained in 87% yield from 4.6 g. $PhNH_2$ in 12 cc. of 96% AcOH and 25 g. NaSCN in 130 cc. AcOH treated with 5.09 cc. Br in 35 cc. AcOH; the AcOH mother liquors yielded 15% of 2,4-dithiocyanooaniline, m. 198°. 1- $C_{10}H_7NH_2$ gives no mono NCS deriv., 2,4-dithiocyanoo-1-naphthylamine, m. 204°, is obtained in 7 g. yield from 12 g. $C_{10}H_7NH_2$, 17 g. NaSCN and 3.0 cc. Br in AcOH, while with 4.06 g. preformed $(SCN)_2$ (from $Pb(SCN)_2$ and Br) in Et_2O , 10 g. $C_{10}H_7NH_2$ yields 71% 4-thiocyano-1-naphthylamine, m. 146–7°, converted by standing in the air in alc. contg. a few drops of NaOH into [1,4- $C_{10}H_6(NH_2)_2S]_n$, m. 168°. 2- $C_{10}H_7NH_2$ (7.15 g.) with 16 g. NaSCN and 2.5 cc. Br yields almost quant. 1-thiocyano-2-naphthylamine (II), sinters 150–4°, turns yellow, resolifies and finally m. 261° (decompn.), converted into the amorphous 50% II is obtained (*p*- $NCSC_6H_4$)₂NH, m. 120°, is obtained in good yield from 0.2 g. $PhNH_2$, 2 g. NaSCN and the calcd. amt. of Br in 15% H_2SO_4 . 1- $C_{10}H_7OH$ (4.2 g.) with 9 g. NaSCN and cc. Br in AcOH gives 70% 1,4- $C_{10}H_6(OH)SCN$, m. 113°, while 1 g. of the naphthol with 8 g. KSCN and 0.6 cc. Br yields 60% of 2,4-dithiocyano-1-naphthol, faintly yellow, m. 118–9° (decompn.). 5,2-NCS(HO) $C_6H_4CO_2H$, m. 167°, is obtained in 0.2 g. yield from 1.38 g. *o*- $HOC_6H_4CO_2H$, 4 g. NaSCN and 1 cc. Br in HCO_2H ; the yield can undoubtedly be increased by changing the conditions. $(CH_3SCN)_2$, m. 90°, is obtained by

passing C_2H_4 and Cl separately (care being taken that the C_2H_4 is always in excess) into NaSCN in cold AcOH, or by using Br in 15% HCl instead of Cl. Styrene (1 g.) with 2 g. NaSCN and 0.5 cc. Br in AcOH yields 65% of $PhCH(SCN)CH_2SCN$, m. 101°; 2.8 g. anethole with 9 g. NaSCN and 1 cc. Br gives 75% of $p-MeOC_6H_4CH(SCN)CH_2SCN$, m. 87°, and from 1.2 g. antipyrine (III) and 2 g. NaSCN treated with Br in AcOH, the reaction mixt. then being dild. with an equal vol. of H_2O and made faintly alk. with 15% NaOH, is obtained 1.3 g. bis-[1-phenyl-2,3-dimethyl-5-pyrazolonyl] 4-disulfide, m. 256°, also obtained in 70% yield from 1.8 g. III and 5 g. NaSCN in AcOH treated with Cl until the mixt. gave no red color with $FeCl_3$ and then worked up as above C. A. R.

***p*-Nitrophenylhydrazine, its preparation and gravimetric utility.** HERBERT HENRY HODGSON AND HERBERT GREENSMITH BEARD. *J. Soc. Chem. Ind.* **45**, 56T (1926).—*p*-Nitrophenylhydrazine-HCl (I) is prepd. by adding $p-NO_2C_6H_4N_2Cl$ to neutral Na_2SO_3 soln., followed by recrystn. of the crude product from concd. HCl. Aldehydes and ketones are gravimetrically detd. by the following method: 2.5 g. of $m-OHC_6H_4CHO$ is dissolved in 25 cc. AcOH and 25 cc. H_2O , 5 cc. of the resulting soln. is added to 50 cc. H_2O and an excess of I is added. The mixt. is heated to 50°, cooled, filtered through a Gooch crucible and dried at 100°. Erratum. *Ibid* 56T.—Correction in the amt. of $NaNO_2$ taken for diazotization. T. S. CARSWELL

Symmetrical di(methylphenylmethyl)hydrazine and related compounds. W. A. SCHULZE AND H. L. LOCHE. *J. Am. Chem. Soc.* **48**, 1030-5 (1926).—Acetophenone ketazine is obtained almost quant. from 2 mols. PhAc and 1 mol. $N_2H_4 \cdot HCl$ at room temp. Catalytic reduction proceeds smoothly only with a fresh sample, yielding symdi(methylphenylmethyl)hydrazine, analyzed as the HCl salt, m. 188°; NO deriv., straw-colored oil, heavier than H_2O ; the oxalates could not be purified. 1,2-Bismethylphenyl methyl-4-phenylsemicarbazide, m. 108°; the 4-phenylurazole resulting by heating to 155°, m. 105.5°. Oxidation of the hydrazine with perhydrol gave 70-90% of a compd., $C_{18}H_{18}N_2$, m. 74°, which gives a good yield of $(MeCHPh)_2$ on distg. *in vacuo*. The hydrazine is reformed by reduction with Al-Hg in 95% EtOH. Methylphenylmethylhydrazine oxalate, m. 172° (decompn.); di-Bz deriv., m. 193°. C. J. WEST

3,4- and 2,5-Dimethoxyphenylhydrazine. WM. H. PERKIN, JR. AND LEON RUBENSTEIN. *J. Chem. Soc.* **1926**, 357-62.—3,4-(MeO) $_2C_6H_3NH_2 \cdot HCl$ (20 g.) in 90 cc. glacial AcOH is diazotized with $MeNO_2$, the diazo salt pptd. with Et_2O , dissolved in ice-cold H_2O and added to stirred $(NH_4)_2SO_3$ soln. at 0°, giving 14 g. NH_4 3,4-dimethoxydiazobenzenesulfonate, red; reduction with Zn dust and AcOH gives 9.5 g. NH_4 3,4-dimethoxyphenylhydrazinosulfonate, grayish white with a metallic luster; 12 g. of this salt, boiled with EtOH-HCl (30 cc. of 15%) for 0.5 hr., gives 4.5 g. 3,4-dimethoxyphenylhydrazine-HCl (I), gray, m. 162° (decompn.); it readily decomp. in the air and gradually loses HCl under reduced pressure; the free base, m. 81°, rapidly decomp. in contact with air. Cyclohexanone and I in EtOH contg. AcONa give 6,7-dimethoxytetrahydrocarbazole, pale yellow, m. 98°. I and $AcCO_2Et$ in EtOH contg. AcONa give Et 5,6-dimethoxyindole-2-carboxylate, yellow, m. 172°. NH_4 2,5-dimethoxydiazobenzenesulfonate, brick-red; the phenylhydrazine deriv., by reduction, is gray and with HCl gives 2,5-dimethoxyphenylhydrazine-HCl (II), darkens above 250°; it rapidly decomp. in the air. The free base m. 84°. II condenses with ketones with such difficulty that the work was discontinued. α -Ketoglutaric acid and $o-MeOC_6H_4NHNH_2 \cdot HCl$ in EtOH contg. AcONa give the yellow methoxyphenylhydrazone, m. 168° (decompn.), which, boiled with EtOH-HCl for 0.5 hr., gives Et 2-carbomethoxy-7-methoxyindole-3-acetate, gray, b₁₁ 245-55°, m. 106°, the free acid, brown, m. 253° (decompn.). Similarly was prepd. 2-carboxy-5-methoxyindole-3-acetic acid, pale yellow, m. 265°, the intermediate products not crystg. C. J. WEST

Amino ethers of the ephedrine group. Ethers of α -phenyl- γ -aminopropyl alcohols. W. DULIÉRE. *Bull. soc. chim.* **39**, 285-92 (1926); cf. *C. A.* **18**, 815, 2494.—The ethers are prepd. by heating the appropriate chloro ethers with the amine in a closed tube for several days at temps. not exceeding 125°. A single distn. of the liquid portion of the reaction product is usually sufficient to give the pure amine. The yields are very good. The following compds. are described: Me α -phenyl- γ -dimethylaminopropyl ether, b₁₂ 170° (HCl salt, sirupy and hygroscopic); Me α -phenyl- γ -diethylaminopropyl ether, b₁₂ 180° (reduced pressure), d₂₀ 0.942; Et α -phenyl- γ -diethylaminopropyl ether, b₁₂ 155° (reduced pressure), d₂₀ 0.921 (HCl salt, m. 74°); Pr α -phenyl- γ -diethylaminopropyl ether (HCl salt, m. 94°); iso-Bu α -phenyl- γ -diethylaminopropyl ether, d₂₀ 0.927 (HCl salt, m. 125°); iso-Am α -phenyl- γ -dimethylaminopropyl ether, d₂₀ 1.011 (HCl salt, hygroscopic). REYNOLD C. FUSON

Reaction between organomagnesium halides and the aryl esters of boric, carbonic, silicic and phosphoric acids. HENRY GILMAN AND C. C. VERNON. *J. Am. Chem. Soc.* **48**, 1063-6 (1926).— $B(OMe)_3$, contrary to the expts. of others, has no methylating action towards $PhMgBr$; all aryl esters of O acids thus far studied show no arylating action with Grignard reagents, the O-aryl group being replaced. From 0.25 mol. $B(OMe)_3$ and $PhMgBr$, 86% of $PhB(OH)_2$ is obtained; with 0.64 mol. $B(OMe)_3$, 58% $PhB(OH)_2$ and 30% C_6H_6 . $B(OPh)_3$ and 3 equivs. of $BuMgBr$ give 80% of $PhOH$ and a small amt. of a yellow compd., probably Bu boride. $PrMgBr$ gives 56% $PhOH$ and 7% Pr boride. 0.1 mol. $B(OPh)_3$ and 4 equivs. of $PhMgBr$ in Et_2O give 40% $PhOH$, 16.5% $PhB(OH)_2$ and 1.3% Ph_2 . Ph_2CO_2 (0.1 mol.) and 0.25 mol. $PhMgBr$ give 69% Ph_2COH , 6-21% $BzOPh$ and 45-61% $PhOH$. Ph_2CO and $EtMgBr$ give no $PhEt$. Equiv. amts. of $(p-MeC_6H_4O)Si$ and $PhMgBr$ give 17.5% unchanged ester, 46.5% $p-MeC_6H_4OH$ and a complex Si compd. $PhCH_2MgCl$ gives 30% $p-MeC_6H_4OH$, $(PhO)_3PO$ and $PhMgBr$ give 17% of Ph_3PO and 49% $PhOH$. $PrMgBr$ at 95% gives 49% $PhOH$ and a compd. b. 280-2° and m. 36°, which may be Pr_2PO . $(p-MeC_6H_4O)PO$ (0.1 mol.) and 0.4 mol. $PhCH_2MgCl$ at 95° give 28% $p-MeC_6H_4OH$ and 15.5% of a compd., m. 148°; $PhMgBr$ gives 50% Ph_3PO and 51% $PhOH$. Ph_3PO is not reduced to Ph_3P by the Grignard reagent. $(PhO)_3P$ and $PhMgBr$ give 60% Ph_3P and 68% $PhOH$. C. J. WEST

Reactions of mercury diphenyl with some acyl halides. H. O. CALAPRY. *J. Am. Chem. Soc.* **48**, 1009-2 (1926).— $ClCO_2Et$, $AcCl$ and $BzCl$ all react with $HgPh_2$ to give $PhHgCl$; $AcCl$ gives $PhAc$ while $BzCl$ gives $PhCO$ and possibly both give $PhClCO_2Et$ does not give $BzOEt$ in large enough quantities to be identified. Thus $HgPh_2$ is probably not an intermediate product in the formation of $BzOEt$ from $PhBr$, $ClCO_2Et$ and $Na-Hg$ but a by-product of that reaction. $AcCl$ is the most reactive of the 3 halides towards $HgPh_2$. $PhMgCl$ is sol. to the extent of 1 g. per 100 cc. 10% $NaOH$. An improved method for the prepn of $HgPh_2$ is given. C. J. WEST

Mercurated hydroxyazobenzenes. F. C. WHITMORE, E. R. HANSON AND G. J. LEUCK. *J. Am. Chem. Soc.* **48**, 1013-6 (1926).—Diazotized $p-H_2NC_6H_4SO_3H$ added to $o-HOC_6H_4HgCl$ in alk. soln. gives Na 3-chloromercuri-1-hydroxyazobenzene-4'-sulfonate, orange-yellow; attempts to prep the free acid failed because of the ease with which the C-Hg linkage was split. Similar Na salts were obtained from metanilic and naphthionic acids, yellow and orange, resp., and the free acid from o -, m - and $p-H_2NC_6H_4CO_2H$. $o-HO_2SC_6H_4N_2Cl$ and 4,2,6-Me(AcOH) $_2C_6H_2OH$ give the yellow Na anhydro 3-hydroxymercuri-5-methylazobenzene-4'-sulfonate; attempts to prep the free acid or the Cl deriv. failed. $o-HO_2CC_6H_4N_2Cl$ gives the deep red anhydro 2-hydroxy 3-hydroxymercuri-5-methylazobenzene-2'-carboxylic acid; the 4'-carboxylic acid is very similar. All these compds. react with hot $NHCl$ and with hot aq. NaI with complete splitting of the C-Hg linkage. No difference in the stability of the linkage in the different compds. was detected. C. J. WEST

Mercuration of aromatic sulfides. GEORG SACHS AND MINNA OTT. *Ber.* **59B**, 171-5 (1926).— Ph_2S (10 g.) and 20 g. $Hg(OAc)_2$ boiled with 50 g. $AmOAc$ until the mixt. no longer gave a black color with $(NH_4)_2S$ (5 hrs.) yielded 5.5 g. of a substance, m. 120-45°, with 57-8% Hg and 4 g. p -phenylmercaptophenylmercuric acetate (I), $PhSC_6H_4Hg(OAc)_2$, m. 148°, 0.5 g. of which with 65% HNO_3 on the H_2O bath and then with $K_2Cr_2O_7$, H_2SO_4 gave 0.02 g. of a $PhSO_3C_6H_4NO_2$, m. 131.5-4.5° (mixed m. p. with o - $PhSO_3C_6H_4NO_2$ (m. 147°) 128-30°; with the p compd. (m. 143°) 140°). With $CaCl_2$ in $MeOH$, I gives quant. the chloride, $PhSC_6H_4HgCl$, m. 181°, 0.4 g. of which in hot alc. with NH_3 yields 0.19 g. of the compd. $(PhSC_6H_4Hg)_2NH_2Cl$, m. 164-7° (slight decompn.). From 1.1 g. $Hg(OAc)_2$ heated in aq. alc. $AcOH$ with 0.5 g. $PhSAc$ until the soln. began to become turbid was obtained 0.8 g. $PhSHgCl$, while 1.5 g. $Hg(OAc)_2$ boiled in a little H_2O with 1 g. $PhSAc$ gave 1.4 g. $(PhS)_2Hg$. C. A. R.

3,4-Diaminophenylarsonic acid and some of its derivatives. W. LEE LEWIS AND H. E. BENT. *J. Am. Chem. Soc.* **48**, 949-57 (1926). At 100-40° and 10 mm. pressure, over P_2O_5 , the compds. $H_2NC_6H_4AsO_3H_2$, $HO-CC_6H_4CONHC_6H_4(NH_2)AsO_3H_2$, and $CH_2(OCNH)_2C_6H_4AsO_3H_2$ lose H_2O ; the Mg salts of these compds. do not lose H_2O under the same conditions, showing that the loss takes place from the arsenic group. 4-Propionylaminophenylarsonic acid, does not m. at 260° (32% yield). The following derivs. of $H_2NC_6H_4AsO_3H_2$ were prepd. by a modified Schotten-Baumann reaction: 4-Valeryl, 59% yield; 4-phenylacetyl, 81%; 3-amino-4-acetylamino, m. 265-7°, 74%; 3-amino-4-propionyl, m. 230-5°, 40%; 3,4-divaleryl, 44%; 3,4-dichloroacetyl, 49%; 3,4-diphenylacetyl, 62%; 3,4-dibenzoyl, 53%; 3,4-diphenyl, 16.5%; 4-carbopropoxy, 81%; 4-carbobutyloxy, 43%; 3,4-dicarbethoxy, m. 192-2.5°, 23%; 3,4-dicarbopropoxy, 81%; 3,4-dicarbobutyloxy, 57%; 3,4-dicarbopropoxy, decomp. 185-7°, 13.6%. Aminoarsanilic

acid (I), and $\text{ClCH}_2\text{CONH}_2$ in NaOH give 62% of *N*-[phenyl-1-amino-4-arsonic acid]-glycine amide, light gray powder, darkens 215° , m. $234-41^\circ$ (decompn.); using 25% more alkali or recrystn. of the amide in excess of alkali gives 1,2-dihydro-3-amino-6-arsono-quinoxaline (II), m. 226° ; NH_4 salt, decomp. 200° . I and $(\text{COCl})_2$ give 32% of the 1,2-dihydro deriv. Bz deriv. of II, m. 234° ; hydroxyethyl deriv., in 34% yield from II and $(\text{C}_2\text{H}_5)_2\text{O}$. I and $\text{BrCH}(\text{CONH}_2)_2$ give the 1,2-dihydro-2-formamide-3-amino deriv. in 17.2% yield. Aminotryparsamide and $\text{HCH}(\text{OH})\text{OSONa}$ give a ppt. during the 1st half hour which appears to be the arseno compd. with but 1 NH_2 group reacting; after 15 hrs., there results 75% of the arseno deriv. of sulfoxylated aminotryparsamide, light yellow powder, does not change up to 260° . *N*-[4-Arsenophenyl]-aminomalonomide, 57% yield. I and $\text{CH}_3(\text{CO}_2\text{Et})_2$ in MeOH give 26% of malonylaminoarsanilic acid, light red, which loses H_2O at 139° . 4-Phthalylamino-3-aminophenylarsonic acid, in 15% yield from I and $\text{C}_6\text{H}_4(\text{CO}_2)_2$; it seems to lose vol. up to $203-7^\circ$, then increase in vol. at $240-5^\circ$ with no further change to 260° . 1,2-Di-[*N,N*-dimethylamino]-4-arsobenzenic, light pink, by refluxing I in MeOH-HCl.

C. J. WEST

10-Chloro-5,10-dihydrophenarsazine and its derivatives. I. The synthesis, preparation and some properties of 10-chloro-5,10-dihydrophenarsazine. HAROLD BURTON AND C. S. GIBSON. *J. Chem. Soc.* 1926, 450-64.—The constitution ascribed to 10-chloro-5,10-dihydrophenarsazine (I) has been proved correct by the following synthesis: $o\text{-H}_2\text{NC}_6\text{H}_4\text{AsO}(\text{OH})_2$ (36 g.), diazotized and treated with CuBr at $30-40^\circ$, gives 27 g. of *o*-bromophenylarsonic acid, m. 201° (decompn.), which is reduced by SO_2 in EtOH-HCl contg. a trace of I, giving 92.5% of *o*-bromophenylarsenious oxide, m. $234-8^\circ$; 27.2 g. of this, coupled with the diazo soln. from 13.8 g. $o\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$, gives 19.6 g. of 2-bromo-6'-nitrodiphenylarsonic acid, pale yellow, m. $254-5^\circ$ (decompn.), 11.5 g. of which is reduced by $\text{Fe}(\text{OH})_2$ in dil. NaOH, giving 9.8 g. of the amino deriv. (II), m. $213-4^\circ$. II (10.8 g.), K_2CO_3 and a trace of Cu powder in AmOH, boiled 12 hrs., and then reduced with SO_2 , give 8.6 g. I. II and Me_2SO_4 at room temp. give the 6'-methylamino deriv. (III), m. $193-4^\circ$ (decompn.), while after heating 3 hrs. on the H_2O bath, there results the 6'-dimethylamino deriv., m. $220-1^\circ$. An attempt to prep. the *N*-Me deriv. of I from III failed, only I being isolated from the reaction product. Likewise the action of AsCl_3 upon Ph_2NMe in $\text{C}_6\text{H}_4\text{Cl}_2$ or by heating together at 200° for 3 hrs. gave only I. I is obtained almost quant. by heating 17 g. Ph_2NH , 20 g. AsCl_3 and 40 cc. $\text{C}_6\text{H}_4\text{Cl}_2$ for 5 hrs. and crystg. from CCl_4 . When AsCl_3 and Ph_2NH are mixed in C_6H_6 , there ppts. the compd. $\text{Ph}_2\text{NH}\cdot\text{HCl}\cdot\text{AsCl}_3$; in the air the crystals become opaque and consist mainly of $\text{Ph}_2\text{NH}\cdot\text{HCl}$. AsCl_3 , Ph_2NH and $s\text{-C}_6\text{H}_4\text{Cl}_2$ developed no pressure after standing 16 months; the residue after making alk. and distg. with steam when treated in hot AcOH with HCl , gave I; the sol. intermediate product may be $\text{Ph}_2\text{NAsCl}_2$. $\text{H}_2\text{NC}_6\text{H}_4\text{NacPh}$ (22.6 g.), diazotized and treated with Na_2HAsO_3 , give 16.5 g. *p*-(phenylacetyl amino)phenylarsonic acid (*N*-acetyldiphenylamine-*p*-arsonic acid (IV), crystg. with 1.5 H_2O , m. 126° (decompn.); boiled with EtOH-HCl 1 hr., it yield *p*-phenylaminophenylarsonic acid, m. 265° (decompn.). When IV is reduced with SO_2 in EtOH-HCl, there is formed *p*-(phenylacetyl amino)phenylarsenious chloride, m. 111° . Boiling PhNH_2 and AsCl_3 for 72 hrs. give Ph_2NH and 39% of an insol. residue, converted into I by $\text{HCl}\cdot\text{Me}_2\text{CO}$. $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$, AsCl_3 and $o\text{-C}_6\text{H}_4\text{Cl}_2$ or $(\beta\text{-C}_{10}\text{H}_7)_2\text{NH}$, AsCl_3 and $s\text{-C}_6\text{H}_4\text{Cl}_2$ give 14-chloro-14,7-dihydrodibenzophenarsazine, yellow, m. 355° (decompn.). $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ does not react in this way but $(\alpha\text{-C}_{10}\text{H}_7)_2\text{NH}$, AsCl_3 and $\text{C}_2\text{H}_5\text{Cl}$ give 60% of 7-chloro-7, 14-dihydrodibenzophenarsazine, yellowish brown needles, m. $278-9^\circ$ (decompn.). A mixt. of 15 g. Ph_2NH , 2.9 g. As_2O_3 and 3.2 g. P_2O_5 , heated with stirring at $160-70^\circ$ for 1 hr., gives 10.7 g. recovered Ph_2NH and 5 g. 10,10-oxybis-5,10-dihydrophenarsazine (V), converted into I by HCl in Me_2CO . V (10.7 g.) and 3.2 g. AcCl in C_6H_6 give 3.5 g. of 10-chloro-5-acetyl-5,10-dihydrophenarsazine, m. $221-4^\circ$. BzCl and V, however, give a nearly theoretical yield of I and Bz_2O . I is characterized by the formation of mol compds. when crystd. from various solvents; the following were analyzed: I. AcOH; 2I. $\text{C}_2\text{H}_5\text{Cl}$; 2I. PhCl ; 2I. $\text{C}_6\text{H}_4\text{Cl}_2$; 2I. Me_2CO ; I. CCl_4 . The dark green soln. of I in AsCl_3 deposits on cooling the compd. I. AsCl_3 , scarlet, decomp. on exposure to the air or on washing with solvents. Ph_2NH (8.5 g.), 17.3 g. AsBr_3 and 20 cc. $o\text{-C}_6\text{H}_4\text{Cl}_2$ give 9.6 g. 10-bromo-5,10-dihydrophenarsazine, also obtained in 13.3 g. yield from 15 g. of the 10-Ac deriv. and HBr in AcOH. The 10-I deriv. was similarly prepd. V in BuOH deposits 10-butoxy-5,10-dihydrophenarsazine, pale yellow, m. $518-60^\circ$; if the soln. is satd. with dry H_2S , there results the 10,10-thio deriv., m. $256-64^\circ$ (decompn.). The 10-benzoyloxy deriv. m. $173-5^\circ$. II. The action of primary chloroarsines on diphenylamine and its homologs. *Ibid.* 464-70. Ph_2NH , PhAsCl_2 and $o\text{-C}_6\text{H}_4\text{Cl}_2$ give I almost quant. $\text{MeC}_6\text{H}_4\text{NHPH}$ (38.6 g.), AsCl_3 and $o\text{-C}_6\text{H}_4\text{Cl}_2$ give 51 g., 10-chloro-2-methyl-5,10-dihydrophenarsazine (VI), yellow m.

199–200° (decompn.); (*p*-MeC₆H₄)₂NH (32.7 g) gives 44.7 g. of the 2,8-di-Me deriv. (VII), orange, m. 261–2° (decompn.); the 5-Ac deriv. of the last 2 compds. m. 154–5° and 164–5° resp. and result by boiling them with Ac₂O. VI and chloramine-T give 2-methylphenarsazinic acid, decomp. above 300°; Na salt, hair-like needles; HCl salt, m. 209–11° (decompn.). VII gives the 2,8-dimethylphenarsazinic acid, decomp. without melting; Na salt, needles; HCl salt, m. 216° (decompn.), *N*-Ac deriv., m. 240° (decompn.). Ph₂NH and ClCH:CHAsCl₂ in *o*-C₆H₄Cl₂ give I quant; α -C₁₀H₁₁NHPh gives 7-chloro-7,12-dihydrobenzophenarsazine, m. 218.9°. C. J. WEST

Organic arsenic compounds. II. Mercurated arylarsonic acids. ERNST MASCH-MANN. *Ber.* 59B, 213–8(1926); cf. *C. A.* 19, 478.—The description by Raiziss, Kolmet and Gavron (*C. A.* 14, 408) of the chem. properties of their "phenylarsonic acid-mercuric acetates" and the work of M. show that these compds. contain no Hg attached to the C of the nucleus and that some of their phenylarsonic acids (3-amino-4-hydroxy, 3,5-diamino- and 3,5-dinitro-4-hydroxy, 4-carboxy) cannot be mercurated at all, the only ones of their acids from which really mercurated derivs. can be prepd. are 3-nitro-4-hydroxy- and 3,5-diacetyldiamino-4-hydroxyphenylarsonic acid (I); this is also true of 3-acetyl-amino-4-hydroxyphenylarsonic acid (II). 5-Hydroxymercuri deriv. of II, from II in cold NaOH allowed to stand 6–7 days in the dark with aq. Hg(OAc)₂; contg. a little AcOH (yield, almost quant), does not visibly change up to 300°, dissolves in Na₂CO₃, alkalis and NH₄OH and loses its Hg with (NH₄)₂S as HgS only on boiling, the time required for complete mercuration can be shortened to 1 hr. by heating the reaction mixt. on the H₂O bath but the product is more deeply colored than that obtained at room temp.; when it is shaken in H₂O suspension with 1-KI as long as the latter is decolorized and the resulting light yellow iodoarsonic acid (III) is cautiously hydrolyzed, there is obtained 3-amino-4-hydroxy-5-iodophenylarsonic (IV), identical with the product obtained by Berthelm in an other way (unpublished communication); IV and its Ac deriv. (III) are readily reduced at 40–50° by Na₂S₂O₄ to the corresponding arseno compds., yellow-gray powders sol. in Na₂CO₃ and in NaOH, but only that from IV is sol. in dil. HCl. 2-Chloromercuri deriv. of I, obtained in 70% yield from I in NaOH and Hg(OAc)₂ in H₂O contg. a little AcOH allowed to stand 30 days in the dark (the reaction cannot be hastened by heating, which produces deep-seated decompn.), the product being pptd. from cold dil. NaOH with dil. HCl, m. 234°, dissolves clear in Na₂CO₃, alkalis and NH₄OH, gives HgS with (NH₄)₂S only after boiling; with 1-KI the CHHg group is replaced by I and the resulting 2-iodoarsonic acid, C₁₀H₁₂O₆N₂IAS, is reduced by Na₂S₂O₄ to the arseno compd., sol. in alkalis. C. A. R.

Phenyltin compounds. R. F. CHAMBERS AND P. C. SCHERER. *J. Am. Chem. Soc.* 48, 1054–62(1926).—Ph₃Sn is obtained in 50% yields by the action of Na-Sn upon PhBr or in 90% yields from PhMgBr and ZnCl₂ (giving Ph₂Zn) and then adding SnCl₄ in PhMe. Ph₃Sn and I in CHCl₃ give Ph₂SnI, which gives 50% Ph₂SnBr (through the hydroxide). Na triphenyltin, pale yellow, amorphous powder, is oxidized by O₂ in liquid NH₃ to Ph₂SnOH, Ph₃Sn and Ph₂SnO, Ph₂SnONa being an intermediate product. Thermal decompn. of Ph₂SnOH gives Ph₃Sn, Ph₂SnO and H₂O. If cold C₆H₆ is used to ext. the reaction product, only Ph₂SnOH is found. In the reaction of Ph₂SnNa with aryl halides, direct substitution of the Ph₂Sn groups occurred in practically none of the cases studied. With PhHgI there results Ph₂Sn, NaI, Hg and phenylmercuramine, m. 123.5–4°, mol. wt. in freezing C₆H₆ normal. This was also obtained from KNH₂ and PhHgI in liquid NH₃. Ph₂SnNa and ClCH₂CO₂Na give the Na salt of triphenyltin acetic acid, m. 122–2.5°; mol. wt. in freezing C₆H₆ normal. Triphenyltin hydride is obtained from Ph₂SnNa and NH₄Br in liquid NH₃, it b_p 173–4° and becomes cloudy on exposure to the air, being oxidized to Ph₂Sn and H₂O, Na gives Ph₂SnNa which reacts with Ph₂SnCl₂ to give Ph₃Sn. Ph₂Sn is obtained from Ph₂SnBr₂ and Ph₂SnH₂ in liquid NH₃; the product is a yellow powder whose properties indicate a high state of polymerization. Free Ph₂Sn, obtained in the monomol form by the decompn. of Ph₂SnH₂, yellow, decomp. 205°; it is not readily oxidized by air in the solid state but Ph₂SnO is rapidly pptd. from its solns. Na and Ph₂Sn in liquid NH₃ give varying amts. of Ph₂SnNa and Ph₂SnNa₂, depending upon the conditions; the presence of the Ph₂SnNa₂ is probably due to the sec. reaction of Na upon Ph₂SnNa. C. J. WEST

Relative directive powers of groups of the forms RO and RR'N in aromatic substitution. I. JAMES ALLAN AND ROBERT ROBINSON. *J. Chem. Soc.* 1926, 376–83.—The directive power (calcd. from the % of the 2 isomers formed) in the nitration of ethers of *o*-MeOC₆H₄OH are as follows: MeO, 100; EtO, 135; PrO, 128; iso PrO, 150; C₆H₅O, 123; PhCH₂O, 113. The following f. p. curve for a mixt. of the 5-NO₂- and 4-nitroethoxyanisoles was detd.: 31.5% 5-NO₂ deriv., 83.7°; 37.8, 79.5°; 42.4, 75.4°;

50.9, 62.6°; 55.6, 60.1°. Nitration of *o*-MeOC₆H₄OEt gives 95% of a crude product contg. 42.5% of the 4-NO₂ and 57.5% of the 5-NO₂ deriv. Crystd. from MeOH (equil. ensured by keeping 5 hrs. at 16°) gave a product contg. 51.9% of the 4-NO₂ deriv. Further nitration of the mixt. gives the 4,5-dinitro-2-ethoxyanisole, pale yellow, m. 150°; reduction with Zn and dil. EtOH-HCl, addn. of AcONa and phenanthraquinone in aq. NaHSO₃ gives 3-methoxy-2-ethoxyphenanthraquinone, yellow, m. 231°, gives a deep magenta soln. in H₂SO₄ and fluoresces violet in C₆H₆. The action of H₂S in dil. EtOH-NH₄OH gives 6'-nitro-3'-(or 4')-methoxy-4'-(or 3')-ethoxyphenyl-4,5-thiotriazocatechol *Me Et ether*, yellow, m. 175°. 4-Nitro-2-propoxyanisole (I), m. 106° (70% yield from PrI, 5-nitroguaiacol and KOH in EtOH); 5-nitro deriv. (II), m. 72°; 65% yield. A mixt. contg. 31.5% I, m. 55.5°; 34.2, 59.9°; 36.7, 63.5°; 41, 69.6°; 44.2, 73.4°; 50.5, 79.3°; 53.6, 82.4°; 57.0, 84.6°. Nitration of *o*-MeOC₆H₄OPr below 9° gives 96% of a mixt. of 13.9% I and 56.1% II. 4,5-Dinitro-2-propoxyanisole, m. 143°. 4-Nitro-2-isopropoxyanisole (III), pale yellow, m. 83°; 5-nitro deriv. (IV), yellow, m. 53°; the yields are 30 and 15% resp. A mixt. contg. 24.6% IV, m. 69.7°; 30.4, 66.7°; 35, 63.7°; 39.5, 60.2°; 48.1, 53.8°. Nitration of 2-isopropoxyanisole, (b. 210-5°, 90% yield) gives 92% of a product contg. 40% III and 60% IV. The 4,5-dinitro deriv., m. 129°. 4-Nitro-2-butoxyanisole (V), m. 74°; 5-nitro deriv. (VI), pale yellow, m. 56°; mixts. contg. 25.5% V, m. 39.8°; 28.3, 37.5°; 33.2, 32.6°; 36.5, 30.4°; 39.6, 33.2°; 42.7, 35.2°; 45.1, 35.7°; 46.9, 35.5°; 50.7, 39.6°; 52.2, 41.8°; 53.8, 44.1°; a compd. contg. 44% V, m. 35.5°; the eutectic on the side of V is near 35°, on the side of VI near 30°. 2-Butoxyanisole, b. 236-9° (quant. yield), on nitration below 12°, gives a product contg. 44.8% V. The 4,5-dinitro deriv., faintly yellow, m. 97°. 4-Nitro-2-benzyloxyanisole, (VII), m. 93°. 98° (75% yield); 5-nitro deriv. (VIII), m. 82°, 55% yields; mixts. contg. 17.1% of VIII, m. 85°; 23.7, 80°; 33.6, 72.9°; 37.2, 69.2°; 41.3, 65.2°; 46, 57.2°. Nitration of *o*-MeOC₆H₄OCH₂Ph at 8° gives 98% of a product contg. 47% VII. II. The nitration of some 2-benzyloxyanisoles substituted in the benzyl group. A. E. OXFORD AND R. ROBINSON. *Ibid* 383-91.—Assuming the directive power of MeO to be 100, that of *m*- and *p*-O₂NC₆H₄CH₂ is 67, of *m*-MeOC₆H₄CH₂ 92. 2-*m*-Nitrobenzyloxyanisole, pale yellow, m. 47.5-8°; the 4-nitro-2-*m*-nitrobenzyloxyanisole (IX), m. 164.5-5°; the 5-nitro deriv. (X), m. 140.5-1.5°; a complete m. p. curve for IX and X is given. Nitration of the 2-*m*-nitro deriv. gives 98.4% of a product contg. 39.4% X. The 4-nitro (XI) and 5-nitro-2-*p*-nitrobenzyloxyanisole (XII), pale yellow, m. 167-8° and 163.5-4.5°, resp.; a complete m. p. curve for the 2 is given. Nitration of the 2-*p*-nitro deriv. at 100° (15 min.) gave a product contg. 42% XII; nitration at 11° gave 99% of a product contg. 39.5% XII. 2-*m*-Methoxybenzyloxyanisole, b_m 220°, m. 31.5°; 4-nitro deriv. (XIII), pale yellow, m. 116-7°; 5-nitro deriv. (XIV), pale yellow, m. 98.5-9.5°; a f. p. curve is given for 0-62% XIV. Nitration of the MeO deriv. gives 99% of a product contg. 52% XIII. 2-*p*-Methoxybenzyloxyanisole, m. 94-6°; satisfactory conditions for the nitration of this compd. could not be established. 4-Nitro deriv., pale yellow, m. 129-30°; 5-nitro deriv., pale yellowish brown, m. 109°; a f. p. curve is given up to 41% of the 4-nitro deriv. III. The nitration of some *p*-alkyloxyanisoles. R. ROBINSON AND J. C. SMITH. *Ibid* 392-401.—2,4-(O₂N(MeO))C₆H₃OH is obtained in 96% yield from 40 g. of the di-Me ether, 80 g. NaOH and 700 g. H₂O by heating 54 hrs.; it also results by hydrolysis with HBr. *Et p*-methoxyphenyl carbonate, b₁ 157°, in 93% yield from MeOC₆H₄OH and ClCO₂Et; complete soln. results after boiling with 10% NaOH for 5 min. The 3-nitro deriv., m. 66° (90% yield), gives on hydrolysis with NaHCO₃ 95% of 3,4-(O₂N(MeO))C₆H₃OH. 3-Nitro-4-ethoxyanisole, yellow, m. 39.5°; 2-nitro deriv., yellow, m. 37-9°; a complete f. p. curve of these 2 compds. is given. Nitration of *p*-MeOC₆H₄OEt gives 62.2% of the 3-NO₂ deriv. and 37.8% of the 2-NO₂ deriv.; hence the directive power of EtO in the quinol series is 163 (MeO, 100). 3-Nitro-4-propoxyanisole, b₁ 127°, m. 10.7°; the 2-nitro deriv., m. 32°; the f. p. curve is given from 48 to 100% of the 2-NO₂ deriv. Nitration of 4-PrOC₆H₄OMe gave 97% of a product contg. 64.35% of the 3-NO₂ deriv.; the directive power of PrO, is therefore, 180. 3-Nitro-1-*p*-nitrobenzyloxyanisole, yellow, m. 153° (98% yield); 2-nitro deriv., m. 123.5° (96% yield); the 2 form an eutectic at about 66% of the 2-NO₂ deriv. and at about 108°. 4-*p*-Nitrobenzyloxyanisole, yellow, m. 87.5°; nitration gives 98% of a mixt. contg. 72.4% of the 2-NO₂ deriv. IV. A discussion of the observations recorded in parts I, II and III. JAMES ALLAN, A. E. OXFORD, ROBERT ROBINSON AND J. C. SMITH. *Ibid* 401-11 V. The nitration of *p*-methoxydiphenyl ether. T. R. LEA AND ROBERT ROBINSON. *Ibid* 411-3. *o*-*m*-Methoxydiphenyl ether, b₁₀ 175°, in 19 g. yield from 15.5 g. *m*-MeOC₆H₄OH, 15.5 g. PhBr, KOH and Cu; *p*-deriv., b_m 186°, m. -10°. Nitration of the latter at 15° gives 3-nitro-4-methoxydiphenyl ether, pale yellow, m. 73-4°; hydrolysis with KOH gives 2-nitro-4-phenoxyphenol, yellow, m. 51-2° gives a bright red K salt. *o*

$\text{PhOC}_6\text{H}_4\text{OMe}$ probably gives the 3-nitro-6-methoxydiphenyl ether, pale yellow, m. $73-4^\circ$.

Molecular compounds of phenols. VII. The behavior of hydrogenated cresols and related compounds. G. WEISSENBERGER, F. SCHUSTER AND K. WOJNOFF. *Monatsh.* **46**, 1-8 (1925); cf. *C. A.* **20**, 1013.—Measurements are reported of the vapor pressure at 15° of solns. of various concns. of *o*-, *m*- and *p*- $\text{MeC}_6\text{H}_4\text{OH}$ in PhMe , MeOH , CHCl_3 , and AcOEt , CS_2 and of *o*-, *m*- and *p*- $\text{MeC}_6\text{H}_4\text{OH}$ in CHCl_3 and AcOEt . Surface tension and viscosity measurements for these mixts are also reported. Hydrogenation does not alter the valence relations of the cresols with CHCl_3 . While PhOH forms mol compds. with alcs., cyclohexanol does not; the same relations holds with the cresols; the cresols form mol. compds. with AcOEt but methylcyclohexanols do not. **VIII. Localization of the residual valence field of action.** G. WEISSENBERGER, F. SCHUSTER AND R. HENKE. *Ibid* 47-56.—Measurements of the vapor pressure of 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ solns. in MeOH , EtOH , Me_2CO and AcOEt indicate the formation of mol. compds. because the differences noted are much greater than with PhOH and the $\text{MeC}_6\text{H}_4\text{OH}$, these values indicate that the seat of the compd. formation is on the H of the HO group. The effect is less marked in the case of AcOEt . Methylcyclohexanol and MeOH do not form a mol. compd., nor do BzH and MeOH , indicating that the H in the CHO group, even when attached to a Ph residue, is not capable of forming mol. compds. with alcs. Cyclohexanone and AcOEt do not form a mol. compd. Viscosity and surface tension measurements for these systems are reported.

Organic molecular compounds. IX. The group $-\text{CCl}_3$. G. WEISSENBERGER, F. SCHUSTER AND R. HENKE. *Monatsh.* **46**, 57-60 (1925).—While results of the measurements of the vapor pressure of solns. of CHCl_3 in PhOH indicate compd. formation, $\text{ClCH}_2\text{CCl}_2$ and cyclohexanone do not form a compd. Viscosity and surface tension measurements are also reported. **X. The vapor pressure curves.** G. WEISSENBERGER AND F. SCHUSTER. *Ibid* 157-65.—Values are given for the const α and τ in van Laar's formula (*C. A.* **4**, 2062) for systems of *m*- $\text{MeC}_6\text{H}_4\text{OH}$ with 29 other components; comparison of the values from van Laar's curve with those from Raoult-van't Hoff for normal fluids shows that there is, in general, little difference. In all systems studied, the max. variation is near the mol. ratio 2:1. **XI. Dolezalek's theory.** *Ibid* 167-9.—From the course of the vapor pressure curves, W. and S. conclude that D.'s assumption (*C. A.* **3**, 603, **4**, 1123) does not hold and that we do not have at present a means of calcg. the amt. of mol. compd. formed from the course of the vapor pressure curve.

Bromophenols. XII. Bromo- and bromonitro ethers of pyrogallol. MORITZ KOHN AND SARA GRUN. *Monatsh.* **46**, 75-90 (1925), cf. *C. A.* **20**, 1394—1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ (10 g.) and Br in CCl_4 give 11.5 g. 4,6-dibromopyrogallol tri-Me ether (I), b_{448} 294.6 $^\circ$, which gives with HNO_3 in AcOH the 5-nitro deriv., yellowish white, m. 110° ; $a:b:c = 1.81668:1.112290$; β 90.1047 $^\circ$, other crystallographic data are given. $\text{HBr} \cdot \text{AcOH}$ gives $\text{Br}_2\text{C}_6(\text{OMe})_3$, m. 168-71 $^\circ$. 5,1,2,3-(O_2N) $\text{C}_6\text{H}_2(\text{OMe})_2$ and $\text{HBr} \cdot \text{AcOH}$ give 5,1,2,3-(O_2N) $\text{C}_6\text{H}_2(\text{OH})_4$, crystg. with 0.5 H_2O , m. 194-46 $^\circ$; $a:b:c = 0.39386:1.018003$; β 96.555 $^\circ$; other data are given. 1,2,3- $\text{C}_6\text{H}_3(\text{OMe})_3$ and quinoline- H_2SO_4 , $\text{AcOH} \cdot \text{Br}$ mixt., well cooled, give the 4-Br deriv., b. 260-46 $^\circ$, further bromination gives I. HNO_3 gives the 5,6-dinitro deriv., yellowish needles, m. 134-5 $^\circ$. 2,6-(MeO) $_2$ - $\text{C}_6\text{H}_3\text{OH}$ and 4 mols. Br give 4,5,6-tribromo-1,3-pyrogallol di-Me ether, m. 134 $^\circ$; complete crystallographic data are given, 15 $^\circ$, alkalies give the K and Na salts. 2 mols. Br in CCl_4 and (MeO) $_2\text{C}_6\text{H}_3\text{OH}$ give the 4,5-di-Br deriv., m. 75.6 $^\circ$, Br deriv., m. 122.3 $^\circ$. Me_2SO_4 gives the tri-Me ether, b_{448} 308-13 $^\circ$, whose 6- NO_2 deriv., yellowish white, m. 84-6 $^\circ$. **XIII. On the exchange of halogen atoms and nitro groups in several nitro-halophenol ethers.** M. KOHN AND MELANIE HELLER. *Ibid* 91-100.—3,5- Br_2 - $\text{C}_6\text{H}_3\text{OMe}$, b. 257-61 $^\circ$; concd. HNO_3 gives the 2,4-dinitro deriv., m. 175 $^\circ$, sapon by concd. H_2SO_4 at 180-90 $^\circ$ to 2,4-dinitro 3,5-dibromophenol (II), pale yellow, m. 146.7 $^\circ$, whose Br deriv., m. 134.5 $^\circ$. Heating 1 mol II with 26 mols. PhNH_2 gives the 3,5-dianilino deriv., red, m. 177-8 $^\circ$. 2,4,6,3,5- $\text{Cl}_4(\text{O}_2\text{N})_2\text{C}_6\text{OMe}$, m. 94.5 $^\circ$, is sapon by concd. H_2SO_4 to 2,4,6-trichloro-3,5-dinitrophenol, m. 165.7 $^\circ$; K salt, Au yellow; pyridine salt, m. 139-48 $^\circ$. Boiling $\text{HBr} \cdot \text{AcOH}$ and 2,6,3,5- $\text{Br}_2(\text{O}_2\text{N})_2\text{C}_6(\text{OMe})_2$ give 2,6,3,5,6- $\text{Br}_4\text{C}_6(\text{OMe})_3$. Similarly 2,6,3,5- $\text{Cl}_2(\text{O}_2\text{N})_2\text{C}_6(\text{OMe})_2$ and $\text{HBr} \cdot \text{AcOH}$ give 2,6-dichloro 3,5-dibromohydroquinol di-Me ether, m. 170-2 $^\circ$, also obtained from 2,6,1,4- $\text{Cl}_2\text{C}_6\text{H}_2(\text{OMe})_2$ (b_{710} 258-9 $^\circ$, m. 34.5 $^\circ$). **XIV. New observations on halophenols.** M. KOHN AND ARTHUR ROSENFELD. *Ibid* 101-17.—*p*- $\text{ClC}_6\text{H}_4\text{OH}$ in aq. suspension and 2 mols. Br in KBr soln. give 2,6-dibromo-4-chlorophenol, m. 90 $^\circ$ (cor.); Me_2SO_4 gives the corresponding anisole (III), b_{448} 265-70 $^\circ$, m. 74 $^\circ$, whose 3-nitro deriv., m. 58 $^\circ$. With a larger amt. of concd. HNO_3 and H_2SO_4 , III gives 2,6-dibromo-4-chloro-3,5-dinitroanisole

m. 146° (cor.), sapond. by HBr AcOH to the corresponding *phenol*, m. 191° (cor.), K salt, yellow. With 9 mols. Br in KBr soln., *p*-ClC₆H₄OH in aq. suspension gives the keto bromide (*tribromochlorocyclohexadienone*), dark yellow, decomp. on heating, reduced by H₂SO₄ in EtOH to 2,6,4-Br₃ClC₆H₃OH; carefully warmed with concd. H₂SO₄, it gives 2,3,6-tribromo-4-chlorophenol, m. 104°. The corresponding *anisole*, m. 94° (cor.); its 5-nitro deriv., m. 120-1° (cor.), with HBr-AcOH gives 2,3,6-tribromo-4-chloro-5-nitrophenol, m. 141-2° (cor.); K salt, yellow; *Bz* deriv., m. 154° (cor.). 2,6-Diiodo-4-chlorophenol, rose-colored, m. 109° (cor.); the *anisole*, rose, m. 79° (cor.), for which crystallographic data are given (also for 2,4,6-I₃C₆H₂OMe). 3,5-Dibromo-2,4,6-triiodophenol, m. 199° (begins to decomp. 180°); the corresponding *anisole*, m. 202-5° (slight decompn.). 3,5-Dibromo-2,6-diiodoquinone, reddish yellow, m. 260° (decompn.). XV. Pseudophenols. *Ibid* 119-30.—Crystallographic data are given for 1,2,3,5-HO(Br)₂C₆H₂CH₂Br (IV); with N₂H₄·H₂O in Et₂O this yields *sym*-bisdi-bromo-*o*-hydroxybenzylhydrazine, m. 176°; with PhNH₂ in Et₂O, *asym*-dibromo-*o*-hydroxybenzylphenylhydrazine, m. 159°. IV and HNO₂(KNO₃ + AcOH) give a mixt. of 2-hydroxy-3-nitro-5-bromobenzyl acetate, golden, m. 134.5° (cor.), difficultly sol. in EtOH, and 2-hydroxy-3-bromo-5-nitrobenzyl acetate, m. 132° (K salt, yellow). HNO₂ and 2,3,5-HOBr₂C₆H₂CH₂NHPh give the compd. 2,3,5-HO(O₂N)BrC₆H₂CH₂N-(NO)Ph, yellow, m. 139-40° (cor.); K salt, bright red. *asym*-Dibromo-*p*-hydroxybenzylphenylhydrazine, m. 141°. XVI. A new tribromophenol, 3,4,5-tribromophenol, and a new tribromo-*o*-cresol, 1-methyl-2-hydroxy-4,5,6-tribromobenzene. M. KOHN and G. SPAR SOLTÉSZ. *Ibid* 245-51 (1926).—3,5-Br₂C₆H₃OH and Br in AcOH give 3,4,5-tribromophenol, m. 129°; complete crystallographic data are given. *Me ether*, b. 300-10°. m. 91-4°, whose 2,6-dinitro deriv., m. 127°. 4,5,6-Tribromo-*o*-cresol, m. 106°; *Me ether*, b. 320°, m. 105°.

C. J. WEST

Synthesis of hydroxydivarin. F. MAUTHNER. *J. prakt. Chem.* 112, 268-72 (1926).—3,4,5-Trimethoxyphenyl *Et* ketone, b₁₁ 177-8°, m. 51-2°, in 16.5 g. yield from 30 g. (MeO)₃C₆H₂COCH₂CO₂Et and 40 g. MeI in EtONa and heating the reaction product with 25% H₂SO₄ for 13 hrs; *p*-nitrophenylhydrazine, red, m. 182-3°. Reduction of 27.2 g. of the ketone with Zn-Hg and HCl gives 8 g. of 3,4,5-trimethoxy-1-propylbenzene, b₁₁ 143-4°, 3 g. of which, heated with HI (d. 1.96) for 5 hrs., give 1.7 g. of 3,4,5-trihydroxy-1-propylbenzene, m. 78°, identical with the hydroxydivarin isolated by Nakao from *Ramalina diracrata* (*C. A.* 17, 3184).

C. J. W.

Splitting of azimethines by mercuric chloride. GEORG SACHS. *Monatsh.* 46, 137-42 (1926).—Benzaldehyde-mercuric chloride, 2PhCH·NEt 3HgCl₂, decomp. 150°, results in 2.4 g. yield from 7 g. HgCl₂ and 8 g. PhCH·NEt in 400 cc. Et₂O. Equimol. amts. of HgCl₂ and PhCH·NEt in EtOH gradually ppt. EtNH₂·HgCl₂ (65% yield); the soln. contains BzH. The decompn. also occurs in moist Et₂O. Benzaldehyde-mercuric chloride, in 0.9 g. yield from 1.6 g. HgCl₂ and 1.5 g. PhCH·NCH₂Ph. PhCH·NCH₂Ph and HgCl₂ in moist Et₂O give 65% of PhCH₂NH₂·HgCl₂·PhCH·NPh (2 mols.) and HgCl₂ sep. 40% of the HgCl₂ as PhNH₂·HgCl₂. PhNH₂ gives the compds. PhNH₂·HgCl₂ or (PhNH₂)₂·HgCl₂, depending upon the proportions used. Benzaldehyde-mercuric acetate, m. 155-7°.

C. J. WEST

Isomerization of ethylene oxides and a comparison of the affinity capacities of some cyclic and acyclic radicals. TIFFENAU AND J. LÉVY. *Compt. rend.* 182, 391-3 (1926). Expts. have already shown (*C. A.* 19, 822) that in the isomerization of certain ethylene oxides, rupture of the O bond occurs on the side nearer to the radical with the greater affinity capacity. Further compds. were studied to det. whether this is a general characteristic. 1-Anisyl-2-phenylethylene oxide, MeOC₆H₄CH₂CHPh O prepd. from

BzO₂H and MeOC₆H₄CH₂CHPh, m. 118-9°, gives on distn. the isomer MeOC₆H₄CH₂COPh. 1,3-Diphenyl-2-benzyl-1,2-propene oxide, PhCH₂C(CH₂Ph)₂O, from BzO₂H

and PhCH₂CPh CHPh, thick liquid, b₃₆ 240-5°, gives on distn. at atm. pressure 1,2,4-triphenylbutanone. The results indicate that in the isomerization of di- or trisubstituted dissymm. ethylene oxides, the acyclic radicals have less affinity capacity than the cyclic radicals and that among the latter the anisyl radical has a greater capacity than the Ph radical. Though the affinity capacity of the Ph group increased by that of H is less than that of 2 Me groups, it is greater than that of 2 PhCH₂ groups.

C. C. DAVIS

p-Nitrobenzoyl esters of β -phenylethyl, γ -phenylpropyl and δ -phenylbutyl alcohols. W. R. KIRNER. *J. Am. Chem. Soc.* 48, 1111-2 (1926).—The *p*-nitrobenzoate of β -phenylethyl alc., m. 62-3°; of γ -phenylpropyl alc., 45-6°; of δ -phenylbutyl alc., 18-20°

These derivs. are no more suitable for identification purposes than are the phenylurethans.

The decomposition of cinnamaldehyde at high temperature by sudden heating. C. J. WEST, E. PEYTRAL. *Bull. soc. chim.* 39, 214-6 (1926); cf. *C. A.* 12, 579.—When PhCH:CHCHO (I) is passed rapidly through a hot tube 11.4% of the material appears in the form of a gas of the following compn.: CO (II) (73%), H (9%), C₆H₆ (III) (3.1%), CH₂:CH₂ (IV) (3.6%), C₂H₂ (V) (8.7%) and CH₄ (2.6%). The liquid products are III, styrene (VI), and unchanged I. In addn. some distyrene and free C are obtained. The decompn. of I into II and VI is the primary reaction (approx. 27%). VI then gives III and V. IV is explained as a reduction product of V. The other products indicate some more profound type of decompn.

REYNOLD C. FUSON
The reversible exchange of oxygen between aldehydes or ketones on the one hand and primary or secondary alcohols on the other hand. WOLFGANG PONNDORF. *Z. angew. Chem.* 39, 138-43 (1926).—PhCH:CHCHO and PhCH₂OH, in the presence of (PhCH₂O)₃Al, yielded PhCH:CHCH₂OH and BzH. Anisaldehyde and PhCH₂OH in the presence of PhCH₂ONa yielded anisyl alcohol and BzH. Citral and iso-PrOH in the presence of (iso-Pr)₃Al yielded geraniol, nerol and Me₂CO. Menthone and AmOH yielded menthol, valeraldehyde and valeric acid. Carvone and iso-PrOH with (iso-Pr)₃Al yielded carveol and Me₂CO. Menthol and PhCH:CHCHO yielded menthone and PhCH:CHCH₂OH in the presence of Al alcoholate. Refluxing PhCH:OH and anisaldehyde with no catalyst produced a partial reaction. The addn. of 5% AcONa increased the velocity of the reaction. The reaction is explained upon the theory that the aldehyde and alc. combine to form an unstable acetal, which decomp. to yield the new alc. and aldehyde. The reaction is thus reversible, and reaches a definite equil.

T. S. CARSWELL
The O-alkyl derivatives of benzoylacetone and the isoxazoles produced from them. (Reply to Mr. C. Weygand.) I. CLAUSEN. *Ber.* 59B, 144-53 (1926), cf. *W. C. A.* 20, 194.—Although in outward appearance, b. p. and d., the ether (I) obtained from BzCH₂Ac and HC(OEt)₃, to which C. assigned the A-ether structure, BzCH: C(OEt)Me, is very similar to the B-ether (II), PhC(OEt)CHAc, prepd from PhCHBrCHBrAc and alc. KOH, the 2 are not identical, as claimed by W. That both should give with NH₂OH·HCl the same isoxazole (III), m. 68°, is not surprising since the ethers, being exceedingly sensitive to acids, are very rapidly dealkylated by the HCl of the NH₂OH·HCl and the product obtained results from the action of the NH₂OH on free BzCH₂Ac. If this preliminary decompn. is avoided or the BzCH₂Ac is at once converted into a form which cannot react with NH₂OH, i. e., if free NH₂OH in the presence of an excess of alkali is used, II gives III almost exclusively while I yields 80-90% of the isoxazole (IV) m. 43°. The only by-product is an alkali-sol. substance, m. 98-9° (probably identical with W.'s product, m. 81-2°), which proved to be PhC(NOH)CH₂C(NOH)Me (V). Again, when I is heated some hrs. in a sealed tube at 100° with the calcd. amt. of NH₃ in MeOH the contents of the tube solidify on cooling to a compact cryst. mass of the A-amide, BzCH: C(NH₂)Me, m. 143°, while with II the contents of the tube remain fluid and only after evapn. of the MeOH does the *Bamide* sep. in prisms, m. 86-7°, which dissolve in cold concd. HCl and sep. again on standing as an HCl salt, but on gentle warming they decomp. quickly into NH₄Cl and BzCH₂Ac. IV heated with concd. H₂SO₄ becomes deep brown-black about 270°, finally carbonizes and evolves SO₂ while III can be heated to boiling without any appreciable color. Both III and IV in about 10% alc. soln. give with alc. CdCl₂ white cryst. ppts., C₁₀H₉ON·CdCl₂; with 20% alc. HgCl₂ III solidifies in about a min. to a magma of fine crystals while with IV nothing seps. in 24 hrs. With PhMgBr III gives BzCH: C(NH₂)Me and Ph₂. III and IV are very stable towards alkalis, neither long boiling or heating under pressure with alc. KOH nor distn. from soda-lime produces any change or a rearrangement of the one into the other. Benzoylacetone dioxime (V) gives a faint yellow color with FeCl₃, is smoothly converted into III by short boiling with HCO₂H. W.'s supposed Me B-ether, obtained from BzCH₂Ac with CH₃N₂ is in reality a mixt. of (about 2/3) A-ether and a smaller amt. of B-ether, as shown by conversion into the amides and isoxazoles.

C. A. R.

by direct transference of O to another substance. Non-hydrolyzed Bz_2O_2 can liberate I from KI when it is sufficiently sol. in the medium, not by oxidation in the true sense, but by rupture of the O bridge: $(RCO)_2O_2 + 2KI = 2RC_2OK + I_2$. When 0.3616 g. Bz_2O_2 in 10 cc. Me_2CO is treated with 25 cc. of an equimol. Me_2CO-H_2O mixt. at 13° and 5-cc. portions are added at definite time intervals to acidified aq. KI and at once titrated with 0.397 N $Na_2S_2O_3$, 0.2, 0.15, 0.15, 0.15 cc. of the latter are required after 2, 13, 45 min. and 12 hrs., resp., *i. e.* there is no appreciable hydrolysis of the Bz_2O_2 to Bz_2OH ; if the aliquot is added to an aq. Me_2CO instead of an aq. soln. of KI, so that the Bz_2O_2 , instead of being pptd., remains in soln., the calcd. amt. of I is instantly liberated. If KI-starch is added to an aq. suspension of Bz_2O_2 a blue color gradually develops, not as a result of hydrolysis of the Bz_2O_2 but produced directly by the traces of it which dissolve; the reaction is impeded by a little AcOH and especially by HCl. A moderately concd. Me_2CO (or aq. alc.) soln. of Bz_2O_2 added to an aq. Me_2CO soln. of KI strongly acidified with concd. HCl liberates I instantly, while with KBr a neutral soln. instantly liberates Br and a HCl soln. only slowly. Finally Bz_2O_2 with NaI in abs. Me_2CO instantly liberates the calcd. amt. of I and NaOBz seps. in gel form; with NaBr the reaction is less smooth. Basic substances very markedly accelerate the hydrolysis of Bz_2O_2 to Bz_2OH , but they may also possibly react with the Bz_2O_2 ; at least, this seems to be the case with NH_3 , for when Bz_2O_2 in aq. Me_2CO is treated with an excess of concd. NH_4OH and at once poured into much H_2O contg. acidified KI-starch a blue color at once appears, owing to the presence of Bz_2OH formed according to the scheme $Bz_2O_2 + NH_3 \rightarrow BzNH_2 + Bz_2OH$. *Addendum. Iodometric detn. of Bz_2O_2 .* 0.2 g. of the sample in 10 cc. pure Me_2CO is treated with 3 cc. concd. aq. KI (faintly acidified if necessary), dild. with a little H_2O and immediately titrated. C. A. R.

Synthesis of the ethyl ester of *p*-aminobenzoic acid. MATAJIRO WATANABE *Gun. D. Z., Tokyo* 889-95(1923); *Japn. J. Med. Sci.* 2, 22.—Treat $p-H_2NC_6H_4CO_2H$ or its salts with iso-BuOH or iso-Bu halide, or reduce $p-O_2NC_6H_4CO_2CH_2CHMe_2$ or its azo compd. H. G.

The value of by-products of saccharin manufacture in analytical chemistry. WALTHER HERZOG. *Osterr. Chem.-Ztg.* 29, 26-7(1926).— $p-MeC_6H_4SO_2NClNa$ (I), when in contact with acceptors of O, decomps. quant. into $p-MeC_6H_4SO_2NH_2$, NaCl and O. A soln. of 15 g. I in 1 l. H_2O gives a 0.1 N Cl soln. of great stability. EtOH or Me_2CO is detected in 1:10,000 solns. by treating 10 cc. of liquid with 0.1 g. I and KI in alk. soln., when CHI_3 is formed. Treatment of $p-MeC_6H_4SO_2NH_2$ with I in KI yields $p-MeC_6H_4SO_2NKI$, which decomps. in H_2O to give HIO, and can be used to estimate phenols, etc. T. S. CARSWELL.

Photochemistry of some cinnamic acid derivatives. HANS STOBBE. *Ber.* 58B, 2859-63(1925).—Solid $PhCH:CHCO_2Me$ (I), m. 33.4° , exposed 6 months to sunlight during the sunny summer of 1921 yielded a mass consisting of 96.8% unchanged I, 0.2% of Liebermann's amorphous polyester (II) (C. A. 5, 2250) and 2.9% of the cryst. easily saponif. Me α -truxillate (III), m. 174° . The II is supposed to be formed from fused I during the warmer parts of the day and the III from the solid I during the cooler parts. *trans*- $PhCH:CHCONH_2$, m. 141.5° , after 5 months gives 75% of α -truxill diamide, m. 266° , also formed in HCl suspension (25:1). The absorption spectra of alc. solns. of the 2 amides are very similar to each other, and the same is true of the spectra of the 2 acids. *trans*- $PhCH:CHCONHPh$, m. 150° , is not polymerized by exposure to sunlight, in dry form or in HCl suspension, for 6 months or by 500 hrs. illumination between glass or uvioil plates. The isomerism of *allo*-cinnamic anhydride in the dark into the *trans*-anhydride is accelerated by heat and light; a sample exposed 9 weeks to sunlight or to a quartz Hg lamp contained 80% *trans*- and 20% *allo*-anhydride. The *trans*-anhydride is in small part resinified on illumination but for the most part remains unchanged. $PhCH:CHCHO$ in sealed glass tubes under 17-mm. pressure gave after 8 months in sunlight a mass contg. 60% unchanged aldehyde, 33% $PhCH:CHCO_2H$ and 7% of Ciamician and Silber's polyaldehyde, m. $103-12^\circ$ (C. A. 5, 3239), which is apparently a tetramer (mol. wt. (Rast) 500-571), is easily depolymerized on dry distn., reduces $KMnO_4$ in AcOH but forms no oxime and does not react with NH_4AgNO_3 or fuchsin- SO_2 . $PhCH:CHBrCO_2H$ after 7 months in sunlight or 375 hrs. exposure to a quartz Hg lamp is 91% unchanged, the remainder being converted by autooxidation into $BzOH$, $(CO_2H)_2$, and free Br. $PhCHBrCHBrCONH_2$ undergoes dimerization but the anilide does not. The above results show how great an influence slight mol. changes have on the photochem. behavior of these structurally closely related substances. C. A. R.

Influence of different substituents on the firmness of the union of carboxyl groups in substituted aromatic acids. Influence of a second carboxyl group and relative effect

of chlorine and bromine. FRANZ HEMMELMAYR AND THEA MEYER. *Monatsh.* **46**, 143–56 (1926); cf. *C. A.* **7**, 1705.—*Bromo- α -resodicarboxylic acid (I)*, m. 303°, crystg. with 1.5H₂O, gives a red Fe reaction; *Ba salt*, with 10H₂O; *Ag salt*, *Dibromo- β -resodicarboxylic acid*, m. 245°, crystg. with 1.5H₂O, gives a blue-violet Fe reaction; *Ba salt*, 2H₂O; *Ag salt*. *Chloro- β -resorecylic acid*, m. 175°, gives a violet Fe reaction; *di-Cl deriv.*, m. 229°, gives a carmine-red Fe reaction; *Ba salt* with 1.5H₂O, *Ag salt*. *Chloro- α -resodicarboxylic acid (II)*, m. 297° (decompn.), gives a red Fe reaction, crysts. with 2H₂O; *Ba salt*, with 7H₂O; *Ag salt*. Nitration of α -resodicarboxylic acid gives styphnic acid Fe reaction; a NO₂ deriv. was not obtained. *Di-Me ether of di-Me β -resodicarboxylate*, m. 122°; nitration gave negative results. Tables are given showing the amt. of CO₂ split off from various aromatic acids upon cooking with H₂O and with PhNH₂: 3,5-(HO)₂C₆H₃CO₂H, 100% in both, 2,4-(HO)₂C₆H₃CO₂H, 49% in H₂O, 95% in PhNH₂, 2,6-(HO)₂C₆H₃CO₂H, 36% in H₂O, 2,5-(HO)₂C₆H₃CO₂H, 33% in PhNH₂, 2,3-(HO)₂C₆H₃CO₂H, 89% in PhNH₂, 2,6,1,3-(HO)₂C₆H₂(CO₂H)₂, 7.8 in H₂O, 100% in PhNH₂, 3,5,1,2-(HO)₂C₆H₂(CO₂H)₂, 4% in H₂O, 18% in PhNH₂, 2,5,1,4-(HO)₂C₆H₂(CO₂H)₂, 11% in PhNH₂, 2,3,1,4-(HO)₂C₆H₂(CO₂H)₂, 81% in PhNH₂. α -Resodicarboxylic acid splits off 100% CO₂ in PhNH₂, the β -Br deriv., 96%, the β acid, 48%, and its 4,6-Br deriv., 18.5%. Chloro- β -resorecylic acid splits off 65% CO₂ in PhNH₂; the Br deriv., 93%, the di-Cl deriv., 89%; in H₂O the di-Cl deriv. splits off 62%, the di Br deriv., 85%. I in PhNH₂ splits off 96%, II 86% CO₂.

Gallocarboxylic acid trimethyl ether. K. FEIST AND W. AWE. *Ber.* **59B**, 175–7 (1926).—The m. p. of different preps. of 2,3,4,1,5-C₆H₃(OMe)₂(CO₂H), had been found to vary from 176–7° to 195° (cf. *C. A.* **13**, 1453). The acid was accordingly prep'd again both from gallic acid and from 2,3,4-(HO)₃C₆H₂CO₂H. The intermediate *di Me ester* in both cases m. 35.4° (cor.) and gave an acid which, on recrystn. from H₂O, m. 189–90° (cor.), from MeOH 191°, from CHCl₃ 189°, from Me₂CO 191.5°. The identity of the acids (and esters) obtained from both sources was shown by mixed m.p.s, titration, analysis and MeO detns.

Acylation of aromatic hydroxycarboxylic acids. RUDOLF LESSER AND GEORG GAD. *Ber.* **59B**, 233–6 (1926).—The acetylation of hydroxycarboxylic acids with Ac₂O in aq. alk. soln., observed in the case of 2,4-C₆H₃(OH)(CO₂H) (*C. A.* **20**, 1233), has now been found to be a general reaction except when the HO group is in the *o*-position to the CO₂H group; in fact, the reaction may be used to detect the presence of an *o*-HO group in poly-HO acids and to prep. partially acetylated derivs. of such acids. The yields are in part quant. and only a slight excess of Ac₂O is required. Thus, *p*-AcOC₆H₄CO₂H, m. 191–2°, is obtained in 6 g. yield from 5.6 g. *p*-HOC₆H₄CO₂H in 80 cc. *N* NaOH at about 40° treated dropwise with 5 g. Ac₂O, stirred 1 hr. longer (finally in ice) and acidified with AcOH, and the *m*-acid in the same way gives the same yield of its acetate, m. 128°. From 1.5 g. 2,4-(HO)₂C₆H₃CO₂H is obtained 4.2 g. *2-hydroxy-4-acetoxybenzoic acid*, m. 152–3°, gives with FeCl₃ the violet salicylic acid reaction while the di-HO acid gives a Bordeaux-red color, 5 *iso* isomer (1 g. from 4.5 g. 2,5-(HO)₂C₆H₃CO₂H), m. 131–2°, likewise gives a violet color with FeCl₃, as against the steel-blue color given by the di HO acid. *3,5-Diacetoxybenzoic acid* (3.5–4.0 g. from 4.5 g. of the di-HO acid), m. 152–3° and, like the di HO acid, gives no color with FeCl₃. 3,4-(HO)₂C₆H₃CO₂H with somewhat more than 2 mols. Ac₂O gives almost quant. the diacetate, m. 157–8°, but 4.5 g. of the di HO acid in 5 cc. H₂O and 15 cc. of 2 *N* NaOH treated in ice simultaneously with 15 cc. more NaOH and 3 g. Ac₂O so that the soln. never becomes alk. yields 4.5 g. of a monoacetate, m. 199°, which does not react with FeCl₃ and is probably identical with the 3-acetate, m. 202–3°, obtained by partial sapon of the diacetate (Fischer, Bergmann and Lipschitz, *C. A.* **12**, 1968). Gallic acid (5.7 g.) with 70 cc. 2 *N* NaOH and 12 g. Ac₂O gives 91% of the triacetate, m. 171–2°, while with 3 mols. NaOH and 2 mols. Ac₂O 10 g. gives 5 g. of the 3,5-diacetate hydrate, m. 174–5°, and from 10 g. of the tri HO acid in 8 cc. of 38% NaOH and 25 cc. H₂O with 6 g. Ac₂O is obtained 4.5 g. of the 3-acetate, m. 226–7°, gives a dark blue-green color with FeCl₃, undoubtedly identical with the compd. obtained by F., B. and L. as a by-product. *4-O-Acetylphloroglucinalcarboxylic acid* (3 g. from 8.2 g. of the K. salt of the tri-HO acid in H₂O treated in ice simultaneously with 20 cc. of 2 *N* NaOH and 4 g. Ac₂O), m. 177–8° (decompn.), gives, like the tri HO acid, a violet blue color with FeCl₃; if the acetylation is carried out at room or higher temp. or if the reaction mixt. is not very cautiously acidified after the acetylation, CO₂ is evolved and the chief product is sym-C₆H₃(OAc)₃, m. 105–6°.

Preparation of *o*-phthalaldehydic acid. R. C. FUSON. *J. Am. Chem. Soc.* **48**, 1093–6 (1926).—The oxidation of C₁₀H₈ to *o*-HO₂CC₆H₄COCO₂H by KMnO₄ gives the

best yields when 32 g., suspended in 0.5 l. *N* NaOH, is gradually treated with 212 g. KMnO_4 in 1.5 l. H_2O over a period of 2.5 hrs.; the aq. soln., concd. to 500 cc. and heated with 100 g. PhNH_2 for 1 hr., gives 80-5% of the aniline deriv. of phthalonic acid, m. 165° ; it probably has the structure $\text{O.CO.C}_6\text{H}_4.\text{C}(\text{NHPh})\text{CO}_2\text{H}_2\text{NPh}$. Boiled with per-

fectly dry $\text{C}_6\text{H}_4\text{Me}_2$, the salt decomps. in a few min., giving practically quant. *o*-carboxybenzylidene-aniline (I), while it remains unchanged even after hrs. of boiling in $\text{C}_6\text{H}_4\text{Me}_2$ contg. only 0.4% H_2O . Hydrolysis of I with 10% HCl gives $\text{o-HO}_2\text{CC}_6\text{H}_4\text{CHO}$ in 80% yields (65% of the C_{10}H_8 used). The acid may also be obtained from *o*-cyano-benzal bromide, m. $62-3^\circ$, by boiling 4 hrs. with dil. H_2SO_4 but the method is unsatisfactory because of the great difficulty encountered in introducing the 2nd Br atom into *o*- $\text{MeC}_6\text{H}_4\text{CN}$.

C. J. WEST

The existence of isopulegone in the natural state. Isolation of α -(iso) and β -(ordinary) pulegones and their enols in the pure state. V. GRIGNARD AND J. SAVARD. *Compt. rend.* 182, 422-5(1926).—Though it has already been shown (C. A. 20, 751) that isopulegone (α -form) (I) is present in natural pulegone, sepn. of I and the β -form (II) has heretofore been impracticable. II, however, combines with NaHSO_3 while I is unattacked, and this difference in behavior was utilized to effect a sepn. of I and II in the pure state. The sepn. is slow and the natural pulegone should be agitated at least 1 month with 2 vols. of NaHSO_3 (36° Bé.) and 0.5 vol. of EtOH , and as the addn. compd. is formed it is filtered and the filtrate is treated with more NaHSO_3 until no more is formed. I is extd. with H_2O , pptd. with H_2O and extd. in turn with Et_2O . Traces of II are removed by reducing it with Al-Hg (cf. *Ber.* 32, 3357(1899)). Two samples (Schimmel and Bernard-Escoffier) of oil of *Mentha pulegium* contained 18 and 16% resp. of I, which when pure b_p 78° , d_{14}^{20} 0.9097, n_D^{20} 1.46332, $[\alpha]_D$ 34.03°, R_M 46.05. *HBr* salt, m. 48° , decomps. readily. Since both this and the *HBr* deriv. of II are 8-bromo-3-*p*-menthanone, they should have enantiomorphous forms. The enol form of natural pulegone previously prepd. (C. A. 19, 1136) was a mixt. of the enols of 2 isomers (I and II). On sepn. of the 2 enolic compds., the following data were obtained: enol form of I (from natural pulegone) b_p $80-1^\circ$, d_{14}^{20} 0.8965, n_D^{14} 1.46732, R_M 47.25, $[\alpha]_D$ -4.3° ; enol form of synthetic I, b_p 81° , d_{14}^{20} 0.8966, n_D^{14} 1.46754, inactive; enol form of II (from natural pulegone), b_p 88° , d_{14}^{20} 0.9160, n_D^{13} 1.48312, R_M 47.40, $[\alpha]_D$ 24.6° . Natural I is therefore identical with that obtained by the isomerization of II. The α -enols can be prepd. like the β -enols and they have the same stability. The values of $[\alpha]_D$ of the α - and β -enols indicate in each case a conjugation of the double bonds.

C. C. DAVIS

Some derivatives of 1,1'-bismenthone. P. G. CARTER AND JOHN READ. *J. Soc. Chem. Ind.* 45, T44-6(1926).—1,1'-bismenthone (I), m. $157-8^\circ$, was prepd. by acting upon piperitone in alc. with Na-Hg . Reduction of I with Na in alc. yielded 1,1'-bismenthol, m. $179-82^\circ$ after recrystn. from alc.; phenylurethan, m. $198-200^\circ$; diacetate, m. $111-2^\circ$. Heating I with $\text{NH}_2\text{OH.HCl}$ yielded 1,1'-bismenthone oxime (II), m. $238-40^\circ$. Reduction of II with Na in alc. yielded 1,1'-bismenthylamine; *HCl* salt, unmelted at 250° . *di-Bz* deriv. darkens 210° , decomps. 245° ; dibenzylidene and disalicylidene derivs., unmelted at 270° .

T. S. CARSWELL

Orientation effects in the diphenyl series. I. H. G. DENNETT AND E. E. TURNER. *J. Chem. Soc.* 1926, 476-81.—(4- BrC_6H_4)₂ on nitration gives the 2-nitro deriv., m. 124° (cf. Lellmann, *Ber.* 15, 2837), also prepd. from 2-nitrobenzidine through the diazo reaction. Further nitration gives the 2,3'-dinitro deriv., m. 148° , which with piperidine gives 4-bromo-4'-piperidino-2,3'-dinitrodiphenyl, orange red, m. $136-7^\circ$; the 2-NO and the 2,2'-(NO)₂ derivs. do not give this reaction. Disalicylidene-4,4'-dibromo-2,3'-diaminodiphenyl, yellow, m. 195° . 4-Chloro-4'-piperidino-2,3'-dinitrodiphenyl, orange, m. 132° . Mononitro-4,4'-ditolyl, yellow, m. $91-2^\circ$; further nitration gives the 2,3'(?)-dinitro deriv., yellow, m. 119° . Disalicylidene-3,5'-diaminodiphenyl, canary yellow, m. $176-7^\circ$. *p*-Nitrobenzylidenesalicylidenebenzidine, yellow, m. 210° . *p*-Nitrobenzylideneacetylisopropylidenebenzidine, brownish yellow, m. 185° . This work is the first example of unsym. substitution in the Ph_2 series.

C. J. WEST

Reduction of oximes by means of sodium and absolute alcohol. Resolution of the racemic amines obtained into their optical antipodes by means of *d*-tartaric acid. P. BILLON. *Compt. rend.* 182, 470-3(1926).—Hydrogenation by the method of Bouveault and Blanc (cf. Billon, C. A. 19, 816) was found to give almost theoretical yields of amines (in no case below 85%) from the corresponding oximes. The ketones whose ketoxime derivs. were tested included both those with 2 different aryl groups and those

with an aryl and an alkyl group. *p*-Tolyl Ph ketoxime gave quant. *p*-tolylphenylaminomethane, m. 40°, b₇₆₀ 296°, b₁₄ 172°, this being the first time it had ever been obtained in cryst. form. *HI* salt chars at about 250°. *p*-Anisyl Ph ketoxime and EtC(:NOH)Ph a quant. yield of the corresponding amine reduction product. Only plished by successive crystns. of the *d*-tartaric acid deriv., m. 166°, from abs. EtOH. *d*-Compd., m. 180°, [α] 9°30'; *l*-compd., m. 195°, [α] -10°30'. Supplementary tests on the reduction of Ph₂C:NOH gave the amine quant.

C. C. DAVIS

Thymolsulfonephthalein, the intermediate acid, 4'-hydroxy-3'-isopropyl-6'-methylbenzoylbenzene-2-sulfonic acid and some of their derivatives. W. R. ORNDORFF AND R. T. K. CORNWELL. *J. Am. Chem. Soc.* **48**, 981-983 (1926) — Condensation of thymol (I) and ClOCC₆H₄SO₂Cl with or without condensing agents (ZnCl₂, AlCl₃) gave only 10-15% of thymolsulfonephthalein (II), the main product being *dit*hymyl *o*-sulfobenzoate, m. 102-3°, slowly saponif. by boiling aq. and cold EtOH KOH, it could not be trans. formed into II by AlCl₃ or SnCl₄. I and the acid anhydride with ZnCl₂ at 105-10° for 30 hrs. give 55% of II and 4'-hydroxy-3'-isopropyl-6'-methylbenzoylbenzene-2-sulfonic acid, crystg. with 2H₂O; an aq. soln. gives a blue color with aq. FeCl₃; above 150° it slowly decomp.; with ZnCl₂ at 85° it gives II. NH₄ salt, Ba salt (crystallographic data); *di*-Bz deriv., m. 119-20°. II crysts. with about 1 mol. H₂O; color changes and qual. soly. in various solvents are discussed. The chocolate-brown powder loses water at 59°, turns red at 195°, carbonizes slightly between 200-20° and then melts to a crimson, opaque liquid. *NH₄* salt, red; the dry powder absorbs 3 mols. NH₃, giving a purple color; 2 of the NH₃ mols. are lost *in vacuo* over H₂SO₄. Zn salt, orange-red plates with 5H₂O; the red soln. in H₂O changes to yellow on diln. *Mono*-Na salt, orange-red, with about 1 mol. AcOEt; anhyd. brown and hygroscopic. *Di* Na salt, dark blue, with 2EtOH. *Di*-Ac deriv., m. 171-2°, *di*-Bz deriv., m. 194-5°. The *di*-Me ether turns red at 195° and m. 201-2°; heated at 180° for 2 min. there results a deep purple form, changing to the colorless form upon recrystn. from or in contact with MeOH. *PhNH₂* salt, brown needles, by heating I in PhNH₂ for 12 hrs. at 115-20°. On adding H₂O to the filtrate there ppts. the *dianilino* deriv., dark green, almost black needles. The *di*-Br deriv. of II, decomp. 130-5°, crysts. with 2H₂O as purple crystals grinding to a red powder. One mol. of NaOH may be added to its soln. before the end point is reached. *Di*-Ac deriv., m. 222-3°. II and Zn dust in H₂O, boiled until soln. results and the product is colorless, give *thymolsulfonephthalein*, crystg. with about 3.5 mols. H₂O, m. 134-5°, isolated as the Zn salt, crystg. with 8H₂O. The free acid is less stable than the Zn salt, oxidizing quickly in the light; it is very sol. in H₂O and the soln. is easily oxidized by bubbling air through it.

C. J. WEST

4- and 4'-Methoxybenzoylbenzoins. HERBERT GREEN. *J. Chem. Soc.* **1926**, 328-36. — Furfuraldehyde, BzCl and KCN in H₂O, shaken 1 hr. with cooling, give practically quant. *benzoylfurfuraldehyde cyanohydrin* (I), m. 49°. A mixt. of this (11 g.) and furfuraldehyde (12 g.) treated with EtONa, gives 7.35 g. *benzoylfuroin* (II), m. 92-3°; cold concd. H₂SO₄ develops an intense green color, becoming brown on warming; the action of EtOH-NaOEt gives a small amt. of furil, m. 161°. Benzofuroin is not benzoylated by BzCl and KOH or C₆H₅N, heating with BzCl alone results in profound decompn. Benzofuroin is the only product of the interaction of benzoylmandelonitrile (III), furfuraldehyde and EtONa, the EtONa being added through 5-6 hrs. Attempts to prep. isomeric benzoylbenzofuroins from I and BzH and III and furfuraldehyde gave mixts. of benzoylbenzoins and II; and equimol. mixt. of these 2 compds. begins to m. 85.5° and still contains some solid at 90°. The 4'-methoxybenzoylbenzoins, m. 119.5-20°, described by G. and Robinson (*C. A.* **17**, 90) is now considered the 4-deriv. It is best prepd. from benzoyl-*p*-methoxymandelonitrile and BzH with a little more than 1 mol. EtONa, the reaction being interrupted after 10 min. This also results in 0.9 g. yield from 12 g. III and 11 g. *p*-MeOC₆H₄CHO, to which was added in 1 lot 13 g. Na in 25 cc. EtOH and the reaction checked after 7 min. In certain preps. of the 4-deriv., benzoylbenzoins was obtained in small amts. 4'-Methoxybenzoylbenzoins, m. 127-8°, results from 23 g. III, 22.5 g. *p*-MeOC₆H₄CHO and 1.15 g. Na in 30 cc. EtOH, the reaction being checked after 5 min; cold concd. H₂SO₄ gives a brassy yellow soln., changing on warming through reddish brown to dark greenish brown. Benzoylmethylenedioxymandelonitrile (IV), furfuraldehyde and EtONa give *piperonyl- α -furylcarbonyl benzoate*, m. 132.5-3.5°; increasing the reaction time from 5 to 20 min. decreases the yield somewhat and an increase in the amt. of Na used gives an impure product. Condensation of piperonal and I with EtONa gives *α -furylpiperonylcarbonyl benzoate*, m. 140-1°; the concd. H₂SO₄ soln. is intensely crimson. III and piperonal are condensed

by EtONa to 3',4'-methylenedioxybenzoylbenzoin, while IV and BzH give the 3,4-isomer.

C. J. WEST

Remarks on the communication of R. Lesser, E. Kranepuhl and G. Gad on the constitution of naphthalene and its derivatives. K. FRIES. *Ber.* 58B, 2845-51 (1925).—According to L., K. and G. (*C. A.* 20, 909) the peculiar behavior of 2,3-C₁₀H₆(OH)CO₂H (I) and its derivs. indicates that they have a double bond between C atoms 2 and 3, this "so to speak forced" position of the double bond in the C₁₀H₈ nucleus explaining the tendency of such derivs. to change into β,β-quinonoid compds., while 2,3-C₁₀H₆(OH)₂ (II), which it has hitherto not been possible in any way to convert into a 2,3-naphthoquinone, would have the normal structure with a double bond between C atoms 1 and 2. I, however, can be degraded to a 2,3-C₁₀H₆(OH)NH₂ (III), which in no way differs from that obtained from II, and there are no indications in the literature, to F.'s knowledge, that β,β-derivs. of C₁₀H₈ can exist in 2 isomeric forms. In 2,1- and 1,2-C₁₀H₆(OH)CO₂H the CO₂H group is replaced by other substituents on treatment with HNO₃, HNO₂, halogens or diazonium salts, and I should behave in the same way if the double bond is between the C atoms carrying the HO and CO₂H groups, but it does not; it is a true β-C₁₀H₇OH deriv. and, like the naphthol, is easily substituted, the 1st substituent always entering position 1. Moreover, the yellow 1,2,3-C₁₀H₆(OH)₂CO₂H, in which, on account of its color, L., K. and G. assume there is a double bond between C atoms 2 and 3, is readily oxidized to 1,2-naphthoquinone-3-carboxylic acid and the structure they assign to I can therefore not be correct. Chloride of I, from the K salt with SOCl₂ in C₆H₆ below 25°, intensely lemon-yellow, m. 99°, much more sensitive to moisture than 2,3-C₁₀H₆(OMe)COCl; amide, m. 217°. If I is heated with 10 parts SOCl₂ at 90° and then 110° it dissolves in 5 hrs. and yields 1-chloro-2-hydroxy-3-naphthoyl chloride, golden yellow, m. 128°, giving with MeOH the *Me ester*, yellow, m. 116°, and with NH₃ the *amide*, yellow, m. 225°. 2-Carbethoxy deriv. of I, from I and ClCO₂Et, m. 141°, chloride, m. 65°; *Me ester*, m. 60°; *amide*, yellowish, loses EtOH on heating above 100° or on boiling in AcOH with formation of 1,4-diketo-3,4-dihydro-*lin-naphtho-1,3-oxazine*, C₁₀H₈CO.NH.CO O, m. 300°, obtained directly from the amide of I with

ClCO₂Et in cold C₆H₅N, not attacked by acids and dil. alkalis, evolves NH₃ on boiling with concd. alkalis and yields I on acidification. *Acide* of I, from the hydrazide in ice H₂O suspension with exactly the calcd. amt. of NaNO₂ and dil. AcOH, yellow, m. 133°, explodes immediately afterwards (yield, 70%), gives in C₆H₆ on the H₂O bath 90% of 2-hydroxy-3-naphthyl isocyanate, yellow, m. 205°, which with 25% KOH on the H₂O bath gives 65% of III. *Me 2-hydroxy-3-naphthylcarbamate* (85% from the azide in MeOH on the H₂O bath), faintly yellow, m. 201°, gives with concd. HCl in sealed tubes at 120° 70% of III. 1,6-Di-Br deriv. of I, from the mono-Br deriv. in AcOH with excess of Br on the H₂O bath, yellow, m. 246° (decompn.), forms a rather difficultly sol. Na salt, gives on further bromination in AcOH a "keto bromide" if NaOAc is present, otherwise 1,6,8,3-C₁₀H₄Br₃CO₂H, m. 320°. C. A. R.

Acetonaphthols. II. K. FRIES AND K. SCHIMMELSCHMIDT. *Ber.* 58B, 2835-45 (1925); cf. *C. A.* 15, 2865.—It was found in the earlier work that β-C₁₀H₇OAc with AlCl₃ gives only 1,2-C₁₀H₆AcOH (I) whereas Witt and Braun reported that β-C₁₀H₇OMe (II) with AcCl gives 3,2-C₁₀H₆AcOMe (III). F. pointed out that their proof of the constitution of their compd. was based on a false assumption but since a C₁₀H₆AcOH prep'd. by their method lowered the m. p. of his, he concluded that their compd. really was III. Later, it was found that when their directions are followed exactly the product is a mixt., not easily sep'd., of 1,2-C₁₀H₆AcOMe (IV), with much unchanged II. III has now been synthesized and found to be entirely different from W. and B.'s product. They therefore undoubtedly obtained IV and their supposed methyl-β,β-naphthindazole was really 3-methyl-4,5-benzindazole (V). IV, m. 58°; *benzal deriv.*, yellow, m. 139°, gives a wine-red color with concd. H₂SO₄; *hydrazone*, leaflets with faint greenish yellow shimmer, m. 130°, gives, after standing 3 hrs. in the least possible amt. of concd. H₂SO₄, 30% of V, m. 216°, which is unchanged by hot concd. HCl or by concd. KOH. 2,3-C₁₀H₆(OMe)CO₂Me, b₁₈ 191°, m. 49°; the free acid (VI) is colorless and when slowly distd. under atm. pressure rearranges into the yellowish 2,3-C₁₀H₆(OH)CO₂Me, m. 72°. 2-Methoxy-3-naphthoyl chloride, from the K salt of VI refluxed with SOCl₂ in C₆H₆ (yield, around 50%), faintly yellow, b₁₇ 200°, m. 57°, gives with MeI, AcOEt and Zn-Cu in cold PhMe 2-methoxy-3-acetonaphthalene (II), b₂₀ 210-2°, m. 48° (*benzal deriv.*, faintly yellow, m. 121°). 2-HO comp'd. (8 g. from 10 g. III with AlCl₃ in C₆H₆ on the H₂O bath), yellow, m. 112°; *Na salt*, yellow, is not oxidized by the air even in soln.; *acetate*, m. 101°; *hydrazone*, faintly yellow, m. 144°, cannot be converted into an indazole. 2,6-C₁₀H₆(OMe)Ac (VII) can be obtained in 50% yield by treating β-C₁₀H₇OH in AcOH

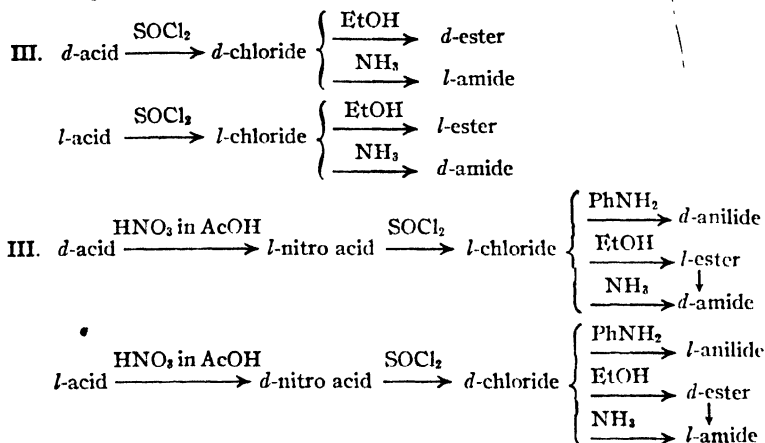
with Br-AcOH, boiling the resulting 1,6,2- $C_{10}H_6Br_2OH$ in alc. with Sn, concd. HCl and a little $CuSO_4$, methylating the 6,2- $C_{10}H_6BrOH$ in KOH with Me_2SO_4 , and treating the $C_{10}H_6BrOMe$ (yield, 50%) in $C_6H_5Et_2O$ on the H_2O bath with Mg and EtBr and sinters 190°, m. 209°; *chloride*, m. 101°; *amide*, m. 216°. 2-Methoxy-6-acetonaphthalene (VII), from the chloride with $MeZnI$, m. 105°, sol in concd H_2SO_4 with yellow color, converted by $AlCl_3$ in xylene on the H_2O bath into the 2-HO compd, m. 172°. In the that to hydrazone formation; in attempting to convert the resulting ketazines into indazoles with concd. H_2SO_4 , it was found that there were formed, instead, SO_3H acids, [1,4,2- $C_{10}H_6(OH)(SO_3H)CR:N$], which with dil. acids give N_2H_4 and 1,2,1- $C_{10}H_6(OH)(COR)SO_3H$. Azine from 1,2- $C_{10}H_6(OH)COEt$, from the ketone in boiling solu. gradually treated with $N_2H_4 \cdot H_2O$ until there is no further deposition of azine on long boiling, red, m. 232°, hardly attacked by concd. HCl or alkalis, *di-Ac deriv.*, yellow, m. 139°; 4-sulfonic acid, from the azine allowed to stand 24 hrs. in 2.5 parts concd. H_2SO_4 , red, m. 234–40° (decompn.), very hygroscopic. 2-Propionyl-1-naphthol-4-sulfonic acid (VIII), best obtained directly from the $C_{10}H_6(OH)COEt$ allowed to stand 24 hrs. in 2.5 parts concd. H_2SO_4 , very hygroscopic, m. 127° (decompn.), pptd by concd. HCl from the yellowish NaOH solu., unchanged by concd. HCl at 100° but converted into the $C_{10}H_6(OH)COEt$ when distd. from its solu. in concd. H_2SO_4 only slightly dild with H_2O ; with the calcd. amt. of Br in AcOH it gives 4-bromo-2-propionyl-1-naphthol, yellow, m. 97°, while with twice as much Br is obtained 4-bromo-2-bromopropionyl-1-naphthol, yellow, m. 138°, sol. in alkalis without change, converted by 3 times the calcd. amt. of boiling 10% NaOH into 2-methyl-3-keto-5-bromo-6,7-benzonouran, yellowish, m. 106°, sol. in concd. H_2SO_4 with yellow color. Azine from 1,2- $C_{10}H_6(OH)COMe$, red, m. above 300° (decompn.); 4-sulfonic acid, yellow hydrated substance changed by rubbing with glacial AcOH into red crystals turning brown 120°, m. 233.6° (decompn.), could not be obtained absolutely anhyd. as it slowly decomp. on drying at 100°. 2-Aceto-1-naphthol-4-sulfonic acid, m. 127°, does not depress the m. p. of VIII. 1-Aceto-2-naphthol Et ether, from I with EtBr and NaOEt, m. 61°, identical with the product described by W. and B. as 3,2- $C_{10}H_6AcOEt$. The following compds. are also erroneously described as 3-acetonorolin derivs. in the literature: 1-benzalaceto-2-naphthol Et ether, m. 90°; *p-anisal analog*, m. 102°; 2-ethoxy-1-naphtholformic acid, m. 162°; 2-ethoxynaphthalene-1-carboxylic acid, m. 147°.

C. A. R.

The α - and β -naphthoxymethylacetic acids, their mononitro derivatives and optical isomers. ERNEST FUORNEAU and BALACEANO. *Bull. soc. chim.* 37, 1602–28 (1925).—*dl- α - $C_{10}H_7OCH_2CH_2CO_2H$* (I), m. 152.3°, was prepd. in 85% yield from the Et ester. This latter, from $C_{10}H_7ONa$ and $BrCH_2CH_2CO_2Et$ (II), b.p. 205°. Acid chloride prepd. from I and $SOCl_2$. *Amide*, from the chloride and NH_3 in dry Et_2O , m. 152°, and is sapond. by prolonged boiling with alc. KOH. *Anilide*, m. 173°. *dl- β - $C_{10}H_7OCH_2CH_2CO_2H$* (III), m. 108°, was prepd. in a similar manner. *Et ester*, m. 52°; *amide*, m. 169°. The action of the Na salts of 2 and 4-mitronaphthol on II did not give the nitro derivs. of I except in minute quantities. 1,2- and 1,4- $C_{10}H_6(OH)NO_2$ were prepd. by acetylating α - $C_{10}H_7NH_2$ to the naphthalide, m. 159°, and nitrating in AcOH solu. at 0° with fuming HNO_3 . The product was boiled with dil. NaOH and the solu. acidified with HCl and treated with abs. EtOH, pptg. 1,2- $C_{10}H_6(OH)NO_2$, m. 128°, in 25% yield. 1,4- $C_{10}H_6(OH)NO_2$, m. 164°, was pptd. by diln. with H_2O in 50% yield. I cannot be nitrated by HNO_3 and H_2SO_4 , but from AcOH and the calcd. amt. of HNO_3 is obtained 70% 4-nitro-1-naphthoxymethylacetic acid (IV), m. 174°. No isomeric acid could be produced by variation of the conditions. *Me ester*, from MeOH and the acid chloride, m. 98°. *Et ester*, m. 60°; *amide*, m. 201–2°; *acetanilide*, m. 186°. Reduction of IV with Sn and HCl gave 4-amino-1-naphthoxymethylacetic acid, m. 248–50° (decompn.). The 1-nitro deriv. of II was obtained both by direct nitration (65% yield) and by the action of the Na salt of 1,2- $C_{10}H_6(NO_2)OH$ upon $MeCHBrCO_2Et$ (60% yield). 1-Nitro-2-naphthoxymethylacetic acid (V), m. 193°; *Et ester*, m. 83°; *Me ester*, m. 74°; *amide*, m. 157°; *anilide*, m. 171°. Reduction of the acid, esters, or amide leads to naphtho- α -methyl- β -morpholine, $C_{10}H_6NHCOCHMeO$, m. 175.6°. I was resolved

into its optical isomers by means of its compds. with cinchonine, and their soly. differences. *Cinchonine salt*, $[\alpha]_D^{20} = +46.66^\circ$. The free acids, $[\alpha]_D^{30} = +10^\circ$, m. 126° (*dl-mixt.* 152–3°); *acid d-chloride*, $[\alpha]_D^{20} = 120^\circ$; *amides*, $[\alpha]_D^{20} = +46.66^\circ$ in 192°; *dl-mixt.* of amides, m. 151.2°; *anilides*, $[\alpha]_D^{20} = +150^\circ$, m. 205°; *mixt.*, m. 171°. II was also resolved with cinchonine though the salts crystallize less well. After two crystals of the

salts, the acids $[\alpha]_D^{20} = 93.33^\circ$, m. 117° ; their mixt. m. 108° ; *l*-chloride $[\alpha]_D^{20} = -45.33^\circ$; *Et* esters, $[\alpha]_D^{20} = 46.66^\circ$, m. $43-4^\circ$; mixt. m. $52-3^\circ$; *amides*, $[\alpha]_D^{20} = 46.66^\circ$, m. 197° ; mixt. m. 169° . Nitration of the *d*- and *l*-acids obtained from **I** gave acids corresponding to **IV** with $[\alpha]_D^{20} = 46.66^\circ$, m. $141-2^\circ$; mixt. m. 174° ; *d*-chloride, $[\alpha]_D^{20} = 111^\circ$; *Et* esters, $[\alpha]_D^{20} = 46.66^\circ$, m. 55° ; mixt. m. 60° ; *amides*, $[\alpha]_D^{20} = 46.66^\circ$, m. 225° ; mixt. m. $201-2^\circ$; *anilides*, $[\alpha]_D^{20} = 83.33^\circ$, m. 215° ; mixt. m. 186° . In nitrating the active isomers from **III** the sign was changed, $[\alpha]_D^{20} = 123.33^\circ$, m. 179° ; mixt. m. 193° . Derivs. of these undergo no further change of sign. *d*-Chloride, $[\alpha]_D^{20} = 150^\circ$; *Et* esters, $[\alpha]_D^{20} = 123.33^\circ$, m. 102° ; mixt. m. 83° ; *amides*, $[\alpha]_D^{20} = 46.66^\circ$, m. 190° ; mixt. m. 157° ; *anilides*, $[\alpha]_D^{20} = 123.33^\circ$, m. 205° ; mixt. m. 171° . The relations of these acids and derivs. are expressed in the following tables:



There are some unexpected agreements in magnitude of sign. Thus, active **I**, and its amide, active **IV**, its *Et* ester, its amide, the *Et* ester and the amide of **III** and the amide of **V** all have the rotation $\pm 46.66^\circ$. Active **II** has exactly twice this value or $\pm 93.33^\circ$. Active **V**, its *Et* ester and its anilide have the value $\pm 123.33^\circ$. M. A. YOUTZ.

Present-day processes for the commercial synthesis of camphor. J. DUBOURG. *Technique moderne* 18, 170-2(1926).—Review. A. PAPINEAU-COUTURE.

New preparation of α -indanonone. CH. COURTOT AND JAN KROLIKOWSKI. *Compt. rend.* 182, 320-3(1926).—The new method is much simpler and more economical than any previous one (cf. *Ber.* 22, 2019(1889); Weissgerber, *C. A.* 5, 3064; *Ann.* 275, 348(1893); *J. Chem. Soc.* 65, 484(1894)). α -Chloroindanone is oxidized directly to α -indanonone in a similar way to the expts. of Grimaux and Lauth (*Compt. rend.* 54, 572(1877)) on the prepn. of aldehydes. With 50% H_2SO_4 and 50% $\text{Na}_2\text{Cr}_2\text{O}_7$ (1 atom of O per mol. of α -chloroindanone) at $55-7^\circ$, a 90-5% yield of α -indanonone was obtained. The method becomes of potential economic value by the chlorination and oxidation of crude indene from the rectification of tar oils with their phenols removed by treatment with NaOH and their bases removed by washing with dil. acid. These oils contain 56-62% indene. They are satd. at 0° with dry HCl and excess HCl is removed *in vacuo* (10-5 mm.) at $40-50^\circ$. The increase of wt. gives the HCl fixed by the indene and indicates the amt. of oxidizing agent to be used. The yield of α -indanonone is approx. 75%, and this may be increased by eliminating, before oxidation, products which accompany the indene and which distil *in vacuo* before the α -chloroindanone. Since phenolic oils from the tar of coke manuf. contain about 10% indene, α -indanonone becomes a readily accessible product of potential value in the lab. and in industry. C. C. DAVIS.

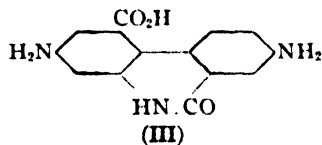
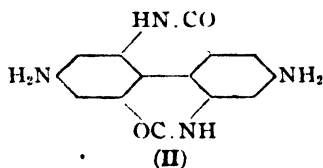
2,7-Naphthalenedicarboxylic acid and its derivatives. ATTILIO PURGOTTI. *Ann. r. scuola agr. Portici* [2] 17, 1-19(1922).—2,7- $\text{C}_{10}\text{H}_6(\text{SO}_3\text{Na})_2$ (10 g.) after drying several hrs. at $230-240^\circ$, was distd. with 15 g. KCN , giving 18% yield 2,7- $\text{C}_{10}\text{H}_6(\text{CN})_2$ as a yellowish, cryst. mass, m. 261° (cor.). Boiled with a soln. of 3 parts of H_2SO_4 in 2 of H_2O for 0.5 hr., 5 g. crude nitrile yielded 5.10 g. of 2,7- $\text{C}_{10}\text{H}_6(\text{CO}_2\text{H})_2$. The yields on boiling with KOH for 5 hrs. and with concd. HCl for 5 hrs. were only 2.7 and 1.2 g.

resp. The product, after pptn. from NH_4OH with cold HCl , does not m. 190° , sublimes with difficulty, carbonizes at 300° , forming C_{10}H_8 . The Me ester, $\text{C}_{10}\text{H}_6(\text{CO}_2\text{CH}_3)_2$, obtained by the action of dry HCl gas on a suspension of the acid in slightly heated MeOH , leaving the satd. HCl soln. several days in a closed vessel, m. 191° (cor.). The Et ester, obtained similarly, m. 238° (cor.). The K salt, obtained by satn. of the crude acid with KOH , cryst. mass contg. $2.5 \text{ H}_2\text{O}$, which is lost at about 180° . The NH_4 salt is an amorphous, dirty white mass, easily decompd. The Ag salt forms a white, flocculent ppt., slightly sol. in H_2O , blackens rapidly when dried, even in the dark. The Ca and Ba salts are brown masses easily decompd by heat. $2,7\text{-C}_{10}\text{H}_6(\text{COCl})_2$, obtained by the action of 2 mols. PCl_5 on 1 mol. of the acid in the presence of POCl_3 finally at 130° , decomp. on distn., reacts easily with NH_3 and PhNH_2 . Passing gaseous NH_3 through a soln. of the chloride in CCl_4 causes vigorous reaction and pptn. of an amorphous yellowish solid. On filtering, drying, dissolving in hot alc. and pptg. with cold H_2O , a yellowish white substance is obtained, sol. in almost all the common solvents but always amorphous. The m. p. varies from 235° to 250° . Subjecting this mixt. of amide and nitrile to distn., a white mass is obtained which cryst. from alc., CHCl_3 and AcOH and is the pure nitrile. PhNH_2 forms the anilide, $2,7\text{-C}_{10}\text{H}_6(\text{CONHPh})_2$, which is nearly insol. in all the common solvents, does not fuse even at 280° and is sol. in PhNH_2 only. $2,7\text{-C}_{10}\text{H}_6(\text{CO}_2\text{Ph})_2$, obtained through the action of dry HCl on a hot mixt. of the chloride and PhOH in excess, and slow cooling, m. 162° (cor.). Impure $2,7\text{-C}_{10}\text{H}_6(\text{COCN})_2$, was formed by heating 3 g. of $\text{C}_{10}\text{H}_6(\text{CO}_2\text{H})_2$ with 6.25 g. of $\text{Hg}(\text{CN})_2$ in the presence of a little CCl_4 in a closed tube for 10 hrs. at 100° , yellowish powder, cannot be purified because it is insol. in the cold and decomp. on heating with formation of the di- CO_2H acid. It was saponif. by Boessneck's method changing, after 10 days, completely into an acid which partly ppts, m. above 280° , is ketonic in character and probably has the formula $\text{C}_{10}\text{H}_6(\text{COC}(=\text{O})\text{H})_2$, is very sol. in all the more common solvents but easily decompd. by heat even in soln. Upon treatment of its di- NH_4 salt in soln. with $\text{NH}_4\text{OH}.\text{HCl}$ a white ppt. forms which contains N after its treatment with AcOH to remove the NH_3 . A similar white ppt., which also contains N after treatment with dil. HCl and washing with alc., is formed with $\text{PhNHNH}.\text{HCl}$. A dinitronaphthalene-2,7-dicarboxylic acid is formed by heating the $\text{C}_{10}\text{H}_6(\text{CO}_2\text{H})_2$ on the water bath with an excess of fuming HNO_3 , cooling, pouring into H_2O , extg. with Et_2O and evapg. the ext. The purified product is very sol. in H_2O and all the common solvents. Alkalies, especially NH_3 , dissolve it with a beautiful dark red color. It intumesces when heated without fusing sharply. The neutral soln. of its NH_4 salt gives with concd. AgNO_3 , a yellow ppt., but slightly sol. in H_2O and darkening on drying. Its Me ester, obtained by passing a current of dry HCl through a soln. of the acid in MeOH , a yellowish, amorphous powder, commences to soften 220° and completely m. 252° . Trinitronaphthalene-2,7-dicarboxylic acid, formed by introducing 4 g. of the $\text{C}_{10}\text{H}_6(\text{CO}_2\text{H})_2$ in finely powd. form in small portions into 30 g. concd. HNO_3 , and 45 g. fuming H_2SO_4 , and heating some time on the water bath, yellowish, amorphous powder which dissolves in alkalies giving an intense dark red color, does not melt even at above 300° but darkens even at lower temp. When heated on Pt foil it burns without explosion. The Ag salt forms an amorphous brown mass which gives a slight explosion when heated rapidly. The Ba salt is formed by heating the acid in suspension in H_2O with pptd. BaCO_3 , yellow mamillary forms or lustrous reddish plates. The Me ester, obtained by the action of gaseous HCl on a MeOH soln. of the acid and letting stand for 12 hrs., begins to m. 243° (decompn.) and at 250° fusion is complete, the mass assuming a black color which persists on recooling. The $2,7\text{-C}_{10}\text{H}_6(\text{CO}_2\text{H})_2$ is distinguished from the acid of Ebert and Merz (*Ber.* 9, 606(1876)) by oxidation with KMnO_4 which gives, instead of phthalic acid, trimellitic acid. A. R. MERZ.

Behavior of some hydrindones towards phenylhydrazine. HERMANN LEUCHS AND GEORG KOWALSKI. *Ber.* 58B, 2822-7(1925); cf. *C. A.* 20, 191. The long pmsms of α -hydrindone obtained by steam distn. contain much H_2O (26.3%). The oxime, m. 146° , undergoes no rearrangement when heated with AcCl in a sealed tube at 95° , merely giving the acetate, m. 85° . Heated with PhNHNH_2 (even in large amt and at $155-60^\circ$), it gives only the phenylhydrazone, for which m. ps. ranging from 120° to 131° are given in the literature; usually it m. brown $124-8^\circ$, after digestion with MeOH $131-3^\circ$, on recrystn. again $124-8^\circ$, in evacuated tubes $134-5^\circ$ without decompn. The deviations are due to impurities produced by soln. and by fusing in open tubes, not to change into structural or spatial isomers; neither could any such rearrangement be produced by treatment in hot MeOH with $\text{H}_2\text{S}_2\text{SO}_4$ or 5% HCl . The α -benzyleneindole, produced by boiling the phenylhydrazone with HCl , m. 254° (previously sintering and turning brown), $254-5^\circ$ without discoloration in evacuated tubes; it reacts neither

with PhNHNH_2 after 7 hrs. at 150° nor with Ac_2O and NaOAc at 100° ; 5 hrs.' boiling with Ac_2O - NaOAc gives an *Ac deriv.*, $\text{C}_{17}\text{H}_{13}\text{ON}$, m. 130° , sol. in about 40 parts hot alc. *2-Ethyl-1-hydrindone*, obtained in 65-75% yield from $\text{PhCH}_2\text{CHClCOCl}$ and AlCl_3 in petroleum ether on the H_2O bath, faintly yellow, b_{18} 144° , has an aromatic odor; *semicarbazone*, m. $200-3^\circ$; no oxime could be obtained; *phenylhydrazone*, does not cryst. and yields no definite products with PhNHNH_2 at 130° ; *p-bromophenylhydrazone*, m. 82° , stable in the air for quite a long time but finally becomes smeary; *2-Br deriv.*, m. $45-6^\circ$. Bishydrindone-2,2'-spiran (2 g.) heated 3-7 hrs. at 130° with 8 g. PhNHNH_2 gives, besides 1.4 g. of the known diphenylhydrazone, m. 102° , 1.5 g. of a more difficultly sol. isomer (I), m. $220-2^\circ$, mol. wt. in 1.63-2.27% C_6H_6 soln. 416, gives a green color with FeCl_3 in H_2SO_4 . There is also obtained 0.1 g. of β -[benzyl-*o*-carboxylic]- α -hydrindone phenylhydrazide (II), $\text{C}_{33}\text{H}_{29}\text{O}_2\text{N}_2$, m. around 238° (decompn.), insol. in dil. alkalies, gives a red-violet color with FeCl_3 - H_2SO_4 , identical with the product obtained from the acid chloride. The acid with PhNHNH_2 at 130° gives only equal parts of I and II. **Addenda to the papers on α -hydrindone- β -oxalic ester (with Georg Kowalski) and anthroxanic acid.** HERMANN LEUCHS. *Ibid* 2827; cf. *C. A.* 20, 179, 1077.—It had escaped the attention of L. and K. that Ruhemann (*C. A.* 7, 1357) had already prepd. hydrindone-oxalic ester; in general, their results agree with those of R., except that the pyrazole-like anhydride, $\text{C}_{10}\text{H}_6\text{O}_2\text{N}_2$, which they obtained from the new isomeric phenylhydrazone of the ester m. $126-7^\circ$, while for that obtained directly from the ester, R. gives $117-8^\circ$. v. Auwers (*C. A.* 18, 2158) from a spectrochem. study of anthroxanic acid in the form of its Et ester derived for it the same formula as did L. from his cleavage expts. *C. A. R.*

Molecular configurations of polynuclear aromatic compounds. V. The identity of the nitration products derived from 2,7- and 4,5-dinitrophenanthraquinones. G. H. CHRISTIE AND JAMES KENNER. *J. Chem. Soc.* 1926, 470-6; cf. *C. A.* 17, 2282.—The nitration of 4,5-dinitrophenanthraquinone gives the 2,4,7-trinitro deriv., previously obtained from the 2,7-dinitro deriv.; the *quinoxaline deriv.*, m. 307° . Oxidation gives 4,6,4'-trinitrodiphenic acid (I), m. 292° , the *quinine d-salt* of which m. 222.5° , $[\alpha]_D^{20} -156.1^\circ$, and the *l-salt*, m. 176° (decompn.), $[\alpha]_D^{19} -77.5^\circ$; the *quinidine l-salt* has $[\alpha]_D^{20} 85.55^\circ$ (56.04° previously given). In passing from the acid to the Na salt, there is a change in sign, so that the prefixes *d*- and *l*- as used in the previous paper should be interchanged. Reduction of 4,6,4',6'-tetranitrodiphenic acid gives a *phenanthridone deriv.* (II), the neutral H_2SO_4 salt, yellow, turning green on exposure to light and air, blackens at 300° , and a *basic salt*, green, being analyzed. Reduction of I gives III, whose H_2SO_4 salt is yellow, turning green on exposure to the air. Dinitrobenzil on further nitration gives the 3,5,3',5'-tetranitro deriv., yellow, m. 168° , whose *quinoxaline deriv.*, m. 274° . Its constitution was established by oxidizing it to 3,5-(O_2N) $\text{C}_6\text{H}_4\text{CO}_2\text{H}$



Esters of furoic acid. J. E. ZANETTI AND C. O. BECKMANN. *J. Am. Chem. Soc.* 48, 1067-9 (1926).—The following esters of *furoic acid* are reported: *Bu*, b_1 83.4° , d_4^{20} 1.0555; *sec-Bu*, b_1 67.9° , d_4^{20} 1.0465; *Am*, b_1 95.7° , d_4^{20} 1.0335; *sec-Am*, b_1 75.7° , d_4^{20} 1.039; *hexyl*, b_1 105.7° , d_4^{20} 1.0170; *sec-hexyl*, b_1 86.8° , d_4^{20} 1.012; *heptyl*, b_1 116.7° , d_4^{20} 1.0005; *octyl*, b_1 126.7° , d_4^{20} 0.9885, does not solidify at -14° . The esters decompose on standing, largely as a result of oxidation; they are stable towards H_2O ; the lower members are readily hydrolyzed by aq. KOH but the higher ones require EtOH KOH . *C. J. WEST*

Synthesis of 2,4-dimethyl-5-carbethoxy-3-vinylpyrrole and its conversion into cryptopyrrole. HANS FISCHER AND BRUNO WALACH. *Ber.* 58B, 2818-22 (1925). *2,4-Dimethyl-5-carbethoxypyrrole-3-carboxylic acid* (I), obtained in 70-95% yield from the di-Et ester added to concd. H_2SO_4 at such a rate that the temp. does not rise above 40° and kept at this temp. 20 min. and then poured upon ice, m. 273° , has a double mol. wt. (424) in camphor (Rast), sublimes without decompn. *in vacuo* on rapid heating easily loses CO_2 under atm. pressure, giving up to 70% 2,4-dimethyl-5-carbethoxypyrrole

(II). 2,4-Dimethyl-5-carbethoxypyrrole-3-acrylic acid (III), obtained almost quant. from the 3-CHO deriv. of II heated with $\text{CH}_2(\text{CO}_2\text{H})_2$ and piperidine until the evolution of CO_2 ceased, m. 240° (decompn.), mol. wt. (Rast) 258 (in the same way were obtained 2,4,5-trimethyl- and 2,4-dimethyl-5-ethylpyrrole-3-acrylic acid, m. 203° and 205° , resp.). 2,4-Dimethyl-3-vinyl-5-carbethoxypyrrole, from III heated in 1-g. portions under 12.5 mm. up to 220° in the course of 6–7 hrs. (yield, about 70%), m. 112° , gives a negative Ehrlich reaction in the cold, positive (blue color) on heating, refluxed with alc. NaOH it yields the hygroscopic 5-carboxylic acid (IV), m. $101\text{--}2^\circ$, while in MeOH with H and Pt sponge it gives the 3-Et compd. (carbethoxycryptopyrrole), m. 91° , identical with the product obtained from cryptopyrrole (V) by the Grignard method. IV, reduced in MeOH with H and Pt sponge and distd. with steam gives V (isolated as the picrate, m. 135°) almost quant. With HI of varying concns. IV loses the vinyl residue, giving 2,4-dimethylpyrrole; mineral acids resinify it, concd. AcOH-HBr carbonizes it and very dil. acid polymerizes or condenses it.

C A R

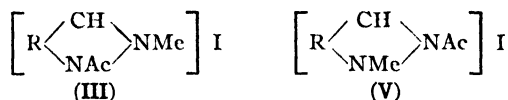
Action of pyridine and bromocyanogen on some pyrroles. HANS FISCHER AND PAUL ERNST. *Ber.* 59B, 138–44 (1926); cf. C. A. 8, 1580. The compd. previously prepd. from 2,4-dimethyl-3-acetylpyrrole (I) with $\text{C}_5\text{H}_5\text{N}$ and BrCN can be obtained in absolutely colorless form by repeated crystn. from alc., it m. 218° (decompn.) (instead of 208°), has the compn. $\text{C}_{27}\text{H}_{30}\text{O}_2\text{N}_6$, contains 2 mols. I (as shown by hydrolysis with concd. HCl and by formation of the 5-Br deriv., decomp. $167\text{--}9^\circ$, of I with Br in AcOH), 2 mols. $\text{C}_5\text{H}_5\text{N}$ (detd. by the method of Malatesta and Germann, C. A. 9, 1020), 2 atoms of N which are given off as NH_3 on hydrolysis and 2 active H atoms (Zerevitinov method). By the direct action of BrCN and $\text{C}_5\text{H}_5\text{N}$ on I in the presence of halogen acids is obtained a blue dye not further investigated. The 2 tetrasubstituted pyrroles (2,4-dimethyl-3,5-dicarbethoxy, 2,4-dimethyl-3-acetyl-5-carbethoxy) subjected to the same treatment were recovered unchanged. Of the trisubstituted derivs. only 2,4-dimethyl-3-carbethoxypyrrole (II) gave a cryst. compd. (III), yellow leaflets, m. 151° , but its compn. ($\text{C}_{20}\text{H}_{24}\text{O}_4\text{N}_4$, mol. wt. in boiling alc. 365 , EtO content 7.97% , active H 0.50%) shows that it contains only one II group and furthermore an HO group, with concd. HCl it gives 1 mol. II, $\text{C}_5\text{H}_5\text{N}$, NH_3 and a substance giving an exceedingly intense red color with $\text{Fe}(\text{NH}_4)(\text{SO}_4)_2$ and oxidized by Br , in the presence of HCO_2H is formed bis-[2,4-dimethyl-3-carbethoxypyrrolyl]methene- HCl . Treated in alc. with concd. HCl and boiled a short time, III evolves ClCN and yields a dye, sepg. from AcOH-HCl in blue-green needles, decomp. $190\text{--}4^\circ$, dil. solns. of which in alc., Me_2CO or AcOEt change after some time from blue-green to red, HCl restoring the blue color, the blue solns. show strong end absorption in the red to 610μ , with a diffuse band between 580 and 553μ . The compn. of the dye (air-dry, C 59.27 , H 6.45 , N 6.30 , Cl 14.12% , dried *in vacuo* at 100° (loss in wt. 8.71%), C 60.27 , H 7.53 , N 6.84 , Cl 8.80) indicates that it is a di- HCl salt of a condensation product of 2 mols. II with 1 mol. glutacetaldehyde and hence belongs to the class of König's polymethine dyes (Schreckenbach, *Diss. Dresden*, 1910). Similarly, from III in alc. with concd. HBr or from II in a little alc. with $\text{C}_5\text{H}_5\text{N}$ and BrCN in Et_2O is obtained a dye, blue needles, decomp. $220\text{--}5^\circ$, with C 54.09 , H 6.29 , N 6.28 , Br 18.50% ; attempts to prep. the free base from this HBr salt with NH_3 in alc. gave a non-cryst. product (C 53.07 , H 7.22 , N 7.54%), begins to smelt 120° but does not m. 220° ; its red soln. in alc. shows strong end absorption in the red but lacks the green band; with concd. HCl in alc. and with HBr it gives the above HCl and HBr salts; the perchlorate (C 52.43 , H 6.17 , N 5.83 , Cl 5.06%), seps. in needles, decomp. above 300° explosively in the air. König has in the meantime prepd. the above HCl salt (C. A. 19, 3488).

C A R

Proline. EMIL ABDERHALDEN AND HANS SICKEL. *Z. physiol. Chem.* 152, 95–100 (1926).—The HCl salt of proline Et ester is quite stable in H_2O and *in vacuo* at 120° whereas the free ester undergoes hydrolysis in the presence of H_2O at ordinary temp. and shows little tendency to form a polypeptide or an anhydride. However, the filtrate obtained in removing EtOH and HCl from the ester- HCl prepd. by hydrolysis of gelatin consists of two layers which, when mixed, evolve EtCl probably with formation of free proline. Proline Et ester b.p. $78\text{--}9^\circ$. In anhyd. Et_2O it undergoes hydrolysis from atm. moisture, with sepn. of proline crystals. From the residue obtained by vac.

A. W. DEX

the stable 2-Ac deriv.; at 50° I and AcI give a very hygroscopic product, m. 83–91°, converted by H₂O into a brown oil, sepd. by means of 2 N H₂SO₄ into II and I; these are also obtained by distg. the original condensation product under 15 mm.; at room temp., I and AcI yielded a product m. 82–90°, sol. in a little cold H₂O and recovered in great part unchanged on evapn. over P₂O₅, but on boiling with H₂O an intense odor of AcOH developed and on evapn. there remained a red-brown mass consisting chiefly of I with a little II; decompn. of the condensation product with K₂CO₃ yielded I and distn. under 15 mm. gave I, II and much indazole. These results indicate that the condensation product has the structure III and that II is 1-acetylintazole; a substance having the same properties is obtained by condensing II with MeI at 50°, while the compd. (IV), m. 170°, formerly regarded as 1-acetylintazole, reacts in an entirely different way with MeI (C. A. 19, 509) (at 100°, II and MeI give a product much contaminated with periodides, at room temp. there is no appreciable reaction in 2.5 months). 1-Methylindazole (IV) and AcI at 100° and at 50° yield products (probably V), m. 95–6° after digestion with Et₂O, at room temp. a product m. originally 125–32° but also m. abt 95° after standing a day in a desiccator; all 3 are somewhat less hygroscopic than III, give AcOH and IV when rubbed with H₂O and are practically unchanged by distn. under 15 mm. Unfortunately, V could not be synthesized from (the labile) 2-acetylintazole, m. 106°, and MeI, as high temps. could not be used and no reaction occurs at room temp.



C. A. R.

Indazylaliphatic acids. K. v. AUWERS AND H. G. ALLARDY. *Ber.* 59B, 95–100 (1926).—Indazole (I) with BrCH₂CO₂Et or MeCHBrCO₂Et at 100–20° gives almost exclusively 2-derivs.; at higher temps. the 1-isomers also are formed and may even become the chief products; in the presence of alkalis both forms are produced. These indazylaliphatic esters are more strongly basic than the indazyl-1-carboxylic esters, they not only form salts with mineral acids (which are decompd. by H₂O) but also picrates; the free acids can readily be obtained by sapon. of the esters, can be recrystd. from H₂O and melt very high; above their m. ps. they lose CO₂ and give the corresponding alkylindazoles, the 2- undergoing this decompn. more easily and smoothly than the 1-isomers. From I and Me₂CBrCO₂Et, which react only at 140°, is obtained 2-ethylindazole (II); probably the HBr formed sapons. part of ester at the high temp. and the resulting EtBr reacts with the unchanged I; the reaction is not smooth and the yield of II is only moderate (3.5 g. from 10 g. I). BrCH₂CH₂CO₂H at a high temp. gives a β-indazylpropionic acid (III) which, in the vacuum of a H₂O pump at 200°, decomp. smoothly into I and acrylic acid. *Indazyl-1-acetic acid*, m. 185–6°. *Et indazyl-2-acetate*, m. 54–4.5°, b₁₁ 175–7° (*picrate*, m. 164.5°); *free acid*, m. 257° (decompn.), forms 1,2-dimethylindazolium iodide with MeI. *Et α-[indazyl-2]-propionate*, yellowish, b₁₁ 172°, sol. in concd. HCl and repptd. by H₂O (*picrate*, yellow, m. 141–2°); *free acid*, m. 209° (decompn.). *1-Ester*, yellowish, b₁₁ 153–5°; *free acid*; *Ag salt*, amorphous powder. II (cf. C. A. 19, 3091), m. 40–1°, b₁₂ 133–4°, d₄²⁰ 1.076, n_D²⁰ 1.591. III, m. 148–9°, sol. in mineral acids and alkalis; *picrate*, yellow, m. 170°.

C. A. R.

Acylindazoles. JAKOB MEISENHEIMER AND OTTO SENN. *Ber.* 59B, 199–202 (1926).—It has been shown (C. A. 19, 508) that 4,5-benzo-7-methyl[hept-1,2,6-oxdiazine] (I) (formerly regarded as 1-acetylintazole) with BzO₂H easily takes up 1 atom of O, the H in position 3 being oxidized to HO. The 3-Me deriv. (II) of I, in which the 3-H atom is replaced by Me, would not be expected to undergo similar oxidation and as a matter of fact it proved to be very resistant towards BzO₂H; even after standing a day with a 2-fold excess of BzO₂H a considerable part of it was recovered unchanged and from the oxidation products were isolated an oil of strong odor (probably methylanthranil) and a small amt. of a substance m. 105–6°, presumably identical with that. m. 114–5°, obtained by oxidation of o-AcNHC₆H₄COMe (III) (Bamberger and Elger. *Ber.* 36, 3650(1903)). On the other hand, II is readily attacked by KMnO₄, yielding chiefly III. 2-Chlorobenzaldehyde benzoylhydrazone, m. 192°, is unchanged by long boiling with aq. or alc. alkalis, dissolves in concd. H₂SO₄ with dark color (H₂O pptg. a yellow substance, m. 142°, probably (2-ClC₆H₄CH:N)₂), rapidly darkens when boiled in cymene with KI, K₂CO₃ and *Naturkupper C* (IV) and yields long red-brown needles, m. about 240° (decompn.). 2-Chloro-5-nitrobenzaldehyde benzoylhydrazone, m. 135–8°, is entirely stable towards alkalis; 0.5 g. in 50 cc. cymene boiled 1.5 hrs. with 1.5 g. ignited K₂CO₃, 0.2–0.3 g. IV and 0.1 g. KI gives 0.2–0.25 g. 1-benzoyl-4-nitroindazole,

m. 192–3°. This synthesis of 1-acylindazoles is a new proof that the compds. formerly regarded as "1-acylindazoles" have the Bischler heptadiazine structure C. A. R.

Comparison of heterocyclic systems with benzene. I. 6,7-Indazolequinone-4-sulfonic acid. L. F. FIESER. *J. Am. Chem. Soc.* **48**, 1097–107 (1926).—6 Amino-indazole is obtained in 83.6% yields by reducing the NO₂ deriv. by SnCl₂; the diazo soln., contg. 1.5 mol. equivs. of H₂BO₃, boiled 15 min. gives 74% of the 6 HO deriv. With PhNH₂Cl this gives 6-hydroxy-7-benzencazoindazole, bright red, m. 238°. Reduction with Na₂S₂O₄ in alk. soln. gives 6-hydroxy-7-aminoindazole, darkens about 190°, decomp. 260°, isolated in 68% yield as the di-HCl salt, microneedles, HCl salt, pale yellow needles with 1 H₂O. It is oxidized to 6,7-indazolequinone, which gives with NaHSO₃ 6,7-indazolehydroquinol-4-sulfonic acid, turns black at 250°; the alk. soln. is first green but in the air it turns brown, clear red and on addn. of acid, yellow. The Na 6,7-indazolequinone-4-sulfonate, orange-yellow needles, results by oxidizing the above acid with NaNO₂; PhNH₂ gives 4-anilino-6,7-indazolequinone, bright red, m. 360° (decomp.); it is reduced by SnCl₂ or Na₂S₂O₄ to a hydroquinol very sensitive to air oxidation. 6-Amino-7-[p-sulfobenzeneazo]indazole, bright red (98% yield) 6,7-Diamino-indazole-HCl, rose-colored needles (51%); the free base is readily oxidized in the air. With HCO₂H and AcONa it gives 6,7-imidazoindazole (1,2,6,8-imidazoindazole), m. 293°. 6,7-Phenanthrazinoindazole (1,2,3,12-indazophenanthrazine), lemon yellow, m. 364°; the H₂SO₄ soln. is carmine-red. E. m. f. measurements are reported at 25° for 6,7-indazolequinone-4-sulfonic acid and 1,2-naphthoquinone-4-sulfonic acid, the normal reduction potentials of the 2 substances are 0.620 v. and 0.630 v., resp., which indicates a close relationship between the pyrazole and the C₆H₄ ring C. J. WEST

Anhydrides of derivatives of amino acids. C. GRANACHER. *Helvetica Chim. Acta* **8**, 865–73 (1925); cf. C. A. **19**, 2051.—35 g. BzNHCH₂CONHEt (I) and 4–5 parts P₂O₅, mixed to a paste with CHCl₃ and boiled 7–8 hrs. on the H₂O bath, taken up with ice-H₂O, filtered, and the aq. soln. made alk., yield 4–7 g. 2-phenyl-4-[glymethylamidimino]-benzoyl-5-ethyliminooxazoline, EtN C O CPh N CHCPh NCl₂CONHEt (II),

C₂₂H₂₄O₄N₄, golden leaflets, m. 143–4°, the reaction going beyond the initial glyoxaline stage (cf. Karrer and G., C. A. **18**, 2708; **19**, 2051) as follows: PhC. N. CH. C (NEt). O +

PhC(OH):NCH₂CONHEt → II. II is not attacked by alkalis, but heated 5 hrs. on the H₂O bath with 5% HCl, it deposits 2-phenyl-4-benzoyl-5-ethyliminooxazoline (III), PhC. N. CHBz C (NHEt) O, purified by removal of an alkali-sol. impurity by

warming with 2% aq. NaOH on the H₂O bath, pale yellow, m. 112°, very weakly basic, in alc. gives a deep yellow color with KOH, intense green with FeCl₃. II or III, heated 1–2 hrs. on the H₂O bath with 20% HCl, loses its yellow color and deposits α-benzoylhippuric ethylamide (IV), BzNHCHBzCONHEt, m. 197–8°, in alc. gives a deep violet-red color with FeCl₃; heated until clear with 5 parts 5% aq. KOH it yields unchanged IV, insol. in Et₂O, BzOH, and I. In an attempt to synthesize IV BzC (NOH)CO₂Et was reduced according to Gabriel and Posner's method for AcCH(NH₂)CO₂Et (Ber. **27**, 1141 (1894)); the resulting HCl salt, boiled 16 hrs. in PhH with BzCl, gives Et α-benzoylhippurate, BzNHCHBzCO₂Et, m. 128–9°, in alc. gives a red color with FeCl₃; is split to I by EtNH₂, hydrolyzes to BzOH and BzNHCH₂CO₂H when heated with alkalis. M. HEIDELBERGER

Anhydrides of amino acid derivatives. C. GRANACHER, V. SCHELLING, AND E. SCHLATTER. *Helvetica Chim. Acta* **8**, 873–83 (1925).—Since the type RC. N. CH. CO NR'

is of interest as an anhydride of tripeptides attempts at its synthesis were made (cf. also preceding abstr.). With Na and alc. PhC. N. CH₂. CO NH yields the Na salt,

evapd. and boiled 3 hrs. with PhH and MeI this gives 2-phenyl-5-methoxyimidazole instead of the expected 1-Me deriv.; it m. 56–8°, is fairly strongly basic, and heated with 1:1 HCl it gives BzOH, NH₄Cl and MeO₂CCH₂NH₂ HCl. PhC. N. CH. CCl NPh,

treated on the H₂O bath in alc. with Na until no more dissolves, yields after evapn. crystals of 1-benzyl-2,3-diphenylimidazolidine (I), PhCH PhN CH₂ CH₂. NCH₂Ph,

and an oil, phenylbenzylethylenediamine (II), PhNHCH₂CH₂NHCH₂Ph. I, m. 123°, is split by cold dil. HCl to BzH and II. To isolate II the aq. sol. of the reduction mixt. is best heated with HCl, extd. with Et₂O, made alk., and again extd. with Et₂O. II, b₁₁, 214–6°, gradually solidifies; with BzH in alc. it gives I, thus accounting for

the presence of I in the reduction mixt.; *dipicrate*, m. 158–60°; *dipicrolonate*, m. 215–7°. $\text{BzNHCH}_2\text{COCl}$ is best purified by shaking out with dry CHCl_3 to remove PCl_5 and POCl_3 . With 2 mols. PCl_5 in CHCl_3 $\text{BzNHCH}_2\text{CONHCH}_2\text{CO}_2\text{Et}$, heated after the initial reaction until reddish, yields *Et 2-phenyl-5-chloroimidazole-1-acetate*, isolated as the *picrate*, sinters 140°, m. 142°; *amide*, sinters 248°, m. 253°, not changed by Br and aq. alk.; with Br and NaOMe in MeOH it gives the *bromouamide*, sinters 260°, m. 264°. *Acetylglycinethylamide*, m. 144°; *1-ethyl-2-methyl-5-chloroimidazole*, b_{12} 101°, smells like $\text{C}_4\text{H}_5\text{NH}$. *Acetylglycinanilide*, m. 191°; *1-phenyl-2-methyl-5-chloroimidazole* (yield poor), isolated from Et_2O as the *picrate*, m. 176°. *Benzoylglucylleucine ethyl ester*, solidifies on long standing; *ethylamide*, m. 209°; neither yielded isolatable amts. of imidazoles.

M. HEIDELBERGER

Tetrahydro- γ -pyrones. IV. W. BORSCHKE AND R. FRANK. *Ber.* 59B, 237–42 (1926); cf. C. A. 18, 837.—Heptan-4-ol 2,6-oxide (I), b. 190°, m. 46–7°, can be obtained in 80% yield from α, α' -dimethyl- γ -pyrone in H_2O with Pt black and H_2 ; it gives in $\text{C}_6\text{H}_5\text{N}$ with $p\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$ the *p-nitrobenzoate*, m. 96°, and with $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ the *p-toluenesulfonate*, m. 88–9°. *4-Chloroheptane 2,6-oxide* (II), b_{20} 65°, is obtained in 1.2 g. yield (together with 3.3 g. *di[hydroxyheptanoxide] phosphite*, $\text{HOP}(\text{OC}_7\text{H}_{13}\text{O})_2$, b_{20} 197°) from I slowly treated below –2° with PCl_5 and allowed to stand in the cold, and in about 50% yield from I slowly added to PCl_5 under cold low boiling petroleum ether and finally boiled 15 min. With EtMgBr , II gives *heptan-2,6-oxide-4-carboxylic acid*, m. 120° (*amide*, m. 197°; *anilide*, m. 177°), and *4,4'-di-[2,6-oxidoheptyl]*, $(\text{CH}_2\text{CHMe.O.CHMe.CH}_2\text{CH})_2$, m. 104°, isomeric with a compd., m. 80°, ob-

tained by Oppenheim in another way (*Diss. Lausanne, 1924*). With SOCl_2 in $\text{C}_6\text{H}_5\text{N}$, 3.9 g. I gives 0.9 g. of the neutral *sulfite*, $\text{SO}(\text{OC}_7\text{H}_{13}\text{O})_2$, b_{20} 160–70°, m. 76–7°. Heated 4 hrs. in a sealed tube at 110° with 4 parts fuming HCl , I gives 65% of a compd. or const boiling mixt. $\text{C}_{12}\text{H}_{24}\text{OCl}_2$ as an oil of peculiar odor, heavier than H_2O , b_{20} 74°. I (13 g.) added to 50 g. PBr_5 under petroleum ether yields 2.2 g. *4-bromoheptane 2,6-oxide*, b_{12} 70–80°; 6.4 g. of a compd. $\text{C}_{12}\text{H}_{24}\text{OBr}_2$, b_{14} 72–4°; and 3.4 g. of a substance, b_{14} 110°, having the compn. $\text{C}_7\text{H}_7\text{OBr}_3$ of a *dimethyltribromoheptadiene oxide*. With HBr (d 1.78) at 100°, 5 g. I gives 4 g. of a compd. $\text{C}_{12}\text{H}_{24}\text{OBr}_2$, b_{25} 94–9°. *Pentan-3-ol 1,5-oxide* (III) (7.4 g. from 10 g. γ -pyrone in H_2O with Pt black and H_2), b_{12} 84°; *p-nitrobenzoate*, m. 69–70°. *3-Chloropentane 1,5-oxide* (7.3 g. from 10.2 g. III slowly added to PCl_5 and CHCl_3 and cautiously warmed a few min.), b_{12} 46°.

C. A. R.

Preparation of benzodi-(γ -pyrones). GEORG WITTIG. *Ber.* 59B, 116–9 (1926). *Resorcinyl dipropionate* (52 g. from 27 g. $m\text{-C}_6\text{H}_4(\text{OH})_2$ with EtCOCl), b. 297–8°; 10 g. treated at 130° with ZnCl_2 and heated until a rapid rise in the temp. indicates that reaction has set in, gives 6 g. *4,6-dipropionyl-1,3-resorcinol* (I), m. 125–6°, 5 g. of which with Ac_2O and NaOAc at 170° yields 4.8 g. $\alpha, \beta, \alpha', \beta'$ -tetramethyl[benzo-1,6,3,4-di-(γ -pyrone)], m. 271–8°; α, α' -diphenyl- β, β' -dimethyl analog (2.5 g. from 2 g. I with Bz_2O and NaOBz at 200°), m. 261–1.5°. *2,3-Dimethyl-7-hydroxychromone* (30 g. from 40 g. 2,4-($\text{HO})_2\text{C}_6\text{H}_3\text{COEt}$, Ac_2O and NaOAc at 160–70° and subsequent sapon. with boiling 2 N Na_2CO_3), faintly yellowish, m. 257–8°, gives quant. with boiling $(\text{EtCO})_2\text{O}$ and EtCO_2Na the *propionate*, m. 75.5–6.5°, 10 g. of which with AlCl_3 at 120–30° yields 9 g. *2,3-dimethyl-7-hydroxy-8-propionylchromone* (II), m. 161.5–2.0°; this with Ac_2O - NaOAc at 170° gives 95% of $\alpha, \beta, \alpha', \beta'$ -tetramethyl[benzo-1,6,3,2-di-(γ -pyrone)], m. 188–91° and this or II with boiling NaOEt in excess gives 2,6-dipropionyl-1,3-resorcinol, m. 82°.

C. A. R.

"Tervalent" carbon. IV. N-Methylpolyaryldihydropyridyls. (Preliminary communication.) K. ZIEGLER AND F. A. FRIES. *Ber.* 59B, 242–8 (1926); cf. C. A. 29, 383.—From the pentaphenylcyclopentadienyl described in the earlier paper can be theoretically derived, by introduction of a -NMe- group between, say, C atoms 3 and 4, an *N*-methyl dihydropyridyl, a radical which, from the observations made in the cyclopentadiene series, should show little tendency to associate and the possible synthesis of which therefore seemed promising. The most obvious way to prep. such a radical would be the removal of the acid residue from the corresponding *N*-methyl pyridinium salt. 2,4,6-Triphenylpyridine (I) reacts quite rapidly with Me_3SO_4 at 100° to form *N-methyl-2,4,6-triphenylpyridinium Me sulfate* (II) and from this numerous other salts can readily be prepd. These quaternary salts show a great tendency to split off the addendum on heating. Thus the chlorides on slow heating at 100° (even on long heating *in vacuo* at 60–6°) or rapid heating to 122° decomp. into I and MeCl and II suffers the same decompn. at 174°; the aq. solns. of the salts, on the other hand, are perfectly stable on long boiling. 2,3,5,6-Tetraphenylpyridine and pentaphenylpyridine behave in the same way as I. If strips of Zn or Mg are dipped into an aq

soln. of the *N*-methyltriphenylpyridinium chloride (III) the surface of the Zn after some time, that of the Mg immediately, becomes covered with a dark blue layer; on adding an org. solvent immiscible with H₂O and shaking, the drops of the org. liquid, as they rise through the H₂O, assume a red-violet color but are immediately completely decolorized when they reach the surface; if the expt is carried out in a completely filled flask or under N the liquid floating on top of the H₂O soon becomes so intensely red-violet that it becomes completely opaque, but on exposure to the air it is very rapidly and completely decolorized. Of the solvents so far tried, AcOH seems to accelerate most the formation of the colored substance, in petroleum ether the reaction proceeds more slowly but the product is difficultly sol in this medium and seps in apparently amorphous flocks. The same characteristically colored solns., sensitive to air are obtained by the action of PhMgBr on III and on electrolysis of III in H₂O there sep at the cathode the same H₂O-insol blue flocks as are obtained with Mg alone or in the presence of petroleum ether. These methods of formation make it practically certain that the blue substance is *N*-methyl-2,4,6-triphenyldihydropyridyl, and although its isolation in analytically pure form has not yet been effected it can be asserted with considerable certainty that it is a radical which, if not completely monomol., shows very little tendency to associate. II (yield, 75%), seps in crystals with 1 H₂O, m. 101° on rapid heating, resolidifies 109° and m. again 174° (decompn.), acid chloride, C₂₁H₂₀NCl·HCl·2H₂O, m. 118–20°, decomp. 122° on rapid heating, sinters 101° on slow heating, resolidifies 123° and decomp. 143°, neutral chloride, seps with 2.5 H₂O. The solns. of the 2 chlorides remain clear on addn. of dil NaOH but assume a yellowish color; concd. NaOH ppts. a yellow substance, concd. Na₂CO₃ a white substance which is apparently not the carbonate but the "pseudo-base"; KBr, KI, HClO₄, HNO₃ give the corresponding difficultly sol salts; the sulfate is apparently easily, the ZnCl₂ and HgCl₂ double salts are difficultly sol, permanganate, violet-red, decomp. in aq suspension at 100°, deflagrates when heated in dry state on the H₂O bath. C A R

Question of the existence of the simplest monomeric dihydroquinolines. W. KÖNIG AND R. BUCHHEIM *Ber* 58B, 2868 70(1925). K and B confirm the doubts cast by Meisenheimer and Stotz (C A 20, 1082) on Rath's supposed synthesis of 1,2-dihydroquinolines (C A 18, 2707). They were never able to obtain from *o*-MeC₆H₄NH₂ and chloro- or bromoacetal any substance which might be regarded as monomeric dihydroquinoline; the products, obtained in the same amts and with the same b p (about 225–30°) as reported by R., yielded with HNO₃ only very small amts. of nitrosamine-like, easily resinified substances, and always consisted in large part of a diazotizable, i. e. of a primary aromatic amine, b 224–6° (after purification through the Bz deriv., m. 179°), d₄²⁰ 0.96251, n_D²⁰ 1.5491, contg 10.48% N and identified, through the compn. of its Bz deriv. (C 79.8 H 7.60, N 5.86%), and the m p of its Ac deriv. (105°), as 2,4-MeEtC₆H₃NH₂. K and B have also been unable to obtain *N*-ethylindole by R.'s method (C A 18, 2898). C A R

Synthesis of β-arylsulfonylquinolyl-α-arylsulfonylmethanes, their degradation by reduction and acid and the determination of their constitution. J. TROGER AND G. PAHLE, *J. prakt. Chem* 112, 221–42(1926). -- *p*-MeC₆H₄SO₂CH₂COCH₂Br (I) and freshly pptd. AgCl in EtOH give quant the chloride, m 140°; AgI gives the iodide, m 102°. *o*-Anisylsulfonylbromoacetone, m 115°, from the ketone and Br in C₆H₆ at room temp. With *p*-MeC₆H₄SO₂Na or from I and *o*-MeOC₆H₄SO₂Na there results *o*-anisylsulfonyl-*p*-toluenesulfonylacetone, m 177° (phenylhydrazone, yellow, m 113°); *o*-H₂NC₆H₄CHO in a tube at 160° for 1 hr gives β-*o*-anisylsulfonylquinolyl-α-*p*-tolylsulfonylmethane (II), m. 208°. Heating with concd HCl for 1 hrs in a tube gives β-*o*-anisylsulfonylquinolalidine, m. 159°, reduced by Sn and HCl to MeOC₆H₄SH. Reduction of II with concd. HCl and Sn and distn. with steam give a mixt. of MeOC₆H₄SH and MeC₆H₄SH, and after making alk., tetrahydroquinolalidine. *p*-Anisylbromoacetone, m. 104°; the *p*-tolylsulfonyl deriv., m 140°, β-*p*-anisylquinolyl-α-*p*-tolylsulfonylmethane, grayish green, m. 187°. *o*-Phenylsulfonylbromoacetone, m 80°, the *p*-tolylsulfonyl deriv., m. 144° (phenylhydrazone, yellow, amorphous, m 80°) β-*o*-Phenylsulfonylquinolyl-α-*p*-tolylsulfonylmethane, grayish green, m 194°; the constitution was established by degradation by acid and reduction. *p*-Phenylsulfonylbromoacetone, m 108°; the *p*-tolylsulfonyl deriv., m 116°. β-*p*-Phenylsulfonylquinolyl-α-*p*-tolylsulfonylmethane, gray, m. 182°. *o*-Anisylsulfonyldibromoacetone, m 160°, from the ketone and Br in AcOH at room temp. Di-*o*-anisylsulfonylacetone, m 165°, β-*o*-Anisylsulfonylquinolyl-α-*o*-anisylsulfonylmethane, m. 188°. *p*-Bromophenylsulfonylacetone, m 103°; quinolyl-α-*o*-anisylsulfonylmethane, m. 150°. Di-*p*-bromophenylsulfonylacetone, m. 195°, β-*p*-Bromophenylsulfonylquinolyl-α-*p*-bromophenylsulfonylmethane, m. 132°; its constitution follows from the products of its reduction. *p*-Bromophenylsulfonyl-α-anisylsulfonylacetone, m. 160°.

β -*p*-Bromophenylsulfonylquinolyl- α -*o*-anisylsulfonylmethane, m. 191°. *p*-Bromophenylsulfonyl-*p*-tolylsulfonylacetone, m. 163°. β -*p*-Bromophenylsulfonylquinolyl- α -*p*-tolylsulfonylmethane, m. 193°. *p*-Bromophenylsulfonyl- β -naphthylsulfonylacetone, m. 165°. β -*p*-Bromophenylsulfonylquinolyl- α -(β)-naphthylsulfonylmethane, grayish green, amorphous powder, m. 195°.

C. J. WEST

Condensation of γ -methoxyquinaldine with aromatic aldehydes. J. TRÖGER AND E. DUNKER. *J. prakt. Chem.* 112, 196-220(1926); cf. C. A. 19, 1278. γ -Methoxyquinaldine (I) and *p*-MeOC₆H₄CHO, heated with or without ZnCl₂ of K₂SO₄ *in vacuo*, give *p*-methoxybenzylidene- γ -methoxyquinaldine (II), pale yellow, m. 144°; HCl salt, with 2H₂O, yellow needles; methiodide, yellow, m. 168°; ethiodide, golden yellow, sinters 236°, m. 246°. If the above condensation is carried out under pressure at 185-90° there results α -*p*-methoxybenzylidene-*N*-methyl-*py*- γ -ketoquinaldine (III), light yellow, m. 283°; that III is not a polymer of II is indicated from its normal mol. wt. in PhOH. II is transformed into III by passing MeI vapors through molten II. The HCl salt, orange-yellow, m. 144°; ethiodide, yellow, m. 219°. Catalytic reduction of II gives the benzyl deriv., m. 92°; HCl salt, pale yellow, with 1.5 H₂O, III likewise gives a benzyl deriv., m. 214°; HCl salt, m. 197°. α -*o*-Methoxybenzylidene- γ -methoxyquinaldine (IV), yellow, m. 130°, from I and *o*-MeOC₆H₄CHO; HCl salt, citron-yellow, m. 191°. The benzyl deriv., m. 108°; picrate, yellow, m. 176°; this is much more sol. in EtOH than the picrate of IV, yellow, m. 208°. α -*o*-Methoxybenzylidene-*N*-methyl-*py*- γ -ketoquinaldine, yellow, m. 268°. α -*m*-Methoxybenzyl- γ -methoxyquinaldine, m. 49°; chloroplatinate, yellow; picrate, yellow, m. 154°. 3,4-Dimethoxybenzylidenequinaldine, m. 109-10°; the reaction is complete in 2 hrs. at 130°, in 15 min. at 155°. The benzyl deriv., m. 52°; chloroplatinate, orange leaflets. None of these benzyl derivs. is identical with cuspateine.

C. J. WEST

Reduction of β -arylsulfonylquinoline derivatives. J. TRÖGER AND A. UNGAR. *J. prakt. Chem.* 112, 243-67(1926).—*p*-Bromophenylsulfonylacetone, m. 100°; with *o*-H₂NC₆H₄CHQ this gives β -*p*-bromophenylsulfonylquinaldine (I), m. 168°. Reduction of 0.25 g. in 50 cc. fuming HCl by 3 g. Zn (60-75 min., the steam distillate amt. to 5 600 cc.) gives 76.1% (*p*-BrC₆H₄S₂). Under similar conditions β -*p*-chlorophenylsulfonylquinaldine gives 67.8% (*p*-ClC₆H₄S₂); β -*p*-tolylsulfonylquinaldine, 55.2% of (*p*-MeC₆H₄S₂); β -phenylsulfonylquinaldine, 60.2% of (PhS)₂. After removal of the thiophenol, the reaction product, after making alk., gives tetrahydroquinaldine (II), whose HCl salt, m. 195-6°; this is a mixt. of the *bz*- and *py*-derivs., which may be sepd. by fractional crystn. of the *bz*-deriv. The *py*-deriv. gives a HCl salt m. 190° (v. Braun gives 128-30°); the *bz*-deriv. gives a HCl salt m. 164°; a mixt. of the 2 m. 195-6°. β -*p*-Bromophenylsulfonylquinophthalone, light yellow leaves, from I, C₆H₄(CO)₂ and ZnCl₂; reduction gives II and *p*-BrC₆H₄SH. α -Propenyl- β -*p*-bromophenylsulfonylquinoline, m. 173°, in 30% yield from I, paraldehyde and ZnCl₂; HCl salt, m. 132°. The *p*-toluene deriv., m. 165°, on reduction with Sn and HCl yields *p*-MeC₆H₄SH and α -propyltetrahydroquinoline, whose HCl salt m. 216° and *Bz* deriv., m. 97°. Reduction with Pd and H gives α -propyl- β -*p*-tolylsulfonylquinoline, amorphous, further reduced by Sn and HCl to the above products. I and MeI in MeOH give the methiodide, yellow, m. 157°; reduction with Sn and HCl gives 90% of the theory of *p*-BrC₆H₄SH and *N*-methyl- α -methyltetrahydroquinoline. In the reduction there is also formed a small amt. of a base, m. 58°, which may be a decahydroquinaldine, though the amt. was insufficient to identify it completely. The following yields of disulfide were obtained upon reduction of β -arylsulfonyl- α -aminoquinoline: toluene, 73; *p*-chlorobenzene, 75; *p*-bromobenzene, 80; β -naphthalene, 46. α -Amino- β -*p*-tolylsulfonylquinoline-*MeI* yellow, m. 185°; the *p*-bromophenyl deriv., yellow, m. 192°. The corresponding ethiodides, yellow, m. 194° and 204°, resp. On reduction they give the corresponding thiophenol and the substituted II. α -Dimethylamino- β -*p*-tolylsulfonylquinoline, m. 132°, reduction gives nearly quant. *p*-MeC₆H₄SH. α -Dibenzylamino- β -*p*-tolylsulfonylquinoline, pale yellow, m. 164°. The reduction of β -*p*-tolyl- and β -*p*-bromophenylsulfonylcarbo-styryl is discussed.

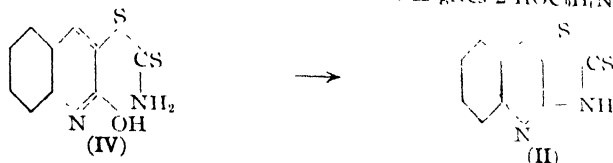
C. J. WEST

Use of rhodanine in organic synthesis. VI. Quinrhodine. C. GRANACHER, A. OFFNER AND A. KLOPPENSTEIN. *Helvetica Chim. Acta* 8, 883-92(1925); cf. G. Mahal, and Gerö, C. A. 18, 2166.—50 g. finely powd. *o*-O₂NC₆H₄CH: C. S. CS. NH. CO

(I) added to a boiling hot soln. of 50 g. Na₂CO₃ in 2 l. H₂O, reduced with a boiling soln. of 350 g. FeSO₄·7H₂O, 600 cc. H₂O, and 150 cc. NH₄OH, heated 15 min. on the H₂O bath, treated with 150 g. Na₂CO₃, filtered, and acidified with dil. HCl, yields 37 g. crude quinrhodine (II), purified by boiling with 20% aq. NaOH, dilg., pptg. with HCl, and crystg. from EtOAc or AmOH; yellow leaflets or brown-red needles, m. 295°. The

intermediate $o\text{-H}_2\text{NC}_6\text{H}_4\text{CH} \begin{smallmatrix} \text{C} \text{ S } \text{CS} \text{NH} \text{CO} \end{smallmatrix}$ (III), pro

rectly to II, since this could not be accomplished by dehydrating agents like Ac_2O , but more plausibly the rhodanine ring is opened by the boiling Na_2CO_3 , after which reduction and condensation take place according to the scheme: $\text{O}_2\text{NC}_6\text{H}_4\text{CH}:\text{C}(\text{CO}_2\text{Na})_2\text{S} \xrightarrow{\text{NH}_2} \text{H}_2\text{NR} \rightarrow \text{IV} \rightarrow \text{II}$. II reacts for SH, does not couple in alk. soln with PhN_2Cl , and forms a K salt (V), yellow needles, oxidized by $\text{K}_2\text{Fe}(\text{CN})_6$ to an insol disulfide. V and PhCH_2Cl , shaken in H_2O 5 hrs, give quinrhodine benzyl thioether, straw yellow, m. 145° . Fused with alkali to a clear melt II gives 2-HOC₆H₄N (VI), added



to 50% aq. NaOH at 120° and stirred 10-15 min., gradually raising the temp. to 180° , it yields mainly 3-sulfhydryl-2-quinolone (VII), with varying amts. of the corresponding disulfide, sol. in alc., and VI. VII is also formed in small amt. on fusing III with alkali. m. 104° . KOH with Me_2SO , it forms 2-quinolone 3-Me thioether, m. 271° (decompn.). benzyl ether (VIII), m. 234° . 1 g. VIII, boiled with excess EtI and treated dropwise with the calc'd amt. 20% NaOH, boiled 15 hrs, neutralized with HOAc, conc'd to incipient turbidity, and boiled with 200-300 cc. H_2O , yield *N*-ethyl-2-quinolone 3-benzyl thioether, white from AcOH, yellowish needles from alc., m. 138° . $\text{MeN} \begin{smallmatrix} \text{C} \text{O} \text{CH} \text{S} \text{CS} \end{smallmatrix}$ condenses smoothly with $o\text{-H}_2\text{NC}_6\text{H}_4\text{CHO}$ in HOAc with NaOAc

on the H_2O bath, boiled 15 hrs. with Ac_2O the product gives *N*-methylquinrhodine, pale yellow, m. 205° ; *N*-ethylquinrhodine (IX) sep. from the HOAc reaction mixt., almost white needles from AcO, m. 155° (yield 56%); *N*-phenylquinrhodine, pale yellow plates from AmOH, white from AcO, m. above 285° ; *N*-benzylquinrhodine, yellowish, m. 233° . IX is not attacked by boiling 50% KOH, but when fused with 50% NaOH, raising the temp. during 0.5 hr. to 220° , it yields VII on acidification. $\text{EtN} \begin{smallmatrix} \text{C} \text{O} \text{CH} \text{S} \text{CS} \end{smallmatrix}$

and 3,5-(O.N)₂C₆H₃CHO, boiled in a little HOAc for 2 hrs. give 2,4-dinitrobenzal-*N*-ethylrhodanine, red-brown, m. 133° , reduced with NH_4OH FeSO_4 it yields, on extn. of the Fe oxides with alc., the 2,4-diamino deriv., red violet, m. 223° ; boiled with Ac_2O this gives the diacetamino deriv., yellow brown, m. 272° , instead of a quinrhodine.

M. HEIDELBERGER

Condensations involving reactive methyl groups in heterocyclic bases. J. E. HUMPHRIES, *J. Chem. Soc.* 1926, 3716. Quinaldine and Michler's hydrol (I) in glacial AcOH condense to the pale yellow $\text{C}_{20}\text{H}_{16}\text{N}_2\text{CH}_2\text{CH}_2(\text{C}_6\text{H}_4\text{NMe}_2)_2$, m. 131° , oxidation with PbO_2 and AcOH gives a red amorphous dye, whose oxalate, $\text{C}_{20}\text{H}_{16}\text{O}_4\text{N}_4$, was analyzed; it dyes silk violet, while the salts are red the pseudo base is brown. *p*-Toluquinaldine and I give the compd., $\text{C}_{25}\text{H}_{24}\text{N}_4$, m. 152° . α -Picoline and I give the pale yellow compd., $\text{C}_{24}\text{H}_{22}\text{N}_4$, m. 187° . *p*-Toluquinaldine MeI (II) and I give Cu-red needles, $\text{C}_{22}\text{H}_{24}\text{N}_4\text{I}$, m. 160° (decompn.). II and $\text{PhN} \cdot \text{HSO}_3$ in EtOH at room temp. give II peroxide, golden yellow, m. 133° . II and $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ (III) in EtOH at 0° give 2-formyl-6-methylquinoline *p*-nitrophenylhydrazine, reddish brown, m. 211° , identical with the synthetic product from the hydrolysis product of $\text{C}_{10}\text{H}_{11}\text{N}(\text{Me})\text{CH} \cdot \text{NC}_6\text{H}_4\text{NMe}_2$ and $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$. Quinaldine-MeI and III gave the compd., $\text{C}_{17}\text{H}_{16}\text{O}_2\text{N}_4\text{I}$, red, m. 250° . The EtI deriv. gave the compd., $\text{C}_{15}\text{H}_{15}\text{O}_2\text{N}_4\text{I}$, red, m. 262° . α -Picoline MeI gave the compd., $\text{C}_{17}\text{H}_{16}\text{O}_2\text{N}_4\text{I}$, yellow, m. 260° . These compds. are all hydrazones. C. J. WEST

Course of the quinaldine synthesis with tetralylamines. 7,8-Tetramethylenequinaldine. JOSEF LINDNER AND ALFRED SIEGEL, *Monatsh.* 46, 225-49 (1926). Benzoyl- α -tetralylamine, m. 151° . Using the method given in C. A. 18, 2707, α -tetralylamine gives 7,8-tetramethylenequinaldine, m. 55° ; HCl salt, darkens 230° , m. 236° ; HBr salt, darkens 300° , m. $309-10^\circ$; soly. in H_2O , about 25° ; III salt, decomp. about 190° ; soly. in cold H_2O , about 1° . Picrate, yellow, m. 199° , soly. in hot H_2O , about 25° . C. J. WEST

Course of the quinaldine synthesis with β -aminotetralin. II. JOSEF LINDNER AND MAX STAUFER, *Monatsh.* 46, 231-40 (1926), cf. C. A. 18, 2707. This is largely

a theoretical discussion. The sepn. of the 6,7- and 5,6-tetramethylenequinaldine is best carried out by means of the HI salt; the relative yields of the 2 products are 35 and 65%. The 2 picrates have practically the same soly. in hot and cold EtOH. M. p. curves of mixts. contg. 87 to 25% of the 5,6-deriv. show a flat course from 175° to 167°. Dehydrogenation of the 6,7-deriv. gives α' -methyl- α -anthrapyridine (benzolo-6,7-quinaldine), m. 129°, b. *in vacuo* around 210°. HCl salt, darkens 196°, m. 200°; picrate, yellow, m. 216°.

C. J. WEST

Anthraquinone series. I. Amides from substituted anthraquinonecarboxylic acids with aminoanthraquinones. ALEXANDER ROLLET, OSKAR HAIDER AND ALOIS MERKA. *Monatsh.* 46, 131-6 (1926).—1-Chloroanthraquinone-2-carboxyl chloride, yellow, m. 201°; boiled with about 2 mols. 2-aminoanthraquinone in C_6H_6 for 5-8 hrs., there results 75-90% of 1-chloroanthraquinone-2-carboxylic acid-anthraquinone-2-amide (I), pale yellow, m. 317°; concd. H_2SO_4 gives an orange-yellow color. 1-Chloro-2-aminoanthraquinone gives 60-75% of the compd. $C_{28}H_{13}O_5NCl_2$ (II), pale brownish yellow, m. 347°. 1-Aminoanthraquinone gives 95% of the compd. $C_{28}H_{14}O_5NCl$ (III), deep yellow, m. 241°; the red-brown bath dyes cotton brownish red, turning to a pale greenish yellow in the air. The condensation product from 1,5-nitraminoanthraquinone could not be purified. I and 10% NH_4OH in a sealed tube give the 1-amino deriv., red, m. 365°; the brownish red vat dyes cotton the same color, changed in the air to a bluish rose. The corresponding deriv. from II, dark red, m. 368°; from III, $C_{28}H_{16}O_5N_2$, m. 331° (not sharply); the brownish red vat dyes cotton a pure red; because of impurities, the yield averages 55%, the highest being 80%. The by-products, one of which m. 293°, were not examd.

C. J. WEST

Comparison of boldine dimethyl ether with glaucine. KURT WARNAT. *Ber.* 59B, 85-6 (1926); cf. C. A. 20, 1405. The suggested identity of boldine di-Me ether with glaucine has been fully confirmed by direct comparison with a sample of glaucine supplied by Gadamer.

C. A. R.

Tetrahydroacridine, octahydroacridine and their derivatives. II. Resolution of the octahydroacridines (A) and (B). WM. H. PERKIN, JR., AND WM. G. SEDGWICK. *J. Chem. Soc.* 1926, 438-45; cf. C. A. 19, 521.—dl-Octahydroacridine (A) (m. 82°) is resolved by camphorsulfonic acid; the *l*-deriv., m. 85°, $\alpha_D -32^\circ$ (0.5 g. in 20 cc. EtOH); *d*-camphorsulfonate, m. 182°. The *d*-deriv., m. 84.5°, $\alpha_D 34^\circ$ (EtOH, c 2.5), 29° (Me_2CO , c 2.0); *d*-camphorsulfonate, m. 180°. Both active modifications undergo racemization on distn. and when equal amts. are mixed and recrystd. from Et_2O (m. 82.5°). 1-Octahydroacridine (B), m. 73°, $\alpha_D -24^\circ$ (EtOH, c 2.5), -19° (Me_2CO , c 1.0); *d*-camphorsulfonate, m. 172°; the *d*-base, m. 73°; $\alpha_D 22^\circ$ (EtOH, c 2). The salts of the B form are more sol. than those of the A form and the 2 may be sepd. by treatment with *d*-camphorsulfonic acid and crystn. from EtOH. $o-H_2NC_6H_4CHO$ (3 g.) and 1-methylcyclohexan-3-one (5 g.) heated at 100° for 1 hr. and at 130° for 1.5 hrs., give 3 g. 6(or 8)-methyltetrahydroacridine (I), m. 70-71°; picrate, yellow, m. 182°; reduction gives a mixt. of methyltetrahydroacridine (A), m. 92°, of which the *d*- and *l*-forms were prepd., m. 92°, $\alpha_D 20^\circ$ (EtOH, c 0.6) and -28° (EtOH, c 0.5) and the B form, m. 80°. I was also prepd. by heating 6(or 8)-methyltetrahydroacridinecarboxylic acid, yellow, m. 296° (decompn.) (from isatin and 1-methylcyclohexanone in 30% KOH) at its m. p. until the evolution of CO_2 ceased. Only the A form results when 6(or 8)-methyltetrahydroacridone is reduced by Na-Hg.

C. J. WEST

Tautomeric forms of 2,5-diketopiperazines and polypeptides. EMIL ABDERHALDEN AND ERNST SCHWAB. *Z. physiol. Chem.* 152, 88-94 (1926).—From enolized diketopiperazines the corresponding enolic dipeptides may be obtained by opening of the ring. The labile enol form of the anhydride undergoes cleavage much more readily than the stable keto form. In addn. to the isomers contg. double bonds between two pairs of carbons, other isomers representing the half enolized form and also double linkages between C and N are conceivable. By neutralizing an NaOH solution of the enol form of glycine anhydride with HCl and evapg. under diminished pressure, the unsatd. dipeptide was obtained. It decolorized $KMnO_4$ in the cold, gave the xanthoproteic and ninhydrin reactions, and dissolved in NaOH with intense yellow color which disappeared on heating. At 90-100° it rearranged to the keto form. It reacted with CH_3N_3 , but the resulting ether-ester could not be crystd. Enolized leucylglycine was obtained from the corresponding anhydride by hydrolysis and also by heating the ordinary dipeptide at 200° with Ph_3NH . It gave the same reactions as the enolic glycylglycine. A 0.05 *M* soln. was completely hydrolyzed by 0.2 *N* NaOH in 9 hrs. while the satd. form showed no hydrolysis in 15 hrs.

A. W. DOW

Decarboxylation of amino acids with formation of the corresponding amines and the preparation of the enol form of 2,5-diketopiperazines. EMIL ABDERHALDEN AND

Acetic anhydride and acetaldehyde from ethylidene diacetate. M. J. MARSHALL and G. S. SHAW. U. S. 1,578,454, March 30. H_3PO_4 is added to the ethylidene diacetate as a catalyst to facilitate its decompn. by heat.

Butyraldehyde. C. E. PIGG. U. S. 1,576,544, March 16. A mixt. of normal BuOH vapor and H₂O vapor is passed over a dehydrogenating catalyst such as one contg. Cu or brass at a temp. of 200-350° and the vapors are condensed.

Parabutyraldehyde. C. BOGIN. U. S. 1,576,503, March 16. H₂SO₄, ZnCl₂ or other acidic catalyst is added to butyraldehyde and the temp. of the mixt. is maintained at 15-50° until reaction is complete.

Oxalates from tree barks. W. A. FRAYMOUTH. U. S. 1,577,573, March 23. Bark of *Terminalia arjuna* or similar trees is crushed or ground to liberate oxalate crystals and the latter are recovered by froth flotation.

Dialkyl selenides and tellurides. C. A. HOCHWALT. U. S. 1,578,731, March 30. An alkali metal alloy such as one contg. Na and Se or Te is caused to react with a dialkyl sulfate, *e. g.*, R₂SO₄.

Symmetrical disubstituted thioureas. W. FLEMMING. U. S. 1,577,997, March 23. An amine, *e. g.*, aniline, is caused to enter into reaction with such amts. of aq. caustic alkali soln. and of CS₂ that the formation of thioureas and trithiocarbonate can take place simultaneously (equi-mol. proportions of amine, caustic alkali and CS₂ being used).

Benzoic acid. P. SEYDEL. U. S. 1,576,999, March 16. Toluene is oxidized to benzoic acid with 40% HNO₃ under a pressure of 10-80 lbs. per sq. in. in the presence of an oxide of Mn.

Oxidizing nitro aromatic compounds. E. R. MAXTED and B. F. COLE. Brit. 237,688, June 2, 1924. *p*-O₂NC₆H₄Me yields *p*-O₂NC₆H₄CO₂H when put in contact with an over Sn vanadate made by pptg. SnCl₄ with NH₃ vanadate in aq. soln.; *o*-ClC₆H₄Me yields *o*-ClC₆H₄CO₂H, nitronaphthalene produces nitrophthalic acid, nitroanthracene forms anthraquinone and *p*-nitrocinamic acid gives *p*-O₂NC₆H₄CO₂H. Other compds. which may be similarly oxidized include *o*- and *m*-nitrotoluene, nitroxylenol, nitro-mesitylene, nitrodurene, nitroethylbenzene, nitropropylbenzene and the corresponding halogen compds. Vanadates of Bi, Pb and Co also are referred to as suitable catalysts for oxidation of these and similar compds.

Nitroanisoles. E. H. WELTZ. U. S. 1,578,913, March 30. *o*-O₂NC₆H₄Cl is heated to 105-110° with MeOH in the presence also of H₂O and alkali metal hydroxide.

***o*-Benzylphenol.** W. KROPP, W. SCHRANZ and W. SCHULMANN. U. S. 1,580,053, April 6. PhOH is treated first with a benzyl halide and the resulting mixt. is then treated with a soln. of Ba(OH)₂ and heated. The cooled liquid is filtered and *o*-benzylphenol is sep'd from the filtrate by acidulation.

1-Phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone. G. LOCHMANN. U. S. 1,580,059, April 6. See Brit. 214,261. C. 1, 18, 2582.

11 - BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A- GENERAL

FRANK P. UNDERHILL

The permeability of protoplasm to ions. MARILDA M. BROOKS. *Am. J. Physiol.* **76**, 116 (1926).—An analysis of the author's data on the amts. of As found by chem. analysis in the protoplasm, sap and wall, resp., of *Lecania* shows that the penetration of As₂O₃ and As₂O₅ cannot be explained according to the hypothesis (advocated by Osterhout) that only undissoc. mols. can penetrate living protoplasm. M. M. B.

Mechanism of the action of proteolytic enzymes. P. GIEARD. *Bull. soc. chim. biol.* **8**, 30-4 (1926). Comment on Hugounenq and Loiseleur. C. 1, 19, 3499. A. T. C.

Primeverose, primeverosides and primeverosidase. M. BRIDEL. *Bull. soc. chim. biol.* **7**, 925-32 (1925). See C. 1, 19, 2514. A. T. CAMERON.

The comparative physiological importance of iron and of zinc. G. BLERAND and H. NAKAMURA. *Bull. soc. chim. biol.* **7**, 933-41 (1925). See C. 1, 19, 3418. A. T. C.

The constitution of proteolytic enzymes and the mechanism of their action. L. HUGOUNENQ and J. LOISELEUR. *Bull. soc. chim. biol.* **7**, 953-73 (1925). See C. 1, 19, 3499. A. T. CAMERON.

The unsaturated mono-ethylenic fatty acids. Physiological role of the ethylene function. E. ANDRÉ. *Bull. soc. chim. biol.* **7**, 974-1003 (1925). A review. A. T. C.

The effect of different hydrogen-ion concentrations on mitochondria in the liver cell. I. T. SCOTT. *Am. J. Anat.* **36**, 385-97 (1925). Mitochondria are best preserved (in physiol. salt soln.) when the pH of the soln. is between 7.5 and 8.6. A. T. CAMERON.

Application of the phenomena of fluorescence in biological chemistry. R. FABRE. *Bull. soc. chim. biol.* 7, 1024-38(1925); cf. *C. A.* 20, 545, 722.—Fluorescence can be used for the qual. and quant. detn. of hydrastine in urine, quinine in urine, salicylic acid in milk after absorption of aspirin, and hematoporphyrin in Harder's gland and in rabbit's bile after intoxication with sulfonal. A. T. CAMERON

Hematoporphyrin. I. Some optical properties of this pigment. Application to the measurement of hematoporphyrin in Harder's gland in the white rat. **II.** Study of the photosensibilizing action of hematoporphyrin on the red corpuscles. R. FABRE AND H. SIMONNET. *Bull. soc. chim. biol.* 8, 56-66(1926); cf. Fabre, *C. A.*, 20, 545, 722, and preceding abstr.—By using the spectrophotometric detn. of the partition of intensity on the fluorescent spectrum, the quantity of hematoporphyrin in Harder's gland in the white rat is per pair of glands of mean wt. 0.18 g. from 1.25 to 1.5×10^{-6} g. The photosensibilizing action appears to be exclusively produced by radiations from the yellow region of the spectrum. A. T. CAMERON

Buffers in the study of proteases. I. Comparative study of methods of measuring p_H when determining pepsin by the Gross method. I. A. SMORODINTZEV AND A. N. ADOVA. *Bull. soc. chim. biol.* 7, 1060-7(1925).—Colorimetric detns. of p_H with methyl violet agree satisfactorily with electrometric measurements, with Gross' method. Methyl violet is unsatisfactory in the presence of glycerol. Casein solns. prepd. by the procedure of Gross possess a p_H almost permanent, and unaffected by boiling. Diln. of natural and artificial gastric juices with H_2O increases the p_H , as does preservation. Boiling does not influence it. A mixt. of casein and pepsin following the procedure of Gross has a p_H 1.04, which is scarcely altered during digestion. A soln. of casein in HCl possesses feeble buffer properties. **II.** Influence of buffers on the digestion of casein by pepsin. *Ibid* 1068-70; cf. *C. A.* 20, 211, 214.—The buffers HCl/glycine (p_H 1.14), HCl/HCl (1.2) and HCl/citrate (1.14 and 1.274) neither retard nor accelerate the digestion of casein by pepsin in the procedure of Gross. A. T. CAMERON

The sugars furnished by gein (geoside); preparation of vicianose by enzymic hydrolysis of this glucoside. H. HÉRISSEY AND J. CHEYMOL. *Bull. soc. chim. biol.* 8, 50-5(1926).—See *C. A.* 20, 435. A. T. CAMERON

The presence, in emulsin of almonds, of two new enzymes, primeverosidase and primeverase. M. BRIDEL. *Bull. soc. chim. biol.* 8, 67-70(1926).—See *C. A.* 19, 2514, 20, 435. A. T. CAMERON

The oxygen content of methemoglobin. M. NICLOUX AND J. ROCHE. *Bull. soc. chim. biol.* 8, 71-97(1926).—See *C. A.* 19, 3302, 3530. A. T. CAMERON

Methemoglobinization: action of hydroxylamine on hemoglobin. J. ROCHE. *Bull. soc. chim. biol.* 8, 98-112(1926).—A quant. study of the action suggests that it is most correctly represented by the equation. $11NH_2OH + 6HbO_2 \rightarrow 11b + 5HbO + 2N_2 + 3NH_4NO_3 + 9H_2O + NH_3$. A. T. CAMERON

New experiments simulating living objects. HERRERA. *Compt. rend.* 182, 462 (1926).—Two solns. are required: (1) gasoline 100 cc., olive oil 50 cc. and (2) NaOH 14 g., rhodamine 1 g., H_2O 100 cc. A few drops of soln. (2) are poured on soln. (1). The drops subdivide, move about slowly, elongate, form vacuoles and constantly change shape, in general closely simulating amebic forms. The smallest droplets resemble infusorial forms, ascending and descending. The phenomena last for some time, even for 1 hr. if the oil is only 5%. The movements probably originate from diffusion currents, changes in the osmotic pressure, and surface tension and other phys. chem. influences. C. C. DAVIS

Maltase. VIII. Direct fermentation of maltose by yeast rich in maltase. RICHARD WILLSTÄTTER AND EUGEN BAMANN. *Z. physiol. Chem.* 152, 202-14(1926); cf. *C. A.* 20, 1244.—With yeasts rich in maltase the optimum p_H for fermentation of maltose is 4.5 and at this acidity the activity of maltase is completely suppressed. Hence when maltose is fermented in acid medium the fermentation is a direct one and not preceded by hydrolysis. In the fermenting medium the enzyme would meet more favorable conditions than those under which the enzyme detn. is performed, since fermentation continually removes inhibitory products. This fact does not, however, invalidate the conclusion stated above, since the amt. of inhibitory cleavage products is very small in the 1st part of the expt. and yet even here hydrolysis is much less than the fermentation in the parallel expt. Maltose fermentation occurs over a wide p_H range, e. g., 3.0-6.5, without much influence on the rate. The induction period is very small, especially with p_H optimum. Distillery yeasts poor in maltase also ferment maltose, but the optimum here is p_H 3.5 and the induction period is much greater. A. W. DOX

Cytochrome, the porphyratin formed by its cleavage, and the related porphyrin

O. SCHUMM. *Z. physiol. Chem.* **152**, 147-59(1926) —Cytochrome, the respiratory pigment recently described by Keilin (*C. A.* **20**, 58), is probably closely related to, if not identical with myohematin. The presence therein of an Fe-pyrrole complex is now established by the prepn. of a porphyratin which may be obtained from plant sources, e. g., sugar beet, in a yield corresponding to the intensity of the cytochrome spectrum. Treatment of the porphyratin with $(\text{NH}_4)_2\text{H}_2\text{O} + \text{AcOH}$ splits off a porphyrin-like pigment which spectroscopically resembles α -porphyrin. Introduction of Fe then gives a porphyratin apparently identical with α -hematoporphyrin. Fischer's conclusion that porphyrin synthesis by yeast does not progress beyond the coproporphyrin stage is contradicted by a study of numerous yeast samples from various distilleries. The spectra of the pyridine exts. revealed without exception a predominance of porphyratin, and the presence of porphyrin could be demonstrated only by recourse to AcOH and Et_2O extns.

A. W. DOX

Plant proteases. IV. The ereptic components of some plant proteases. RICHARD WILLSTÄTTER, WOLFGANG GRASSMANN and OTTO AMBROS. *Z. physiol. Chem.* **152**, 160-3(1926); cf. *C. A.* **20**, 1245 —The instability of erepsin must be taken into account when examg. plants and fruits for their protease components. The dry enzyme prepn. from pineapple is without action on dipeptides, while the freshly pressed juice is active. A difference in activity was noted between the juice of fresh and that of wilted fruit. Pumpkin protease was active toward leucylglycine, although this action was feeble compared to that of its other protease components. Erepsin could not be demonstrated in commercial dry prepn. of papain, but the possibility remains that it may be found in the fresh latex of the immature fruit. The ereptic component of yeast protease is characterized by instability. **V. The individuality of some plant proteases.** *Ibid.* 164-82.—In his early work on plant proteases Vines ascribed peptone formation and peptone cleavage to 2 sep. enzymes. These he claimed to have sep'd. by extn with 2% NaCl. Quant. methods for estimating enzyme action were not employed. It is now shown that the tests used by Vines for distinguishing the 2 supposed enzymes, viz., the digestion of fibrin and the color test for tryptophan, were of such unequal delicacy that a negative tryptophan test was not valid. Moreover, in the fibrin test an enormous excess of enzyme was used, so that a considerable loss resulting from the NaCl treatment would not have been apparent here, but would have rendered the tryptophan test subliminal. Far more satisfactory for purposes of comparison is the present method of detg. the loss in wt. of fibrin and the increase of free carboxyls in peptone or gelatin by titration in alc. soln. Dried fibrin, thoroughly ground and passed through a 0.2-mm. sieve, is preferable to fresh fibrin. After the digestion with enzyme prepn. the mixt. is filtered, the residue dried and weighed and the loss calcd. By using these quant. methods for detg. peptone formation and peptone cleavage no evidence could be obtained of any sep'n. of enzyme components by means of NaCl extn. or alumina and kaolin adsorption. Papain digests fibrin at the p_{H} optimum of 7.1 to about 60%, after which further digestion proceeds with extreme slowness. Papain activated by HCN, on the other hand, digests fibrin completely and at a uniform rate. The fibrin residue is attacked only with difficulty by further treatment with fresh papain, but readily by papain-HCN. The duration of the HCN activation has no distinct influence on the hydrolysis. Pumpkin protease, the optimum of which is also at p_{H} 7.2, attacks fibrin more readily than other substrates. The action of papain on peptone, even after the HCN activation, is relatively slight, and the negative tryptophan reaction of Vines is not conclusive. The p_{H} optimum here lies between 5.0 and 5.2. By using Vines's method of fractionation of enzyme prepn. by means of NaCl extn. the relative activity toward fibrin and peptone remained the same in all fractions. Unlike trypsin, the adsorption of papain by $\text{Al}(\text{OH})_3$ occurs most readily from NH_4OH soln. especially in the presence of EtOH . Elution by 0.02 N AcOH then yields a more active prepn. but the relative activity toward fibrin and peptone remains const. Pumpkin protease is more readily adsorbed from acid soln., and here again the residual soln. and the adsorbate show the same relative activity toward fibrin and peptone. With kaolin the reaction of the medium has little influence on the adsorption. Fibrin itself adsorbs papain but does not effect any sep'n. of the supposed components of the enzyme. The digestion products which are formed during the adsorption pass into the residual soln. and appear to inhibit the digestion of fibrin more than that of gelatin. NaF is without influence on peptone digestion by papain with or without HCN, but inhibits somewhat the digestion of fibrin by papain-HCN.

A. W. DOX

Porphyrins from blood pigment. IV. The constitution of the porphyrins. ARNO PAPENDIECK. *Z. physiol. Chem.* **152**, 215-29(1926); cf. *C. A.* **19**, 303, 2674; **20**, 770.—In Willstätter's structural formula for hematoporphyrin the 2 hydroxymethyl side chains

are assumed to originate with hydration of an ethine bridge within each of 2 pyrrole rings in the hemin mol. The presence of unsatd. side chains is now generally accepted, and even an acetylenic linkage in the case of ooporphyrin, but the assumption of an ethine bridge in the Fe complex of a porphyrin or even in the more intricate structures of the blood pigments is no longer justified. Expts. with electrolytic and catalytic hydrogenation of several porphyrins throw some light on certain structural relationships in which the unsatd. side chain is concerned. Hemateric acid yielded meso-porphyrin, Nencki's hematoporphyrin gave a new deriv. for which the name *oxymeso-porphyrin* is proposed, and hemoporphyrin gave mesoporphyrin or a porphyrin indistinguishable from it, when hydrogenated by either method. These transformations confirm the existence of 1 or more unsatns. in the side chains of the porphyrins.

A. W. DOX

Temperature inactivation of sucrase. HANS V. EULER AND KARL JOSEPHSON. *Z. physiol. Chem.* **152**, 254-63(1926); cf. *C. A.* **19**, 2675.—Partial inactivation of sucrase by heating in aq. soln. and at optimum acidity effects no change in the affinities of the enzyme for the different forms of glucose or for fructose. Even in the presence of glucose or fructose as protective substance the heat inactivation causes no appreciable change in the affinity relations. If the inactivation can be traced to an alteration of the "colloidal carrier" of the enzyme complex, this denaturing process should not result in any alteration of the sp. properties of the enzyme portion designated as substrate-binding groups.

A. W. DOX

Fermentation of galactose by yeast after preliminary treatment with this sugar. II. HANS V. EULER AND RAGNAR NILSSON. *Z. physiol. Chem.* **152**, 249-53(1926); cf. *C. A.* **19**, 2834; **20**, 929.—In addn. to the numerous differences previously observed between top yeasts and bottom yeasts it is now shown that the capacity to ferment galactose is acquired much more slowly by the former than by the latter. The varieties tested were distillery top yeast R and brewery bottom yeast II, which are believed to be representative of the 2 types employed industrially throughout Germany and Sweden. English top yeast differs in many respects from German top yeast, and possibly might show a difference also in its response toward the galactose treatment.

A. W. DOX

Protein chemistry. III. The constitution of the proteins. PERCY BRIGLE AND ROBERT HELD. *Z. physiol. Chem.* **152**, 230-48(1926).—Various conceptions of protein structure have been advanced from time to time. These include polypeptide chain, pyrrole rings, oxazoline rings and diketopiperazine rings. No direct evidence of the presence of pyrrole or oxazole nuclei has yet been presented, and the evidence in favor of the diketopiperazine structure is not considered altogether conclusive. A serious objection to all of these modes of linkage of the component amino acids is the O:N ratio, which in proteins varies from 1.28:1 in lactalbumin to 1.12:1 in elastin. In regard to the extra O in the terminal COOH, which in a large complex would be negligible, the O:N ratio for the acid-amide or diketopiperazine structure should be 1. Hydroxyamino acids are not known to be present in sufficient amt. in proteins to account for the higher O:N ratio. In lactalbumin, for example, the known cleavage products account for 84.2% of the protein, and here the extra O of hydroxyglutamic acid is offset by the additional N of the diamino acids. As a working hypothesis the possibility is suggested that shorter polypeptide groupings may occur in parallel chains connected by a CO bridge. Two possibilities then arise, (1) the linkage of terminal NH₂ groups through CO to form urea complexes and (2) ester-like complexes between the terminal carboxyls and polyatomic alcohols. Such a structure would be in harmony with the occurrence of polypeptides among the cleavage products of proteins and with the susceptibility of proteins to hydrolysis by enzymes. The expts. described deal with the behavior of simpler complexes of this type, viz., carbonyl-bis(dipeptide) toward C₆H₅(CO)₂O fusion, NaOBr and pepsin. These reagents were selected because they act upon proteins without attacking the polypeptide linkage. Fusion of the ester of carbonyl-bis(glycylglycine) (I) with C₆H₅(CO)₂O breaks down the urea linkage with formation of phthalylglycylglycine ester. The failure of NaOBr to act on I is due to the insol. of the latter, since it readily decomps. the free acid liberating CO₂ and N, then splitting the peptide if an excess of the reagent is employed. Neither I nor its free acid is, however, attacked by pepsin. No significance should be attached to this negative result until other carbonylbispeptides have been tested, since glycolic derivs. might be expected to exhibit anomalous behavior.

A. W. DOX

The enzymes contained in taka-diastase preparation. TOKUTSCHI SANO. *J. J. Shp. Tokyo* **42**, 730-4(1922); *Japn. J. Med. Sci.* **2**, 25-6.—S. detected catalase

lactase and emulsin, besides maltase, invertase, trypsin, lab, erepsin, lipase, hemolysin, adrenalase, glucoisomaltase etc., which had been found before.

Chemical constitution of spermine. II. The methylation of spermine. H. W. DUDLEY AND OTTO ROSENHEIM. *Biochem. J.* **19**, 1032-3 (1925); *C. A.* **19**, 1117. By methylating spermine, $C_{30}H_{52}N_4$, ten methyl groups are taken up, giving a quaternary ammonium base, $C_{20}H_{60}N_4(OH)_4$ and indicating that two of its N atoms are primary while the other two are secondary.

Notes on spermine. H. W. DUDLEY AND OTTO ROSENHEIM. *Biochem. J.* **19**, 1034-6 (1925).—Spermine is identical with musculamine, neuridine and gerontine, bases which have been obtained from calf muscle, human brain and dog liver, resp., by earlier investigators. Spermine is absent from bull semen, ox blood, cow milk and hen egg (cf. preceding abstr.).

Tyrosinase, its action on phenols and on tyrosine and other amino acids. R. A. MCCANCE. *Biochem. J.* **19**, 1022-31 (1925), cf. *C. A.* **19**, 2060. All the aerobic expts. were done in Barcroft differential micro respirometers and the anaerobic expts. in Thunberg vacuum tubes. Tyrosinase catalyzes the reduction of methylene blue by a soln. at pH 8 to p -cresol + glycine. When tyrosinase acts on tyrosine the action depends upon the fact that the latter is both an amino acid and a phenol, the amino acid acts as a coenzyme for the oxidation of the phenol. The spontaneous oxidation of the phenols exand. is independent of KCN.

A further note on the kinetics of enzyme action. G. E. BRIDGES. *Biochem. J.* **19**, 1037-8 (1925); cf. *C. A.* **19**, 2060.—A further modification of the equation of Michaelis and Menten (*C. A.* **7**, 2232).

Interaction of free amino nitrogen and glucose. HENRY BORSOOK AND HAROLD P. WASTENEYS. *Biochem. J.* **19**, 1128-37 (1925).—In alk. soln. in the presence of glucose, the free amino N of glycine and of complex derivs. of protein (peptic digest of albumin, Witte peptone and Parke-Davis peptone) was found to decrease, and the mixts. acquired the property of reducing methylene blue, which, in some cases, is accelerated by phosphate.

Oxidation of acetoacetic acid and ester by hydrogen peroxide and its biochemical significance. P. W. CLUTTERBUCK AND H. S. RAPER. *Biochem. J.* **20**, 59-68 (1926). An aq. soln. of the Na compd. of acetoacetic ester, or of the acid, is readily oxidized by H_2O_2 in the cold. On distg. the products of the reaction under reduced pressure, the aq. distillate reduces Fehling soln. in the cold and gives an osazone. From it mono-hydroxyacetone (acetol) was isolated. In addition, by subsidiary reactions, the following substances are produced: diacetylsuccinic acid, acetylacetoacetic acid, acetylacetylacetone, acetic acid, glyoxylic acid and oxalic acid. The authors discuss the mechanism of the reaction in relation to the later stages of β -oxidation, the possible derivation of carbohydrate from acetoacetic acid and a mode of origin of substituted pyrroles in living organisms.

Nature of the action on a photographic plate of sawdust and cholesterol irradiated by a mercury vapor quartz lamp. N. S. LUCAS. *Biochem. J.* **20**, 23-5 (1926). The action on a photographic plate of sawdust after irradiation by ultra-violet rays is not due to any secondary radiations given out by it (Hume and Smith, *C. A.* **19**, 1150), but probably to the production and subsequent gradual emanation of either H_2O_2 or O_3 (see Russell, *Proc. Roy. Soc. London* **74**, 131 (1906)). Similar expts. were carried out on cholesterol. This substance was melted on a roughened glass plate, and after irradiation placed in contact with a photographic plate. The fog produced was intense. When, however, the plate was sep'd. by quartz, no fogging occurred.

Tyrosinase-tyrosine reaction. IV. Note on the identity of tyrosinase from different sources. H. S. RAPER AND H. B. SPEAKMAN. *Biochem. J.* **20**, 69-72 (1926), cf. *C. A.* **18**, 402. —R. and S. prep'd. tyrosinase from the mealworm (*Tenebrio molitor*) and *Agaricus do.ophilus*. In each case the enzyme produced the same red comp'd. with tyrosine. These results contradict Gortner's expts. (*C. A.* **20**, 210).

Production in vitro of black pigments derived from hemoglobin. II. G. VERNONI. *Sperimentale* **70**, 1013-5 (1925), cf. *C. A.* **19**, 1577. —In the presence of serum and $HCHO$ an alc.-HOAc soln. of hematoporphyrin gives black granules much like those previously obtained with hemoglobin. Chlorophyll does not yield granules.

Separation of the lactic-acid-forming enzyme from the muscle; some of its properties. OTTO MEYERHOF. *Naturwissenschaften* **14**, 190-8 (1926). —By careful extn. at -1° or -2° with isotonic KCl soln. of chopped frog muscle and sharp centrifugation, a transparent granula-free ext. can be obtained of strong enzymic activity. It is almost free from cleavable carbohydrate and forms hardly any lactic acid spontaneously. The following results were obtained with it: Lactic acid is formed from glycogen or

starch at a slowly decreasing rate of 0.15 to 0.2% per hour (calcd. on wt. of fresh muscle) at 20° and p_H 7.4, *i. e.*, about $\frac{2}{3}$ of the spontaneous action of the cut muscle. The cleavage velocity of the first ext. is 5 times as high calcd. on dry substance as that of minced muscle, 100 times more than that of intact muscle. The enzyme is sol. in water, precipitable with acetone and can be dried with ether, retaining $\frac{1}{3}$ of its activity. Kept on ice the ext. loses its activity in $\frac{1}{2}$ day, instantaneously at 37°. It is filtratable through a Berkefeld candle and separable by ultrafiltration from the coenzyme (*C. A.* 16, 2545), which is essential to its action. The enzyme attacks hexoses (also glucose) and disaccharides (maltose, amylobiose) (*cf. Laquer, C. A.* 16, 2545) weakly. For moderate concns. (0.2 to 0.5%) the rate of lactic acid formation from glycogen, starch, amylopectin, amylose or trihexosan is about the same (dihexosan acts less vigorously); the last substances react at higher concns. (1 to 2%) more strongly than glycogen. Lactic acid is also formed by it from hexosediphosphoric acid (from yeast) and its products: fructosemonophosphoric acid (Neuberg) and hexosemonophosphoric acid (Robison). The action on starch or glycogen is, however, more vigorous, showing that the phosphoric esters are not intermediates. Addn. of phosphoric acid to the ext. somewhat reduces the initial speed of the action in glycogen, but increases the final yield.

B. J. C. VAN DER HOEVEN

Structural problems of protein chemistry from an enzymic point of view. ERNST WALDSCHMIDT-LEITZ. *Naturwissenschaften* 14, 129-33(1926).—A review (*cf. C. A.* 19, 3496, 2678; 20, 921). The proteolytic enzymes are divided into 4 groups; the sp character of enzyme action is emphasized and from it is concluded that the new conception of proteins as polymerized diketopiperazines cannot in its simple form account for the facts.

B. J. C. VAN DER HOEVEN

Changes in the colloidal condition of serum proteins under physical influences. III. I. PETSCHACHER. *Z. ges. expl. Med.* 47, 348-58(1925).—Detn. of the serum proteins and of the sp. viscosity indicate the changes in the colloidal condition of native serum brought about under the influence of time, heating to 56°, shaking and irradiation with ultra-violet and X-rays. In all cases there was an increase in viscosity and precipitability with $(NH_4)_2SO_4$ without any marked change in total protein. The changes were greatest on heating, less on standing and least by shaking and irradiation. The changes in colloid condition under physical influences seem to be similar in nature but proceeding at different rates. There is a progressive change in the structure of the protein mol., until it is finally denatured. The assumption of a change of albumin into globulin is unnecessary and unsubstantiated.

HARRIET F. HOLMES

Notes on tectin. E. BRESSLAU. *Verh. deut. Zool. Ges.* 29, 91-4(1924); *Ber. ges. Physiol. expl. Pharmakol.* 29, 703(1925).—Pure tectin is prepd. by heating a dense washed culture of colpidium 0.5-1 min. to 36°, then rapidly to 75°, centrifuging the aq. soln. and pptg. the pure tectin with coagulants. Yield: 1 g. from 750 l. culture. The white amorphous powder gives all protein reactions and Molisch's carbohydrate test. It is probably a mucin. Serum in diln. 1:5000 also causes sepn. of tectin from colpidium. Sp. immune serum is pptd., whereby tectin acts as the antigen. The serum obtained by previous treatment with colpidium cultures has also an agglomerating effect. This is probably a common property of all protozoa and was demonstrated particularly for trypanosomata.

MARY JACOBSEN

Metal-albumin compounds. The ultra-violet absorption spectrum as a means of discrimination between adsorption and chemical reaction. A. RONCATO. *Arch. sci. biol.* 6, 263-77(1924); *Ber. ges. Physiol. expl. Pharmakol.* 31, 329(1925).—The compd. formed by shaking egg albumin with Fe powder is an adsorption compd. Its ultra-violet spectrum is the same as that of albumin, while the addn. of a trace of ionized Fe is sufficient to produce an essential change. Oxyhemoglobin shows the same behavior. Starch forms an adsorption compd. with I without any change in the ultra violet spectrum.

MARY JACOBSEN

The occurrence and significance of enzymes in the human skin. ERICH KLOPSTOCK AND A. BUSCHKE. *Dermatol. Wochschr.* 79, 1485-7(1924); *Ber. ges. Physiol. expl. Pharmakol.* 31, 714(1925).—The skin has its own enzymes. The diastase content is the same for the entire skin; lipase, phenolase and tryptase show higher values for the skin of genital organs. The latter and the sole have the highest nuclease content.

MARY JACOBSEN

The liver and spleen pigments of the toad. HIROO OKAMOTO. *Frankf. Z. Pathol.* 31, 16-53(1925); *Ber. ges. Physiol. expl. Pharmakol.* 31, 820(1925).—The 2 pigments, hemosiderin and a decompn. pigment, occur chiefly in the endothelial cells of the liver and in the reticular cells and splenocytes of the spleen, in quantities subject to seasonal variations. The hemosiderin content of spleen and liver is low during the summer.

and remarkably high during the mating period. The decompn. pigment suffers parallel variations in the liver, while its content in the spleen is higher in summer than during hibernation. Spleen atrophy during hibernation is possibly related to these phenomena. The liver may vicariously take care of some functions of the spleen.

The buffering properties of serum proteins. MARY JACOBSEN. *Biochem. Z.* 163, 470-5 (1925).—By a detn. of the buffer value of serum, its ultrafiltrate, and the residue from the ultrafiltration, it is shown that the buffering of the serum is dependent only in small part upon phosphates or other salts of the serum, but in large part upon the protein or non-diffusable fraction.

Oxidation of dihydroxyacetone and glyceraldehyde in phosphate solutions, and the catalysis of the oxidation by heavy metals. F. WIND. *Biochem. Z.* 159, 58-67 (1925). The oxidation of mol. O of dihydroxyacetone and glyceraldehyde in phosphate soln is 20-30 times faster than for fructose. The oxidation is catalyzed by metals, especially Cu, but is slowed up by KCN and $\text{Na}_4\text{P}_2\text{O}_7$.

Enzymes of the skin. III. J. WOHLGEMUTH. The enzyme content of fresh skin of man and animals, and the influence of different kinds of light upon the skin. N. SUGIHARA. *Biochem. Z.* 163, 260-70 (1925); cf. *C. A.* 19, 2368.—The enzymic activity of the skin of the cow, swine, goat, sheep, dog, rabbit, cat, guinea pig, rat, hen, fish and frog are compared with respect to diastase, phenolase, gelatinase, and lipase. The skin of the rat is very rich in diastase and phenolase. There is no parallelism between the activity of the skin and of the blood. Irradiation of the skin with natural and artificial sunlight causes an increase of phenolase but a decrease of diastase and lipase activity, while ultra-violet light causes a decrease of the activity of phenolase, without affecting that of diastase and lipase.

Activity and heat stability of enzymes. Relation between rennet and pepsin. J. WOHLGEMUTH AND N. SUGIHARA. *Biochem. Z.* 163, 253-9 (1925).—Salts which activate diastase render it more stable to heat. The effect of heat upon the protective action of CaCl_2 , $\text{Ca}(\text{NO}_3)_2$, MgCl_2 and $\text{Mg}(\text{NO}_3)_2$ with parachymosin, chymosin, rennet and pepsin indicates that the protective action of CaCl_2 is not due alone to the Ca ion. The difference in behavior of the enzymes shows that pepsin and rennet are not the same, but instead are 2 distinct enzymes.

Enzymes of the human mammary gland. R. TATEYAMA. *Biochem. Z.* 163, 297-307 (1925).—The lactating mammary gland of the human is active with respect to nuclease, phosphatase, diastase, tributyrase and phenolase. It also decomposes a number of sugars into AcH.

Dialyzability and adsorbability of insulin. ELISABETH DINGEMANSE. *Biochem. Z.* 163, 412-21 (1925).—Insulin does not diffuse or electro-dialyze through collodion membranes, and diffuses only to a slight extent through parchment. However, it does flocculate at the cathode with the protein when electro-dialyzed in HCl soln. This pptn cannot be used further to purify the insulin. Insulin solns. with 0.06 to 0.5 mg dry substance per unit are only slightly adsorbed on kaolin in acid or in Na_2CO_3 soln. But upon charcoal, it is adsorbed either from an acid or neutral soln. This adsorbed material cannot be removed by 80% alc. or by solns. buffered at $p_{\text{H}} = 8.0$. Nor does AcOH always remove the adsorbed insulin from charcoal. **Behavior of insulin toward heat and some of its chemical properties.** ELISABETH DINGEMANSE. *Ibid.* 422-7.—Insulin may be heated for $1\frac{1}{4}$ hrs. on a H_2O bath without loss of activity and in N/100 HCl solns. is $\frac{1}{3}$ destroyed by heating for 2 hrs. If insulin is treated with Ac_2O , AcCl or BzCl , its activity is destroyed.

Remark upon the work of M. Dixon and S. Thurlow and that of G. Ahlgren. O. WARBURG. *Biochem. Z.* 163, 252 (1925), cf. *C. A.* 19, 303, 1901.—The system liver mash + hypoxanthine apparently is not part of a respiratory mechanism, since it is not affected by HCN. Methylene blue and oxygen cannot be expected to behave similarly as oxidizing agents in cells, as is implied by Ahlgren.

A tartarylhematin. S. HADIC. *Biochem. Z.* 163, 233 (1925).—Hemin from sheep's blood is treated with 4% tartaric acid in MeOH, and the soln. gently warmed, when micro-crystals of a tartarylhematin sep. from the soln. Analyses indicate that 4 hemin mols. may be present per mol. of the tartarylhematin.

Importance of the study of ions. ALBERT FARINE. *Rech. Ind. Schweiz. Chem.-Ztg.* 1926, 28-31.—Brief explanation of what ions are, with a brief discussion of their importance in physiology, pharmacology, food chemistry and medicine in general.

The effect of exposure period and temperature on the photosensory process in Ciona. S. HEGHT. *J. Gen. Physiol.* 8, 291-301 (1926). The latent period in the photosensory response of the tunicate, *Ciona*, is inversely proportional to the duration of the exposure

period to light. The velocity of the chem. reaction which detcs. the latent period is directly proportional to the concn. of photochem. products formed during the exposure period. Two processes in the form of a coupled photochem. reaction probably govern this response; the secondary reaction proceeds only in the presence of products from the primary reaction. The coupling may be a catalysis or a direct chem. relation. The relation between temp. and the latent period follows the Arrhenius equation in which $\mu = 16,200$. On this basis, the process governing the latent period is tentatively identified as an oxidation reaction catalyzed by Fe. The photocatalytic properties of certain Fe compds. are used as a model for the chem. reactions controlling the photo-sensory mechanism of *Ciona* and *Mya*. CHAS. H. RICHARDSON

Time relations of growth. I. Genetic growth constants of animals. S. BRODY *J. Gen. Physiol.* **8**, 233-51(1926).—Growth is conceived as a complex physiochem. process, the velocity of which is limited or governed, during any given phase, by a single master reaction. The time relations of each phase may be represented by an expression that represents the time relations of a single limiting reaction. The growth curve indicates that there are several consecutive phases of growth each of which has its particular velocity const. Two growth consts. are given for each of several species of mammals including man and methods of computation are discussed. C. H. R.

Studies on the formation and ionization of the compounds of casein and alkali. IV. The transport numbers of the compounds of casein with the alkali earth elements. D. M. GREENBERG AND C. L. A. SCHMIDT. *J. Gen. Physiol.* **8**, 271-8(1926); cf. *C. A.* **14**, 1434.—The values for the transport nos. of casein in solns. contg. alk. earth elements are abnormally high as compared with those obtained for casein in solns. of alkali metals. This is probably due to the fact that part of the base is bound by the casein ion in the form of complex ions. These complex ions probably have a definite chem. compn. CHAS. H. RICHARDSON

Enzyme effect and ionic antagonism. R. HÖBER AND A. SCHÜRMEYER. *J. Gen. Physiol.* **8**, 265-9(1926).—Invertase (from yeast) is sensitive to salts only in the presence of colloids such as gelatin, albumin, globulin and lecithin. Under these conditions its activity is reduced by the salts. The invertase-globulin and invertase-lecithin complexes show an ionic equil. in the form of a physiol. cation antagonism. At certain concns., Na and K on the one hand, and Mg, Ca, Sr, Ba, Al, and La on the other, inhibit one another; by observing these relations the invertase reaches its optimum activity. The salt inhibition and the cation antagonism are lacking on the acid side of the isoelec. point of globulin and lecithin. CHAS. H. RICHARDSON

The influence of electrolytes upon the electrophoretic migration of bacteria and of yeast cells. C. E. A. WINSLOW AND E. H. FLELSON. *J. Gen. Physiol.* **8**, 195-214 (1926).—The effect of electrolytes on electrophoretic charge is probably essentially the same for silica dust, bacteria and yeast cells. The normal negative charge is slightly increased by very low concns. of electrolytes, and markedly so in the case of yeast cells. Higher concns. of electrolytes cause a marked decrease in negative charge; this may at times lead to an isopotential condition or reversal of charge. The effect is probably due to the cation and increases with the valency, but the H ion shows exceptional activity. NaOH behaves like an ordinary univalent salt and increased alk. does not further depress the charge already depressed by salts. Because of the activity of the H ion, increased acidity does not further depress the charge even in salt solns. NaCl exerts less influence on the charge either in high or low diln. than the other compds. with the univalent ions studied. KCl is distinctly more effective than NaCl. Moderately high concns. of electrolytes depress the charge on yeast cells more than on *B. coli*. Silica dust is less affected by univalent and bivalent ions than are yeast cells, but is more affected by $AlCl_3$ than yeast cells or *B. coli*. High concns. of $AlCl_3$ decrease the positive charge produced by moderate concns. Org. substances do not affect electrophoretic velocity till they reach a concn. at which viscosity changes are involved. The following results are in accord with the Donnan theory of equil. as worked out by Loeb (*Proteins and the theory of colloidal behavior*, 1922): (1) the increase in charge as the result of small addns. of electrolytes; (2) the marked decrease in charge with further concn. of electrolytes depending on the valency of the cation. Certain difficulties with this theory as applied to colloidal particles are discussed. C. H. R.

Application of the theory of quanta to peripheral vision. P. LAZAREV. *J. Gen. Physiol.* **8**, 189-93(1926).—This is an extension of a theory of vision previously described (Lazarev, *Arch. ges. Physiol.* **154**, 310, 1913; cf. *C. A.* **8**, 1288; *Ionen-theorie der Reizung*, *C. A.* **17**, 2719). If the chem. formula of visual purple is A, that of its photochem. product B, that of the sensitive substance which under the action of B gives stimulating ions C, and D, stimulating products from C, then: $A \rightarrow P$

$C \longrightarrow D$. B acts as a catalytic agent for the reaction in C and $C \longrightarrow D$ is an autocatalytic reaction. "Every quantum of light energy absorbed by the rods produces a mol. of B , and the mol. of B produces in that of C a mol. of stimulating substance D . D produces in the substance C an acceleration of the reaction and the complete destruction of the substance C in an illuminated rod is produced. In the same time the visual purple is also destroyed." The theory is modified to account for dark adaptation.

CLARA H. RICHARDSON

Isolation of an extremely active non-phosphorized anticoagulant, by prolonged autolysis of organs. DOYON AND I. VIAL. *Compt. rend.* 182, 112-114 (1926), cf. C. A. 19, 1296.—Horse intestine was washed, hashed, and mixed with 2 l. of 0.5% NaCl soln. and 150 to 200 cc. of CHCl_3 for each kg. of tissue. The mixt. was placed in large well stoppered bottles and was allowed to autolyze 3 or 4 months (temp. not stated). The mixt. was then filtered and to the filtrate was added an equal vol. of 95% alc. when a ppt. formed which contained 7 to 8% of P. This ppt. was centrifuged and taken up with warm water when the mixt. was heated on the boiling water bath for at least 1 hr. A ppt. of phosphatides and other material was formed which was filtered out and alc. was added to the filtrate. If a ppt. was formed the process was repeated. If no ppt. was formed there was added to the filtrate in addition to the alc. it already contained, 2 vols. of alc. contg. 1 to 2% AcOH or HCl when the active substance was pptd. This was purified by washing with alc. in the centrifuge until neutral to litmus, then washing with Et_2O and drying in a vacuum. One g. of the substance *in vacuo* prevents the coagulation of 3 liters of blood and sensibly retards the coagulation of 10 l. The substance is acid, slightly sol. in water, and sol. in alk. solns. from which it is reprecipitated by acidified alc. It contains N but not P and it does not reduce Fehling's soln.

I. W. RIGGS

Invisibility of certain flocculates. AUGUSTE LUMBERT. *Compt. rend.* 182, 286-7 (1926).—Serums contg. gelose or starch are toxic, but after prolonged centrifugation become non-toxic. If sugar is added to the serum contg. gelose or starch so as to raise the density to 1.050, the toxicity is not removed by centrifuging.

I. W. RIGGS

Organic autoregulation and the biologic applications of the theorem of LeChatelier. A. LABBÉ. *Rev. gen. sci.* 37, 38-43 (1926).

I. W. RIGGS

Hemochromogen and hemoglobin. KESLER 10. Effect of the phenoxyl group on taste (LANGE, REED) 10. Specificity of the α -phenolase from yeast (HELFERICH, et al) 10.

TAYLOR, E. M. The Toxicity of Acids Toward Yeast and Other Papers from the Department of Chemistry. Toronto Univ. of Toronto Library. \$0.50.

WAKSMAN, SELMAN, AND DAVISON, WILBERT C. Enzyme: Description, Distribution, Principles, Methods and Applications. Baltimore: The Williams & Wilkins Co.

B. METHODS AND APPARATUS

STANLEY R. BENEDICT

Characterization of hematoporphyrin and urobilin in urine by means of Wood's light. A. POLICARD AND A. LEULIER. *Compt. rend. soc. biol.* 91, 1422-31 (1924). Fluorescopy by means of Wood's light (light from the Hg arc filtered through a Ni screen) is more sensitive than ordinary spectroscopy. The hematoporphyrin must be extd. from the urine, since the latter gives a weak blue fluorescence.

B. C. A.

A microchemical method for the determination of calcium in urine. TAKEO INOUE. *Tokyo Ig. Kyo Z.* 36, 161-7 (1922), *Japn. J. Med. Sci.* 2, 18 (1924). Acidify with AcOH 2 cc. of urine in a centrifuge tube, place in a boiling H_2O bath, and add 0.3 cc. satd. $(\text{NH}_4)_2\text{C}_2\text{O}_4$. Heat 10 min., remove and centrifuge. Wash the ppt. twice with 2-cc. portions of H_2O , dissolve in weak acid and titrate with 0.01 N KMnO_4 . The error of this method is 5-6%.

F. A. CAYORI

Remarks on the measurement of p_{H} of whole blood and of plasma with the aid of the quinhydrone electrode. E. VELLINGER AND I. RACH. *Bot. soc. chim. biol.* 7, 1001-8 (1925).—The quinhydrone electrode is unsuitable for the measurement of the p_{H} of the whole blood, but can be utilized for that of plasma or serum, if account be taken of the protein error. A protein error of 1 millivolt corresponds to 0.1% protein (isoelec. gelatin).

A. T. CAMERON

The micromethod of Kjeldahl simplified, procedure without distillation. (MME.) B. PCHORECKA-LELESZ. *Bull. soc. chim. biol.* 7, 1039-43 (1925), cf. C. A. 19, 1287-7 (1925).—The quinhydrone electrode is employed for traces of NH_3 (dil. by the procedure already outlined, the coned. H_2SO_4 is exdmd. for traces of NH_3 , 1 cc. to 50, neutralize with 30% NaOH with methyl red, and est. with NaOH as usual).

and then the $(\text{NH}_4)_2\text{SO}_4$ is detd. directly after combustion by decompn. with alkali hypobromite and iodometry. A. T. CAMERON

The micromasurement of urea in 0.1 cc. of blood. (MME.) B. POHORECKA-LELESZ. *Bull. soc. chim. biol.* 7, 1085-8(1925); cf. preceding abstr.—Decompose 0.1 cc. blood, serum, or similar liquid with urease at p_{H} 9.2, aerate in a special app.; and est. NH_3 by the hypobromite-iodometric method. A. T. CAMERON

Adaptation of the method of isothermic distillation to the determination of the concentration of blood serum. C. HYRNAKOWSKI AND MISS A. RYCHTER. *Bull. soc. chim. biol.* 7, 1131-8(1925); cf. C. A. 19, 1212.—Results are in good agreement with recent cryoscopic detns. A. T. CAMERON

A sphyximeter. J. P. BOUNHIOL. *Bull. soc. chim. biol.* 7, 1139-43(1925).—A simple app. for measurement of respiratory exchange and basal metabolism. The original must be consulted for details. A. T. CAMERON

Comparative value of the principal technics of deproteinization. H. WUNSCHENDORFF. *Bull. soc. chim. biol.* 7, 1158-67(1925).— HPO_3 should be avoided; filtrates constantly give a positive biuret. CCl_3COOH gives too acid filtrates permitting possible mol. alteration. Tungstic acid gives better results, but the slow filtration renders acid hydrolysis possible. Colloidal $\text{Fe}(\text{OH})_3$ is considered the best precipitant. A. T. CAMERON

Some applications of spectrographic analysis in biological chemistry. E. BAYLE, R. FABRE AND H. GEORGE. *Bull. soc. chim. biol.* 7, 1168-77(1925).—Satisfactory results have been obtained in the detection of Mg in Ca oxalate ppts. in blood Ca detns. under incorrect conditions, in a study of Bi elimination in urine, and in the toxicological identification of Hg. The method is of advantage when the amt. of material is minute, and is easy and rapid. A. T. CAMERON

Modified tests for the alkaloids of the tropine group which have been mixed with organic matter and submitted to putrefaction. MADELEINE MAGNETTE. *J. pharm. Belg.* 7, 757-67, 781-3, 797-805, 821-3(1925).—As a result of extensive researches, the following conclusions were reached: (1) The alkaloids, like atropine, hyoscyamine and tropacocaine, direct derivatives of tropine, may be recovered from decomposing organic material. (2) In cadavers atropine and hyoscyamine resist putrefaction for a considerable length of time. (3) The alkaloids which yield ecgonine on hydrolysis, as benzoylecgonine and cocaine, and ecgonine itself cannot be detected in putrefying cadavers. (4) The identification of the products of hydrolysis of cocaine does not serve as conclusive evidence of the presence of the latter; these products either occur occasionally, e. g., MeOH, or else they exist normally in cadavers, e. g., benzoic acid. (5) Certain factors retard the disappearance of atropine and cocaine in the cadaver, viz: low temperatures, dry ground, exposure to air and especially an acid reaction of the medium. A. G. DUMÉZ

A comparison of Bang's method of blood sugar determination with that of L. Benedict. K. GOTO AND N. OSAWA. *Chug. Ij. Shp., Tokyo* 42, 1422-44(1922); *Japn. J. Med. Sci.* 2, 26-7.—On comparing Mayer-Benedict's method with that of Bang in the detn. of blood sugar of rabbits and dogs in hunger the authors proved that Mayer's method is influenced by creatinine and acetone in the blood and that the degree of increase of blood sugar after fructose administration appears to be higher in Mayer's method than in Bang's. The superior points of Mayer's method are the simplicity of treatment and the ever readiness of the expt. whenever picric acid has been added to the blood soon after it is taken. H. G.

The quantitative method for glycogen determination. TOSHIO OHARA. *Tohoku Ig. Z. Sendai* 6, 124-32(1922); *Japn. J. Med. Sci.* 2, 23.—A comparative study of 3 glycogen detn. methods. The results indicate that Pflüger's method gives the lowest, Yamakawa's the highest and Birry-Gurzevska's an intermediate value. H. G.

A method for the determination of pepsin by Congo red. M. KAWAHARA AND O. PRZCZENIK. *Wiener med. Wochschr.* 76, 129-30(1926).—The method of C. A. 19, 838 is modified by substituting casein for egg albumin. ARTHUR GROLLMAN

The micrometer syringe. J. W. TREVAN. *Biochem. J.* 19, 1111-4(1925).—An app. is described for measuring small vols. of fluid (0.01 cc., with an accuracy of less than $\pm 1\%$). The article does not lend itself to abstracting. BENJAMIN HARROW

A new type of micro-respiration apparatus. WM. K. SLATER. *J. Sci. Instruments* 3, 177-81(1926).—Measurements of CO_2 evolved and O_2 absorbed by living tissue may be made with accuracy to 1 cu. mm. E. H.

Denigé's method applied to Labat's reaction. PEREIRA A. FORJAZ. *Arch. Med. Legal* 1, 53-4(1922).—For the detn. of Br in biol. material (war gas poisoning) the Br is set free by $\text{K}_2\text{Cr}_2\text{O}_7\text{-H}_2\text{SO}_4$ and carried by an air current into a fluorescein soln. The

eosin formed is compared colorimetrically with soln prepd in the same way with a known and approx. equal quantity of Br.

Condensation of ninhydrin with indoxyl. (A new test for indican.) M. TOMITA *J. Oriental Med.* **2**, 189-90(1924); *Ber. ges. Physiol. exptl. Pharmacol.* **29**, 623(1925). Ten cc. of clear urine filtrate treated with Pb acetate and contg 1 cc HCl is heated with a few drops of 5% ninhydrin. A deep red color is formed. The very sensitive reaction is suitable for a detn.

A new reaction of cerebrospinal fluid. G. TACONE *Pediatrics* (Riv.) **34**, 131 (1926).—The reagent consisting of a 5% $K_2Cr_2O_7$ soln. contg 1 drop CCl_3CO_2H to each cc. produces a white turbid ring at the zone of contact with spinal fluid, which in positive cases (meningitis, encephalitis, postencephalitic lesions) is more intense than in normal sera and permanent. Differences in intensity and structure of the turbidity permit differential diagnosis.

Determination of carbon in urine and in dilute water solutions. O. KAUFFMANN AND J. LIEBOWITZ. *Biochem. Z.* **163**, 230-2(1925).—The C content of a soln such as urine or of glucose may be accurately detd. on samples of 0.3-0.4 cc., the Liebn method of combustion being used.

A new method for the estimation of pepsin in stomach contents. I. BOAS *Dent. med. Wochschr.* **51**, 511-2(1925).—The principle of this clinical method is the exposure of a carbohydrate-protein mixt., macromol. of const. compn., to the action of the gastric fluid and the estn., volumetrically, of the starch set free by the digestion of the protein.

Results of gastric juice analysis by the new pepsin method of Boas. P. HIRSCH, MAMROTH AND H. RINDELEISCH *Deut. med. Wochschr.* **51**, 512-3(1925), cf. preceding abstr.—The results obtained for pepsin parallel fairly closely the degree of acidity of the gastric juice in subjects without org. disease of the stomach.

Methods of separation by specific adsorption. A. PODOR AND A. ROSENBERG *Kolloid-Z.* **37**, 234-6(1925).—Expts. have been made to find a systematic method of sepg. substances usually encountered by the biochemist. The substances sepd from one another were albumin, peptone, carbohydrates, aliphatic acids and oxyacids (oxalic, malonic, succinic, lactic, malic, glyceric, tartaric, citric, pyruvic). The method consisted in removing: (1) the acids by adsorption on talcum powder in a relatively strong acid soln.; (2) the albumin from the filtrate by adsorption on kaolin (cf. C. A. **19**, 2224, 3102); (3) the starch from the kaolin filtrate by moist Fe hydroxide. The carbohydrates and peptone or amino acids remain and can be detd. by the ordinary approved methods. With dicarboxylic acids the decrease of the no. of OH groups in a homologous series favors adsorption with talcum. The introduction of OH groups into the mol. changed the talcum adsorption very little.

A spectrophotometric method for determining ammonia in blood. V. M. ARCHANGELSKII. *Arkiv. Biol. Nauk* **24**, 169-78(1924).— NH_3 can be detd. in solns by means of the spectrophotometer, this is a very delicate and accurate procedure. The examn. is made on Nesslerized material and is applicable to quantities ranging from 0.005 to 0.030 mg.; larger quantities cannot be accurately measured. It is, therefore, possible to det. the NH_3 in blood. The NH_3 content of the blood of dogs suffering from tetany increases on standing. This is not apparent in parathyroidectomized dogs on a Ca diet.

The microchemical determination of sugar according to Hagedorn and Jensen. E. KAUFFMANN. *Biochem. Z.* **166**, 207-9(1925).—Slight improvements are suggested for the microchem. sugar detn. in blood.

New micro-physicochemical methods. R. KELLER *Biochem. Z.* **168**, 88-93 (1926).—The cell is the seat of relatively very high elec. tension.

Cataphoresis of substances under physiological conditions. R. KELLER. *Biochem. Z.* **168**, 94-7(1926).—All colored and uncolored compds. show unmistakably and very quickly their behavior in cataphoresis provided their migration is studied under conditions similar to those in living cells, viz., comparatively high elec. tension and with a min. current. The results thus obtained agree very well with the behavior of these substances in plant or animal cells.

Clarification of urine containing sugar with charcoal. I. M. KOLTHOFF. *Biochem. Z.* **168**, 122-7(1926).—Charcoal adsorbs various sugars. Nevertheless a soln. can be freed from coloring matter and be cleared without any appreciable loss of the sugars. In clarifying urines, if the charcoal is used cautiously in just sufficient amt. to decolorize, the glucose is retained quantitatively.

The Hagedorn blood sugar determination. E. MERICH V. FAZEKAS *Biochem. Z.* **168**, 175-7(1926).—The original Hagedorn method is modified to obviate the errors

resulting from spontaneous reduction and oxidation of $K_3Fe(CN)_6$ and $K_4Fe(CN)_6$. The blood is deproteinized according to Bang's U acetate method. To the blood are added 2 cc. of the $K_3Fe(CN)_6$ soln. (3.3 g. $K_3Fe(CN)_6$ + 100 g. Na_2CO_3) and 5 cc. 0.5% $ZnSO_4$, and the whole is boiled 5 min. on the water bath. This is then acidified with 5% $AcOH$ and after cooling 1 cc. 5% KI is added and the material is titrated with 0.005 N $Na_2S_2O_3$. S. MORGULIS

Electrotitration in physiological fluids. II. Determination of iron. ERNST MISLOWITZER AND WERNER SCHAEFER. *Biochem. Z.* **168**, 203-16(1926); cf. *C. A.* **20**, 773.—The e. m. f. of a Pt electrode placed in a soln. contg. Fe^{+++} and Fe^{++} ions is given by the formula $E = A + 0.058 \log (C_{Fe^{+++}}/C_{Fe^{++}})$ volts (20°), where A is a const. (normal potential). So long as both Fe^{+++} and Fe^{++} ions are present E varies little, but changes strikingly as soon as one or the other ion is used up. This sudden and abrupt alteration in the value of E is used as the end point in the titration, which in practice consists of 3 steps. First all Fe^{+++} ions are reduced to Fe^{++} with $TiCl_3$, [(I) $Ti^{+++} + Fe^{+++} = Ti^{++4} + Fe^{++}$]. Next all the $TiCl_3$ and Fe^{++} are oxidized with bromate [(II) $BrO_3^- + 6H^+ + 6Ti^{++4} = Br^- + 3H_2O + 6Ti^{+++}$; (III) $BrO_3^- + 6H^+ + 6Fe^{++} = Br^- + 3H_2O + 6Fe^{+++}$]. The amt. of bromate used up between the end of II and of III, indicated by the sudden changes in E , corresponds to the quantity of Fe . For detg. the Fe in biol. fluids various procedures for ashing are discussed. III. A new method for determining sugar. *Ibid* 217-26.—The detn is carried out in 3 stages: (1) oxidation of glucose in a soln. of $CuSO_4$, $NaOH$ and Na citrate; (2) oxidation of the formed Cu_2O with a Fe^{+++} salt in HCl ; (3) titration of the resulting Fe^{++} ions with BrO_3^- with the sudden change in potential as the indicator. Solns. required are: (1) 75 g. Na citrate dissolved in about 140 cc. boiling water and filtered. Add to this 5.4 g. $NaOH$ in 25 cc. H_2O , and 1.68 g. $CuSO_4$ also in 25 cc., and dil. to 200 cc. (2) Fifty g. $Fe_2(SO_4)_3$ and 200 cc. H_2SO_4 (d. 1.81) are made up to 1 l. with H_2O . Twenty-five cc. of this soln. is mixed with 225 cc. concd. HCl , which gives the oxidizing reagent. (3) A 0.02 N or 0.01 N $KBrO_3$ is made from a 0.1 N soln. (0.783 $KBrO_3$ in 1 l.) which has been standardized with I^- and $Na_2S_2O_3$. Amts. of glucose range from 0.39 to 2.97 mg. with an av. error of ± 0.0016 mg., the probable error of the av. value being ± 0.001 mg. The glucose in blood is detd. as follows: 1.6 cc. blood and 7.5 cc. H_2O are boiled quickly in a small beaker, then acidified with 3 drops acetic acid. With const. stirring 9 cc. of a 1:9 dild. 5% colloidal soln. are added now, drop for drop, then 5 drops N $NaOH$ and 3 drops satd. Na_2SO_4 soln. The contents are transferred to a 20-cc. cylinder, and washed several times with small amts. of H_2O . This is filtered through a dry paper, and 5 cc. used for a blank titration and 2-5 cc. samples are used for the preliminary reduction, etc. S. MORGULIS

Determination of uric acid in blood. AL. IONESCU, I. BIBESCU AND D. POPESCU. *Bul. soc. chim. România* **7**, 65-72(1925).—A volumo-colorimetric method is recommended, based on decolorizing with $K_3Fe(CN)_6$ the blue compd. obtained with uric acid and Folin and Denis' phosphotungstic reagent. Prep. standard uric acid as follows: dissolve 0.10 g. of pure dried acid in 100 cc. of hot distd. H_2O contg. 0.20 g. NaH_2PO_4 and 0.40 g. Na_2HPO_4 , let cool, dil. to exactly 200 cc., and add 1 cc. $CHCl_3$ or 0.1% salicylic acid to prevent development of bacteria. For use, dil. 1 cc. to 10 cc. The soln. should not be more than 2 weeks old. Prep. a soln. contg. 2 g. $K_3Fe(CN)_6$ and 2 g. KOH per 100 cc., and dil. 1 cc. to 100 cc. before use. To standardize the $K_3Fe(CN)_6$, to 2.5 cc. of standard uric acid add 2.5 cc. of 20% CCl_3CO_2H , 2 cc. of phosphotungstic reagent and 20 cc. satd. Na_2CO_3 , shake, and titrate with $K_3Fe(CN)_6$ till decolorized. To det. uric acid in the blood, ppt. albumin with an equal vol. of CCl_3CO_2H , filter, and proceed as above. The reaction is $2K_3Fe(CN)_6 + 2KOH + C_4H_3N_3O_6 \rightarrow 2K_4Fe(CN)_6 + C_4H_3N_3O_6$ (allantoin) + CO_2 . The end point is sharp, and the results are not affected by variations in shade produced by a given amt. of uric acid under varying conditions of concn., time and medium. The reaction is practically not influenced by the other constituents of de-albuminized blood. Under normal conditions the av. uric acid content of the blood is 0.05 g. per l. for serum, 0.15 for whole blood and 0.020% in red corpuscles. Considerable variations are found in pathological conditions. A. PAPINEAU-COUTURE

Histological detection of sugar. J. WOLF. *Centr. allgem. Path.* **36**, 125(1925). The osazone reaction was used. F. B. SEIBERT

The specificity of the microchemical cholesterol reaction with acetic-sulfuric acid. A. SCHULTZ. *Centr. allgem. Path.* **36**, 529-31(1925).—Cholesterol dibromide heated in 90% alc. with $C_2H_5O_2Na$ gives oxysterol, which in turn gives the blue-violet color with the acetic anhydride-sulfuric acid reagent. The oxysterol treated with $FeCl_3$ soln. gives a green color. In the presence of neutral fats the reaction is

negative because oxidation of the cholesterol does not take place. Therefore, the reaction is specific for cholesterol, providing oxysterol can be produced.

F. B. SEIBERT

Detection of albumin in cloudy urines. A. FLORENCE *J. pharm. chim.* [8] **2**, 97–102 (1925).—Ppt. the albumin with $\text{CCl}_3\text{CO}_2\text{H}$ and use Mestrezat's diaphanometric method; or filter the pptd. urine, leaving a dry margin on the paper, wash with a little H_2O , dry at 100° , cut the paper into strips and (a) boil in a test tube with *Millon's reagent* (A), obtain a characteristic red-brown to brick-red color, (b) moisten other strips in a dish with concd. HNO_3 , after 1 min. wash off the HNO_3 with H_2O , then add NH_4OH , obtain a lemon-yellow to orange color if albumin is present. If pptn. of the urine with (10%) $\text{CCl}_3\text{CO}_2\text{H}$ (1:1.5) is slow, add .1 direct, then the paper turns red on drying. If pptn. is abundant, boil with .1 and obtain red brown grains, or heat a trace of the ppt. with a drop of NaOH on porcelain over a strong flame and note the odor of burnt horn.

S. WALDBOTT

McCANN, WILLIAM S.: **Calorimetry in Medicine.** *Medicine Monograph. IV.* Baltimore: The Williams & Wilkins Co. 98 pp. \$2.25.

C—BACTERIOLOGY

A. K. BALLS

Production of pyruvic acid by yeasts. E. KAYSER *Ann. Brass. Dist.* **23**, 305 (1925); cf. *C. A.* **18**, 3071.—The pigmented torulae found on grapes and apples give negative results in regard to production of pyruvic acid. With a Sauterine yeast more pyruvic acid was formed in mineral nutrient media contg. Ca lactate or sucrose when 2% of NH_4NO_3 was added than in solns contg. only 0.5%. Solns to which 0.5% of $(\text{NH}_4)_2\text{SO}_4$ had been added gave more pyruvic acid than solns. to which 2.0% had been added. Comparisons were made of the production of pyruvic acid in nutrient media contg. dextrose and levulose by 2 cider yeasts and one wine yeast which fermented dextrose more rapidly than levulose and by Sauterine yeast and pigmented torulae which fermented levulose more rapidly. The first 3 gave more pyruvic acid in dextrose media; the Sauterine gave more pyruvic acid with levulose and the torulae gave no pyruvic acid.

B. C. A.

Formation of gums by bacteria. A. FERNBACH, M. SCHOEN AND S. HAMAWARA *Ann. Brass. Dist.* **23**, 321 (1925).—Fernbach and Schoen (*C. A.* **6**, 3143) showed that a levulosan-producing bacterium was unable to produce the gum except from nascent levulose produced by the bacterium itself in the hydrolysis of sucrose. *Leuconostoc dextranicus*, Beijerinck acts in a manner exactly comparable on the dextrose from sucrose, producing a dextrosan free from reducing power. It produces the dextrosan only from sucrose and no gum is obtained from sucrose previously hydrolyzed by acid or invertase, nor from dextrose or levulose. The max. yield of dextrosan so far obtained is 10% of the sucrose.

B. C. A.

Water-soluble vitamin and bacterial growth. S. HOSoya AND M. KUROYA *Tokyo Imp. Univ. Govt. Inst. Infectious Diseases. Sci. Repts.* **2**, 233–85 (1923); *Expt. Sta. Record* **53**, 162–3.—An extensive investigation of the relation of water sol. vitamin to bacterial growth. The vitamin preps. used were an aq. ext. of yeast, 2 oryzanin preps., and the substance isolated by Tsukiye (*C. A.* **17**, 1494) from the phosphotungstic acid ppts. of an alc. ext. of bran by the action of AgNO_3 and baryta. Four media were employed—routine broth autoclaved in neutral reaction at 140° for 2 hours and adjusted to pH 6.8 to 7; routine broth heated to 100° for 1 hr. with the addn. of N NaOH to 0.1 *N* alkyl. and adjusted to pH 6.8 to 7 with N HCl , and 2 protein free synthetic media, Uschinsky's soln. and Fraenkel's soln., both adjusted to pH 6.8 to 7. Care was taken not to carry over traces of autolyzed cells or of the original medium in making the inoculations. The conclusions are based chiefly on the growth of the bacteria tested in 1 of the synthetic media with the Tsukiye vitamin prepn. Some of the bacteria examd. were capable of growing without the vitamin prepn., although growth was in most cases stimulated by its presence, and for others the addn. of the vitamin was absolutely essential for growth. To the first class belong the meningococcus, *B. diphteriae*, *S. aureus* and *citreus*, *B. typhosus*, *B. paratyphosus* A, *B. dysenteriae*, *B. coli communis*, *V. cholerae*, *B. pyocyaneus*, *B. anthracis*, *B. tetani*, *B. oedematis maligni*, and *B. capsulatus welchii*, and to the second *Streptococcus hemolyticus* and pneumococcus. With these organisms the substitution of various amino acids and Na nucleate, indole, creatine, and urea was without effect. The activity of the vitamin as regards growth of hemolytic streptococci was destroyed by autoclaving at 182 – 185° for 2 hrs., but

not at 162° for the same length of time. It proved to be easily adsorbed from neutral aq. solns. by both fuller's earth and animal charcoal. In the presence of 0.025 *N* NaOH it was easily destroyed by heating at 100° for 2 hrs. In similar tests using yeast in place of hemolytic streptococci, it was found that the substance in the vitamin prep. which is essential for yeast growth was not destroyed by treatment with *N* NaOH or *N* HCl even if exposed to a temp. of 140° and pressure of 3.5 atms. for 2 hrs., and in neutral soln. was not destroyed by autoclaving at 160–162° or 182–185° for 2 hrs. It was adsorbed readily by animal charcoal but not to any extent by fuller's earth. The antineuritic factor present in the vitamin prep. was unstable in neutral soln. when autoclaved at a temp. of 140° for 2 hrs. In discussing the difference in properties of the factor required for the growth of hemolytic streptococci, the yeast stimulant and the antineuritic factor, 3 possible explanations are suggested: (1) that the 3 factors may be the same substance, the difference being simply the dose required by each kind of organism; (2) that the vitamin may be a single substance consisting of different parts utilized in different ways by bacteria, yeast and the pigeon; and (3) that the 3 factors may be of entirely different chem. nature. In the opinion of the authors, the third explanation is the most plausible. It is suggested that the yeast is capable of utilizing the simplest and most stable form, the hemolytic streptococcus a less stable, and the pigeon the least stable form. H. G.

The synthesis of the water-soluble vitamin by *B. coli* grown on synthetic medium. M. KUROYA AND S. HOSOYA. *Tokyo Imp. Univ. Govt. Inst. Infectious Diseases Sci. Repts.* 2, 287–304(1923); *Expt. Sta. Record.* 53, 163.—Evidence is presented that *B. coli* is capable of synthesizing the 3 factors present in the Tsukiye vitamin. A pure strain of *B. coli* was grown for 70 generations on one of the synthetic media used in the above study and finally for 3 days on a synthetic agar medium. The culture thus obtained was emulsified in distd. water, allowed to autolyze for 1 week at 37°, and extd with 70% alc. at 85–90° for 4 hrs. in the water bath. The resulting ext. after concn was used as the source of vitamin for the growth of hemolytic streptococci, yeast and rats, and in curative tests for pigeons, with positive results in all cases. As a source of vitamin for the growth of streptococci, the material showed the same properties as the factor contained in the Tsukiye vitamin. Conclusion: *B. coli* is able to synthesize vitamin D or bios, the streptococcus vitamin and vitamin B. H. G.

Studies in bacterial metabolism. LXXIII. Non-glucose-fermenting bacteria and insulin. A. I. KENDALL. *J. Infectious Diseases* 37, 329–32(1925); cf. *C. A.* 18, 3621.—Bacteria that regularly do not ferment glucose could not be made to do so by adding insulin to the media. LXXIV. Effect of insulin on cultures of *B. bulgaricus* and *B. acidophilus*. A. I. KENDALL AND MITZUTERU ISHIKAWA. *Ibid* 333–6.—Insulin had no effect on the amt. of glucose fermented by *B. bulgaricus* and *B. acidophilus*, although the character of the expts. leaves the subject an open question (cf. Noyes and Estill, *C. A.* 19, 1582). LXXV. Effect of insulin on bacterial metabolism. A. I. KENDALL AND MITZUTERU ISHIKAWA. *Ibid* 336–9.—The observations made in the preceding paper were extended to a larger no. of bacteria. Negative results were again obtained inasmuch as the bacteria were not changed in their characteristic action on glucose. JULIAN H. LEWIS

The mechanism of the Russell double sugar tube. M. W. HALL AND G. R. LACY. *J. Infectious Diseases* 38, 14–23(1926).—While the acids produced in the fermentation of dextrose in the Russell double sugar medium are mainly, if not entirely, volatile, their diffusion out of the medium is not the cause of the alk. reaction shown on the slant when typhoid and related organisms are grown. This reaction is due to excess of alk. substances produced from nitrogenous elements in the presence of O. In the absence of O a "mother substance" is formed, which rapidly becomes alk. when exposed to O. The ultimate alk. reversion in the butts of Russell tubes is the result of the diffusion into the butts of O rather than of the alkali formed in the slant portion of the tube. The paratyphoid and colon groups appear capable of producing an alk. reacting substance under anaerobic conditions, thus evidencing a definite difference in metabolism which may prove worthy of further study. No suggestion is made as to the chem. nature of the substance which is so easily oxidized into an alk. substance. JULIAN H. LEWIS

The effect of *Clostridium histolyticum* on the tyrosine in proteins. C. G. KING AND LILLIAN V. HJORT. *J. Infectious Diseases* 38, 42–7(1926).—A quant. study was made of the tyrosine content of edestin, salmon, tuna, cheese, casein, milk, gluten, beef, cottage cheese and peptone before and after growth of *Clostridium histolyticum*. The relation of the digestive action of the organism to the formation of tyrosine crystals in the medium was noted. In 7 of the 10 media, destruction of tyrosine was found. In

the remaining cases there was practically no destruction of tyrosine during approx. 3 months' growth of the organism
JULIAN H. LEWIS

Relations of surface tension to bacterial phenomena. MARTIN FROBISHER, JR. *J. Infectious Diseases* 38, 66-91(1926).—A consideration of the role of surface tension in biology indicates that it is an important factor in bacterial growth, morphology, probably in cell division, and to a less extent in the motility of bacteria, and their ability to retain Gram's stain. Numerous substances are tested as to their ability to lower surface tension and their effect on the growth of bacteria studied. Differences in ability to grow at low surface tensions offer a valuable means of differentiation between species of bacteria. It is possible, by measuring their ability to grow at low surface tensions, to distinguish *B. aerogenes* from *B. typhosus* and *B. morgani*; *B. diphtheriae* from *B. xerosis* and *B. hofmanni*; certain resistant types of streptococci from sensitive types; pneumococci from streptococci. The serologic types of pneumococci do not differ from one another in their sensitiveness to low surface tensions. Low surface tension of the culture medium may be an important factor in defg. the size of individual cells, the rate and extent of cell division, and the cell grouping. The growth producing properties of Hüntoon's "hormone" medium for pneumococci may be improved by raising the surface tension of the medium with charcoal. When prep medium for pneumococci, the surface tension should be raised to some point above 51 dynes. The loss of virulence of pneumococci after treatment with surface tension reducers may be due to the fact that these bacteria disintegrate when they are subjected to low surface tension, and the dissolution of pneumococci by bile may be due to the low surface tension induced by this substance. Na oleate was found to be the most useful reagent for reducing the surface tension of culture media.
JULIAN H. LEWIS

The acidophile bacteria. K. SCHIRK. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 104-18(1926).—Acidophilic bacteria from mouth, caries, intestines, vagina and milk were studied culturally and biochemically. They should be termed acid-tolerant rather than acidophilic.
JOHN T. MYERS

The question of vitamin production by bacteria. W. KOLLATH and B. LICHTEN-TRITT. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 119-25(1926).—*B. coli*, *B. mucosus capsulatus* and intestinal organisms from guinea pigs had no antiscorbutic effect when fed to guinea pigs. Apparently they neither produce nor set free vitamins from food materials. Evidence points toward a difference between the growth-promoting substance for *B. influenzae* and vitamins for animals
JOHN T. MYERS

The biological manifestations of corynebacteria. I. BITTER, M. GUNDEL and T. G. SANCHE. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 132-18(1926).—There are borderline strains of *B. diphtheriae* and *B. pseudodiphtheriae* which cannot be differentiated on cultural or morphological grounds. *B. diphtheriae* produces more acid from glucose than does *B. pseudodiphtheriae*, but some avirulent strains produce more acid than do weak acid-producing virulent strains. *B. diphtheriae* produces more alk than the pseudo types but again there are borderline indistinguishable strains. *B. diphtheriae* reaches an acid max. quicker and the opposite holds for alk. production. By means of animal passage, and variations in content and μ n of media, virulent strains may be changed to avirulent and vice versa
JOHN T. MYERS

Indole production by Bacillus avisepticus. J. CSONTOS. *Centr. Bakt. Parasitenk., I Abt., Orig.* 97, 178-81(1926).—Ten strains of *B. avisepticus* formed no gas from dextrose and did not break up arabinose, xylose or lactose. Indole was produced, but it gave a violet instead of a red color with the Salkowski test.
JOHN T. MYERS

The use of potassium tellurite in differential media. R. GILBERT and E. M. HUMPHREYS. *J. Bact.* 11, 141-51(1926).—A conen of H_2TeO_3 approximating 1/17 000 gave excellent results in isolating diphtheria bacilli from throat cultures and seemed to have no effect on the virulence. Certain Gram positive cocci, some of the higher bacteria, yeasts and molds seem to be inhibited very slightly if at all, while many of the motile bacteria including many anaerobes were markedly inhibited.
J. T. M.

The magnitude of the error due to ammonia and its salts in the Van Slyke amino nitrogen procedure as commonly applied in studies of bacterial metabolism. I. B. PARSONS and W. S. STURGES. *J. Bact.* 11, 165-75(1926).—The Van Slyke method has a high temp. coeff. 18% of the total NH_3 is evolved in 3 min. at 20°, 32% at 25° and 46% at 30°. Increase in diln. of samples markedly hastens the evolution of NH_3 . When NH_3 is removed consistent checks for amino N can be obtained. Without removal of NH_3 results are too high by 18 to 50% of the NH_3 N present depending on the temp. and the size of the sample used. This may cause amino N values to be 50% too high if the NH_3 N is equal to or greater than the amino N.
JOHN T. MYERS

Studies on salt action. X. The influence of electrolytes upon the viability and

electrophoretic migration of *Bacterium coli*. H. J. SHAUGHNESSY and K. I. CRISWELL. *J. Gen. Physiol.* **9**, 123-36(1925).—The electrophoretic charge on *B. coli* is highest in distd. H_2O at p_H 6.0 and 8.0. Under all conditions studied the migration velocity is decreased, but the decrease is not immediate, and is not affected by long exposure. A soln. of p_H 2.0 causes rapid death of the cells and a sharp decrease in electrophoretic charge, whereas a soln. of p_H 11.0, although nearly as toxic as the strongly acid soln., causes only a slight reduction in charge. In distd. H_2O the H -ion concns. near the neutral point are favorable to both viability and electrophoretic charge. In the presence of salts, however, this does not hold true. All concns. of $NaCl$ studied proved somewhat toxic and tended to decrease the charge. $CaCl_2$ was more toxic than $NaCl$ and greatly decreased the charge. Ringer-Locke soln. was markedly stimulating to growth at p_H 6.0, whereas it was somewhat toxic at p_H 8.0. It depressed migration velocity at all p_H values. These expts. show: (1) that a balanced salt soln. may be favorable to viability of bacteria at an optimum p_H , but distinctly unfavorable at more alk. reactions; (2) that the parallelism between viability and electrophoretic charge is not close and the two effects probably follow entirely different laws. C. H. R.

The production of hydrogen by microorganisms. A. C. THAYSEN. *Chemistry & Industry* **45**, 71-2(1926); cf. *C. A.* **20**, 964.—A number of publications seem to confirm Wieland's and Warburg's theories on the chemistry of respiration. Wieland regarded the process of respiration as depending on the faculty of the living cell to activate H atoms present in the respiratory substance. $AcOH$ bacteria convert $EtOH$ to $AcOH$ in the absence of free O provided methylene blue is available as H acceptor. Warburg did not accept this explanation but contended that it was the activation of mol. O by the plasma which was the essential feature of respiration and that this oxidation was due to the presence in the plasma of traces of organically bound Fe which acted as an activating catalyst. Szent-Györgyi and Kluver and Donker believed that both of these theories explain the metabolism of respiration. In earlier papers it is shown that H may be produced by the action of microorganisms on carbohydrates. Biological H production could compete with chemical production only where the H was a by-product. Such a case is found in the butyl alcohol fermentation. It is known that 1 lb. of maize, in addition to other products, yields 5.5 cu. ft. of H . A plant using 20 tons of maize per day would produce one quarter million cu. ft. of H . F. W. TANNER

D- BOTANY

B. M. DUGGAR

Role of different nitrogenous compounds as sources of nitrogen for higher plants in pure cultures. V. BIALOSUKNIA. *Bull. Inter. Acad. Polonaise*, **B**, 1924, 715-27.—Expts. on the availability of the N of different compds. for the nutrition of mustard and cabbage seedlings in sterile water cultures show that, in addn. to nitrates, the following compds. are also able to serve as sources of N : NH_4 salts, in the presence of $CaCO_3$, nitrites and asparagine. Carbamide, glycine and lecithin serve as sources of N only in the presence of sugars. Peptone, gelatin, egg-yolk and amino acids, except glycine, give no growth. B. C. A.

The presence of β -methylglucoside in the leaves of *Scabiosa succisa* L. (Dipsacaceae). N. WATTIEZ. *Bull. soc. chim. biol.* **7**, 917-24(1925).—See *C. A.* **19**, 3284. A. T. C.

The chemical composition of *Asperula odorata*. Extraction and properties of a new glucoside, asperuloside. H. HÉRISSEY. *Bull. soc. chim. biol.* **7**, 1010-6(1925).—See *C. A.* **19**, 2970. A. T. CAMERON

The glucosides of several species of indigenous orchids. P. DELAUNEY. *Bull. soc. chim. biol.* **7**, 1144-7(1925).—See *C. A.* **19**, 1442. A. T. CAMERON

The presence of loriglossin in *Listera ovata* R. Br. and *Epipactis palustris* Craniz, and some new reactions of this glucoside. C. CHARAUX and P. DELAUNEY. *Bull. soc. chim. biol.* **7**, 1148-50(1925).—See *C. A.* **19**, 2970. A. T. CAMERON

Melilotoside, glucoside liberating coumaric acid, extracted from the flowers of *Melilotus altissima* Thuil. and of *Melilotus arvensis* Wallr. C. CHARAUX. *Bull. soc. chim. biol.* **7**, 1053-9(1925).—These flowers contain a cryst. glucoside, which is hydrolyzed by emulsin or H_2SO_4 to a mol. of glucose and one of coumaric acid. Melilotoside crystallizes from H_2O with 1 mol. H_2O . A. T. CAMERON

The question of a substitute for iron in chlorosis. KARL BORESCH. *Ber. botan. Ges.* **42**, 284-90(1924); *Botan. Abstracts* **14**, 718.—When chromates and manganates are added together to the Fe -chlorotic cultures of *Phomidium Retzii* var. *nigro-violacea*, there results a rebuilding of the chlorophyll and of its water-sol. accompanying pigments in a way similar to that following the addn. of Fe . H. G.

Plant pigmentation and its biological significance. F. R. DA SILVA. *Rev. Tribunaes, Rio de Janeiro* 1923, 109 pp.; *Botan. Abstracts* 14, 723.—Plant pigments and their biological significance are discussed according to their functions, structure and characteristics. A brief summary of conclusions from Bohm to the present day is given and also a bibliography. Life is the function of chloro-assimilation. Pigments, as defined, include not only plastid and crystal pigments but the diffused pigments of the protoplasm, cellular sap, nucleus, of the corky and woody tissues (for which pigments the name of xylochromes is proposed), and of the excretions. Chem. properties of pigments are the basis of the classification. The groups are divided according to functions, chloro-assimilation, protection and nutrition and excretion. Many structural formulas are given. The physiol. classification is rejected. H. G.

Carbon dioxide and p_{H} regulation of the water by some fresh water algae. VI. ADMIR ULEILA. *Ber. botan. Ges.* 41, 20-31 (1923); *Botan. Abstracts* 14, 729.—The algae studied responded quickly to change in H-ion concn. Because of this rapidly to response U. believes that the cell membrane, instead of the whole protoplast, is involved in the reaction. He detd. the p_{H} value for the different green algae and divided them into 3 classes. (The p_{H} boundaries were narrow.) The C and H-S concn. of the water actually detd. the algal associations. The p_{H} value of water and surrounding water were remarkably const., but that of standing water. Extreme fluctuations. Yet such algae as *Cladophora* and *Oedogonium*, with narrow p_{H} limit, actually existed in standing water. They sometimes grew on different rocks, which had a p_{H} regulators. *Oedogonium* with p_{H} 7.5-7.7 grew in a strongly acid water. It was with incrustations called *Psichohormium* which are formed by the bacteria in *Synomonis confervarum* Chol. The latter forms a slimy ring around the algal cell. This bacterium produces the Fe carbonate and CaCO_3 , which form incrustations on the algae. The carbonate dissolves with the increase of CO_2 , freeing OH-ions , thus keeping down the H-ion concn. U. calls this relation "electrical symbiosis." H. G.

Potassium consumption of rye. MAX ESCHENHAGEN. *Botan. Arch.* 7, 418-48 (1924); *Botan. Abstracts* 14, 889.—K consumption is not a function of the K supply but of the concn. of K in soil. H. G.

Starch. H. ZIEGENSPECK. *Botan. Arch.* 7, 251-33 (1924); *Botan. Abstracts* 14, 893.—Differences in the digestibility of starch from different sources may be due to differences in the digestibility of the starch or by the amylase diastase may be due to chem. differences of the starch, which in turn, may be due either to differences in structure of the starch grain or merely to closer packing of individual particles. The permeability for diastase of the plasma layers immediately surrounding the starch grain plays an important role in digestibility. H. G.

Studies in the physiology of the fungi. XVII. The growth of certain wood-destroying fungi in relation to the hydrogen-ion concentration of the media. F. S. WOLPERT. *Ann. Missouri Bot. Gardens* 11, 43-97 (1924); *Botan. Abstracts* 14, 898.—Expts. were conducted with the following fungi: *Pezizomyces arvensis* (Willd.) Fr., *Polystictus versicolor* (L.) Fr., *Pleurotus ostreatus* Jacq., *Sarcophaedum commune* Fr., *Pholiota adiposa* Fr., *Leucites sepiaria* (Wulf.) Fr., *Armillaria mellea* (Ahl.) Quel., and *Daedalea confragosa* (Bolt) Fr. Growth curves for these fungate given to illustrate the relation of growth to active acidity of the culture medium. A greater portion of the growth curves of all of these fungi is on the acid side and in the majority wholly on the acid side. The range of tolerance for acidity is given for each fungus when grown in Richard's and in peptone-nutrient solns., and there is a discussion of the nutritional value of cellulose-nutrient solns. for these fungi when the source of C is the cellulose from filter paper, also white oak, pine, sugar maple and poplar woods. Of all the solns. used, growth of all the fungi is best when peptone is used as the source of both N and C. This is especially true when sugar is used in addition. One N is more available for wood-destroying fungi than are the more forms. Under environmental and physiol. conditions differing from those recorded in this paper the results would vary to some extent. "The p_{H} limits, optimum p_{H} zone, and direction of change in the active acidity of the substratum vary with the environmental conditions." H. G.

The effect of stimulating agents on the growth of roots. WILHELM WOLKENHAUER. *Botan. Arch.* 6, 233-74 (1924); *Botan. Abstracts* 14, 901.—A 0.0005% soln. of CuSO_4 stimulates growth of rye roots. Higher concns. retard growth. Rb nitrate down to 0.0005% retards root growth. A 0.01% soln. of the Rb salt permitted growth equal to the control. Orange G solns. of 0.01, 0.1, 0.3, 0.5 and 1.0% strength stimulate the growth of roots of rye; of these, 0.1% is the optimum. In 0.005, 0.05 and 2.0% solns., growth is just as rapid as in tap water. All higher concns. retard growth. H. G.

Reaction sensitivity of seedlings. CHRISTIAN KRULL. *Botan. Arch.* 6, 331-401

(1924); *Botan. Abstracts* 14, 901.—At a concn. of 0.0019%, H_2SO_4 causes death of oat and rye seedlings. Both withstand concns. of 0.00048% and under. Barley withstands 0.00004% of H_2SO_4 , is badly damaged by 0.00095%, and is killed by 0.00245%. Wheat is like oats and rye. Expts. are listed which deal with H_2SO_4 , HCl, NaOH and NH_4OH . H. G.

Hydrogen-ion concentration in relation to ecological factors. HERMAN KURZ. *Botan. Gaz.* 76, 1-29(1923).—Loams, silts or clays of the upland or slopes, whether of morainic, dolomitic or loess origin, were nearly always found to be more acid than the immediate alluvial flood plain soils. The draining waters were always alk. B. H.

Plum investigations. I. Winter injury to plum during dormancy. M. J. DORSEY AND P. D. STRAUSBAUGH. *Botan. Gaz.* 76, 113-43(1923).—The fruit bud is considered the dormant winter bud formed in late summer or early fall, as distinguished from the flower buds, 1 to 5 in number, inclosed by the scales of the fruit bud. The pith core is a storage region, its cells being packed with materials consisting principally of protein substances, fats and dextrin. Starch was not found. The p_H value of the pith core cells was 4.6. Ca, Mg, K, Fe and P were found. BENJAMIN HARROW

Inherited deficiency in carbohydrate metabolism in maize. W. H. EYSTER. *Botan. Gaz.* 78, 446-52(1924).—The first source of carbohydrates for maize seedlings is the endosperm. When this supply is exhausted, the plant dies, unless it is able to synthesize additional carbohydrates. E. has found a genetic type of maize that digests and absorbs the endosperm, but is unable to utilize the sugars thus obtained. BENJAMIN HARROW

Salt requirements of wheat at different growth phases. W. F. GERICKE. *Botan. Gaz.* 80, 410-25(1925).—The elements required longest in available form in the growth media for normal development of wheat are Ca and Fe. The removal of cultures grown 4, 6, 8 or 10 weeks in complete nutrient solns. to media devoid of N curtailed dry matter production, both of grain and straw, but otherwise the plants appeared normal. The max. development among all cultures was obtained from plants grown 4 weeks in complete nutrient soln. and then transferred into media devoid of P, in which they grew 104 days. BENJAMIN HARROW

Interrelation of relative day length and temperature. B. E. GILBERT. *Botan. Gaz.* 81, 1-24(1926).—Growth expts. and chem. analyses were made with plants of *Xanthium pennsylvanicum*, grown under known conditions of temp. and relative day length. Temp. was found to be a detg. factor in influencing the time of flower primordia formation. This temp. effect, however, was closely associated with a response to relative day length. Chem. analyses of seedlings germinated under high and low temp. conditions showed a marked accumulation of reducing sugars. BENJAMIN HARROW

Changes in nitrogen, potassium and phosphorus content of wheat seedlings during germination and early stages. JEHIEL DAVIDSON. *Botan. Gaz.* 81, 87-94(1926).—Wheat seedlings, within the age limits in which they are used for exptl. purposes, while changing but slightly in P content during germination, vary appreciably in N and P content from the stock seed from which they were obtained, depending upon their age and the conditions under which they were grown. BENJAMIN HARROW

The solutes exuded by root pressure from vines. J. H. PRIESTLEY AND A. WORMALL. *New Phytologist* 24, 24-38(1925).—A chem. examn. was made of a large quantity of exuded sap from the vine. Several dibasic acids occur exclusively. Only traces of org. N are present. A discussion is given of the bearing of the results upon the explanation of the mechanism of exudation pressure and of the substances essential in promoting and maintaining growth in the shoot of the plant. H. R. KRAYBILL

Hydrogen-ion concentration as a determining factor in physiological tissue development in the secondary cortex of the plant. H. PFEIFFER. *New Phytologist* 24, 65-98(1925).—The process of crystn. of Ca oxalate is detd. partly by the p_H of the soln. The monocline form is assumed at low p_H values while the tetragonal and the "gland" forms are found at neutral or basic p_H values. Sclerization of cortical cells occurs at a well defined p_H of the cell wall proteins on the alk. side of their iso-elec. points. H. R. K.

Suggestions concerning the absorption of ions by plants. D. R. HOAGLAND AND A. R. DAVIS. *New Phytologist* 24, 99-111(1925).—Doubt is raised whether the greatest progress will be made by observations upon the effects of many solns. of slightly varying compn. upon the yield of different plants. Many of the most important problems in plant nutrition are concerned with the absorption and utilization of the various ions and the part which they play in plant metabolism. H. R. KRAYBILL

The enzymes of *Stereum purpureum*. J. K. MAYO. *New Phytologist* 24, 162-71(1925).—Of the following enzymes tested for: diastase, inulase, glycogenase, invertase.

raffinase, maltase, emulsin, pectinase, protease, tyrosinase, oxidase and reductase all were found present except maltase, protease and reductase. H. R. KRAYBILL.

The effect of light of different wave lengths on the rate of reproduction of *Volvox aureus* and *Closterium acerosum*. A. BROOKER KLUGH. *New Phytologist* **24**, 186-90 (1925).—If the rate of reproduction is taken as a criterion of photosynthetic activity, photosynthesis is a wave-length phenomenon, red being most efficient, blue much less so and green inefficient. H. R. KRAYBILL.

Light and growth. I. The effect of brief light exposure upon etiolated plants. J. H. PRIESTLEY. *New Phytologist* **24**, 271-83 (1925).—Etiolated plants were found very sensitive to daily exposures of light of only a few min. duration. The results eliminate the explanation that the morphological changes produced upon etiolated plants by light are due to the effect of photosynthetic products. The light action appears to be photocatalytic and is produced upon products of metabolism in the living shoot and not upon the living metabolic machinery itself. H. R. KRAYBILL.

Phytochemical studies. II. AS. ZLATAROFF. *Biochem. Z.* **161**, 379-89 (1925); cf. *C. A.* **17**, 835.—The phosphatides (lecithin) from *Cicer arctium* L. obtained by extn. with Et₂O are sepd. by pptn. with acetone, and fractional pptn. with EtOH. Analysis indicates the presence of a lecithin pentosan, a lecithin glucose and a third lecithin, C₄₅H₈₀NPO₈. Hydrolysis of a fraction similarly obtained liberated betaine. W. D. L.

Absolute and percentage content of the alkaloid of some parts of *Lupinus luteus* L. during vegetation. TH. SABALITSCHKA AND C. JUNGERMANN. *Biochem. Z.* **163**, 415-56 (1925).—Seeds of *Lupinus luteus* L. were assayed for total alkaloid, and similar seeds were then sprouted, and the parts of the developing plants assayed after definite time intervals, so that the rate of change in the total amt. of alkaloid was detd. During germination, there is a decrease, and during growth, an increase in the amt. of alkaloid present. It later decreases markedly, probably due to its transference to new seeds. W. D. L.

Potassium as an antagonist to Röntgen rays and to radium. G. A. NADSON AND A. J. ZOLKEVIC. *Biochem. Z.* **163**, 457-63 (1925).—Seeds of *Sinapis alba* were irradiated with ultra-violet light, or else dipped into solns. of various salts, or exposed to Ra rays for definite time intervals, and the rate of germination and the no. of germinating seeds detd. Those seeds which were treated with solns. of KI and then exposed to Ra grew so much better than those directly exposed to radium, that there must be an antagonism between the K and radium. Na salts showed no such action. W. D. L.

The influence of alcohol upon the growth of seedlings. R. PEARL AND A. ALLEN. *J. Gen. Physiol.* **8**, 215-31 (1926).—When cantaloupe seeds (*Cucumis melo*) are soaked for 3 hrs. in solns. of EtOH (2-16%), and are germinated and grown in the dark in distd. H₂O, the total growth is 9-35% greater than from seeds grown under the same conditions but in distd. H₂O only. This is probably due to a simple selective action of the EtOH whereby the constitutionally weak and defective seeds are eliminated. C. H. R.

Quantitative variations of carbohydrates in the leaves of green plants in the course of one day. P.-P. STANESCU. *Compt. rend.* **182**, 154-6 (1926); cf. *C. A.* **18**, 1005.—Leaves of 6 species of plants were collected hour by hour and were cut up and dried as quickly as possible. The leaf powders thus prepd. were analyzed for mono-, di- and polysaccharides. The results indicate that these plants may be placed in 3 classes. (a) *saccharophiles* (*Polyanthes tuberosa*), characterized by a strong variability of the sol. carbohydrates and a comparatively slight variability of the polysaccharides, (b) *typical amylophiles* (*Medicago sativa*) with characters the opposite to those of class (a), (c) *amylophiles* (*Acer negundo*, *Urtica dioica*, *Carpinus betulus*, and *Rhus typhina*) in which these differences are less pronounced or non-existent. A study of the curves plotted from the results of analysis shows the rhythmic character of photosynthesis which is particularly sharp in daytime and in summer. I. W. RIGGS.

Formation, by heating plant juice, of urea and of a substance giving the same hydrazinic color reaction as formaldehyde. R. FOSSE. *Compt. rend.* **182**, 175-7 (1926); cf. *C. A.* **18**, 1472.—The expressed juice of young leaves of *Acer* and of *Phaseolus* was centrifuged and was treated with a mixt. of phenylhydrazine-ferricyanide-HCl when little or no color was produced. But if the juice is heated for 5 min. on the water bath a

occurs in the heated juice. After heating for 20 min. at 100°, followed by defecation with Pb(AcO)₂ and the removal of the Pb and S, 1 g. of urea per l. is found by the xanthidrol method. The juice without heating contains but a trace of urea. The production of HCHO and urea is attributed to the hydrolysis of a ureide. I. W. R.

Variations of inulin in the grafted Jerusalem artichoke. LUCIEN DANIEL. *Compt. rend.* **182**, 282-4(1926); cf. *C. A.* **18**, 848, 2022, 2360. L. W. RIGGS

Presence of a new oxidase in various fungi. J. WOLFF. *Compt. rend.* **182**, 343-4 (1926).—There exists in certain fungi of the genus *Russula* an oxidase, hitherto unnoticed, which accompanies laccase and tyrosinase, and has the property of oxidizing org. salts of Fe in wine. *Ferrase* is the name proposed for this enzyme. The species *Russula foetens* and *R. emetica* are poor in laccase but rich in ferrase. L. W. RIGGS

Influence of light and temperature on the germination of seeds in the absence of calcium. R. CERIGHELLI. *Compt. rend.* **182**, 483-5(1926); cf. *C. A.* **20**, 435.—In the absence of Ca, roots and stems of pea seedlings grew practically the same in the dark as in the light. In the presence of Ca, the roots and stems in 8 days made about 3 times the growth in the light and 4 times the growth in darkness that was made in the absence of Ca. The temp. exercises a special action upon both roots and stems. In the absence of Ca the root attains the same length at temps. ranging from 11 to 34°. The relation of the temp. to the growth of the stem is somewhat erratic, but the presence of Ca is necessary for the normal growth of either root or stem. L. W. RIGGS

Chemistry of albumin. OSCAR LOEW. *Ber.* **58B**, 2805-7(1925).—The results of the detn. of the constitution of the protein mol. by the usual methods, no matter how definitely they may establish the chem. structure of the mol., by no means permit of drawing conclusions as to how protein is built up in plants. Plants do not first form a series of NH_2 acids and diketopiperazines and then combine them in a definite order and no. into a large mol. but they manuf. the protein mol. with great rapidity from glucose, NH_3 (or asparagine) and sulfates. Except for asparagine, no single NH_2 acid nor diketopiperazine can be brought into relation with the process of protein formation in plants. Hitherto only one investigator (E. Schulze) has thoroughly studied the metabolism of protein in plants and the work of himself and his collaborators (especially Winterstein and Trier) has been entirely ignored by all who have carried out purely chem. investigations on the chem. constitution of protein. After germination of the seeds the reserve protein is peptonized and converted into NH_2 acids which, on the way to the meristems, are oxidized, their N finally appearing as asparagine which, in combination with sugar and sulfates, serves by the formation of new cells to manuf. protein. This new protein, formed in the cells of growing plant organisms, is not indifferent, like the reserve protein in the seeds or the protein of commerce, but is an exceedingly labile substance which as a rule is used up as fast as formed for the organization of the living organoids (cell nuclei, chloroplast, cytoplasm); its rearrangement into the stable, passive protein means the death of the cell. In some plants at a certain definite time more of this labile protein than is necessary for the formation of the living organoids is formed. It then accumulates in the cell juice of the vacuoles in roundish lumps rich in H_2O or in droplets which at 1st sight might be mistaken for fat droplets as they seem to disappear quickly in Et_2O because the resulting coagulum occupies only a very small space; when protein is needed, these formations are coagulated, dissolved and carried away, as can be seen by examg. suitable plants under the microscope at different seasons of the year (e. g., the epidermis of the base of the petiole of *Funkia siboldiana* in May, July and the end of Sept.). In the epidermis of the white base of old leaves of *Iris germanica* or *I. interregna* magnified 500-600 times, each cell, especially in the fall, is seen to contain a large, doubly refractive drop which is easily coagulated by heat, dil. acids, dil. alc., CHCl_3 , water, dil. HCHO , I-KI, quinone, in fact, any poison, considerable H_2O being forced out and a solid hollow sphere or a shrunken, irregularly shaped turbid mass resulting; alkalis, when not too dil., completely dissolve the drop. If a piece of this epidermis is cut through and immediately placed under the microscope, the drops in those cells which have been cut and, as a result, have almost instantly died, will soon be seen to shrink and lose H_2O , in sharp contrast with the large gleaming drops in the uninjured neighboring cells. As the labile protein evidently undergoes a deep-seated chem. change in the rearrangement there is no justification for drawing conclusions as to its mode of formation in plants from the structure of the stable form. C. A. R.

Philippine citrus fruits. A. H. WELLS, F. AGCAOILI, AND MARIA Y. OROSA. *Philippine J. Sci.* **28**, 453-527(1925).—Largely horticultural. Analyses for total solids, sucrose, reducing sugars, citric acid and oil are given for a large number of citrus species grown in the islands. J. J. WILLAMAN

FREY, ALBERT: Calciumoxalat-Monohydrat und -Trihydrat in der Pflanze. Zürich Gebr. Fretz. 65 pp.

E--NUTRITION

PHILIP B. HAWK

The fundamental requirements of a diet. C O SWANSON *Northwestern Miller* 145, 1167(1926).—Tables show the percentage of the different chem. elements found in the human body and the mineral compn. of wheat and mill products. A discussion follows showing the kinds of proteins to use to get the essential amino acids lysine, necessary for growth, and tryptophan, necessary to maintain life. Milk, meat and eggs are excellent supplements to white bread. L H BAILEY

Gas metabolism in the beri-beri of fowls (polyneuritis gallinarum). RYOJIYUN KINOSHITA. *Ni. Byor. Gak. K. Tokyo* 12, 186 7(1922); *Japan J. Med. Sci.* 2, 154 5 (1925).—During exptl beri-beri in fowls the respiratory quotient fell but there was no decrease in the O_2 consumption. These facts are explained on the basis of a defective carbohydrate oxidation in beri-beri. F A CATORI

Ultra-violet light and the antiscorbutic vitamin. P EGGLETON AND I J HARRIS *Brit. Med. J.* 1925, II, 989-91.—Light is unnecessary for the synthesis of vitamin C. Direct exposure of an animal on a scorbutic diet to ultra-violet light did not appreciably retard the onset of scurvy, and the treatment had no curative effect on a scorbutic animal. In cabbage in which the vitamin had been largely destroyed by heat exposure to the Hg vapor lamp gave doubtful regeneration of the vitamin, and infant food rich in C exposed to the rays showed no increase in the vitamin. A T CAMERON

Classification of vitamins. C FUNK. *Bull. soc. chim. biol.* 7, 1017 9(1925). See *C. A.* 20, 62. A. T. CAMERON

Definition of vitamins. MME. L. RANDOIN AND H. SIMONNET *Bull. soc. chim. biol.* 7, 1020-3(1925).—Vitamins are defined as substances still indeterminate chem and phys., which the animal organism cannot synthesize, and which possess properties recognized in certain fractions of the unknown part of the diet which are indispensable for the accomplishment of vital phenomena in the adult, or during the course of development of the animal, and whose absence produces characteristic pathological nutritional changes. It is considered desirable to restrict the term to substances indispensable to the life of the animal (excluding plants). A. T. CAMERON

Avitaminosis B, glucemia, and glycogen reserve. MME L. RANDOIN AND E. LE LESZ. *Bull. soc. chim. biol.* 8, 15-29(1926); cf. *C. A.* 19, 2693.—Further proof is advanced of the specificity of the results of avitaminosis, as contrasted with those of inanition. Deficiency of B results in a definite train of phenomena, which are only complicated by inanition changes. The disequilibrium following B deficiency does not affect the storage of glycogen in liver or muscle, nor its transformation into blood sugar, the increase in blood sugar preceding death being due to deprivation of some substance directly or indirectly indispensable to combustion of glucose. A. T. C

The technic of testing for the presence of vitamin A. J C. DRUMMOND, K. H. COWARD AND JAMES HANDY *Biochem. J.* 19, 1068-74(1925).—To insure the presence of the anti-rachitic factor, irradiated cholesterol is added to the basal diet. The latter consists (in parts by wt.) of purified casein 15, pure rice starch 70, yeast ext 5, salt mixt. 5, lemon juice 5. 10 mg. of irradiated cholesterol is given daily, this being administered to the animals separately in the form of one drop of a soln. in liquid paraffin, or it may be incorporated in the diet to the extent of 20 mg. %, so that each rat obtains 2-3 mg. daily. (The anti-rachitic factor may also be supplied by the addn. to the food of aerated cod-liver oil—that is to say, oil which has been oxidized for 12-28 hrs. by a current of air at 100°, thereby destroying its content of vitamin A, but not affecting the anti-rachitic factor.) BENJAMIN HARROW

Mammary secretion. VI. Vitamin B and the lactating rat's diet. 1. The quantitative relation of vitamin B to protein (continued). 2. Vitamin B requirement of the lactating and non-lactating rat. (Preliminary note.) G. A. HARTWELL *Biochem. J.* 19, 1075-81(1925); cf. *C. A.* 19, 98.—On a synthetic diet contg. 20% casein, 6-8 g. marmitol (the vitamin B prepn.) per 20 g. casein is needed for the mother rat to rear her young. On the same synthetic diet, the lactating rat requires at least 4 times as much vitamin B as does the growing animal. BENJAMIN HARROW

The effect of various carbohydrates on the ketosis of starvation in human subjects. M. W. GOLDBLATT. *Biochem. J.* 19, 948 57(1925).—The plan of the expt. was to undergo a preliminary period of complete starvation and then, having detd. the fasting respiratory quotient, blood sugar and excretion of ketonic substances, to ingest solns. of the various sugars and make similar observations. Glucose, fructose, sucrose and maltose have an antiketogenic action, while galactose, mannose, lactose and glycerol are inert. BENJAMIN HARROW

Studies in nitrogen and sulfur metabolism. H. E. C. WILSON. *Biochem. J.* 20, 76-83 (1926); cf. *C. A.* 19, 2074.—Gelatin ingested during starvation can be retained in part for six days. Meat extractives ingested during N starvation are in part retained. Excess water ingestion increases the output of N in the urine. In the storage of protein, the sulfur is probably retained first.

BENJAMIN HARROW

Studies on the metabolism of arginine and histidine. Part II. Arginine and histidine as precursors of purines. C. P. STEWART. *Biochem. J.* 19, 1101-10 (1925); cf. *C. A.* 19, 2074.—On a diet deficient in histidine and arginine young rats lose wt. and their allantoin excretion is markedly decreased. The addn. of histidine to the deficient diet causes a resumption of growth and an increased allantoin excretion, suggesting, as Ackroyd and Hopkins have pointed out (*C. A.* 11, 1454), that histidine functions as a precursor of purines in the animal body. The addn. of arginine to the deficient diet does not give rise to assumption of growth nor to increased allantoin excretion.

BENJAMIN HARROW

Note on anemia, urobilinuria and intestinal hemorrhage in rabbits in consequence of exclusive nutrition with cow and goat milk. E. BROUWER. *Biochem. J.* 20, 105-7 (1926).—In expts. on rabbits, with either cow or goat milk, in which 5 of the 8 animals developed severe anemia and died after a time, B.'s autopsies lead him to say "not only in human milk-anemia but also in exptl. milk-anemia one should make allowance for decreased building up of hemoglobin; for a symptom (urobilinuria) may be found which indicates an increased loss of red blood corpuscles, and in the deceased exptl. animals an increased loss of red blood by capillary hemorrhage into the intestinal cavity was observed."

B. H.

Use of colloidal ferric hydroxide sol for adsorbing vitamins B and D. ROSA ZAJDEL AND CASIMIR FUNK. *Biochem. J.* 20, 26-30 (1926).—[Z. and F.'s "vitamin D" is the yeast-growth-promoting substance.] The authors have repeated the work of Eddy, Kerr and Williams (*C. A.* 19, 308) in which they used colloidal Fe(OH)₃ gel for the adsorption of vitamin D, and find it unsatisfactory. No better results were obtained when the method was applied for the prepn. of vitamin B.

BENJAMIN HARROW

Vitamin B of lemon rind. S. G. WILLIMOTT. *Biochem. J.* 20, 31-6 (1926); cf. *C. A.* 19, 3295.—0.5 cc. (equiv. to 0.25 g. of rind) of lemon ext. fed per rat per day as the sole source of vitamin B gave nearly normal growth.

BENJAMIN HARROW

Sources of error in the technic employed for the biological assay of fat-soluble vitamins. HARRIETTE CHICK. *Biochem. J.* 20, 119-30 (1926).—C. tends to take Steenbock and Nelson's view (*C. A.* 18, 1320), that vitamins A and D (the antirachitic factor) are to be regarded as 2 members of a whole group of essential factors in diet, any one of which may limit growth; therefore in estg. vitamin A, it is important that a necessary supply of the antirachitic factor be provided. This constitutes a serious criticism of much of the previous work on vitamin A. Variations in the reserves of vitamins A and D which may be present in young rats, and which in turn depend on the diet upon which the young rats are reared, are another source of error.

B. H.

Maintenance of a standardized breed of young rats for work upon fat-soluble vitamins, with particular reference to the endowment of the offspring. H. H. SMITH AND HARRIETTE CHICK. *Biochem. J.* 20, 131-6 (1926).—A description of the lab. methods employed at the Lister Institute, London.

BENJAMIN HARROW

Antirachitic value of fresh spinach. HARRIETTE CHICK AND M. H. ROSCOE. *Biochem. J.* 20, 137-52 (1926).—Spinach grown in the open has little or no antirachitic properties, but when irradiated with ultra-violet rays it becomes powerfully antirachitic, confirming the work of Hess and Weinstock (*C. A.* 19, 845, 2068). "There is no obvious explanation for this discrepancy between the effect of direct sunlight and of artificial ultra-violet radiation." 0.1 g. of fresh leaves of spinach encourages growth and lessens or prevents xerophthalmia in young rats on diets devoid of vitamin A.

B. H.

Antirachitic value of winter spinach. M. A. BOAS. *Biochem. J.* 20, 153-65 (1926).—Winter spinach added to a diet deficient in vitamins A and D caused a marked improvement in the well-being of the rats and in the rate of growth, but the wt. of the skeleton was not, however, proportionally increased; from this it is concluded that winter spinach contains an amt. of vitamin D (antirachitic factor) which is negligible compared with its content of vitamin A.

BENJAMIN HARROW

The variation of the sodium chloride content of the blood and its relation to the food ingested. CHIYOMI FURUKAWA. *Hoku-Etsu Ig. Kw. Z., Niigata* 37, 548 (1922); *Japn. J. Med. Sci.* 2, 15.—The quantity of NaCl in the blood is nearly const. in hungry persons. When 50 g. NaCl was given to a hungry person, the increase of NaCl in the blood occurred 30 m.-1 hr. later. When food poor in NaCl such as bread or meat was given in sufficient amt., the quantity of NaCl in the blood showed a decrease 30 m.

later, which continued for about 2-2½ hr. When, however, 50 g. NaCl was added to the above food there appeared no alteration in the NaCl content of the blood. H. C.

Modern views on vitamins. J. C. DRUMMOND. *J. Roy. Soc. Arts* 74, 369-82 (1926).

The effect of deficiency of vitamin A on the blood platelet count in rats. A. D. STAMMERS. *Brit. J. Exptl. Path.* 6, 312-3 (1925).—No significant changes in the platelet count took place as a result of vitamin A deficiency confirming the view of Bedson and Zilva (*C. A.* 17, 1987; 18, 1321) rather than of Cramer, Drew and Mottram (*C. A.* 17, 2595).

HARRIET F. HOLMES

Flavoring substances in foods. I. The effect of ethyl acetate and a few other substances on the nitrogen excretion in normal dogs and in partly thyroidectomized dogs. II. Effect of ethyl acetate and a few other substances on the rate of growth of rats. III. The thyroid of rats receiving aliphatic esters and essential oils by mouth. U. G. BIJLSMA. *Rep. Dutch Civil Med. Service* 1924, 696-771; *Ber. ges. Physiol. exptl. Pharmakol.* 31, 754-5 (1925).—Dogs can be given 4 cc/kg. AcOEt without injury. Ten cc. are lethal. Salivation, somnolence and deranged coordination are the symptoms. The effect of aliphatic esters is similar to that of the alcs. and perhaps of other narcotics. Female and male dogs with considerably reduced thyroid show an increase of N excretion under AcOEt. Normal male dogs show an increase, female a decrease of N excretion. This is interpreted as an inhibition of thyroid activity in the female with simultaneous increase of N metabolism. AcOAm has the same effect. Cinnamon oil increased the N excretion in male animals. In females no definite conclusion could be reached. No distinct results were obtained with cumarine. II. A growth promoting effect on rats is probable. III. Administration of aliphatic esters or essential oils tends to decrease thyroid activity in rats.

MARY JACOBSEN

The active substances of rice bran against the disease of pigeons fed on polished rice. II. TOKICHIRO IKEDA. *J. Orient. Med.* 2, 90-101 (1924); *Ber. ges. Physiol. exptl. Pharmakol.* 29, 686 (1925).—Extn., purification and sepn. into protein fractions are described. The greatest part of the active substance (detd by the yeast method) was in the choline fraction, but could not be isolated. 25% was in the purine, and a small part in the histidine-arginine fraction.

MARY JACOBSEN

The influence of the thyroid on carbohydrate metabolism. (Thyroid in normal cases and in exophthalmic goiter under Röntgen irradiation.) D. MASELLI. *Problemi di nutrizione* 1, 367-80 (1924); *Ber. ges. Physiol. exptl. Pharmakol.* 31, 69 (1925). Irradiation of normal thyroid in dogs produced hyperglucemia without glucosuria. Irradiation of other parts of the body did not influence carbohydrate metabolism. A similar effect was produced by Röntgen irradiation of the thyroid in a patient with exophthalmic goiter. No histological changes of the thyroid were observed. M. J.

Action of daylight on nitrogen metabolism. GIUSEPPE SUNZERI. *Problemi di nutrizione* 1, 441-9 (1924); *Ber. ges. Physiol. exptl. Pharmakol.* 31, 71 (1925).—N metabolism and N utilization of N compds. in the intestine are lower in the dark than in daylight. Rabbits kept in the dark put on wt. owing to storage of N compds. M. J.

Chemistry of vitamin A. I. Separation of the effective constituent of liver oil and its properties. Preliminary report. KATSUMI TAKAHASHI AND KOZO KAWAKAMI. *J. Chem. Soc. Japan* 44, 590-605 (1923).—One kg. cod-liver oil was sapond. by means of 2 l. of alc. contg. 20% KOH at 80-90° for 30 min. Two l. of 28% alc. soln. of CaCl₂ was gradually added to the soln. with cooling and the mixt. was agitated for 1 hr. The Ca soap and KCl were sepd., the soln. was satd. with CO₂, the solvent distd. off below 60° under reduced pressure and the residue extd. with ether or petr. ether. The ethereal ext. was treated with dil. HCl and the freed fatty acid was sepd. with 50% alc. contg. dil. alkali, the soln. dried with Na₂SO₄ and the solvent was driven off in a current of CO₂. To the residue was added about 50 cc. of 80-90% MeOH; after 2-3 hrs. at 0°. 3-5 g. of cholesterol sepd. Impurities were sepd. by adding digitonin and the soln. was coned. to a reddish viscous sirup, which was once more dissolved in a small quantity of 80-90% MeOH and cooled at -20°; the active constituent then sepd. as a semicryst. substance, in a yield of about 0.1%. By the same method, the active constituents of butter and egg yolk were isolated. A mouse at the point of death because of lack of vitamin A recovered after being given 0.08 mg. of the constituent per day for 10 days. The isolated constituent is an aldehyde, contains no N, is very hygroscopic, is unstable to light and O₂ and is reduced by H₂ in the presence of Pt black, it is stable in Et₂O, alc., and especially in fat. It is insol. in H₂O, sol. in alc., Et₂O, C₆H₆, Me₂CO and other org. solvents. Its CHCl₃ or CCl₄ soln. gives the lipochrome reaction and blue color with Japanese acid clay.

K. K.

Photoactivation of vitamin A, cholesterol, of fats and other substances by ultra-

violet light. S. HAMANO. *Biochem. Z.* **163**, 438-44(1925).—Photographs of compds. and food substances made after irradiation show that cod-liver oil, butter, olive oil, oleic acid and its Ca salt, cinnamic and abietic acids, camphor, borneol, menthol and balsam are photoactive, just as is cholesterol. Other substances, such as glucose, sucrose, starch, satd. fatty acids, succinic, suberic, amino and salicylic acids, anthracene, naphthalene and acetyl alc. are not photoactive. W. D. L.

Antirickettic substances. II. The action of *n*-butyl nitrite on activated cholesterol and the antirickettic vitamin. CHARLES E. BILLS. *J. Biol. Chem.* **66**, 451-7(1925); cf. *C. A.* **19**, 2971.—The antirickettic vitamin in cod-liver oil is destroyed slowly at room temp. and rapidly on heating by *n*-butyl nitrite (used for the production of oxides of N rather than NaNO_2 and AcOH as it is freely miscible with oils and can be accurately measured). Seal oil which resembles cod-liver oil chem. and phys. and is sometimes used to adulterate it has no antirickettic value. Irradiated cholesterol dissolved in seal oil is moderately antirickettic. When irradiated cholesterol is dissolved in cod-liver oil and heated with *n*-butyl nitrite, the antirickettic activity of both are destroyed. The reactions support, but do not prove, the hypothesis that the antirickettic vitamin is identical with the antirickettic deriv. of cholesterol produced by irradiation.

A. P. IOTHROP

Further studies of the metabolism of avitaminosis. A. BICKEL. *Biochem. Z.* **166**, 251-94(1925).—During avitaminosis the body wt. of dogs progressively diminishes (loss up to 48%), the fat depots disappear almost completely, anemia and atrophica changes become prominent although the mixed diet is practically quant. absorbed and is sufficient in calories. The unoxidized urinary C gradually increases, while the N excretion remains unchanged at first but greatly increases in later periods. The quotient of urinary C:N slowly rises. During the middle period of the avitaminosis there is a great increase in the quotient, which B. attributes to an elimination of fat in the urine, but this diminishes again in a later stage. The increased lactic acid excretion during avitaminosis cannot account for the rise in the C:N quotient. The mineral components of the urine likewise increase in avitaminosis; especially is the excretion of P and Ca increased in this condition. Through insulin injections the pathological excretion of unoxidized C through the urine can be reduced in avitaminosis; this regulatory effect of the insulin upon the oxidation of C is only manifested where the C elimination is really pathological. The insulin effect in avitaminosis depends upon simultaneous ionic reaction, and in the absence of certain ions the regulatory influence of insulin upon the excretion of unoxidized C is lost. Of these ions P and Ca are especially indispensable, and these cannot be replaced by one another. Under the influence of insulin the organism retains P, if this is supplied in sufficient quantity, or it mobilizes the P from its tissues if the diet is deficient in P. In general, insulin causes a retention of ions. The increased lactic acid excretion during avitaminosis is likewise reduced to the normal level under the influence of insulin.

S. MORGULIS

Cholesterol content of some organs of the guinea pig fed a scorbutic diet. MOURIQUAND AND LEULIER. *Compt. rend. soc. biol.* **93**, 1314-5(1925).—Lack of vitamin C causes a very marked fall in the cholesterol content of the adrenals without modifying that of other organs or of the blood in any degree.

S. MORGULIS

Casein in the diet of white rats. LIDIA SAVAZZINI. *Compt. rend. soc. biol.* **93**, 972(1925).—Casein causes slight intoxication with loss in wt. and anemia in white rats.

S. MORGULIS

Basal nitrogen excretion. CHARLES RICHTER, JR., AND MINET. *Compt. rend. soc. biol.* **93**, 1270-1(1925).—By basal N excretion is meant the amt. of urea per day and per sq. m. of body surface under good dietary conditions but lacking in N. The av. N excretion of dogs in g. of urea per day and sq. m. was 7.53, but the individual variations are so large (4.1 to 11.3) that the significance of the av. value is not apparent.

S. MORGULIS

Excretion of urea in dogs on a nitrogen-free diet; its relation to the weight and body surface of the dogs, and its individual variations. CH. RICHTER, JR., AND MINET. *Compt. rend. soc. biol.* **93**, 1229-30(1925).—Expts. show that on a N-free diet the N excretion is proportional to the surface, but only for av. values.

S. MORGULIS

Studies of the digestibility of lichenin. ALBERT WALLERSTEIN. *Biochem. Z.* **166**, 157-61(1925).—The expts. were carried out on white mice which were fed on white bread or the same diet in which a part of the bread was replaced by lichenin. During the feeding periods with lichenin the fecal mass is greatly increased. The lichenin is 53-64% utilized.

S. MORGULIS

Metabolism of urinary nitrogen in dogs fed without protein. CH. RICHTER, JR., AND MINET. *Compt. rend. soc. biol.* **93**, 1228-9(1925).—Dogs were fed 3-7 days either

on sugar alone or on a mixt. of sugar and lard in different proportions. The N elimination diminishes during the expt. Thus, if the initial N elimination is 100, it becomes 84, 64 and 41 in the second, third and fourth fasting periods. Sugar causes a diminution in the amt. of N eliminated, and if the N without sugar is taken as 100, it is only 73 on a sugar diet. On a fat diet the N is sometimes diminished and at other times increased, the results being extremely variable. The N elimination is at a min on a diet consisting of fat and sugar.

S. MORGULIS

Phosphorus and calcium metabolism in young rats on a rachitic diet rich in calcium, under the influence of ultra-violet rays, cod-liver oil and phosphates. POUL SCHULTZER. *Compt. rend. soc. biol.* 93, 1005-7(1925).—The Ca and P in both feces and urine have been studied in several groups of rats. The number of mg. retained per g. of body increase is designated as the "retention quotient"; this was as follows under the different exptl. conditions: in the control animals on a rachitic diet and with evident rickets the quotient for Ca was 5.2-4.7 and for P 9.5-8.2 in 2 sep. periods. In the next group the quotient was detd. while the animals were on the rachitic diet and again when ultra-violet treatment was administered, with this result: Ca 4.1 and P 8.1 before, and Ca 10 and P 15.7 after the treatment with cure of the rickets. Similarly in the group given cod-liver oil during a second period the Ca quotient changed from 1.5 to 10.7, and the P from 8.3 to 18.4. Likewise when the rachitic rats were given phosphates the Ca quotient increased from 4.4 to 10.6 and the P quotient from 9.2 to 18.6.

S. MORGULIS

Calcium and inorganic phosphorus in the serum of rachitic rats under the influence of different treatments. POUL SCHULTZER. *Compt. rend. soc. biol.* 93, 1008-9 (1925).—In a number of rachitic rats (condition verified radiographically and also by necropsy) there was on an av. 11.9 mg. Ca and 5.6 mg. P per 100-cc serum. In 4 rats treated with ultra-violet rays the serum Ca rose to 15.2 and P to 8.6 mg. per 100 cc. In rats given cod-liver oil the serum Ca increased to 13.8 mg. and the P to 10.6 mg. per 100 cc. Normal young rats on an ordinary diet fail to show this increase in serum Ca under the influence of cod-liver oil or of ultra violet rays. The healing of rickets resulting from the exptl. adjustment of the Ca and P of the diet (either by increasing P or diminishing Ca) differs from the other 2 forms of treatment, in that the serum Ca and P reach but do not exceed the normal level.

S. MORGULIS

New studies on the relations between age and the appearance of avitaminosis C. C. G. MOURIQUAND AND M. BERNHEIM. *Compt. rend.* 181, 1103-4(1925); cf. *C. A.* 18, 1521.—Tests with guinea pigs, using 10 subjects in each trial, showed that in pigs weighing from 70 to 200 g. sensibility appeared in 11 to 14, av. 13 days, and crepitation in 16 to 23, av. 19 days; with pigs weighing 200 to 400 g. the figures were 6 to 9, av. 7.5 and 13 to 16, av. 14.8 days; with pigs weighing 600 to 800 g. the figures were 13 to 23, av. 16.3, and 23 to 30, av. 25.7 days. The symptoms of avitaminosis C appear sooner in young than in adult guinea pigs but also the symptoms appear sooner in pigs weighing 200 to 400 g. than in younger pigs.

L. W. RIGGS

Experimental production of the pellagra syndrome. GEORGES MOURIQUAND. *Compt. rend.* 182, 347-8(1926).—The pellagra-producing action of maize is exercised only in the presence of a regimen partially disequibrated. Alimentary equil. opposes the pathologic action.

L. W. RIGGS

Reproduction, growth and alimentary equilibrium. (MME.) L. RANDOIN, J. ALQUIER, (MME.) ASSELIN AND (MME.) CHARLES. *Compt. rend.* 182, 91-6(1926), cf. *C. A.* 19, 2365, 3298.—White rats were fed rations contg. 51.5-80% of coarse bran, the remainder of the ration consisting of one or more of casein, butter, sugar and salts. The conditions of alimentary equil. most favorable to growth were not always those most favorable for reproduction. Butter carries the indispensable principles of fertility. Thus in a ration contg. bran 56%, casein 16.8, sugar 25.5 and salts 1.7, sterility was absolute in both sexes. The ration bran and butter sufficed to keep the male fertile but not always the female; the addn. of casein insured the fertility of the female. With butter and casein present it is still necessary to take account of the ratio between the salt and energy constituents of the ration, especially for the female. Of the 8 rations studied, the best, all things considered, contained bran 51.5%, casein 7.8, butter 14, sugar 21.9 and salts (NaCl and CaCl₂) 1.8, in which the ratio of (total mineral matter) to (total digestible carbohydrates) was 1:9.5.

L. W. RIGGS

EDDY, WALTER H.: **Nutritional Factors.** Baltimore: The Williams & Wilkins Co.

violet light. S. HAMANO. *Biochem. Z.* **163**, 438-44(1925).—Photographs of compds. and food substances made after irradiation show that cod-liver oil, butter, olive oil, oleic acid and its Ca salt, cinnamic and abietic acids, camphor, borneol, menthol and balsam are photoactive, just as is cholesterol. Other substances, such as glucose, sucrose, starch, satd. fatty acids, succinic, suberic, amino and salicylic acids, anthracene, naphthalene and acetyl alc. are not photoactive. W. D. L.

Antiricketic substances. II. The action of *n*-butyl nitrite on activated cholesterol and the antiricketic vitamin. CHARLES E. BILLS. *J. Biol. Chem.* **66**, 451-7(1925); cf. *C. A.* **19**, 2971.—The antiricketic vitamin in cod-liver oil is destroyed slowly at room temp. and rapidly on heating by *n*-butyl nitrite (used for the production of oxides of N rather than NaNO_2 and AcOH as it is freely miscible with oils and can be accurately measured). Seal oil which resembles cod-liver oil chem. and phys. and is sometimes used to adulterate it has no antiricketic value. Irradiated cholesterol dissolved in seal oil is moderately antiricketic. When irradiated cholesterol is dissolved in cod-liver oil and heated with *n*-butyl nitrite, the antiricketic activity of both are destroyed. The reactions support, but do not prove, the hypothesis that the antiricketic vitamin is identical with the antiricketic deriv. of cholesterol produced by irradiation.

A. P. LOTHROP

Further studies of the metabolism of avitaminosis. A. BICKEL. *Biochem. Z.* **166**, 251-94(1925).—During avitaminosis the body wt. of dogs progressively diminishes (loss up to 48%), the fat depots disappear almost completely, anemia and atrophica changes become prominent although the mixed diet is practically quant. absorbed and is sufficient in calories. The unoxidized urinary C gradually increases, while the N excretion remains unchanged at first but greatly increases in later periods. The quotient of urinary C:N slowly rises. During the middle period of the avitaminosis there is a great increase in the quotient, which B. attributes to an elimination of fat in the urine, but this diminishes again in a later stage. The increased lactic acid excretion during avitaminosis cannot account for the rise in the C:N quotient. The mineral components of the urine likewise increase in avitaminosis; especially is the excretion of P and Ca increased in this condition. Through insulin injections the pathological excretion of unoxidized C through the urine can be reduced in avitaminosis; this regulatory effect of the insulin upon the oxidation of C is only manifested where the C elimination is really pathological. The insulin effect in avitaminosis depends upon simultaneous ionic reaction, and in the absence of certain ions the regulatory influence of insulin upon the excretion of unoxidized C is lost. Of these ions P and Ca are especially indispensable, and these cannot be replaced by one another. Under the influence of insulin the organism retains P, if this is supplied in sufficient quantity, or it mobilizes the P from its tissues if the diet is deficient in P. In general, insulin causes a retention of ions. The increased lactic acid excretion during avitaminosis is likewise reduced to the normal level under the influence of insulin.

S. MORGULIS

Cholesterol content of some organs of the guinea pig fed a scorbutic diet. MOURIQUAND AND LEULIER. *Compt. rend. soc. biol.* **93**, 1314-5(1925).—Lack of vitamin C causes a very marked fall in the cholesterol content of the adrenals without modifying that of other organs or of the blood in any degree.

S. MORGULIS

Casein in the diet of white rats. LIDIA SAVAZZINI. *Compt. rend. soc. biol.* **93**, 972(1925).—Casein causes slight intoxication with loss in wt. and anemia in white rats.

S. MORGULIS

Basal nitrogen excretion. CHARLES RICHT, JR., AND MINET. *Compt. rend. soc. biol.* **93**, 1270-1(1925).—By basal N excretion is meant the amt. of urea per day and per sq. m. of body surface under good dietary conditions but lacking in N. The av. N excretion of dogs in g. of urea per day and sq. m. was 7.53, but the individual variations are so large (4.1 to 11.3) that the significance of the av. value is not apparent.

S. MORGULIS

Excretion of urea in dogs on a nitrogen-free diet; its relation to the weight and body surface of the dogs, and its individual variations. CH. RICHT, JR., AND MINET. *Compt. rend. soc. biol.* **93**, 1229-30(1925).—Expts. show that on a N-free diet the N excretion is proportional to the surface, but only for av. values.

S. MORGULIS

Studies of the digestibility of lichenin. ALBERT WALLERSTEIN. *Biochem. Z.* **166**, 157-61(1925).—The expts. were carried out on white mice which were fed on white bread or the same diet in which a part of the bread was replaced by lichenin. During the feeding periods with lichenin the fecal mass is greatly increased. The lichenin is 53-64% utilized.

S. MORGULIS

Metabolism of urinary nitrogen in dogs fed without protein. CH. RICHT, JR. AND MINET. *Compt. rend. soc. biol.* **93**, 1228-9(1925).—Dogs were fed 3-7 days either

on sugar alone or on a mixt. of sugar and lard in different proportions. The N elimination diminishes during the expt. Thus, if the initial N elimination is 100, it becomes 84, 64 and 41 in the second, third and fourth fasting periods. Sugar causes a diminution in the amt. of N eliminated, and if the N without sugar is taken as 100, it is only 73 on a sugar diet. On a fat diet the N is sometimes diminished and at other times increased, the results being extremely variable. The N elimination is at a min. on a diet consisting of fat and sugar.

S. MORCULIS

Phosphorus and calcium metabolism in young rats on a rachitic diet rich in calcium, under the influence of ultra-violet rays, cod-liver oil and phosphates. POUL SCHULTZER. *Compt. rend. soc. biol.* 93, 1005-7 (1925).—The Ca and P in both feces and urine have been studied in several groups of rats. The number of mg. retained per g. of body increase is designated as the "retention quotient"; this was as follows under the different exptl. conditions: in the control animals on a rachitic diet and with evident rickets the quotient for Ca was 5.2-4.7 and for P 9.5-8.2 in 2 sep. periods. In the next group the quotient was detd. while the animals were on the rachitic diet and again when ultra-violet treatment was administered, with this result: Ca 4.1 and P 8.1 before, and Ca 10 and P 15.7 after the treatment with cure of the rickets. Similarly in the group given cod-liver oil during a second period the Ca quotient changed from 4.5 to 10.7, and the P from 8.3 to 18.4. Likewise when the rachitic rats were given phosphates the Ca quotient increased from 4.4 to 10.6 and the P quotient from 9.2 to 18.6.

S. MORCULIS

Calcium and inorganic phosphorus in the serum of rachitic rats under the influence of different treatments. POUL SCHULTZER. *Compt. rend. soc. biol.* 93, 1008-10 (1925).—In a number of rachitic rats (condition verified radiographically and also by necropsy) there was on an av. 11.9 mg. Ca and 5.6 mg. P per 100-cc. serum. In 1 rat treated with ultra-violet rays the serum Ca rose to 15.2 and P to 8.6 mg. per 100 cc. In rats given cod-liver oil the serum Ca increased to 13.8 mg. and the P to 10.6 mg. per 100 cc. Normal young rats on an ordinary diet fail to show this increase in serum Ca under the influence of cod-liver oil or of ultra violet rays. The healing of rickets resulting from the exptl. adjustment of the Ca and P of the diet (either by increasing P or diminishing Ca) differs from the other 2 forms of treatment, in that the serum Ca and P reach but do not exceed the normal level.

S. MORCULIS

New studies on the relations between age and the appearance of avitaminosis C. C. G. MOURIQUAND AND M. BERNHEIM. *Compt. rend.* 181, 1103 (1925); cf. *C. A.* 18, 1521.—Tests with guinea pigs, using 10 subjects in each trial, showed that in pigs weighing from 70 to 200 g. sensibility appeared in 11 to 14, av. 13 days, and crepitation in 16 to 23, av. 19 days; with pigs weighing 200 to 400 g. the figures were 6 to 9, av. 7.5 and 13 to 16, av. 14.8 days; with pigs weighing 600 to 800 g. the figures were 13 to 23, av. 16.3, and 23 to 30, av. 25.7 days. The symptoms of avitaminosis C appear sooner in young than in adult guinea pigs but also the symptoms appear sooner in pigs weighing 200 to 400 g. than in younger pigs.

L. W. RIGGS

Experimental production of the pellagra syndrome. GEORGES MOURIQUAND. *Compt. rend.* 182, 347-8 (1926).—The pellagra producing action of maize is exercised only in the presence of a regimen partially disequibrated. Alimentary equil. opposes the pathologic action.

L. W. RIGGS

Reproduction, growth and alimentary equilibrium. (MME.) L. RANDOIN, J. ALQUIER, (MME.) ASSELIN AND (MME.) CHARLES. *Compt. rend.* 182, 916 (1926), cf. *C. A.* 19, 2365, 3298.—White rats were fed rations contg. 54.5-80% of coarse bran, the remainder of the ration consisting of one or more of casein, butter, sugar and salts. The conditions of alimentary equil. most favorable to growth were not always those most favorable for reproduction. Butter carries the indispensable principles of fertility. Thus in a ration contg. bran 56%, casein 16.8, sugar 25.5 and salts 1.7, sterility was absolute in both sexes. The ration bran and butter sufficed to keep the male fertile but not always the female; the addn. of casein insured the fertility of the female. With butter and casein present it is still necessary to take account of the ratio between the salt and energy constituents of the ration, especially for the female. Of the 8 rations studied, the best, all things considered, contained bran 54.5%, casein 7.8, butter 14, sugar 21.9 and salts (NaCl and CaCl₂) 1.8, in which the ratio of (total mineral matter) to (total digestible carbohydrates) was 1:9.5.

L. W. RIGGS

EDDY, WALTER H.: **Nutritional Factors.** Baltimore: The Williams & Wilkins Co.

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The occurrence of fatty substances in the human ear. KICHIRYO NAKAMICHI. *Ni. Byor. Gak. K. Tokyo* 12, 106-9(1922); *Kyoto Ig. Z.* 19, 1045-70(1922); *Japan. J. Med. Sci.* 2, 141-2(1925).—The fat deposits in the ear are largely glycerol esters. Cholesterol esters are present if the fat deposits are extensive. By means of staining with Sudan III, the distribution of fat in the various tissues of the ear and the variation of fat content at different ages were studied. Usually the fat deposits increase with increasing age and the conclusion is reached that the hard hearing of old age is due in large part to increased fat infiltration.

F. A. CAJORI

Cholesterol metabolism in organisms. I. Cholesterol problem in regard to birds. MASAMICHI YAMAGUCHI. *Ni. Byor. Gak. K. Tokyo* 12, 111-2(1922); *Hokkaido Ig. Kw. Z. Niigata* 37, 1235-78(1922); *Japan. J. Med. Sci.* 2, 143-4(1925).—Cholesterol esters were found more abundantly in the bodies of birds than in human beings. Thirty species of birds were examined and cholesterol esters found in the endothelial cells of all the important organs and tissues. A hypercholesterolemia was produced in fowls and pigeons by the feeding of egg yolks. After such feeding large deposits of cholesterol were found in the liver. Lanolin, when fed, failed to increase the cholesterol of the blood or tissues.

F. A. CAJORI

Presence of an oxytocic substance (posterior hypophysis extract) in cerebrospinal fluid. SHEPARD SHAPIRO. *Arch. Neurol. Psychiatry* 15, 331-40(1926).—Of 28 cerebrospinal fluids from 25 different patients none caused an oxytocic effect on the virgin guinea-pig uterus. No evidence was obtained that intravenous injection of pituitary ext. caused increased secretion of the posterior principle into the fluid within 3 min.

A. T. CAMERON

Variations of phosphatides during liver autolysis. C. ARTOM. *Bull. soc. chim. biol.* 7, 1099-1128(1925).—In the livers of normal dogs the greater part of the fatty acids is combined as phosphatides, presenting very limited individual variations. The total P sol. in CHCl_3 can be fractionated into (a) true phosphatide-P, (b) P of phospho-nitrogenous impurities and (c) P sol. in acetone. The phosphatide index (phosphatide fatty acids/phosphatide P) is close to 18, so that almost all the phosphatides are lecithins or cephalins. During aseptic autolysis of such livers the phosphatides constantly diminish; the degree of diminution is more marked in animals killed during digestion or after administration of HCl than killed when fasting. Presence of excess of triolein or Na oleate slightly slows the phosphatidolysis. The phosphatide index varies very little, indicating that the hydrolysis is essentially a cleavage of the mol. with total liberation of the fatty acids. Sometimes, however, the index is sharply diminished, probably because of formation of marked amts. of intermediate products. Exptl. addn. of fat usually feebly augments the index. P of the (b) fraction diminishes more rapidly than that of (a), while the acetone-sol. P increases, both absolutely and relatively.

A. T. CAMERON

The hypoglucemic action of duodenal secretin. R. NOVOA SANTOS. *Bull. soc. chim. biol.* 7, 1151-3(1925).—Previous positive results (Santos, Barreiro and Criado. *Archiv. Endocrin. Nutricion*, Oct. 1924) are confirmed, both for man, the rabbit and the dog. The depancreatized dog does not respond to the injection of secretin like the normal animal, contrary to the statement of Penau and Simonnet (*C. A.* 19, 1883).

A. T. CAMERON

The corpus luteum as the source of the follicular hormone. C. G. JOHNSTON AND V. L. GOULD. *Surgery Gynecol. Obstetrics* 42, 236-9(1926).—In expts. with rats and rabbits no effect was obtained by injecting the alc.-ether-acetone ext. of carefully collected corpora lutea of pigs. Since the corresponding ext. of liquor folliculi of hog ovaries gave positive results it is concluded that the corpus luteum does not secrete the hormone which produces hyperplasia of the uterus and vagina.

A. T. CAMERON

Studies on the amount of combined carbonic acid in milk. H. TOKURA AND K. OGASAWARA. *Taisho Fujinkwa Gak. Z. Kyoto* 1922, 253-72; *Japan. J. Med. Sci.* 2, 15-6.—It was shown that the amt. of the combined carbonic acid in milk runs parallel to that of the blood.

H. G.

The intermediary metabolism of the kidneys. J. SNAPPER. *Wiener med. Wochschr.* 76, 50-1(1926).—The kidneys can oxidize β -hydroxybutyric acid. The intensity of the ketosis in acidosis depends on the state of this oxidative function of the kidney.

ARTHUR GRÖLLMAN

Distribution of phosphorus and fat in the resting and fatigued muscle of the cat, with a note on the partition of phosphorus in the blood. D. P. CUTHBERTSON. *Biochem*

J. 19, 896-910(1925).—Muscle fatigue causes (a) no change in total P_2O_5 , (b) an increase in the inorg. P_2O_5 of the stimulated muscle, a decrease in the inorganic P_2O_5 of resting muscle, (c) a decrease in the lactacidogen P_2O_5 in fatigued, and an increase in resting muscle, (d) no alteration in the total amt. of inorg. plus lactacidogen P_2O_5 , (e) no effect on the organic acid-soluble P_2O_5 other than lactacidogen, (f) a small increase in the total acid-soluble fraction and (g) no alteration in the phosphatide P_2O_5 . On the P compds. of the blood, the effect of fatigue was an increase in the inorg. P_2O_5 and in the total acid-soluble P_2O_5 , and a decrease in the organic acid-soluble P_2O_5 . The P-contg. skeletal muscles belong to the nucleoprotein group. BENJAMIN HARROW

Fate in the animal body of phenylsuccinic acid and β -phenylhexoic acid. P. W. CLUTTERBUCK AND H. S. RAPER. *Biochem. J.* 19, 911-14(1925); cf. *C. A.* 19, 3097. Phenylsuccinic acid administered to a dog (0.22 g. per kg.) is not easily oxidized, since 61% of the amt. given was recovered from the urine. β -Phenylhexoic acid, administered subcutaneously in the form of its Na salt, was recovered from the urine to the extent of 45%, chiefly as a compd. with glycuronic acid, but no phenylsuccinic acid could be detected. Probably γ -oxidation in this instance does not take place. B. H.

Influence of the administration of certain salts on the yield and composition of milk. A. T. R. MATTICK AND N. C. WRIGHT. *Biochem. J.* 19, 915-20(1925). For raising the plasma Ca content, $CaCl_2$ and NH_4Cl were used, and for lowering it, $NaHCO_3$ and Na_2HPO_4 were used. These were given in large oral doses. Neither the plasma Ca nor the general compn. of the milk was altered by these means. B. H.

Sulphydryl reaction of skin. ERNEST WALKER. *Biochem. J.* 19, 1085-7(1925); cf. *C. A.* 19, 1885. The substance which gives the nitroprusside reaction in skin cannot be extd. with water, despite Kaye's claims to the contrary (*C. A.* 19, 992), and is probably not glutathione but a thermostable sulphydryl constituent of muscle. B. H.

Studies on the physiology of plain muscle. IV. The lactic acid content of plain muscle under various conditions. C. L. EVANS. *Biochem. J.* 19, 1115-27(1925); cf. *C. A.* 18, 854. Lactic acid is present to the extent of 0.03-0.08% in "resting" plain muscle. The amt. is increased when the muscle is made to contract, or by treatment which in skeletal muscle produces *rigor*. The lactic acid production is much greater when the pH of the soln. is 9 than when it is 4.5. The acid rapidly accumulates in plain muscle when kept under anaerobic conditions, but not when kept in O. B. H.

On the presence of cyanate in the blood. ERIK GOTTLIER. *Biochem. J.* 20, 1-5(1926).—Despite Montgomery's assertion (*C. A.* 19, 1874), G. denies that there is any cyanate in blood. BENJAMIN HARROW

Note on the excretion of phosphate during water diuresis. R. E. HAVARD AND G. A. REAY. *Biochem. J.* 20, 99-101(1926).—The rate of phosphate excretion is independent of the water rate even when, owing to copious diuresis, the urinary phosphate is below the level of the plasma phosphate. BENJAMIN HARROW

Determination of bilirubin in meconium and feces of the nursing. VITTORE ZAMORANI. *Clin. pediatr.* 23, 9-19(1925); *Ber. ges. Physiol. exptl. Pharmacol.* 31, 254(1925).—Normal feces of children over 1 year and of adults contain only urobilinogen and urobilin, those of the nursing unaltered bilirubin. Bile secretion begins in the 6th fetal month and biliverdin appears in the meconium. In the first 8 days of life the bilirubin excretion is const., about 0.13% of the feces. It decreases to 0.01% after 6 months. Bilirubin is detd. by the method of Hijmans van den Bergh. M. J.

The significance of the color index of the blood. JAC. J. DE JONG. *Geneeskund. Bladen* 24, 139-69(1925); *Ber. ges. Physiol. exptl. Pharmacol.* 31, 261(1925).—Methods of detn. are discussed and results in health and disease are given. The color index is a measure not of the hemoglobin content but of the size of the cell, since the hemoglobin concn. has always the same value in health and disease. In normal man the vol. of the erythrocyte is $90\mu^3$, its hemoglobin content 26×10^{-12} g., the ratio 1.59-1.512. MARY JACOBSEN

Occurrence and significance of thymus lipoids. ANGELO KYRILOW. *Z. Konstitutionslehre* 10, 460-81(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 31, 276(1925).—Cholesterol esters alone and in mixts. with fatty acids occur in intrathymic tissue in quantities increasing with the age. The Hassall bodies contain phosphatides. The parenchyma shows a varying no. of cells contg. fat. No definite relation between lipid content and certain diseases could be established. Numerous large Hassall bodies with a high fat content were present in 3 cases of uremia. The cells contg. fat were absent during menstruation, in amenorrhoea and during the climacterium. MARY JACOBSEN

The chemical composition of the vitreous body of the eye especially of the extractive matter. TOKICHIRO IKEDA. *J. Orient. Med.* 2, 135-41(1924); *Ber. ges. Physiol. exptl.*

Pharmakol. 31, 925(1925).—The chem. constituents are: proteins, *d*-lactic acid, *l*-leucine (?), *d*-alanine, *l*- and *r*-proline, *l*-phenylalanine (?), *d*-valine (?), *d*-isoleucine (?) and hypoxanthine; 0.15 g. fat and 0.5 g. phosphatides per 29.49 g. fluid. This analysis proves that the vitreous body is chem. different from the retina and the gray matter of the brain.

MARY JACOBSEN

Ammonia content and ammonia formation in blood. III. Source of blood ammonia. J. P. PARNAS AND M. TAUBENHAUS. *Biochem. Z.* 159, 298-310(1925); cf. *C. A.* 19, 3108. —If protein-free blood is allowed to stand, the NH_3 concn. increases, which shows that the NH_3 comes from non-colloidal material. This NH_3 does not come from amino acids, but from some substance not recognized. A comparison of accuracy of colorimetric and volumetric methods for the detn. of small amts. of NH_3 is made, and the former is selected as being the more accurate.

W. D. L.

Activity of sodium in blood serum. L. MICHAELIS AND S. KAWAI. *Bipchem. Z.* 163, 1-7(1925).—In order to det. the active concn. of Na in blood serum, the potential of serum vs. a Na-Hg electrode, and the concn. of Na in a soln. of pure NaCl giving the same potential vs. the same electrode are detd. The difference between the 2 concns is a measure of the Na bound by proteins. The presence of Ca or K ions does not appreciably affect the p. d. The potential of horse serum is the same as that of 0.180 *N* NaCl, whereas analysis of the serum showed a concn. of 0.175 *N*. The agreement is within the limit of error of the method. Therefore, the activity of Na in serum is the same as that in a pure NaCl soln. of the same concn.

W. D. L.

Influence of insulin upon the fat content of rats in avitaminosis and in different conditions of nourishment. K. ONOHARA. *Biochem. Z.* 163, 51-60(1925).—White rats are fed upon diets contg. vitamin A in various amts. and then are treated with insulin and the change in the fat deposits in the body is observed. Insulin (0.8 units per kg. body wt.) shows no fat sparing action in white rats. **Influence of the mineral content of food upon the fat content of the body.** *Ibid* 61-6. —The average fat content of white rats fed upon a diet contg. sufficient amts. of CaCl_2 , MgCl_2 and NaCl is about 1% more than of rats upon a diet poor in salts. **The influence of insulin upon the blood fat content of dogs in avitaminosis.** *Ibid* 67-74. —Dogs are maintained upon a slightly negative N balance, the diet being insufficient in vitamins (not specified). Insulin is then injected into them but no changes in the blood fat or blood sugar are found. W. D. L.

Physiology of glands. L. ASHER. LXXVIII. Influence of the thyroids upon the growth-promoting properties of blood: the occurrence of a growth-promoting substance in blood. S. UCHIDA. *Biochem. Z.* 163, 75-94(1925); cf. *C. A.* 20, 941. —Tissue cultures are grown in the sera of animals from some of which the thyroids and thymus glands have been removed. With the removal of the thyroids, the sera lose some substance which normally promotes growth, so that poor development results. Removal of the thymus has a less well defined effect upon the growth of the cultures, whereas removal of the ovaries seems to have no effect at all. **LXXIX. Dependence of the ovaries upon the excitability of the central nervous system proved by the hyperglucemia after injection of diuretin.** S. UCHIDA. *Ibid* 95-108. —Upon the removal of the ovaries of rabbits, the effect of diuretin is diminished, but there results a hyperglucemia which lasts for several weeks. By removing one suprarenal gland, and sectioning of the splanchnic nerve on the opposite side, the hyperglucemia resulting from injection of diuretin is shown to be of central origin. **LXXX. Nature of the action of specific diuretics; urine secretion.** GEO. M. CURTIS. *Ibid* 109-60. —The diuretic action of *euphyllin* (theophyllin-ethylene diamine) is studied. Injection of glucose simultaneously with the drug repressed the diuresis. Urine chlorides and urea, f. p., elec. cond., org. materials, and osmotic relationships are studied. Neither the secretory nor the mechanical theory of urine excretion explains the action of specific diuretics. **LXXXI. Relation between the thyroids, thymus, spleen, and bone marrow.** H. NAKAO. *Ibid* 161-75. —The function of bone marrow in young rabbits is stimulated by injections of nucleic acid. The effect of the removal of the thyroids, spleen or thymus in various combinations upon this stimulation is observed. **LXXXII. Relation of supra-renals to the development of secondary sex characteristics.** W. KICHNIKAWA. *Ibid* 176-86.

W. D. L.

The thiocyanate content of human blood serum. H. SCHREIBER. *Biochem. Z.* 163, 241-51(1925).—The concn. of the CNS ion in the blood serum of women and non smoking men varies between 0.025 and 0.04 mg. %. With smokers, the value may be 3 times greater. After ingestion of thiocyanates, the concn. in the serum rapidly increases to perhaps 30 times the normal value, and remains above normal for 2 or 3 weeks.

W. D. L.

Decomposition of sugar in human placenta. R. TATEYAMA. *Biochem. Z.* 163,

292-6(1925).—By the detn. of the AcH formed by the action of placenta upon solns. of glucose, sucrose, lactose, sucrose, phosphoric acid, glycogen and starches, it is shown that all are decompd. into AcH. The action, however, is not uniform nor const. Both insulin and *dl*-alanine usually increase slightly the amt of AcH formed W. D. L.

G—PATHOLOGY

II. GIDEON WELLS

The distribution of phosphorus compounds in the blood in tuberculosis. K. LUCILLE McCUSKEY. *J. Lab. Clin. Med.* **10**, 466-74(1925).—A decrease in lecithin content of both the cell and the plasma with a simultaneous increase in acid sol P represents a grave, prognosis while the opposite is favorable. M. believes that the acid-sol P is used in the synthesis of lecithin. The sum of the lecithin and acid sol fractions is equal to the total P, except in the terminal stages of exudative pulmonary tuberculosis, in which the total P is greater than the sum of these two fractions. The additional P fraction is confined to the cell and represents a group not sol in EtO_2Ac or $\text{CCl}_3\text{CO}_2\text{H}$ (cf. *C. A.* **19**, 528).

L. K. CAMPBELL.

Physico-chemical aspects of hemolysis. III. A further study of some of the factors involved. REED ROCKWOOD AND E. C. MASON. *J. Lab. Clin. Med.* **10**, 91, 24 (1925); cf. *C. A.* **19**, 317.—Hemolysis by hypotonic solns. is accompanied by swelling of the cell mass while hemolysis by alkali, complement and antioceptor, saponin and NaOH soln shows no change in the cell vol. Hemolysis by acid may or may not be accompanied by swelling. The cells have considerable buffer power, which is greatest at the extremes of acidity and alk. This suggests a combination of acid and alkali with an additional buffer substance in these parts of the range and it is suggested that this combination may play an important part in rendering the hemoglobin-stroma union unstable in these zones. Viscosity detns. on the components of the biologic hemolytic system show no significant change during hemolysis. The hemoglobin and agar mixt. shows a certain similarity to the corpuscles in their behavior toward acid and alkali. The discharge of pigment from the cell of the red beet under the influence of acid and alkali and salt is in many respects similar to the loss of hemoglobin from the red cell or from the hemoglobin-colloid complexus. L. K. CAMPBELL.

Uric acid levels in the blood of man and animals. A. T. WEATHERS AND H. C. SWEANEY. *J. Lab. Clin. Med.* **10**, 480-5(1925).—The Folin Wu test does not give results equal to the total amt. of uric acid in the blood. Folin's and Benedict's latest methods give the same results and each method gives a fairly accurate recovery of uric acid added to human and animal bloods. Polyphenols and amino acids in quantities double those found in normal blood do not make appreciable error in uric acid detns. by the Folin or the Benedict method. The normal level of uric acid in the blood should be raised from 1.3 mg. to 1.4 mg. per 100 cc. of blood. Uric acid content of bloods in all stages of tuberculosis is normal excepting a slight decrease in the far-advanced stages. L. K. CAMPBELL.

Observations on the relation of urinary p_{H} to salt and water metabolism in a case of nephrosis. M. B. COHEN. *J. Lab. Clin. Med.* **10**, 526-32(1925).—Record of the urinary vol., percent chloride output, urinary p_{H} , plasma chlorides and wt. were kept for 110 days in a case of nephrosis on a diet of 10 g. of NaCl daily. With a rise in wt. of patient there was a chloride retention, diminished H_2O output, and a heightened acidity of the urine. Administration of alkalis to render the urine neutral was accompanied by a sharp increase in the chloride output, and loss of edema. Administrations of KH_2PO_4 reversed the process and was followed by a gain in wt. L. K. C.

The chloride content of the blood in pernicious anemia. R. I. HADEN. *J. Lab. Clin. Med.* **10**, 557-61(1925).—The chloride detns. on 30 cases of pernicious and 20 cases of secondary anemia are reported. The whole blood chlorides are usually high in blood with a low cell vol. in both primary and secondary anemia. The plasma remains normal regardless of the cell vol. A few cases of primary anemia show a low chloride content. No patients with secondary anemia had low chlorides. There is no relation of the chloride level of the blood to the free HCl of the gastric juice or to the vol. index of the corpuscles. The total store of chlorides in patients with very low cell vol. is higher than normal since the blood vol. shows little variations from normal and the plasma chloride content is higher than whole blood. L. K. C.

An attempt to find an antipeptic enzyme in the blood. U. D. KEASER. *J. Lab. Clin. Med.* **10**, 787-93(1925).—The methods described in the literature demonstrating an antipepsin were used and found to be inaccurate. More accurate methods must

Arch. inn. Med. **11**, 561-6(1925).—The water test in a healthy individual leads to no changes in the blood. When the reticulo-endothelial system has been blocked by an injection of electrocollargol there is a decreased elimination of H_2O and an hydremia as shown by a decrease in hemoglobin content and refractometric index. In patients with a tendency to edema these changes are particularly marked. H. F. H.

Insulin and the glucosuria of pregnancy. H. ELIAS, J. GÜDEMANN AND R. ROUBITSCHKEK. *Wiener Arch. inn. Med.* **11**, 567-80(1925).—Small doses of insulin increase the blood sugar content in pregnant and non-pregnant women. Intravenous introduction of sugar increases the blood sugar content equally in pregnant and non-pregnant women but in pregnant women the threshold of elimination is lower. Alimentary hyperglucemia responds to insulin less readily in pregnant or menstruating women than normal women. HARRIET F. HOLMES

The trypsin flocculation reaction in serum in its biologic meaning. P. SAXI AND A. KELEN. *Wiener Arch. inn. Med.* **11**, 549-60(1925).—The trypsin flocculation method previously described (*C. A.* **18**, 3401) has been modified by adding tricesol instead of chloral hydrate to the trypsin soln. Normal sera give a ppt. at 1:300 or 1:800. In certain pathological conditions, particularly severe diabetes, flocculation took place at dilns. as high as 1:51,200. A high titer was noted in carcinoma, pregnancy, decompensated heart disease, tuberculosis and nephritis. The antitryptic titer was not affected by parenteral introduction of trypsin or of a protein. The antitryptic titer was lowered by ligation of the pancreatic duct or extirpation of the pancreas. Administration of trypsin by mouth increased the antitryptic titer and it was also increased after meals. The trypsin flocculation reaction, therefore, is brought about by trypsin in the intestinal canal. HARRIET F. HOLMES

Exchange between tissue and blood. I. The action of venesection on the gases of the blood and the acid-base equilibrium of the organism. G. ENDRES AND C. NEUHAUS. *Z. ges. expl. Med.* **47**, 585-605(1925).—After venesection the CO_2 tension and the CO_2 content of the blood and serum are lowered. Small and moderate losses of blood cause no change in the reaction of the blood, but large losses of blood cause in most cases a change of the reaction of the blood towards the side of acidity. Loss of blood up to 0.3% of the body weight is without noticeable effect on the acid base equilibrium of the blood. Venesection leads to a lowering of the O_2 content of the arterial blood but has no noticeable effect on O_2 saturation or O_2 pressure. Both the CO_2 - and the O_2 -binding power of the blood are reduced, and in one case only half as much CO_2 was brought from the tissues to the lungs after venesection. Even after small or moderate loss of blood the urine shows an increase in the percentage of total P, primary phosphates, total N, ammonia N, NH_3 and degree of acidity. There is a decrease of alveolar CO_2 tension at the same time. HARRIET F. HOLMES

Fat replacement of the glycogen in the liver as a cause of death. E. R. LACOUNT AND H. S. SINGER. *Arch. Pathol. Lab. Med.* **1**, 84-9(1926).—With an extensive replacement of the liver by fat in persons who drink heavily of alcoholic beverages, death may be entirely unexpected and abrupt and with few symptoms of illness. H. F. H.

Amyloidosis produced by injections of proteins. R. H. JAFFÉ. *Arch. Pathol. Lab. Med.* **1**, 25-36(1926).—Amyloidosis occurring in mice after long-continued intramuscular injections of nutrose or serum results from an acquired hypersensitiveness to the injected substance. An endothelial resorption of the amyloid finally takes place in the liver, even though the injections are continued. HARRIET F. HOLMES

The lipid ratio and the content of water of normal and neoplastic tissues. A. H. ROFFO. *Néoplasmes* **4**, 65-72(1925).—In mice the amt. of H_2O contained in grafted tumors is 3 times the amt. of H_2O in the rest of the mouse, and this is also the ratio of cholesterol content of tumor and mouse. The ratio of cholesterol to fatty acids is an index of the capacity for the absorption of H_2O . This ratio is much higher in tumor tissue than in the rest of the mouse, or in a normal mouse. HARRIET F. HOLMES

The chemotherapy of cancer. J. THOMAS. *Néoplasmes* **3**, 108-25(1924). A review. HARRIET F. HOLMES

The dependence of the rapidity of oxidation on changes of reaction. I. The influence of an acid diet. R. DÜRR. *Z. ges. expl. Med.* **47**, 721-33(1925).—If an individual is kept on an acid diet for a number of days, the degree of oxidation is increased to a max. of 14%. Disturbance of the acid-base equil. by an acid diet is indicated by a decrease of the pH of the urine and a decrease of alveolar CO_2 tension, as well as by an increased degree of ventilation of the lung. If NH_4Cl is added to the acid diet the degree of oxidation is decreased 3.5-12%. HARRIET F. HOLMES

The catalytic activity of tissues and fluids in normal and pathologic conditions. J. THOMAS. *Néoplasmes* **1**, 145-52(1922).—The catalase content of the tissues and

blood varies normally, not only with the species of animal and with the individual, but also with the physiol. condition of the individual. It is probable there is a physiol. catalytic activity as there is a physiol. leucocytosis. The catalase content of the tissues and blood of patients with diseases other than cancer shows considerable variation but is generally lowered in cachectic conditions. It is low in tuberculous and syphilitic patients. The catalase content of the tissues and blood is generally lowered in patients with cancer, but there is nothing characteristic about the reduction. Exts. of cancer tissue contain less catalase than certain normal tissue exts. and more than others. The blood of cancer patients is also poor in catalase, but no more so than the blood of patients with other diseases.

HARRIET F. HOLMES

Serological diagnosis of cancer, based on a study of the reducing power of serum. J. THOMAS AND BINETTI. *Néoplasmes* 1, 51-9(1922).—The reduction of methylene blue proceeds more rapidly in a mixt. of serum and cancer ext. when the serum has been taken from an individual having a cancer. A positive cancer reaction with this test may be of diagnostic value. There were 2 apparent exceptions. In a far advanced case of cancer with cachexia the reaction was negative and one individual with a cancer heredity but showing no sign of a tumor gave a positive reaction, indicating that enzymes may be present in the blood in such cases in advance of the appearance of a tumor.

HARRIET F. HOLMES

The effect of solutions of copper sulfate on ducks. C. T. HURST. *Arch. Pathol. Lab. Med.* 1, 201-12(1926).— CuSO_4 solns. produced pigmentation in the livers of ducks. This pigment was hemofuscin. Definite pigmentation was produced in one instance with a 1:500,000 diln. of the salt. Paling of the deep yellow color of the feet and legs of several ducks, together with the deepening of the yellow color of the abdominal fat, may indicate that the carotinoid pigment responsible for this coloration may also be influenced by an overdose of CuSO_4 . It is probable that CuSO_4 would present only negligible dangers if used as anthelmintic for ducks and fowls provided its concn. does not go above 100 mg. per liter and if it is not used continuously. H. F. H.

A growth-promoting factor in tumor tissue. H. CHAMBERS AND G. M. SCOTT. *Brit. J. Exptl. Pathol.* 7, 33-40(1926).—A substance is produced from tumor cells during autolysis which *in vivo* causes an appreciable increase in the rate of tumor growth. It is a fairly stable chemical substance which is apparently derived from the nuclear structures.

HARRIET F. HOLMES

The action of calcium in man. II. The effect of calcium salts on the elimination of nitrogen in healthy individuals and in individuals with diseased kidneys. E. BARATH AND T. V. GYURKOVICH. *Z. ges. exptl. Med.* 47, 741-4(1925).—Ca salts, given intravenously or by mouth, caused a marked diminution in N elimination in the urine, both in healthy individuals and in individuals with kidney disease. Proteins are eliminated in decreased amount while Ca is administered. This may be due to an effect of the Ca salts on the permeability of the blood vessels of the kidney or to a decreased N metabolism.

HARRIET F. HOLMES

The behavior to nuclear staining of the erythrocytes of guinea pigs poisoned with lead. K. VORT AND G. ROESE. *Z. ges. exptl. Med.* 47, 734-40(1925).—The basophile granules and the polychromatic erythrocytes of guinea pigs poisoned with Pb give no nuclear stain, indicating an absence of a nucleic acid of the nature of thymonucleic acid. The basophile granules, therefore, have no genetic relation with the basophile nuclear substance of the cell nuclei. The nuclei of the normoblasts give the nuclear stain.

HARRIET F. HOLMES

Intercellular substances in experimental scorbutus. S. B. WOLBACH AND P. R. HOWE. *Arch. Pathol. Lab. Med.* 1, 1-24(1926).—Scorbutus is due to an inability of the supporting tissues to produce and maintain intercellular substances. The failure of cells to produce intercellular substance in scorbutus is due to the absence of an agent common to all supporting tissues which is responsible for the setting or jelling of a liquid product. Antiscorbutic substance is liberated in the destruction of tissues. Osteoblasts, in spite of great change in morphology, preserve their chem. potentialities and produce bone matrix.

HARRIET F. HOLMES

The importance of the phenomena of oxidation and reduction in the origin of cancer: a new hypothesis and arguments in its favor. J. THOMAS AND R. FIALIP. *Néoplasmes* 4, 73-9(1925).—Clinical study and chem. analysis of tissues and blood both indicate that cancer is the result of a disturbance of equil. between the oxidizing and reducing ability of the cells. There may be a disappearance from the nucleus of an oxidizing metal, as Mn, Mg, Fe or Cu, or its replacement by an inert metal incapable of acting as an oxidizing agent, as K or Zn. The production of cancer may be due to a decrease in oxidizing power or an increase in reducing power of the cell. H. F. H.

Urobilinemia. M. WINTERNITZ. *Z. ges. expl. Med.* **47**, 634-51(1925).—Urobilinemia is a frequent symptom of severe general infections and cardiac decompensation and is found in certain diseases of the liver and in the moribund. The urobilin contained in the serum is always enterogenous in origin, and its increase in the serum depends on a disturbance in the function of the reticulo-endothelial app. H. F. H.

A test of the function of the reticulo-endothelial apparatus. H. ADLER AND F. REIMAN. *Z. ges. expl. Med.* **47**, 617-33(1925).—Colorimetric detns. of the color index of the blood serum, made 4 min. and 1 hr. after intravenous injection of 10-12 cc. of a 1% Congo-red soln., gave an indication of the efficiency of the reticulo-endothelial app. of the organism. Septic infections, liver and circulatory disturbances, and extirpation of the spleen led to a rise in color index. The marked parallelism of the height of the Congo red index and the occurrence of urobilinemia indicate a relationship in the 2 conditions
HARRIET F. HOLMES

Diastatic activity in blood and urine. C. REID. *Brit. J. Exptl. Pathol.* **6**, 314-26(1925).—It is advisable to est. the blood diastatic activity in all cases where the urine diastatic activity is being examd. and especially in those cases which give a urinary diastatic figure toward the lower limits of normality. It would appear that the diastatic concn. factor would serve as an additional confirmatory test to MacLean's urea concn. test, as the figures obtained in both tests in healthy and pathol. cases were in general agreement.
HARRIET F. HOLMES

Ammonia in the blood of epileptics. J. M. LUCK, G. THACKER AND J. MARRACK. *Brit. J. Exptl. Pathol.* **6**, 276-9(1925).—High blood NH_3 occurs at times in epileptics, but not invariably before epileptic fits, and cannot be considered as the cause of the fits. An increase of blood ammonia is found in ketosis, whether occurring in starvation or in diabetes mellitus.
HARRIET F. HOLMES

A physico-chemical study of the serum of cancer patients subjected to an ultra-penetrating radio-therapy. A. H. ROFFO AND J. CORREA. *Neoplasmes* **3**, 211-24(1924).—Various physico-chem. tests were made on the serum of cancer patients before and after deep irradiation. In all cases after irradiation the surface tension and viscosity were increased, while the density, sp. cond. and p_H values showed no regular alterations in either direction.
HARRIET F. HOLMES

Free hydrochloric acid in the gastric juice in cancer patients. A. ROBIN. *Neoplasmes* **3**, 145-54(1924).—While free HCl is usually absent from the stomach content in cases of cancer of the stomach, this is not the absolute rule. Free HCl may be found in 10-25% of cases of cancer of the stomach and may be absent in a number of non-cancerous conditions as chronic gastritis. The absence of HCl is not to be attributed to a sp. action of the cancer on the secretion of HCl but may be due to chronic gastritis present. In cases where there is a normal secretion of HCl there may be little free HCl, due to a satn. with alk. bases coming directly from an ulcerating cancer or with albuminoids produced from the cancer tissue by peptic or peptolytic enzymes.
HARRIET F. HOLMES

The density of the blood. A. ROBIN. *Neoplasmes* **3**, 49-53(1924).—In general, the density of the blood is diminished in cancer patients. The lowered density is not, however, necessarily accompanied by a lessened hemoglobin content and a lowered blood count. The cases in cancer patients of an increased density of the blood are accompanied by an evident diminution in the activity of the glucolytic enzyme. The diminution in the density of the blood is less marked in sarcoma than in epithelioma.
HARRIET F. HOLMES

Refractometric study of the serum of cancer patients. A. KNIPFER. *Neoplasmes* **1**, 177-87(1922).—The refractometric methods of Freud-Kaminer and of Abderhalden may give values with normal serum of the order of +40: +10 and with serum from cancer patients an inverse ratio of +10: +30. Normal serum loses refractometric power on irradiation while serum from cancer patients on irradiation has its refractometric power augmented. Application of both refractometric tests before and after irradiation may prove of diagnostic value in cases of suspected cancer. H. F. H.

The influence of the ions $\text{Rb-SeO}_4\text{-SeO}_4$ on the respiration of normal and neoplastic cells. A. H. ROFFO AND S. M. NEUSCHLOSS. *Neoplasmes* **3**, 223-30(1924); cf. *C. A.* **19**, 2240.—Expts. *in vitro* and *in vivo* with rats indicate that Se and Rb salts cause a diminution of cell respiration in neoplastic and embryonal tissues as compared with normal and adult tissues.
HARRIET F. HOLMES

Glucolytic activation by tumor extracts. N. WATERMAN. *Brit. J. Exptl. Pathol.* **6**, 300-11(1925).—It is possible to increase the glucolytic activity of normal tissue by addn. of tumor ext. The activator substance present in tumor is not specific, as it

also contained in embryonic and to a lesser degree in normal tissue. The different behavior of the tumor-cell towards sugar utilization seems to depend only on quantitative differences caused by the presence of a much larger amt. of activator. Regarding the nature of the activator, some properties seem to point to an analogy with an insulin-like substance (cf. *C. A.* 19, 1737).

HARRIET F. HOLMES

The so-called reversion of hemolysis. I. The conditions of reaction for the change of the lake color of hypotonic hemolyzed blood to cover color with simultaneous reappearance of red blood cells in the microscopic field of vision. W. STARLINGER. *Z. ges. expl. Med.* 47, 406-19(1925); cf. *C. A.* 19, 1737 — Red blood corpuscles, hemolyzed by hypotonic solns., under certain conditions take up again hemoglobin from the laked soln. This so-called reversion of hemolysis is dependent on the kind and concn. of the blood used and the kind and concn. of the substance added. Reversion of hemolysis is brought about by neutral salts, heavy metal salts, HCl, NaOH and glucose, while urea, suspensions of lipoids and proteins are without effect. The H-ion concn. is of importance, as the neutral salts react less strongly on the reversion in a $p_{H} = 7$ than in a more acid or alk. medium. The reaction is more pronounced the lower the temp. **II. The nature of the course of the reaction.** W. STARLINGER. *Ibid* 420-33 — The so-called reversion of hemolysis seems to be due in part to an osmotic shrinking of greatly swollen, incompletely dissolved blood cells, and in part to a true return to the stroma of hemoglobin that had gone into solution. **III. A method of determination of the amount of hemoglobin that did not go into solution at first as well as of the amount that later was bound again to the stroma.** W. STARLINGER AND U. STRASSER. *Ibid* 434-46 — Native or citrated blood is suspended in its own plasma or in 0.9% NaCl. After centrifuging, the blood cells are dissolved in 9 parts distd. H_2O for at least an hr. 0.2 cc. of the blood soln. is mixed with 0.3 cc. distd. H_2O and 0.5 cc. 0.1 N HCl, and after a few min. 4 cc. 96% alc. are added. To 1 cc. of the soln. is added 1.0 cc. H_2O and to another cc. 1.0 cc. 0.308 mol NaCl soln. After centrifuging for an hour 0.5 cc. of the fluid is mixed with 0.5 cc. 0.1 N₂HCl and 4.0 cc. 96% alc. and the values obtained in an Authenreth colorimeter are compared with that of a standard soln. **IV. Some preliminary clinical findings.** W. STARLINGER AND U. STRASSER. *Ibid* 447-53 — A quant. study of hemolysis and its reversion in 50 normal and pathol. conditions showed that it gives an indication of the colloid chem. condition of the erythrocytes which is of no little importance if it is recognized that there are definite relations between the functional quantity and quality of red blood cells and their physico-chem. structure.

HARRIET F. HOLMES

Blood sugar in pernicious anemia. E. MEULENGRACHT AND POUL IVERSON. *Deut. Arch. klin. Med.* 148, 19(1925) — Two hundred and fifty detms. showed moderate increases in the blood sugar content accompanying pernicious anemia. The authors find no relation between blood sugar content and hemoglobin content or temp.; in this regard they fail to confirm the observation of Johansson (*C. A.* 17, 2317). The blood sugar curve in the acute periods may be raised or lengthened; these deviations result not from the anemic condition, but from the accompanying intoxication.

P. Y. JACKSON

The differential diagnosis of diabetes mellitus and glucosuria innocens. E. KULCKE. *Deut. Arch. klin. Med.* 148, 262-72(1925) — The blood-sugar curve after (1) feeding glucose, (2) injecting glucose and (3) injecting insulin, and the sugar content of the urine after the injection of insulin, do not strictly distinguish the 2 diseases. A case is discussed in which the blood sugar curve indicated diabetes after feeding carbohydrate, but harmless glucosuria after the injection of carbohydrate. P. Y. J.

The diazo and urochromogen reactions in the blood filtrate in kidney insufficiency; their explanation and clinical importance. E. BECHER. *Deut. Arch. klin. Med.* 148, 10-19(1925). — The blood serum, rendered protein free by pptn. with CCl_3COOH , gives a distinct yellow-brown diazo color-reaction in case of severe kidney insufficiency. NaOH was used instead of NH_4 , since the latter gave a slight color in a blank test; the other reagents were the usual ones for the test on urine. The filtrate from normal blood gives only a yellow test, due apparently to tyrosine and histidine. Acidification removes the color from a normal sample, but not from the pathol. one. In the latter case the color may be partly ascribed to aromatic oxacids, mono- and diphenols are not involved.

P. Y. JACKSON

Chromogens in the blood serum and in the urine in kidney disease; the origin of the bright color of the urine in atrophied kidney. E. BECHER. *Deut. Arch. klin. Med.* 148, 46-57(1925). — Blood and urine contain urochromogens and other chromogens, apparently tryptophan derivs.; tissue exts. also contain chromogens. Their appearance in the blood accompanies retention of indican, phenol, *p*-cresol, diphenols and aromatic

oxyacids. These are oxidized in the kidneys to the corresponding colored substances and eliminated as such.

P. V. JACKSON

Clinical observations on the physiology and pathology of the stomach secretions. LUDWIG HEILMEYER. *Deut. Arch. klin. Med.* **148**, 273-312(1925).—After stimulation with a 5% soln. of alc. contg. indigo carmin, the stomach juices of healthy persons contain 0.2-0.4% HCl; in true hyperacidity, over 0.5%; and in hypoacidity, 0.1% or less. The detns. were made as follows: A mixt. of 350 cc. H₂O, 18 cc. 96% alc. and 3 cc. of a 0.5% soln. of the dye is introduced into the stomach, mixed with the stomach contents, and every 10 min. a sample withdrawn for colorimetric detn.; the detn. is made rapidly as acid acts upon the dye. While the HCl concn. in an individual varies during the period of secretion, the total chloride is more nearly const. In pathol. cases showing no free HCl, or even an alk. juice, the Cl content is normal. Achyliaes secrete a juice of normal Cl content; but both the p_H of the urine and the CO₂ pressure of the alveolar air indicate that no acid is present and subsequently neutralized. Apparently secretion of Cl-ion and of HCl are independent; the latter requires more energy, is more easily disturbed by nervous impulses, and is especially more dependent upon the intensity of the stimulation.

P. V. JACKSON

The pathogenetic relations between true uremia, and the substances retained in the blood in cases of kidney insufficiency. E. BECHER AND F. KOCH. *Deut. Arch. klin. Med.* **148**, 78-85(1925).—The true symptoms of uremia vary widely with the blood content of phenol, cresol, diphenols and aromatic oxyacids; and are less closely related to the presence of intermediate decompn. products of proteins. This agrees with the observation that the symptoms of chronic phenol poisoning resemble those of true uremia.

P. V. JACKSON

The xanthoproteic reaction in protein-free blood in normal and pathological conditions. E. BECHER. *Deut. Arch. klin. Med.* **148**, 159-82(1925).—Normal whole blood and serum give a xanthoproteic reaction of the same intensity, detd. colorimetrically by comparison with a standard dichromate soln., the color in the serum being due to tyrosine and tryptophan. In kidney insufficiency the serum gives a higher value than whole blood; *p*-cresol, phenol, aromatic hydroxy acids and small amts of indican and diphenols are present. Extn. with ether, after hydrolysis, removes phenolic substances and reduces the intensity of the reaction. In severe kidney insufficiency the intensity is reduced by extn. with ether without previous hydrolysis, due to the removal of free aromatic hydroxy acids. Phenylalanine and other phenyl derivs. give a weaker reaction than do tryptophan, tyrosine, and other phenol and indole derivs. In acid soln. tyrosine shows less effect than tryptophan or indican; in alk. soln. this condition is reversed. Expts. are tabulated giving the comparative colorimetric values of other related substances, as indican, pyrocatechol, salicylic acid, adrenaline, etc.

P. V. JACKSON

Clinical, experimental, and histological investigation of the poisoning of the stomach by acids. K. SICK. *Deut. Arch. klin. Med.* **148**, 318-43(1925).—Observations on a number of hospital cases and on cats, of the anatomical and functional results of mineral acids taken through the mouth.

P. V. JACKSON

Disturbance of the physico-chemical equilibrium of the skin by making it acid or alkaline. FRANZ WIRZ. *Krankheitsforschung* **2**, 186-94(1926).—The hands and arms of the subject are placed in a galvanic bath at body temp.; the current enters by the skin of one arm, passes through the body, and leaves by the other arm. With normal individuals the skin of the anode-arm, in which there are an excess of anions, shows after about 12 min., with a current of 10 milliamps., small bright-red spots, which increase in size until all the immersed skin is red; the color disappears in a few hrs. after the end of the expt. On the cathode side after about 17 min. exposure, the skin begins to turn grayish or livid. In 100 different persons the results differed only in intensity. The acid-reddening is arterial, and corresponds to active hyperemia; the alkali-color is venous, and corresponds to passive erythemia. If the skin is exposed to bright sunlight, producing erythema before exposure to the current, the acid-arm is more inflamed, while inflammation is retarded and is less intense in the other arm. W. recognizes the acidification or alkalization of the tissue as a sp. causative factor in many skin diseases.

P. V. JACKSON

Experimental investigation of inflammation. HERMANN GROLL. I. The influence of acid and alkali upon the migration of leucocytes. L. SIEGEL. *Krankheitsforsch.* **1**, 59-65(1925).—The web of each hind foot of a frog is punctured, touched with 2% AgNO₃, and washed with water; water is then dripped upon one leg, and 0.01% HOAc, or 0.001% lactic acid upon the other. The degree of inflammation and the no. of leucocytes found in the tissue seemed not to be affected by the use of acid rather than

water, except where the acid was strong enough to exert a destructive effect of its own. When a current of 7–12 milliamp. is sent through the body of rats or guinea pigs, whose skin has been previously irritated with turpentine, no difference is observed in the no. of leucocytes in the tissues around the anode and cathode. **II. Further investigation of the action of acid and alkali upon the living organism.** HERMANN GROLL, *Ibid* 66–9.—A small current passed through both hind legs of a frog, previously injected with acid fuchsin or other dye, causes the skin of the acid leg to assume the acid color of the dye. Circulation ceases in the skin of both legs, and in the anode leg does not resume upon cessation of the current. Apparently an excess of OH-ions has less harmful effect than an excess of H-ions. This is also true in the muscles. **III. The oxygen-respiration of surviving kidney tissue, with special attention to alterations in the tissue.** HERMANN GROLL AND ILSE SCHIEFERDECKER, *Ibid* 2, 195–219(1926).—The O₂ consumption is detd. thus: A small piece of the surviving tissue is shaken in Ringer soln. satd. with O₂ in a closed vessel contg. air, at 37.5°; the change in pressure is followed with a manometer. For normal kidney tissue the value detd. ranges from 13.20 to 20.05, averaging 15.02 for 1.5 hrs.; these values represent cm. O₂ absorbed/(mg. tissue × hrs.). After HgCl₂ poisoning the normal values were found, except where the tissue showed fatty deposition and advanced necrosis; then the value was lower. In salicylate poisoning the rate of respiration falls much more rapidly with time than for normal tissue, though no morphological changes are visible microscopically. **IV. The effect of inflammation and of irritation on the rate of oxygen-respiration of tissues.** G. BORGER AND H. GROLL, *Ibid* 2, 220–62.—When one ear of a mouse is painted with croton oil, the rate of O₂-absorption is found first to rise sharply and then to sink below the value for the other ear; and to cease entirely after 24–36 hrs. When painted with 6% diphenylarsine chloride in petroleum ether, respiration ceased within 8 hrs.; with concd. formic acid, almost at once. One percent papain and tincture of cantharides increased the rate. The increase was the same whether the irritant was applied before or after cutting off the ears, so the change is not a secondary one due to hyperemia. P. Y. JACKSON

The cholesterol content of the blood serum in pernicious anemia. HERMANN KÖHN, *Deut. Arch. klin. Med.* 148, 357–71(1925).—The method of Autenrieth and Funk was used to det. cholesterol. In all cases of pernicious anemia there was a decrease in the cholesterol content, greater or less according to the stage of the disease. K. believes that hypocholesterolemia is directly proportional to the degree of toxicity produced by the disease in each stage. New researches are needed to clear up the question of cholesterol metabolism in pernicious anemia. P. Y. JACKSON

The sugar and calcium content of the cerebrospinal fluid. K. BRUCKE, *Deut. Arch. klin. Med.* 148, 183–94(1925).—B. confirms the conclusion of Leicher that the Ca content is very nearly const. in normal adults, and does not vary even with diseases of the central nervous system. B. noted a lowering of the sugar content in some cases of meningitis, and in progressive paralysis, an increase in epilepsy, and normal values for cerebrospinal syphilis. The const. value for Ca can be explained only by the active selective ability of the chorioid plexus, but whether this selectivity is resorptive or secretory is not detd. The results of numerous analyses are given in tabular form. P. Y. JACKSON

Disturbance of carbohydrate metabolism in pregnancy. O. KLEIN AND E. RIS CHAWY, *Deut. Arch. klin. Med.* 148, 195–213(1925).—Diabetes of pregnancy has been ascribed to renal disturbance, to failure of the liver to build up glycogen, and to disturbance of the glands of internal secretion. K. and R. investigated a case which showed blood sugar subnormal; after feeding glucose in 3–20 g. portions at 30 min. intervals, the blood sugar at first rose with each portion higher than for a normal person, but fell much more quickly to its subnormal level than in true diabetes. Levulose fed in the same way caused a pronounced decrease in sugar in both blood and urine, there was no levulosuria. The glucosuria observed did not correspond to the glucose intake, nor did it increase with a heavy protein diet. The usual symptoms of pancreatic diabetes were absent. The injection of 60 units of insulin, incompletely compensated by 70 g. of white bread 30 min. later, was followed in 2.5 hrs. by a rise in blood sugar from 0.089 to 0.162, an increase of 100%, while more than 4 hrs. were required for a return to the original value. Both serum protein and the no. of erythrocytes decreased with insulin injection. A control expt. without insulin showed about the same increase in blood sugar, and the same rate of elimination in the urine. The authors conclude that the abnormal carbohydrate metabolism in pregnancy results from disturbance of the glands of internal secretion. P. Y. JACKSON

Determination of variations in the acid content of the blood. KL. GOLLWITZER-

MRIER. *Deut. Arch. klin. Med.* **149**, 151-6(1925).—An abnormal concn. of acid in the blood may be detd. by the degree of loss of ability to take up CO_2 , after making an allowance for any change in the total alkali content. In a case of diabetic coma with uncompensated acidosis ($p_{\text{H}} = 6.94$) about 0.02 mol. alkali was withdrawn by the blood to neutralize the ketonic substances present. This was calcd. by measuring the decrease in CO_2 tension, and the corresponding decrease in bicarbonate content. In Hg poisoning, when the blood contains large amts. of the products of decomp. proteins, there is a large decrease in the anion deficiency, showing the retention of acids; on the other hand, in a case of tetany of the stomach the CO_2 rose to 117 vol. %, due to the alkali freed by loss of Cl.

P. Y. JACKSON

The antigen properties of hemoglobin. W. ENGELHARDT. *Biochem. Z.* **163**, 187-96(1925).—Rabbits are immunized by injection of hemoglobin from dogs' blood, and the antigen properties of the rabbit serum are studied. In this serum is found an antibody which can bind hemoglobin. The method of prepn. of the hemoglobin is without influence upon its ability to react with immune serum, which is specific in its action.

W. D. L.

The oxidase nature of the leucocyte granules. A. NEUMANN. *Folia Hematol.* **32**, 95-6(1925).—A defence is made of the theory of the oxidase nature of leucocyte granules.

JOHN T. MYERS

The genesis of blood platelets in the light of the oxidase reaction. K. KATSUNUMA. *Folia Hematol.* **32**, 29-31(1925).—The granules in the cytoplasm of megakaryocytes and blood platelets both give the oxidase reaction, which supports the theory that blood platelets arise from the cytoplasm of megakaryocytes.

JOHN T. MYERS

Experimental production of vituline fever. L. AUGER. *Compt. rend.* **182**, 348-50(1926).—Injection of insulin in the healthy cow produced symptoms like those of collapse in vituline fever. Instead of the usual injection of air into the udder, a subcutaneous injection of 40 g. of glucose in 20% soln. gave rapid relief.

L. W. RIGGS

Urinary calculi. Chemical composition and structure in relation to radiography. D. E. SHEA. *J. Am. Med. Assoc.* **85**, 1939-43(1925).—The relative opacity of a urinary calculus depends on the total mol. or at. wts. of its constituents and is influenced by its structure and thickness. Some urinary calculi having constituents of low at. wt. are negative to the Röntgen ray. These include stones composed of uric acid, urates and triple phosphate. The diagnosis of urinary calculi should not be guided entirely by radiographic reports.

L. W. RIGGS

The influence of nutrition on the growth of mouse carcinomas and rat sarcomas. F. LUDWIG. *Z. Krebsforsch.* **23**, 1-8(1926); cf. *C. A.* **19**, 2842.—Rats and mice kept on a vitamin-free diet as long as possible and then inoculated with malignant tumors either failed to develop these tumors or outlived control animals, all of which developed tumors. The animals were given vitamins when it became necessary to keep them alive. It is suggested that the fact that cancer appears mostly in old age is because in the actively growing periods of life the necessary vitamins are used by the normal growing tissues and only after cessation of body growth is there a surplus supply of vitamins available for tumor growth.

H. G. WELLS

The cytolytic action of selenium and its compounds. A. H. ROFFO AND L. M. CORREA. *Z. Krebsforsch.* **23**, 82-4(1926).—The effect of various Se compds. was tried on spindle cell sarcoma of the rat and normal rat liver cells. The tumor cells were much more sensitive to the lytic action of the selenium salts than were the normal cells. Sarcoma cells were not compared with normal connective tissue cells.

H. G. WELLS

The growth of normal and malignant tissue cells under increased oxygen pressure. A. FISCHER AND E. B. ANDERSEN. *Z. Krebsforsch.* **23**, 12-27(1926).—Under increased O tension, sarcoma cells are killed more quickly than normal tissue cells in artificial cultures. It was found possible, by using suitable O tension, to transform mixed cultures of normal fibroblasts and sarcoma cells into pure cultures of connective tissue.

H. G. WELLS

Anaphylactic shock caused by antibody in animals sensitized by antigen. Reversed passive anaphylaxis. E. L. OPIE AND J. FURTH. *J. Exptl. Med.* **43**, 469-82(1926).—Anaphylactic shock occurs (in rabbits) when the usual procedure for the production of passive anaphylaxis is reversed; that is, when an animal previously treated with an antigen receives the corresponding antiserum by way of the circulating blood. This susceptibility to the action of anti-horse serum produced by injection of antigen reaches a max. intensity after an interval of 4 hrs. presumably required to permit penetration of the antigen in sufficient concn. into the tissues. Desensitization to the action of a shock-producing dose of anti-horse serum can be brought about by repeated small

doses of the same antiserum. Anaphylactic shock and local anaphylaxis manifested by the acute inflammation of an immunized animal when injected with the antigen used for immunization (Arthus phenomenon) occurs under analogous conditions; that is, when antigen and antibody meet within the tissues. The peculiar characters of these reactions are dependent upon the site of entry of the irritating agent, which is the vascular system in 1 instance and tissue space in the other, and upon the concn. of antigen and antibody within susceptible tissues. Meeting of antigen and antibody within susceptible tissues is sufficient to explain the phenomena of local and general anaphylaxis so that it is unnecessary to assume the sudden formation of a toxic substance (anaphylatoxin).

Reaction of cow milk to blood serum precipitin. P. S. JONES AND C. J. WEST. *J. Exptl. Med.* **43**, 451-9 (1926).—Normal milk when tested with units of sp. blood serum precipitin which will detect 1/40,960 cc. of cow serum will react in dilns. of 1:80 and 1:160 and in some cases, at even higher dilns. Milk withdrawn from the udder at the end of milking is not richer in blood protein than that obtained at first. The udder fluid just before parturition is rich in serum proteins, their concn. within the udder is temporary; at first they diminish rapidly as soon as the udder is regularly emptied and then fall gradually to the normal level. Even in milder cases of mastitis there is a considerable increase in the serum content of milk from the affected quarter. As the process becomes more severe serum passes into the udder to a greater degree but the increase is confined only to the involved quarter. The addn. of even as little as 1:80 part of mastitis milk to bottled milk will increase the serum titer 4 to 8 fold. Milk heated to a temp. as high as 66° for 20 min. will react at the same dilns. as the raw milk. Milk pasteurized at 68-9° for 20 min. will no longer react. The precipitin test then affords a ready means of detecting milk heated above 68-9°.

Effect of antiserum against the soluble toxic substance of *Bacillus coli* in *Bacillus coli* peritonitis. BERNHARD STEINBERG AND E. E. ECKER. *J. Exptl. Med.* **43**, 443-50 (1926).—From young cultures of *B. coli* (18 to 24 hrs.) a sol. toxic substance was obtained and an antiserum against this toxic substance was produced. The sol. toxic substance is the principal lethal factor when cultures of *B. coli* are injected into the peritoneal cavity of rabbits. Intravenous administration of the antiserum can avert death in rabbits previously injected intraperitoneally with lethal doses of *B. coli*.

Effect of jejunostomy in experimental obstruction of the jejunum of the dog. R. L. HADEN AND T. G. ORR. *J. Exptl. Med.* **43**, 183-93 (1926).—Jejunostomy does not prevent the development of the chem. changes of the blood characteristic of obstruction of the jejunum in the dog. Treatment of jejunal obstruction with NaCl soln. tends to prolong the life of animals regardless of jejunostomy.

Experimental bone marrow reactions. I. Anemia produced by collargol. G. L. MÜLLER. *J. Exptl. Med.* **43**, 533-53 (1926).—The effect produced by the intravenous administration of collargol on the bone marrow of rabbits varies directly with the amt. of collargol injected; 3 fairly well defined stages are recognized. There was no evidence of injury to blood cells in the peripheral circulation. The erythrocytic bone marrow aplasia was present before any appreciable decrease of red blood cells was found in the peripheral blood. The results were less clear cut in a series of rats, but anemia of a similar type was produced in all animals when sufficiently large doses were injected. Splenectomy did not alter the course in rats materially. The cause of the anemia may be sought in the deviation of the parental endothelial cell towards clastocyte formation at the expense of the development of erythrocytes.

PETERS, JOHN P. AND VAN SLYKE, DONALD D. **Quantitative Chemistry in Clinical Medicine.** Baltimore: The Williams & Wilkins Co.

H PHARMACOLOGY

ALFRED N. RICHARDS

The individual sensitivity of rabbits toward insulin. E. LAQUEUR AND S. E. DE JONGH. *Biochem. Z.* **163**, 308-37 (1925). There is an intra and an inter-individual variation in the response of rabbits to insulin. Climate is responsible for some of these variations. **Determination of the active strength of insulin and the new clinical unit.** E. LAQUEUR AND S. E. DE JONGH. *Ibid.* 338-43.—The method used for assay of an insulin prepn. is described. **Relation between dose and blood sugar lowering (concentration-activity curve) and swelling value of insulin.** E. LAQUEUR AND S. E. DE JONGH. *Ibid.* 344-55.—By the swelling value of insulin is meant the smallest dose which will in 2 hrs. produce a lowering of the blood sugar of 0.06 to 0.15 mg. cc. For rabbits, it

is about 0.1 unit. It may vary as much as 400% for humans, and so must be detd. for each individual. **Influence of carbohydrates, fats, and protein upon the sensitivity toward insulin.** A. GREVENSTUK, S. E. DEJONGH AND F. LAQUEUR. *Ibid* 355-70.—See C. A. 19, 3538. **Influence of the degree of purity upon the activity of insulin.** S. E. DEJONGH AND F. LAQUEUR. *Ibid* 371-80.—See C. A. 19, 3538. **Giving of insulin by means other than by subcutaneous or intravenous injection.** S. E. DEJONGH, E. LAQUEUR AND K. NEHRING. *Ibid* 381-9.—Insulin given by enteral, rectal, vaginal or nasal routes is not absorbed, but given percutaneously in salves it is absorbed. The last method is being studied for its clinical application. **The glycogen content of the liver of rabbits with insulin, especially with the detachable abdominal window.** A. GREVENSTUK AND F. LAQUEUR. *Ibid* 390-402.—The technic whereby successive portions of the liver of rabbits may be removed for the detn. of glycogen enables the effect of insulin upon liver glycogen to be detd. Insulin seems to have no definite influence upon liver glycogen, probably because the error of the detn. is so large. **Influence of glycogen and starch injections upon the cramps of insulin rabbits.** S. E. DEJONGH AND F. LAQUEUR. *Ibid* 403-5.—Intravenous injection of glycogen or sol. starch can relieve insulin convulsions in rabbits. **Influence of intravenous injection of glycogen and starch upon the blood sugar of rabbits.** F. LIPMANN AND J. PLANELLES. *Ibid* 406-11.—The ability of blood diastase to hydrolyze glycogen is dependent largely upon the degree of purity of the glycogen. Intravenous injection of sol. starch or glycogen produces a rise in blood sugar lasting for 3 hrs. W. D. L.

Insulin and the blood-fat. A. C. WHITE. *Biochem. J.* 19, 921-6(1925).—The marked hypoglycemia caused by insulin in the normal dog is accompanied by an increase in the blood-fat, the fatty acid being affected more than the cholesterol.

BENJAMIN HARROW

Insulin and glucose utilization: effects of anesthetics and pituitrin. C. G. LAMBIE. *Brit. J. Exptl. Pathol.* 7, 22-32(1926).—The av. rate at which the tissues remove glucose from the circulation in the decerebrate cat with the liver tied off is 0.15 g. per kg. per hour. This rate is increased by 75 to 100% by insulin in doses of 10 units per kg. When the liver is included and the splanchnics are cut, the rate of removal averages 0.6 g. per kg. per hr. The rate at which the tissues remove glucose from the circulation when the liver is excluded is about the same under anesthesia as in the decerebrate prepn. The rate at which insulin accelerates the removal of glucose appears to be unchanged by the administration of anesthetics. Doses of pituitrin which are sufficient to prevent the fall in blood sugar under insulin in the intact animal fail to do so when the liver is excluded, and glucose is supplied at the rate necessary to keep the blood sugar level during the control period.

HARRIET F. HOLMES

The antagonism between adrenaline and insulin with regard to the autonomous nervous system. V. KOGAN AND N. PONIROWSKY. *Z. ges. exptl. Med.* 47, 557-671(1925).—Insulin and adrenaline are antagonistic in their behavior towards the autonomous nervous system.

HARRIET F. HOLMES

The influence of insulin on the secretion of adrenaline by the adrenals. M. N. TSCHIBOKSAROFF AND Z. J. MALKIN. *Z. ges. exptl. Med.* 47, 580-4(1925).—The injection of insulin has a stimulating action on the process of excretion of adrenaline by the adrenals.

HARRIET F. HOLMES

Effect of Röntgen rays on the vegetative system. OTTO STRAUSS AND JULIUS RÖTHNER. *Strahlentherapie* 18, 37-63(1924); *Ber. ges. Physiol. exptl. Pharmacol.* 31, 486(1925).—Röntgen irradiation lowers the blood pressure of rabbits. This action has some relation to the sympathetic as it can be suppressed by atropine. Liver and pancreas irradiation increases the blood sugar; in the dog pancreas irradiation has the same effect. Isolated irradiation of the adrenals is followed a few days later by a decrease of blood sugar. Skin irradiation in man has no influence on glucemia.

MARY JACOBSEN

Thallium as a poison and a remedy. HUGO HARTNACK. *Berl. tierärztl. Wochsch.* 41, 49-51(1925); *Ber. ges. Physiol. exptl. Pharmacol.* 31, 633(1925).—A review.

MARY JACOBSEN

BERKELEY, WILLIAM NATHANIEL: The Principles and Practice of Endocrine Medicine. Philadelphia: Lea and Febiger. 368 pp. \$4.50. Reviewed in *J. Am. Med. Assoc.* 86, 973(1926).

MACLEOD, J. J. R. AND CAMPBELL, W. R.: Insulin and Its Use in Diabetes. Baltimore: The Williams & Wilkins Co. Reviewed in *Endocrinology* 10, No. 1, 64(1926).

MOLLGAARD, HOLGER et al.: Chemotherapy of Tuberculosis. Copenhagen: Munksgaard. 427 pp. 25s.

Organotherapy. New York: G. W. Carnick Co. 249 pp. \$2.00.

POULSSON, EDUARD. *Lehrbuch der Pharmakologie für Aerzte und Studierende*. Leipzig: S. Hirzel; Oslo. H. Aschehoug & Co. 585 pp. R. M. 20.
 ROBINSON, G. CANBY: *The Therapeutic Use of Digitalis*. Medicine Monograph I
 Baltimore: The Williams & Wilkins Co. 144 pp. \$2.50.

I- ZOÖLOGY

R. A. GORTNER

Determination of water-soluble excretions of aquatic animals. EMIL LENK. *Biochem. Z.* **168**, 61-8 (1926).—Changes in elec. cond. of the water in which fish live are used to det. the elimination of H_2O -sol. waste products. The fish (*Phoxinus phoxinus*) begin to excrete about 2 hrs after feeding. Expts. at 10, 18, and 25 show that the metabolism and the rate of excretion both increase with the rise in temp. The temp. coeff. (van't Hoff's) varies from 1 to 1.44, and is greater at the higher exptl. temp. (10-20°, 1-1.21; 15-25°, 1.18-1.41). S. MORELLIS.

Cetacea. IX. Serological investigation of the relationship of different kinds of whales. NOBUYOSHI FUSE. *Japan J. Med. Sci.* **1**, Pt. II, 1-4 (1925).—Pptn. reaction and complement fixations indicate that the sperm whale, the finback and the "seiwal" are closely related. **X. Synovial liquid.** *Ibid.* 5-9.—The synovial fluid of the finback has a slightly alk. reaction and is very thick, though this property is lost on standing some time at room temp.; that from a head joint required 325 sec. to flow from a Redwood viscometer at 38° (50 cc. of H_2O required 25 1/2 sec.), d. 1.012, solid constituents, 2.45-2.55; ash, 0.96-1.00; total N, 0.2645-0.2896 (g. per 100 g. liquid), corresponding values for the liquid from a shoulder joint are .275 sec., 1.012-2.13, 0.93-1.01, 0.2110-0.3016. The liquid from the shoulder joint of a "seiwal" had d. 1.013, solids, 2.39, ash, 1.10. The liquid from the finback had a refractive index of head, 1.33797-1.33766; shoulder, 1.33820-1.33799. **XI. Physiological importance of the divisions of the whale stomach.** MAKI TAKATA. *Ibid.* 11-23, cf. *Ch. I* **16**, 3511. A study of the enzymes of the whale stomach indicates that the pepsin formation occurs in the 2nd stomach; lipase occurs in the mucous membrane of all 3 of the stomachs but is present in largest amts. in the 3rd stomach. The H_2O , Cl and Fe content of the mucous membrane showed the following variations in 4 animals: 2nd stomach, 79.6-84.7, 2.33-3.14; 0.026-0.040 (the last 2 are reported for the dry substance), 3rd stomach 85.5-88.7; 2.50-4.48; 0.022-0.041, duodenal ampulla, 83.1-86.3, 3.30-5.75, 0.011-0.026. The behavior on autolysis is also reported. **XII. Physicochemical properties of the "seiwal" urine.** SHIKANOSKE MORIMURA. *Ibid.* 25-7.—The limits observed in 7 samples of urine were, d. 1.023-1.034, freezing point lowering, 1.83-2.51, dec. cond. (K_{10}^0), 239.3-432.2, p_H (electrometric) 3.8-5.6, (thy. indicators) 5.5-6.5, relative surface tension, 92.2-97.9, stalagmometric quotient, 1.01-1.01. **XIII. Content of the cysts occurring in the spermatid duct. The liquid accumulation in the uterus.** KATSUMI OKAZAKI. *Ibid.* 29-30.—The cyst consists of a pale yellow, slightly turbid liquid of d. 1.010-1.015, it is slightly alk., lies between 7 and 8, analysis showed H_2O , 97.83%, solids, 2.17%, total N, 0.12, protein, 0.3, Et_2O -extractives 0.61; ash, 0.89. A non-pregnant uterus contains a nearly colorless liquid, which is slightly turbid, reacts slightly alk., d. about 1.030, freezing point lowering, 1.86°, ash 3.5-4%, of which about 0.5 is Cl. **XIV. The nature of ambergris and its constituents.** MAKOTO SUZUKI. *Ibid.* 31-42. Ambergris contains about 25% of ambrin (I), very small amts. of morg. compds., largely $Ca(PO_3)_2$ a porphyrin but principally a fat-like product which has not been investigated. I m. 83° [α_D^{20}] 20.5 (0.5 g. in 25 cc. 90% $EtOH$), contains 83.7% C and 12.1% H, mol. wt. in camphor, 340. Catalytic reduction caused the addn. of about 4 atoms of H, the reduced compd. m. 78-80°. I adds 86% Br. The behavior of I towards different cholesterol reagents is reported, which indicates that I is a sterol or a deriv. thereof. **XV. Composition of finback whale blood.** YOSHIO OKAHARA. *Ibid.* 43-7 (1925).—The dry matter of the blood is about 22 g. per 100 cc. blood, the total N 2.6 to 2.8 g. The urea N varies from 20 to 30 mg. for blood, 25 to 34 mg. for serum, the NH₄ N varies from 7 to 15 for blood, 3 to 4 mg. for serum, ammonia N, 0.5 to 0.9 mg. for blood, 0.9 to 0.12 for serum. The total fatty acids (mg. per 100 cc.) in the blood are about 545 for the serum, 662-825. The lecithin, 250-75, 370-120, cholesterol, free, 86, 21-30, combined, 48-53, 68-76. The blood sugar may vary from 0.0806 to 0.1604 g. per 100 cc. blood, and from 0.0532 to 0.1626 for serum. The inorg. constituents of the blood vary as follows in 4 samples: Na, 322-343 mg. per 100 cc.; K, 221-232; Mg, 4.6-6.6, Ca, 5.4-7.4, Cl, 8.7-50.7, H₂SO₄, 1.9-2.6; H₃PO₄, 30.6-40.3. **XVI. Whale flesh.** MAKOTO SUZUKI. *Ibid.* 49-50.—The "seiwal" flesh on the market contains 75% H_2O , the solid matter contains 3.4% N

The flesh, treated with Me_2CO at room temp., then extd. with EtOH and CHCl_3 , gave 6% of an ext., contg. 0.068 g. free and 0.004 g. combined cholesterol and 0.1 g. lecithin P_2 as P_2O_5 ; I no., 29.7; acid no., 65.2. An air-dried sample contained 4.5% Et_2O extractives, contg. 0.03 g. cholesterol. The dry material usually contained 15-20% H_2O , 10-15% N, 5-6% ash. The ash gave the following analysis (g. per 100 g. flesh): Cl, 0.57; P_2O_5 , 1.68; H_2SO_4 , 1.68; Na_2O , 0.42; K_2O , 0.94; CaO , 0.03; MgO , 0.13; Fe, 0.035. **XVII. Peritoneal fluid.** NOBUYOSHI FUSE. *Ibid* 51-3.—The peritoneal fluid of the finback whale is a brownish yellow fluid of sp. gr. 1.020, slightly alk. towards litmus, shows a f. p. lowering of 0.70° , contains 3.42 g. solid substance per 100 cc.; urea 0.006, NH_3 0.008, amino N 0.018, creatinine 0.01, uric acid trace, total N 0.542, non-protein N 0.75, sugar 0.065, Et_2O ext. 0.07, total ash 1.05, NaCl 0.8, H_2SO_4 0.02, H_3PO_4 0.08, K 0.03, Ca 0.01, Mg 0.006, Fe 0.0003. **XVIII. Sugar content of the blood.** YOSHIBUMI MASUMIZU. *Ibid* 55-60.—The various methods employed for detg. sugar gave fairly consistent results, indicating that the values really represent sugar. In the blood and serum of the finback whale the sugar varies from 0.205 to 0.364, 0.110 to 0.35; in the "seiwai" the values are from 0.065 to 0.262, 0.165 to 0.341 (only 2 samples of serum reported). **XIX. Composition of the tendons and sclera.** Preparation of *d*-aminobutyric acid from sclera. SHU OIKAWA. *Ibid* 61-7 (1925). The tendon of the sperm whale, air-dried, lost 23.2% of its wt. at 110° and contained 15% ash, the air-dried sample contained 14.28% total N. The fat-free sclera contained 13.4% H_2O , 0.7% ash and 12.30% total N. The total N of the tendon and sclera was divided as follows (% of the total): NH_3 , 5.53, 1.17, humin, 2.03, 0.89; mono- NH_2 , 69.75, 60.49; non- NH_2 , 3.08, 8.85; arginine, 6.44, 10.49; lysine, 7.49, 8.21; histidine, 2.24, 1.71; cystine, 3.01, 5.04. The hydrolysis of 200 g. sclera and 100 g. tendon gave the following amts. of NH_2 acids: glycocoll ester-HCl, 21.2 g., 18.5 g., alanine, 6.6 g., 5.7 g.; leucine, 2.9 g., 1.2 g.; proline, 1.6 g., 8.5 g.; glutamic acid-HCl, —, 2 g.; phenylalanine, 3.5 g., traces; *d*-aminobutyric acid, 4 g., —. This is the 1st time this acid has been definitely isolated from an acid hydrolysis of a protein. **XX. Composition of the urine of Delphinidae.** MAKOTO SUZUKI. *Ibid* 69-70.—Three samples are reported, one from "Grindwal" and 2 from porpoises; samples were collected 8 hrs. after death. Sp. gr. 1.032 at 11° , 1.052 at 22° , 1.038 at 20° ; f. p. lowering, 2.005, 3.408, 2.278; total N, 1.747, 2.974, 1.764; urea, 2.940, 5.250, 2.910; NH_3 , 0.17, 0.145, 0.091; creatinine, 0.162, 0.116, 0.156; creatine, 0.187, 0.148, 0.137; uric acid, 0.048, 0.036, 0.029; Cl, 0.653, 0.848, 0.606; Ca, —, —, 0.028; Mg, —, —, 0.025. **XXI. Enzymes of the pancreas.** MAKI TAKATA. *Ibid* 73-89.—Trypsin is present but amylase is nearly or completely absent. **XXII. Preliminary investigation of the articular cartilage of the whale.** SHU OIKAWA. *Ibid* 91-5(1925).—The cartilage contained 77.5% H_2O , 2.43% ash, 2.9% N, 1.9% total S, 1.4% SO_4 and 0.8% fat. Extn. with 0.1% HCl gave about 0.3 g. chondroitinsulfuric acid from 500 g. cartilage. About 35% of the total N is present as collagen, 7% as chondromucoid, 5% as albumoid, and 15% extractives. The chondromucoid was isolated and the protein component sepd. and its N partition detd. of the total N (12.39%) 1.05% is humin N, 48.75 mono- NH_2 , 15.90 non- NH_2 , 6.78 NH_3 , 18.64 arginine, 1.05 histidine, 5.25 lysine and 2.66 cystine. The gelatin after purification contained 1.17% ash, 0.47% S and 17.57% total N, distributed as follows: humin 0.06, mono- NH_2 53.78, non- NH_2 18.21, NH_3 1.94, arginine 12.86, histidine 2.62, lysine 7.29. **XXIII. Amniotic liquor of the sperm whale.** MAKOTO SUZUKI. *Ibid* 97-101(1925).—The amniotic liquor, collected 10 hrs. after the death of the whale, was pale yellow, slightly opalescent, d_{20} 1.013, freezing point, -0.577° , nearly neutral to litmus and showed the following analysis: H_2O , 96.11 g. per 100 cc.; dry substance, 3.89; total N, 0.216; protein according to Scherer, 0.043; by AcOH pptn., 0.028; urea, 0.064; NH_3 , 0.022; NH_2 N, 0.018; uric acid, 0.004; creatine, 0.014; creatinine, 0.016; fat, 0.011; cholesterol, present; fructose, 1.975; Cl, 0.122; H_2SO_4 , 0.055; P_2O_5 , 0.008; K_2O , 0.061; Na_2O , 0.078; CaO 0.046; MgO , 0.015; Fe, 0.0004. C. J. WEST

Blood of the seal. MAKOTO SUZUKI. *Japan. J. Med. Sci.* (Trans., II) 1, 71-2 (1925).—The blood of the seal has a hemoglobin value of 160 (Sahli), contains 81.7 mg. Fe per 100 cc. blood, has a sp. gr. at 18° of 1.069-1.073, shows a freezing point lowering of $0.70-0.72^\circ$ and contains 3.8501 g., total N per 100 cc. blood, divided as follows: residual 0.0800, urea 0.0187, NH_3 0.0125, NH_2 0.0243, creatinine 0.0028, uric acid 0.0082; Cl, 0.3440; Na and K as chlorides, 0.8420. C. J. WEST

Comparative biochemistry of urine. NOBUYOSHI FUSE. *Japan. J. Med. Sci.* (Trans., II) 1, 103-10(1925).—In a series of 17 tables, F. gives the compn. of the urines from the weasel, racoon, tiger, leopard, hyena, bat and python, including the total N, urea, NH_3 , NH_2 N by formol titration, creatine and creatinine, uric acid, purine N

and allantoin, total S, total and ethereal H_2SO_4 , P, ash, sp gr etc For most of the animals several samples are reported.

Developments in pest destruction with hydrocyanic acid. WALTHER HERZOG *Oesterr. Chem.-Ztg.* 29, 27-8(1926).—Tin cans filled with diatomaceous earth impregnated with HCN are opened in the room to be fumigated, and the room is sealed for 24 hrs. The room is then opened for 20 hrs., and the atm is tested for HCN by hanging up paper strips impregnated with 0.25% soln. of $Cu(AcO)_2$ and benidine. If HCN is present, the paper turns blue.

Pigments of butterflies' wings. I. Melanargia galatea. D. L. THOMSON. *Biochem. J.* 20, 73-5(1926).—By successive extrs with ether, ammonia and alcohol, and a final pptn. from an alk. soln. by means of acid, a yellow cryst. powder, sol. in AcOH and hot alc., was obtained. The m p was 253° and the mol wt (by Rast's camphor method) 313, with a probable error of not less than 10%. T thinks the pigment is a flavone or flavonol.

The substance in the oyster and edible mussel giving a positive naphthol reaction. W. LOELE. *Centr. allgem. Path.* 36, 8-12(1925).—The cells contg. this substance are enumerated. They give a gray-violet color when put into an alk. naphthol soln.

F. B. S.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

A modification of the calcium pectate method for the estimation of pectin. A. M. EMMETT AND M. H. CARRÉ. *Biochem. J.* 20, 6-12(1926); cf. *C. A.* 16, 1994.—"The authors criticize the methods in which pectin is pptd. by neutral 95% alc., "owing to the failure of alc. to ppt. a dil. soln." Acidified alc. is much better. Where the pectin solns. contain substances precipitable by Ca, the authors ppt. first with acid alc., and then dissolve the ppt. and reppt. as Ca pectate.

BENJAMIN HARROW

Effect of short periods of cold storage on beef and mutton. W. M. CLIFFORD. *Biochem. J.* 19, 998-1003(1925).—Beef and mutton kept at 25° F. and 35° F. appear identical in appearance with freshly killed meat up to the third day of storage, on the sixth day, kept at 25° F., they show ice spicules and the red color characteristic of frozen meat. In hot English weather, beef and mutton will not keep for 6 days in a room at 35° F. There was no change in total N, sol. N, amino N, carnosine or creatine in meat kept at 35° F. for 3 days, or at 25° F. for 13 days.

BENJAMIN HARROW

Crystals found in canned salmon. E. D. CLARK AND R. W. CLOUGH. *Pacific Fisherman* 23, 11-2(Oct., 1925).—Complaints were made of the presence of broken glass in cans of salmon. The material was found to be not glass but crystals of $MgNH_4PO_4$.

E. H.

Effect of chemical preservation of eggs upon the stability of their vitamin contents. ERNEST TSO. *Biochem. J.* 20, 17-22(1926).—"Pidan" is made from raw duck eggs by applying a mixt. of slaked lime, straw ash, soda, table salt and water. In these preserved (Chinese) eggs, the vitamin B content has been destroyed, without, however, affecting the vitamin A or the antirachitic factor.

BENJAMIN HARROW

Note on the storage of eggs. E. A. GRIFFITHS, D. J. R. DE VILLIERS AND LEITCH ANDERSON. *Dept. Agr., Union S. Africa, Science Bull.* 41, 16 pp(1925).—In eggs with 16 eggs the f. p. of the albumin varied from 30.55 to 31.65° F. and that of the yolk from 30.74° to 31.82°, the av. being 31.29° and 31.38°, resp. In some cases the yolk froze at a lower temp. than the albumin and *vice versa*. F. p. detns. on eggs laid by the same hen on 3 successive days showed no definite trend. Under suitable conditions eggs could be kept in storage for several months at 28° without freezing. White-shelled eggs lost wt. more rapidly in storage than brown eggs. Varnish and wax were not suitable agents for reducing evapn. losses. Eggs coated with the former were contaminated by the solvent and the latter caused bursting in a no. of cases. Coating with oil at 250° F. was effective in preventing evapn. losses but detracted from the appearance of the eggs.

K. D. JACOB

Simplified determination of milk fat in fat mixtures. J. GROSSFELD. *Z. deut. Oel-Fett-Ind.* 46, 49-51, 65-6, 84-5, 97-9, 114-5, 130-2(1925); cf. *C. A.* 19, 3548—G. records an extended investigation of detg. butter fat in mixts. by means of his "butyric acid no.," which expresses the amt. of sol. volatile fatty acids which distills over after the saponified fat has been treated with a satd. soln. of Na_2SO_4 and caprylic acid (coco-nut oil fatty acids) and has been acidified with H_2SO_4 expressed as 0.1 N acid and boiled.

(1) The ratio no. V is suitable for the detn. of milk fat in the presence of coconut oil. (2) V equals 3.8 for the R.-M. no., 12 for the B no. of Bertram, Bos and Verhagen, and 20 for the new distn. no. of van Gilmour. More accurate values are obtained by incorporating other constns. such as the sapon. no., the A no. of Bertram, Bos and Verhagen and the Polenske no. or the sum of the Polenske and R.-M. no. (van Gilmour). (3) Bertram, Bos and Verhagen's method is far superior to older methods but more complicated than van Gilmour's. (4) G.'s expts. increased the V value to 81 by salting out the acids with Na_2SO_4 soln., satd. with caprylic acid; but for coconut oil the value could not be reduced to zero. (5) By incorporating the sapon. no. the milk fat content can be accurately detd. to within $\pm 1.0\%$. (6) A simple method is described for detg. the "butyric acid no.," which on the basis of a 5 g. sample has the value of 20 for milk fat, 0.9 for coconut oil and 0 for other edible fats of low sapon. no., -0.3 to -0.8 for oils and for fish-liver oils, but the latter may be brought to 0 by appropriate modification. (7) The butyric acid no. is practically proportional to the milk fat content. Smaller samples than 5 g. furnish a higher value and larger ones a lower value. Increased temp. when the soap soln. is acidified gives lower results. (8) Under varying exptl. conditions the titration values depend upon the distribution of the sol. acids between the salt soln. and the liquid insol. acids and this influence overshadows the soly. proper of the fatty acids in H_2O . (9) Caprylic and caproic acids are more influenced by this distribution ratio than butyric acid, so that the name "butyric acid no." is justified. (10) A formula is derived for the calcn. of the probable milk fat content M in a fat mixt. from the butyric acid no. b and the value V (sapon. no. less 200), viz.: $M = 5.115b - 0.085V$ and a table has been calcd. for convenience. (11) Com. margarins furnished the butyric acid nos. 0.0 to 0.6 with sapon. nos. of 194-223, equal to 0.0 to 1.1 milk fat by calcn. Com. butter samples yielded a butyric no. of 18.6-23.0, mean 20.3, equal to 3.28-4.05% butyric acid, corresponding to a mean R.-M. no. of 27.3. The factor for calcg. the butyric acid no. from the R.-M. no. is 745. *Method*—Saponify in a R.-M. flask over the free flame 5 g. of the fat with 2 cc. KOH (75% g. in 1000 cc.) and 10 cc. glycerol and dil. the resulting clear soap soln. carefully after a few min. with 100 cc. H_2O . When cooled to 20° add, while shaking, 50 cc. dil. H_2SO_4 (25 cc. coned. H_2SO_4 in 1000 cc.), 15 g. powd. anhyd. Na_2SO_4 , 10 cc. of coconut oil soap soln. (described below) and about 0.1 g. purified kieselguhr. Let stand 10 min. or longer with repeated shaking and filter through a dry folded paper with fine pores. Of the perfectly clear filtrate dil. 125 cc. with 50 cc. H_2O in a 500-cc. round-bottom flask; add some pumice stone and distil 110 cc., titrate directly with 0.1 N caustic and phenolphthalein. Subtract from the no. of cc. used the amt. required for a blank detn. and multiply the result by 1.40, giving the butyric acid no. *Prepn. of the coconut oil soap soln.*—Heat carefully 100 g. coconut oil, 100 g. glycerol and 40 cc. of the above KOH soln. in a l flask with shaking until a clear soap soln. is obtained. Let stand, dil. carefully to 1000 cc. A modification of this method is also given for the detn. of very small amts. of milk fat in which a 15% soln. of MgSO_4 is used to ppt. all acids of high mol. wt., including oleic, linolic and linolenic acids, which exert a disturbing influence on the distribution of butyric acid between H_2O and org. solvents. P. ESCHER

Lactose determination. H. WEISS AND B. BEYER. *Milchwirtschaft Forsch.* 2, 108-12(1925); *Ber. ges. Physiol. exptl. Pharmakol.* 31, 10(1925).—Besides the method of Bruhns that of Weiss is recommended, a detailed description of which is given.

MARY JACOBSEN

Freezing data on ice cream. C. D. DAHLE. *Ice Cream Trade* 22, No. 3, 63(1926). The f. ps. of ice-cream mixes of variable ingredient content were detd. Sugars and water-sol. substances lower the f. p. of ice cream mixes; they also increase the total freezing time. The influence of glucose and corn sugar, in lowering the f. p. against cane sugar, was brought out. General physico-chem. laws seem to hold true for ice cream freezing. H. F. ZOLLER

Investigations in fig culture and treatment. S. R. GANDHI. Dept. Agr., Bombay Presidency, *Bull.* 117, 27 pp.(1924).—Fresh Poona figs contained H_2O 75.0, total sugar 17.2 and reducing sugars 15.2%. The compn. of the dried figs was ash 3.2, ether ext 0.7, proteins 4.7, digestible carbohydrates 89.3 and fiber 2.1%. The water and reducing-sugar contents of Persian, Afghanistan, Grecian and Smyrna figs are given. K. D. JACOB

Size and maturity of canned peas. C. F. MUTTELT. *Ann. fpls.* 10, 74 6(1926). Regenerated mature peas canned to imitate green peas can be distinguished by draining, washing in cold water, drying in vacuum over H_2SO_4 to const. wt., and measuring. Regenerated peas have a considerably greater diam. than even "semi-fine" or "medium"

peas. Screening of the peas, either before or after canning, cannot give reliable indications as to the degree of maturity. Cf. following abstr. A. PAPINEAU-COUTURE.

Procedure for distinguishing "regenerated" preserved dry peas from preserved green peas. C. F. MUTTLERT. *Compt. rend.* 182, 238-40 (1926).—Four samples of canned green peas contained an av. of 58% hydrolyzable matter of which 10% is sol. and 21.8% nitrogenous material of which 4.7% is sol. The corresponding figures for canned regenerated dry peas were 63.5, 5.3, 23.5 and 2.2. The green peas averaged 12.1% cellulose, the ratio of starch to sugars was 5.1, starch to cellulose 4.1, insol N to sol. N 3.8. The corresponding figures for dry peas were 7.8, 11.2, 7.6 and 9.6%. Cf. preceding abstr.

Influence of cooking and of malting on the digestibility of leguminous starches. R. LECOQ. *J. pharm. chim.* [8] 3, 12-5 (1926); cf. C. A. 16, 2151.—The optimum proportion of malt flour acting on raw and cooked flours of lentils and of wheat is 30%, and the optimum temp. is 75° for raw and 60° for cooked flours. The raw starches of lentil flours are less easily converted into reducing sugars by maltase than those of wheat flour, but the action of maltase on the cooked flours yields practically the same (and increased) quantity in both cases. Hence the addn of malt flour to cooked leguminous starches (A) is a convenient means of aiding their digestibility. Moncaux's observation (C. A. 18, 134) that pancreatic juice acting on A produces less maltose than with starches of wheat and other cereals suggests that possibly malt amylase is more active towards A than is the amylase of the pancreatic juice. L. W. RIGGS.

Determination of moisture in wheat and flour. IV. HARRY SNYDER AND BETTY SULLIVAN. *Ind. Eng. Chem.* 18, 272-6 (1926); cf. C. A. 19, 1605.—Fifty-eight flour moisture tests obtained by drying in a current of H₂ yielded 0.54% more moisture than vacuum oven drying at 100° and 600 mm. and upwards. Flour moisture results are relative rather than an abs. expression of moisture content. S. WALDBOFT.

The conditioning and milling of grain. C. H. BRIGGS. *Northwestern Miller* 144, 988, 1307 (1925). RUTH BUCHANAN.

Methods of storing and aging flour. C. H. BRIGGS. *Northwestern Miller* 144, 452 (1925). RUTH BUCHANAN.

Moisture in flour. W. W. SKINNER. *Baking Tech.* 5, 72-7 (1926).—Changing of moisture limit is discussed from the viewpoint of the miller and the public. The change of analytical methods since the establishment of the 13 1/2% moisture standard is considered. If any change in limit is to be made, it should be changed by as much as the differential between the assumed moisture and what the true moisture is finally found to be, or that upon which the standard was based be continued in use. R. B.

The calcium and phosphorus content of commercial wheat flours. C. B. MORISON AND M. R. REESER. *Baking Tech.* 5, 86-7 (1926).—Tables are given showing the Ca and P content of com. brands of wheat flour for the purpose of supplementing older information found in textbooks such as König, Sherman and Leach. A. O. A. C. methods were used for the analytical detns. Data given are of contemporary interest as it is from flour obtained under modern milling conditions. RUTH BUCHANAN.

Studies on the toxicity of copra meal. I. VICTOR SULIT. *Philippine Agr.* 14, 511-22 (1926).—Analyses of the copra meals used are given. Copra meal is toxic to guinea pigs when it constitutes a large part of an otherwise complete ration, but promotes health and vigor when it does not constitute more than 37% of the ration. The symptoms, which developed irrespective of the oil content of the meal used, suggested scurvy, but liberal administration of tomato juice was not beneficial. Twenty-two citations are appended. A. L. MERRINS.

Fluorine cachexia in herbivorous animals fed on forage experimentally altered by treatment with gases containing fluorine. H. CRISTIANI AND R. GAUTIER. *Compt. rend. soc. biol.* 93, 911-2 (1925); cf. C. A. 19, 3521. S. MORGULIS.

Study of the effect of fodder altered by fumes from aluminum factories on animals: fluorine cachexia in cattle. H. CRISTIANI AND R. GAUTIER. *Compt. rend. soc. biol.* 93, 912-4 (1925).—Fodder so treated produces cachexia and finally death. S. M.

Shervi as a fodder crop. ANON. Dept. Agr., Bombay Presidency. *Bull.* 115, 12 pp. (1924).—Shervi (*Sesbania acgyptiaca*) may cause diarrhea when fed to cattle in amts. greater than 10-15 lbs. per day, but in limited quantities it is a valuable supplementary food. A sample of the green fodder contained H₂O 68.25, ether ext. 1.61, proteins 5.50, digestible carbohydrates 11.99, fiber 9.07, ash 2.58, and total N 1.01%. K. D. JACOB.

Philippine citrus fruits (Wells, et al.) HD. Determination of moisture (Tausz, Rumm) 7.

WARTH, A. H.: *Carbonated Beverages*. Baltimore: The Williams & Wilkins Co.
 HUBER, KARL: *Die Obstverwertung*. Berlin: P. Parey. 216 pp. R. M. 6.

Apparatus for pasteurizing milk in bulk. A. J. DAVIS. U. S. 1,578,267, March 30.
Sterilizing and deodorizing milk and cream. F. L. ARMITAGE. Brit. 237,899, Aug. 2, 1924. Mech. features.

Skim-cheese. C. M. GERE. U. S. 1,578,820, March 30. Skim milk is coagulated at a temp. of about 31° and the curd thus formed, after sepn. from the whey, is worked up at about the same temp., then soaked in whey which has been cooled to about 22°, drained to remove surplus whey, warmed to substantially its original temp., pressed and cured.

Ripening cheese. R. W. COON. U. S. 1,579,196, March 30. Cheese with an original moisture content of 36-40% is exposed to a temp. of about 13-21° and a humidity of 75-90%.

Butter. B. PLISIC. U. S. 1,572,123, Feb. 9. Milk is heated to "blood heat" and churned at this temp. until the milk is in a light white creamy form. The butter is then skimmed off, melted and cooled.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Laboratory of the Société Française des Constructions Babcock & Wilcox. C. ROSZAK. *Technique moderne* 18, 137-8(1926).—Brief description of the chem. and of the phys. testing labs. A. PAPINEAU-COUTURE

Studies in filtration. J. W. HINCHLEY, S. G. M. URE and B. W. CLARKE. *J. Soc. Chem. Ind.* 45, 1-10T(1926).—A discussion is given of Poiseuille's law and the formulas of Lewis, Baker, Sperry, Alliot, Donald and Hunneman, and Hatschek. Expts. were run on small lab. filters of both suction and pressure type. The solns. were prepd. by pptg. CaCO_3 , MgCO_3 , $\text{Ba}_3(\text{PO}_4)_2$ and $\text{Al}(\text{OH})_3$ and allowing to stand overnight to form cryst. ppts. Eleven tables and 11 figures are given showing the results. With filtration under vacuum, (a) neither thickness of cake nor compn. of liquor affected the structure of the cake, (b) increase in vacuum gave no evidence of consolidation of cake, (c) compn. of prefil does not apparently affect the structure of the cake. With pressure filtration with CaCO_3 , (a) increase in pressure increases solids in cake, (b) as the solids in the prefil decrease the solids in the cake increase. Different filter cloths offer different resistances. With cakes over $\frac{1}{4}$ inches the flow is directly proportional to the pressure, but for thinner cakes the flow depends upon some power of the pressure. Cakes of different structure are shown to offer different resistance. Curves plotted with resistance against cake thickness are straight lines. L. A. PRIDGEON

Some practical applications of the Lewis filtration equation. H. C. WEBER and R. L. HERSHEY. *Ind. Eng. Chem.* 18, 341-4(1926).—The derivation and integration of the filtration equations given by Walker, Lewis and McAdams in "Principles of Chemical Engineering" are given. An exptl. method of examg. these equations on commercial app. filtering defecated sugar solns. is described and results of a series of expts. are tabulated and discussed. It is valuable in estg. the proper amt. of filter aid. Within the accuracy of plant measurements, the equation is generally valid. L. A. PRIDGEON

Cooling by evaporation. FRIEDRICH MERKEL. *Z. Ver. deut. Ing.* 70, 123-8 (1926).—A development of the theory of heat exchange between the surface of water and air, moving in counter currents, leads to the expression $Wd\vartheta = k(i'' - i)dF$, where W = water going to cooler, ϑ = temp. of water, k = proportionality constant, i'' and i = heat content of moist air at ϑ and t , resp. (temps. of water and air), and dF = area over which transfer occurs. The heat content of in- and out-flowing air, rather than its temp. and moisture content, is the important factor. By integration and graphic development curves are derived, and these are tested by comparison with exptl. results from studies on different types of cooling devices. "The practical conclusion is that the cooling effect is improved more by increasing the quantity of air employed than by subdividing the water more minutely." W. C. FBAUGH

Temperatures of the evaporation of water into air. W. H. CARRIER and D. C. LINDSAY. *Refrigerating Eng.* 11, 241-57(1925).—A thermodynamic treatment of drying and cooling by evapn. Equil. temp. is measured accurately by the wet-bulb thermometer, and this throws much light on the fundamental laws involved in all com.

drying processes. The amts. of error in the wet-bulb temps. have been detd. by the authors and applied in obtaining the theoretical temps. of equilibria. Tables contg., and formulas for arriving at these errors are given. H. F. ZOLLER

Concentration by fractional condensation. J. L. YOUNG. *Ind. Eng. Chem.* 17, 984(1925).—Inserting four fractionating bulbs of special design between a boiling flask and a condenser makes it possible to collect five fractions of the distillate. Students' expts. showed 85–90% EtOH in the last bulb and a concn. of only 2–3% in the first. The result represents the equil. existing at the time the distn. is interrupted. W. C. EBAUGH

The flow of liquids. A. H. McADAMS. *Refrigerating Eng.* 11, 279–306(1925).—When a fluid flows at const. rate through a pipe the motion may be either turbulent or viscous. For isothermal flow the mechanisms of the 2 types of motion are discussed, and data are given to verify the mental pictures of these mechanisms. It is shown that the dimensionless ratio Du/μ has a controlling influence upon the numerical value of the friction factor, the equiv. frictional length of an elbow, the ratio of av. to axial velocity, and upon a 4th dimensionless ratio involving the coeff. of heat transmission between the wall of the pipe and the liquid flowing inside the pipe. In addn. auxiliary data are given as to the effects of temp. and concn. upon both viscosity and sp. gr. and of sp. heat, sp. gr. and av. mol. wt. upon the coeff. of thermal cond. So far as possible such data are given for fluids of interest to refrigerating engineers. H. F. Z.

Roasting and burning ores, limestone and similar materials. ANTON APOLD AND HANS FLEISSNER. *Chem. Ztg.* 50, 156–7(1926).—An experimental plant was made by using a shaft roaster through which siderite (spathe iron ore) descended while hot gases ascended. These gases were obtained by burning powd. coal in the usual way, but mixing cold air (from the one fan) with the products of combustion so as to yield a gas mixt. of about 650°. This entered the roaster through the sides and the central hearth. Cold air blown into the bottom of the shaft roaster mixed with the heated air above, giving a temp. of about 450°; spathe iron roasts quickly at this temp. Fuel economy and other advantages are claimed. Ca and Mg carbonates, etc., can be burned readily in the same plant if suitable operating temps are maintained. W. C. EBAUGH

Movement of materials in industrial plants. VON BRZOLD. *Chem.-Ztg.* 49, 855–6(1925); cf. C. A. 20, 100.—This concludes an elementary presentation of the theory and practice of conveyor systems. W. C. EBAUGH

Methods of packing chemicals for export. ANON. *Chem. Age* (London) 14, 294–7(1926). E. H.

Safeguards against accidents in chemical works. A. O. JONES. *J. Soc. Dyers Colourists* 42, 83–6(1926).—Safeguards against accidents caused by machinery, fire, handling and transportation of materials and poisoning are discussed. I. W. RIGGS

Regulations proposed following the tetraethyl lead investigation. ANON. *Ind. Eng. Chem.* 18, 432–3(1926). To be considered at a meeting of health authorities with Surgeon General in May, 1926. They cover the manuf. of PbEt₄ and blending to make ethyl fluid, ethylizing gasoline, distribution of ethyl gasoline, automobile garages, repair shops, service stations and filling stations. C. M. SALLS

Chronic benzene poisoning. Report of a case with necropsy findings. F. J. ROHNER, C. W. BALDRIDGE AND G. H. HANSMANN. *Arch. Pathol. Lab. Med.* 1, 221–6(1926).—A description is given of a typical case of benzene poisoning, with a history of industrial exposure to fumes of benzene. HARRIET F. HOLMES

Modern trend in applying ozone to cold storage. F. E. HARTMAN. *Refrigerating Eng.* 11, 400–15(1925); cf. C. A. 19, 548. —A review of the field in an able manner. Quant. study of the application is urged. Types of com. app. are discussed. H. F. ZOLLER

The production of low temperatures. BALTZAR VON PLATEN AND C. G. MUNTERS. *Refrigerating Eng.* 12, 142–8(1925).—A small absorption refrigerating machine has been designed from thorough thermodynamic considerations. Elec. heat is employed for driving the dissolved NH₃ gas from the H₂O absorber. Use is made of an inert gas (H), which is lighter than NH₃, to act as a lifting-pump (injector) for circulating the NH₃. H. F. ZOLLER

Determination of the diameter of pore and pore number in filter stones (Ruoss) 2. Stoneware and chemical industry (Binz) 19.

AUDUBERT, R. and QUINTON, M.: *Les applications usuelles de la chimie.* Paris: Librairie de l'Enseignement Technique. 300 pp. Fr. 20.

ENGEL, HANS: Ueber die Gesundheitsgefährdung bei der Verarbeitung von metallischem Blei. Berlin: J. Springer. 40 pp. R. M. 2.70.

SPENNRATH, JOSEPH: *Éléments de chimie industrielle*. Trans. from 5th German ed. by J. Fritsch. Paris: Desforges. 340 pp. Fr. 20.

Chemical Engineering and Chemical Catalogue. 1925. Ed. by D. M. NEWITT. 964 pp. 15s.

Chemiker-Kalender. Vol. III. Ed. by Walther Roth. Berlin: Julius Springer. 592 pp. R. M. 16.50. Reviewed in *J. Am. Chem. Soc.* **48**, 1115, Vol. I & II. Cf. C. A. 19, 1654.

Comminuting solids and forming colloidal solutions. O. AUSPITZER. U. S. 1,577,052, March 16. Mech. features.

Separating gases. E. B. MILLER. U. S. 1,577,534, March 23. Silica gel or similar finely divided porous solid gas-adsorbing material is fed into a stream of mixed gases such as air carrying vapors of volatile liquids and the adsorbed gas is subsequently sepd. and the adsorbent used again, in a cyclic process. An app. is described.

Electric resistance material. W. OTTO. U. S. 1,577,981, March 23. Finely divided graphite is mixed in different proportions with rubber (which is at least partially vulcanized) to form resistance elements adapted for use as resistance standards, etc.

Electrical insulating material. C. L. DAWES and W. A. BOUGHTON. U. S. 1,578,812, March 30. A mixt. of mica fragments and a binding material, such as NaPO_3 , which at ordinary atm. pressure requires a temp. substantially as high as the disintegration point of mica to render it fluid, is subjected to hot molding under pressure at a temp. below that which would cause the mica to disintegrate. U. S. 1,578,813 specifies the use together of mica fragments and Na silicate.

Electrical insulating composition. F. KRUPP AKT.-GES. Brit. 237,885, July 30, 1924. "Roasted chalk" or other ground insulating material is mixed with mineral oil, for filling hollow spaces in castings contg. elec. conductors.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Modern British practice in water softening. VI. Zeolite or base-exchange plants.

DAVID BROWNLIE. *Ind. Chemist* **2**, 108-12(1926); cf. C. A. 20, 1479.- The following types of zeolite or base-exchange plants are described with illustrations of each (a) Boby-Azed, (b) Kennicott and (c) Permutit. "Doucil," used in type (a), differs from all other base-exchange materials in being a colloid; it is a hard, rigid and homogeneous dried gel with the approx. composition $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 5\text{SiO}_2$. Of the 13.3% Na_2O about 10% is active. Doucil is sold on a 50% moisture basis, and 1 ton (2240 lbs.) will soften about 25,000 gals. of water of 20° hardness. "Kenzelite," used in type (b), is a natural mineral zeolite. "Permutit B," used in type (c), is made from glauconite. Certain advantages are claimed for the base exchange products prepd. from natural zeolites.

E. G. R. ARDAGH

Purification studies on aerofilters in 1925. N. A. BASIAKINA. *Fifth Report of the Moscow Commission on the Purification of Sewage* **1**, No 3, 127-36(1925). The sewage of Moscow contains chlorides 109.6 p. p. m.; NH_4N 69 p. p. m.; nitrate N 65 p. p. m. and dissolved O 0.0 p. p. m. The demand of air for normal purification is 4 to 6 vols. air to one vol. sewage. Aerofilters are found the most efficient type of disposal plant for the city of Moscow. The proposed plant has a capacity of 12,300 cu. m. of sewage daily.

BEN H. PETERSON

Essentials of correct boiler water conditioning. R. E. HALL. *Power Plant Eng.* **30**, 327(1926); *Proc. Eng. Soc. Western Penn.* **41**, 347-89(1925).- To prevent scale formation, the relation $[\text{CO}_3] = K_1$ (at operating pressure p) $\times [\text{SO}_4]$, which exists when soda ash is used to treat the water, must be maintained with a slight excess of $[\text{CO}_3]$. Allowance must be made for the decompn. of Na_2CO_3 to NaOH , the rate depending upon the pressure and boiler rating. This difficulty may be prevented by the use of the more stable phosphate compds. The relation in this case is expressed by $[\text{PO}_4] = K_2$ (at operating pressure p) $\times (3[\text{SO}_4]/2) \times (D[\text{SO}_4]/2)$, where D is the relation of the ionic to total $[\text{SO}_4]$. Small concn. of NaOH and loose crystals of suspended CaCO_3 prevent scale in water lines and preheating surfaces. Corrosion must be controlled electrolytically. HO ions prevent corrosion in sulfate waters and help in chloride waters.

K. C. BRISON

Stream pollution by acid mine drainage. R. D. LEITCH. *Chem. Age* (London) 14, 266-7 (1926).—See C. A. 20, 959.

Utilization of the gas from Imhoff tanks in city mains. B. NERRETER. *Gas u. Wasserfach* 69, 185-9 (1926).—The gas from 2 activated-sludge (Imhoff) sewage-disposal plants at Essen is mixed with the city coal gas supply. The av. compn of the gas is 80% CH₄, 17.4% CO₂, 0.2% O₂, 2.4% N₂, heating value 7653 kg. cal./cu. m., the limit variation of the compn. being shown by that of the heating value, viz., 7200-8200 kg. cal./cu. m. Charts and tables are given showing production and heating value by monthly averages for 2.5 years, as well as max. and min. daily figures. The total production (1925) of 1 plant was 62,000 cu. m., of the other 341,000 cu. m. W. B. P.

The rate of solution of oxygen as an agent in biological purification. N. BASIAKINA. *Fifth Report of Research on the Purification of Sewage at Moscow I*, No. 3, 139-59. —The rate of solution of O₂ is proportional to the difference between the O₂ concn in a satd. solution and the concentration in a given solution and is given by the equation $dx/dt = k(b-x)$, in which b is the value in a satd. solution and x is the concentration in the given solution. The value of $b-x$ depends upon the rate at which the sludge uses up the dissolved oxygen. Experimental determinations of the rate of oxidation of ammonia nitrogen show it to be proportional to the rate of solution of O₂. The dissolved O₂ content of the effluent of the Moscow plant is about 4.65, about half saturated. BEN H. PETERSON

Water filter. R. H. SMILIE. U. S. 1,579,158, March 30

Base-exchanging silicates for purifying water. NORDISCHE NATROLITH AKTIESELSKAB. Brit. 237,626, July 25, 1924. A substance suitable for removing Fe, Mn, Ca and Mg from H₂O is prep'd by granulating clay, calcining it at 500-700° and then treating it with a soln. of alkali hydroxide or carbonate, e. g., boiling it for 1/4, 4 hrs with a soln. corresponding to 1% Na₂O or a 2% Na₂CO₃ soln.

Separating scale-forming ingredients from boiler feed-water by preheating and sedimentation. O. GÜNTHER. U. S. 1,579,414, April 6. Mech. features

"Boiler compound." W. P. PECK. U. S. 1,579,949, April 6. A boiler cleaning mixt. is formed from ext. of hemlock 40 lbs., Na₂CO₃ 60 lbs., brown sugar 10 lbs. and H₂O 30 gals.

Sewage and water clarifying tank. H. L. THACKWELL. U. S. 1,578,691, March 30.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Broadening agricultural chemistry. WM. P. HEADDEN. *J. Chem. Education* 3, 201-12 (1926).—Problems arising in connection with the raising of sugar beets and wheat in Colorado are good examples of how general principles of agriculture, based largely upon results under humid conditions, need material modification when applied to other conditions. The tacit assumption that irrigation and rainfall produce the same effects upon the wheat crops is wholly wrong. P. R. DAWSON

The sourness of soils. N. M. COMBER. *Rept. British Assoc. Adv. Sci.* 1923, 495. *Botan. Abstracts* 14, 768. Sourness in soils is recognized from the agricultural point of view by the failure of certain plants and the dominance of others, the prevalence of certain diseases and a rectification of these conditions following the use of lime. C. holds that the cause of sourness is not the H-ion concn. nor the ratio of Ca to other metals. There is, however, evidence that the ratio of basic lime to weak bases, chiefly alumina, is the fundamental cause of sourness. The function of lime appears to act as a flocculent of the soil colloids and the root-hair colloids and to prevent too great an uptake of alumina and other toxic substances. H. G.

The quinhydrone method and the relationship of its results to the forms of acidity of the soil. H. KAPPEN AND R. W. BELING. *Z. Pflanzenernähr. Düngung* 6A, 1-26 (1926).—The quinhydrone method was found to be a rapid and useful method for the detn. of the H-ion concn. of soil suspensions. The small amts. of electrolytes in soils were found to lower the H-ion concns. of soil suspensions; washing increased the pH value of soil suspensions. The authors call the relationship (called the acidity quotient) of the "hydrolytic acidity" to the "exchange acidity"—and maintain that in soils where the quotient exceeds 6 that part of the base cated by the Daikuhara formula is used for the neutralization of the "hydrolytic acidity" and that the "exchange acidity" is therefore not neutralized. Filtrates of soils (both in water and in KCl soln.) were

found to be less acid than the corresponding suspensions. This result is explained on the basis that active H-ions are held by the finer soil particles. In using the quinhydrone method it was found that care must be taken to have sufficient quinhydrone, especially for large amts. of soil. 500 mg. was sufficient for suspensions. contg. 100 g. of soil. The electrometric titration of soil suspensions was carried out successfully by the quinhydrone method. It is maintained that another argument for pure Al-exchange with acid soils and neutral salt solns. is in the fact that a const. p_H value is obtained immediately upon the addn. of a neutral salt soln., which would not be the case if HCl (by exchange of cation with H-ion) were first formed and Al subsequently dissolved.

R. M. BARNETTE

The question of the exchange acidity of soils and the connection between "titration" and "actual" acidity. H. NIKLAS AND A. HOCK. *Z. Pflanzenernahr. Düngung* 5A, 370-92(1925).—Supporting the views of Kappen on the nature of soil acidity, the authors find a relationship between the p_H and the total (titration) acidity of KCl exts. of mineral soils. By means of this relationship, based on the hydrolysis curve of $AlCl_3$, the authors maintain that either the p_H or the total acidity may be used to det. the reaction of an acid soil. This relationship was not found to hold for humus contg. soils, for forest soils, nor for soils with p_H values above 4.6 (in the KCl ext.). Only in soils with so-called "exchange acidity" is the correlation perfect. Iron was found to play a part only in extreme cases, i. e., subsoils of forest soils. The difference between the theoretical (from titration) and the detd. amts. of Al_2O_3 (in pure Al salt solns. and in KCl exts. of soils) was shown to be dependent upon the concn. of the Al salt.

R. M. BARNETTE

The origin of alkali land. ALBERT HOWARD. *Agr. J. India* 20, 461-2(1925). H. suggests that the gradual alteration of fertile soils into dead alkali land has much in common with the observations of Ossendowski (Man and Mystery in Asia, London p. 5, 1924) on vast colonies of reducing bacteria, *Beggiatoa bacilli*, in lake Szira kul, Siberia, and the intermediate stages that occur between ordinary fresh water lakes and reservoirs of dead salt water.

RUSSELL M. JONES

Method for the determination of the fertilizer requirements of soils. ALFRED MITSCHERLICH. *Z. Pflanzenernahr. Düngung* 4B, 193-9(1925).—An extension of the polemic between M. and Gerlach over the calcn. of consts. in the M formula for the calcn. of yield increases resulting from definite fertilizer applications; and of that between M. and Lemmermann over the adaptability of field and pot expts. for such calcns.

R. M. B.

The Mitscherlich procedure for the determination of the fertilizer requirements of soil. GERLACH. *Z. Pflanzenernahr. Düngung* 4B, 273-85(1925). Polemic

R. M. BARNETTE

An explanation for the relative effects of timothy and clover residues in the soil on nitrate depression. B. D. WILSON AND J. K. WILSON. *Cornell Univ. Agr. Expt. Sta. Memoir* 95, 1-21(1925).—Clover roots and hay were completely oxidized in the soil in less time than those of timothy were; this is due to the greater N content of the former. The evolution of CO_2 was directly proportional to the bacteria counts from the soil contg. decomposing clover and timothy. The soil organisms are believed to remove sol. nitrates from the soil soln. to be returned again later when their bodies decompose. Eleven references are appended.

A. I. MEHRING

Productivity of the soil as a function of its physical structure and changes in soil structure and composition during vegetation. W. NITZSCH. *Wiss. Veröff. Siemens Konzern* 4, Heft 2, 75-94(1925).

C. G. F.

Humification of the dead covering of forest soils. ANTONIN NEMEC. *Compt. rend.* 182, 590-2(1926).—Eight samples of the floor covering from pine forests of 30 to 100 years old showed that the percentage of org. matter varied with the age of the covering and that the p_H of the soil soln. was generally more acid with age although this figure was modified by the presence or absence of moss and herbage. The loss or gain of nitric N, by the H_2O_2 method of Robinson, bore a rough direct relation to the p_H value, but was more affected by the kind of trees in the forest. L. W. RUGGS

Studies on the growth of some Danish agricultural plants in soils with different concentrations of hydrogen ions. CARSTEN OLSEN. *Compt. rend. trav. Lab. Carlsberg* 16, No. 2, 21 pp. (1925).—Portions of a highly acid soil (p_H 4.0) were brought to a p_H range of 4.0 to 7.5 by thorough mixing with $CaCO_3$. Where a higher alk. was required, $Ca(OH)_2$ soln. was necessary. The plants were grown in pots of the soil thus prepd. and with the addn. of heavy applications of appropriate nutrients. The p_H was detd. before and after the expt. and the mean taken. Alfalfa showed a very

regular growth curve with a summit at approx. pH 6.5-7.1; *Medicago lupulina* showed a similar curve with a summit at approx. pH 6.5-7.0; barley produced its best growth at pH 6.5-8.0; rye attained a summit at approx. pH 6.2; and buckwheat reached its max. at about pH 6.0-7.0. In the case of alfalfa growth fell off most markedly on the side of decreasing pH ; the same was true of *lupulina*; with barley the drop on the acid side was less marked; rye appeared less sensitive to such variations than the preceding plants; while buckwheat showed a rapid drop with increasing pH , but a more gradual drop on the acid side. Rye and buckwheat are far more tolerant of high H ion concn. than the other 3 species; less difference was shown in the tolerance of high pH . No evidence was deduced of double summits of growth curves as reported by Arrhenius. The results are considered chem. valid in the presence of the high concns. of nutrients employed. Since the growth curves showed a drop at a pH higher than that of the summits, it is evident that in the culture of even such edemiphilous plants as alfalfa too much lime can be applied.

P. R. DAWSON

Physiological importance of extractable nutrients, a contribution to the determination of the fertilizer requirements of soils by chemical means. BLANK AND F. ALTEN. *J. Landw.* 73, 219-30 (1925).—The amt. of P_2O_5 extd. from a soil by a variety of acid solvents was detd., the weaker acids being used both with and without making allowance for the carbonates present in the soil. Oats were then grown on sand culture receiving P_2O_5 equiv. to the varying amts. extd. by the different solvents, each pot having the same application of other essential nutrients. It is concluded that only dil. acids are suitable solvents for detn. of assimilable P_2O_5 in soil. Of those tried 1% nitric, 1% acetic acid and 0.5% citric acid gave satisfactory results, if the amt. used was adjusted to allow for neutralization by the carbonates present. Water saturated with CO_2 was, however, quite unsuitable.

F. M. SCHERTZ

The isoelectric theory. Its application to certain problems of crop products manufacture and soil fertility. I. F. HARDY. *Trop. Agr. Trinidad* 2, 179-81 (1925).—A discussion of the isoelec. point of proteins. The ease of pptn. of hydrophilic colloids by certain ions bears a definite relation to the dehydrating power of the latter, and this fact is suggested as throwing considerable light upon the mechanism of simple salts. II. *Ibid* 208-9.—A description of the physical chemistry of the coagulation of rubber latex. The view is held that coagulation phenomena in rubber latex are manifestations of the reactivity of lightly hydrated protein films that effectively protect globules of caoutchouc dispersed in an aq. serum. III. *Ibid* 251-3.—A no. of obscure points in connection with the delecation of sugar cane juice are discussed in connection with this theory. IV. *Ibid* 256-8.—The isoelec. point of cacao bean protein was found to be pH 3.8. The fermentation and acid processes of preparing cacao beans are discussed in the light of the isoelec. theory. V. *Ibid* 283-5.—Laterite soils predominate in the tropics and their chief component is hydrous alumina, the isoelec. point of which is pH 6.5. Applications of superphosphate flocculate this type of soil in exactly the same manner that lime flocculates a hydrous silica soil. Two to seven references are given with each part.

A. L. MEHRING

The rate of absorption of nitrate of soda by oats and cotton when applied at different stages of plant growth. W. H. APPLETON AND H. B. HELMS. *J. Am. Soc. Agron.* 17, 596-605 (1925).—In greenhouse expts. $NaNO_3$ applied at the rate of 400 lbs. per acre 14 days after planting, absorption of the nitrate was very slow for 3 weeks. After the 3rd week absorption increased and all nitrate was absorbed by the close of the 7th week. When nitrate was applied to oats at later stages of growth, the rate of absorption was more rapid. Nitrate applied 42, 70 and 92 days after planting was completely absorbed in 20, 14 and 10 days, resp. With both oats and cotton there was a close correlation between rate of growth and rate of nitrate absorption. $NaNO_3$ at the rate of 600 lbs. per acre was applied to cotton, 14, 40 and 64 days after planting. Absorption of the nitrate was completed in 30, 14 and 11 days, resp.

F. M. SCHERTZ

Investigation of the development and composition of potato plants under the influence of different fertilizers. WERNER HENDORFF. *J. Landw.* 73, 177-212 (1925).—The subjects discussed are: The influence of the vegetation period upon the formation of the potato plant, the dry wt. and the compn. of the ash of the potato plants, the influence of fertilizers upon the formation of potato plants. Microscopical investigation of the stems and the tubers. Influence of fertilizers upon the dry wt. and the compn. of the ash of potato plants.

F. M. SCHERTZ

Carbon dioxide fertilizer. GERLACH AND SCHIEL. *Z. Pflanzenernähr. Düngung* 4B, 241-7 (1925).—A so-called CO_2 fertilizer (composed of peat, charcoal, etc., with small percentages of N, K_2O and P_2O_5) proved ineffective in increasing the yield of lupine in a field expt. on a light sandy loam soil. A pot expt. with lupine on the same

soil substantiated the field observations. In the same expt. MnO_2 increased the yield and crude protein content slightly.

R. M. BARNETTE

Permanent grassland. F. E. CORRIE. *Fertiliser, Feeding-Stuffs and Farm Supplies J.* 11, 127, 131(1926).—Phosphatic fertilizers increase the N content of pastures by promoting growth and development of clovers and other legumes. The N content of a pasture soil receiving phosphates alone over a period of 11 years was increased by 0.05% while another plot receiving $(NH_4)_2SO_4$ and $NaNO_3$ in addn. to phosphates contained 0.04% less than the control. Grass from a pasture plot fertilized with basic slag and lime contained an av. of 1.5 times as much CaO over a period of 6 months as grass from the control plot. The value of mineral compds. in animal nutrition is also discussed.

K. D. JACOB

The agricultural value of dicyanodiamide. C. B. GREENING. *Fertiliser, Feeding-Stuffs and Farm Supplies J.* 11, 162-3(1926).—G. cites the work of a no. of investigators to show that dicyanodiamide and dicyanodiamidine are as valuable as other forms of available N when used in amts. corresponding to not more than 10% of the total N applied under usual farming conditions.

K. D. JACOB

Effects of lime and potash fertilizers on certain muck soils. FERDINAND LOEWING. *Bot. Gaz.* 80, 390-409(1925).—Crops on acid muck soils chemically deficient in lime or potash may be injured by these elements in fertilizers. Use of $CaCO_3$ as fertilizer depressed the K content and the K/Ca ratio in crops grown on acid mucks. High yields of clover showed a low K/Ca ratio in tissues. Injuries following lime and potash applications to the soil are marked internally by depression of org. N and carbohydrate content. Antagonism of ions between Ca and K was not observed. High nitrate N is associated with high Ca content of tissues and low crop yield; high crop yield is associated with high organic N and high total carbohydrate content.

B. H.

Comparison of the action on plants of sodium and potassium chlorides and of rich sylvinite. P. LESAGE. *Ann. agron. sci.* 42, 172-91; *Chimie et industrie* 15, 281(1926). Results of tests carried out at the Botanical Gardens at Rennes lead to the following conclusions: (1) Distd. H_2O condensed in a metal worm exerts a toxic action on plants. The toxicity is not always destroyed by dissolved salts in the water, its destruction depending on the nature and concn. of the salts dissolved. (2) $NaCl$ and KCl at equal mol. concns. exert practically the same effects on plant growth, both at high (harmful) concns. and at low concns. In all cases sylvinite gave better results than pure KCl . (3) It does not seem necessary (except possibly for economic reasons) to sep. KCl from sylvinite on the ground that the latter is of value only on account of its KCl content. (4) It is suggested that the Na ions of rich sylvinite can penetrate to the seeds and act in a manner similar to other metals such as Ca and K, giving addn. or substitution products of interest in the utilization of the plants or derived vegetable products.

A. PAPINEAU-COUTURE

The influence of fertilizers in protecting corn against freezing. O. C. MAGISTAD AND E. TRUOG. *J. Am. Soc. Agron.* 17, 517-26(1925).—Application of fertilizers in the hill increases the osmotic pressure of the sap of young corn plants, which in turn lowers the freezing temp. of the plant 1-2° C. Plants grown on soils of low soil salt content such as peats, mucks and poor sands will undoubtedly benefit most from such a use of fertilizers.

F. M. SCHERTZ

The Italian fertilizer "Clumina." P. EHRENBURG. *Z. Pflanzenernähr. Düngung* 4B, 213-5(1925).—"Clumina" is an earth satd. with Cl gas in an attempt to make use of the Cl gas used for the prepn. of war gases. "Clumina" is supposed to make available the org. N of the soil by its sterilizing action followed by a stimulation of the microbiological processes. Pot expts. were not conclusive.

R. M. BARNETTE

The better use of P_2O_5 found in soils. J. WITYN. *Z. Pflanzenernähr. Düngung* 6A, 27-51(1926).—In neutral and slightly alk. soils the P_2O_5 is present chiefly as $Ca_3(PO_4)_2$; in acid soils in combination with org. materials and with Fe and Al hydroxides. With the change in reaction of the soil there is a transition in these compds. W. concludes that $CaCO_3$ or anything increasing the OH-ion concn. will decrease the soly. of $Ca_3(PO_4)_2$, while carbonic acid or anything increasing the H-ion concn. will increase the soly. He concludes that carbonic acid and other weak acids decrease the soly. of $FePO_4$ and $AlPO_4$, while alk. materials increase the soly. of these phosphates. For acid soils, liming therefore increases the soly. of the phosphates by changing them into the Ca phosphates. Acid soils usually contain larger amts. of P_2O_5 than neutral or productive soils, only the P_2O_5 is less available.

R. M. BARNETTE

Test with phosphate flour on different soils. K. KALININA. *Trans. Inst. Fertilizers (Russian)* 1925, No. 30, 119-27.—Expts. on some of the black soils of Russia with raw phosphate flour show that they may be utilized by most crops.

J. S. JOFFE

Preliminary report on artificial or synthetic farmyard manure. H. G. MUNDY. *Rhodesia Agr. J.* 22, 447-53 (1925).—The comps. of artificial manures made by the Rothamsted method from corn stalks, green grass and dried grass were, H_2O 72.40, 72.92 and 81.10, org. matter 16.25, 15.48 and 2.37, ash 11.35, 11.60 and 6.52, N 0.55, 0.54 and 0.42, P_2O_5 0.36, 0.46 and 0.34 and K_2O 0.28, 0.29 and 0.21%, resp. A. L. M.

Four years of fertilizer experiments with increasing applications of potash. KUHN ERT. *Z. Pflanzenernahr. Dungung* 4B, 307-9 (1925).— K_2O fertilizers were found valuable for increasing the yield of potatoes and rye on unreclaimed sandy heath soils near Hamburg.

R. M. BARNETTE

The effect of simple and increasing applications of nitrogen, potash and phosphate on different crops. O. NOLTE AND R. LEONHARDS. *Z. Pflanzenernahr. Dungung* 4B, 286-306 (1925).—A review of numerous fertilizer expts. conducted in Germany and in Denmark. By comparing the increase of crop yield for a unit of the fertilizing element (1 kg. of N, K_2O and P_2O_5) the authors find a variation in the effect, particularly of the N-contg. fertilizers, for the various parts of Germany and Denmark. They explain the variation of the effects of the N-contg. fertilizers by the difference in the climate, length of day, etc. A review of the comparative results on various crops fertilized with $NaNO_3$, $(NH_4)SO_4$ and $Ca(NO_3)_2$ showed that $NaNO_3$ and $(NH_4)SO_4$ were alike in increasing the crop yield, while $Ca(NO_3)_2$ was often not as effective as the other two forms of N. From the results with increasing applications of N fertilizers, it was concluded that an application of over 60 kg. of N per ha. would not be profitable. The paper offers an excellent collection of the data obtained in the numerous German and Danish fertilizer expts.

R. M. BARNETTE

Land crabs as agricultural pests in western India. P. V. WAGLE. Dept. Agr., Bombay Presidency, *Bull.* 118, 47 pp. (1924).—A large no. of compts. were experimented with as poisons for land crabs. The best results were obtained by fumigating the burrows with CS_2 .

K. D. JACOB

Derris and its uses as an insecticide. A. S. CARLOS. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 11, 161 (1926).—The milky colloidal soln. of resins and other compts. obtained by extg. the roots and stems of *D. elliptica* and *D. uliginosa* with water has an exceedingly toxic action on insects. As dil. a soln. as 0.025% is effective as a contact poison for aphids while an 0.8% soln. constitutes an effective stomach poison. *Derris* does not injure blossoms and foliage and is not particularly poisonous to warm-blooded animals although quite toxic to cold blooded animals. Leaves sprayed with *derris* soln. remain toxic to insects for many days. The poison has been found effective against caterpillars, aphids, psylla and red spiders. The powd. material may be applied as a dust with equal effect.

K. D. JACOB

The use of petroleum oils as insecticides. E. R. DE ONG. *Oil & Gas J.* 24, No. 36, 142 (1926).—A quick-breaking oil-water emulsion is most effective from the insecticidal standpoint. Citrus sprays should contain two gal. of oil per 100 gals. of mixt. Criteria as to the value of an oil for spraying are sp. gr. and the sulfonation test which is described. Oils having a high sulfonation value are least toxic to plants.

M. B. HART

Colloid chemistry of humus and peat (OSTWALD, STEINER) 2.

CHAMBERLAIN, JOSEPH AND BROWNE, C. A. *Chemistry in Agriculture.* New York The Chemical Foundation. 440 pp. \$1.00

LUNDEGÅRDH, HENRICK: *Klima und Boden in ihrer Wirkung auf des Pflanzenleben.* Jena: G. Fischer. 419 pp. R. M. 24.

Calcium nitrate fertilizer. W. WILD and K. EYER. U. S. 1,579,989, April 6. A hot concd. soln. contg. $Ca(NO_3)_2$ and urea is sprayed into a stream of air or other suitable gas in order to form globular granules.

Phosphatic fertilizers. RHEINANIA VEREIN CHEMISCHER FABRIKEN AKT.-GES. Brit. 237,875, Aug. 1, 1924. A mixt. of a natural Ca phosphate with $MgCl_2$ or $MgSO_4$ (with or without an alkali salt) and enough SiO_2 to form Ca orthosilicate with Ca displaced by the Mg and alkali metal is heated to 900-1100° in an atm. contg. H_2O vapor. Cf. C. A. 20, 964.

Available phosphate from phosphate rock. H. H. MEYERS. U. S. 1,578,339, March 30. Ground phosphate rock is sintered with $NaHSO_4$ or Na_2SO_4 , the sintered mass is crushed into porous lumps and the latter are calcined.

Insecticides. S. LOMANITZ. U. S. 1,577,916, March 23. A "sticker mixt."

for use with insecticides and fungicides is formed of a homogeneous fused mass of soap and S.

Insecticide. G. E. SANDERS and R. H. PESTELL. U. S. 1,577,369, March 16. A mixt. adapted for use on plants comprises nicotine, ammonia, MgO, lime, nicotine, sulfate and $(\text{NH}_4)_2\text{SO}_4$.

Insecticide and fungicide. E. C. HOLTON. U. S. 1,578,520, March 30. A dry powdered mixt. comprises BaF_2 with a smaller quantity of S. U. S. 1,578,521 specifies forming a ppt. for the same purpose by treating an alk. earth polysulfide with SO_2 and H_3AsO_4 or an oxy acid of Se. U. S. 1,578,522 specifies reacting on a polysulfide of Ca with H_2SiF_6 . U. S. 1,578,523 specifies similar use of Ba polysulfide instead of Ca polysulfide.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The significance of phosphoric acid in alcoholic fermentation. W. WINDISCH. *Wochschr. Brauw.* 42, 297-8(1925); cf. C. Neuberg and A. Gottschalk, *C. A.* 20, 923.-Acetone dry yeast ferments pyruvic acid but not sugar. This is due to deficiency of coenzyme. The dry yeast is unable to form hexose phosphates until coenzyme is added. The cozymase and the apozymase together constitute the true active zymase.

C. N. FREY

Fuel alcohol from brushwood and from waste cellulosic matter. EDMUND MARCOTTE. *Rev. sci.* 64, 110 5(1926).—A discussion of the Memier process (*C. A.* 16, 1664), which consists essentially in saccharifying wood with dil. acid by passing superheated steam through the reaction mixt. and continuously drawing off the volatile decompn. products as soon as formed to prevent their further decompn. The yield and nature of the products obtained can be controlled within fairly wide limits by variation of the operating conditions.

A. PAPINEAU-COUTURE

Alcohol shrinkage in brandies. H. LÜHRIG. *Pharm. Zentralhalle* 67, 49-55 (1926).—A discussion of the factors involved in the apparent shrinkage in alc. content during storage of brandies, notably in wood and glass containers.

W. O. E.

Algerian grape musts of the 1925 vintage. POUGET and BONNIER. *Ann. fals.* 19, 88-99(1926).—Nature of the soil, drainage, vine, climatic conditions during growth and at vintage time, condition of the grapes, yield and analysis of the must are tabulated for 90 samples and briefly commented.

A. PAPINEAU-COUTURE

A wine 100 years old. GIOVANNI ISSOGLIO. *Giorn. farm. chim.* 75, 31-5(1926). The tartaric acid was relatively low. A large part of the malic was converted into lactic acid. Succinic acid, glycerol and alc. were high. p_H was 3.4, ash 0.276%, volatile esters were calcd. as EtOAc 0.027%, total esters calcd. as Et tartrate 0.068.

MARY JACOBSEN

Salicylic acid as a preservative for wine samples. FONZES-DIACON and LAFORET. *Ann. fals.* 19, 99-102(1926).—Samples of wines preserved by addn. of 0.5 g. of salicylic acid showed practically no change in compn. after 1 yr., whether kept in completely filled and well-stoppered bottles, or in partly filled bottles.

A. PAPINEAU-COUTURE

Some methods of detecting irregularities in the composition of South African wines. F. FEVKIER. Dept. Agr. Union S. Africa, Division of Chemistry Series, *Bull.* 34, 17 pp.(1924).—The methods used for detecting adulteration and fortification are discussed in detail and data are given for typical South African wines.

K. D. JACOB

Temperature conditions in the vinegar generator and their influence on production. FR. SCHIRANK. *Drut. Essigind.* 30, 70 2(1926); cf. *C. A.* 20, 1300.

W. O. E.

CUNIASSE, L.: **Mémorial du distillateur-liquoriste.** Paris, 1925. Librairie La François. 229 pp. 15 francs. Reviewed in *Recherches et inventions* 7, 188(1926). *Rev. chim. ind.* 35, 96(1926).

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

A new preparation for hindering the coagulation of blood. HUGO SCHLESINGER and WILHELM REICH. *Chem.-Ztg.* 49, 961(1925).—"Novirudin," a new compd. belongs to the melanin acid group. It is a dark brown powder, commercially available in 1 and 5 g. packages. 0.5 mg. added to 1 cc. of blood *in vitro* prevents coagulation.

It imparts a dark color to blood, but does not change it otherwise. Injected intravenously 1 mg. per cc. of blood prevented coagulation for 3 hrs. No action was detected on heart, blood pressure or respiration.

The extraction of alkaloids. P. DUROCHER. *La nature* 54, i, 37-40 (1926).—An illustrated description of present large scale production. GEO. R. BANCROFT

The preparation of chloral. P. DUROCHER. *La nature* 54, i, 81-3 (1926).—An illustrated description of large scale production. C. C. DAVIS

Constitution of cyanomercurisalicylic acids and hydrargyrum salicylicum D. A. B. E. RUPP AND H. GERSCH. *Arch. Pharm.* 264, 88-92 (1926).—A series of expts. is described showing that nitration of easily sol. K cyanomercurisalicylate yields *o*-nitrosalicylic acid, while the difficultly sol. K cyanomercurisalicylate gives *p*-nitrosalicylic acid under the same treatment. By utilizing this behavior it becomes possible to differentiate between samples of hydrargyrum salicylicum D. A. B., whether *a* or *p*-mercurisalicylic acid is present, or a mixt. of the two, as follows. Dissolve 2 g. of the sample in 20 cc. H₂O and 30 to 40 drops of official NaOH soln., add 25 g. HNO₃ (1:1) with agitation and heat 1/4 hr. on the steam bath. Cool, filter by suction, boil, filter and ppt. with 100 cc. of H₂O, filter and cool. Collect the crystals, dry at 100-10°, evap. meanwhile the mother liquor one-half and again allow to crystallize. If the crystals remain colorless when dry, the product is solely *p*-nitrosalicylic acid, if they develop color, the product is *o*-salicylic acid, m. 144, or a mixt. with indeterminate m. p.

W. O. E.

Evaluation of digitalis. R. WASICKY, F. LASCH AND K. SCHONOVSKI. *Arch. Pharm.* 264, 92 (1926).—The colorimetric method for the evaluation of digitalis preps. via Knudson-Dresbach is in its present form to be rejected. Methods involving the entire frog or the cat are serviceable as at present in vogue. For practical purposes, the simplest possible method involving use of the frog is preferable, notably the 2 hr. method of Pick-Wasicky.

W. O. E.

Salts of anhydromethylenecitric acid. I. VANINO AND O. GUYOT. *Arch. Pharm.* 264, 113-7 (1926).—With concd. aq. solus. of "citarin" AgNO₃ yielded a white ppt., CuSO₄ green, sol. in excess of citarin, stable on boiling alone, but pptg. Cu with caustic alkali; BeCl₂ immediate white ppt. soon changing to a transparent viscous mass, MgSO₄ cryst. ppt. after a short time; CaCl₂ fine cryst. ppt. on standing, SrCl₂ gradual amorphous ppt.; BaCl₂ immediate heavy amorphous ppt.; ZnSO₄ gradual heavy cryst. ppt.; CdSO₄ very gradual cryst. ppt.; HgNO₃ and Hg(NO₃)₂ white ppt. sol. in large excess of citarin, very slow reduction on boiling the mercurous salt, none with the mercuric salt; AlCl₃ strong white ppt.; Pb(NO₃)₂ white amorphous ppt.; KCr(SO₄)₂ immediate cryst. ppt.; UO₂(OAc)₂ no ppt.; MnSO₄ cryst. ppt.; FeCl₃ red brown ppt. sol. in excess of citarin, soln. giving with NH₃ no ppt. but a red brown color, (NH₄)₂Fe(SO₄)₂ gradual yellowish white amorphous ppt. permanent in the air, Bi(NO₃)₃ immediate white amorphous ppt.; SnCl₂ white amorphous ppt. The following salts were isolated and characterized: lithium anhydromethylenecitrate C₃H₄O₄Li₂·3H₂O, prismatic plates, Mg salt, C₃H₄O₄Mg·2H₂O, Cu salt, C₃H₄O₄Cu·2H₂O, Mn salt, C₃H₄O₄Mn·3H₂O, long prisms; Cr salt, (C₃H₄O₄)₂Cr₂·2H₂O, blue-green needles, Co salt, C₃H₄O₄Co·3H₂O, red crystals; Ni salt, C₃H₄O₄Ni·3H₂O, cryst.

W. O. E.

Siamese benzoin. V. FRIEDRICH REINITZER. *Arch. Pharm.* 264, 131-40 (1926); cf. C. A. 9, 121; 15, 2851; 19, 2724.—The present paper embodies a study of the entire resin. A summary of the author's investigations on Siamese benzoin is presented as follows: (1) Siamese benzoin is originally a purely white, cryst. mass. The amorphous bark layer of the com. product is a subsequent formation. The same probably also applies to the thin amorphous layers interspersed through the mass. (2) This benzoin consists essentially of cryst. conferyl benzoate together with some free BzOH and *d*-siaresinolic acid which originally forms with cinnamyl benzoate a thick cryst. magma, the latter finally becoming firm and hard through evapn. of the solvent. Slow oxidation of conferyl benzoate yields a small amt. of vanillin. (3) The benzoates of benzo-resinol and siaresinotannol reported by Ludy do not in fact exist. (4) Siamese benzoin is, contrary to the belief of Tschrech and Ludy, readily saponifiable. A small amt. of free conferyl alcohol in the resin is apparently due to the spontaneous decompn. of conferyl benzoate, possibly through participation of a little H₂O. On dry heating at 120° to 130° this benzoate loses 1/2 of the BzOH. (5) The colored glacial bark layer of the com. product is formed by passage of cryst. conferyl benzoate into the amorphous type, through simultaneous oxidation and polymerization. This change is effected by protracted storage at the ordinary, more quickly at elevated, temp. (6) On treating Siamese benzoin with solvents, a very large part of the cryst. conferyl benzoate becomes amorphous. (7) Siamese benzoin is formed

by the morbid action of the diseased cambium, carrying compds. of coniferyl alcohol, which is normally expended in the lignification of the cells walls. W. O. E.

Seed of *Datura alba* Nees. H. DIETERLE. *Arch. Pharm.* **264**, 140-64 (1926).—A study has been made of the oil (123 g.) extd. from the seed (950 g.) by C_6H_6 , Et_2O , trichloroethylene and AcMe. The clear product thus obtained had a dark green or brown color, was thickly liquid at the ordinary temp., depositing a cryst. ppt. at 10° and acquiring a salve-like consistency at 0° . The consts. detd. were: d_{15}^{40} 0.9250; n_D^{40} 1.5144; acid no. 20.35; ester no. 172.5; fatty acids free 10.14, total 95.65%; Hehner no. 93.6; Reichert-Meissl no. 2.41; Polenske no. 0.41; I no. 98.36; acetyl no. 10.2, unsaponifiable 2.9%. 100 g. of the oil consisted of palmitic and other solid fatty acids 6.18, caproic acid 1.00, α -linolic acid 23.55, β -linolic acid 2.92, oleic acid 60.86 g. W. O. E.

Influence of sodium hydroxide on the adsorption of arsenious acid by saccharated iron. L. HERBOTH. *Arch. Pharm.* **264**, 181-6 (1926).—The adsorption of As_2O_3 by saccharated Fe is markedly affected by NaOH. This adsorption capacity of com. saccharated Fe is lowered by the addition of HCl. Samples prepd. via the Ger. Pharmacopoeia develop with age a min. adsorption capacity, due probably to the action of atm. CO_2 . Further addn. of NaOH effects restoration of the adsorptive power. After addn. of about 0.5% NaOH more than the official requirement, the max. adsorptive power for the stored product is reached. The question whether a part of the originally incorporated NaOH is converted into carbonate remains open. The amts. of alkali leading to the formation of NaH_2AsO_3 and Na_2HAsO_3 show an apparent break in the adsorption curve, the highest value of which corresponds closely to disodium arsenite. W. O. E.

New drugs and pharmaceutical specialties during the year 1925. F. ZERNIK. *Pharm. Ztg.* **71**, 249-52, 279-80, 294-6, 314-6 (1926). W. O. E.

Reagent for the recognition of inferior neoarsphenamine. A. KIRCHER AND F. V. RUPPERT. *Pharm. Ztg.* **71**, 264-5 (1926).—Controversial with respect to the reagent "strontiuuran" as applied to arsphenamine and neoarsphenamine (cf. Kolle, Bauer and Leupold, *C. A.* **20**, 261; Hirsch, *C. A.* **20**, 646). The authors conclude from recent expts. that this reagent is useless insofar as the detection of inferiority in neoarsphenamine is concerned. W. O. E.

Compound of pyramidone and volutal. PAUL PFEIFFER AND OLGA ANGERN. *Pharm. Ztg.* **71**, 294 (1926).—Equimol. proportions of pyramidone and volutal unite when fused together or dissolved in ligroin, EtOH or H_2O to yield a definite compd. (needles from ligroin) m. $75-6^\circ$, and separable again into its components by treating the powdered substance for 10 min. with 10% HCl and filtering the dissolved pyramidone from the insol. volutal. W. O. E.

Digitalis preparations. RAPP. *Pharm. Ztg.* **71**, 312-4 (1926).—A presentation of the knowledge a druggist should possess in order properly to prep. digitalis powders, infusions, pills, suppositories, injections and tinctures on physicians' prescriptions. W. O. E.

Theory of the specific gravity of sirups. F. WRATSCHKO. *Pharm. Presse* **31**, 79-80 (1926); cf. *C. A.* **19**, 3349.—Various equations are discussed relative to the density of sirups, similar to the author's treatment of the theory of the sp. gr. of tinctures. W. O. E.

New diuretic. ABA SZTANKAY EDLER VON HERMANY. *Pharm. Zentralhalle* **67**, 113-5 (1926).—A new compd. of theobromine with Ca succrate is described, having the compn. $(C_7H_5N_4O_2)_2Ca(OH)_2 \cdot CaOC_{12}H_{21}O_{11}$, marked diuretic properties, and favorably affecting high blood pressure, weakened heart action and restlessness. W. O. E.

Acidimetric estimation of both components in mercury oxycyanide. E. RUPP. *Pharm. Zentralhalle* **67**, 145-6 (1926).—The method is based upon (1) the behavior of the oxycyanide toward HCl: $Hg(CN)_2 + HgO + 2HCl = Hg(CN)_2 + HgCl_2 + H_2O$ and (2) upon the behavior of the resulting cyanide and chloride toward $Na_2S_2O_3$: $Hg(CN)_2 + 2Na_2S_2O_3 = Hg(S_2O_3)_2 + Na_2 + 2NaCN$ and $HgCl_2 + 2Na_2S_2O_3 = Hg(S_2O_3)_2 + Na_2 + 2NaCl$. In a beaker contg. 40 to 50 cc. warm H_2O dissolve 0.3 g. of the sample and 0.5 g. of NaCl, cool and add 2 to 3 drops of methyl orange, then run in 0.1 N HCl to a color change of yellow to orange; now add 1.5 to 2 g. of pure $Na_2S_2O_3$ and titrate further with 0.1 N HCl until the color reverts to rose. Pure $Hg(CN)_2$, HgO require an equal amt. of acid for each titration, or 12.8 cc. for 0.3 g. 1 cc. 0.1 N HCl = 0.0108 g. HgO and 0.0126 g. $Hg(CN)_2$, resp. W. O. E.

Separation of cinchona alkaloids. J. MESSNER. *Pharm. Zentralhalle* **67**, 146-8 (1926).—With 1% aq. solns. of the salts and a 5% soln. of Na_2HPO_4 , on adding 3 drops

of the reagents to 10 cc. of the alkaloidal soln. The color is brown, as noted. 1. No immediate nor subsequent turbidity or cloudiness, or precipitate is noted. 2. (in the course of $\frac{1}{2}$ min.) turbidity or ppt. develops, which disappears on shaking. 3. On addition of a reagent develops a cloudiness which disappears on shaking. 4. On addition of a reagent tinge between the two, acidify 90 cc. of the alkaloidal soln. with 1 drop of 25% HCl, and mix 10 cc. thereof with 10 cc. of reagent. 5. With 1 drop of 25% ppt. indicates quinine, while the absence of any turbidity or ppt. even after standing indicates quinidine. Application of these observations to com. operations suggested.

Wolfsmilk as skin irritant. A. NESTLER *Pharm. Zentralhalle* 67, 161 (1926). A study has been made of the latexes of various species of domestic wolf-milk relative to their irritating effect upon the skin. The irritating substance of *Lithosaurus scopolii* is insol. in H_2O , easily sol. in Et_2O , C_6H_6 , $EtOH$, $CHCl_3$, slowly sol. in oil of turpentine, colored brown-red in concd. H_2SO_4 , also in concd. HNO_3 , all properties characteristic of resins. The activity of the latex seems to be more or less seasonal, that of Aug. and Sept. producing dermatitis, while the latex of Apr. and May was inactive. Of other species examd., *T. lathyris scopolii* was inactive, *T. populi Gaurmo* in 1 of 3 cases applied only produced transitory itching dermatitis, *T. pilosopus scopolii* as in the preceding, *T. platyphyllus scopolii* mild dermatitis, *T. calva scopolii*, none.

Microchemical reactions of tutocaine. L. ROSENTHALER *Pharm. Zentralhalle* 67, 177-9 (1926).—A study was made of the behavior of tutocaine, $pH.NC_6H_4.CO.CHMeCHMeCH_2NMe_2.HCl$, toward the reagents $PtCl_4$ (1), $AuCl_3$ (2), K tetratritro diammine cobaltite (3), KI (4), trinitroresorcinol (5) and $HgCl_2$ (6), and compared with procaine and cocaine under like conditions. Thus (1) produces, with the 3 alkaloids the following phenomena in the order named: droplets changing into bundles of needles; cryst. aggregates of notched rods or plates, possibly with or following the formation of droplets; cryst. aggregates of feathery forms following an amorphous stage. (2) Droplets changing into branching forms, droplets then clusters of rods more or less notched; amorphous changing to cryst. forms, dendritic or thread-like clusters; (3) clusters of prisms and plates with oblique end surfaces, also sep. prisms, clusters of prisms with needles; clusters of long needles and spikes, (4) droplets changing into (monoclinic?) prisms, droplets then cryst. clusters, droplets sometimes followed by needles, rods and spikes; (5) granules then cryst. clusters developing into notched forms; granules, then drusy forms changing into clusters and bundles of long needles with more or less feathered ends, seldom clusters of small prisms, amorphous then fungoid forms; (6) droplets no crystals observed, droplets becoming cryst. (separate prisms or branching aggregates); droplets, then granules, crystals not observed.

Reaction of alkaloids with furfural-sulfuric acid. L. EKKERT *Pharm. Zentralhalle* 67, 179 81 (1926).—A mixt. of 1 g. of an aq. 1% furfural soln. with 10 g. concd. H_2SO_4 constituted the reagent, 3 to 4 drops of which were applied to 1 to 3 g. of the alkaloid in a porcelain dish. Only in the case of veratrine did any striking color develop at ordinary temp. If, however, the dish be carefully warmed over a small flame, there is observed not only with veratrine but with atropine, novatropine, scopolamine, hyoscyne, colchicine, codeine, ethylmorphine and also antipyrine the development of brilliant colors. In the case of the alkaloid HBr , as scopolamine- HBr and hyoscyne- HBr , dissolve 0.02 to 0.03 g. of the salt in H_2O , treat with a little $NaOH$ soln. and ext. with 2 to 3 cc. of Et_2O , evap. the org. solvent in a porcelain dish and apply the reagent as above. β -Eucaine, caffeine, theobromine, cocaine, strychnine, brucine, pilocarpine and physostigmine yield no unusual color. Papaverine dissolves notably in warm concd. H_2SO_4 with a violet color. The colors developed on warming with the above reagent are in the case of atropine: intense violet red, novatropine: bright blue changing to dark green with continued heat, scopolamine: intense violet red, hyoscyne: intense violet red; veratrine (immediate blue, olive green, dark green, dark blue, finally violet) on heating wine-red, intense cherry-red, violet red, finally intensely dark red, yellow on diln. with H_2O ; colchicine: (yellow, brown yellow), on warming immediate yellow, green and finally brown; quinine: violet stripes, morphine (reddish) reddish then green and finally brown; codeine: like morphine, blue on diln. with H_2O , ethyl-cherry-red, finally violet red; codeine: like morphine, blue on diln. with H_2O , green with morphine: like codeine; apomorphine (reddish) dark red, green with H_2O , green with caustic alkali becoming red on shaking, antipyrine: evap. on ted. blue red, finally mulberry-red, shaken with $CHCl_3$ and H_2O , former yellow latter violet. To atropine scopolamine and hyoscyne the reagent is highly sensitive.

Standards of Bulgarian rose oil. M. SIEFANOVA *Rec. inst. *Académie des sciences**

Bulgarie 3, 30-52(1924).—In order to obtain results representative of pure Bulgarian oils, the investigation was extended over a period of 3 years at 4 of the chief production points and involving the different climatic and soil conditions. Distn. was carried out in the small village retorts, in the usual manner, on both the red (*Rosa damascena* Mill) and white (*Rosa alba* L) separately, in order to det. any difference in const. of the 2 sorts. Typical of the recorded results for oils from red and white roses, resp.: d_{15}^{20} 0.8523, 0.8584 during 1921; 0.8622, 0.8668 during 1922. Solidification point 17.0, 21.4°; 15.4, 16.6° n_D^{20} 51.7, 53.25; 56.25, 60.4; α -3.24, -1.56; -2.35, -1.32°. Acid no. 0.859, 0.747; 1.152, 0.921. Ester no. 7.65, 7.467; 8.933, 7.258. Sapon. no. 8.509, 8.214; 10.085, 8.179. Ac no. 205.84, 225.87; 245.11, 249.76. Free alc. as geraniol 64.02, 71.84; 78.952, 81.525%. Total alc. 66.127, 73.9; 81.412, 83.52. Color yellow. Numerous const. are recorded covering the operations of associated distns. for the years 1922, 1923 and 1924. The limits of const. over this period were: d_{16}^{20} 0.8494-0.8586 (1922), 0.8436-0.8634 (1923), 0.8550-0.8619 (1924). Solidification temp. 17-22.1, 15.5-22.1, 15.2-19.4°; n_D^{25} 52-53.6, 45.8-54.85, 49.4-52.1; α -1.74-3.17, -1.9-4.54, -2.94-3.61°. Acid no. 0.886-2.122, 0.712-3.021, 0.767-2.81. Ester no. 7.07-6.678, 6.505-11.36, 6.587-8.281. Sapon. no. 8.268-11.804, 7.426-13.446, 7.73-11.091. Ac no. 211.05-224.1, 196.97-237.38, 216.24-233.74. Free alc. 66.09-70.25, 61.17-74.84, 67.76-85.32. Total alc. 68.121-72.807, 63.1-77.97, 70.04-77.13%. The investigation is being continued. W. O. E.

The alkaloids of *Ceanothus americanus*. A. H. CLARK. *Am. J. Pharm.* 98, 147-56(1926).—*C. americanus* contains a complex mixt. of alkaloids. Methods of extg. them are discussed. One cryst. alkaloid was isolated. The reactions of the alkaloids, both the mixt. of amorphous ones and the cryst. one, towards a no. of alkaloidal precipitants has been recorded and photographs of the few cryst. ppts. obtained, all from the cryst. alkaloid, have been made. The common color tests were tried but no characteristic reactions were obtained. An interesting resin-like substance is mentioned. W. G. GAESSLER

Application of micro methods to control work in pharmaceutical manufacturing. W. FIGDOR. *Am. J. Pharm.* 98, 157-62(1926); cf. *C. A.* 19, 2791.—F. reports methods and results on the detn. of alk. earth salts of org. acids, quant. micro ash detn. of drugs, detn. of residues in tinctures and fluid exts., detn. of esters and menthol in oil of peppermint, detn. of non-volatile extractive sol. in ether or petroleum ether, and detn. of alkaloids in drugs and alkaloidal preps. W. G. GAESSLER

The instability of the sodium perbenzoate. A. J. GELARIE AND F. R. GREENBAUM. *Am. J. Pharm.* 98, 163-6(1926).—The compd. has the tendency to give off O and is transformed into the more stable $BzONa$: $C_6H_5CO_2O_2Na \rightarrow C_6H_5COONa + O$. This O is in the *status nascendi* and has a very great oxidizing power. On standing the soln. loses its activity, that is the free O decreases more and more so that after standing for 2 days only Na benzoate is left. The decompn. is accelerated by the presence of foreign substances. A characteristic reaction for this compd. which can be used to det. the degree of decompn. is its behavior towards KI. The pure compd. dissolved in H_2O is decompd. in 24 hrs. to about 95% and after 48 hrs. the decompn. is complete. W. G. GAESSLER

Comparative anatomy of the roots and rhizome of Solanaceae of importance in pharmacognosy. Localization and determination of the alkaloids. ERICH LEWINSKY. *Botan. Arch.* 6, 312-33(1924); *Botan. Abstracts* 14, 880.—The chief places of storage of the alkaloids in the roots of Solanaceae are the epidermal and subepidermal layers. Because of its alkaloidal contents, the rhizome of *Scopolia* species can be used for the same purposes as belladonna roots. The alkaloidal content surpasses that of belladonna roots. The content of alkaloids in the roots of *Mandragora vernalis* is less than that in *Scopolia* species but above that of belladonna. The rhizome and roots of *Physalis alkekengi* contain no alkaloids. The solanine content of the roots of *Solanum dulcamara* agrees with that in the roots of this plant. H. G.

A pharmacognostical study of *Chenopodium ambrosioides* Linnaeus from the Philippines. J. K. SANTOS. *Philippine J. Sci.* 28, 529-48(1925).—For microchem. tests, in order to note the parts of the plant in which the oil is secreted and stored a 5% alc. KOH soln. was found to be preferable to a freshly prepd. alkanet tincture, osmic acid, Sudan red and an aq. soln. of $Cu(OAc)_2$. The oil of chenopodium is confined largely to the glandular hairs of sac-like shape; some is found in the embryo. The oil-bearing hairs are especially abundant on both sides of the leaves, on the upper half of the ovary, when this is nearly mature, in the crevices between the ridges of the young portion of the stem, and on the surface of the calyx. In order to secure a greater

yield of oil, the entire plant, with the exception of the old part of the stem should be utilized before the fruits and leaves become too mature. The favorable time for distn. would appear to be after the most of the flowers are open. ANTON HOGSTAD, JR.

Some further remarks on tobacco cultivation for nicotine. J. VERNELL CUTLER, J. J. THERON AND J. DU P. OOSTHUIZEN. Dept. Agr. Union S. Africa, *Bull.* 2, 23 pp. (1925).—The max. nicotine content of whole plants of *Nicotiana glauca* varied from 2.79 to 4.79%. The leaves, constituting 45 to 55% of the air-dry plant, contained from 5.4 to 8.2% nicotine for 8 plants. The nicotine content of the leaves increased continuously to a max. at about 88 days after transplanting and then decreased rapidly. The stalks and pods, constituting 25 to 45 and 18 to 25% of the whole plant, contained 0.79 to 1.20 and 0.65 to 1.39% nicotine, resp. The seed contained 0.00 to 0.06% and the roots 0.29 to 0.71%. "Topping" increased the total nicotine content 10 to 50%, the greatest increases occurring in the leaves. Green sweating followed by air-drying appeared to be the most economical method for treating the plants to obtain a high yield of nicotine although flue-curing gave the best results. In general the highest percentages of nicotine were obtained in the first cutting followed by slight decreases in the second and third. Application of complete fertilizers appreciably increased the total yield of nicotine but had little effect on the percentage content of the plant while heavy applications of N fertilizers had little effect in either case. K. D. LISON.

Iodotannic acid with reference to the preparation of the sirup. EVAKISIO GAM BETTA. *Boll. chim. farm.* 65, 33-6 (1926).—Iodotannic acid was prepd. in nearly quantitative yield by heating to 60° a soln. of 4 g. tannic acid, 2 g. I, 1 g. KI in 100 cc. water with Na_2PO_4 and $\text{Ca}_3(\text{PO}_4)_2$ 2 g. each. The 1, 30% is chem. combined. The taste of the sirup is pleasant, not astringent. MARY JACOBSEN.

Baroni's reaction in neutral glass for pharmaceutical uses. LUIGI TIRILLI. *Boll. chim. farm.* 65, 65-72 (1926), cf. C. C. 1, 20, 975.—Because of the great sensitiveness of hematoxylin the results are easily vitiated by impurities of the reagents, dust, fumes, vapors, etc. The great sensitiveness to Cu may often be misleading. It also is a delicate test for the decomposition of glass made up of silicates only and containing bases or heavy metals. It fails entirely in the case of borate glass, the decomposition of which can be detected with phenolphthalein. It does not indicate neutral salts or acids (SiO_2 , borosilicic acids) washed out of the glass. Its use in conjunction with phenolphthalein is recommended. MARY JACOBSEN.

Non-toxic insulin. CESARE PIAZZA. *Problemi di Nutrizione* 1, 120-4 (1925). *Ber. ges. Physiol. exp. Pharmacol.* 31, 68 (1925).—The non-toxic insulin, the prepn. of which is described elsewhere, is an amorphous, slightly yellow powder. It differs from Banting's insulin only in that it is thermostable (the soln. can be sterilized 15 min. at 120°), and that it does not produce the hypoglycemic complex even if the blood sugar is reduced to 0. A daily dose of 0.01 g. solid substance is sufficient. Actonuria and glucosuria disappear slowly under this dose, hyperglycemia is mitigated to a lesser degree. No untoward effects were observed except for irregular menstruation in some women. P. assumes direct stimulation of the pancreas. MARY JACOBSEN.

Solid petroleic ether extracts of flowers. M. J. VARD. *Partens de France* No. 36, 35-7 (Feb., 1926).—These exts. contain, besides the essential oil proper, a certain amount of vegetable waxes and coloring matters. The waxes at times act as excellent fixing agents for the perfume, but are only slightly sol. even in strong alc. The bulk of the wax can be removed by washing in alc., the residual portion acting as fixer without interfering with its soly. The total ext. and the essential oil content of the latter were detd. by extg. the flowers with petroleic ether, evapg. the solvent, steam distg. the residue till odorless, and recovering the oil from the distillate by extn. with ether. The following results were obtained, and figures obtained by Hesse and by von Soden are given for comparison:

	Oil per 1000 kg. of flowers		Total ext. per 1000 kg. of flowers	Yield of oil of extract
	Hesse	von Soden		
Jasmine	178 g.	770 g.	240 g.	3000 kg.
Orange	800 g.	660 g.	609 g.	2820 kg.
Roses (Grasse)	—	520 g.	683 g.	2400 kg.
Tuberose	60 g.	—	33 g.	0986 kg.
Violet (leaves)	—	20 g.	18 g.	1070 kg.

V.'s results are means of several detns. differing by not over 2-3%. There is fairly good agreement in the figures of the different experimenters, except for von Soden's results for jasmine, and V. attributes the discrepancy to the fact that von S. probably

started from a jasmine pomatum concentrate, instead of using the flowers themselves.

A. PAPINEAU-COUTURE

Anisaldehyde in perfumery. ANON. *Parfums de France* No. 36, 52-5 (Feb., 1926).—Brief review of its prepn. and properties, and of its use in perfumery. A. P.-C.

Absolute oil of tuberose. GUIDO ROVESTI. *Profumi Italiani* No. 9, 248 (1925); *Parfums de France* No. 36, 56 (Feb., 1926).—Three samples of the 1922, 1923 and 1924 crops gave the following results, resp.: d_{16} 1.211, 0.988, 1.061; rotation $-5^{\circ}41'$, $-1^{\circ}7'$, $-3^{\circ}15'$; ester no. after acetylation 168, 256, 217; methyl anthranilate 4-5%.

A. PAPINEAU-COUTURE

Oil of bergamot in 1924-1925. R. STAZIONE SPERIMENTALE DI REGGIO-CALABRIA. *Riv. ital. ess. profum.* 1925, No. 11, 127-9; *Parfums de France* No. 36, 56 (Feb., 1926).—The consts. given fall within the normal limits. A. PAPINEAU-COUTURE

Oil of nepetella. P. LIOTTA. *Riv. ital. ess. profum.* No. 11, 129 (1925); *Parfums de France* No. 36, 56 (Feb., 1926); cf. C. A. 19, 378.—Three samples of oil of nepetella (*Nepeta cataria* and *canescens*) distd. from plants from the Calatabiano district had d 0.9085 (at 18°), 0.9095 (at 15°), 0.9090 (at 15°); $[\alpha]_{20}$ $109^{\circ}35'$, $104^{\circ}37'$, $108^{\circ}25'$; b . p. 214° , 214° , 214.2° ; soly. in 80% alc. 1 vol., 1 vol., 0.95 vol.; residue on evapn. 4.8, 4.82, 4.72%; sapon. no. of the residue 157, 157, 155, resp. L. considers the oil consists largely of terpenes, is high in carvacrol (?), and contains an alc. for which he proposes the name *nepetol*, and also traces of pulegone and of thymol. A. P.-C.

First distillate from essence of thyme. Thymene. ANGE ADIDA and MAURICE DEMIGNEUX. *Bull. sci. pharmacol.* 33, 65-70 (1926).—Thymene is a term applied to that part of the essence of thyme which distils between 160° and 185° . Essences of *Thymus capitatus*, *T. vulgaris* and *T. serpyllum* yield distillates at $158-165^{\circ}$, $158-163^{\circ}$ and $155-160^{\circ}$, resp., contg. 3.2, 7.5 and 18.0% of pinene, resp., calcd. to the original essences. The first of these is dextrogyrous, the other two are levogyrous. Pinene is characterized by its yielding pinonic acid on treatment with permanganate.

L. W. RIGGS

Preparation of gentian violet for intravenous injection. VICTOR BURKE and JANE L. NEWTON. *J. Am. Med. Assoc.* 86, 529-34 (1926).—The conclusions of this study are given in 13 paragraphs. L. W. RIGGS

Pharmacy in Japan. T. NOZOE. *J. pharm. chim.* [8] 3, 41 6, 90-4 (1926).—A comprehensive survey, demonstrating the high plane occupied by pharmacy in Japan. S. WALDBOTT

"Cenomassa zyma." P. WEINREICH. *Schweiz Apoth. Ztg.* 63, 533-4 (1925)

A new pill mass for the rapid prepn. of non-hardening pills. It is a non-drying mixt. of purified powd. yeast dried at 120° and yeast ext., with addn. of a little NaCl. In taste it resembles meat ext., and causes digestive juices to flow, which assists in the resorption of unpleasant drugs, e. g., quinine, Fe, etc., given in pill form. (Cf. Heimz, *Verhandl. d. Congr. f. innere Medizin*, 1921.) Pharmacopoeial recognition of purified powd. yeast and yeast ext. for use in pill masses is recommended. S. WALDBOTT

Note on extractum belladonnae. R. MAEDER. *Schweiz Apoth. Ztg.* 63, 535 (1925).—A dried ext. prepd. by vacuum evapn., according to Pharm. Helv. IV, of an ext. of belladonna leaves stored for more than 6 yrs., gave as high as 4% total alkaloid. This result seems to favor vacuum evapn. of ext. of dried leaf, as against the use of fresh leaves and stabilization. An editorial note points out that pharmacol. keepn. qualities are as important as a high alkaloidal content. S. WALDBOTT

Determination of santonin in pastilli santonini cum saccharo. R. EDER and W. SCHNEITER. *Schweiz Apoth. Ztg.* 63, 557-61 (1925).—Kropat's method (C. A. 6, 2486) gives somewhat higher results on account of slight soly. of sugar (1 mg.) and tragacanth (1.8 mg.) in CHCl_3 (50 g.). Shake 4 very finely powd. tablets with 50 ml. CHCl_3 for 5 min., add 20 drops of H_2O , again shake for 0.5 min., filter, collect 45 g., distil off the CHCl_3 , dry the residue for 1 hr. at 100° , allow to cool in a desiccator and weigh. The limiting wts. of the residue should be 0.085-0.095 g., corresponding to a santonin content of 0.024-0.026 g. per tablet. Identify the santonin by its m. p. 170. S. WALDBOTT

Suggestions for the galenical preparations of Pharm. Helv. V. H. GOLAZ and K. SIEGFRIED. *Schweiz Apoth. Ztg.* 63, 593-6, 607-11, 625-9, 641-3, 657-9 (1925). cf. C. A. 17, 2346, 18, 151; 19, 2109.—A system of galenical preps. is suggested in which tinctures, wines, sirups, ointments, etc., of a given drug, potent or non-toxic, are prepd. by decimal diln. of a stabilized standard ext. of this drug, obtained by an internationally adopted uniform method. A synoptical table of potent exts. and galenical derivs., with graded alkaloidal contents, and max. doses is given; examples of non-toxic exts. are included. Ext. are of class A (fresh drug) or B (dried drug). To

prep. fluid exts. of *A*, press out the juice of the plant, repeat this after addn. of H_2O , then pasteurize for 30 min. at $50-65^\circ$ in presence of 15-25% EtOH, ppt. inert matter. With potent drugs, standardize the ext. by a chem. or physiol. method and adjust to the adopted % of active principle. To obtain a dry ext. of *A*, evap. the fluid ext. *in vacuo* at $25-40^\circ$ and bring to required strength by addn. of lactose or Na-IPSO_4 . For exts. of class *B*, dry the drug in a warm current of air at $25-35^\circ$ or more, obtain fluid exts. by the usual methods of extn. and dry exts. as under *A*. The manuf. of several exts. typical of these classes is described in detail.

The assay of aloes. R. EDER AND W. SCHNEITER. *Schweiz. Apoth. Ztg.* 63, 630-1, 644-5, 660-2, 669-71 (1925).—The assay consists in detn. of non-resin (Tschirch and Hoffbauer, 1905; Pharm. Helv. IV). Dissolve 1 g. powd. aloes in 5 cc. MeOH on a water bath under reflux, then add to the boiling soln. 30 cc. CHCl_3 in small portions, allow the stoppered flask to stand for 12 hrs., weigh its contents, filter into a tared flask, weigh an aliquot and distil off the solvent, pass a current of dry air through the flask on the boiling water bath for 20 min., dry for 1 hr. at 100° , cool in a desiccator and weigh, then calc. % of non-resin. Two com. samples gave 69.90, 70.10, 71.10, 70.84.10-84.45%; min. required: 80%. S. W. WARDEN.

Christian Bühner, 1849-1925. "C." *Schweiz. Apoth. Ztg.* 63, 689-91 (1925).—An obituary. S. W. WARDEN.

The value of microanalytical methods and examples of their application. G. L. KEENAN. *J. Am. Pharm. Assoc.* 14, 112-3 (1925).—Essay. The microscopical identification of plant ingredients, microchem. tests, optical crystallographic methods and quant. microscopy are discussed. L. E. WARREN.

Temperature effects on hypochlorite solutions of the Carrel-Dakin type, including the proposed U. S. P. X formula. I. A. BECKER. *J. Am. Pharm. Assoc.* 14, 129-32 (1925).—Hypochlorite solns. were made by each of several formulas from recently assayed CaOCl_2 . The solns. were assayed for Cl equiv. at once and again after storage under various conditions of light and temp. Dakin solns. may be heated to 50° without serious injury. Daylight is a stronger decomposing factor than heat. The observations on the U. S. P. X formula are that the gelatinous nature of the Ca phosphate ppt. holds some of the sol. hypochlorite so tenaciously that the amt. of H_2O is not sufficient to remove all of it, and that the filtration process is consequently too long and tedious. The CaCO_3 ppts. yield the sol. hypochlorite more readily and filtration is fairly rapid. L. E. WARREN.

Report on proximate analysis of Euphrasia. WM. F. MILLON AND L. E. SAYRE. *J. Am. Pharm. Assoc.* 14, 308-17 (1925).—The medicinal properties lie in the aromatic, resinous substance. Volatile oil is present. The tincture has a decided herb-like taste. Ash 8.6, moisture 10.1, acid-insol. ash 1.46. EtOH ext. 10.1, EtOH ext. (after EtOH) 13.6, H_2O ext. (after EtOH and EtOH) 9.9%, cellulose 11.1, albumin 10.3, tannin 1.84, EtOH ext. of drug 13.3%. Resinous substances and glucose are present in considerable amts. L. E. WARREN.

The influence of climatic conditions on the yield and quality of oil of *Mentha arvensis*, variety *piperascens*. G. A. RUSSELL. *J. Am. Pharm. Assoc.* 14, 679-81 (1925); cf. *C. A.* 19, 1753. Plants were grown at 6 locations and the oil was distd. from each. The yields of combined and free menthol were detd. The altitudes, soil types, rainfall, mean temp., etc. were noted. An attempt to discover the causes for the variation in the compn. of the oil from season to season failed. It is believed that plants grown in the sun give higher yields of oil than do others. L. E. WARREN.

Notes on pepsin preparations. C. C. GLOVER AND C. G. FESS. *J. Am. Pharm. Assoc.* 14, 682-6 (1925); cf. *C. A.* 17, 3568. It is again shown that the presence of free acid in considerable amts. tends to accelerate the loss in pepsin preps. A very small amt. of acid is necessary for preservative, but the amt. is much less than the U. S. P. prescribes. Preps. were made contg. various substs. which it was thought would act as preservatives. Caffeine Na salicylate, Me salicylate and Na phosphatide in varying proportion were added to the pepsin prepn. All of the preps. were assayed and were allowed to stand for 6 mo. They were then re-assayed. Some were nearly of full strength, but most had depreciated considerably or had completely lost their activity. There appeared to be no consistent explanation of the behavior of specimens contg. preservatives. From expts. in dialyzing sols. of pepsin it is apparent that pepsin is composed of but one enzyme. In curdling milk by pepsin casein, Ca salts and acid appear to be essential. L. E. WARREN.

A new emulsifying agent for volatile oils. C. H. LAWALL. *J. Am. Pharm. Assoc.* 14, 703-4 (1925).—A mixt. of 20% of powd. egg albumin and 80% of powd. K bitartrate

is an excellent emulsifying agent for volatile oils. For oils heavier than H_2O , such as sassafras or wintergreen, place 100 g. of oil in a 200-cc. bottle, add 1 g. of the emulsifying mixt. and agitate well. Then add 100 cc. of H_2O and shake violently for 1 min. The emulsions stand well. For oils lighter than H_2O use 2.5 times the amt. of emulsifying mixt. This emulsifying mixt. is particularly useful for prepg. concentrates for adding to sirups in the carbonated-beverage industry. Immiscible liquids like $CHCl_3$, Et_2O or C_6H_6 do not emulsify well with the mixt. and fixed oils do not emulsify as well as with other emulsifying agents.

L. F. WARREN

Ether studies. III. The quantitative determination of aldehyde as a contaminant. E. P. PHELPS AND A. W. ROWE. *J. Am. Chem. Soc.* **48**, 1049-53(1926); cf. *C. A.* **18**, 3254.—A method based on the use of Schiff's reagent is described for the quant. detn. of aldehyde in Et_2O which allows the estimation of min. amts. of the order of 0.003%.

C. J. WEST

Therapeutic organic mercury compounds. WELLCOME FOUNDATION, LTD., T. A. HENRY AND T. M. SHARP. *Brit.* 237,735, Aug. 12, 1924. Products sol. in oils, fats and artificially prepd. fatty acid esters are prepd. as follows: (1) 2-hydroxy (or acetoxy) mercuri-3-hydroxybenzaldehyde is warmed with caproic acid and allowed to cool; 2-caproxymercuri-3-hydroxybenzaldehyde seps. Caprylic, lauric, myristic, oleic and chaulmoogric acids give similar products. (2) *p*-tert-Butylphenol is boiled with $Hg(OAc)_2$ and the resulting 2,6-diacetoxymercuri-*p*-tert-butylphenol treated with lauric acid to yield 2,6-dilauroxydimmercuri-*p*-tert-butylphenol. Other phenolic substances such as carvacrol, thymol and *p*-isoamylphenol may also be used and other higher fatty acids may be substituted for lauric acid. (3) 2-Hydroxy(or acetoxy)-mercuri-3-hydroxybenzaldehyde is dissolved in NaOH soln. or the Na salt is dissolved in H_2O and treated with caprylic acid to effect pptn. of 2-capryloxymercuri-3-hydroxybenzaldehyde.

Bismuth phosphatide compounds. CHEMISCH-PHARMAZEUTISCHE AKT.-GES. BAD-HOMBURG. *Brit.* 237,912, July 29, 1924. Bi compds. are caused to react upon phosphatides such as lecithin to obtain products adapted for treating syphilis. Lecithin may be used with Bi quinine iodide, Bi cholate, the Bi salt of 2-phenylquinoline-4-carboxylic acid and the Bi salt of trichlorobutyl malonate. The products may be mixed with oils and used for injection.

Medicine for treating arteriosclerosis. V. MLADJEVSKY. U. S. 1,579,828, April 6. Finely ground *Drosera* is subjected to extrn. with a soln. of Na silicate, while avoiding pptn. of SiO_2 , and the soln. is inspissated *in vacuo* to a concn. at which the SiO_2 only just remains in soln. The product contains the *Drosera* enzymes in active condition.

Heart-affecting glucoside from bulbus scillae. E. SUTER. U. S. 1,579,338, April 6. An aq. ext. of squills is shaken with an immiscible org. solvent such as $CHCl_3$, mixed with MeOH in order to remove the glucoside from the ext. in the form of a compd. with natural tannin, the soln. is evapd. *in vacuo* to dryness at a low temp., the residue is dissolved with H_2O and an org. solvent such as MeOH and the glucoside is liberated by the addition of Pb subacetate or other tannin-pptg. agent. After filtering, the excess tannin-pptg. agent is pptd. and the sepd. soln. evapd. to dryness *in vacuo* at a low temp. and the glucoside in the residue is selectively dissolved by a solvent such as $CHCl_3$ contg. 5% MeOH.

Laxative choline compound. J. CALLSEN. U. S. 1,580,012, April 6. $AcOCH_2CH_2OCH_2CH_2NMe_2$, treated with MeBr in C_6H_6 gives the methobromide, a white cryst. powder, easily sol. in H_2O and alc., almost insol. in ether, m. 126-8°. It may be used subcutaneously as a laxative. Cf. *C. A.* **19**, 560.

Medicinal composition. G. L. COUSINEAU. U. S. 1,579,086, March 30. A liquid mixt. for hypodermic use comprises sol. and insol. portions of the whole parathyroid gland comminuted to a substantially impalpable condition and mixed with a physiological salt soln.

Killing microorganisms. W. RUPPEL. U. S. 1,577,659, March 23. Cultures for vaccine manuf. or other material contg. microorganisms is subjected to the action of an elec. current between diaphragms which sep. the electrodes from the material under treatment.

Acridinium compounds. I. BENDA AND O. SIEVERS. U. S. 1,577,415, March 16. Hydroxy-10-alkylacridinium compds. which are good antiseptics are prepd. by heating hydroxyacridines with alkylating agents in the absence of acid-binding substances. Cf. *C. A.* **20**, 95.

Composition for sterilizing toothbrushes, etc. V. J. M. THESER. U. S. 1,579,413, April 6. See *Brit.* 216,464 (*C. A.* **19**, 154).

Denicotinizing tobacco. H. W. SMITH. U. S. 1,577,768, March 23. Tobacco is treated with live steam at a temp. above 100° and under superatm. pressure and with NH_3 and then extd. with an org. solvent such as C_6H_6 .

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

The gypsum-sulfuric acid process of the Farbenfabriken vorm. Friedr. Bayer and Co. W. J. MÜLLER. *Z. angew. Chem.* 39, 169-74 (1926). — See C. 1 20, 970.

Catalytic ammonia oxidation. L. ANDRUSSOW. *Z. angew. Chem.* 39, 321-32 (1926).—A lab. study of the reaction between NH_3 and O_2 in air with Pt gauze as catalyst. An air mixt. contg. 8.3% NH_3 was passed through Pt gauze (3000 meshes per sq. cm., 0.04 mm. wire) set in a heated quartz tube. The temp. was measured with a thermocouple close to the Pt on the downstream side. The rate of flow of the gas mixture was varied within wide limits giving times of catalytic contact from 2×10^{-4} to 100×10^{-4} sec. Below 500° some free NH_3 escapes the catalyst. Above 600° the product is mainly NO , mere traces of NH_3 . Below 600° the yield of NO (less than 50%) is nearly independent of the time of contact. Above 600° the yield of NO at any fixed temp. increases rapidly as the contact time decreases. A yield above 90% is obtained only at temps. above 750° and time of contact less than 3×10^{-4} sec. The decomposition of NH_3 and NO , their interaction and other possible side reactions are discussed.

The chlorination of metals. P. S. BRALLIER. *Trans. Am. Electrochem. Soc.* 49, (preprint) (1926).— SiCl_4 is prepd. by passing Cl over a mixt. of 90% Si and SiC . The furnace consists of a steel or cast-Fe shell cooled by a H_2O spray and lined with C slabs. The condensers are flushed with cooled SiCl_4 liquid to prevent choking by FeCl_3 and AlCl_3 . TiCl_4 is prepd. similarly from titanium carbonitride contg. 70-75% Ti . SiCl_4 is immediately decomposed by H_2O but TiCl_4 can be dissolved under proper conditions. Sn reacts readily with Cl at 100° to 111° , but does not react when molten. When Sn is exposed to Cl gas, the exothermic reaction melts down the metal. The process adopted is to pass Cl into a bath of fused SnCl_4 in which Sn is submerged, a little S being added to the bath. SbCl_3 is prepd. by exposing metallic Sb to Cl in a chamber cooled by H_2O . ZnCl_2 is produced by passing Cl into molten Zn at 500° , the chloride floating on the surface and being tapped off. This is a bluish gray product which contains ZnO and finely divided Zn . It can be purified by distn., giving a white product.

Chemistry of bleaching powder. SHUTCHIRO OCHI. *Trans. Am. Electrochem. Soc.* 49, (preprint) (1926).—The principal constituent of bleaching powder has a crystal form, although an amorphous variety may be present in some of the product. Its constitutional formula is probably $\text{Ca}(\text{OCl})\text{Cl} \cdot \text{H}_2\text{O}$. This is proved by microscopic researches, by the measurement of the heat of soln., and by the heat of hydration and the aq. vapor tension of the crystal. The heat of soln. of crystd. $\text{Ca}(\text{OCl})\text{Cl} \cdot \text{H}_2\text{O}$ is 7530 cal., that of $\text{Ca}(\text{OCl})\text{Cl} \cdot 9830$ cal. The heat of hydration is, therefore, 2300 cal. The aq. vapor tension of crystals of bleaching powder at 30° , 20° and 10° , is 7.99 mm., 3.93 mm. and 1.80 mm., resp. The mechanism of bleaching powder formation is considered to be: at first an amorphous mass of mixed Ca salts of HCl and HClO and water is formed, then crystals of $\text{Ca}(\text{OCl})\text{Cl} \cdot \text{H}_2\text{O}$ sep. out. When the chlorination is carried out at higher temp. and quickly finished by cooling, the product is chiefly of the amorphous nature, while slow chlorination at lower temp. favors the formation of the crystal variety. Presence of an excess of water retards the crystal development of the crystal variety. The amorphous variety has less stability and is more easily decomposable by CO_2 than the crystal variety. From the reaction between H_2O and bleaching powder, the heat of formation of $\text{Ca}(\text{OCl})\text{Cl} \cdot \text{H}_2\text{O}$ are exothermic, while the Cl -forming decompos. are endothermic reactions. The heat of formation of $\text{Ca}(\text{OCl})\text{Cl} \cdot \text{H}_2\text{O}$ from slaked lime and Cl is calcd. to be +12,120 cal. The equl. pressures of O and Cl over $\text{Ca}(\text{OCl})\text{Cl} \cdot \text{H}_2\text{O}$ are computed by applying Nernst's heat theorem.

Optimum temperature and time conditions for the preparation of sodium sulfide by fusing sodium sulfate with coal. Recovery of sodium thiosulfate as a by-product. M. MINAIKOV. *Mitt. Wiss.-techn. Arbeiten Republ. (Russ.)* 13, 90-6 (1924).—Best yields of Na_2S were obtained by the use of 1 pt. of coal to 4 pts. of Na_2SO_4 , a furnace temp. of $700\text{--}800^{\circ}$, and a time of treatment of 45 min. Longer heating rapidly

reduces the yield. If wood charcoal, with its lower ash content, is used, the temp. should be 800-900°. The disappearance of the flame, which develops 5-6 min. after the crucible is placed in the furnace, is evidence that the reaction is complete. The melt should be porous and pink in color with greenish specks. After lixiviation of the melt and sepn. of cryst. Na_2S , SO_2 may be passed into the mother liquor, when reasonably pure $\text{Na}_2\text{S}_2\text{O}_3$ is obtained. B. C. A.

The active carbons of Edouard Urbain. H. CHAUMAT. *La nature* 54, i, 149-55 (1926).—A description with diagrams and illustrations of the manuf. of active C, and its properties and com. uses. C. C. DAVIS

Preparation of an ash-free wood charcoal. L. H. REYERSON. *Ind. Eng. Chem.* 17, 1114(1925); 18, 213(1926).—Coconut shells cleaned superficially, broken up and extd. in a Soxhlet app. for 48 hrs. with Et_2O , and similar lengths of time with EtOH and H_2O , then dried and coked as usual, showed an ash content of 0.4% (chiefly SiO_2), and gave an aq. ext. practically neutral. W. C. EBAUGH

Methods of revivifying inorganic decolorizing powders. LEOPOLD SINGER. *Chem.-Ztg.* 50, 4-5, 57-8, 64-5, 74-6(1926); cf. C. A. 15, 311, 1212; 18, 887, 2062, 2446, 2802, 2958, 3270; 19, 2, 157, 394, 726, 878, 1760, 1970, 2393, 3372.—A collective review of the work carried out to revivify decolorizing carbons, fuller's earth, silica gel, etc., referring to foreign and U. S. patents. The Brockway roasting app. for fuller's earth (U. S. 978,625) is described. S. points out that much work is yet to be done in this field and contributes the present review as a basis for future work. D. THURSEN

Bleaching action of fuller's earth. O. ECKART. *Seifensieder-Ztg.* 53, 154-5, 169-70, 187-8(1926).—The differences in the bleaching quality of Bavarian earths lie principally in the degree of their purification. Small amts. of acidity increase their activity but large amts. hinder it. The max. bleaching effect is generally obtained in 10-30 min.; it is a purely physical phenomenon, because the first percents of earth are much more effective than the later ones and because some of the color can often be removed from the oil by anhyd. alc. The reason why absorbed coloring matters cannot be completely removed by solvents from spent earth is their change in size upon the earth. A chem. action may occur as a secondary effect when deposited impurities may react with the small amts. of FeCl_3 or AlCl_3 , thereby blackening the earth. Activated earths can remove acidity, especially from mineral oils. In the manuf. of activated neutral earths CaCO_3 is added. In storage this reacts with the chlorides or sulfates of Fe and Al, forming hydroxides, which cover the active surface of the earth, decreasing activity and thus give rise to the observed phenomenon of "aging"; properly washed earths do not show such aging. The activity cannot be due to electrically charged particles, since there are always some electrolytes present which by absorption of H_2O from the air would soon cause a discharge of these particles. P. ESCHER

Increasing the internal volume of silica gels by moist heat treatment. H. N. HOLMES, R. W. SULLIVAN AND N. W. METCALF. *Ind. Eng. Chem.* 18, 386-8(1926).—"A method is described for greatly increasing the adsorptive capacity of gels by checking the initial slow drying at a water content of approx. 60%, allowing the partly dried gels to synerize for a week or two in closed vessels and then boiling a few hours in dil. acid before washing and final drying. The method is general, but is applied particularly to the gelatinous ppt. obtained by addn. of FeCl_3 soln. to water-glass soln. In this case the boiling acid removes the Fe_2O_3 , leaving somewhat hydrated SiO_2 as a white, highly porous gel." F. L. BROWNE

The future demand for bromine. C. R. DELONG. *Ind. Eng. Chem.* 18, 425-8 (1926).—Statistics for the production of Br during 1900-1925 showed a marked increase in demand in 1924, probably due to the anticipated use in making "lead tetraethyl gasoline." As the du Pont Company shifted its process from EtBr to EtCl it is likely that hereafter Br will be used only in $\text{C}_2\text{H}_5\text{Br}$, etc., as carriers. Of a potential demand of 9,000,000 lbs. in the U. S. A. (about 3 times the max. consumption in 1924), 5,000,000 lbs. could be supplied from Saginaw Valley, Mich. Recovery from sea water offers the greatest immediate possibilities; about 1800 gal. of sea water yields a pound of Br. Other sources of Br are brines at Pomeroy, Ohio, and Kanawha, W. Va.; solar evapn. of sea water at San Diego Bay, Cal., and brines of the west. In Germany 40,000,000 lbs. of Br could be obtained annually from potash operations at Stassfurt—about ten times the max. heretofore produced. France and her colonies, the Dead Sea and other saline deposits swell the potential resources. No shortage of Br is feared, even in view of increased demands by reason of prospective consumption of "leaded gasoline." W. C. EBAUGH

Production and consumption of sulfur. B. SEGERFELT. *Svensk Pappers-Tid.* 28, 505-7(1925).—The occurrence of S in Japan is compared with the world's needs.

Japanese localities are listed; prices, export points and freight rates are given.

Sodium and its use. P. HOLMSEN. *Teknisk Ukeblad* 1923, 452-3, *J. Inst. Metals* 33, 501-2.—A short account of the world's production of Na and the phys. and chem. properties of this metal. Only the electrochem. methods of manuf. are said to be of any importance. Most of the Na is used in the manuf. of NaCN for extg. Au from its ores. Other important uses are in the manuf. of peroxide for bleaching purposes and for disinfection and as metal or amide in the dye industry. As a reducing element Na is used in the manuf. of some uncommon elements, such as Ta and B. During the war Na was to some extent used for bearing metals.

Cobalt and its recent applications. L. GUILLET. *Rass. min. met. chim.* 64, 33 G (1926).

Silica in 1924. F. J. KATZ. Bur. of Mines, *Mineral Resources of U. S.*, 1924, Part II, 183-6 (preprint No. 16, published Mar. 19, 1926).

Gypsum in 1924. K. W. COTTRELL. Bur. of Mines, *Mineral Resources of U. S.*, 1924, Part II, 231-40 (preprint No. 19, published Mar. 27, 1926).

Antimony in 1924. F. C. SCHRADER. Bur. of Mines, *Mineral Resources of U. S.*, 1924, Part I, 105-18 (preprint No. 10, published Mar. 13, 1926).

Modern production of imitation pearls. G. DUROCHER. *La nature* 54, 1, 161 G (1926).—An illustrated description, including the chemistry involved.

Annual review for 1925 of progress in the manufacture of plastic materials with casein as a base. O. MEIER. *Caoutchouc & gutta-percha* 23, 13062 3 (1926).—Chiefly patents.

Washing and sizing sand and gravel. EDMUND SHAW. *Trans. Am. Inst. Mining Met. Eng.* 1926, No. 1528-H, 10 pp.—A review, mentioning the impurities to be washed out, a standard washing method, and means of detg. the water required for washing by decantation. Special washing methods for removal of liquid and shale, film, clay, trash, etc., are outlined. The sand and gravel market is demanding more and more from the producers in the no. of sizes and the efficiency of screening.

HERMANN, C.: *Einführung in die Kaliindustrie.* Halle W. Knapp 136 pp. R. M. 5.70.

Distilling persulfuric acid and solutions of persulfates. G. BAUM. U. S. 1,577,201, March 16. The liquid is directly heated by a c., the alternations of which are lower than 500 per sec.

Stabilizing liquid hydrocyanic acid. G. H. BUCHANAN. U. S. 1,577,057, March 16. A small proportion of CNCl or other halogen compd. is added.

Nitrogen peroxide. Soc. D'ETUDES MINIERES & INDUSTRIELLES. Brit. 237,762, Sept. 18, 1924. In prepg. NO₂ by interaction of NH₃ and O in the presence of rhodium black as described in Brit. 133,041 (C. A. 14, 325), the O is replaced by air or oxygenated air and the rate at which the mixt. is passed over the catalyst is slower than that when O alone is used.

Ammonia from gases containing hydrogen cyanide. B. F. HALVORSEN. U. S. 1,580,038, April 6. A gas mixt. contg. H and HCN is mixed with O and the mixt. is passed at an elevated temp. over a suitable catalyst to produce NH₃. A temp. of about 400° may be employed when Fe and Cr oxides are used as catalyst.

Ammonia synthesis. G. CLAUDE. U. S. 1,579,647, April 6. In direct NH₃ synthesis, H and N are caused to react within a chamber and the heat generated by the reaction is eliminated while the metallic pressure-resisting wall is maintained at a uniform temp. The entering gases surround the reaction chamber contg. the catalyst. Cf. C. A. 19, 2729.

Zinc oxide. W. T. GIDDEN and W. G. RAGG. U. S. 1,579,302, April 6. See Brit. 228,244 (C. A. 19, 2866).

Sodium chloride from saline liquors. A. W. GAUGER and H. H. STORCH. U. S. 1,576,739, March 16. Saline liquors such as alkali lake brines are evapd. so that NaCl and other salts are crystd. out, the crystals are sepd. from the concd. liquor, ground to finely divided form and washed with original liquor.

Purifying sea salt, etc., in stages by washing with water or brine. NAAMLOOZE VENNOOTSCHAP MATECHU MAATSCHAPPIJ TOT EXPLOITATIE VAN CHEMISCHE UITVINDINGEN. Brit. 237,867, Aug. 2, 1924. Mech. features.

Aluminum chloride. A. M. McAFEE. U. S. 1,578,052, March 23. A mixt. comprising C and oxidized Al compds. such as bauxite is treated with Cl and the period of induction in the production of AlCl₃ is shortened by first contacting with the solid

materials a mixt. of Cl and returned gases from AlCl_3 condensers or other gas contg. an oxide of C and then continuing the operation with a gas contg. a greater proportion of Cl. Cf. C. A. 19, 2730.

Rochelle salt crystals. A. M. NICOLSON. U. S. 1,578,677, March 30. In prepg. a mother liquor from which to grow hour-glass crystals of Rochelle salt, the salt is dissolved in H_2O to secure complete equil. between the solvent and the solute, the soln. is maintained at all times at a temp. not exceeding 40° and at a d. of 1.37-1.38 ($38^\circ/50^\circ$).

Alkali metal sulfides. G. DE BETHUNE and R. VAHRENKAMPF. U. S. 1,578,718, March 30. An atm. of H_2S from an external source is used for effecting double decompn. of compds. of alkali metals such as NaNO_3 and of Ba sulfide to form a sulfhydrate.

Insoluble alkaline earth arsenates. D. LOPEZ. U. S. 1,578,150, March 23. A mixt. of As_2O_3 and $\text{Ca}(\text{OH})_2$ or other alk. earth hydroxide in warm H_2O is treated with Cl. At least 5% of the hydroxide is used in freshly pptd. form. Cf. C. A. 19, 2730.

Hydrogen separation by partial liquefaction of gas mixtures. G. CLAUDE. U. S. 1,579,348, April 6. A heat-exchange system is specified for obtaining H from its mixts. with N, CO and CH_4 . Cf. C. A. 19, 167.

Removing traces of chlorine from air or other gases. L. ROSENSTEIN. U. S. 1,578,850, March 30. The air or other gas to be treated is passed over scrap Fe wet with a soln. of FeCl_2 .

Carbon disulfide. E. LEGELER. Brit. 237,716, July 11, 1924. S is separately evapd. and superheated and led to a reaction chamber in which C is maintained at reaction temp.

Ozone. A. STARKE and H. VON WARTENBERG. U. S. 1,579,162, March 30. Air to be ozonized is passed between electrodes and subjected to a. c. in the form of undamped oscillations of a periodicity of 1000 to 100,000 periods per sec.

Carbon black. O. G. MESSENGER. U. S. 1,577,481, March 23. A gasiform hydrocarbon material such as natural gas is reacted on with a successive series of small regulable portions of O and the residue of C black thus formed is recovered.

Graphite. V. M. WEAVER. U. S. 1,576,883, March 16. Lime is heated with carbonaceous material such as petroleum coke to form a fluid carbide and the heating is continued until the carbonaceous material has been transformed into graphite and the Ca volatilized.

Porous catalytic gels. W. A. PATRICK. U. S. 1,577,186, March 16. Solns. of FeCl_3 or other readily hydrolyzable salts of a heavy metal are mixed with a substance such as a sol. silicate which will react with the acid resulting from hydrolysis of the salt to produce a colloidal soln. that will set to a hydrogel without the removal of the excess acid or salt. U. S. 1,577,187 specifies forming a hydrogel capable of being converted into material having pores of such size that the H_2O content at 30° in equil. with H_2O vapor at substantially 22 mm. of Hg will be at least 21% of its wt. and treating this hydrogel with a dil. soln. of alkali such as NaOH to form a catalytic material. U. S. 1,577,188 specifies a similar catalyst.

Gels for catalytic and adsorbent purposes. W. A. PATRICK. U. S. 1,577,189, March 16. A hard glassy material of substantially the same porous structure as silica gel comprises SiO_2 and oxides of Fe, Cu or other metals. U. S. 1,577,190 specifies making products of this character by mixing solns. of salts of Ni or other metal salts, acid and substances such as silicate solns. which will react with the acid to form a colloidal soln., in such concns. and proportions that neither gelatinization nor pptn. occurs immediately but after some time the entire mixt. hardens into a hydrogel and the latter is then treated to form a hard porous gel.

Resinous cement. L. E. FROST. U. S. 1,576,737, March 16. A cement which has high insulating properties is prepd. by dissolving manila gum or a similar gum resin in H_2O -free C_6H_6 and using this soln. with a solid phenolic condensation product and an inert filler such as SiO_2 .

Molding resinous compositions. C. ELLIS. U. S. 1,579,195, March 30. Resins such as those prepd. by heating tar acids with formaldehyde and MgO and of the type ordinarily hardened by $(\text{CH}_2)_6\text{N}_4$ in the hot press are treated with a regulated proportion of $(\text{CH}_2)_6\text{N}_4$ (usually about 10%) to cause subsequent setting during the molding operation without excessively rapid hardening, so that molded articles of good finish and sharp impressions are obtained.

Articles from phenol-formaldehyde condensation products. W. HUNTER and J. G. FAIRGRIEVE. U. S. 1,579,112, March 30. See Can. 245,651 (C. A. 19, 710).

Phonograph records. V. H. EMERSON. U. S. 1,576,582, March 16. Record tablets are formed of an interior body comprizing silica clay and resin, faced with a thermoplastic sound record material. Cf. C. A. 19, 878.

Waterproofing solution. R. M. MEAKES and G. F. WILLIAMS. U. S. 1,579,725, April 6. A compn. for waterproofing canvas, wood, etc., comprises Irish moss 8 oz., "caustic soap" 6 oz., glue 6 oz., H_2O 1 gal. and linseed oil 1 qt.

Waterproofing composition. C. D. SHAFFER. U. S. 1,579,493, April 6. A compn. for waterproofing leather, canvas or other materials is prepd. by heating and dissolving colophony in gasoline, dilg. and cooling with additional gasoline, and further mixing with a soln. of paraffin in gasoline and with rubber cement.

Material for fireproofing iron, wood, etc. K. SAMSON. Brit. 237,804, Jan. 15, 1925. A compn. for molding or for application in plastic form as a coating material is made by mixing fine wood meal with talc contg. not more than 5% lime, allowing the mixt. to stand for a time, then adding magnesite contg. not more than 2% lime, and moistening with $MgCl_2$ soln.

Synthetic emeralds. J. F. RIERA. U. S. 1,579,033, March 30. A fusion product is formed from a mixt. of SiO_2 , tinted with green or greenish coloring material, with hydrated or anhydrous BeO and with Al_2O_3 and substances such as Li_2CO_3 , H_3BO_3 and Na borate which act as fluxes. The fused mass is subsequently broken into fragments and these are heated to soften them and are molded while softened.

Treating China wood oil. A. G. SCHURICH and G. T. WRIGHT. U. S. 1,577,426, March 16. A product which is suitable for use as a binder with cork, etc., is prepd. by heating China wood oil to form a jelly and then quenching with cold H_2O .

"Composition cork." A. FISCHER. U. S. 1,577,061, March 16. Cork, linseed oil and S are combined with a binder composed of a glue mixt. contg. $(CH_2)_6N_4$.

Clutch facing material. S. SIMPSON. U. S. 1,578,928, March 30. Unwoven asbestos fibers are impregnated with about 10-20% of an asphaltic binder and associated material such as a flux oil and cured to give strength and hardness to the material. U. S. 1,578,929 specifies use of a hardening binder such as linseed oil or other drying oil.

Printer's blanket with a nitrocellulose back and a rubber face. R. JOHN. U. S. 1,578,736, March 30.

Transfer film. C. P. OLSON. U. S. 1,578,203, March 23. A film adapted for hot embossing comprises a ribbon-like strip of "glassine" paper or other flexible material, a layer on this strip consisting of Chinese insect wax and varnish and a coating of metallic powder.

Transfer sheet. C. CAMPBELL. U. S. 1,578,952, March 30. A textile fabric is coated on one side with paper fibers forming an absorbent and adherent coating held only by adherence of the fibers to the fabric. The paper fibers are impregnated with a transfer pigment.

Detergent. C. J. WAGNER. U. S. 1,578,487, March 30. A mixt. for cleaning clothes comprises Na_2CO_3 6, S. 2, turpentine 1 and bluing 1 part.

Detergent paste. A. L. GACOND. U. S. 1,579,698, April 6. A pasty mixt. for cleaning metal ware, etc., comprises H_2O 1 gal., soap 2 lbs., creolin $\frac{1}{2}$ oz. and "household NH_3 " 2 oz.

Mixture for cleaning and polishing metals. B. L. CLUTIER. U. S. 1,579,435, April 6. Hard SiO_2 25, petrolatum 30 and stearic acid 15 parts.

Composition for removing stains. A. E. MOORE. U. S. 1,576,985, March 16. A compn. for removing vegetable juice stains and the like from the hands, etc., comprises citric acid 40-50, pumice stone 40-50 and cuttle-fish bone 5-15% all in powdered form.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Comparative study of laboratory chemical glassware made in France, England, Germany and Austria. P. NICOLARDOT. *Le Verre* 5, 49-53, 73-6, 97-104 (1925).—A résumé of work done in 1916 on Erlenmeyer flasks of 500-cc. capacity. The proportion of CaO is small in the highly resistant glasses, whereas the Al_2O_3 content is apparently high in these glasses. Those contg. the highest and lowest silica mol. ratio are among the most resistant glasses. The most resistant glasses contain B_2O_3 , but the best of them do not contain high B_2O_3 . In all and Al_2O_3 in fair quantities, but the best of them do not contain high B_2O_3 . The glasses cases it seems preferable to replace part of the Na_2O by ZnO or by MgO . The glasses of lowest chem. resistance, some of which contain B_2O_3 , contain no Al_2O_3 ; they are also rich in CaO and K_2O , poor in MgO and contain no ZnO . It would appear that high

CaO glasses are the least resistant and that the K_2O glasses are less resistant than the Na_2O glasses. From the relative proportions of bases and alkalis (to the other constituents) it is not possible to predict the resistance of a glass. LOUIS NAVIAS

Ceramics in the service of industry and economics. FRITZ SPITZER. *Z. angew. Chem.* 36, 287-90(1926). E. H.

The plasticity of clays and kaolins. PFEFFERKORN. *Sprechsaal* 58, 183(1925); *J. Soc. Glass Tech.* (Abstracts) 9, 151; cf. *Sprechsaal* 57, 297(1924); *C. A.* 18, 3692.—In expts. on a series of 5 German clays, P. had found that oxidation of the org. matter at 60–70° by treating finely ground clay with H_2O_2 did not alter the plasticity. No reduction of plasticity followed the extn. of org. matter by using org. solvents to remove org. matter from the clays. Ether extd. 0.2%, acetone-alc. (1:1) 0.2%, CS_2 0.4%, pyridine 2.4%. Further, when the ext. was added to a kaolin there was no appreciable increase in its plasticity. P. tested Keppeler's method of extg. the clay substance by means of dil. HCl. The clay which then passed a 200-sieve after being washed free from acid showed a much greater plasticity. When this more plastic material was wetted up, and poured on to a plaster slab, it set like ordinary clay, but pressure such as squeezing in the hand caused liquid to run away. This was perhaps due to a loosely combined mol. of H_2O and SiO_2 which formed during the action of the HCl. It was not possible to obtain the small particles of free SiO_2 by any method of pulverizing. CO_2 was also useless, and had no effect on Pilsen kaolin even at a temp. of 60–70°, and a pressure of 20 atms., over a period of 1½ months. H. G.

The plasticity of clay. ALEX VON BARANOFF. *Z. tech. Physik* 7, 76-84(1926).—A mathematical paper. B. J. C. VAN DER HOEFEN

Influence of alkalis, acids, and salts upon the plasticity of kaolin. M. JACOBY. *Keram. Rundschau* 32, 634(1924); *J. Soc. Glass Tech.* (Abstracts) 9, 150.—Plasticity numbers of washed Zettlitzer kaolin, Kodauer kaolin treated osmotically, washed Kemnitz and washed Schnaittenbach kaolin, according to Rosenow's formula and app., were detd., with the formula: plasticity no. = (water content × tensile strength) / (load necessary to cause tearing × time load applied) and the tearing tests carried out on cylinders of kaolin 30 mm. in diam. and 25 mm. long. The effect of the addn. of small quantities of various chemicals was measured. Alkalies (in the case measured, NaOH) acted on plastic kaolin in a manner similar to their action on kaolin slips, but in a somewhat diminished measure. Tannin and humic acid raised the plasticity, while raising the colloidal content of the mass. When a certain max. colloidal content was exceeded the effect was the reverse. HCl, AcOH and NaCl lowered the plasticity and the shrinkage on drying and the strength when dry. Analogous results were obtained for measurements on plasticity, drying shrinkage and dry strength, and it was thought that the latter 2 might give a measure of the former. It was also claimed that OH ions and colloids raised the plasticity to a certain limit, and H ions continuously lowered it. The plasticity numbers for the NaOH expt. were:

NaOH added %	Washed Zettlitzer	Osmosed Kodauer	Washed Kemnitz	Washed Schnaittenbach
0	141	111	102	55
0.1	169	119	117	58
0.2	188	142	145	62
0.3	54	101	78	85
0.4	72	124	64	102
0.5	52	147	61	124
0.6	86	203	145	54
0.7	194	211	173	70
0.8	135	103	149	106
0.9	112	110	134	98
1.0	82	120	166	79

H. G.

Production methods, especially froth flotation processes and electroosmotic purification of clay and kaolin. KUNO WOLF. *Metall u. Erz* 22, 474-80(1925).—A discussion of purification processes based upon differences in sp. gr., magnetic properties in the dry and liquid states, and oil flotation. C. G. KING

Some properties of clay-sillimanite mixtures. J. W. COBB AND H. S. HOULDSWORTH. *British Clayworker* 33, 274-6(1924); *J. Inst. Metals* 33, 564.—The effect of the addn. of sillimanite in varying proportions to Farnley fireclay on the drying and firing shrinkages, porosity, true and apparent sp. gr., refractoriness, reversible thermal expansion, and resistance to attack by Na_2O -CaO glass and by basic slag is investigated.

The presence of 50% of sillimanite or more leads to a pronounced increase in refractoriness; but though a mixt. contg. 90% sillimanite is very resistant to attack by glass and slag, mixts. contg. less than 70% do not seem to offer any advantage over fireclay alone in this respect.

Alleged sillimanite in ceramic products. W. EITEL, *Keram. Rundschau* **33**, 470(1924); *J. Soc. Glass Tech.* (Abstracts) **9**, 151.—E. discussed the methods and results obtained by Shepherd, Rankin and Wright (*C. A.* **5**, 1982) and by Bowen and Greig in their studies of the system $Al_2O_3-SiO_2$. In 1914 E. had produced an artificial agreeing more nearly with that of mullite. About 1% of $Fe_2O_3 + TiO_2$ in solid soln. gave the crystals a higher n . Mullite produced in ceramic products was generally almost Fe-free and so could be identified by its low n . R. G. Wyckoff had shown that natural sillimanite and the compd. $3Al_2O_3 \cdot 2SiO_2$ gave the same diagram when examined by X-rays, so nullifying the claim advanced by Shearer who obtained identical diagrams from sillimanite and porcelain. Sillimanite mixings and natural sillimanite were improved by an excess of Al_2O_3 or natural corundum. Certain insulators made of pure mixts. of Al_2O_3 and SiO_2 must have been burnt at temps. exceeding 1810°, since they contained both corundum and mullite, but a small quantity of foreign oxides considerably reduced the temp. of formation of corundum.

The physical properties of stoneware. FELIX SINGER, *Z. angew. Chem.* **35**, 290-2(1926).—Physical properties of 30 diff. samples of stoneware are tabulated.

Stoneware and chemical industry. A. BINZ, *Z. angew. Chem.* **36**, 285-92(1923).

Correct decolorizing. Dangers of over-decolorizing. L. SPRINGER, *Ceramic Industry* **6**, 522-3(1925).—Glasses low in alk. fluxes are easiest to decolorize. Iron will color in proportion to the amt. of alkali in the batch. The min. amt. of CaO is desirable. K glasses are always brighter and less colored than the corresponding Na glasses. Reducing gases give poor color. In decolorizing glass made from salt cake, the effect of the decolorizers is reduced when they are added directly to the salt cake batch. No attempt is made to decolorize glass in continuous tanks because a large part of the glass remains in the bottom of the glass tank. The best crystal glass can be made only in glass pots. For high-grade white glass, the Fe content of the sand should not be over 0.03%. The Fe content of the calspar should not exceed 0.1% for white glass.

Use of lignite gas in ceramic plants. ADOLPHE FABER, *Chaleur et industrie* **7**, 119-23(1926).—Description of the technique of the use of lignite producer gas for firing ceramic kilns in Germany, with a discussion of its advantages.

The true specific gravity and after-expansion of lime-bonded silica bricks. W. J. REES, *Trans. Ceram. Soc.* **24**, 66-9(1925).—In a study of 10 com. lime-bonded silica bricks it was found that a sufficiently close relation existed for practical purposes between the true sp. gr. and the degree or extent of quartz inversion. For bricks of fine to medium texture there is close relation between the true (powd.) sp. gr. and after-expansion as detd. by standard methods. For practical purposes the grading of the raw material is more important than variations in the source or type of the English raw material. For coarse material ($1/4$ in. and over) expansion and sp. gr. are not closely related owing to the slower inversion rate. After-expansion of from 0.0% to 2.60% was found. The chem. analyses of 40 bricks are given.

The addition of chromium oxide to silica bricks. S. SANDLUND, *Jernkontoretts Annaler* **109**, 358-72(1925); cf. *C. A.* **19**, 566.—Chromium oxide contg. 89.25% Cr_2O_3 was prepd. from $K_2Cr_2O_7$ and C in a lab. furnace. Silica bricks were made with addn. of 0, 2, 3 and 4% of this product, the 4 brick species being called, resp., S, CrS_2 , CrS_3 and CrS_4 . Analyses are given. The following table shows the physical properties of the bricks:

Quality	Temp. of beginning weakness	Sp. gr.	Weight in kg. per l.	Porosity
S	1650°	2.33	1.95	0.16
CrS_2	1615°	2.35	1.89	0.20
CrS_3	1630°	2.36	1.835	0.22
CrS_4	1620°	2.39	1.845	0.25

The resistance to slags was tried in a small elec. arc furnace, 3 types of slag being used, (1) and (2) being acid Martin slags contg., resp., 57.7, 15.91% SiO_2 ; 22.76, 33.37% FeO ; and 13.89, 15.59% MnO besides other minor constituents. (3) was a Bessemer

slag contg. 50.47% SiO_2 , 8.36% FeO , 35.74% MnO , etc. Analyses of the slags after smelting in different linings show that CrS_2 , CrS_3 and CrS_4 were nearly unattacked by all the 3 slags, no advantage being observed with the higher contents of Cr_2O_3 as compared with the 2% type. The S bricks were markedly attacked by slags (1) and (2) but not substantially by (3). The analytic observations were verified by microscopic examns. of the used bricks. C. A. ROBAK

Selecting refractories for use in metallurgical furnaces. E. R. THEWS. *Iron Trade Rev.* 78, 508-9, 638-40 (1926).—The following are the necessary characteristics for metallurgical refractories: high softening and melting temp. under normal load; high resistance against sudden and sharp changes in temp.; chem. inertness; least possible change in shape and vol. under all practical melting conditions; low heat cond.; high mechanical resistance; uniform compn.; ease of dressing brick in laying; accurate and uniform measurements; smooth and sharp-edged surfaces. The grain size of raw materials influences the properties of SiO_2 brick. The lack of resistance against temp. changes in magnesite brick necessitates careful treatment. J. F. B.

Refractories for high temperatures, especially for electric furnaces. D. W. BERLIN AND J. HARDÉN. *Jernkontorets Annaler* 1922, 186-7; *J. Inst. Metals* 33, 558. —A mixt. of fused magnesite crushed to 0.5 mm 75, Cr ore crushed to 0.5 mm. 20, magnesia alba 5% has proved to be an excellent refractory, especially in elec. furnaces used for the melting of metals. This refractory does not bring any C or other foreign matters into the bath. Definite conclusions cannot as yet be drawn as to its shrinkage and freedom from cracking on cooling. H. G.

Abrasives: their use in finishing of metals. W. S. BARROWS. *Can. Foundryman* 15, 26 (1924); *J. Inst. Metals* 33, 525. —The importance of running, polishing and grinding wheels at the correct speed is emphasized. Generally, a min. speed of 4000 surface ft. per minute is correct, but hard tough abrasives can be used at higher speeds than softer ones, because the latter quickly crush and glaze. SiC is not merely a grinding abrasive, but, in the finer grades, can be used for polishing. Corundum is superior to emery in that it does not cause the article that is being ground to rise in temp. so much as when emery is used. H. G.

Coagulation of clay (GALLAY) 2. Silicate analysis (SCHWARZ, SCHINZINGER) 7. Structure of kaolin (DOMINIKIEWICZ) 8.

SPRINGER, LUDWIG: *Die Fortschritte des Glastechnik in den letzten Jahrzehnten.* Braunschweig: F. Viewig & Sohn. 52 pp. R. M. 2 50.

Glass furnace. G. E. HENNING. U. S. 1,579,364, April 6. A bridgeless tank has an individual bridge wall in the flow spout.

Glass furnace with water-cooled bridge. R. GOOD. U. S. 1,579,353, April 6

Refining glass. W. O. AMSLER. U. S. 1,577,602, March 23. Mech. features

Leer for annealing sheet glass. W. G. KOUPAL. U. S. 1,576,516, March 16

Cutting plastic quartz. L. B. MILLER. U. S. 1,579,019, March 30. Mech. features

Ceramic material ("synthetic clay"). R. T. STULL. U. S. 1,576,558, March 16

A material for making light colored brick comprises a mixt. of natural highly colloidal secondary kaolin deficient in alkali and alk. earth fluxes, with a pegmatite.

Continuously operated kiln for burning and drying brick, etc. C. SMITH. U. S. 1,578,559, March 30

Face brick. S. M. DUTY. U. S. 1,578,409, March 30. Finely divided material such as ground shale is applied to the surface of wet molded bricks and subsequently burned into the surface.

Vitrified insulators. F. RICHARD. U. S. 1,579,032, March 30. A natural clay contg. about 56% SiO_2 , 20% Al_2O_3 , 8% Fe oxide, and alkalis is mixed with sufficient H_2O to form a plastic mass, molded, heated to about 480° and then further heated to a temp. not exceeding about 870° to effect vitrification.

Refractory material. O. H. ESCHHOLZ and P. G. GUEST. U. S. 1,576,732, March 16. "Arc splitters" or similar articles comprise a refractory base including SiO_2 and Na silicate in hydrous form as a binder, with a thin surface glaze of anhydrous Na silicate.

Refractory cement. W. F. ROCHOW. U. S. 1,576,550, March 16. A dry powdered cement compn. adapted for use in furnace walls comprises silica, fireclay, calcined silica and 5-20% of Na silicate.

Refractory chemical-resisting articles. S. J. LUBOWSKY. U. S. 1,578,900, March

30. Filter plates or cups or other articles are formed of crushed rutile, the particles of which are bound together to form a porous body by use of a temporary heat-destructible binder, which is destroyed in sintering the rutile particles together. Cf. C. A. 20, 650.

Refractory articles. A. J. JACKMAN. U. S. 1,577,124, March 16. Crucibles, saggars or other refractory articles are formed principally of graphite and a vitrifiable ceramic bond, burned prior to use at a temp. above the vitrification of the bonding material.

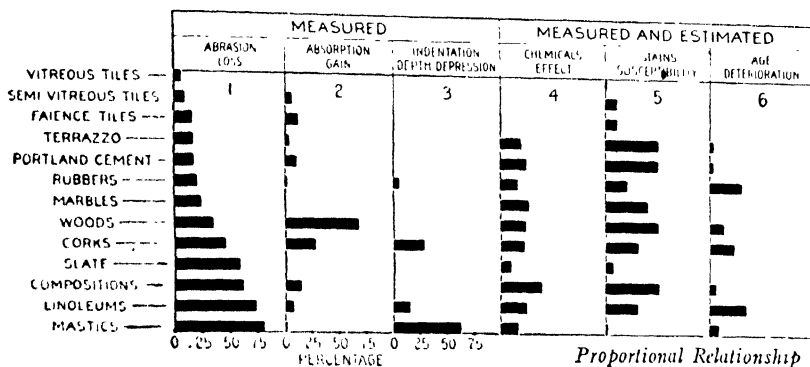
Enameling metal. W. J. BECK and J. A. ATTERLEE. U. S. 1,578,706, March 30. Metal for enameling is formed of open-hearth or similar mgot Fe refined to a stage where the Mn content is below 0.04% and degasification has taken place to the extent of leaving a substantially sound metal and not to the extent of removing all the oxide content, so that well-distributed spots of oxide are visible under the microscope in the surface and through the body of the metal.

Enameling the interior of pipes. W. LAMBERT and A. A. MILAD. U. S. 1,571,531, March 23. A hot pipe is rotated about a nozzle which is passed within the pipe to supply reducing gas and enamel.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Endurance of flooring materials. C. H. GEISTER. *J. Am. Ceram. Soc.* 9, 126-30 (1926).—The data are summarized in the following chart



C. H. KERR

A refractory hydraulic cement. J. ARNOULD. *Chimie et industrie* 15, 181-8 (1926). A mixt. of fused cement ("electric" or "aluminous" cement), MgO calcined at 1000° and water glass gives a good cement which stands up at fairly high temps., but which unfortunately sets too rapidly. A 1-2 mixt. of fused cement and of calcined (above 1070°) and ground bauxite constitutes a true hydraulic cement, which, on mixing with 22-30% H₂O, begins to set in 1 hr. and is completely set in 1-6 hrs. It hardens very rapidly, and after 3 days has a crushing strength of 115 kg. per cm.² and a tensile strength of 21 kg. per cm.². It can be made into concrete by using 1, 2 or 3 parts of broken up old refractory bricks (screened, or preferably washed, to remove dust) to 3 parts of cement, which is used and handled the same as ordinary portland cement concrete. Both the cement (fused cement bauxite mixt.) and the concrete after setting soften at 1350-1400° and m. at about 1600°. The cement has a crushing strength of 20 kg. up to 1200-50°, which drops to 2 kg. at 1300-50°, above this it becomes quite soft, but does not flow. The crushing strength curve at high temps. lies between the corresponding curves of bauxite and of carbundum. Both the cement and the concrete have a very small shrinkage, 1-1.5% at 1350°, and as low as 0.5% in some cases. They are remarkably resistant to sudden changes in temps. and do not crack on rapid cooling from 1380° to 20°. Strength tests on the cold cement after heating to various temps. showed a certain degree of friability (probably due to elimination of H₂O of constitution), which appeared at about 800° reached a max. at 1000°.

1200°, and disappeared at about 1300°. The friability decreases with the proportion of bauxite in the mixt. Friability in the concrete can be completely eliminated by heating once above 1250°. The addn. of broken refractory in the concrete decreases the shrinkage, increases the strength, prevents cracking of the concrete, and cheapens the product, but increases the friability. BeO gives the same results as Al_2O_3 , which confirms the place assigned to it in the table of elements, but is of no practical interest. Presence of up to 3% TiO_2 in the bauxite causes no trouble. Using an aluminous cement prepd. by clinkering instead of fusion raises the m. p. of the cement-bauxite mixt. by about 50°. The friability can be reduced, and even eliminated completely, by addn. of a little powdered flint or powdered Na silicate (of low alkyl. and consequently non-hygroscopic); but this lowers the m. and softening points. A. PAPINEAU-COUTURE

Reactions occurring during the burning of synthetic cement mixtures. W. DYCKERHOFF. *Zement* 14, 174-7(1925).—Mixts. consisting of 66% CaO, 24% SiO_2 and 10% Al_2O_3 are held for 20 min. at temps. up to 1500°, the products formed being examd. microscopically to det. the constituents of normal portland cement clinker. In following the heating curve of the batch there is a lag of about 200° around 910° during the expulsion of the CO_2 . At 1000° $\text{CaO} \cdot \text{SiO}_2$ forms and from 1100° to 1360° α -, β -, and γ -dicalcium silicate are formed, the loosely adhering powder being composed largely of γ - $2\text{CaO} \cdot \text{SiO}_2$ at the higher temp. No calcium aluminates appear to form below 1360°. At 1390° an exothermic reaction takes place which is the m. p. of the eutectic $5\text{CaO} \cdot 3\text{SiO}_2$ and $2\text{CaO} \cdot \text{SiO}_2$. On cooling, recrystn. of the constituents causes a break in the curve near 1350°. On quickly cooling a melt at temps. above 1390° $2\text{CaO} \cdot \text{SiO}_2$ crystals are found in a matrix of $5\text{CaO} \cdot 3\text{Al}_2\text{O}_3$. On slow cooling after being raised to 1500° these crystals were found— $2\text{CaO} \cdot \text{SiO}_2$ chiefly of the β -form with some of the γ - but no α -forms, isotropic crystals of index 1.710 which were taken to be $3\text{CaO} \cdot \text{Al}_2\text{O}_3$, others of index 1.608 assumed to be the stable form of $5\text{CaO} \cdot 3\text{Al}_2\text{O}_3$, and very few crystals of index 1.74 or CaO. No $8\text{CaO} \cdot 2\text{SiO}_2$, Al_2O_3 , $3\text{CaO} \cdot \text{SiO}_2$ or $\text{CaO} \cdot \text{SiO}_2$ were found, there being not enough time for the 2 former compds. to form. D. states that this reason prevents $3\text{CaO} \cdot \text{SiO}_2$ being formed in com. cement. The β - to γ -inversion of the $2\text{CaO} \cdot \text{SiO}_2$ throws out of solid soln. the CaO held and it can be seen as tiny crystals in with the γ -form. When the inversion had been carried to completion by long heating at 1450° there was found to be practically no set to the ground clinker even after 8 days. On quick cooling of a mix held at this temp. for 20 min. the set produced was equal to that of normal portland cement. From this it is concluded that the set is due chiefly to the β - $2\text{CaO} \cdot \text{SiO}_2$, this with the CaO dissolved being nearly $\frac{2}{3}$ of the whole. With SiO_2 -rich and Al_2O_3 -rich mixes the minerals produced were identical with those of a normal cement. To retain the dissolved CaO in the β - $2\text{CaO} \cdot \text{SiO}_2$ quick cooling of the sintered mass must occur. The effect of this constituent on the hardening of cement is compared to that of Fe_2C in steel. Portland cement clinker may then be considered an undercooled soln. of CaO in $2\text{CaO} \cdot \text{SiO}_2$. H. F. K.

The petrography of modern portland cement clinkers. CARL BIEHL. *Zement* 14, 379-82, 397-9(1925).—The compn. temp. of burning, and rate of cooling are factors affecting the quality of cement. These can be successfully studied by microscopic mineralogical methods since the kind and degree of crystn. are governed by these conditions, plus the influence of fluxes. The so-called alite is considered to be $2\text{CaO} \cdot \text{SiO}_2$ while belite and celite seem to be members of an isomorphous series whose chief variable constituent is Fe_2O_3 . Well-crystd. clinker results either from high temps. and the presence of fluxes or from quick cooling which prevents the complete crystn. of the minerals and retains in the mass latent energy which is liberated during the setting of the cement. Fifteen photomicrographs are included and discussed. H. F. K.

The hydration of aluminates rich in lime. KRISTO RADEFF. *Zement* 14, 177-82 (1925).—Melts varying in compn. from $\text{CaO} \cdot \text{Al}_2\text{O}_3$ to $4\text{CaO} \cdot \text{Al}_2\text{O}_3$ were prepd. from pure materials. Finely powd. samples were kept in an excess of satd. $\text{Ca}(\text{OH})_2$ soln. in sealed containers at 20° for 1-16 days under const. agitation. After filtering through a membrane in the absence of CO_2 an aliquot of the filtrate was run for CaO and Al_2O_3 . The compn. of the residue was calcd. from these data. The detns. were continued on sep. samples until no change was found in the compn. of the filtrate and equil. had been established. $\text{Ca}(\text{OH})_2$ was found to react with any kind of $\text{Al}(\text{OH})_3$, if shaken with it, but only freshly pptd. $\text{Al}(\text{OH})_3$ reacted quickly. Tricalcium hydroaluminate results from the hydration of $3\text{CaO} \cdot \text{Al}_2\text{O}_3$, it being also the end product of the hydration of $\text{CaO} \cdot \text{Al}_2\text{O}_3$ and $5\text{CaO} \cdot 3\text{Al}_2\text{O}_3$ in the presence of sufficient CaO. The melt of the compn. of $4\text{CaO} \cdot \text{Al}_2\text{O}_3$ lost CaO during hydration and its existence as a tetracalcium hydroaluminate is doubtful. The crystd. aluminate formed from $\text{Ca}(\text{OH})_2$ and $\text{Al}(\text{OH})_3$ approaches the compn. $1\text{CaO} \cdot 3\text{Al}_2\text{O}_3$. Amorphous masses of $\text{Al}(\text{OH})_3$ and $\text{Ca}(\text{OH})_2$

cannot exist together in set cement. Either of these can appear in an amorphous form only when the other constituent is deficient.

Absorption of moisture by portland cement during storage. V. BODT *Zement* **14**, 520-2(1925); *Chimie et industrie* **15**, 242(1926).—When the atm. relative humidity is 10-50% the absorbed H_2O reaches a max. of not over 1% in 25 days or less. With a relative humidity of 60% a max. absorption of about 2% H_2O is reached in 25 days. With higher humidities, the following absorption took place: at 70%, absorption of 5.8% in 143 days; at 80%, 18.2% in 189 days; at 90%, 22.0% in 85 days. When large masses of cement are stored absorption takes place only in the outside layer in contact with the atm.

Chemico-technical studies in bituminous road making. A. PAPINEAU COUTURE *Teer* **24**, 139-41(1926).—A brief explanatory discussion of pitch specifications.

W. B. PLUMMER

Steam treatment in kilns for preserving resinous lumber (U. S. pat. 1,577,014) **22**.
Cement from iron ores (Brit. pat. 237,779) **9**.

HARRIS, W. R.: Concrete Products, Their Manufacture and Use. Chicago: International Trade Press. 640 pp. Reviewed in *J. Western Society of Engineers* **31**, No. 1, 9(1926).

Coloring cement or other building materials. J. KOEBIG U. S. 1,577,729, March 23. The material is treated with a soln. of substances which react after being applied to form a H_2O -insol. coloring material, e. g., lake- or pigment-forming substances.

Plaster opaque to X-rays. P. E. HARTH U. S. 1,576,730, March 16. A wall covering is formed of a cemented mixt. of sand and a powder such as $BaSO_4$, both of which are opaque to X-rays, the proportion of the powder increasing toward the surface of the wall.

Slaking lime. C. E. HITE U. S. 1,579,766, April 6. Quicklime is slaked with a lime-S soln. to produce a plaster or mortar material of good strength.

Composition for mortar, etc. C. E. HITE U. S. 1,579,611, April 6. Hydrated lime is made into a plastic mass with a lime-S soln.

Cement mortar. W. KIRCHNER U. S. 1,578,139, March 23. Cement mortar is stirred with H_2O contg. protalbinic and lysalbinic acids, in order to increase the strength and impermeability of the product.

Building blocks. C. A. PERKINS and H. A. PERKINS U. S. 1,578,091, March 23. Blocks simulating natural stone have a facing of mixed granite dust, ground mica, black slag and white cement.

Paving and building blocks. G. B. STRYKER and F. A. MANTEL U. S. 1,578,481, March 30. Ground cotton stalks or other vegetable fiber 70-80, ashes 10-20 and a bituminous binder 10-20% are used together.

Ornamenting artificial stone. A. N. P. JACOBS U. S. 1,577,972, March 23. The material is impregnated with an insol. compd. of a heavy metal, e. g., with Pb oxide or white lead, and then imprinted and coated with a gum, e. g., dextrin, and with a soln. of H_2S .

Coating floors. J. F. NACHOD U. S. 1,579,729, April 6. A thin soln. of bitumen is applied to a floor as a priming coating, permitted to dry, and a thick soln. of bitumen is then applied. Coloring and stiffening materials may be admixed with the superficial coating.

Road composition from rock asphalt. W. P. BENTLEY U. S. reissue 16,301, March 30. See original pat. 1,529,829, C. A. **19**, 1625.

21 FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Analyses of Missouri coals. Mine samples. A. C. FIELDNER, H. M. COOPER AND F. D. OSGOOD *Bur. of Mines, Tech. Paper No. 366*, 8-33(1926) Delivered coal. N. H. SNYDER *Ibid.* **31**, 7.

Composition of durain. N. SIMPKIN. *J. Soc. Chem. Ind.* **45**, 76 ST(1926)—See C. A. **20**, 1312.

Coal in South Africa. W. M. T. HESLOP. *J. Chem. Soc. S. Afr.* **25**, 157-72 (1925).—Testing is very frequent in S. African collieries because of variation in quality.

Analyses are given of the coal mined from various areas and districts, as well as analyses of coal ash from the Natal district. H. also discusses mining conditions. H. C. P.

The investigation of coal and determination of its suitability for commercial low-temperature distillation. ERNST LÁSZLÓ. *Chem.-Ztg.* 50, 173-5(1926).—The ordinary coal analysis is not suitable for use in judging the value of coal for low-temp. distn., although it may be of value in high-temp. work. In high-temp. distn. the first step really gives low-temp. products, but these are subsequently changed into high-temp. products before they can escape from the retort. To get an adequate idea of the value of coal for low-temp. work the use of large pieces (not powder) in the sample, of a large sample, of an iron retort shaped like an inverted Erlenmeyer flask or an egg, and occasionally of means for heating in inert gas, are recommended, and a number of analytical procedures are outlined. W. C. EBAUGH

Operation and economics of powdered-coal firing. SCHULTZ. *Feuerungstechnik* 13, 111-2(1925).—Remarks on the performance of some German installations.

Determination of temperature of plasticity of coals. C. F. FOXWELL. *Ind. Eng. Chem.* 17, 1161(1926).—A critic of the work of Layng and Hathorne (C. A. 19, 884). W. C. EBAUGH

The fusibility of coal ash. A. C. FIELDNER AND W. A. SELVIG. *Fuel in Science & Practice* 5, 24-33(1926).—A review and discussion of work by the U. S. Bur. of Mines. Eleven references relating to the subject are included. C. C. DAVIS

Compressed metaldehyde or white coal. P. BRUÈRE. *Ann. f.uls.* 19, 70-3(1926).—Stabilization according to Fr. pat. 547,152, of Sept. 13, 1922 (Usines Electriques de la Lonza), consisting in elimination of paraldehyde by means of vacuum at 20-5° and neutralization of the catalyst by aq. Ba(OH)₂, Ag salts or colloidal substances, is very efficient: untreated metaldehyde (I) lost over 50% of its wt. in less than 2 hrs. and gave a positive test for sulfates, while the stabilized product showed practically no change in wt. in 1 yr. The fuel value of n g. of I is practically equiv. to that of 100 cc. of n% denatured alc. I burns with a slight odor of AcH and leaves no appreciable residue, while trioxymethylene leaves a slight yellowish gray residue and burns with an odor of CH₂O. According to Denigès (C. A. 20, 1043) I gives a blood-red color with guaiacol and H₂SO₄; under the same conditions trioxymethylene gives an intense violet, sucrose gives as strong a color as I, and lactose and starch give a rose color. A. PAPINEAU COUTURE

The determination of carbon in coal. J. G. KING AND D. MACDOUGALL. *Fuel in Science & Practice* 5, 33-5(1926).—Expts. were carried out to det. the best temp. and time of contact with CuO of the gases from the ordinary combustion method. The conditions used were those of the Sampling and Analysis Coal Committee of the Fuel Research Board (Phys. and Chem. Survey of the National Coal Resources, No. 2 *Interim Report on Methods of Analysis of Coal*) and a bituminous coal high in volatile with strong tendency to cake was chosen as that offering the greatest difficulty in detg. C. This method was found to be entirely satisfactory if 30 min. are allowed for heating the coal to 800°, if a temp. of 800° is maintained 50 min. to complete combustion and if the O is swept out with air for 30 min. The CuO layer need not be over 45 cm. long, but a min. length of 20 cm. in the center section should be maintained at 800°. Under these conditions, even with rapid heating, the loss of C is not over 0.015%. Below 800°, the amt. of C escaping is greater. At 700° and 650° results accurate to 0.3% can be obtained by careful manipulation, but there is a tendency for variations over 1% to occur. C. C. DAVIS

The microscopic structure of mineral coal. ANDRÉ DUPARQUE. *Compt. rend.* 182, 475-7(1926).—The examn. of different types of coal by the metallographic method indicated that they are composed of 2 microscopic components: (1) *substances of definite pattern and of vegetable origin* (lignified tissue, spores, algae, etc.) and (2) a *colloidal structureless paste or matrix*, the "fundamental substance" of secondary origin, i. e., subsequent to component (1). The 4 macroscopic components (fusain, durain, clarain and vitrain) are derived from the association or the sepn. of the first or second component. The fundamental substance, which was identified as vitrain, originated in 2 different ways: (1) by jellying of the substances of definite figure, evidence of which was seen in transition stages of the ligneous masses and spores to vitrain and in lenses of clarain or of vitrain in durain and (2) by pptn. of org. substances from water, the original substance having undergone total destruction. This latter process accounts for the fine bands of vitrain and of paste-like masses of clarain and of durain in bright coal. Animal organisms, complete or fragmentary, were not observed in vitrain and the 2 microscopic components of coal appear to be almost exclusively vegetable in

origin. Furthermore the volatile content of coals is inversely proportional to the development of the fundamental matrix. Bogheads, cannel-coals, bright coals and durain show different proportions of the fundamental matrix and different proportions and states of development of the spores, algae, etc., evidence indicating that the 3 types of coal are of different origin.

The initial decomposition of coal by heat. M. J. BURGESS AND R. V. WHEELER. *Fuel in Science & Practice* 5, 65-8 (1926) - Thermal decompn. *in vacuo* of Lancashire Silkstone coal already described (C. A. 8, 1865), the same app. and the same technic being used. The gases removed *in vacuo* up to 200° were chiefly paraffin hydrocarbons and appeared to be occluded, but the character of the gases evolved between 270° and 300° indicated that they were decompn. products of the coal substance. Simultaneously with the appearance of these gaseous decompn. products which were chiefly CO and CO₂, traces of a reddish brown oil were distd. at about 280°. This latter temp. was considered as the initial temp. of decompn. of the particular Lancashire coking coal, which was essentially clarain.

Recent developments in fuel technology. R. WIGGINTON. *Fuel in Science & Practice* 5, 1-5, 45-7, 89-91 (1926); cf. C. A. 20, 101 - Short reviews in abstract form.

Powdered fuel. W. LULOFS. *Combustion* 14, 40-3 (1926) - A system of burning powdered fuel in conjunction with mechanical stokers is described. This combination is effected by inserting a number of small burners of powdered fuel at the rear of the stoker in such a manner that a row of small flames from these burners is directed almost parallel to the mechanical grate but pointing slightly toward it. This results in increased efficiency due to better contact of the excess air with the combustible material and utilization of the excess air for completing the combustion of the powdered fuel, increased evapn. due to higher temp. in the combustion chamber, and increased adaptability for a varying load due to instantaneous adjustment by regulating the supply of powdered fuel. A general discussion of powdered fuel and of the central vs. the unit system is given.

Fuels for high-compression engines. S. W. SPARROW. *Oil & Gas J.* 34, No. 34, 118, 120, 122, 181-90 (1926) - Contains a bibliography. Preignition and detonation are the most important phenomena of a motor fuel. Calorific value, explosive range, distn. range, latent heat of evapn., l. p., viscosity, corrosiveness, sp. gr., chemical compn. and rate of flame propagation are the important properties affecting the value of a fuel. Ethyl alc. is adapted for use with higher-compression ratios than gasoline. Kerosene is rendered anti-detonating by the addition of xylidene with the absence of alc. Data are given.

Ash from powdered fuel installations. J. T. DIXON. *J. Soc. Chem. Ind.* 45, 60-1T (1926).—Size analyses are given for various samples which settled out at points within various plants (in stack flues, Cottrell precipitator, etc.), for 3 such samples from 3 American plants, size data are 48-58% < 0.01 mm. diam., 18-22% 0.01-0.02 mm., 11-16% 0.02-0.03 mm., 10-12% 0.03-0.06 mm., 1-4 3.2%, 0.06-0.1 mm., 0.1-0.5% 0.1 mm. Significant samples of material, which have been carried out of the stack and deposited, cannot be readily obtained.

Fuel briquets in 1924. W. F. MCKENNEY. *Bur. Mines, Mineral Resources of U. S.*, 1924, Part II, 187-92 (preprint No. 17, published Mar. 20, 1926).

The estimation of unburned carbon from the analysis of flue gases. W. R. CHAPMAN. *Fuel in Science & Practice* 5, 128-9 (1926) - The idea that a flue gas analysis cannot yield information on the quantity of unconsumed C lost during combustion on an industrial scale, as maintained by Kreisinger (C. A. 20, 274) and others, is fallacious. The loss of C can be calcd. from the compn. of the original coal, to which end the following formula is derived: $\text{unburned C} = 100 + 37.5\alpha - [1.5\alpha(1 + s + r) + (1140\beta + 42.8\delta - 142.5\gamma)] / [100 - 4.8r - 2.9s - 1.8t + 0.9u + 2.8v]$, where α is the % C, β the % H, γ the % O, δ the % N and ϵ the % S in the ash free, dry coal and r is the % CO₂, s the % CO, t the % O₂, u the % H₂ and v the % CH₄ in the flue gas. This formula is especially useful in the control of pulverized fuel, where large quantities of unconsumed coke particles may pass into the flue gases even when a large excess of air is used. In some cases a CO recorder would indicate a good combustion efficiency and a flue gas analysis also would indicate a better efficiency than that revealed by calcg. the unburned C according to the formula above. The latter is applicable to boilers and furnaces fired either by mech. stokers or by hand.

Flue gas injury of plants from the standpoint of metabolic pathology. KURT NOACK. *Z. angew. Chem.* 39, 302-1 (1926) - The real cause of the highly poisonous

action of H_2SO_4 for illuminated green plants is due to the fact that it stops C assimilation. Then the photo-oxidative energy of chlorophyll which normally finds an acceptor in the CO_2 lacks this acceptor and the protoplasm becomes the acceptor resulting in the death of the cell. SO_2 is hence only an intermediate agent in the killing.

H. R. KRAYBILL

Development tendencies of the German fuel economy. M. DOLCH. *Z. Elektrochem.* 32, 63-7 (1926).—The surplus coal, not necessary for direct energy production, will have to be considered as raw material for the manuf. of liquid fuel or products other than fuels; the energy market at the present time is overloaded. Processes important in this respect are: (1) low temp. carbonization with the object maximal tar production and (2) liquefaction of the coal (Bergius or B. A. S. process); the latter procedure promises best for the future.

B. J. C. VAN DER HOEVEN

Combustion control in explosion engines by analysis of the exhaust gases and by the use of combustion diagrams. BERNARD JOUSSET. *Chaleur et industrie* 7, 124-6 (1926).—A theoretical mathematical discussion of combustion of hydrocarbons with deficiency, excess and theoretical amt. of air, showing how the ratio of air to gasoline can be found from the CO_2 content of the exhaust gas, and indicating the manner of using the results in regulating the operation of explosion engines.

A. P.-C.

Adiabatic ignition of mixtures of hydrocarbons. ANDRE PIGNOT. *Compt. rend.* 182, 376-7 (1926).—The initial temp. necessary to ignite mixts. of air with $n\text{-C}_4\text{H}_{10}$, $n\text{-C}_5\text{H}_{12}$, $n\text{-C}_6\text{H}_{14}$, cyclohexane, PhH, PhMe, $m\text{-C}_6\text{H}_4\text{Me}_2$, 1,3,5- $\text{C}_6\text{H}_3\text{Me}_3$ and EtOH on a sudden fixed compression was measured. The method is proposed as of general value in testing fuels. Curves obtained are said to differ for aliphatic and aromatic compounds, to be affected by traces of more combustible materials and by concn. NH_3 , PhMe and CS_2 are without great effect. No data or curves are given in the article.

F. R. B.

Use of lower calorific value in calculating boiler efficiency. M. H. LEWIS. *Combustion* 14, 36-9 (1926).

J. F. BYRNE

The power alcohol problem. F. HARDY. *Trop. Agr.* (Trinidad) 2, 192 4 (1925).—A review.

A. L. MEHRING

Gasoline substitutes gain in Europe. L. M. FANNING. *Oil & Gas J.* 34, No. 34, 142, 150 (1926).—A general discussion of the synthetic-fuel situation. Berginization, methanol production, production of ethyl alc. from coal gas, low-temp. carbonization and synthol prepn. are discussed.

M. B. HART

Elimination of sulfur impurities from technical cresols and petroleum. G. I. STADNIKOV, N. M. GAVRILOV AND V. E. RAKOVSKII. *J. Chem. Ind.* (Moscow) 2, 315-9 (1925).—To eliminate the acidic S compds. the authors propose to use the reaction of condensation with aldehydes on the principle that the speed of condensation of thiocresols with aldehydes is much greater than that of cresols. The aldehydes used were a glucose soln. and a 40% aq. soln. of CH_2O . It is very important to maintain during the reaction an intimate contact between the aldehyde and the oil. As a condensing agent petroleum sulfonic acids (condensing agent of G. S. Petrov) were used as they have the advantage over H_2SO_4 of emulsifying the oil with the aq. solns. of the aldehydes. The sulfonic acids and the glucose soln. are mixed with an equal quantity of the oil and the mixt. is introduced in small portions into the bulk of the oil contained in a distg. flask provided with a stirrer and a condenser and immersed in an oil bath at 120° . Under these conditions the water introduced together with glucose or with formaldehyde is gradually distd. off and does not settle to the bottom. Then the oil is distd. off *in vacuo*, the temp. of the bath being not over 140° . Crude coal-tar cresol with a S content of 2.24% gave by the treatment with 1% sulfonic acids and glucose soln. to the amount of 3% a product contg. but 0.01% S and not darkening on keeping for several months. The presence of neutral oils in large quantities interferes with the removal of S substances of acid character, as the neutral oils do not emulsify with aldehyde solns and do not condense with aldehydes. As a rule, when cresols contain more than 10-15% of neutral oils S is not removable by this method.

BERNARD NELSON

Investigations on low-temperature carbonization at the Sarre mines. J. SAINTE CLAIRE DEVILLE. *Chimie et industrie* 15, 163-71 (1926); cf. *C. A.* 20, 101, 490.—The app. used for the investigations, consisting of a small Salerni retort having a capacity of about 100 kg. per half-day, and of a small exptl. distn. plant with two 15-ton per day Salerni retorts, is described in detail, and the general procedure of the tests on the various types of raw materials outlined. The economic feasibility of low-temp. carbonization is discussed, and D. concludes it is practical provided the raw material is of

Crude coal gas for recovering scrap copper and brass. CH. BERTHELOT. *Le gaz; Gas World* 83, 96(1925).—The wastefulness of melting scrap Cu and brass, the loss of Zn and heavy transport charges for electrolysis are pointed out. It is more economical to sell Cu and Zn as cryst. sulfates. CuSO_4 and ZnSO_4 cannot be sepd. by crystn. The Cu or brass is dissolved in H_2SO_4 and crude coal gas is passed through the soln. CuS is deposited and H_2SO_4 regenerated. $\text{CuSO}_4 + \text{H}_2\text{S} = \text{CuS} + \text{H}_2\text{SO}_4$. On exposure to air or an oxidizing agent CuS becomes CuSO_4 . $\text{CuS} + 2\text{O}_2 = \text{CuSO}_4$, which is washed out and crystd. The liquor contains ZnSO_4 and H_2SO_4 and is used again and the Zn crystallized out occasionally. A production of $3\frac{1}{2}$ million cu. ft. of gas per day would give 10 cwt. of S as H_2S which would ppt. 0.984 ton Cu and yield 3.889 tons $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. If brass contd. $\frac{1}{3}$ Cu and $\frac{1}{3}$ Zn, $1\frac{1}{2}$ tons brass could be handled per day, yielding 2.808 tons $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$. Costs are given in terms of francs.

A. E. GALLOWAY

Complete gasification of coal for firing boilers. C. H. S. TUPHOLME. *Chem. Met. Eng.* 33, 160–2(1926).—A brief description of the Wollaston, Mills, and Rincker gasification systems, particularly from the standpoint of the direct utilization of the gas under boilers.

W. B. PLUMMER

Resistance to the flow of gases in the fuel bed of a coke-fed furnace or a water-gas generator. M. W. TRAVERS. *J. Soc. Chem. Ind.* 45, 61–3T(1926).—Brief discussion and calcs. based on the data of the Bur. Mines, *Tech. Paper* 137 (C. A. 11, 1740) for blast volume versus blast pressure in a small furnace. Complex equations are presented relating certain of the variable and const. factors, and choking in the reaction zone is discussed.

W. B. PLUMMER

The corrosion and rusting of wrought iron and steel gas barrel. Report of the Wrought Iron Tubing Inquiry Committee. ANON. *Gas J.* (Supplement) 171, 3–13 (1925).—Appendix II. *Work by the South Metropolitan Gas Co.*—Samples of metal were immersed for definite periods of time in siphon liquor and in distd. water. Results show that the most desirable material is wrought iron of the very best quality without any admixt. of steel. Exposure in a stream of moist coal gas gave the same result. Some samples of material which had given poor service were found to be heterogeneous, a mixt. of wrought iron and steel. Appendix III. *Work carried out by the Gas Light and Coke Co.*—Tests carried out in a closed bottle system, using different electrolytes, different gas mixts., and subjecting the samples to complete immersion, to the action of a film of the electrolyte, and to the action of a current of the gas without and with water, gave results from which conclusions were drawn as follows: (1) CO_2 is not an essential agent for oxidation. Its presence to the extent of $2\frac{1}{2}\%$ in a wet gas contg 1% of O accelerates oxidation about 10%. (2) CO_2 slowly removes Fe in the form of a soln. of $\text{Fe}(\text{HCO}_3)_2$. (3) Liquid water is an essential agent of corrosion. Its effect is more marked when present in small than in large quantities. (4) None of the products of corrosion has a retarding effect upon further corrosion. (5) The relative rates of corrosion are: very pure iron, 100, wrought iron, 150, steel, 190. (6) $(\text{NH}_4)_2\text{SO}_4$ considerably accelerates the rate of oxidation. (7) The chief agencies of corrosion are: O, H_2O , and certain compds. of NH_3 . (8) Rust is formed even with wrought iron although slower than with steel. (9) The soln. of troubles from transported oxides is (a) to cover internal surfaces with protective coating, (b) to remove H_2O completely from the system, (c) and to limit the amt. of O in the finished gas.

A. E. GALLOWAY

Limits of inflammability, and the control of gas mixtures. L. CAUSSÉ. *Gas J.* 171, 394–5(1925).—This summary of C.'s observations is concerned with the control of water gas in gas mixts. by detg. the upper or lower limits of inflammability. A mathematical relation exists between the compn. of a gas mixt. in admixt. with air and the limit of inflammability of each of the constituent gases. If n_1, n_2, \dots, n_p are the proportions of the various gases G_1, G_2, \dots, G_p in the mixt. and N_1, N_2, \dots, N_p the respective upper or lower limits of inflammability of the individual gases when mixed separately with air, $n_1/N_1 + n_2/N_2 + \dots + n_p/N_p = 1$. In a mixt. of 2 gases if m is the proportion of the composite gas M in mixt. with air at the inflammability limit, and if the mixt. M contains x of the gas G and $(1-x)$ of the gas G_1 , then $(mx/N) + m(1-x)/N_1 = 1$ and $x = N(m - N_1)/(m(N - N_1))$. From the latter formula the compn. of the mixt. of 2 combustible gases may be calcd. Either the upper or lower limit may be used but the upper limit is preferable. The limits of inflammability of a mixt. of coal gas and water gas were: upper limit—coal gas 25 to 30%, water gas 70 to 75%; lower limit—coal gas 8 to 10%, water gas 12 to 15%. C. used and describes a modified form of the method of Mallard and Le Chatelier. The app. is a cylinder filled with gas to which is connected a graduated buret filled with air which is emptied by water displacement into the gas cylinder and there mixes with and displaces gas and gas-air

When the level of air in the buret has risen to the assumed limit of inflammability the air cock is closed and the combustion test made. If the result is negative the flame is extinguished and the buret water level raised a division at a time until the limit is reached. The vol. of air a is read from the buret and the limit of inflammability N calcd. by the formula $N = e^{-a}/V$, where V is the vol. of gas in the cylinder

The benzene plant. GG. ILLERT. *Chem.-Ztg.* **50**, 153-4 (1926). —A description of a C_6H_6 plant built by Hirzel (Leipzig-Plagwitz). Illustrated. A. E. GALLOWAY

The central gas producer battery of the Lichtenberg II gas works (Berlin). C. ARNEMANN. *Gas. u. Wasserfach* **69**, 204-9 (1926). —A detailed report of production and heat-balance tests. The battery consists of 5 Allgemeinen Vergasungsgesellschaft type producers gasifying brown coal briquets with low temp tar recovery. The av. total (5 producers) daily throughput was 95.4 metric tons of briquets contg. 11.7% H_2O and 10.5% ash with a heating value of 5215 kg. cal./kg., producing 1.94 cu m. of gas/kg. briquets, its higher heating value being 1866 kg. cal./cu m. (lower, 1744), other yields (% on briquets) being 11.4% of tar and 0.52% of light oil. The cold gas efficiency (higher heating value) was 69.4%, the overall thermal efficiency 86%. The av. gas compn. was CO_2 10.3, illuminants 0.4, O_2 0.3, CO 24.3, H_2 21.8, CH_4 1.1 and N_2 38.8%. Detailed descriptions of the plant are given; it may be noted that these producers are of the water-cooled shell type. W. C. EBAUGH

Guarantees for gas producers. F. PLENZ. *Gas u. Wasserfach* **69**, 210-1 (1926). A discussion of the methods of determining guaranteed performance. W. B. PLUMMER

Nomenclature of technical fuel gases. ANON. *Gas u. Wasserfach* **68**, 615-8 (1925); **69**, 220-1 (1926). W. B. PLUMMER

Influence of pressure upon amount and composition of natural gases. F. W. WOTZASEK. *Petroleum Z.* **17**, 1954 (1926).—Vacuum was applied to a gas well which was yielding only small amts. of natural gas. The specific gravity, and in consequence the content of higher homologs, increased with increasing vacuum. M. B. HART

Economic possibilities of re-processing low temperature tar. ALFRED FABER. *Teer* **24**, 99-103 (1926). Low temp tar not being as good a direct source for motor fuels and lubricants as has been the current (German) impression, various possible methods of processing are briefly discussed, such as cracking, hydrogenation (Bergius) of the tar, reduction of the phenols, conversion of the phenols to $PhNH_2$ and Ph_2NH by treatment with $ZnCl_2 \cdot NH_3 \cdot NH_4Cl$, etc. W. B. PLUMMER

The composition of coal tars. KARL B. EDWARDS AND E. S. R. WILLMORE. *J. Soc. Chem. Ind.* **45**, T51-6 (1926).—Analysis of tar, $d_{44}^{20} 1.272$, produced by high temp carbonization, gave the following results: neutral oils 46.6%, phenols 3.6%, bases 2.0%, CO_2H acids 0.026%, resins 0.9%, asphalt ($C_{10}H_8$ sol.) 17.0%, asphalt ($C_{10}H_6$ insol.) 12.4%, ulmins 15.1%, acid ulmins 0.7%, free C and ash 3.3%. T. S. C.

Lignite flaming coke. D. HUDLER. *Feuerungstechnik* **13**, 208-10, 220-2, 256-8 (1925).—After a discussion of the work of Seidenschur (C. A. **18**, 3706), H. calcs. the heating value of the gas and of the solid residue in 1 kg. of flaming coke. The gas forms so small a part of the total that the burning qualities of the flaming coke must be attributed to its better combustibility and lower water content. E. W. T.

American and French work on the combustibility of coke. L. KOREVAAR. *Fuel in Science & Practice* **5**, 92-7 (1926). —A review and discussion of the work of Sheridan and Kinney (C. A. **17**, 3666) and of Arend and Wagner (C. A. **19**, 721). Several defects are pointed out in the work of S. and K. and their conclusion that size is the only factor of importance in combustibility is unwarranted. It is also demonstrated that the method of A. and W. for estg. combustibility has the serious objections that it is impossible to est. combustibility at 1000° or over, and that it fails to detect differences between very combustible fuels. C. C. DAVIS

The reactivity of coke. J. P. AREND AND J. WAGNER. *Fuel in Science & Practice* **5**, 106-16 (1926). —English version of a previous article (cf. C. A. **19**, 721). C. C. D.

Sampling and examination of mine gases and natural gas (BURRELL, *et al.*) **7**. The ignition point of gases at different pressures (DIXON, HIGGINS) **24**. Chronic benzene poisoning (ROHNER, *et al.*) **13**. Combustion of gas in the blast furnace (LILOR) **9**. Electric dust precipitation in brown coal briquet factories (FISCHER) **4**. Utilization of the gas from Imhoff tanks in city mains (NERRETER) **14**. Colloid chemistry of humus and peat (OSRWALD, STREINER) **2**. Regulations proposed following the tetraethyl lead investigation (ANON.) **13**.

BUNBURG, H. M. AND DAVIDSON, A.: *The Industrial Applications of Coal Tar Products*. London: E. Benn Brothers. 296 pp. 42s.

HERZOG, RUDOLF: *Braunkohlenverwertung*. Leipzig: P. R  th. 12 pp. R. M. 18.

Flotation separation of coal and ash or similar materials. B. E. ELDRED and R. N. GRAHAM. U. S. 1,578,274, March 30.

Coal-like product from peat. O. LINKER. U. S. 1,580,058, April 6. A peat mass is finely disintegrated in the presence of added H_2O contg. an added salt such as $FeSO_4$ to assist filtration, subjected to preliminary filtration in a series of filtering cells, further filtered in a final series of filtering cells until the material becomes sufficiently hard for handling and then subjected to the action of steam substantially free from uncombined O.

Heating and mechanical treatment of lignite to form fuel briquets. E. FERNHOLTZ. U. S. 1,577,902, March 23.

Apparatus for handling and burning pulverized fuel. V. Z. CARACRISTI. U. S. 1,578,953-4, March 30.

Thermostatic control devices for liquid fuel burners of the wick type. L. S. CHADWICK, M. RESEK and J. A. DAHLSTROM. U. S. 1,576,718, March 16.

Fuel for internal-combustion engines. J. E. BABB. U. S. 1,579,801, April 6. An explosion-motor fuel such as gasoline is mixed with a gasoline-sol. resinous gum distn. product such as rosin oil and with PbO or other Pb oxide in order to permit increase of compression. U. S. 1,579,802 specifies a fuel composed of a distn. product of rosin and Pb oxide, the acids of the rosin being in excess of the quantity which the Pb present is capable of neutralizing. U. S. 1,579,803 specifies a fuel mixt. for internal-combustion engines such as gasoline contg. a Pb oxide, e. g., PbO , and an org. acid compd. such as oleic acid in sufficient quantity to unite with the Pb present after combustion, for rendering substantially all of the Pb volatile or gaseous. Rosin oil, xylene and $PhNO_2$ also may be added.

Fuel for internal-combustion engines. T. MIDGLEY, JR. U. S. 1,578,201, March 23. "Commercial" $EtOH$ is mixed with about an equal quantity of "cracked gasoline" contg. about 16% of unsatd. hydrocarbons. Cf. C. A. 20, 1511.

Producing gas from oil or similar hydrocarbon fuels. G. L. REICHHELM. U. S. 1,576,787, March 16. Mech. features of contacting vaporized fuel with combustion gas so as to avoid C deposition in the app. used.

Rotary grate for furnaces or gas producers. SOC. ANON. DES USINES LAMBOT. Brit. 237,865, July 29, 1924.

Gas-producer (adapted also for iron smelting). L. CHAVANNE. Brit. 237,883, July 29, 1924.

Gas-producer adapted for use on self-propelled vehicles. L. SAIVES. U. S. 1,579,335, April 6.

Water-gas apparatus. H. WOOD. U. S. 1,578,306, March 30.

Purifying gas. HUMPHREYS & GLASGOW, LTD. Brit. 237,920, Aug. 1, 1924. A soln. which has been employed for removing H_2S from gas by formation of a sulfhydrate is oxidized to regenerate the original salt which it contained (with liberation of S) by passing air in fine division through a column of the foul soln. An app. is described.

Eliminating hydrogen sulfide from coal gas. F. W. SPERR, JR. U. S. 1,578,560, March 30. Air after use for regeneration of gas-purifying material is washed with a liquid contg. a freshly pptd. Fe compd. such as $Fe(OH)_2$ to eliminate the H_2S from the air.

Removing naphthalene and similar hydrocarbons from fuel gas. F. W. SPERR, JR. U. S. 1,578,687, March 30. A solvent such as kerosene is recirculated through the flowing gas, and the same gas is subjected to substantially uncontaminated solvent after it has passed through the recirculating stage.

Apparatus for distilling ammoniacal liquor, benzenized oil, etc., or for washing coal gas. J. BARRATT, W. H. GREAVES AND ASHMORE, BENSON, PEASE & CO., LTD. Brit. 237,659, May 6, 1924.

Treating tar water. C. SCHNEIDER. U. S. 1,579,957, April 6. An alkali metal hydroxide is added to hot tar water, and the liquor is exposed to the air and utilized again for cooling gases obtained by the distn. of bituminous fuel.

Oven for distillation of bituminous or other solid materials. O. LASCHER. U. S. 1,576,916, March 16.

Horizontal coke oven. H. B. CARPENTER. U. S. 1,579,075, March 30.

Coke and tar from coal. F. SEIDENSCHNUR. U. S. 1,578,376, March 30. A down-

wardly traveling column of coal is treated with a counter-current of generator gases or other gases free from O at a rate of at least 80-96 cu. ft. of gas per lb. of coal, the temp. of the gas being about 500°.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Petroleum and natural gas in Montana. J. P. ROWE. *Eng. Mining J.-Press* 121, 563-8(1926).

The petroleum reserves of Trinidad. ANON. *Rass. min. met. chim.* 64, 303 (1926).—The most important reserves are petroleum and asphalt. The former varies considerably, showing d. 0.966-0.818 and in %: benzine 0.6-18.3, naphtha 1.7-9.2, kerosene 22.8-43.2, gas oil 0-8.1, lubricating oil 12.8-39.6, asphalt 6.0-56.7, H₂O 0.2-1. The asphalt lake and the geology of the petroleum are also described. C. C. DAVIS

The deposit of bituminous schists at Resiutta (Friuli). GUIDO CONSETTINI. *Rass. min. met. chim.* 64, 29-30(1926).—The deposit comprizes in ascending strata (1) boghead coal, d. 1.32, contg. 36% volatile and giving on distn 30% bituminous oils; (2) fat schist, d. 2.18, contg. 16% volatile and giving 12.5% oils, (3) poor schist, d. 2.30, contg. 7.5% volatile and giving 5.5% oils and (4) dolomite contg. 1% bituminous material. The oil is dark brown with blue fluorescence d. 0.85-0.90, a penetrating garlic odor, partly sol. in EtOH, Et₂O, CS₂, CHCl₃, etc., readily inflammable (leaving no residue), calorific power 11,000, 5.3% org. S, forms black bituminous ppts. with H₂SO₄, HNO₃, or HCl and gives the reaction of ichthyol oils with alc. HgCl₂. It is composed of satd. and unsatd. hydrocarbons of the paraffin and ethylene series, with heterocyclic compds., pyridine and quinoline bases and phenylsulfonic acids. The first portion distils at 80°, the last at 350°. Fractionation yields light oils, d. 0.80-0.82, burning oils, d. 0.850-0.875 and heavy oils, d. 0.950-0.971. Products suitable for solvents of fats, resins and bitumen, driers for varnishes, agricultural insecticides, wood preservatives, alc. denaturants, motor fuel, etc., can be obtained from the schists, of which at least 500,000 tons is available. Among the most important products are ichthyobenzene, ichthyol and its derivs. C. C. DAVIS

Problems of petroleum technology. LEOPOLD SINGER. *Naturwissenschaften* 14, 133-9(1926).—A general review. B. J. C. VAN DER HOEVEN

Oil production and refining in Egypt. M. SAMY. *Oil & Gas J.* 34, No. 34, 138 (1926).—Hurghada, Egypt's largest oil field, produced 159,500 tons of oil in 1924. The oil is heavy mixed-base, brownish black, having a small benzine and kerosene content. Gernsah oil, a high-class paraffin-base oil is dark greenish brown in color, having a benzine content of 8% and kerosene 28%. Abu Durba oil is heavy asphaltic base containing a varying proportion of a waxy resin and having a low benzine and kerosene content. Hurghada crude is run to produce benzine, kerosene, solar (gas) oil, furnace oil, fluxing oil pitch and (in the State refinery) Diesel oil. Gernsah oil produces benzine, kerosene, solar oil and fuel oil. M. B. HART

Economic fuel burning in refining. P. A. MOORE. *Oil & Gas J.* 34, No. 34, 130-2, 136, 176-8(1926).—A discussion of properties of economic fuels and their use. M. B. HART

Chemical investigation of noxious gases in the refining of "viscosine." M. BLINKOFF. *Azerbaidjan Neft. Choz.* 36, 91-3(1925); *Chimie et industrie* 15, 225(1926).—Preliminary report on an investigation of the petroleum industry at Baku. "Viscosine" is the product obtained on refining "nigrol" (residue obtained after removal of kerosene, gasoline and light oils from naphtha). Nigrol is refined by treating with H₂SO₄ and with NaOH, and the chief noxious gas is SO₂, which was detd. by passing the air through I soln., and also by passing it through H₂O soln. An av. of 1.29 mg. SO₂ per l. of air was found during the discharge of the acid sludge, and an av. of 0.51 mg. per l. during other operations. No cases of serious intoxication have occurred, but the gases gradually affect the organism. Better ventilation and the use of masks are recommended. A. PAPINEAU-COUTURE

The refining of mineral oils. H. I. WATERMAN. *J. Inst. Petr. Techn.* 11, 576-82 (1925).—The presence of 1 vol. % of S and halogen compds. in kerosene increased the soot-forming property 10 and 7 times, resp. The Edelmann, silica-gel and Dunstan hypochlorite methods owe their value to their desulfurizing powers. One treatment with 54% of silica-gel decreased the S content of a Persian fraction 20% in two treat-

ments, while 117% of gel by wt. caused a reduction of 60-70% of S in a Mexican kerosene. The Dunstan process followed by filtration through bauxite produced a 68% to 40% reduction in S content. M. B. HART

The importance of the Edeleanu process. H. I. WATERMAN AND J. N. J. PERQUIN. *J. Inst. Petr. Techn.* 11, 560-70(1925); cf. *C. A.* 19, 3371.—The Edeleanu process permits the crude oil distillate to be sepd. into two parts with a loss of less than 1% of SO_2 . The S content of Venezuela kerosene has been lowered 80% and the aniline point has been lowered to 65.2°. A final treatment with 2% oleum improves the color and lowers the S content. M. B. HART

Carborundum furnace assures uniform heat application in oil refining. A. E. NASH. *Oil Trade* 17, No. 2, 49-51, 61(1926).—SiC has a thermal cond. 8-10 times that of ordinary fire brick. A furnace equipped with carborundum muffles within the chamber permits a uniform distribution of radiant heat over the entire shell with no danger of overheated bottoms or tubes. Analysis of waste gases shows an av. of 14% CO_2 . The temp. of the exit gases is reduced and a temp. of 700° F. is produced. Data show a heat loss of 13½% instead of 30% as with normal practice. M. B. HART

The determination of unsaturated compounds in petroleum spirit. W. R. ORMANDY AND E. C. CRAVEN. *J. Inst. Petr. Techn.* 11, 533-6(1925); 12, 48-67(1926).—The Hanus test was applied to det. the unsatd. compds. present in gasoline samples. Results obtained with fractions of a given spirit show that the unsatd. compds. appear to be fairly evenly divided. The mol. wt. of original spirits was detd. by the Victor Meyer method in a coal-gas atm. at 25°, allowances being made for the resinous residue. Aromatics were detd. by the modified Tizard-Marshall method in which the difference of the aniline point of the spirit after washing with 3 vols. of 80% H_2SO_4 and 3 vols. 98% H_2SO_4 is considered to be due to the removal of aromatics. The results obtained with the two acids appear to check within reasonable limits. M. B. HART

Extension of the "critical-solution-temperature" method of analysis of gasoline. M. AUBERT AND E. AUBRÉ. *Compt. rend.* 182, 577-9(1926); cf. Chavanne and Simon, *C. A.* 13, 2125; 14, 117, 464.—In order to avoid removal of aromatic hydrocarbons by nitration, A. and A. det. the critical soln. temp. (CTS) in two different solvents and obtain 2 equations with 2 unknowns: $C(\Theta_{Ac}-\Theta_c)/(100-Ar) = \Theta_{Ac}-[(Ar/k)+T]$ and $C(\Theta'_{Ac}-\Theta'_c)/(100-Ar) = \Theta'_{Ac}-[(Ar/k')+T']$ in which $Ar = \%$ aromatic hydrocarbons, $C = \%$ satd. cyclic hydrocarbons, Θ_c and Θ'_c are the CTS of the cyclic hydrocarbons in the 2 solvents, Θ_{Ac} and Θ'_{Ac} are the CTS of the satd. acyclic hydrocarbons, T and T' are the CTS of the crude mixt. in the 2 solvents, and k and k' are consts. PhCH_2OH has been found very suitable as second solvent; but owing to its ready spontaneous decompn. its purity should be controlled by checking the CTS of a standard hydrocarbon. A. PAPINRAU-COUTURE

The valuation of motor spirit and lubricating oils. HAROLD MOORE. *J. Inst. Petr. Techn.* 11, 571-5(1925).—Minimum tests for lubricating oils are: sp. gr.; viscosity at 70°, 100°, 140° and 200° F.; cold test; flash point; coke test; and appearance. The value of each test is discussed. Addition of 2-10% vegetable oil aids in the maintenance of a film under pressure. Motor spirit tests are: sp. gr., Engler distn. corrosion test and aniline cloud test. M. B. HART

Gasoline manufacture in California. G. W. H. REID. *Oil & Gas J.* 24, No. 31, 238, 9(1926).—A specially prepd. distillate from California crude is used as the absorption medium at the Signal Hill plant of the California Petroleum Co. M. B. HART

Investigation of the composition of cracked spirit. HAROLD MOORE AND R. B. HOBSON. *J. Inst. Petr. Techn.* 11, 587-92(1925).—Expts. were conducted to det. the compn. of cracked spirit produced in a Cross cracking unit, from a refined petroleum from the Russian field. Fractionation and examn. by analysis of the whole spirit and of the fractions are described and the results are given. M. B. HART

The action of sulfuric acid on cracked spirit. C. M. HOUGHTON AND S. BOWMAN. *J. Inst. Petr. Techn.* 11, 583-6(1925).—A method to det. the strength of H_2SO_4 most effective in producing the polymerization of olefins in cracked spirit consists in distg. two 100-cc. samples, one of which has been treated with acid, to the same final b. p. In each case the vol. of reflux from the column into the flask upon removing the flame is measured. The difference between the vols. of the reflux is assumed to be a measure of the polymerization that has occurred. Results are given when low-boiling fractions and also the original cracked spirit are mixed with aviation spirit in a ratio of four to one, showing that 91% is the optimum strength of acid for producing polymerization. M. B. HART

Capillary control in oil and gas reservoirs. S. C. HEROLD. *Oil & Gas J.* 24,

No. 36, 92-3, 96, 98, 100(1926) Time velocity-pressure velocity, pressure-time pressure-volume relations are discussed. M. B. HART

Effect of ozone upon oils. M. A. DOYLE AND R. B. APPLEBY. *Ind. Eng. Chem.* 18, 63(1926).—Olive oil, Velocite B and Redown Engine oil were treated with O varying lengths of time. For all three oils the I number decreased, the acid no., sp. gr. and viscosity increased; for olive oil interfacial tension increases while surface tension and efficiency decrease, and for the other two oils interfacial tension decreases, while surface tension and efficiency increase. Qual. results only are given. W. C. EDWARDS

N. T. U. Company's shale retort. I. S. WISBY. *Pet. Times* 15, 107, 8(1926). A vertical retort charged with 40 t. of shale is ignited at the top. A zone of combustion is set up at the top of the column by a down draft. The distn. is carried on at about 700-800° F. or less. The data obtained upon examn. of Utah shale oil and California oil are given. M. B. HART

The hydrogenation and desulfurization of Norfolk shale oil. H. G. SHAWWILL. *J. Inst. Petr. Techn.* 11, 548-55(1925).—Norfolk shale oil has the following properties: sp. gr. 0.942-0.960, is very mobile, contains up to 7.8% S, 3.4% bases, 3.4% phenols, cresols, etc., 3-4% benzene and toluene. The crude oil contains 20% S free satd. hydrocarbons, 50-60% olefins and diolefins, and 20% S compds. Data are tabulated to show Engler distn. tests, giving sp. gr. and S content of fractions. Data obtained upon hydrogenation and cracking in an atm. of nitrogen show reform losses, sp. gr. and S content. M. B. HART

Lubricants from mixed-base crudes. H. L. KAUFFMAN. *Oil & Gas J.* 24, No. 31, 32, 34, 36, 38, 40(1926).—General practice in lubricant manu. is discussed. Data show yields from pressed distillate when reducing to bottoms of different viscosities, costs of treating, blending tests, physical tests on oils prepd. by blending and those by straight reduction of overhead lubricating distillates or by the reduction of pressed distillates to viscous bottoms. M. B. HART

How will reclaimed oils affect the lubricating oil market? R. B. DAY. *Pet. World (Calif.)* 11, No. 1, 126(1926).—Analysis of used crankcase oil distd. in an Engler flask gave the following results: gasoline 1%, 190; kerosene 15%, 300; lubricating oil 71%, 350; coke and loss 13%. The specifications of the lubricating oil fraction were; Baumé gravity, 31.2, flash point 412° F., viscosity (Saybolt Univ.) 182, unsatd. hydrocarbons 6%. M. B. HART

Paraffin wax and its properties; methods of testing wax and of analyzing oil-wax mixtures. L. D. WYANT AND L. G. MARSH. *Bur. of Mines, Tech. Paper* 368, 26 pp (1925).—For detg. the m. p. of com. waxes, the Am. Soc. for Testing Materials "paraffin wax" method was found best for waxes contg. less than 15% of oil, and the "petrolatum" method for waxes contg. more than 15% of oil. The following procedure was developed for detg. the amt. of oil in oil-wax mixts.: 5 g. of wax was refluxed for a few min. with 35 cc. of MeAc, the soln. was transferred while hot to a 120 cc. test tube, and the flask was rinsed with 15 cc. MeAc. The soln. (contg. 5 g. sample in 50 cc. MeAc) was cooled to 60° F. with vigorous shaking, filtered, and washed with 50 cc. MeAc. The filtrate was evapd. at 212° F. (finally *in vacuo*) and the residual oil weighed, the wax in the sample was calcd. by difference. The wax was dried *in vacuo* at 212° F. and its m. p. detd. If the m. p. was unduly low, the wax was recrystd. as before, from 20 cc. MeAc per g. wax, and the total amt. of oil was taken (for calcn.) as that sepd. by the 2 treatments. If the m. p. of the wax was unduly high, the oil was redissolved in MeAc and a second crop of wax crystals removed. DONALD W. MACARDLE

Analysis of a mixture of unsaturated gases. Determination of erythrene (DOBRYANSKII) 7. Fuel alcohol from brushwood (MARCOU) 16.

BELL, H. S.: American Petroleum Refining. N. Y.: D. VAN NOSTRAND CO. 475 pp. \$5.00
ELLIS, CARLETON and MERES, JOSEPH V.: Gasoline and Other Motor Fuels. N. Y.: A. Van Nostrand Co. 728 pp. \$10
NIMPTSCH, REINHOLD: Beiträge zum russischen Erdölproblem. Berlin: H. Sack Verl. 96 pp. R. M. 3.50

Separating gas, water and oil. D. G. LORRAINE. U. S. 1,577,917, March 23, 1924.
Apparatus for separating fuel oils from water. M. S. GIBB. Brit. 237,768, Oct. 22, 1924.

Electric apparatus for dehydrating crude oil. D. K. CASON, JR. U. S. 1,579,515, April 6.

Apparatus for dehydrating petroleum oil by heating and settling. H. L. EDWARDS. U. S. 1,578,273, March 30.

Thermostat adapted for use in oil refining, etc. R. B. RICHARDSON. U. S. 1,578,208, March 23.

Forming oil stills from metal plates by electric welding. L. R. SMITH. U. S. 1,577,410, March 16. Mech. features.

Vertical oil still. F. E. WELLMAN. U. S. 1,576,563, March 16. A vertical petroleum still is surrounded by an annular combustion space within a furnace setting within the lower part of which a burner is revolvably mounted.

Cracking still and fractionating apparatus for hydrocarbon oils. F. E. WELLMAN. U. S. 1,576,564, March 16.

Distilling oil-bearing sand or similar materials. JACKSON RESEARCH CORPORATION. Brit. 237,757, Sept. 22, 1924. Vapors and gases leaving a condenser are passed through and around the materials undergoing distn. An app. is described.

Treatment of dirty acid obtained in petroleum refining. R. A. HALLORAN, W. N. DAVIS and G. A. DAVIDSON. U. S. 1,579,607, April 6. The dirty weak acid obtained in refining petroleum oil with H_2SO_4 is subjected, while intermingled with a relatively small quantity of fuel oil, to a pressure of over 50 lbs. per sq. in. in a closed retort, and to a high hydrolyzing temp. so that the mass is sepd. into a relatively weak clean acid and a liquid fuel.

Refining oils for gasoline production, etc. R. WILES. U. S. 1,579,799, April 6. Refining and natural gases or other hydrocarbon gases contg. gasoline constituents are subjected to the absorbent action of reduced crude oil, the reduced crude oil is mixed with crude oil contg. gasoline and heavier constituents and the mixt. is subjected to fractional distn.

Distilling hydrocarbon oils. W. C. AVERILL, JR. U. S. 1,577,440, March 23. Oil contg. H_2O is vaporized, part of the vapors of oil and H_2O are simultaneously condensed and remaining vapors are subjected to previously condensed hydrocarbons of higher b. p. obtained from the vapors, which latter are supplied by removing the H_2O collected from the condensed vapors.

Distilling oils with volatile catalysts. A. M. McAFEE. U. S. 1,578,049, March 23. Gas oil or other oils of relatively high b. p. are heated together with $AlCl_3$ or a similar catalyst and vapors of lower boiling oils are led away and condensed after bringing them into intimate contact with added petroleum hydrocarbon oil. U. S. 1,578,050 specifies distg. petroleum oils with $AlCl_3$, partially cooling the vapors to condense out $AlCl_3$ and kerosene, separately condensing and collecting hydrocarbons of lower b. p. than kerosene, sepg. the $AlCl_3$ from the kerosene by settling and returning the $AlCl_3$ to the still. U. S. 1,578,051 specifies distg. oils with $AlCl_3$ and maintaining a flow of oil through a succession of stills. Volatilized and condensed $AlCl_3$ is returned toward the first still of the series.

Catalytic conversion and distillation of hydrocarbon oils. G. L. PRICHARD and H. HENDERSON. U. S. 1,577,871, March 23. Oil of relatively high b. p. is distd. with $AlCl_3$ or the like and vapors of the catalyst and of oil of high b. p. are collected in a second body of heavy oil and catalyst undergoing distn. Vapors of lower b. p. are delivered for final condensation.

"Pyrogenesis" of petroleum oils. E. M. CLARK. U. S. 1,578,802, March 30. Sepd. bodies of relatively heavy oil are confined under pressure within a digester. One of them is heated and vapors thus formed are led over into the second body of oil, abstracting heat from the latter to cause condensation of the vapors of the desired products. Oil displaced by vapor condensation in the second body is fed to the first body of oil and the operation is continued until the second body becomes of substantially lower b. p. than the first body. A substantial conversion is thus effected without other distn. and at a relatively low pressure.

Converting hydrocarbon oils into products of lower boiling point. G. EGLOFF. U. S. 1,579,601, April 6. A bulk supply of crude petroleum or other oil to be converted is externally heated and simultaneously there is produced within the body of the oil an elec. arc to heat it to cracking temp. Evolved vapors are passed through an aerial condenser from which reflux condensate returns to the bulk supply of oil, thence to a condenser and receiver, and the bulk supply of oil is maintained under a self-generated super-atm. vapor pressure.

Cracking hydrocarbon oils. E. W. ISOM. U. S. 1,578,035, March 23. Oil is circulated in a single pass through a heating circuit and heated to cracking temp. by

heating gases which are circulated counter-current to the direction of oil flow. Vapors of the cracked oil are discharged from the heating conduit to a reflux device and the resulting reflux is supplied to the oil-heating conduit adjacent the end of the conduit over which the heating gases first circulate. Fresh oil is supplied to the oil at an intermediate point and part of the heating gases are recirculated in admixture with fresh heating gases. Cf. C. A. 19, 3585.

Electrically heated spiral pipe coil for converting hydrocarbon oils into others of lower boiling point. W. M. McCOMB. U. S. 1,579,554, April 6.

Horizontal still and associated apparatus for converting heavy hydrocarbon oils into lighter products. W. T. HANCOCK and M. BOYLE. U. S. 1,576,742, March 16.

Removing aluminum chloride residues from oil stills. A. M. McAFEE. U. S. 1,578,053, March 23. A caked residue is treated with H-O to disintegrate it into small particles and the latter are flushed from the still. Cf. C. A. 20, 649.

Boat carrying apparatus for recovering naphtha floating on water. A. MEIANI. U. S. 1,573,085, Feb. 16.

Apparatus for testing lubricating properties of oils. A. HENRIKSON, N. A. STEPHENS and V. ZBYSHEVSKI. U. S. 1,578,730, March 30. Lubricating oil for steam engines is tested in a cylinder to which steam is supplied and which contains a driven plunger.

Apparatus for forming lubricating emulsions from oil and water. S. A. BULLOCK and B. T. PERRY. U. S. 1,578,187, March 23.

"Cutting-oil" from mineral oil. E. M. HUGHES. U. S. 1,577,723, March 23. A heavy lubricating oil distillate from mineral oil is treated with mineral acid, e. g., H_2SO_4 , and the ppt. sepd. The remaining acid-contg. oil is treated with alkali, e. g., NaOH, and there is sepd. a pptd. emulsion comprising soap, salt H_2O , some free alkali and unsapon. mineral oil. The soap is decomposed with relatively dil. inorg. acid, e. g., H_2SO_4 , H_2O and salts are sepd. and the remaining product is saponified and mixed with mineral oil to form a cutting oil emulsifiable with H_2O .

Separating wax from lubricating oil. E. PETTY. U. S. 1,577,852, March 23. Mineral-oil lubricating stock contg. wax is dild. with a light petroleum distillate and agitated with an acid, e. g., H_2SO_4 . The sludge is sepd. and the acid-treated stock is treated with alkali, soap and H_2O are removed from the stock and a clarifying and decolorizing agent such as fuller's earth is mixed with the stock and then sepd. The stock is chilled and centrifuged to sep. wax and a portion of the dilg. agent from the remainder of dilg. agent and oil. Cf. C. A. 20, 109.

Sulfonating products from gilsonite. C. N. FORREST, H. P. HAYDEN and O. R. DOUTHETT. U. S. 1,578,235, March 23. A sulfuric purification process for gilsonite material is described from which there is obtained a fat-splitting sulfonic product, useful also as a detergent. Cf. C. A. 19, 1773.

Steam treatment in kilns for preserving resinous lumber and recovering by-products. W. H. MASON. U. S. 1,577,044, March 16.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Report of the Chief Inspector of Explosives of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles. B. W. DUNN. B. E. Rept. No. 19, Mar., 1926, 71 pp.—Although over 500,000,000 lbs. of explosives were transported by the railroads of the U. S. and Canada during the calendar year 1925, they were involved in but 26 accidents causing a property loss of \$11,702 and giving rise to no casualties. All of these 26 accidents were due to fireworks, 24 of them being caused by toy torpedoes. chiefly because of excess charges in them. The most frequent cause of accidents, 608 in no., was "Inflammable liquids" chiefly gasoline, causing a loss of over \$830,000. The next most frequent, 547 in no., was "Acids and Corrosive Liquids," causing a loss of over \$35,000. The next most dangerous substances in the order of frequency of accidents were "Inflammable Solids and Oxidizing Materials," 166, "Compressed Gases," 72, "Explosives," 26, "Poisonous Liquids and Solids," 10, with "Unlisted Semi-dangerous Articles," 82. The totals from all accidents were: killed 13, injured 57, loss \$1,056,178. The personal injuries attendant on handling compressed gases were with those contg. Cl, Pintsch gas, or He. Five of the 6 from Cl resulted from a single cylinder shipped in violation of the regulations. In the case of the Pintsch gas the fatality was due to effects of fumes from a supposed empty cylinder. That of He was due to rough handling of a compressed-gas cylinder. A large item of loss resulted from a freight train carrying

C_2H_2 cylinders being derailed by flood. The immersion caused a short circuit of the storage batteries in the car and the resultant flash ignited escaping gas causing explosion and fire. There were many blow-offs, principally of CO_2 cylinders, during extremely hot weather. Among the accidents from poisons was that of fumes from a damaged shipment of $Ca(CN)_2$ which severely affected 15 men. The rept. from the Chem. Lab. by Charles P. Beistel records tests of imported tooth brushes whose handles of a pyroxylin plastic were of such low stability as to be liable to ignition in transit. An interesting investigation was that of cars in which As_2O_3 had been transported with a view to their subsequent suitability for transporting foodstuffs. From 0.02 to 0.60 percent of As_2O_3 was found in the swept and washed cars. It was advised that in shipping As_2O_3 containers be used that will not permit of leakage or sifting of the contents. A CS_2 emulsion for use as an insecticide was found to give off inflammable vapors at all temps. above freezing. In tests of HNO_3 carboys, one a wooden box using mineral wool for packing, the other a wooden box having wood strips for cushioning, when the carboys were punched and broken so as to allow the HNO_3 (d. 1.4) to escape, the first carboy took fire as a result of the action of the acid on the mineral wool producing heat, and to its holding the acid longer in contact with the wood. Tests of Ascoloy, an alloy of steel contg. C 0.01% and Cr 12-14%, showed it to be suitable for drums or tank cars for HNO_3 . Tests of pressures of commercial HCl at various temps. led to the opinion that pressures from these causes in tank cars will not be such as to damage a steel shell of the strength ordinarily used in tank car construction. A shipment of H_2SO_4 in metal barrels was condemned because its d. was less than 65° Bé. Many appendixes give detailed descriptions of accidents. C. E. MUNROE.

The ignition point of gases at different pressures. III. H. B. DIXON AND W. F. HIGGINS. *Mem. Proc. Manchester Literary and Phil. Soc.* 70, 29-36(1926); cf. C. A. 20, 290.—Combustible gas being introduced from a 2-mm. orifice at the upper end of a 4-mm. tube which is at the center of a 12-cm. vertical tube through which air is passed upwards, the whole being heated in an elec. furnace, the ignition temp. must be expressed in terms of the time lag of ignition after turning on the gas, since mixing and slow combustion cause delayed ignition at lower temps. For expts. under pressure the whole furnace was enclosed in a steel jacket and suitable inlet and outlet valves were provided. The following data for H_2 -air, H_2 - O_2 , CH_4 -air and CH_4 - O_2 mixts., resp., at atm. pressure, are illustrative of the more complete data tabulated; lag 1 sec., 620° , 617° , 728° , 657° ; lag 5 sec., 588° , 587° , 678° , 619° ; lag 10 sec., 577° , 576° , 657° , 602° . The foregoing represent the most uniform conditions of heating of the tube (after enclosure in the steel jacket, but at atm. pressure); less uniform conditions in the non-jacketed furnace gave higher ignition temps. for the same lag, the difference being less than 15° up to 2 sec. lag, but for CH_4 -air mixts. at 15 sec. lag it was 45° high. Increasing the pressure on CH_4 -air mixts. decreases the ignition temp. regularly; for 1 and 2 sec. lag, resp., the temps. were 100 mm., 804° , 782° ; 400 mm., 747° , 717° ; 760 mm., 728° , 710° ; 2 atm., 711° , 690° ; 3 atm., 695° , 680° ; 5 atm., 666° , 652° ; 7 atm., 644° , 633° . For H_2 -air mixts. increasing the pressure (from low pressures) first increases the ignition temp. rapidly, finally decreasing it slowly; for 1 and 2 sec. lag, resp., temps. were 100 mm., 521° , 519° ; 200 mm., 554° , 549° ; 400 mm., 592° , 581° ; 600 mm., 614° , 601° ; 760 mm., 620° , 606° ; 1000 mm., 623° , 609° ; 1520 mm., 619° , 608° . For H_2 - O_2 mixts. a similar max. ignition point is noted, but at 200 mm. instead of at 1000 mm. W. B. P.

An explosion with potassium. J. G. F. DRYCE AND E. J. WEEKS. *Chem. News* 132, 193(1926); *Chem. Age* (London) 14, 248.—In a lecture demonstration of the properties of K, a knife was stuck into a piece of K to remove it from the bottle. A violent explosion occurred. It is suggested that the explosion may have been due to the presence of K carbonyl. E. H.

Precautions in working with low temperature baths. A. MITTASCH AND E. KUSS. *Chem.-Ztg.* 50, 125(1926).—Disastrous explosions are cited, one from cooling C_2H_2 with liquid air, another from cooling nickel carbonyl with liquid air. Both were probably due to leaks in the container which allowed liquid air to reach the condensate. Combustible materials must never be cooled with liquid air unless a metal condensing vessel is used, and liquid N_2 is preferable. If a Cu beaker, 10 cm. diam. by 40 cm. high, is suspended in a 15×60 cm. metal Dewar flask and liquid air circulated between the two, 0.75 l. pentane may be cooled to -150° in 15 min. W. L. BADGER.

Experiences in making cooling baths from organic materials and liquid air. F. A. HENGLEIN. *Chem.-Ztg.* 49, 1037(1926); cf. Biltz, C. A. 20, 824.—More than a hundred mixts. were prepd. and used by the author and his pupils without bad results. The materials used were Et_2O , $AcOEt$, $C_6H_5CH_3$, CS_2 , benzene, C_6H_5Br , anisole, C_6H_5N , $CHCl_3$, and mixts. of Et_2O and CS_2 . Only 2 explosions resulted, both with CS_2 .

these were due to the formation of a crust above the liquid air when CS_2 was dropped into it, so that the evapg. liquid air could not escape. No ignition of the CS_2 occurred
W. C. EBAUGH

Special properties of sulfuric cellulose esters (CAILLE) 25. Regions of reaction (JORISSEN) 2.

BEYERSDORFER, PAUL. Staub-Explosionen. Dresden and Leipzig, Theodor Steinkopff. ix + 125 pp.; 5.50 marks (paper) and 7 marks (bound). Reviewed in *Rev. chim. ind.* 35, 96-7(1926)

Drying smokeless powders. J. C. VICKERY and M. H. DAVIS. U. S. 1,579,262, April 6. A gaseous carrier is partially satd. with solvent vapors such as ether and alc. by spraying the heated solvent into the air or other gaseous carrier, the temp. of the latter is raised and it is passed over the powder to be dried and then through a spray chamber and reused in cyclic operation until the powder is sufficiently dried.

Removing coloring substances from smokeless powder. E. C. PITMAN and G. F. HUNTER. U. S. 1,577,075, March 16. The powder is subjected to the action of dil. HCl or of other dil. acid capable of rendering sol. coloring substances without injury to the powder and the solubilized substances are dissolved out with a solvent such as alc.

Machine for packing gelatin dynamite or similar explosives G. JOHNSON. U. S. 1,578,036, March 23.

Cartridge wad. A. G. SCHURICHT and G. T. WRIGHT. U. S. 1,576,759, March 16. Wads are formed of a compressed mixt. of cork flour or similar bindable material and polymerized China-wood oil.

Explosive mixture for disseminating military poisons or other toxic substances. W. O. SNELLING. U. S. 1,579,964, April 6. Nitrated starch is mixed with diphenyl-cyanoarsine or other non-explosive toxic material, and the mixt. is detonated.

Waterproofing matches. H. D. SCHMIDT. U. S. 1,579,401, April 6. A mixt. of beeswax 4, sealing wax 3 and rubber cement 6 parts is used with sufficient gasoline to produce a liquid compn.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Electro-capillary analysis of coloring materials. W. KOPACZEWSKI. *Rev. gén. mat. color.* 30, 34-44(1926); cf. *C. A.* 19, 2436.—Dyes in the colloidal state and of a concn. not greater than 1% may be classified as acid, basic and amphoteric. The acid dyes show about the same ascension in filter paper as pure water, basic dyes hardly exceed the level of emergence of the strips of filter paper, amphoteric dyes are indicators and are characterized by the appearance of zones of color changes. The rate of electro-capillary ascension of electronegative and of amphoteric dyes with relation to water is greater than that of positive dyes. The rate of ascension varies directly as the degree of micellary dispersion. Electrocapillary analysis is a means of detg. the relative rates of imbibition of salts and colloids, and of detg. variations in viscosity and surface tension of liquids.

Spectrophotometric evaluation of dye mixtures. W. C. HOLMES. *Am. Dyestuff Rept.* 15, 189-91(1926).—The methods in use in the Color Lab., Bur. of Chemistry, Washington, are described
L. W. RIGGS

Action of sulfur on monochloroanilines. H. H. HODGSON. *J. Soc. Dyers Colourists* 42, 76-80(1926).—The structure of sulfide dyestuffs was studied. The action of S on a large no. of simple aromatic amines was examd. to ascertain the fundamental processes which may be involved in the general complex reaction resulting in the final production of colored substances. The thionation of *o*-, *m*- and *p*-chloroaniline is described in
L. W. RIGGS

268°; when coupled with Naphthol AS-D formed long scarlet needles, m. 272°.

L. W. RIGGS

Constitution of Hansa Yellow G (MLB) and other yellow pigment colors. F. M. ROWE, A. H. BURR AND S. G. CORBISHLEY. *J. Soc. Dyers Colourists* 42, 80-2(1926).—A quantity of the coloring matter was made by coupling diazotized *m*-nitro-*p*-toluidine with acetoacetic anilide, the product being in all respects identical with Hansa Yellow G. Monolite Yellow G(BDC) and Pigment Fast Yellow HGL conc. new (JWL) were found to be identical with Hansa Yellow G (MLB).

L. W. RIGGS

Satin white as the foundation for coal-tar lakes. A. COBENZL. *Farbe u. Lack* 31, No. 4, 40(1926).—A short note on the prepn. and use with lakes, of satin white.

R. J. MOORE

Dyeing apparatus for naphthol AS. KARL REIK. *Textilber.* 7, 234-7(1926).

E. R. CLARK

Various precipitation formulas and practical yields. ANON. *Farbe u. Lack* 31, No. 8, 90; No. 9, 102; No. 10, 111(1926).—A list of the most important dyes for the prepn. of dry colors, with numerous formulas and methods of pptn. R. J. MOORE

(Printing) red or white on a dark indigo (ground). JOSEPH POKORNY. *Bull. soc. ind. Mulhouse* 91, 759-61(1926). Sealed notes 2318 of April 24, 1914, and 2328 of June 22, 1914.—According to Jos. Skoupil the mercerized fabric is dyed a deep indigo, prepd. with Na-naphthol, printed with a paste contg. approx. 1 mol. of MnO_2 , 1 mol. $PbCrO_4$, 1 mol. of $NaClO_3$ and diazo-*p*-nitroaniline (the diazo being omitted for whites, steamed 3-4 min. in a small Mather & Platt, passed 3-5 sec. in 17° Bé. HCl (contg.) 30 g. $FeSO_4$ per l.) at 37° C., steamed 35-40 sec. at 35°, washed, treated cold with 40 Bé. HCl to remove excess of Mn, rinsed, and washed with soap. The red or white is perfect and the fabric but very slightly attacked. In com. operations a no. of pieces turned out a dirty orange instead of bright red, and P. found that: (1) the dirty orange is produced when the printed goods are not put through the small Mather-Platt; (2) a good red is obtained without the $NaClO_3$; (3) the presence of MnO_2 is unnecessary and a perfect red can be obtained with $PbCrO_4$ alone. He recommends the following process: dye the unmercerized fabric a deep indigo, prep. with Na-naphthol, print with paste contg. $PbCrO_4$ (but no MnO_2 or $NaClO_3$), pass through 17° Bé. HCl at 37° C. for 3-5 sec., steam 35-40 sec. at 35°, and wash. This treatment is easier both on the blue and on the fabric. P. found that in discharging the indigo to a white perfect results are obtained without the use of $NaClO_3$, and that quite an acceptable white is also obtained by omitting the $NaClO_3$ and reducing the MnO_2 by half. Report. PIERRE SEYDER. *Ibid* 762-4.—The principle of discharge by means of oxidizing agents was used as early as 1825 by Thompson, and the novelty of P.'s process lies in the method of application rather than in the choice of oxidizing agent. S. easily duplicated P.'s results, obtaining perfect reds, and whites that were excellent on small objects but slightly yellowish on larger surfaces. On progressive bleaching with hyposulfite followed by dyeing with methylene blue, the portions of the fabrics which had been printed had greater affinity for the methylene blue, showing the presence of oxycellulose; and the pieces printed *via* Skoupil showed the presence of a larger amount of oxycellulose than those printed *via* P.

A. PAPINEAU-COUTURE

Fast discharge-colors on indigo. CH. SUNDER AND R. SOLBACH. *Bull. soc. ind. Mulhouse* 91, 755-7(1925). Sealed note 2171 of April 22, 1912.—In order to prevent simultaneous reduction of the indigo and of the vat dyes when using pastes contg. indanthrene or helindone dyes to discharge indigo, $Sn(OH)_2$ is used instead of the $Zn(O)$ generally employed in rongalite CL + anthraquinone discharge pastes. The indigo is thus reduced by the hyposulfite, while the vat dyes are subsequently reduced by the $Sn(OH)_2$ on passing through the NaOH bath. Three formulas are given for red, yellow and blue, resp. Report. OSCAR MICHEL. *Ibid* 757-8.—The process described in D. R. P. 263,647, applied for July 30, 1912, granted Dec. 23, 1912, uses ZnO + $FeSO_4$ + a Sn salt, and is very similar; but the process of S. and S. is anterior to it. A. P.-C.

Practical hints on the production of bright colors on textile fabrics. RAFFAELE SANSONE. *Am. Dyestuff Rept.* 14, 536-40, 596-600, 628-30(1925); cf. C. A. 19, 2748.

L. W. RIGGS

History of dyeing silk piece goods. D. P. KNOWLAND. *Am. Dyestuff Rept.* 15, 183-5(1926).

L. W. RIGGS

Dyeing of acetate silk. H. R. DAVIES. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 101-7; *Am. Dyestuff Rept.* 15, 197-203(1926).

L. W. RIGGS

Dyeing acetate silk. CHAS. E. MULLIN. *Am. Dyestuff Rept.* 14, 517-21, 588-93, 622-7, 653-8, 694-9(1925); cf. C. A. 19, 2748.—Acetate silk—its dyes and their application; supplemental to the preceding series of articles on dyeing of acetate silk.

Ibid 747-52, 765, 787-91, 849-50, 893; 15, 1-2, 38-9, 43-4, 69, 81-5, 139-42, 153-6, 181, 191-3, 223.

The dyeing of cellulose-acetate silk. I. VALENTIN KARTASCHOFF. *Helvetica Chim. Acta* 8, 928-42(1925).—Theoretical and exptl. evidence is given to support Witt acetate (to which I closely corresponds) was shown by cataphoresis expts. to have a negative charge in contact with water. The course of dyeing of I fibers by Celatene dyes (aminoanthraquinone derivs.) was followed under the microscope, and was found to be a dissoln. of the particles of the dyestuff by the fiber. Dry fibers in contact with dry, finely powdered dianisidine were dyed a fast brown shade in 15 days (probably dissolved by the fiber could be partially diazotized and coupled. The use of this method with Celatene dyes gave results brighter and faster than those obtained by the usual method. A rather complete literature and patent review of dyestuffs and dyeing methods for I is given.

The theory of dyeing of acetate rayon. V KARTASCHOFF. *Textilber.* 7, 28(1926).—The partition coeffs. of a number of dyes between the fiber and water and between water and EtOAc are of the same general order of magnitude, indicating that dyeing proceeds by a process of soln.

The dyeing of non-denitrated nitro type rayon. KURT H. MEYER, CURT SCHUSTER AND W. BÜLOW. *Textilber.* 7, 29-30(1926).—The dyeing of this fiber proceeds by soln. similarly to the dyeing of acetate rayon and similar dyes may be used. The soly of $H_2NC_6H_4NO_2$ in the fiber is over 100 times its soly in H_2O . The rate of diffusion of such materials into undissolved and hence unspun nitrocellulose is much less than for the spun product, but the ultimate equil. is the same.

Fine-fibered rayon by the copper process. WILHELM HANKE. *Textilber.* 7, 38-40 (1926).—In the method described, dusted linters are cooked twice, first with 3.5% NaOH, and a little $Na_2S_2O_4$, and then with perborate and a bleachers' oil. The product is thoroughly macerated in the hollander and mixed with $Cu(OH)_2$ obtained by pptn. with NaOH. From 1.6 to 1.75 kg. $Cu(SO_4)_2$ is used to each kg. of cellulose. This mixing is done at 15°. The resultant mass is mixed with 125 l. 25% NH_4OH per kg. of cellulose, let stand 30 min., stirred for an hour and again allowed to stand. After some 8 hrs. the stirring is again started, and continued until the desired spinning conditions are attained. The soln. is filtered through Ni wire cloth and the excess NH_3 recovered in a vacuum app. Some 5-6.5% of NH_3 is left in. Spinning is done by the methods of D. R. P. 220,051 and 303,017 in most works, but a new method is described which utilizes a stream of water to produce the stretch.

Will acetate rayon supersede older types? E. SCHULKE. *Textilber.* 7, 25-6 (1926).—Physical tests, especially wet tensile strength, show that substantial improvements must take place first.

The ripening of viscose. RUD BERNHARDT. *Kunstseide* 1, 193-8(1925).—Chem. changes accompany changes in particle size in the ripening of viscose. The amts. of CS_2 given off by boiling viscose solns. of varying ages with dil. H_2SO_4 in a stream of H_2 show that a dicellulose xanthate, $NaSCSO(C_6H_5O)_2OH$ is first formed and that this eventually changes completely to tetraxanthate of equivalent formula. Remarks. R. O. HERZOG. *Ibid* 261-2.—B used methods inferior to those of H and associates who published first. Reply. BERNHARDT *Ibid* 284-5. Comment. LEUCHS. *Ibid* 286.—B. failed to distinguish between xanthate S and by-product S.

The practical side of viscose-rayon manufacture. H G DAHLNVORD. *Textilber.* 7, 56-9(1926).—Describes some German made machinery with illustrations.

Wool-like viscose fibers. E. SCHULKE. *Textilber.* 7, 36-8(1926).—*Snafil* has developed from the early patents of Beltzer (D. R. P. 271, 215), and Pellerin and Girard (Fr. P. 410,776, 466,292 and D. R. P. 266,140) (followed by the war-time production of "Stapelfaser") Increased fineness is the most noteworthy improvement of the last few years in prepg. such spinnable fibers. *Snafil* and wool mixts. give fabrics which do not shrink and felt in washing and yet have high warmth-retaining value. The production of finer denier rayon will give a better tow for carding.

Special properties of sulfuric cellulose esters. ABEL CAILLE. *Chimie et industrie* 15, 189-92(1926); cf. C. A. 19, 1495, Kuecht and Thompson, C. A. 16, 1872—By immersion of strips of cotton in 20, 30, 40, 50 and 60% solns. of H_2SO_4 in AcOH for 30 min. sulfocelluloses were obtained contg. 4.37, 4.49, 5.70, 8.83 and 7.48 g H_2SO_4 per kg., resp. Tensile strength and dyeing tests showed a gradual increase in strength and in affinity for basic dyes with increase in H_2SO_4 content, but the 60% soln. attacked

the fiber, reducing the strength and also the affinity for basic dyes as compared with the ester contg. 8.83 g. H_2SO_4 . The affinity of the various samples for acid dyes was found to be the same as that of untreated cotton. Three portions of a nitrocellulose contg. 12.5% N were treated as follows: (1) washed 20 min. in distd. H_2O , (2) completely stabilized *via* Hervé to eliminate combined H_2SO_4 , (3) washed 20 min. with tap H_2O and then stabilized *via* Hervé. They contained the following amts. of total and of neutralized H_2SO_4 : (1) 0.0967, nil; (2) trace, —; (3) 0.052, 0.046%, resp. Both (1) and (3) had a decidedly greater affinity for methylene blue and rhodamine than (2). Com. nitrocellulose rayon after stabilizing *via* Hervé (total H_2SO_4 0.19, neutralized H_2SO_4 0.17%) had much less affinity for methylene blue than before stabilizing (total H_2SO_4 0.58, neutralized H_2SO_4 0.18%). Cellulose acetate gave similar results, but the difference in affinity of the stabilized portions was not as pronounced as with nitrocellulose. Quant. detns. of the amt. of dye (methylene blue and auramine) absorbed by the treated and untreated esters confirmed the above results, and showed that the combined H_2SO_4 has the same effect on the affinity whether or not it has been neutralized with Ca and that the nitrate radicals have very little, if any, effect on the affinity. C concludes that the fixing of basic dyes by cellulose products is not due solely to the presence of oxycellulose, but may also be due to sulfuric esters, which are mainly responsible for the affinity of nitrocellulose (even when denitrated) and acetylcelluloses. The dyeing is not a chem. phenomenon, as the amt. of dye fixed by the cellulose ester is not proportional to the total H_2SO_4 content.

A. PAPINEAU-COUTURE

The fine structure of rayon and its resistance to enzymic activity. P. KARRER. *Textilber.* 7, 23-4(1926).—The rate of soln. of various types and modifications of cellulose in cellulase preps. varies greatly, e. g., in a comparative test a com. Cu rayon lost 10% as against 57% for a lab. viscose prepn. Each gave a low Cu number, and the X-ray interference diagrams obtained were similar. The difference is possibly due to variation in micelle arrangement and surface exposure. Rayon of the same but different denier showed similar loss. Mercerized cellulose is much more vigorously attacked than unmercerized. Cellulose is not completely saccharified by cellulase and must be considered as two substances which differ in enzymic resistance. "Milky" viscose rayon showed unusually rapid bacterial resolution into sol. products. The method is recommended for further study and investigation.

E. R. CLARK

Bleaching rayon with activin. RICHARD FEIBELMANN. *Textilber.* 7, 47-8(1926). The stable nature of activin makes it especially suited to the bleaching of rayon. In a neutral soln. cream shades are obtained. Acid solns. give a good white without tendering.

E. R. CLARK

Bleaching with peroxides. T. D. AINSLIE. *Proc. Am. Assoc. Textile Chem. Colorists* 1926, 107-13; *Am. Dyestuff Rept.* 15, 203-9(1926).

L. W. RIGGS

Cold bleaching (of cotton) as opposed to boiling bleaching. M. FREIBERGER. *Textilber.* 7, 148, 226-7(1926).—The Mohr system is uneconomical, dangerous to the goods, and not particularly new.

E. R. CLARK

The behavior of fibers toward colloidal solutions. W. HERBIG AND H. SEYFERTH. *Z. deut. Oel-Fett-Ind.* 46, 81-4(1926); illust.—To obtain a definite measure for the ease with which fibers become "wetted" by solns. used for textiles, H. and S. made attempts to develop a lab. method (1) by measuring the rise of a liquid in a standard thread under fixed conditions, (2) measuring the horizontal distance that a liquid will travel in thread in a given time, and (3) by measuring the time elapsing before a drop of 0.05 cc. falls and disappears through a number of parallel threads stretched under a given tension. While each method yielded interesting information, none gave consistent data.

P. ESCHER

Estimating the degree of mercerization. HALLER. *Textilber.* 7, 65-6(1926). It has formerly been proposed to det. the degree of mercerization by comparing the depth of shade produced by dyeing with direct colors with that of standards, etc. When the shades produced are measured on the Ostwald chromometer, the percentage of black gives a good measure of the property in question.

E. R. CLARK

The manufacture of waterproof fabrics. HUGO JAEGER. *Textilber.* 7, 140-56(1926).—A number of recipes covering metallic soaps, drying oils, waxes, CuO-NH_3 , etc., are given together with descriptions of useful app.

E. R. CLARK

Historical notes on the development of chemical finishes for cotton. A. BODMER. *Textilber.* 7, 232-4(1926).—Samples of recent Heberlein H_2SO_4 finishes are attached.

E. R. CLARK

Some effects of humidity on the properties of fabrics, with special reference to the control of humidity during strength tests. R. G. PARKER AND D. N. JACKMAN. *J. Soc. Chem. Ind.* 45, 47-54T(1926).—Perfectly dry fibers take up moisture from the atm.

and attain their equil. rapidly, the H_2O content at 70% relative humidity varying from 6 to 12.4% in the order celanese, cotton, linen, silk, wool, viscose. Mullen bursting strength tests upon samples of fabric in equil. with atm. of varying relative humidity showed a slight increase in strength for cotton and mercerized cotton with rising humidity. Linen increased 25% when wet. Other fabrics lose in strength as the humidity rises. These changes are temporary and the fabric reverts to its original strength when reconditioned at normal (70%) humidity. One % Na oleate soln at 60° decreases the strength of silk and wool, but has no further effect on rayon. The oleate soln weakens wool silk, and celanese to a greater extent than 1% Na_2CO_3 . T S C

Finishing cotton goods with activin-treated starch. RICHARD FEHDELMANN *Textilber.* 7, 144-6(1926).—Starch may be modified with activin rather than by fermentation, etc., and the process is easily controlled. E R CLARK

Studies on the action of starch-modifying agents. HALLER AND A HOHMANN *Textilber.* 7, 239-42(1926).—Some quant. viscosity data which show the superiority of activin to various diastase preps and other chemicals. E R CLARK

Use of the microscope in the textile laboratory. L. G. LAURIE *J. Soc. Dyers & Colourists* 42, 73-6(1926). L. W. RIGGS

Studies on the bacterial decay of textile fibers. II. A preliminary study of the deterioration of samples of artificial silk through the action of microorganisms. A. C. THAYSEN AND H. J. BUNKER *Biochem. J.* 19, 1088-91(1925), cf. Fleming and Thaysen, *C. A.* 15, 3556.—The rate of destruction of artificial silks by microorganisms varies considerably, being slowest in the case of cellulose acetate silk and quickest in the case of cuprammonium silk. III. The occurrence of humus compounds in deteriorated fabrics and the bearing of their formation on the origin of peat and coal. A. C. THAYSEN, W. E. BAKES AND H. J. BUNKER. *Ibid.* 20, 210-6(1926). Microbiological activity does not eliminate all the cellulose present in plant tissues decaying to form peat. Humic compds. obtained from peat consist of two varieties (a) one which yields a Cl deriv. similar to "natural humus" and (b) another which gives a Cl compd. closely related to the artificial humus compds. obtained when morg. acids act on carbohydrates or when cellulose fibers decay through aging. BENJAMIN HARROW

Use of aminohydroxystilbolic acids in the dyeing of skins (CASABURI) 29.

CHAPLET, A. Soies artificielles. 2nd edn. Paris, 1925. Gauthier-Villars. 267 pp.; 40 francs. Reviewed in *Rev. chim. ind.* 35, 96(1926).

KÖNIGSBERGER, CARL. Die deutsche Kunstseiden- und Kunstseidenfaserindustrie in den Kriegs- u. Nachkriegsjahren u. ihre Bedeutg. f. unsere Textilwirtschaft. Berlin: W. de Gruyter & Co. 172 pp. R. M. 5.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BÂLE. *Brit.* 237,872, Aug. 2, 1924. Aminoanthraquinone-acridone and -thioxanthone dyes are obtained by condensing a 1,3,5-triazine deriv. halogenated in the nucleus with a 4-aminoanthraquinone-4'-halo-1,2-thioxanthone or -acridone. Some of the products may be condensed with other compds. simultaneously or subsequently. They dye cotton from the vat in violet, blue, brown, green, gray and other shades. Numerous examples are given.

Vat dye. A. LÜTTRINGHAUS, H. NERESHEIMER and H. EMMER. U. S. 1,580,062, April 6. Benzanthrone is acted on by alkali metal alcoholate at such a high temp. (usually about 170° or higher) that the benzanthrone is substantially completely converted into a dye.

Dyeing apparatus. SMITH, DRUM & CO. *Brit.* 237,712, July 8, 1924.

Dyeing apparatus. H. M. DUDLEY. U. S. 1,577,311, March 16.

Dyeing apparatus. H. E. VAN NESS. U. S. 1,577,881, March 23.

Yarn-dyeing apparatus. J. SCHLUMPE. U. S. 1,579,956, April 6.

Apparatus for dyeing yarn. G. T. THOMAYER. U. S. 1,579,040, March 30.

Apparatus for dyeing or other treatment of hosiery or other fibrous materials.

H. M. DUDLEY. U. S. 1,577,315, March 16.

Apparatus for dyeing or other treatments of yarn in hanks or skeins. H. M. DUDLEY. U. S. 1,577,312 3-4, March 16.

Fast dyeings on wool. H. KRZIKALIV, H. KAMMERER and J. NÜSSELEN. U. S. 1,579,121, March 30. Wool or other animal fiber is charged with a sulfonated naphthalene deriv. such as 2-benzoylamino-3-hydroxynaphthalenesulfonic acid and then treated with a diazo compd., e. g., diazotized *m*-xylidine.

Designs on textile fabrics. HEBERLEIN & CO., AKT. GES. *Brit.* 237,009, July

29, 1924. Fabrics woven with "acetate silk" or the like and cotton, wool, silk, viscose, mercerized cotton, cuprammonium or nitrocellulose silk or with mixts. of these are printed with a resist such as glue, alc. shellac soln., a thickened soln. of Na_2CO_3 , K_2CO_3 , NaOH or KOH , and then treated with a solvent for the "unresisted" acetate silk such as CHCl_3 , acetone, pyridine or epichlorohydrin. The fabric may also be dyed or printed.

Dyeing or printing cellulose acetate. BRITISH DYESTUFFS CORPORATION, LTD., W. H. PERKIN and S. C. BATE. Brit. 237,739, Aug. 22, 1924. "Acetyl silk" is dyed in a neutral, acid or alk. dye bath or printed with "sulfato" compds. of monoazo dyes, preferably nitrated monoazo dyes. Numerous examples are given, including procedure for dyeing mixed goods.

"Viscose silk." A. KÄMPF. U. S. 1,579,711, April 6. Freshly spun "viscose silk" is subjected to a vacuum of sufficient strength to remove rapidly and completely the CS_2 from the fiber, and is afterward washed.

Viscose. H. DREYFUS. U. S. 1,578,588, March 30. A cellulosic material in association with caustic alkali is subjected to the action of CS_2 in C_6H_6 . The caustic alkali is used in not more than an equimol. proportion with the cellulose and the quantity of CS_2 is 0.2-0.5 of a mol. proportion.

Filaments and films from viscose. W. MENDEL. U. S. 1,576,529, March 16. Undesirable S compds. are removed from viscose products, after forming in an acid bath and before drying, by the action of Na_3PO_4 . U. S. 1,576,530 specifies pptg. viscose in an aq. soln. contg. NaHSO_3 and treating with Na_3PO_4 . U. S. 1,576,531 specifies pptg. by heat and treating with Na_3PO_4 .

Apparatus for acid-carbonization of textile materials. A. SHAW and B. SHARP. Brit. 237,713, July 9, 1924.

Weighting fibers. O. BERG and M. IMHOFF. U. S. 1,579,628, April 6. Silk or other fiber to be weighted is preliminarily weighted with Sn by any known method, which includes the use of a fixing bath, and is then treated with Pb acetate or other sol. Pb compd. to increase the weighting.

Lustrous fabrics. A. GELBERT. U. S. 1,578,981, March 30. An ordinary fabric such as cheese cloth or calico is treated with a soln. of a crystallizable salt such as CaBr_2 or other fireproofing salt and after drying is further treated with a gelatinous soln.

Degumming, bleaching and dyeing silk. H. B. SMITH. U. S. 1,578,933, March 30. A hot bath contg. H_2O_2 and a dye such as rhodamine B or the sky-blues 6-B is used for combined degumming, bleaching and dyeing treatment.

Mercerizing textile materials. F. B. VOEGELI. U. S. 1,577,393, March 16. The goods are subjected to hot caustic baths, squeezed and mangled, and then cooled and stretched.

Treating tow or other fibrous material with sulfur dioxide or other insecticidal gas and compressing it. J. E. LAPPEN. U. S. 1,577,240, March 16.

Absorbent fibrous composition. J. O. GOODWIN. U. S. 1,579,925, April 6. An absorbent material adapted for use in making footwear or floor coverings comprises cotton or other fibrous material and partially coalesced particles of prevulcanized rubber.

Rubberized felt. R. B. RUSSELL and H. BROOMFIELD. U. S. 1,579,890, April 6. Fibers are impregnated with rubber latex during a felting operation, the latex is coagulated, and the material is subjected to pressure and dried.

Hair felt. A. L. CLAPP. U. S. 1,577,955, March 23. A felt is formed of hair and a leather soln. which is pptd. on the hair, e. g., by use of alum and a soln. of scrap leather in caustic alkali.

Brattice sheeting. C. D. ABRAHAM. U. S. 1,577,890, March 23. A fabric such as duck or drill is impregnated with NH_4 phosphate to render it fire-resistant, and then coated on both sides with rubber, coal tar and natural bitumen.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Examination of anti-rust paint pigments and efficacy of pigments and varnish in rust prevention. P. HERRMAN. *Farbe u. Lack* 31, No. 3, 27 (1926).—A review of the report of the "Technical Research Council for the Underground Construction of Berlin," published in *Korrosion u. Metallschutz* 1, 80-4 (1925). A color film protects iron from rust as long as no water penetrates it. Measurement of water protection is made by elec. means with the aid of electrolytes, in that a current is set up when moisture reaches the iron. Under the conditions of the expt. clear linseed oil varnishes failed in 24 hrs.; linseed oil color films protected the metal one week. Varnishes contg. bodied oils

were more waterproof. China wood oil added to the linseed oil varnish increased the water resistance considerably. Various pigments and the influence of particle size are considered.

Color styles for industrial buildings. WILH. SCHWIETE. *Chem.-Ztg.* 50, 20 (1926).—Commending "Fixil," a silicate paint, as suitable for use in industrial districts because of its resistance to weather, fumes, soap and water, sunlight, etc. R. J. MOORE

Chemical colors. SEVIER BONNIE. *Drugs, Oils & Paints* 41, No. 10, 342 (1926).—An address. B. briefly reviews types and prepn. of paint pigments. R. J. MOORE

Determination of the covering power, density and granulation of paint pigments. W. REGLIN. *Z. angew. Chem.* 39, 334 5 (1926).—A paint film is coated upon gelatinized paper, this is placed upon a ground-glass plate over a box, 20 X 40 cm., in which is a 32-c. p. lamp. The whole is placed in a darkened room, and the light transmitted through the film is easily studied. This affords a means of comparing various pigments and vehicles, as well as detg. the most suitable method of applying the paint, or the type of brush to be used. Photographs of rust-proofing paint, green paint for Fe work and coal tar colors for masonry are shown. H. STÖERTZ

Phenol resins. OTTO BEHRENS. *Teer* 24, 129-30 (1926).—Mainly a reproduction of advertising matter. W. B. PLUMMER

The A B C of pyroxylin lacquer. F. W. FASIG. *Drugs, Oils & Paints* 41, No. 10, 337-40 (1925).—An address. R. J. MOORE

Natural and artificial resins. JOH. SCHEIBER. *Farbe u. Lack* 31, No. 7, 76; No. 8, 87; No. 9, 99; No. 10, 113 (1926).—A comprehensive review of production and chemistry of resins. R. J. MOORE

HENGST, GUIDO: **Rezepte und seltene Arbeitsweisen für Maler, Lackierer und Anstreicher.** Munich: G. D. W. Calley. 88 pp. R. M. 2 50.

Paint remover. S. ISHIZAMA. U. S. 1,577,824, March 23. A mixt. suitable for removing paint from automobiles comprises H₂O 1 125 gals., NaOH 1/2 lb., "lye" 1/2 lb., benzine 2 oz., 7% NH₃ soln. 2 1/2 oz., CHCl₃ 1 oz., lemon juice 2 oz. and corn starch 4 oz.

Luminous paint. SOC. LA LUMINESCENCE. Brit. 237,624, July 24, 1924. Luminous paint for making signs, etc. is applied to a backing of celluloid or other material which will remain inert to the constituents of the paint.

Enamel finish. G. J. NIKOLAS. U. S. 1,578,464, March 30. Lustrous particles such as bronze powder are set in a lacquer-like coating and in a similar overlying coating and an outer protecting layer covers these 2 layers.

Printing ink. J. H. CAUGHLAN. U. S. 1,578,582, March 30. Rosin 15 lbs., NaOH 2 1/2 lbs., and H₂O are boiled together and pptd. with a soln. of Al sulfate, thus forming Al resinate and gelatinous Al(OH)₃. This product is washed and ground while still wet with 24 lbs. of No. 00 lithographic varnish to produce a vehicle for printing inks.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Analysis of by-product fats. C. BERGELL. *Seifensieder Ztg.* 53, 153-4 (1926).—For purposes of standard methods of analysis for fats and oils B. proposes to distinguish sharply between ether exts. of fats before and after sapon., only the latter furnishing reliable results for total fat content. B. also cites a case in which by-product soy-bean oil yielded 90.4% by direct ether extn. and only 83.9% when the oil was boiled with acid before extn. with ether. P. ESCHER

Marine animal oils—sperm whale oil. EMILE ANDRÉ AND Mlle. TH. FRANCOIS. *Compt. rend.* 182, 497-9 (1926).—The characteristics of the fat obtained from the whale indicate that the fat is intermediate between the fats and waxes. It is a question whether these properties are characteristic of the whale oil itself or whether they are due to the cephalopods upon which it feeds. E. SCHERUBEL

Report of Color of Oil and Meal Committee, A. O. C. S. 1/24. DAVID WESSON. *J. Oil Fat Ind.* 1, 23-9(1925).—A study of the Lovibond and Eastman Colorimeters for the color grading of vegetable oils. H. S. BAILEY

Constituents of crude cottonseed oil. G. S. JAMIESON AND W. F. BAUGHMAN. *J. Oil Fat Ind.* 1, 30-4(1925).—Analysis of the acetone-insol. portion of settlings of crude cottonseed oil showed Cl 0.0, SiO_2 0.60, P_2O_5 6.14, SO_3 0.0, CaO 0.26, MgO 1.46, K_2O 1.79, Na_2O 0.33% and Fe trace. Some of the P and bases in the settlings are inorg. phosphates. A phosphatide related to vegetable lecithins was isolated in the form of its CdCl_2 salt from an alc. soln. of the settlings; this was sol. in Et_2O , m. $194-6^\circ$ with decompn. and contained 15.36% Cd , and 3.91% P . The phosphatide could be only partially extd. from crude oil by MeOH and was partly decomposed and extd. by H_2O at 55° . NaOH refining of crude oil removes almost all the P compds. H. S. B.

Ochna pulchra berries. A. W. FACER. *Rhodesia Agr. J.* 22, 566-72(1925).—The berries are borne abundantly once in 2 yrs. on large trees, which grow well on poor soil. The oil derived from them is considered to be as good or better than peanut or cotton seed oils for most purposes. They contd. 8.4% H_2O and 32.9% oil. Constants for the kernel, pericarp and whole berry oil are given. Those for the latter are $d_{4^\circ}^{25}$ 0.9121, m. p. $22.5-25.5^\circ$, acid value 13.8, sapon. no. 199.7, I no. 67, titer 41.4° . The expressed cake contd. H_2O 10.0 protein 12.65, oil 7.0, carbohydrates 58.0, fiber 9.8 and ash 2.55%. A. L. MEHRING

Method for the direct identification of rapeseed oil by isolation of erucic acid. A. W. THOMAS AND MORRIS MATTIKOW. *J. Am. Chem. Soc.* 48, 968-81(1926).—The soly. (and in some cases the d. of the soln.) of stearic, behenic and erucic acids and Mg erucate in EtOH and H_2O and of Pb erucate in Et_2O is reported; the acids were detd. at 0° and 10° ; the salts at 25° . These results indicate a satisfactory sepn. of the Mg erucate from other unsatd. Mg soaps and also the unreliability of anhyd. Et_2O as a solvent. There is but slight loss of Mg erucate in the presence of large amts. of stearic acid (96% recovery) but with equal amts. of erucic and oleic acids less than 50% of the calcd. amt. of erucic acid was recovered as the Mg salt. The complete sepn. of Mg erucate depends upon the time of cooling (not more than 24 hrs.), the amt. of available $\text{Mg}(\text{OAc})_2$ present in soln. (25 cc. of 0.81 M $\text{EtOH-Mg}(\text{OAc})_2$ per 10 g. oil) and the amt. of EtOH necessary to wash the insol. soaps. The catalytic reduction of erucic acid to behenic acid is discussed. The technic of the proposed quant. method for the sepn. of erucic acid is given in detail, by which method from 42.7 to 48.2% erucic acid were isolated from various samples of rapeseed oil; if an oil be analyzed by the proposed method and an acid product weighing about 44% and having a m. p. of about 26° , and I no. of about 73, a mol. wt. of 336, then the oil may be said to be a genuine, pure, refined rapeseed oil. Catalytic reduction should yield an acid product, to the extent of 35% of the amt. of the oil, m. $77-79^\circ$ after 2 fractional crystns. The method is applied to mixts. of rapeseed-olive and rapeseed-cotton-seed oils. The acid does not distinguish rapeseed from mustard seed oil, since both yield a large proportion of erucic acid. C. J. WEST

A study of activated fuller's earth. O. ECKART. *Z. angew. Chem.* 39, 332-4 (1926).—Activated earths increase the free fatty acid of vegetable and animal oils exposed to their decolorizing action. This cannot be remedied by washing, and neutralization with alkali reduces the bleaching power of the earths, in consequence of a reduction of the effective surface by the pptn. on it of Fe and Al hydrates. Addition of CaCO_3 and $\text{Ca}(\text{OH})_2$ somewhat decreases the acidifying action. By heating the earths up to 450° , to drive out all the H_2O , the bleaching effect is reduced only about 10%, but the acidifying action is considerably reduced. Thus soy-bean oil, which shows an acid no. of 0.2 before decolorization, when treated with an earth dried in the air, shows an acid no. of 0.39 after treatment, while an earth heated at 450° gave an acid no. of only 0.29. When heated above 500° the bleaching effect is much decreased. Complete decolorization is attained in 10-30 min. If the oils are in contact with the decolorizer longer than 30 min., they take up coloring matter again. H. STOBRTZ

The mechanical handling of palm-oil fruit. M. A. STIELTJES. *Bull. mat. grasses inst. colonial Marseille* 1925, 275-83. E. SCHERUBEL

Marseille soap perfumes—behavior of some chemical products and perfume essences in Marseille soap with a coconut oil base. G. DE BELSUNCE. *Bull. mat. grasses inst. colonial Marseille* 1925, 288-93.—Three tables giving organoleptic results of various perfumes are discussed. E. SCHERUBEL

Method for determining reaction velocity in the soap-boiling process. G. I. FINCH AND A. KARJYM. *J. Soc. Chem. Ind.* 45, 35-6T(1926).—The reaction mixt. sample is dild. with distd. H_2O to a definite vol., contg. 2-3% of sample, and 25 cc. satd. with

laCl, which grains out the soap and fat, leaving the free alkali in soln with the exception of that occluded by the grains. The mixt. is then titrated against standard acid with phenolphthalein. Near the end point some light petroleum is added to liberate the occluded alkali from the grains. The titration is then completed. The total alkali is obtained by titrating a sep. portion of the mixt. with methyl orange as indicator. The difference between the 2 readings gives the amt. of combined alkali and from the quantity required by the oil for complete sapon., the degree of sapon attained in the reaction mixt. can be calcd.

E. SCHERUBEL.

Stain-removing soaps. A. C. *Tiba* 4, 93, 95, 211-5 (1926) A no. of formulas are given.

A. PAPINEAU-COUTURE

Manufacture of scented soaps. COLOMBO. *Parfums de France* No 36, 38-47 Feb., 1926).—Descriptive.

A. PAPINEAU-COUTURE

The equilibria underlying the soap-boiling processes. The system potassium oleate-potassium chloride water. J. W. MCBAIN AND W. J. ELFORD *J. Chem. Soc.* 1926, 421-38; cf. *C. A.* 19, 2139. "The equil. between the various forms of a K soap are very similar to those for a Na soap. All the soap phases that exist in the 3-component system including salt are found in the simpler system, soap and water, where also their sep'n is spontaneous; that is, they 'salt out' in the absence of salt and may even be observed at room temp. The limits of the field of existence of isotropic liquid solns. of K oleate with and without KCl have been accurately detd. for temps. up to 210°. This single phase includes wholly crystalloidal solns. and ranges, at sufficiently high temps., from pure H₂O up to pure anhyd. liquid K oleate, the two being miscible in all proportions above 300°. Improvements in the methods of optical investigation have enabled progress to be made with the delimitation of the two important anisotropic liquids, neat soap and middle soap. Both neat soap and middle soap are typical conic anisotropic liquids."

F. L. BROWNE

The highest melting saturated acids of peanut oil (HOLDE, GODBOLE) 10.

Rendering animal fats. W. LAABS. U. S. 1,578,245, March 23. Material such as packing-house offal or garbage is heated at such low temps. and pressures as not to cause substantial disintegration, fats and oils are sep'd. before the H₂O content is reduced to 60% and the material is then disintegrated under steam pressure at temps. above 115° (the steam pressure being developed from the H₂O naturally present in the material). Disintegration is effected while the H₂O content is still above 17% and then, after further heating at subatm. pressure and at temps. below 115°, the solid residue is expressed to sep. residual fats and oils.

Purifying and decolorizing oils. H. I. KAUFFMAN. U. S. 1,579,326, April 6. The mineral leverrierite is used for treating oil after dissolving out acid sol. constituents associated with the mineral.

28--SUGAR, STARCH AND GUMS

F. W. ZERBAN

Sugar industry in western India. R. G. PADHYE. Dept. Agr., Bombay. Presidency. *Bull.* 116, 223 pp. (1924). A general discussion with comparative figures for other countries.

K. D. JACOB

Prevention of inversion in the sulfuring of raw juice. E. HADDON. *Intern. Sugar J.* 27, 445 (1925). It was pointed out by H. in 1904 that the glucose ratio of sulfured juices was always higher than that of unsulfured juices, which leaves no doubt as to inversion having taken place. In factories where the juices are first limed, then sulfured, the glucose ratio of the 2 juices remains the same, this being due to the neutralization of the H₂SO₄ which is gradually being formed by the oxidation of the H₂SO₄. On slightly limed cane juices 1% of SO₂ has no inverting action even at 50°. To prevent inversion in the factory it is only necessary to add some lime now and then to the sulfuring tank. Some destruction of sugar always results from heat when steam ejectors are used for drawing in air for combustion of the S and for forcing the acid into the juice. The only way to prevent this destruction is to isolate the top part of the Pb coil by means of a large cylinder of Pb, closed and soldered at the bottom to the coil.

W. L. OWEN

The physico-chemical properties of raw sugar and their significance for the raw sugar manufacturer and refiner. W. TAEGENER. *Deut. Zuckerind.* 51, 173, 176,

249-51(1926).—A general qual. discussion of grain size, hygroscopic moisture, purity, color, surface tension, alky. and their relation to refinery operations. W. L. BADGER

The question of undetermined losses. H. CLAASSEN. *Deut. Zuckerind.* 50, 1628(1925).—Reply to Gredinger (*C. A.* 20, 835); W. GREDINGER. *Ibid* 51, 168-9, 248(1926).

W. L. BADGER

The trend of research work in the sugar industry. I. A. KUKHARENKO. *Zapiski (Russian)* 1, 89-94(1924).

J. S. JOFFE

Sucrose crystallization. I. A. KUKHARENKO. *Zapiski (Russian)* 1, 173-84 (1924).—To crystallize sucrose at high temp. it is rarely possible to avoid the formation of cracks. The heating has to be done gradually. In taking out the crystals from the hot environment to a cooler the crystals are damaged; they are covered with a layer of the soln. and the process of crystn. is continued under new conditions; the crystals become dull; difficulties are encountered in manipulating supersatd. solns. at high temp. The appearance of the soln. is not always a true guide; centers of crystn. may appear which are not noticeable to the observer; it is necessary to decrystallize the soln. For this purpose the soln. at this point is heated for $1\frac{1}{2}$ hour at a temp. 20-25° higher. In sampling there is danger of contaminating the soln. with crystals from the air.

J. S. JOFFE

The application of the refractometer in selecting sugar beets. A. Z. ARKLIMOVICH. *Zapiski (Russian)* 1, 164-72(1924).

J. S. JOFFE

The role of a heat pump in sugar manufacture. M. D. ZURV. *Zapiski (Russian)* 1, 137-58(1924).—A theoretical discussion.

J. S. JOFFE

The accumulation of lime salts in the products of the beet-sugar industry. P. V. KRIZHANOVSKII. *Zapiski (Russian)* 1, 25-8(1924).—A loss of time in the process of the operations of sugar making brings about a higher CaO content; this is due to the rapid formation of org. acids. A high CaO content prevents the complete crystn. of the sugar.

J. S. JOFFE

Dextran in the products of sugar manufacture. I. I. DOKHLENKO. *Zapiski (Russian)* 1, 123-6(1924).—Dextrins are formed by fungi. The analytical procedure for dextrins is given.

J. S. JOFFE

ANDÉS, LOUIS EDGAR: Gummi arabicum und dessen Surrogate in festem und flüssigen Zustande. Wien: A. Hartleben. 183 pp. R. M. 4.

PRINSEN-GEERLIGS, H. C.: Zuckerrohr. Hamburg: Deutscher Auslandverl. W. Bangert. 123 pp. R. M. 5.

Purifying sugar solutions. K. URBAN. U. S. 1,577,389, March 16. Sugar solns. are filtered through a mass of natural or artificial zeolites or similar base-exchanging material until the soln. is enriched with alk. earth substances and then further filtered through additional material to remove alk. earths and other ashy substances and org. non-sugars.

Electroosmotic purification of saccharine juices. K. WOLF and E. LANGSTEIN. U. S. 1,577,669, March 23. An aq. saccharine soln. is subjected to the action of an elec. current with the soln. sepd. from the electrodes by semi-permeable diaphragms. The anodic diaphragm is formed of leather impregnated with quinone and the cathodic diaphragm of sail cloth.

Filtering sugar solutions or other liquids. C. V. ZOUL. U. S. 1,579,171, March 30. Clean liquid such as filtered solution under treatment is repeatedly circulated through a filtering app., followed by a gradual addition of a filter aid, such as diatomaceous earth, to the circulating liquid to form a bed of the filter aid on the filtering surfaces of the app. previous to filtration of the liquid to be treated.

Recovering calcium hydroxide in sugar purification. G. M. DRUMMOND. U. S. 1,580,024, April 6. In recovery of Ca(OH)₂ from cold sucrate obtained in a process of recovering sugar from molasses in the manuf. of sugar from sugar beets, the liquid mixt. is continuously introduced into pressure or vacuum thickeners from which clear liquid continuously flows. The ppt. is removed from the bottom and subjected to filtration and the filtering medium in the thickener is kept completely submerged at all times.

Beet sugar. E. E. NICHOLSON and R. B. BEAL. U. S. 1,578,463, March 30. Beet juice is treated with an excess of caustic lime and Na aluminate or other H₂O-sol. aluminate is added to ppt. portions of the excess lime and other hydroxides present. Floccular and granular ppts. are formed, filtered out and the filtered soln. is treated with CO₂ and again filtered.

Sugar recovery from molasses. C. DROUIDE. U. S. 1,579,090, March 30. Org.

impurities contained in molasses and sugary juices are pptd. and destroyed by monopyritic silicate, preparatory to sucrose recovery.

Refining sugar. C. STEFFEN. Brit. 237,861, July 31, 1924. In washing tri-Ca ucrate on the filter after filtration, 1-2% of fine sawdust, well-washed satn sludge, sand, oal or kieselguhr or other finely divided readily filterable substances are added to the washing H_2O (with or without decolorizing substances) to prevent formation of cracks and facilitate uniform washing.

Desugaring "muds" of sugar recovery. R. VACHIER. U. S. 1,578,220, March 23. A partially exhausted "mud" is treated with fresh H_2O and with a quantity of lime sufficient to cause coagulation and ext. the sugar content of the "mud." A clear sweet water is thus produced for use in the milling process and the "mud" is substantially desugared.

Clarifier for sugar solutions. R. VACHIER. U. S. 1,578,221, March 23.

Preserving sugar. W. L. OWEN. U. S. 1,579,387, April 6. Raw or unrefined sugar is inoculated with a small proportion of torulae yeast.

Conversion products from starch. J. M. WIDMER. U. S. 1,578,568, March 30. Starch is converted with hydrolyzing acid to the glucose stage, the hydrolyzing acid is neutralized in the presence of H_3PO_4 , pptd. impurities are removed by filtration, the liquor is treated with tannic acid, filtered to remove coagulated albuminoids and insol. inorg. salts, and then treated with C to remove excess tannic acid and coloring substances.

29--LEATHER AND GLUE

ALLEN ROGERS

Properties of shoe leather. I. Micro-structure. J. A. WILSON AND GUIDO DAUB. *J. Am. Leather Chem. Assoc.* 21, 193-8 (1926).—Description of technic and full-page photomicrographs of typical samples of the following kinds of shoe leather: vegetable-tanned calf upper, chrome calf upper, glazed kid, kangaroo, cordovan, buck, chrome side, suede, calf lining, sheep lining, shark upper, patent side, patent kid, patent colt, heavy chrome upper, chrome-tan army upper, vegetable tanned sole, and chrome sole leathers. **II. Chemical composition.** J. A. WILSON AND GEO. O. LINES. *Ibid.* 198-206.—Chem. analyses of the 18 leathers whose photomicrographs are pictured in paper no. I of the series. J. A. WILSON.

A possible explanation of the antagonistic action of neutral salts upon hide substance. K. H. GUSTAVSON. *J. Am. Leather Chem. Assoc.* 21, 206-16 (1926).—Thomas and Foster (C. I. 20, 123) found that hide protein is hydrolyzed by chlorides and preserved by sulfates. Proteins may be broken upon as complex polypeptides held together by forces of secondary valence. Chlorides show a marked tendency to form addn. compds. with polypeptides. Decompn. of the protein and dispersion follow the switching of the secondary valency forces of the polypeptides from each other to the neutral chlorides. Different salts arranged in order of their tendency to form stable compds. with amino acids and polypeptides showed a similar order for protein decompn. in the work of T. and F. J. A. WILSON.

Tanning with vegetable tannin. PIERRE LABADIE. *La nature* 54, 1, 172-5 (1926).—An illustrated description of operations on a large scale. C. C. DAVIS.

Tannin plants of Maquilung region. AURELIANO J. VILLANEVA. *Philippine Agr.* 14, 569-79 (1926). The bark, leaves, roots and fruits of 81 plants, belonging to 30 families were tested for tannin. Members of 14 families contained tannin and the results are tabulated. Six references are given. A. I. MEHRING.

Adsorption. XII. Adsorption of tannin and quebracho tannides by skin. P. N. PAVLOV. *Kolloid Z.* 37, 215-21 (1925). The adsorption coeff. (cf. C. I. 10, 760) of tannin by skin which had been macerated and then pressed dry depends in a high degree upon the vol. of the bath and the mass of the adsorbent. This suggests a chem. reaction between the tannin and the skin. The variation from a direct proportionality between the adsorption coeff. and the vol. and an inverse proportionality between the adsorption coeff. and the mass of the adsorbent suggests that the chem. process is accompanied by a diffusion of the tannin into the skin and by a distribution of the tannin between the 2 phases. The adsorption coeff. of the quebracho tannides by skin similarly treated showed less dependence upon the vol. of the bath and the mass of the adsorbent. The chief process was not a chem. reaction between the skin and the tannides but a distribution of the tannides between the 2 phases. The presence of H ion in the skin or in the soln. considerably increased the adsorption of the tannide. H. M. McLAUGHLIN.

The recovery and use of waste products. IV. J. B. C. KERSHAW. *Ind. Chemist* 2, 122-6(1926).—Outlines are given of methods now in use and methods suggested for the disposal or working up of the various liquid and solid wastes from *tanneries* (cf. *C. A.* 20, 634, 955). E. G. R. ARDAGH

Use of aminohydroxysulfonic acids in the dyeing of skins. V. CASABURI. *Boll. ufficiale* 3, 61-9(1925); *Chimie et industrie* 15, 271(1926).—The mordanting of leather with Cr compds., alum, tannins or metallic salts for dyeing with basic dyes does not readily give even colors; moreover, the astringency of even the mildest tannins modifies the grain and interferes with proper finishing. "H acid" (1-amino-8-naphthol-3,6-disulfonic acid) easily combines with metallic hydroxides used as mordants and allows of applying them to leather without any of the above drawbacks. The following formulas are given: H acid 100, Na phosphate 10, Cr sulfate 6; H acid 100, Na_2CO_3 100, KMnO_4 20, NaHSO_4 20, Rochelle salt 20; H acid 100, Fe^{++} sulfate 87, Na acetate 40, Na_2CO_3 30, NaHSO_4 60; H acid 109, Cu sulfate 78, Na acetate 40, Na_2CO_3 30, NaHSO_4 60. A. PAPINEAU-COUTURE

Cementing and vulcanizing rubber and leather sheets together (U. S. pat. 1,577,349) 30.

LAMB, M. C.: **Die Chromlederfabrikation.** Berlin: J. Springer. 268 pp. R. M. 20.

Finishing leather. J. B. WELCH and W. C. WELCH. U. S. 1,579,264, April 6. Degreased leather is humidified to restore the degreasing shrinkage, a layer of coating material such as a "patent leather" compn. is applied to the leather and the coating is dried under conditions so regulated as to counteract the tendency of the leather to shrink during the drying.

Electrosmotic purification of glue and gelatin. W. RUPPEL and K. WOLF. U. S. 1,577,660, March 23. An aq. soln. of the material is subjected to an elec. current with the soln. spnd. from the electrodes by diaphragms. The anodic diaphragm is of wool fabric impregnated with chromated gelatin and the cathodic diaphragm is of parchment.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Synthetic rubbers. I. I. SLOIM. *Rev. gén. caoutchouc* 1926, No. 19, 69.—Historical. C. C. DAVIS

Notes from a pioneer on Indian rubber from the latex. HENRY WICKHAM. *Trans. Inst. Rubber Ind.* 1, 304-7(1926).—Historical. C. C. DAVIS

The spraying of latex. R. DITMAR. *Rev. gén. caoutchouc* 1926, No. 19, 13-4. A new app. is described which is adapted for the concn. of latex on a large scale. It is characterized by the use of a current of hot air, under pressure and of very high velocity, which comes in contact with a stream of latex and disperses the latter in an extremely fine spray. This spray is then mixed immediately with hot air, and the concd. latex subsequently recovered. The system is described in detail and illustrated. C. C. DAVIS

Remarks on the work of Dr. Ditmar on the concentration of latex. E. A. HAUSER. *Caoutchouc & gutta-percha* 23, 13,046(1926).—Comments on an article by Ditmar (*C. A.* 20, 1338). C. C. DAVIS

Deterioration with time of crude and of vulcanized rubber. A. CHERBULIER. *Recherches et inventions* 6, 877-80(1925); 7, 102-7, 135-9(1926).—Critical review of the more important work published on the subject, with bibliography of 68 references. A. PAPINEAU-COUTURE

Factors influencing the plasticity of sole crepe (rubber). H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 7, 716-22(1925).—The spread of crepe rubber soles is due to the plasticity induced by machining, which has been held to rupture the protein films surrounding the particles of the rubber hydrocarbon. The behavior of rambong (*Ficus elastica*) and *Castillou elastica* rubbers, the particles of which have no skin, makes this hypothesis doubtful. The method and results of plastometer tests are described. B. C. A.

Tendencies in rubber compounding. WM. B. WINGAND. *Trans. Inst. Rubber Ind.* 1, 141-76(1926).—More comprehensive than *C. A.* 20, 840. C. C. DAVIS

The calendar in the rubber industry. W. G. MARTIN. *Trans. Inst. Rubber Ind.* 1, 177-90(1926). C. C. DAVIS

A new method for determining the quality of raw rubber. W. GREINERT AND J. BEHRE. *Kautschuk* 1926, 29-31.—The method depends upon the fact that the better the rubber and the less plasticized it is, the less the capillary action shown by its dispersions. A strip of filter paper (Schleicher & Schull No. 597 is recommended) 0.5 cm. wide and 14 cm. long is clamped to a vertical glass scale so that about 1 cm. of the strip projects below the scale into a C_6H_6 soln. of the rubber (0.5 g. per 100 cc.). The scale must be safely above the liquid, and to avoid evapn. the scale and paper are put in a closed test tube. The most reliable results are obtained by measuring not the max. height to which the liquid ascends, but the rate of ascent compared to the rate for the solvent alone. Readings may be taken each min. for 10 min. and the height plotted against the time. The rates are such that when plotted logarithmically, straight lines are obtained. The method not only shows clearly the differences between various types of rubber, but also reveals the progressive changes taking place when rubber is plasticized. In tests with different rubbers, the rate of capillary ascent of the liquid was slowest for first latex crepe and increased in the order: smoked sheets (highest quality), unsmoked sheets, *Ficus* crepe, guayule (Duro), light brown remilled crepe (native), C_6H_6 alone. The wide differences in rate are shown by the fact that after 10 min. the heights in mm. were approx. 7, 19, 21, 32, 48, 50, 100, resp. for the C_6H_6 in the order above. Increasing plasticity due to milling also manifests itself by a progressively increasing rate of capillary ascent. Based on the changes in rate, smoked sheets which were milled for 80 min. showed a relatively great change after the first 5 min., the changes being relatively small thereafter, and becoming progressively smaller. C. C. DAVIS

Research work on the plantations. B. J. EATON. *Trans. Inst. Rubber Ind.* 1, 112-22 (1925).—An English version of C. A. 19, 1962. C. C. DAVIS

Sulfur. EDWARD ANDERSON. *Trans. Inst. Rubber Ind.* 1, 171-6 (1925). See C. A. 19, 908. C. C. DAVIS

Gutta-percha. Its preparation and general properties. C. W. H. HOWSON. *Trans. Inst. Rubber Ind.* 1, 36-54 (1925).—See C. A. 19, 908. C. C. DAVIS

Influence of the fineness [of rubber] on the time of acetone extraction. SR. REINER. *Kautschuk* 1926, No. 1, 5-6.—Systematic expts. with fine Para rubber (unvulcanized) show that the time required for complete extn. of the Me_2CO -sol. resins depends upon the extent to which the rubber is subdivided for extn. Under the conditions used, which included agitation of the rubber, uniform distn. and condensation of Me_2CO and particles of rubber of 9 sizes from 6.8 to 18.1 mm. diam., the extn. was almost complete (2.49%) in 7 hrs. for the largest size and in 2 hrs. for the smallest size. Contrary to Spence and Scott (cf. C. A. 6, 430) moreover, there was no approach to "practical" extn. in 0.5 hr. The smallest size of particles gave 1.74% in 1 hr., 2.34% in 2 hrs. and 2.43% in 4 hrs. while the largest size gave 1.03% in 1 hr., 1.28% in 2 hrs., 1.63% in 3 hrs., 2.08% in 4 hrs., 2.28% in 6 hrs. and 2.12% in 7 hrs. Since the extn. was continuous rather than intermittent as with zeolite and H_2O (cf. Weigel and Steinhoff, *Z. Krist.* 61, No. 1, 2 (1925)) and since the process is irreversible, the resin is probably combined intramolecularly or additively and is not merely adsorbed by the rubber. Since rubber can adsorb large vols. of vapors and gases, the extn. may also be an exchange by the rubber resin for Me_2CO and not simply removal of the resin because of its soln. in Me_2CO . The results also indicate that by agitation of the rubber, the 8-10 hrs. usually prescribed for extn. may be reduced in technical work. C. C. DAVIS

Sodium fluosilicate as a coagulant. J. EDWARDS. *Bull. Rubber Growers' Assoc.* 8, 34-6 (1926), cf. C. A. 20, 511. Although *p*-nitrophenol enhanced the violet coloration to which the H_2OAc coagula from some samples of latex are liable, no such coloration took place in Na_2SiF_6 -coagula, with or without *p*-nitrophenol. Na_2SiF_6 prevented the formation of bubbles in smoked sheet. F. H. YORSTON

Sulfuric acid-rubbers. F. KIRCHHOFF. *Kautschuk* 1926, No. 1, 1-4.—A comprehensive review and discussion of earlier work by K. (C. A. 15, 960, 16, 1885, 17, 3112, 19, 2758). Work in progress on the action of concd. H_2SO_4 on latex is also described in a preliminary way. The product differs from that obtained from rubber in org. solvents, is yellowish white and crumbly and is converted to a tough mass by treatment with warm Me_2CO . It swells greatly in xylene and on prolonged boiling the greater part dissolves. On evapn. this soln. yields a tough yellowish brown, transparent mass, which has but little elasticity and tackiness and somewhat resembles synthetic dimethyl rubber. It fuses to a black pitch having when cold a lustrous fracture. With S_2Cl_2 the xylene soln. yields a stiff but fragile gel, which differs therefore from cold-vulcanized rubber. It is probable that the action of S_2Cl_2 on latex does not progress.

so far as its action on rubber in org. solvents, and it is possible that only the outer layer of the latex particles is attacked. The unchanged inner portion thus dissolves in boiling xylene. The product of the action of H_2SO_4 on latex has a potential value technically.

C. C. DAVIS

The acceleration of vulcanization by alkaloids. B. J. EATON AND R. O. BISHOP. *Malayan Agr. J.* 14, 8-12(1926).—In view of the accelerating action of the alkaloids of cinchona bark (cf. C. A. 17, 1350), 3 other alkaloids were tested for their activity. Cocaine, nicotine and hyoscyne failed to accelerate the cure of rubber-S (90:10) mixts. but emetine had a marked accelerating power even in very small amts., the optimum cure being reduced almost to $1/4$ its original time by the addn. of 0.0081%. This activity was further enhanced by the addn. of ZnO. Only small amts. of the alkaloids were used in the expts., the max. % of cocaine, nicotine, hyoscyne and emetine tested being 0.1, 0.45, 0.075 and 0.05. Since *Ipecacuanha* root and root bark contain these alkaloids, the attempt was made to utilize the accelerating action of the finely ground root and bark as a criterion of their value with respect to their alkaloid content. Though in general the rate of cure increased with the amt. of active alkaloid added by means of the root, no definite relation could be ascertained.

C. C. DAVIS

Investigations of native rubber. W. SPOON. *Arch. Rubbercultuur* 10, 29-83, 84-106(1926).—(In English). About 250 samples of native rubber from 6 residences of the Dutch East Indies were examd. Most of the samples were slabs which contd. 10-50% H_2O and frequently 10% earth and bark shavings. Adulteration with Jelutong rubber was detected in a few cases. The time of cure, the tensile strength and the viscosity of 96 crepes prepd. from the slabs were very similar to those previously found for fewer samples (cf. C. A. 19, 3035). Detailed information concerning the source, appearance and properties of the rubber is given.

F. H. YORSTON

Coagulation and mold prevention of smoked sheet rubber. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 8, 36-40(1926); cf. C. A. 20, 125, 311.—Vulcanization tests of rubber coagulated with $HOAc$ or Na_2SiF_6 , alone or with dinitrophenol or *p*-nitrophenol. The acceleration of vulcanization due to the latter partly compensates for the retardation due to the Na_2SiF_6 .

F. H. YORSTON

Crepe rubber prepared with different reagents. H. P. STEVENS. *Bull. Rubber Growers' Assoc.* 8, 77-9(1926).—Expts. with crepe similar to those reported in the preceding abstract.

F. H. YORSTON

The influence of disinfectants on the coagulation phenomena in Hevea latex. O. DE VRIES AND N. BEUMÉE-NIEUWLAND. *Mededeelingen van het Centraal Rubberstation* No. 48; *Gummi-Ztg.* 40, 1255-6(1926).—An abridged version of C. A. 20, 676.

C. C. DAVIS

The isoelectric theory [coagulation of latex] (HARDY) 15.

CHAPLET, A.: *Manuel de l'industrie du caoutchouc*. Paris, J. B. Baillière et Fils. 247 pp. Reviewed in *Rev. chim. ind.* 35, 97(1926).

Vulcanizing rubber. D. N. SHAW. U. S. 1,580,089, April 6. Rubber is mixed with a vulcanizing agent such as S, incorporated with a nitrocarbazole and with an activator such as ZnO or PbO and the mixt. is heated.

Lining pipes with rubber. C. C. LOOMIS and H. E. STUMP. U. S. 1,576,767, March 16. Pipes of water systems or for other purposes are coated internally with latex and the coating is coagulated, e. g., by blowing air through the pipes.

Dipped seamless rubber goods. G. VENOSTA. U. S. 1,579,169, March 30. A suitable former is dipped in latex to which S and a metallic oxide have been added, the H_2O present is evapd., an accelerator is introduced into the film thus obtained by absorption and vulcanization is effected.

Rubber composition. W. B. WEGAND. U. S. 1,578,875, March 30. A compn. adapted for making shoe soles, etc., is formed by mixing rubber with 60-100% its wt. of C or lampblack and with vulcanizing agents.

Rubber composition. M. M. HAW. U. S. 1,578,121, March 23. In forming shoe heels or other articles, rubber is slowly mixed with pulverized hard stone to coat the particles of stone with the rubber. Additional rubber is then incorporated with the mixt. together with substances for promoting vulcanization.

Cementing and vulcanizing rubber and leather sheets together. A. L. MURRAY. U. S. 1,577,849, March 16.

Wall covering of sheet rubber containing cotton threads. J. H. STEDMAN. U. S.

